DEVELOPMENT AND VALIDATION OF MODULES ON PERCENT AND RATIO FOR MATHEMATICS I

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of the Requirements for the Degree

Master of Arts in Teaching Mathematics

VALENTINA WANIWAN DACULA

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APPROVAL SHEET

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The Researcher,

VWD

D E D I C A T I O N

This humble work is lovingly and

sincerely dedicated to my dearest husband

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and to our children

VINCENT and GLAIZA

for their prayers, unfailing love

and inspiration.

Valen

ABSTRACT

The advancement of science and technology calls for upgraded mathematics instruction in accordance with standards to improve mathematics achievement of students to meet the demands of our present and modern technology. On the Reading Ease Score and Human Interest Score tests, it was found out that the developed module was fairly easy and appropriate for first year high school students and the module is interesting based on the results of the tests. The level of mathematical knowledge and experience of the experimental and control groups before the experimentation were the same as reflected in their pretest results. If the results of the pretest of the experimental group had been significantly different from the control group or vice versa, the improvement brought about by the method of teaching introduced may not be attributed to it fully but to the one group that is better than the other group at the beginning. There is a highly significant improvement in the performance of the students in the experimental group as reflected in their pretest and posttest results. This improvement was brought about by the modular approach of teaching the topic on percent and ratio. There is a significant improvement in the performance of the students in the control group as reflected in their pretest and posttest results. This improvement in the performance of the students may be attributed to the strategies used by the researcher such as lectures, discussions, seatwork, boardwork, exercises and short quizzes.

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CHAPTER 1

THE PROBLEM

Introduction

The cry of the government educational system at present is quality education. To meet this demand the educators of today are exerting efforts for the improvement of instruction in terms of modern techniques and instructional materials to enhance quality education.

One of the important learning areas in all levels of educational endeavor which require upgraded and effective teaching techniques and methodology on the part of the teacher in order to effect learning to its maximum is mathematics.

It is a common knowledge that mathematics is not everybody's favorite subject. In fact, it is one of the basic subjects in school that has always been labeled by the students as very difficult. Experience tells us that more often than not, it is the cause of many students' academic difficulties and majority of schoolers encounter failures in this subject.

The belief that the "the ability to do math is inborn" is erroneous (Smith, 1979:367). It is imperative that mathematics teachers recognize that the suitability of teaching methods has much to do with improving students'

achievement in mathematics. Math teachers should not just indifferently allow students to pass. The duty to improve mathematics learning should not just be blamed on too many teaching loads where the teacher no longer bothers to ascertain the learning progress of individual students and the extent to which the method of teaching that he is using works.

The advancement of science and technology demands that mathematics be properly taught. Mathematics teachers should be able to effectively teach the subject. They should be able to utilize alternative teaching methods, strategies and techniques. They must see and recognize this need for the progress in science and technology depends to a great extent on the effectiveness of mathematics teaching and learning.

As a response to the call for quality education through quality instruction and modern instructional materials, the researcher wants to help improve mathematics instruction by developing an instructional material which is self-contained and self-sufficient that could provide the students a chance to progress at their own rate and develop their potential capacities to the maximum. This is possible through an instructional material which could be managed independently by the students and thereby help them direct their own learning capabilities. This material which will cater to the varied needs and abilities of students in mathematics is a

module.

The researcher wishes to develop and validate modules on percent and ratio, based on relevance and applicability of the topics to real life situations of the first year high school students of Wright Vocational School.

Having been assigned to teach the subject for a number of years now, the researcher observed that the most difficult topic in the first year mathematics book for the students to learn is percent and ratio. So the researcher wants to help these students overcome their difficulties by developing a module which is made simple and easy to understand which they can read and study even without the presence of a teacher, like at home.

The researcher also believes that this module will be very helpful for the students in terms of overcoming their difficulties in this topic on percent and ratio, because the lessons in the module are being broken down to simpler lessons in such a way that every skill is learned one at a time from simple to complex.

Aside from being the most difficult to be learned by the students, the researcher believes that the topic is most applicable and relevant to students in real life situations in Wright Vocational School because they could apply their knowledge in their life situations especially because most of these students are coming from low-income families where

children are made to help their parents earn for their living by helping produce and sell farm products, during market days, or in other forms of income-generating activities which require knowledge of percent and ratio. Most of them are also made to purchase for the family needs. So, knowledge on percent and ratio is very important and useful. To the teacher, this would mean lighter work, thus, enabling him/her to give particular attention to the slow learners in the class.

Theoretical/Conceptual Framework

This study is anchored on a learning principle of John Dewey (1936:165) which states that learning takes place by doing. Learning through doing has long been recognized as sound educational procedure. The principle of self-activity in teaching means that it is the teacher's function to develop this quality in the individual by gradually placing more responsibility upon the learner for initiating and carrying through to a successful conclusion of the work that should be done.

This principle made possible maximum adjustment in terms of the individual needs, capabilities and interest. It is only in actual doing that a learner can fully grasp the meaning of the learning experience, like doing his own, thinking, analyzing, organizing, concluding and making his

own decision. It also enables each learner to progress at his own best rate or speed without hindering the progress of others.

This study comprises four stages as shown in Figure I on the next page, showing the conceptual framework of the study. The stages are: 1) Stage I - Development of module; 2) Stage II - Validation of the module; 3) Stage III - Output - Validated module in Percent and Ratio for Mathematics I; 4) Stage IV - Determining the readability level of the developed module.

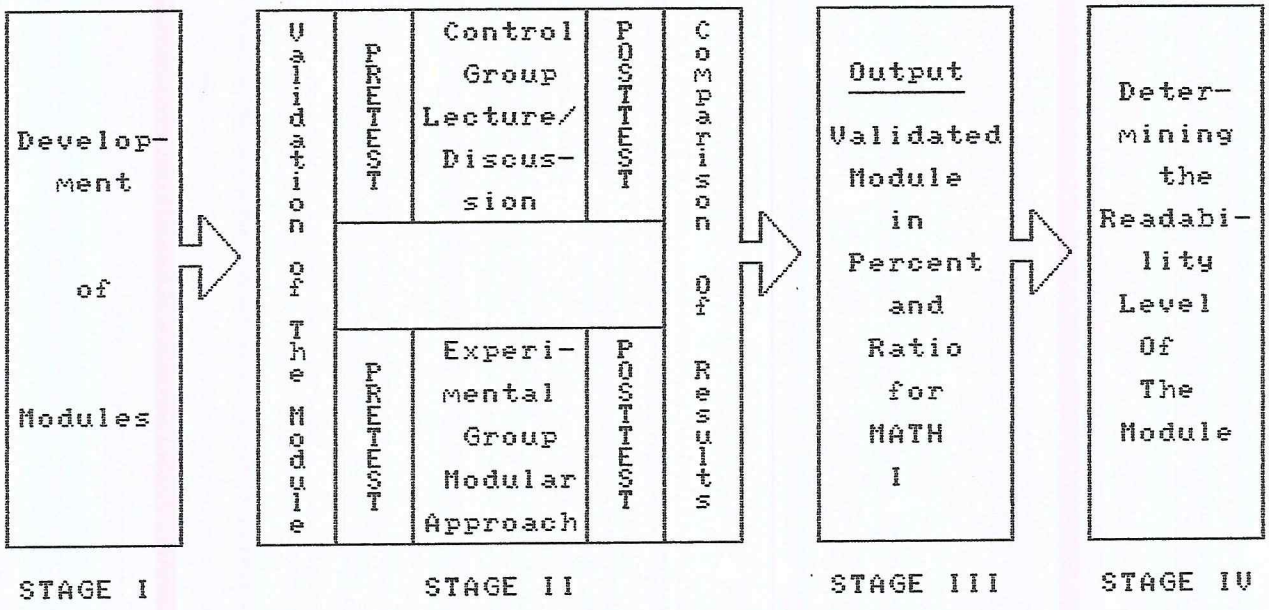


FIGURE 1: Schema of the Conceptual Framework of the study consisting of the Development, Validation and Readability test of the module.

Stage I in this study was the development of module in percent and ratio for mathematics I based on relevance and meaningfulness of the topics to real life situations.

The second stage of the study was validation of the module as shown in Figure I. It was started by giving first a pretest to both experimental and control groups. The results were expressed in terms of mean scores of both groups which were compared. After which, the module was tried out in the experimental group while the control group was taught using the traditional lecture/discussion method. A post test was given after teaching the lesson content in Percent and Ratio to both groups. Results of the pretest and posttest were compared to find out the performance of each group. Results of the posttest of both groups were compared to determine which method or approach was more effective.

Stage III of the study was the output or the validated module in percent and ratio.

The readability level of the module was determined in the fourth stage to find out if the developed module is appropriate to the first year high school students.

Statement of the Problem

The general problem of the study is: How can modules be best developed and validated to meet the needs and difficulties of students in high school mathematics I, particularly on the topics Percent and Ratio? Specifically,

the study aimed to answer the following questions:

1. What is the entry behavior in Mathematics of the first year high school students of Wright Vocational School, Paranas, Samar in Percent and Ratio for SY 1994-1995 in terms of:

1.1 math grades in Grade VI

1.2 pretest mean score

2. Is there a significant difference between the pretest mean scores of the experimental group and control group?

3. What are the posttest mean scores of the experimental and control groups?

4. Is there a significant difference between the pretest and posttest mean scores of the experimental group and control group in the same learning content?

5. Is there a significant difference between the posttest mean scores of the experimental and control groups?

6. Is the module appropriate to the respondents in terms of readability level?

Hypothesis

The hypotheses which this study aimed to test were:

1. There is no significant difference between the pretest mean scores of the experimental group and control group.

2. There is no significant difference between the pretest and posttest mean scores of the experimental group and control group in the same learning content.

3. There is no significant difference between the posttest mean scores of the experimental and control groups.

Significance of the Study

This study on development and validation of module on Percent and Ratio was undertaken with a hope that the findings would be beneficial to the students, teachers, parents and the educational system in general.

To the students, this module will develop independent learners. This will help develop their own potential and improve their learning capabilities through self-discovery and self-realization at their own rate. This will also provide the students a reading material for the subject matter in case of inavailability of references or textbooks due to scarcity of supply. For the students in the rural areas where they are made to help their parents earn a living for the family causing them to be absent from classes, students can learn the lesson even when they are absent in class, all they have to do is to have a module on hand to read and study to cope with the lesson recited in class.

To the teacher, the modular approach means a lesser task because he/she will not be preparing lesson plans anymore but instead he/she will have a logbook. Furthermore,

the teacher will not be exerting his/her energy in discussing or explaining the lesson so she could give particular attention to the slow learners. This will also mean a good reference and an additional source of information for the subject.

To the parents, this means that their children can learn the lesson even away from class, so, they can be made to help earn for their family living when the assistance of their children are necessary.

To the school administrator, the module provides a solution to the problem on increasing student population which creates shortage of classroom and buildings, textbooks, references and qualified and competent teachers, thus, this study could contribute to the development of better instructional materials and improve the quality of mathematical instruction in particular.

Scope and Delimitation

This study is limited to the development and validation of module in mathematics particularly on Percent and Ratio intended for the first year high school students of Wright Vocational School, Paranas, Samar for school year 1994-1995. The respondents of this study consisted of forty first year high school students presently enrolled at Wright Vocational School, which were selected through purposive random sampling technique based on their Mathematics grades in Grade Six.

Only those students with Math grades of 80 and above in grade six were used as samples of this study, considering that these students maybe mathematically literate particularly on the four fundamental operations in arithmetic. Of the forty first year high school students of Wright Vocational School taken as respondents, twenty students were assigned to the experimental group and another group of twenty students were assigned to the control group. This was done in order to have the two groups equated.

Definition of Terms

The following terms are defined to facilitate better understanding of this study.

Appropriateness. Refers to the readability level of the module as a whole as determined by using the Flesch formula.

Control Group. Is the group with which the experimental group is compared. This is the group that is subjected to traditional instruction, the lecture/discussion method.

Difficulties. Refers to the state or quality of being difficult or of presenting or constituting an obstacle to the achievement or mastery (Webster).

Entry behavior. Refers to the pretest mean score and math grades in grade six of the respondents.

Evaluation. Refers to the assessment and reactions of

selected groups of a set of criteria on how the module was prepared.

Experimental group. Is the group subjected to the modular instruction.

Flesch formula. Refers to the instrument used in determining the readability level of the developed instructional material. It consists of the human interest scores and reading ease score.

Mathematics I. Refers to course I in the New Secondary Mathematics program (SEDP Handouts, 1982) which deals with the basic concepts, knowledge, and skills in arithmetic, algebra, geometry, consumer mathematics, and statistics intended for the first year high school students.

Modular instruction. Refers to instruction that uses the module as an instrument in the teaching-learning process.

Module. Is a self-contained and independent unit of instruction with primary focus on well defined objectives (Creager and Murry, 1971:28). In this particular study the module developed is about Percent and Ratio.

Post test. Is the test given after instruction has been taken up or studied which aims to evaluate the students' achievement through the total application of skills and knowledge that have been sequenced for the module.

Pre-test. Is the test administered before the learning content of the module is given and/or taught to the

respondents to determine the extent of knowledge they have on the topic being modularized.

Readability. Refers to the state of being legible or easy and pleasant to read to the reading comprehensive level of the students (Webster, 1992). This is determined by evaluating the Reading Ease Score and Human Interest Score of the developed learning material or module using the Flesch formula.

Validation of module. Is the process of testing the effectiveness of the module.

CHAPTER 2

REVIEW OF RELATED LITERATURE AND STUDIES

This chapter consists of the review of related literature and studies related to teaching and teaching approaches with emphasis on modular approach and their effectiveness.

Related Literature

Butler and Wren (1965:206) said that instruction can be improved through a program of testing and associated activities. Mathematics teachers should be familiarized with ways in which they can make tests to contribute to the improvement of their teaching and in the selection and constructive uses of the results. Tests enable teachers to determine whether the goals of instruction are satisfactorily attained or not.

Harbison and Myers (1973:3-5) said that programmed teaching is teaching in which the instructor follows a prearranged plan or program in detail. The program describes not only what is to be taught but also specific procedures for teaching which have taken a number of forms, one of which is the modular teaching. The basic problem is to find new technologies of primary education which can be utilized effectively by low paid and less competent teachers.

Programmed teaching, specifically in modular instruction form is one such technology.

Soriano and Casareo (1975:206-212) said that the children have different learning abilities in mathematics. They differ in their attitudes towards numbers, some like computing numbers, others do not seem to like numbers as much. To help the majority of pupils, a new method of teaching called individualized instruction is being tried. This method hopes to improve the attitudes of most pupils towards mathematics. In this method, the classroom is a self-learning laboratory. The children are kept busy with the different activities. One advantage of this method is that it helps the slow learners in improving their attitude towards mathematics.

According to Creager and Murray (1971:28), a module is a self-contained and independent unit of instruction with a primary focus on a few well-defined objectives. The substance of a module consists of materials and instructions needed to accomplish these objectives. The boundaries of a module are definable only in terms of the stated objectives.

Murray himself felt that his definition was inadequate and he said that to be able to tell what a module is, would necessitate an analysis of a variety of modules.

Torralba (1983:24) observed that learning module is the answer to the needs of a developing country like the

Philippines with inadequate logistics for a rapid increasing school population. Through it instruction can be individualized and from it pupils and students learn even out of school.

Carin and Sund (1970:221) in a brief review of research program which considered individualized instruction have these to say:

1. Children do more collateral reading.
2. Problem on discipline are likely to decrease.
3. Gifted pupils achieve to a greater extent than with traditional group instruction.
4. Pupils achieve well in individualized classes.
5. Children prefer the individualized instruction over the traditional approach.

Hughes (1962:6) describes modular instruction as a special kind of individualized instruction which provides the basis for a class interaction between the learner and the subject matter. He said "The learner is called upon to respond frequently in the interaction with an instructional program and the rate at which instruction proceeds is governed individually by each learners responses. An education technique is then created in which difference among students in background and attitude are taken directly into account in the management of the learning process, in a way that is hardly possible in the fixed paced instruction

typical of the classroom".

Bautista (1978:17) defined module as a teaching system that is self-contained, self-pacing, and self-directing. The module provides for the student participation and allows him to repeat segment of the content until a maximum level of performance is achieved. The module therefore, could be a better medium for the integration of desirable values.

Collete (1973:519) stressed that the problem on individual differences is not solved by acceleration and retardation of grades because students who are given this form of treatment are faced with many social adjustment problems. He pointed out that opportunities can be provided with in the framework of a program to take care of individual differences of the students. Certain forms of groupings, independent work, and individualized instruction can be used for both rapid and slow learners when facilities permits.

McMillan (1973:166) said that individualization requires the teacher to assist the present functional level of every child and the selected tasks that are appropriate for each. It means a separate assignment for each child in the class, the range and abilities are so vast that to have an assignment in an academic area is to invite trouble. The teacher in keeping with the foregoing discussion, would assume the role of task collector, contingency arranger, reinforcement dispenser.

The review of related literature made the researcher aware of the importance of modular instruction to the educational system. It tells the advantages of modular instruction to the learners, the responsibilities of the teacher in preparing modules, and the presentation of mathematical instruction in modular form.

Related Studies

Development of instructional materials has been the subject of a large number of studies in the past. Most of these studies imply that the development of said materials can be attributed to the increasing need for relevant teaching. The survey and review of the related studies provided materials that served as a foundation for this study.

Avila (1984) developed modules based on some identified difficulties in College Algebra for freshmen students at Cebu State College of Science and Technology.

Her findings showed that the experimental group performed better than the control group based on the mean score of the posttest, hence, modular instruction is more effective than the traditional method.

She recommended that module should be accessible to students with identified difficulties.

In the study of Labro (1984) on "Development of Self-Instructional materials to meet Selected Deficiencies in

Physics of students in the BSIT Curriculum, Samar State Polytechnic College", he revealed that based on the findings of his study the developed instructional materials are more effective in attaining the objectives of the lesson whether for self-instruction or remedial purposes.

He also found out that the developed instructional materials are interesting and suitable for the respondents.

He recommended that instructional materials should be developed based on the difficulties or deficiencies of the students.

Perez (1984) in her study on "Development and Validation of Instructional Materials in the form of a Module based on the Identified Difficulties in Progression, a topic in Mathematics for Technology 201", found out that the mean performance of the experimental group was higher than the mean performance of the control group. This findings can be interpreted that the use of modules is more effective than the traditional method or the lecture method of imparting knowledge.

She concluded that modular instruction method is more effective than the traditional lecture method in imparting knowledge, for it encourage the students to learn the lesson independently without depending on the teacher's discussion.

She recommended that students with identified difficulties should be given learning materials like modules

to give them time to catch up with the lesson not well learned from classroom. She also recommended that workshop on module preparation and construction should be conducted to provide basic knowledge to teachers and should be motivated and supported to undertake further research on the effectiveness of modular instruction to improve teaching-learning process.

Soriano (1984) in his study on the "Deficiencies in College Algebra of BSIE students at the Bicol College of Arts and Trades: Module Development of Selected Results", found out that the experimental group got a much higher mean score in the post test rather than the control group. He then concluded that there existed a significant difference between the mean scores of the post test results of the experimental and control groups, indicating that modular instruction is more effective than the traditional instruction in attaining the objectives of the lesson.

According to Molina (1985) who conducted a study on the "Construction and Validation of Instructional Materials on the Three Identified Difficulties in Geometry of the Third Year High School Students", modular approach of teaching is relatively more effective than the lecture-discussion or the traditional approach of teaching.

She then recommended the use of module to meet the problem on individual differences and the need to produce

independent and self-directed individuals.

On the study of Nones (1985) on "Development and Validation of Modules on Selected Topics in Mathematics 102 (Trigonometry) for DIT students of the Nueva Vizcaya State Polytechnic College", she found out that the students who used the modules learned more than those students who used the lecture method.

She concluded that the use of modules produced significant difference on the scores of the students. In view of the said significant findings, she suggested that teachers should adjust instruction to the needs and characteristics of individual learner. Development and use of instructional materials like modules are strongly recommended to cope with these problems on deficiencies.

Roberto (1985) in his study on "Development and Validation of Modules on Students' Deficiency in Math for Technology 201 (Graphs)" found out that the posttest mean score of the experimental group was comparatively higher than the posttest mean score of the control group. He therefore concluded that the modular instruction can bring effective learning to students more than the traditional instruction.

He then recommended the use of modular instruction to students with above average intelligence as often as possible in order to maximize the learning process and output. For the average and poor students, modules can be used provided

that it will go hand in hand with traditional instruction.

Tuanda (1985) on his study on the "Construction and Validation of Modules on Selected Topics in College Trigonometry for DIT Students", revealed that the students who used modules achieved better than the students who learned through the lecture method.

He also concluded that modular approach is more effective than the lecture-discussion approach in teaching a lesson. So, he strongly recommended the use of modules in teaching.

Uy (1992) in her study on "Development and Validation of Modules on Circular Trigonometric functions and Fundamental Identities", found out that there was a significant amount of learning after the respondents were exposed to modularized instruction based on the result of the posttest. Her findings proved that the experimental group performed better than the control group in the posttest.

She then concluded that the modular approach or material centered instruction was more effective than the traditional lecture/discussion method.

She recommended the use of module for it serves as an effective remedial resource material for students.

Gordove (1993) in his study on "Effectiveness of Self-Learning Kits in Grade V Mathematics", revealed that the mean score of 26.2 of the experimental group in the posttest

compared with that in the control group mean score of 20.65 implies that the experimental group performed better than the control group. Hence, it can be said that individualized approach in teaching Geometry through self-learning kits to the Grade V pupils is better than the use of the traditional lecture method.

He therefore concluded that based on the findings of his study, teaching with the use of self-learning kits is more effective than the lecture/discussion method based on the result of the posttest. The experimental group performed better than the control group.

He recommended the use of self-learning kits since it develops proper mathematical abilities and skills in the pupils.

The studies conducted by Avila, Perez, Soriano, Molina, Nones, Roberto, Tuanda, Uy and Gordove have some similarities to the present study because they all make use of developed instructional materials as well as the pretest-posttest results in gathering the data needed in the study.

However, the present study differs from the studies cited above in terms of setting, place, and respondents. This study was conducted in the first year high school students of Wright Vocational School specifically on the topics Percent and Ratio for Mathematics I.

CHAPTER 3

METHODOLOGY

This chapter presents the method and procedures employed in the conduct of the study, including the research design, the statistical tools or instrument used in gathering the necessary data, the selection and description of the samples or research subjects and the statistical measures used in the treatment of data gathered.

The Research Design

This study used the experimental method of research using the pretest-posttest-control group design (Sevilla, et. al., 1988). The research design is illustrated in the table form below:

Table 1

Group	Pretest	Treatment	Posttest	Difference
Experimental	E_1	module	E_2	$D_e = E_2 - E_1$
Control	C_1	lecture	C_2	$D_c = C_2 - C_1$

Where:

E_1 = pretest of the experimental group

E_2 = posttest of the experimental group

C_1 = pretest of the control group

C_2 = posttest of the control group

$D_e = E_2 - E_1$ (difference between pretest and posttest mean scores of the experimental group)

$D_c = C_2 - C_1$ (difference between pretest and posttest mean scores of the control group)

The study used independent and dependent variables. The independent variable used was the treatment or the modular approach and the lecture/discussion methods of teaching the learning content on percent and ratio. The dependent variable was the achievement or the scores of the students.

The measuring instrument used to gather the necessary data from the respondents of the study was a self-made achievement test in Mathematics I. The achievement in Mathematics I was represented by posttest mean scores of the control and experimental groups. The posttest mean scores of the control and experimental groups were compared using the t-test for uncorrelated means to find out which group performed better.

Instrumentation

The data gathering instruments that were used in this study were the pretest, posttest, and the DECS form 138.

Pretest. The study used a 40-item teacher made test which was given to both experimental and control groups before each group was taught with the content of the module, using the modular approach for the experimental group and

lecture/discussion for the control group. A multiple choice type of test was used using knowledge, comprehension and application type of cognitive abilities based on the content of the module.

Posttest. The posttest in this study made use of the pretest which was rearranged and was given after the experimental and control groups were exposed to the respective teaching methods to determine the amount of knowledge acquired by the respondents from the particular topics on Percent and Ratio.

DECS Form 138. Another instrument which was used in the experimentation was the DECS Form 138, or the Students Progress Report Cards of the experimented subject. These forms were used to determine the mathematics grades of students for the randomization of choosing the members of the control and experimental groups. These forms were secured from the first year classroom advisers of Wright Vocational School in the month of August during the first semester, school year 1994-1995.

To validate the test instrument (pretest/posttest), an 80-item test was first constructed based on the table of specification prepared using knowledge, comprehension and application type of cognitive abilities based on the content of the module. Upon completion of the 80-item test, it was subjected to criticism and comments of some mathematics

teachers for the improvement of the constructed test. It aimed to establish the reliability of the test and to produce the final form of the test.

The said test was then administered to second year high school students of Wright Vocational School who already took the subject last school year 1993-1994. The test factors such as room, time and conduct of the test were taken into consideration to avoid bias in the test results.

After the try-out, answer sheets were corrected followed by item analysis. The following steps were undertaken by the researcher as suggested by Ebel (1965:346):

1. The answer sheets were arranged from the highest to the lowest score.

2. Two subgroups of answer sheets were separated, a high scoring of twenty-seven percent (27%) of the total group who received the highest scores in the test and low scoring group consisting of twenty-seven percent (27%) of the total group who received the lowest scores.

3. The number of correct responses per item of the high group scores were tabulated. The same was done separately for the papers of the low scores.

4. To compute for the difficulty index, the number of correct responses on both groups were added and expressed as a ratio to the number of cases on both groups. The quotient obtained was the index of difficulty. The formula used was:

$$P = \frac{U + L}{2\ (N)}$$

Where:

P = difficulty index

U = upper 27% of the test papers of students

L = lower 27% of the test papers of students

N = number of cases in each group

5. To obtain the Discrimination index of the item, the number of correct responses in the lower group was subtracted from the number of correct responses of the upper group and was expressed as a ratio to the number of cases in each group. The quotient obtained was the discrimination index.

$$D = \frac{U - L}{N}$$

Where:

D = discrimination index

U = upper group

L = lower group

N = number of cases in each group

The accepted indices of discrimination ranged from 0.30 and up. This acceptance was based on the item selection of Ebel (1965:374) as shown below:

Index of Discrimination		Item Evaluation
0.40 and up	-	Very good items
0.30 to 0.39	-	Reasonably good but possibly subject to improvement

0.20 to 0.29	–	Marginal items, usually needing improvement
0.19 and below	–	Poor items, to be rejected or improved by revision

As to the index of difficulty, Ebel's interpretations (1965:376) as shown below was used:

Index of Difficulty		Item Evaluation
86% - 100%	–	Very easy items
71% - 85%	–	Easy items
40% - 70%	–	Moderately difficult items
15% - 39%	–	Difficult items
1% - 14%	–	Very difficult items

The reliability of the test was computed using the Richardson Formula and interpreted based on the Interpretation given by Ebel (1965) as shown below:

Interpretation of the Coefficient of Reliability

Reliability	Degree of Reliability
0.95 - 0.99	Very high, rarely found among teacher's made tests.
0.90 - 0.94	Highly equaled by few tests.
0.80 - 0.89	Fairly high, adequate for individual measurement.

0.70 - 0.79	Rather low, adequate for group measurement but not very satisfactory for individual measurements.
Below 0.70	Low, entirely inadequate for individual measurement although useful for group average and school survey.

The test administered was revised based on the results of the item analysis of the test. The selection of items for the final 40-item test was based on the discrimination value of each item. Items with higher discrimination index were accepted, improved, and revised. The final form of the test included only items with 0.30 and above index of discrimination.

As implied by the index of discrimination of the items from the total number of 80 items developed, 35 items were retained, 5 were improved by revision, and 40 items were totally rejected for the final form of the test instrument. (Appendix G)

The final form of the test was used as the pretest instrument which was given to both experimental and control groups before each group was taught with the content of the module, using the modular approach for the experimental group and lecture/discussion for the control group.

Sampling Procedures

The samples of this study consisted of forty first year

high school students presently enrolled at Wright Vocational School. These samples were taken by purposive randomization technique. The mathematics grades of the students in grade six were the basis of distributing the members of the control and experimental groups. To avoid bias in the experimental results, the mathematics grades were matched or equated correspondingly to assure equivalency. The cards were secured from the first year classroom advisers.

After taking the forty samples, the researcher assigned the samples of the study to control and experimental groups by match-group technique with random assignment. The first twenty samples was the experimental group and the second group of twenty samples was the control group.

Data Gathering Procedure

The date gathering procedures in this study consisted the following:

1) Development of Modules. The module contained the following features:

a) Overview. This is a general statement about the subject or content of the modules, its relation to the previous lesson and its importance in the course or subject.

b) Direction for use. This is an information on the directions including the activities that the students will undertake while he/she is using

the module.

c) Objectives. This is the learning objectives for each lesson in every module.

d) Input. This is the subject matter or the new lesson for the student to learn which consist the discussion of the theoretical lesson and procedures in case of skill lesson together with necessary illustrations, including activities and exercises designed to apply the new knowledge.

e) Practice Task. This made use of the practice task on each lesson and the pretest/posttest.

f) Feedback to practice task. This refers to the answer key to the practice task.

2) Construction and Validation of the Pretest/Posttest tests. A table of specification was prepared based on the content of the module. An eighty-item multiple choice type of test was constructed based on the table of specification. The test items were shown to mathematics teachers for comments and suggestions for the improvement of the constructed test.

The said test was administered to second year high school students of Wright Vocational School who already took the subject last school year 1993-1994. The test factors such as room (clean and orderly and well ventilated), time

(start at the same time and finish at the same time), and conduct of the test (no cheating) were taken into consideration to avoid bias in the test results.

After the test was administered, the answer sheets were corrected, scored and item analysis was carried out to determine the discriminability of the test items. The eighty-item test was reduced to forty-item test.

The reliability level of the constructed test was determined by computing the coefficient of reliability using the Kuder-Richardson Formula 20.

3) Validation and Evaluation of the Readability of the modules. For the validation of the module, twenty first year high school students currently enrolled in Wright Vocational School was used as the experimental group. Another group of twenty first year high school students composed the control group. The experimental group was taught with the modular approach, while the control group was taught with the lecture/discussion method.

The researcher personally handled both groups. The subject was scheduled for forty minutes daily from September 19, 1994 to November 18, 1994. The schedule of classes for the subject was alternated every week. For the first week of the experimentation, the experimental group had their classes from 8:10 to 8:50 A.M., while that of the control group had their classes from 10:10 to 10:50 A.M. On the second week it

was the control group who had their classes from 8:10 to 8:50 A.M., while the experimental group had their classes from 10:10 to 10:50 A.M. This was done every week to control the time variable.

During the experimentation classes of both groups were held in only one room. The room was always kept clean and orderly, well ventilated and well lighted to control this variable.

Each member of the experimental group was provided with a module. Clear copies of each lesson was provided for the students to read clearly the content, while the control group was provided with a complete list of references for them to study the lesson discussed in class and for them to refer for their homeworks and assignments.

A pretest was given to both groups before they were exposed to the teaching methods. After teaching the content of the module using modular approach for the experimental group and lecture/discussion for the control group, a post test was given to both groups to evaluate the achievement of both groups on the learning content taught.

To determine the reading ease score (RES) and human interest score (HIS) of the module, the Flesch Formula was used.

To measure the reading ease score of the module the following steps were undertaken:

1. Choosing the sample pages - The samples were selected from 69 pages of the developed module in Percent and Ratio. Practice task, feed back to practice task, and title page were excluded. Thirteen pages were chosen at random representing 20% of the total number of pages. If the sample fell on a page without reading material, the next page having a reading matter was taken.

2. Counting the number of words. One hundred words were taken from each page by counting the first paragraph up to the 100th words. In samples where there are no new paragraphs, the first word of the sentence was considered. Figure captions, heading of the lessons, number, and title were not included in the counting.

3. Counting the number of Sentences. The total number of sentences in the 100th words in each sample were counted. If the 100th word fell after more than one-half of the words of the sentence, it was counted as one. Otherwise, it was not counted.

4. Counting the number of syllables. The syllables in the 100th words in each sample were counted. The syllables were counted the way the word is pronounced.

5. Finding the average word length. To get the average word length, the number of syllables in all the samples pages were divided by the total number of sample pages.

6. Finding the average sentence length. To get the average sentence length, the number of sentences in all the samples were divided by the total number of pages.

7. Solving for the reading ease score (RES). The formula for RES is:

RES = 206.835 - (1.015 x ave. sentence length + 0.846 x ave. word)

Statistical Treatment of Data

The reliability of the test instrument was determined by using the Kuder-Richardson Formula 20 given by Ferguson (1981) as:

$$r_{11} = \left(\frac{N}{N-1} \right) \left(\frac{S^2 - NP_q}{S^2} \right)$$

Where:

r_{11} = reliability coefficient of the test

n = number of items in the test

$P = \frac{\overline{X}}{N}$ = the proportion of the group passing an item and where X is the mean of the test scores.

q = 1 - p = the proportion of the group failing an item.

S = standard proportion of the test scores.

Statistical tools like the mean, standard deviation and the t-test for non-independent and independent samples were

used in treating the test results which were the basis of the formulation of the interpretation and formulation of the results or findings of the study.

The mean provided a concise description of the performance of the group in the pretest and posttest of the same group.

The standard deviation described the average distance of the individual scores from the mean in a given distribution.

To find out if there was significant difference between the pretest and posttest mean score of the experimental and control groups, the t-test for non-independent samples was used. The formula (Walpole, 1982) used was:

$$t = \frac{\bar{d}}{Sd/\sqrt{N}}$$

Where:

$\bar{d}$ = mean of the difference of the pretest as well as posttest scores.

N = number of pairs

Sd = standard deviation of the difference whose formula is:

$$Sd = \sqrt{\frac{N \Sigma d^2 - (\Sigma d)^2}{N (N-1)}}$$

To test the difference between the mean scores of the experimental and control group per pretest and posttest, the

t-test for independent samples was used whose formula is (Walpole, 1982):

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(N_1-1)\ S_1^2 + (N_2-1)\ S_2^2}{N_1 + N_2 - 2}\ (1/N_1 + 1/N_2)}}$$

Where:

$$S_1^2 = \frac{N_1\ \Sigma X_1^2 - (\Sigma X_1)^2}{N_1\ (N_1-1)}$$

Where:

X_1 = mean of the experimental group

X_2 = mean of the control group

N_1 = number of cases in the experimental group.

N_2 = number of cases in the control group

To determine the reliability level of the module the Flesch Formula was used. The formula is:

a) Reading Ease Score (RES) = 206.835 - (1.05 x average sentence length + 0.846 x average word length)

Where:

$$\text{Ave. sen. length} = \frac{\text{no. of words in all samples}}{\text{Total no. of sentences}}$$

$$\text{Ave. word length} = \frac{\text{no. of syllables in all samples}}{\text{Total no. of sample pages}}$$

b) Human Interest Score = (% personal words per 100 words x 3.635) + (% personal sentences x 0.314)

Where:

$$\% \text{ personal words} = \frac{\text{Total no. of personal words in all samples}}{\text{Total no. of words in all sample pages}}$$

$$\% \text{ personal sen.} = \frac{\text{Total no. of personal sentences}}{\text{Total sentences in all samples}}$$

CHAPTER 4

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter presents the statistical treatment made of the collected data, their subsequent analysis and their logical significance based on the results.

The data consist of mathematics grades in grade six of the respondents, pretest and posttest results of the experimental and control groups, computed t-test between the mean scores of the pretest and posttest of both groups and the Evaluation of the Readability level of the module.

Mathematics Grades in Grade Six of the Respondents

Table 2 shows the mathematics grades in grade six of the respondents of the study. The respondents came from the town proper of Paranas Samar, Motiong Samar, and their neighboring barangays.

The mathematics grades for the forty respondents were taken from DECS Form 138 or the Students Progress Report Cards. Students with mathematics grades of 80 and above were used as samples considering that these students maybe mathematically literate in the four fundamental operations in arithmetic.

Table 2

Mathematics Grades in Grade Six of the Respondents

Student No.	Experimental Group	Control Group
1	80	85
2	84	85
3	87	82
4	80	83
5	85	88
6	80	84
7	82	83
8	83	86
9	88	85
10	86	85
11	82	83
12	89	85
13	84	89
14	84	86
15	89	84
16	81	86
17	89	86
18	83	82
19	90	84
20	90	85
Average	84.8	84.8

As shown in the table above, both groups have an average grade of 84.8

Pretest Results of the Experimental and Control Groups

The researcher found out from the results of the corrected test papers of the pretest that both the experimental and control groups can only answer less than fifty percent of forty items.

Table 3

Pretest Results of the Experimental and Control Groups

Student No.	Experimental Group	Control Group	Difference
1	15	18	- 3
2	15	10	5
3	17	16	1
4	14	11	3
5	13	19	- 6
6	16	20	- 4
7	19	15	4
8	12	15	- 3
9	18	19	- 1
10	10	6	4
11	11	12	- 1
12	15	19	- 4
13	10	18	- 8
14	8	18	-10
15	14	16	- 2
16	12	18	- 6
17	21	15	6
18	20	10	10
19	15	10	5
20	17	13	4
	292	298	12
	$\bar{X}$ = 14.6	$\bar{X}$ = 14.9	$\bar{X}$ = 0.3

The data in Table 3 revealed that the pretest mean score of the experimental group is 14.6 and the control group is 14.9.

Difference Between Pretest and Post-test

This part of the study attempted to answer the problems concerning the difference between the mean scores of the

pretest and the mean scores of the post-test of the experimental and control groups. It also includes the analysis and interpretation of the findings.

Hypothesis No. 1: There is no significant difference between the pretest mean score of the experimental group and control group.

This hypothesis seeks to compare the performance of the experimental and control groups on the content of the module.

Result of the t-test between the Mean Scores of the Pretest of the Experimental and Control Groups

Table 4 shows the mean score of the experimental group was less than the mean score of the control group by 0.3.

Table 4

Result of the t-test Between the Mean Scores of the Pretest of the Experimental and Control Groups

Respondents	No. of Students	$\bar{X}$	S_1^2	Computed t	t value	Interpretation
Experimental Group	20	14.6	12.15			Not Significant
Control Group	20	14.9	15.57	0.25	2.042	

To test the hypothesis, t-test for independent samples was used. The table shows that the computed t was 0.25.

This value is less than the tabular value of 2.042 at .05 level of significance and at 38 degree of freedom. The difference has an absolute value of 0.3. Therefore, both groups have almost the same level of entry behavior or level of mathematical knowledge and experience based on their pretest mean scores. Therefore, the null hypothesis which states that there is no significant difference between the pretest mean scores of the experimental and control groups is accepted.

If the result of the experimental group had been significantly different from the control group or vice versa, the improvement brought about by the method of teaching introduced may not be attributed to it fully but to the one group being better than the other group at the beginning.

As shown in table 2, both groups have an average grades of 84.8. Therefore both groups have the same entry behavior or level of mathematical knowledge and experience based on their math grades in grade six. This further implies that the experimental and control groups had the same level of entry competencies in mathematics I.

Hypothesis No. 2: There is no significant difference between the pretest and posttest mean scores of the experimental group and control group in the same learning content.

This hypothesis is concerned with the problem of

comparing the pretest and posttest results of the experimental and control groups.

Posttest Results of the Experimental and Control Groups

The table below shows the posttest result of the experimental and control groups.

Table 5

Posttest Results of the Experimental and Control Groups

Student No.	Experimental Group	Control Group
1	33	21
2	24	18
3	25	17
4	27	16
5	31	20
6	26	24
7	35	23
8	28	21
9	36	20
10	26	24
11	23	25
12	30	26
13	21	20
14	16	24
15	20	25
16	16	20
17	38	26
18	38	23
19	18	18
20	23	22
	Σ = 534	Σ = 433
	$\bar{X}$ = 26.7	$\bar{X}$ = 21.65

Result of the t-test Between the Mean Scores of the Pretest and Posttest of the Experimental Group

As indicated in table 6, the mean score of the experimental group in the posttest which is 26.7 is higher than the pretest which is only 14.6. The difference in the mean scores were tested for significance by using the t-test for dependent samples.

Table 6

Result of the t-test Between the Mean Scores of the Pretest and Posttest of the Experimental Group

Test	$\bar{X}$	Sd	No. of Students	Computed t	t value	Interpretation
Pretest	14.6	3.48	20			
Posttest	26.7	5.08	20	10.65	2.093	Reject

The computed t of 10.65 is very much greater than the tabular value of 2.093 at .05 level of significance and 19 degree of freedom. Therefore, the null hypothesis which states that there is no significant difference between the pretest and posttest mean scores of the experimental group is rejected.

There is a highly significant improvement in the

posttest mean score of the experimental group from its pretest. Furthermore, the improvement or increase in the mean score of the posttest in the experimental group showed a significant amount of learning after the respondents were exposed to modularized instruction. The experimental group found modularized instruction more effective to attain the objectives of the lesson.

Result of the t-test Between the Mean Scores of the Pretest and Posttest of the Control Group

Table 7 shows the result of the t-test between the pretest and posttest mean scores of the control group. The mean score of the posttest which is 21.65 is greater than the mean score of the pretest which is only 14.9. The difference in the mean scores were tested for significance by using the t-test for dependent samples.

Table 7

Result of the t-test Between the Mean Scores of the Pretest and Posttest of the Control Group

Test	$\bar{X}$	Sd	No. of Students	Computed t	t value	Interpretation
Pretest	14.9	3.9451	20			
Posttest	21.65	4.63	20	6.49	2.093	Reject

The computed t of 6.49 is greater than the tabular value of 2.093 at .05 level of significance and 19 degree of freedom. Thus, the null hypothesis that there is no significant difference between the pretest and posttest mean scores of the control group is rejected. This means that a significant difference exists between the mean score of the pretest and posttest of the control group with the posttest being significantly higher than the pretest score.

The significant increase in the posttest may be attributed to the lectures, discussions, seatwork, boardwork, problem sets or exercises, assignments, and short quizzes. Therefore, the performance of the control group in the posttest was better than in the pretest, and that learning through the lecture method took place.

Hypothesis No. 3: There is no significant difference between the posttest mean scores of the experimental and control groups.

To test this hypothesis, t-test for independent or uncorrelated samples was used. Table 8 reflects the posttest results of both the experimental and control groups.

Table 8

Result of the t-test Between the Posttest Mean Scores of the Experimental and Control Groups

Respondents	$\bar{X}$	S^2	No. of Students	Computed t	t value	Interpretation
Exp. group	26.7	6.89	20			
Control group	21.65	3.01	20	3.00	2.04	Reject

The posttest mean score of the experimental group was 26.7 and 21.65 for the control group. The difference is 5.05. The computed t-value was 10.65.

The computed t of 10.65 was greater than the tabular t of 2.042. This led to the rejection of the null hypothesis in each case. This implies a significant difference between the mean scores of the posttest of the two groups. The result also indicated that the experimental group performed better than the control group in the posttest.

Therefore, the significant difference between the results in the posttest of the experimental and control groups substantiate the fact that Modular Approach in teaching mathematics is much more effective than the traditional lecture method.

The findings of the study supported the findings of

the study conducted by Avila, Labro, Perez and Uy that modularized instruction is more effective than lecture method in attaining the objectives of the lesson.

Evaluation of the Readability Level of the Module

The evaluation of the readability level of the developed module includes the test for appropriateness and how interesting the module was prepared.

Table 9

Result of the Reading Ease Score (RES) and the Human Interest Score (HIS)

RES	Interpretation	HIS	Interpretation
75.5501	Fairly Easy	25.0778	Interesting

Table 9 shows the result of the Reading Ease Score (RES) and the Human Interest Score (HIS) obtained from the different pages chosen as samples.

As reflected on Table 9, based on the RES value, the module was Fairly Easy and suited or appropriate for the first year high school students. The computed HIS interpreted to be interesting indicates the desire of the students to go through the module.

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter presents the summary, conclusion, and recommendations of the study.

Summary of Findings

The findings of the study are herein presented vis-a-vis the specific questions and null hypotheses already stated.

Based on the data gathered, the following results were obtained:

1. The average grades in grade six mathematics of the experimental and control groups are both 84.8 indicating that both groups, the experimental and control groups, have the same entry behavior based on their math grades in grade six.

2. The pretest mean score of the experimental group was 14.6 while that of the control group was 14.9. This indicates that the entry behavior or level of mathematical knowledge and experience of the respondents based on their pretest were almost the same or equal.

3. The computed t value of 0.25 is much lesser than the tabular value of 2.042 at .05 level of significant and 38 degree of freedom indicating the acceptance of the null hypothesis that there exist no significant difference between the mean scores of the pretest of the experimental and

control groups.

4. The computed t-value of 10.65 is very much greater than the tabular value of 2.093 at 0.05 level of significance at 19 degree of freedom, indicating the rejection of the null hypothesis, thus there is a significant difference between the pretest and posttest mean score of the experimental group. This indicates that the increase in the score of the posttest in the experimental group shows significant amount of learning after the respondents were exposed to modularized instruction.

5. The computed t-value of 6.49 is much greater than the tabular value of 2.093 indicating the rejection of the null hypothesis. This means that a significant difference between the mean of the pretest and posttest of the control group with the posttest being significantly higher than the pretest score.

6. The computed t-value of 3.00 is greater than the tabular value of 2.042. This led to the rejection of the null hypothesis in each case. Thus, there is significant difference between the mean score of the posttest of the two groups. The result also indicates that the experimental group performed better than the control group in the posttest.

7. On the Reading Ease Score and Human Interest Score, it was found out that the developed module was fairly easy

and appropriate for first year high school students and the module is interesting based on the results of the tests.

Conclusions

Based on the findings of the study, the following conclusions were drawn;

1. The experimental and control groups have more or less the same level of entry behavior or level of mathematical knowledge and experience.

2. The level of mathematical knowledge and experience of the experimental and control groups before the experimentation were the same as reflected in their pretest results. If the results of the pretest of the experimental group had been significantly different from the control group or vice versa, the improvement brought about by the method of teaching introduced may not be attributed to it fully but to the one group being better than the other group at the beginning.

3. There is a highly significant improvement in the performance of the students in the experimental group as reflected in their pretest and posttest results. This improvement was brought about by the modular approach of teaching percent and ratio.

4. There is a highly significant improvement in the performance of the students in the control group as reflected in their pretest and posttest results. This improvement in

the performance of the students may be attributed to the strategies used by the researcher such as lectures, discussions, seatwork, boardwork, exercises and short quizzes.

5. The modular approach of teaching is more effective than the traditional lecture/discussion method as far as the topic Percent and Ratio is concerned. This is true because the students can go through the module and learn its contents at his own rate, check and repeat some sections of his work if needed, discover processes and technique to learn the lesson until the feeling of self-satisfaction is attained.

6. The module is appropriate and interesting to the first year high school students.

Recommendations

Based on the conclusion, the following recommendations were made:

1. The developed module on Percent and Ratio should be used and evaluated in other schools to further confirm its effectivity.

2. Modular instruction is highly recommended to meet problems on individual differences and the need to produce independent and self-directed individuals.

3. Modules should be used to students with learning difficulties or slow learners to give them chance to catch up

with the lesson not well learned from classroom. However, this should go hand in hand with the traditional instruction.

4. Modular instruction should be used to students with above average intelligence as often as possible in order to maximize the learning process and output.

5. School Administrator/Officials should give full support and incentives to teachers who develop instructional materials for the improvement of classroom instruction.

6. Modular instruction is strongly recommended for it helps the students to learn to be independent, responsible, self-reliant and hardworking.

CHAPTER 6

THE MODULE

This chapter presents the module developed in this study.

The module developed in this study is Percent and Ratio. It consists the following:

1. An overview includes, the direction on how to use the module, the objectives which give the main goal of the module, its contents and the title page.

2. A series of lessons, each containing specific objectives, the input, practice tasks and the feedback to the practice tasks.

A pretest/posttest constructed and suited to achieve the objectives of the module should be taken before and after going over the module to determine the extent of learning the student has in the topics modularized, and to find out the extent to which the objectives of the module were attained.

The module contains the following lessons; Percent, Problems on Percent which was divided into three sub-topics namely: Percent Problem of Type A, Percent Problem of Type B, and Percent Problem of Type C; Computing Discount, Marked Price and Sale Price, Borrowing and Lending Money, Ratio, Equal Ratio or Proportion, and Problem Solving in Equal Ratio.

THE MODULE

THE MODULE

This module will show you how Percent and Ratio are very useful in many activities of man. Percent and Ratio can be expressed as fraction or decimals and are useful to real life situations especially in activities which involve percentages, interests, and taxes.

This module will also help you understand better the meaning, relevance, and applicability of the topics on Percent and Ratio even without the presence of a teacher. This will help you develop to be an independent learner by developing your own potentials and improve your learning capabilities through self-discovery and self-realization at your own rate. The lessons herein will help you develop the skill and processes needed in the application of the topics to real life problems. This is divided into 9 lessons, namely:

Module 1 Percent

Lesson 1 - Percent

Lesson 2 - Percent Problem of Type A (Finding the Percentage

Lesson 3 - Percent Problem of Type B (Finding the first factor or rate)

Lesson 4 - Percent Problem of Type C (Finding the second factor or base).

Lesson 5 - Computing Discount. Marked Price, and Sales price.

Module 2 Ratio

Lesson 1 - Ratio

Lesson 2 - Equal Ratio

Lesson 3 - Problem Solving in Equal Ratio

Each lesson has the following sequence of activities:

A. OBJECTIVES

These are the specific objectives of the lesson

B. INPUT

This contains the subject matter for you to learn.

C. PRACTICE TASK

This presents a series of tasks based on content of the input.

D. FEEDBACK

This contains the correct answers to the practice task.

HOW TO USE THIS MODULE

Here are the guides on how to use this module. Follow the instructions carefully in order to gain maximum benefit from this module.

1. This module is divided into 9 lessons. Each lesson is presented in a separate booklet.

2. The learning objectives are found on the first page in each lesson, read them carefully.

3. You must work through each lesson in the sequence

it is presented. After going through the INPUT, do the PRACTICE TASK. Look at the FEEDBACK TO PRACTICE TASK page only after you have completed the practice task.

4. Work as a memeber of the group whenever possible. When you cannot work in a group work on your own.

5. Begin working on the next lesson in the module only after you have completed the previous lesson in order that you can work on it step by step, and you are confident that you have achieved the objective of the lesson.

6. When you have successfully completed all the lessons in the module, answer the POSTTEST. After you have done the post test, compare your answer with the feedback provided. You must score 75% or better before proceeding to work any more module in this series. if you score less than 75%, review this module and do the exercise again.

OBJECTIVES OF THE MODULE

At the end of this module, you should be able to:

1. Change percent to decimal and or fraction.
2. Solve problems on percent
    a. Find the product or percentage (Type A Problem
    b. Find the first factors or rate (Type B Problem
    c. Find the second factor or base (Type C problem.

3. Compute for discount, marked price, and sale price.
4. Compute for interests.principal, interest rate and time for amounts borrowed.
5. Express relation of quantities as ratios or equal ratios (proportion).
6. Solve for the missing term of an equal ratio (proportion).
7. Solve word problems on ratio and proportion that are applicable to real life situation.

Pretest/Posttest Test in Percent and Ratio

Direction: Choose the letter of your best answer by writing it on your answer sheets.

1. Percent means:

   a. 100 c. 1/100

   b. 100/100 d. 10/100

2. The percent of a number is called:

   a. Percentage c. base

   b. product d. rate

3. In percent problem, n represents the:

   a. unknown c. product

   b. factor d. percentage

4. The regular price of an article is called:

   a. discount c. sale price

   b. marked price d. discount rate

5. A reduction in price of some items is called:

   a. discount c. sale price

   b. marked price d. discount rate

6. The discount expressed as percent number is:

   a. sale price c. discount rate

   b. marked price d. discount rate

7. The amount paid for the use of money is called:

   a. principal c. rate

   b. interest d. time

8. The percent of interest being charged on borrowed amount is:

a. rate c. interest

b. time d. principal

9. The relationship between two quantities or terms, which is usually used for comparison is:

a. percent c. fraction

b. ratio d. proportion

10. Which is the first term in the relation 2:8?

a. 2 c. both 2 & 8

b. 8 d. neither 2 & 8

11. An expression of equallity between two ratios is:

a. percentage c. equal ratio

b. proportion d. ratio

12. A sign used between the two ratio expression to indicate that one expression is equal to the other is

a. (:) c. (=)

b. ( ) d. (x)

13. Which of the following is the decimal equivalent of 15%?

a. 1.5 c. .15

b. .015 d. 15.

14. The percent form of .8 is:

a. 8% c. .15

b. 800% d. 80%

15. The fractional form of 2% is:

a. 2/10 c. 2/100

b. 20/10 d. 20/100

16. The percent form of 2 1/4 is :

a. 150% c. 225%

b. 200% d. 250%

17. 10% of 30 is equal to:

a. 3 c. 2

b. 30 d. 20

18. 100 is what percent of 200?

a. 20% c. 100%

b. 50% d. 200%

19. 5 is 10% of:

a. 100 c. 50

b. 10 d. 20

20. The discount of an album marked P150 with a 10% discount rate is

a. P10 c. P20

b. P15 d. P25

21. The sale price of a book marked P225 with P45 discount is:

a. P200 c. P180

b. P150 d. P270

22. The marked price of a blouse sold at P80 with a 20% discount is:

a. P90 c. P100

b. P110 d. P100

23. The interest of P500 at 12% per annum for 1 year is:

a. P50 c. P70

b. P60 d. P80

24. The principal with an interest of P60 at 10% per annum for 1 year is:

a. P500 c. P800

b. P600 d. P1000

25. The ratio of six cookies to a child is:

a. 1:6 c. 6:1

b. 3:2 d. 2:3

26. Which relation expresses the ratio of four buttons to twenty centavos?

a. 20:4 c. 1:2

b. 4:20 d. 2:4

27. A ratio equivalent to 3:8 is

a. 8:3 c. 9: 24

b. 3:24 d. 15:36

28. The value of n in the statement. 7/3 = n/15, is:

a. 15 c. 35

b. 21 d. 105

29. The missing term in the equal ratio, 5n=25:30 is

a. 8 c. 10

b. 6 d. 12

30. In a class of 40 students, 40 got perfect score in a test. What percent of the class got perfect?

a. 1% c. 50%

b. 10% d. 100%

31. Aida spelled 90% of 50 words correctly. How Many words were correct.

a. 30 c. 40

b. 20 d. 45

32. A calculator was sold at P400 with 20% discount. What was its marked price.

a. P600 c. P700

b. P500 d. P800

33. A toy car was originally marked P250. It was sold at P200. find the rate of discount

a. 25% c. 10%

b. 20% d. 15%

34. What rate of interest was imposed by the bank if P75 interest was paid for P500 borrowed for 1 year

a. 15% c. 10%

b. 5% d. 20%

35. Mrs. Roa paid the bank an interest of P50 at 10% per annum for 1 year. How much money did she borrow from the bank?

a. P1000 c. P1500

b. P500 d. P2000

36. There are 10 boys and 15 girls in the class. What is the ratio of boy to girls

a. 2:5 c. 3:5

b. 10:15 d. 15:10

37. A box contains 15 balls where 8 are yellow and 7 are red. What is the ratio of the red balls to the yellow balls in percent form

a. 87.5% c. 85%

b. 87% d. 80%

38. A bus having 34 seats has 30 passengers. What is the ratio of the number of seats to the number of passengers in fractional form?

a. 24/30 c. 1/30

b. 30/24 d. 1/24

39. Resty can type 150 words in two minutes. How many words can he type in 5 minutes.

a. 275 c. 375

b. 300 d. 475

40. Roberto is 6 feet tall and casts a shadow of 4 feet. How high is the flagpole, if it casts a shadow of 10 feet?

a. 10 ft c. 18 ft

b. 15 ft d. 25 ft

Module 1

Lesson 1

PERCENT

RELATIONSHIP BETWEEN DECIMAL PERCENT AND FRACTION

Introduction

This lesson deals with the conversion of percent to decimals and /or fractions and vice versa.

A percentage expresses a part of a whole number in terms of hundredths. A whole quantity can be divided into any number of equal parts, such as fraction or decimals. Simple interest, discounts, commissions and taxes are percentages used in business transactions.

Objectives:

After reading and studying this lesson, you should be able to ;

1. Define percent.
2. Express fractions and decimals as percents
3. Express percents as fractions and decimals
4. Display interest in changing percent to fractions and decimals.

You have just learned two ways of expressing parts of a whole, decimals and fractions. Fractions can be expressed as decimals and decimals can be expressed as fractions as what you learned in the previous lesson. This knowledge of changing fractions to decimals and decimals to fractions is very important in the next lesson which you are going to have. So you need to recall some points. Try to look back.

RECALL

The fraction 1/4 can be changed to decimal by dividing the numerator 1 by its denominator 4 as illustrated below:

$1/4 = 1 \div 4 = 0.25$ dividing 1 by 4 is like this

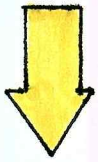
```
      0.25
    / ------
4/    1.00
      8
     -----
      20
      20
     -----
       0
```

So the fraction 1/4 can be written as decimal and is equal to .25 (twenty five hundreths). Likewise. decimals can be changed to fractions by simply writing it as a fraction and rename it in its simplest term.

For example, the decimal .25 can be changed to fraction by writing it as a fraction 25/100 (twenty five hundreth) and rename it in simplest form by dividing both the numerator and denominator by their greatest commom factor (GCF). Thus,

$$.25 = \frac{25 \div 25}{100 \div 25} = \frac{1}{4}$$

1/4 is the simplest form of 25/100.



INPUT

PERCENT

Percent means "out of a hundred", "by the hundred" or "for every hundred".

Percent is another way of writing a fraction whose denominator is 100. The percent sign (%) is used instead of the denominator 100. Thus, 40 out of 100 is 40/100 or 40% and 20% means 20 out of 100.

Percents are also very similar to decimals, we simply replace the decimal point in the hundreths place by a percent sign (%). The percent sign (%) indicate that the number is a part of 100. Thus, .14 (fourteen hundreths) becomes 14% (fourteen percent). Both expressions mean fourteen out of a hundred.

Because decimals, percent and fractions are simply different ways of expressing the same value, you can easily change percents to decimals, decimals to percents, percent to fractions, and fractions to percents.

CHANGING DECIMALS TO PERCENTS

To change decimals to percent, multiply by 100 or move the decimal point two places to the right and put the percent sign (%) at the end of the last digit.

Example 1. Change .15 to percent

Multiply by 100 or move the decimal point two places to the right.

.15 x 100 = 15 or .15 = .1 5 = 15

Drop or leave the decimal point and replace it by a percent sign (%). So,

.15 x 100 = 15% | Multiplying by 100 means moving the decimal point 2 places to the right

.15 = .1 5 = 15% < The decimal point belongs here. It was omitted

Example 2. Express .02 to percent

Multiply by 100 or move the decimal point two places to the right. Then drop or leave the decimal point.

.02 x 100 = 2 or .02 = .0 2 = 2

0 infront of 2 has no value, drop or leave it

Add the percent sign (%) Thus,

.02 = .0 2 = 2% or .02 x 100 = 2%

Example 3. Change .125 to percent

Multiply by 100 or move the decimal point two places to the right,and drop or leave the decimal point.

.125 x 100 =12.5 or .125 = .1 2 5 = 12.5

Add the percent sign.

.125 x 100 = 12.5%

or

.125 = .1 2 5 = 12.5% < The % takes the place of hundreths

Example 4. Express .8 as percent

Multiply by 100 or move the decimal point as in the above example.

.8 x 100 =80 %

or

.8 = .8 0 = 80% < Complete the 2 decimal places or hundreths place by adding 0 after 8.

Example 5. Change .543 to percent

.543 x 100 = 54.3% or

.543 = .5 4 3 = 54.3%

CHANGING PERCENT TO DECIMAL

To change percent to decimal, you reverse the operation of changing decimals to percents. Divide by 100 or move the decimal point two places to the left and drop or remove the percent sign (%).

Example 1. Change 15% to decimal

1. Divide by 100 or move the decimal point two places to the left. (Take note that the decimal point is

replaced by %).

15% / 100 = .15 or

15% = .15 % = .15 so 15% = .15 < Percent

Example 2. Express 2% as decimal

1. Divide by 100 or move the decimal point two places to the left.

2% / 100 = .02 or

Percent means hundreths >

2% = .02% = .02 so, 2% = .02 < hundreths means 2 decimal places.

Example 3. Express 12.5% as decimal

12.5% / 100 = .125 or

12.5% = .125

Example 4. Change 80% to decimal

80% / 100 = .8

Example 5. Change 32% to decimal

32% = .32 = .32

CHANGING FRACTIONS TO PERCENTS

To change a fraction to a percent. change the fraction first to its decimal equivalent. Then move the decimal point two places to the right and add the percent sign.

To change a fraction to its decimal equivalent. Divide the numerator by its denominator.

Example 1. Change 5/8 to percent

1. Change the fraction 5/8 to its decimal equivalent by dividing the numerator by its denominator.

$$\frac{5}{8} = 5 \div 8 = .625 \quad \text{<------}$$

```
      0.625
    /------
8/ 5.000
   4 8
   -------
     20
     16
    ------
      40
      40
   -------
         0
```

2. Change .625 to percent by multiplying by 100 or moving the decimal point two places to the right.

.625 x 100 = 62.5% so, 5/8 = 62.5%

Example 2. Express 3/4 as percent

1. Change 3/4 to its decimal form

$$3/4 = 3 \div 4 = .75 \quad \text{<-----}$$

```
      0.75
    /--------
4/  3.00
    2 8
    --------
      20
      20
    --------
         0
```

2. Change to percent and add % sign.

.75 x 100 = 75% so, 3/4 = 75%

Example 3. Write 4/5 as percent

$$4/5 = 4 \div 5 = .8 \quad \text{<------}$$

```
      0.8
    /------
5/  4.0
    4.0
   -------
         0
```

Example 4. Change $2\frac{1}{4}$ to percent

1. Change $2\frac{1}{4}$ to improper fraction by multiplying the denominator 4 by the whole number 2 and adding the numerator 1 as illustrated below.

$4 \times 2 = 8 + 1 = 9$, use 9 as your numerator and copy the denominator 4.

So, $2\frac{1}{4} = \frac{9}{4}$ $\qquad 2\frac{+1}{\times 4} = \frac{9}{4}$

2. Change 2.25 to percent by multiplying it by 100.

$2.25 \times 100 = 225\%$

Example 5. Change $1\frac{1}{2}$ to percent

1. Change to improper fraction

$1\frac{1}{2} = 2 \times 1 = 2 + 1 = 3/2$

2. Change 3/2 to decimal

$3 \div 2 = 1.5$

3. Change 1.5 to percent

$1.5 \times 100 = 150\%$ thus $1\frac{1}{2} = 150\%$

CHANGING PERCENTS TO FRACTION

By the definition of percent, it is a fraction with a denominator of 100. So, write percent as a fraction whose denominator is 100, and rename the fraction in simplest form.

Example 1. Change 2% to fraction. (This means 2 out of 100.

1. Write 2% to fraction whose denominator is 100.

$$2\% = \frac{2}{100}$$

2. Rename or change 2/100 to simplest term by dividing both the numerator and denominator by their Greatest Common Factor (GCF). GCF is 2.

$$\frac{2 \div 2}{100 \div 2} = \frac{1}{50} \qquad \text{so, } 2\% = \frac{2}{100} = \frac{1}{50}$$

Example 2. Express 15% as fraction (means 15 out of 100)

1. Write as fraction whose denominator is 100

15/100

2. Rename in simplest term by dividing both numerator and denominator by their GCF. GCF is 5.

$$\frac{15 \div 5}{100 \div 5} = \frac{3}{20} \qquad \text{so, } 15\% = \frac{15}{100} = \frac{3}{20}$$

Example 3. Write 50% as fraction (means 50 out of 100)

1. Write as fraction whose denominator is 100

50/100

2. Rename in simplest term (GCF is 50)

$$\frac{50 \div 50}{100 \div 50} = \frac{1}{2} \qquad \text{so, } 50\% = \frac{50}{100} = \frac{1}{2}$$

Example 4. Change 5% to fraction (means 5 out of 100).

$$5\% = \frac{5}{100} = \frac{1}{20}$$

Example 5. Express 75% as fraction

$$75\% = \frac{75 \div 25}{100 \div 25} = \frac{3}{4}$$

KEY POINTS

Percent is a fraction with denominator of 100. Here are the key points;

1. A fraction whose denominator is 100 can be written as a percent.

This is read : > $\frac{60}{100}$ = 60% < This is read:
sixty hundreths **sixty percent**

*** Percent means hundreths, or per hundred.**

2. If you can read a fraction whose denominator is 100, you can rename it as a decimal.

six hundreths --> $\frac{6}{100}$ = .06 <-- six hundreths

3. If you can read a decimal, you can rename it as a fraction.

seventy-three hundreths --> .73 = $\frac{73}{100}$ = <-- seventy-three hundreths

4. Since percent means hundreths, you can write a percent for a two place decimal.

.38 = 38 %

5. You can rename any fraction as a percent.

2/5 = ! ! %

2/5 means 5 / $\overline{2.00}$ <-- 2 is the same as 2.00

```
      0.40
    /-------
5 /  2.00
     2 0
    ------      then, 2/5 = .40 = 40 %
       0
       0
     -----
       0
```

* Percent means hundreths

* To rename a fraction as percent, first you write it as a decimal, then change decimal to percent by multiplying it by 100.

With this knowledge you learned in this lesson, you can now write expressions about percents in fractions, decimals and percents. Try to study carefully the following examples:

Example 1. Suppose there are 100 balloons, 20 of these are colored yellow. Express the relation of the yellow balloons to the number of all the balloons as (a) fraction, (b) a decimal, and (c) a percent.

Solution: Since there are 20 yellow balloons out of 100 balloons:

a.) the fractional representation is 20/100.

b.) the decimal representation

$$
\begin{array}{r}
0.2 \\
\hline
100 \,/\, 20.0 \\
20.0 \\
\hline
0
\end{array}
$$

c.) a percent, 20 out of 100 =

$0.2 \times 100 = 20\%$

Example 2. There are 50 students inthe class, 35 of them are girls. What part of the number of students are girls? Express this number as (a) a fraction, (b) a decimal, and (c) a percent.

Solution: a) a fraction 35/50

b.) a decimal, divide 35 by 50 = 0.70 or .7

c.) a percent, multiply 0.7 by 100 = 70%

Example 3. In a class of 20 boys, 8 are wearing shoes. Express the number as (a) a fraction, (b) a decimal, and (c) a percent.

Solution: a.) a fraction = 8/20

b.) a decimal = 0.40 or 0.4

c.) a percent = $0.4 \times 100 = 40\%$

From the example, we obtain the following table of equivalents

Percent	Decimal	Fraction
20%	0.20 or 0.2	20/100
70%	0.70 or 0.7	70/100 or 35/50
40%	0.40 or 0.4	40/100 or 2/5

PRACTICE TASK

Set A

1. Change the following decimals to percents;

   a.) .36 d.) .03

   b.) .4 e.) 4.5

   c.) 1.25

2. Express the following percents as decimals

   a.) 20% d.) 40%

   b.) 8% e.) 6.5%

   c.) 15%

3. Express the following fractions as percents;

   a.) 1/5 d.) 5/8

   b.) 4/5 e.) 3/5

   c.) 1/2

4. Change the following percents to fractions;

   a.) 70% d.) 80%

   b.) 9% e.) 25%

   c.) 50%

Set B

Look at the squares in the figure on page 83 and use the figure to answer the following:

1. How many small squares are there in the large square.
2. How many squares are shaded with vertical lines?
3. a) What fractional part of the large square

is shaded with vertical lines?

b.) What decimal part of the large square is this.

c.) What percent of the large square is this?

4. How many squares are shaded with horizontal lines?

a.) What fractional part of the large square is this?

b.) What decimal part of the large square is this?

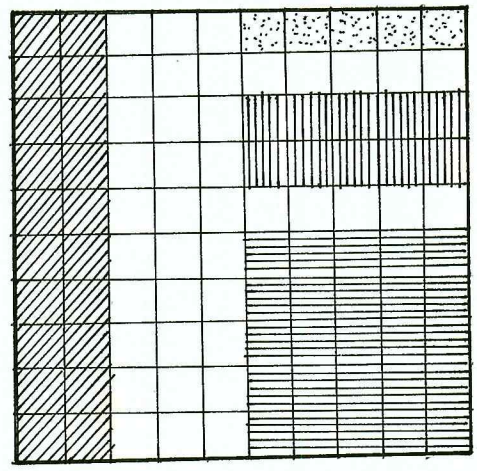
c.) What percent is this?

5. How many squares are shaded with small dots?

a.) What fractional part of the large square is this?

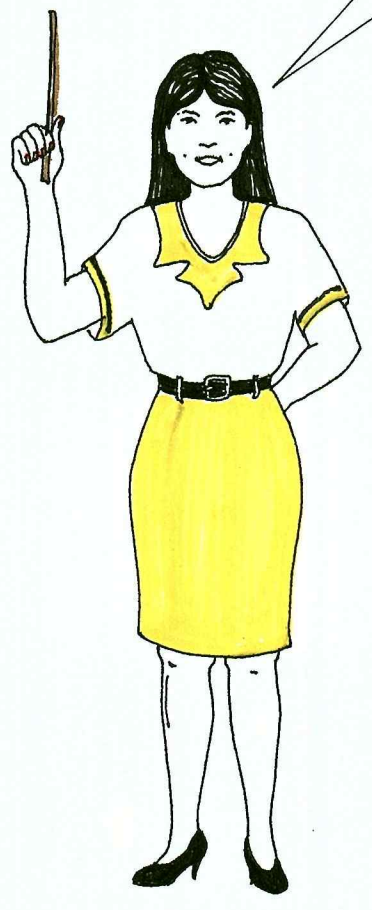
b.) What decimal part of the large square is this?

c.) What percent is this?



CONGRATULATIONS!!!

You have just completed lesson 1 of module 1. Ask for the answer key from your teacher and compare your answers with the solutions on the answer key. If you answered 75% of the PRACTICE TASK correctly, then you have achieved the objectives. If you did not get 75% of the PRACTICE TASK correctly, then you have to go back to lesson 1 and do the PRACTICE TASK again.



FEEDBACK TO THE PRACTICE TASK

Set A

1. Decimal to Percent

   a. 36% c. 125% e. 450%

   b. 40% d. 3%

2. Percents as Decimals

   a. .2 c. .25 e. .065

   b. .08 d. .4

3. Express fractions as percent

   a. 20% c. 50% e. 60%

   b. 80% d. 62.5%

4. Change percents to fraction

   a. 70/100 or 7/10 c. 50/100 or 1/2

   b. 9/100 d. 80/100 or 4/5

   e. 25/100 or 1/4

Set B

1. 100 small squares
2. 10 squares out of 100 squares are shaded with vertical lines.
3. a.) 10/100 b.) 0.10 or 0.1 c.) 10%
4. a.) 25 our of 100 squares are shaded with horizontal lines (25/100).

   b.) 0.25 c.) 25%
5. 5 out of 100 squares are shaded with small dots.

   a.) 5/100 b.) 0.05 c.) 5%

Module 1

Lesson 2

PERCENT

PERCENT PROBLEM OF TYPE A
(Finding the Product or Percentage)

PERCENT PROBLEM OF TYPE A

(Finding the Product or Percentage)

OBJECTIVE:

After reading and studying this lesson you should be able to:

1. Identify and illustrate percent problems of type A.
2. Find the product when the factors are given.
3. Solve percent problems of Type A.

In the previous lesson, you have learned that percent may be written as a decimal or as a fraction. This knowledge of expressing percent as fraction is very necessary because this will enable you to solve many different types of problems which you are going to take up or study in the next lessons. Study the following carefully....

INPUT

PERCENT PROBLEMS OF TYPE A

(Finding the Product or Percentages)

There are three types of problem involving percent. These are given in the following examples where [n] represents the missing number or the unknown.

Type A 10% of 30 = n Type B n% of 250 = 50

Type C 20% of n = 100

In these examples, three quantities are involved: two factors and a product. The general format or formula that you will be using here is:

$$Factor_1 \times Factor_2 = Product$$

or in the traditional method:

Rate x Base = Percentage

Let's study them one by one carefully

Type A. 10 % of 30 = n

Where: 10% - is the first factor (F_1) and represents the rate. Rate is the number of percent.

30 - is the second factor (F_2) and represents the base. Base is a number of which some percent is to be taken.

n - is the product and represents the percentage. Percentage is the number found by taking a certain percent of a number.

In this type of problem type A, since [n] is the missing number or the unknown, it is very clear that it is a product. You can find the value of [n] by multiplying 10% and 30, hence the word "of " between 10% and 30 represents the symbol for multiplication, "x" (times). So, change or translate the problem into symbols as:

10% x 30 = n

Take note that 10% and 30 are unlike terms, the other is in terms of percent, while 30 is a whole number. You can not multiply them immediately. First, you have to change 10% into it's decimal form before multiplying. So, from your knowledge in changing percent to decimal;

10% = 10÷100 = .10

.10 x 30 = n

3.0 = n

n = 3, therefore 10% of 30 is 3

Example 1. 20% of 60 = n

a.) Write in symbols

20% x 60 = n

b.) Change 20 % to decimal

20% = 20÷100 = .20

c.) Solve the equation

.20 x 60 = n

12.00 = n

n = 12 or 20% of 60 is 12

Example 2. Change 1.5% to decimal, that is 1.5% = .015

.015 x 100 = n

1.5 = n

n = 1.5, therefore 1.5% of 100 is 1.5

Example 3. n = 100% of P2000

n = 100% x P2000

Change 100% to decimal, that is, 100% = 1

n = 1 x P2000

n = P2000, therefore 100% of P2000 is P2000.

Example 4. What is 5 % of P500?

Take note that the word "What" represents the missing number, so this can be represented by "n". The word "is" represents the equal sign [=].

Write the problem in symbols as:

What is 5% of P500

n = 5% x P500

Solve: n = .05 x P500

n = P25.00

Example 5. $12\frac{1}{2}$ of P1000 is how much?

The word "how much" represents the unknown or the missing number. Represent this by "n". Thus

$12\frac{1}{2}$ of P1000 = n

Take note again that in solving problems in percent always change fractions to decimal before using any operation . So, change the fraction 1/2 to its decimal

form before solving the equation as;

1/2 = 1 ÷ 2 = 0.5

Thus, 12.5 % x P1000 = n

Change 12.5% to decimal, that is 12.5% = .125

.125 x P1000 = n

P 125.000 = n

n = P125

Example 6. Mother gaved Mario P250 for his allowance. She told him to spend 40% of it for food. How much is Mario going to spend for food?

In order to be able to solve the problem, it is necessary that you know the steps on problem solving. The suggested steps are the following:

1. Read and analyze the problem by identifying the given values or data and the missing value.
2. Form the equation by looking for some patterns or format and translate the phrases of the problem into mathematical symbols and sentences.
3. Identify the operation to be used.
4. Solve and check the result.

So to solve the above problem, you must be able to identify the given values. Remember that the values you need in solving problems on percent are the following:

a.) first factor (F_1) or rate which is expressed in %.

b.) second factor (F_2) or base, this is the whole quantity

c.) product or percentage.

It is very important that you can identify which of these values are given in the problem. Whatever value is not found or not given in the problem is the missing number. In this particular problem the given values are:

40% - this is expressed in %, therefore this is the first factor or rate.

P250 - this is the second factor or base.

Notice that the missing number is the percentage or product since, this is type A problem. So, to solve the problem do it as follows;

a.) Given: 40% - Ist factor or rate

P250 - 2nd factor or base

Missing value: Product or Percentage (n)

b.) Formula for Type A problem

$$Factor_1 \times Factor_2 = Product$$

c.) Substitute the formula with the given values

$$40\% \times P250 = n$$

d.) Solve the equation by performing the indicated operation: $.40 \times 250 = n$

$$100 = n$$

n = 100, is the amount to be spend for food.

To check the results or to find out if your answer is correct, substitute the formula with the corresponding

values as in the following

$$\begin{array}{rcl} F \times F & = & n \\ & & ? \\ 40\% \times P250 & = & 100 \\ & & ? \\ .40 \times 250 & = & 100 \\ & & / \\ 100 & = & 100 \end{array}$$

Since the left and right sides of the equation are equal or having the same value, therefore your answer is correct.

Example 7. A boy spelled 90% of 50 words correctly. How many words were correctly spelled.

Given: 90% - 1st factor or rate (F_1)

50 words - 2nd factor or base (F_2)

Missing Value: product or percentage (n)

Formula: $Factor_1 \times Factor_2 = product$

Substitute the formula with the given values

$$90\% \times P50 = n$$

Solve the equation by performing the indicated operation:

$$\begin{array}{rcl} .90 \times 50 & = & n \\ 45 & = & n \\ n & = & 45, \text{ words correctly spelled} \end{array}$$

Check: substitute the value of n in the formula

$$\begin{array}{rcl} F_1 \times F_2 & = & n \\ 90\% \times 50 & = & 45 \\ .90 \times 50 & = & 45 \end{array}$$

Example 8. The freshmen team won 80% of the game in the last intramural meet. If there were 25 games. how many games did they win?

Given: 80% - 1st factor or rate (F_1)

25 - 2nd factor or base (F_2)

Missing Value: product or percentage (n)

Formula: Factor x Factor = product

Substitute the formula with the given values

90% x P50 = n

Solve the equation by performing the indicated operation: .80 x 25 = n

20.00 = n

n = 20, no. of games the team won.

Check:. substitute the value of n in the formula

F_1 x F_2 = n

90% x 50 = 45

.90 x 50 = 45

PRACTICE TASK

Do the Practice Task:

A. Find the value of n

1. 30% x 60 = n
2. n = 20% of 50
3. n = 60% of 80
4. 150% of 80 = n
5. n = 125% of 100

B. Find the answer to each of the following

1. 15% of 60 is what number
2. 100% of 80 is how much
3. What is 5% of 30?
4. What is 200% of 20?
5. 50% of 4 is how much?

C. Solve each of the following problems completely,

1. In a class of 46, 50% were girls. How many girls were there in the class?
2. In a test of 80 items, a student answered 75% correctly. How many item did he answer correctly?
3. A team played 18 games and won 100%. How many games did the team won?

CONGRADULATIONS!!! You have just completed lesson 2. Ask for the answer key from your teacher and compare your answers with the solutions on the answer key. If you answered 75% of the PRACTICE TASK correctly, then you have achieved the objectives. If you did not get 75% of the PRACTICE TASK correctly, then you have to go back to lesson 2 and do the PRACTICE TASK again.

FEEDBACK TO PRACTICE TASK

A. Values of n

1.) n = 18 3.) n = 48 4.) n = 125

2.) n = 10 4.) n = 120

B Answer

1. 15% x 60 = n
   .15 x 60 = n
   9 = n
   n = 9

3. n = 5% x 20
   n = .05 x 20
   n = 1

5. n = 50% x 4
   n = .5 x 4
   n = 2

2. 100% x 80 = n
   .1 x 80 = n
   80 = n
   n = 80

4. n = 200% x 20
   n = 2 x 20
   n = 40

C. Answer to problem solving

1. Given: 50% - Ist factor; 46 - 2nd factor

   Missing: Product (n)

   Formula for Type I problem

   $Factor_1 \times Factor_2 = Product$

   Substitute: 50% x 46 = n

   Solve: .50 x 46 = n

   23 = n

   n = 23, there were 23 girls in the class

2. Given: 75% - Ist factor; 80 items - 2nd factor

   Missing: Product (n)

   Formula for Type I problem

$F_1 \times F_2 = n$

Substitute: 75% x 80 = n

Solve: .75 x 80 = n

60 = n

n = 60, correct answers

3. Given: 100% - Ist factor;

80 games - 2nd factor

Missing: Product (n)

Formula for Type I problem

$F_1 \times F_2 = n$

Substitute: 100% x 80 = n

Solve: 1 x 80 = n

n = 80, games won out of 80

Module 1

Lesson 3

PERCENT

PERCENT PROBLEM OF TYPE B

PERCENT PROBLEMS OF TYPE B

(Finding the first factor [F_1] or Rate)

OBJECTIVES

After reading and studying this lesson you should be able to :

1. Identify and illustrate percent problem of type B.
2. Find the quotient when the product and one of the factors is given.
3. Solve problems of Type B.

You have already learned one type of problem on percent and that is finding the product or percentage. This time you are going to study the second type of problem on percent which is finding the First Factor (F_1) or rate. Study each example carefully. GOOD LUCK!!!

INPUT

PERCENT PROBLEM OF TYPE B
(Finding the First Factor (F_1) or Rate)

Type B

n% of 250 = 50

where: n% - is the first factor or rate

250 - is the second factor or base

50 - is the product or percentage

From the general format, $Factor_1$ x $Factor_2$ = Product or from the traditional, Rate x Base = Percentage, you can see that the missing number is the first factor or rate. Reformat the formula in such a way that the unknown is on one side of the equality sign [=], preferably on the left side, and the given values on the other side [right] of the [=] sign. So your formula for Type B problem is:

First Factor (F_1) = product : second Factor (F_2) or

$$F_1 = P \div F_2$$

Where: F_1 = Ist factor or n%

P = product

F_2 = 2nd factor

or Rate = Percentage $\div$ Base

$$R = P \div B$$

Hence, to solve Type B probelm do it this way;

n% of 250 = 50

n% x 250 = 50

n% = 50 / 250 (divide)

n% = 0.2 (change 0.2 to percent by multiplying by 100)

n = 0.2 x 100

n = 20%, so 20% of 250 = 50

Example 1. n% of 100 = 10

n% of 100 = 10

n% x 100 = 10

n% = 10 / 100 -> divide

n% = 0.1 (change 0.1 to percent by multiplying by 100)

n = 0.1 x 100

n = 10%, so 10% of 100 = 10

Example 2. 60 = n% of 240 (change to general form)

n% x 240 = 60

n% = 60 / 240 (divide & change to percent)

n = 0.25 x 100

n = 25%

Example 3. What percent of 50 is 20 (change to symbol)

n% x 50 = 20

n% = 20 / 50

n% = 0.4

n = 0.4 x 100

n = 40%,

Example 4. 125 is what percent of 500?

125 = n% x 500

n% = 125 / 500

n% = 0.25

n = 0.25 x 100

n = 25%

EXample 5. 36 is what percent of 48?

36 = n% x 48 n = 0.75 x 100

n% = 36 / 48 n = 75 %

n% = 0.75

Example 6. John took a 50-item test in Mathematics I. He got 45 correct answers. What percent of the test did John answered correctly?

Again, to solve the problem you have to go through the suggested steps in problem solving as in the previous lessons. You have to identify the given values and the missing value. Remember again that the values you need in solving problem are the following:

a.) first factor (F_1) or rate which is expressed in %.

b.) second factor (F_2) or base, this is the whole quantity.

c.) product or percentage

In this particular problem the given values are:

50 items test - 2nd factor or base

45 correct answer - product or percentage

Notice that the number in percent is not found in the given values of the problem, therefore this is the missing

number.

Missing Value : first factor or rate (%)

Formula: n% = product ÷ second factor

Substitute the formula with the given values:

n% = 45 / 50

n% = 0.9 (change to percent by multipying it by 100)

n% = .09 x 100

n% = 90%, John answered 90% of the test correctly.

Example 7. Robin's team scored 18 out of a total of 20 points in a game What percent of the total number of points is the score of Robin's team?

Given: 18 - product or percentage

20 points - second factor or base

Missing: first factor or rate (n%)

Formula of Type B Problem

n% = product / second factor

Substitute the formula with the given values:

n% = 18 / 20

n% = 0.9 (change to percent by multipying it by 100)

n% = .09 x 100

n% = 90%, therefore, 18 is 90% of 20

Example 8. Marsha earned P25.00 commission or share from selling P250 worth of newspaper. What percent was her share?

Given: P25 - product or percentage

P250.00 - second factor or base

Missing: first factor or rate (%)

Formula of Type B Problem

n% = product / second factor

Substitute the formula with the given values:

n% = P25 / P250

n% = 0.1 x 100

n% = 10%, therefore, 25 is 10% of P250

PRACTICE TASK

Do the Following Exercises

A. Find the value of n

1. n% x 80 = 20
2. 75 = n% of 100
3. 5 = n% of 50
4. n% of 40 = 8
5. 7 = n% of 35

B. Find the answer to each of the following:

1. 60 is what percent of 300?
2. What percent of 200 is 50?
3. 6 is what percent of 24?
4. 16 is what percent of 16?
5. 25 is what percent of 125?
6. What percent of 5 is 3?
7. 9 is what percent of 36
8. 16 is what percent of 6
9. 100 is what percent of
10. 48 is what percent of 1

c. Solve each of the following problems completely:

1. In a class of 44 students 22 are boys. What percent of the class is made up of boys?
2. On a rainy day only 27 pupils out of 45 were present. What percent of the class was present?
3. The San Juan's monthly income is P4000. They pay P800 for rent. What percent of their income is used for rent?
4. A newspaper boy had 80 Sunday papers to sell. He sold 68. What percent of his Sunday papers did he sell?

CONGRATULATIONS!!! You have just completed lesson 3. Ask for the answer key from your teacher and compare your answers with the solution on the answer key. If you answered 75% of the PRACTICE TASK correctly, then you have achieved the objectivs. If you did not get 75% of the PRACTICE TASK correctly, then you have to go back to lesson 3 and do the PRACTICE TASK again.

FEEDBACK TO PRACTICE TASK

A. 1. n = 25% 3. n = 10% 5. n = 20%

2. n = 75% 4. n = 20%

B. 1. 60 = n% of 300

n% = 60 / 300

n% = 0.2

n = 0.2 x 100

n = 20%

2. n% of 200 = 50

n% = 50 / 200

n% = 0.25

n = 0.25 x 100

n = 25%

3. 6 = n% of 24

n% of 24 = 6

n% = 6/24

n = 0.25 x 100

n = 25%

4. 16 = n% of 16

n% of 16 = 16

n% = 16 / 16

n = 1 x 100

n = 100%

5. 25 = n% of 125

n% x 125 = 25

6. n% of 5 = 3

n% = 3/5

n% = 0.6

n = 0.6 x 100

n = 60%

7. 9 = n% of 56

n% x 36 = 9

n% = 9 / 36

n = 0.25 x 100

n = 25%

8. 16 = n% of 64

n% x 64 = 16

n% = 16 / 64

n = 0.25 x 100

n = 25%

9. 100 = n% of 50

n% x 50 = 100

n% = 100 / 50

n = 2 x 100

n = 200%

10. 48 = n% of 12

n% x 12 = 48

n% = 25 x 125 n% = 48/ 12

n = 0.2 x 100 n = 4 x 100

n = 20% n = 400%

C. Problem Solving

1. Given:

44 students - 2nd factor or base

22 students - product or percentage

Missing: Ist Factor or Rate (n)

Formula: n% = product / 2nd factor

Solution: Substitute the given values

n% = 22/44 n = 0.5 x 100

n% = 0.5 n = 50%

Therefore 50% of the class is made up of boys

2. Given: 45 students - 2nd factor or base

27 students - product or percentage

Missing: Ist Factor or Rate (n)

Formula: n% = product / 2nd factor

Solution: Substitute the given values

n% = 27/45

n% = 0.6

n = 0.6 x 100

n = 60% of the class was present

3. Given: P4000 - 2nd factor or base

P800 - product or percentage

Missing: Ist Factor or Rate (n)

Formula: n% = product / 2nd factor

Solution: Substitute the given values

n% = P800 / P4000 n = 0.2 x 100

n% = 0.2 n = 20%

Therefore 20% of the San Juan's Monthly income is used for rent.

4. Given: 80 - 2nd factor or base

68 - product or percentage

Missing: Ist Factor or Rate (n)

Formula: n% = product / 2nd factor

Solution: Substitute the given values

n% = P68/ P80

n% = 0.85

n = 0.85 x 100

n = 85%

Therefore the newspaper boy had sold 85% of his Sunday paper

Module 1

Lesson 4

PERCENT

PERCENT PROBLEMS OF TYPE C

(Finding the Second Factor or Base)

PERCENT PROBLEMS OF TYPE C

(Finding the second Factor (F_2) or Base)

OBJECTIVES:

After reading and studying this lesson you should be able to;

1. Identify and illustrate percent problems of Type C.
2. Find the quotient when the product and one of the factors is given.
3. Solve problems of Type C.

In the previous lessons you have already learned the first two types of problem on percent, finding the product or percentages and finding the first factor (F_1). The next lesson that you are going to study is the third type of problem on percent, finding the second factor or base. Again study the examples carefully. GOOD LUCK!

INPUT

PERCENT PROBLEMS OF TYPE C

(Finding the Second Factor or the Base

TYPE C 20% of n = 100

Where:

20% - is the first factor or rate

n - is the second factor or base

100 - is the product or percentage

From the general format, $Factor_1$ x $Factor_2$ = product or in the traditional, Rate x base = percentage, you can see that the missing number in the sentence is the second factor or the base. So, you can find the missing value if you will reformat the general formula.

Since the missing value is the second factor or the base, again place it on the left side of the [=] sign and the given values on the rigth side of the [=] sign. So, the formula for Type C problem:

2nd factor = product / 1st factor

or

$F_2 = P / F_1$

Base = percentage / rate

B = P / R

To solve Type C problem is as follows;

20% of n = 100 (change to form $F_2 = P / F$)

20% x n = 100 (change to form $F_2 = P / F$)

n = 100 ÷ 20% (change 20% to decimal)

n = 100 ÷ .20 (divide)

n = 500, therefore 20% of 500 = 100

Example 1. 20 % of n = 200

20% x n = 200

n = 200 ÷ 20%

n = 200 ÷ .20 n = 1000

Example 2. 12 is 30% of what number? (Change to symbols)

12 = 30% x n (change to format for Type C)

n = 12 ÷ 30%

n = 12 ÷ .30

n = 40, therefore, 12 is 30% of 40

Example 3. $3\frac{1}{2}$ of what number is 35? (change to symbols)

$3\frac{1}{2} \times n = 35$

$n = 35 \div 3\frac{1}{2}\%$ (change 1/2 to decimal)

n = 35 ÷ 3.5% (change 3.5% to decimal)

n = 35 ÷ 0.35

n = 1000

Example 4. 57 is 75% of what number

57 = 75% x n

n = 57 ÷ 75%

n = 57 ÷ .75 n = 76

Example 5. 20% of a number is 45?

20% x n = 45

n = 45 ÷ 20% n = 225

n = 45 ÷ .20

Example 6. Yesterday Harry recieved a salary increase of P60. This is 20% of his monthly salary? How much is his monthly salary?

Given: P60 -product or percentage

20% - Ist factor

Missing: 2nd factor (n)

Formula for Type C problem

n = product ÷ 1st factor

Substitute: n = P60 ÷ 20% (change 20% to decimal that is 20% = .20

Solve: n = P60 ÷ .2

n = P300, Harry's Monthly salary is P300.

Example 7. A teacher found out that 80% of the students in his class owned dogs. How many students were in his class if 32 out of them owned dogs?

Given: 32 -product or percentage

80% - 1st factor

Missing: 2nd factor (n)

Formula for Type C problem

n = product ÷ 1st factor

Substitute: n = 32 ÷ .80

Solve: n = 32 ÷ .80

n = 40, there are 40 students in the class.

Example 8. Norma wants to save 30% of her monthly allowance. How much is her monthly allowance if she saves P 60 a month?

Given: P60 -product or percentage

30% - ist factor

Missing: 2nd factor (n)

Formula for Type C problem

n = product ÷ 1st factor

Substitute: n = P60 ÷ 30%

n = P60 ÷ .30

n = P200, the monthly allowance of Norma is P200

Example 9. Last school year 95% of section Dahlia passed Math 1. If there were 38 passers how many students were in the class?

Given: 38 -product or percentage

95% - Ist factor

Missing: 2nd factor (n)

Formula for Type C problem : n = product ÷ 1st factor

Substitute: n = 38 ÷ 95%

Solve for the equation n = 38 ÷ .95

n = 40, there were 40 students in section Dahlia.

PRACTICES TASK

Do the Practice Task

a. Find the value of n.

1. 8 = 50% x n
2. 12% x n = 6
3. 40% of n = 30
4. 75 = 25% of n
5. 90% of n = 9

b. Find the answer to each of the following:

1. 25% of what number is 15?
2. 20% of what number is 5?
3. 3 is 5% of what number?
4. 24 is 40% of what number
5. 50% of what number is 100?
6. 20 is 50% of what number?
7. 25% of what number is 24?
8. 60% of what number is 15?
9. 12 is 75% of what number?
10. 10% of what number is 8?

c. Solve each of the following problems completely

1. Patrick was given a 10% increase in his salary If his increase is P100, What was his previous salary?
2. In the election for class president, 24 students casted votes for Susan. If 40% of the class voted for Susan, how many students were in the class?
3. A family spends 20% of their income for clothing. If they spend P300 for clothing, how much is their income?

If you are through, ask for the answer key from your teacher and compare your work with that of the answer key.

You must see to it that your answers are the same as those in the FEEDBACK TO PRACTICE TASK. If you have answered 75% of the PRACTICE TASK correctly, then you have achieved the objectives. If you did noy get 75% of the PRACTICE TASK correctly, then you must go back to lesson 4 and do the PRACTICE TASK again.

CONGRATULATIONS!!! You have just completed lesson 4 of module 1

FEEDBACK TO PRACTICE TASK

A. Value of n

1. n = 16
2. n = 50
3. n = 75
4. n = 300
5. n = 10

B. Answer

1. 25% x n = 15
   n = 15 ÷ 25%
   n = 15 ÷ .25
   n = 60

2. 20% x n = 5
   n = 5 ÷ 20%
   n = 5 ÷ .20
   n = 25

3. 5% x n = 3
   n = 3 ÷ 5%
   n = 3 ÷ .05
   n = 60

4. 24 = 40% of n
   40% of n = 24
   n = 24 ÷ 40%
   n = 24 ÷ .40
   n = 60

5. 50% x n = 100
   n = 100 ÷ 50%
   n = 100 ÷ .50

6. 20 = 50% of n
   50% of n = 20
   n = 20 ÷ .50
   n = 40

7. 25% x n = 24
   n = 24 ÷ 25%
   n = 24 ÷ .25
   n = 96

8. 60% x n = 15
   n = 15 ÷ 60%
   n = 15 ÷ .60
   n = 25

9. 12 = 75% of n
   75% of n = 12 ÷ 75%
   n = 12 ÷ .75
   n = 16

10. 10% of n = 8
    n = 8 ÷ 10%
    n = 8 ÷ .10

n = 200 n = 80

C. Problem Solving.

1. Given : 10% increase - Ist factor P100 - product

Missing: 2nd factor (n) Type C problem

Formula: n = product ÷ 1st factor

Substitute: n = P100 ÷ 10%

Solve: n = P100 ÷ .10

n = P1000, the previous salary of Patrick is P1000.

2. Given : 24 students - product or percentage; 40%

Missing: 2nd factor (n) Type C problem

Formula: n = product ÷ 1st factor

Substitute: n = 24 ÷ 40%

Solve: n = 24 ÷ .40

n = 60, there were 60 students in the class.

3. Given : 20% - Ist factor P300 - product

Missing: 2nd factor (n) Type C problem

Formula: n = product ÷ ist factor

Substitute: n = P300 ÷ 20%

Solve: n = P300 ÷ .20

n = P1500, the income of the family is P1500.

Module 1

Lesson 5

PERCENT

COMPUTING DISCOUNT, MARKED PRICE AND SALE PRICE

COMPUTING THE DISCOUNT, SALE PRICE AND MARKED PRICE

OBJECTIVES:

After reading and studying this lesson you should be able to.

1. Solve discount when marked price and rate of discount are given.
2. Calculate the rate of discount.
3. Find the sale price or net price.
4. Find the marked price.
5. Have positive attitudes in solving problems involving discount, sale price and marked price in real life situations.

In the previous lesson, you have learned the types of percent problems. You must always remember that what is important is that you can identify what term is missing in the problem, is it the product or a factor? It is also very necesary to go through the various steps in solving problem such as; identify the given data and the missing value, form the equation or formula, identify the operation to be used and solve the problem. With these knowledge you can now solve various types of word problems. You're now ready to proceed to the next lesson. GOOD LUCK!!!.

COMPUTING THE DISCOUNT, SALE PRICE AND MARKED PRICE

In some stores or in Department Stores and in Bargain Sales or during Fiestas, Christmas Sales, and Summer sales, you can see these signs;

"10% discount"

"20% Off on all items"

"25% reduction sale on all items"

"30% discount on all plastic products"

"Original price P200, now only P120"

These signs refer to bargain sales in some stores to promote their products. Most people, especially mothers take advantage of this oppurtunity to save by buying goods at bargain prices. With these announcements, you will be comparing the prices of the items from one store to another trying to find out which is the better buy, how much is the discount, what percent is the discount, how much are you going to pay the store if you will buy the discounted items, and many more. To be able to do this, you have to study these terms carefully:

Marked price - is the regular price of an article or item.

This is usually the tag price of the

article. This is also called the List Price.

Discount - refers to the reduction in prices.

Discount rate - refers to the discount stated in percent number.

Sale Price - is the price of an article after the discount has been deducted.

In order to solve problmes involving discount, marked price, sales price and rate of discount you have to study them one at a time.

Computing the Discount

Key Points:

1. To find the discount (D) when the marked price (MP) and the rate of discount (r%) are given, multiply the marked price by the rate of discount. The formula is;

$$D = MP \times r\%$$

where: D = amount of discount or discount
MP= Marked price
r%= discount rate

2. To find discount (D) when the given are the Marked Price (MP) and the Sale Price (SP), subtract sale price from the marked price. The formula is;

$$D = MP - SP$$

where: D = amount of discount or discount
MP= Marked price
SP = Sale price

Example 1. Find the discount (D) of a hat marked P50 with a 5% discount.

You must remember that to be able to solve the problem, you need to go through the steps in problem solving as you did in the previous lesson. In this particular problem the given data are as follows:

Given:

P50 - MP or marked price

5% - r% or rate of discount

The problem is to find the discount or (D)

From the given data, the given values are the MP and r%. So to solve the problem you need to use formula number 1, because, it is where the given data are found.

Formula: D = MP x r%

Substitute the formula with the given data:

D = P50 x 5%

Solve: D = P50 x .05

D = P 2.50 - discount of the hat.

You can check your answer by substituting the formula such as this;

Check: D = MP x r% where: D = P2.50

MP = P50 r% = 5%

Substitute: P2.40 = P50 x 5%

$$P2.50 \overset{?}{=} P50 \times .05$$

$$P2.50 \overset{/}{=} P2.50$$

Since both sides of the equation [=] are P2.50 or both sides are equal, then your answer (P2.50) is correct.

Example 2. A pair of shoes marked P120 was sold at P80. How much was the discount?

Given: P120 - marked Price; P80 - sales price

Find: discount (D)

Since the given data are the MP and SP, you need to use formula number 2, because it is where the given data are found.

Formula: D = MP - SP

Substitute: D = P120 - P80

Solve: D = P120 - P80

D = P40.00 - discount of the shoes

Check: D = MP - SP

$$P80 \overset{?}{=} P120 - P80$$

$$P80 \overset{?}{=} P120 - P80$$

$$P40 \overset{/}{=} P40$$

Example 3. A dozen notebook is marked P60. Find the discount if a discount rate of 20 % is given.

Given: P60 - marked Price; 20% - discount rate

Find: discount (D)

Formula: D = MP x r%

Substitute: D = P60 x 20%

Solve: D = P60 x 20%

D = P60 x .2

D = P12.00 - discount for a dozen notebooks.

Check: D = MP x r%

$$P12 \overset{?}{=} P60 \times 20\%$$

$$P12 \overset{?}{=} P600 \times .20$$

$$P12 \overset{/}{=} P12$$

Example 4. A T- shirt is marked P80. How much is the discount if it was sold at P60?

Given: P80 - marked Price; P60 - sales price

Find: discount (D)

Formula: D = MP - SP

Substitute: D = P80 - P60

Solve: D = P80 - P60

D = P20.00 - discount of the T-shirt

Check: D = MP - SP

$$P20 \overset{?}{=} P80 - P60 \qquad P20 \overset{/}{=} P20$$

$$P20 \overset{?}{=} P80 - P60$$

Example 5. A pair of socks is marked P40. Find the amount of discount if a 10% discount rate is given.

Given: P40 - marked Price

10% - discount rate

Find: discount (D)

Formula: D = MP x r%

Substitute: D = P40 x 10%

Solve: D = P40 x 10%

D = P40 x .1

D = P4.00 - discount of the pair of sock.

Check: D = MP x r%

$$P4 \overset{?}{=} P40 \times 10\%$$

$$P4 \overset{?}{=} P40 \times .1$$

$$P4 \overset{/}{=} P4$$

PRACTICES TASK

Do the Practice Task:

A. Find the amount of discount:

1. MP = P500
   SP = P425
2. MP = P380
   r% = 8%
3. MP = P450
   r% = 12%
4. MP = P350
   SP = P315
5. MP = P140
   SP = P110

B. Solve for the discount of the following:

1. A ring marked (MP) P300 and r% is 15%.
2. A notebook if marked price is P70 and sale price is P50.
3. A mirror if MP is P60 and r % is 10%.
4. A wrist watch if marked price is P400 and discount rate is 20%.
5. A pair of shoes if MP is P45 and SP is P38.

C. Solve the following problems completely by following the suggested steps in problem solving.

1. Find the discount of a polo-shirt marked P400 with a 25% discount.
2. How much was the discount of an item marked P50 and its discount rate is 10%.
3. The marked price of a pair of pants is P450.

Find the discount if it was sold for P380.

4. A casette tape was sold for P80. How much much was the discount if its original price was P92?

If you are through, ask for the answer key from your teacher and compare your answer with the solution on the answer key. You must see to it that your answer are the same as those in the feedback to practice task.

FEEDBACK TO PRACTICES TASK

A. 1. D = P75.00

2. D = P30.40

3. D = P54.00

4. D = P35.00

5. D = P30

B. 1. Given:

MP = P300

r% = 15%

Find: D

Formula: D = MP x r%

Substitute:

D = P300 x 15%

Solve:

D = P300 x .15

D = 45.00

4. Given:

MP = P400

r% = 20%

Find: D

Formula: D = MP x r%

Substitute:

D = P400 x .20

Solve:

D = P400 x .20

D = 80.00

2. Given:

MP = P70

SP = P50

Find: D

Formula:

D = MP - SP

Substitute:

D = P70 - P50

Solve:

D = P70 - P50

D = 20.00

5. Given:

MP = P300

r% = 15%

Find: D

Formula:

D = MP x r%

Substitute:

D = P300 x 15%

Solve:

D = P300 x .15

D = 45.00

3. Given:

MP = P60

r% = 10%

Find: D

Formula:

D = MP x r%

Substitute:

D = P60 x 10%

Solve:

D = P60 x .10

D = 6.00

C.

1. Given:

MP = P400

r% = 25%

Find: D

Formula:

D = MP x r%

Substitute:

D = P400 x 25%

Solve:

D = P400 x .25

D = 100.00

2. Given: MP = P50

r% = 10%

Find: D

Formula: D = MP x r%

Substitute:

D = P50 x 10%

Solve:

D = P50 x .10

D = 5.00

3. Given:

MP = P450

SP = 380

Find: D

Formula:

D = MP - SP

Substitute:

D = P450 - P380

Solve:

D = P450 - P380

D = 70

1. Given: MP = P92

SP = 80

Find: D

Formula: D = MP - SP

Substitute:

D = P92 - 80

Solve:

D = P92 - 80

D = 12

COMPUTING THE DISCOUNT RATE OR RATE OF DISCOUNT

To find the rate of discount or discount rate, find what percent of the marked price the discount is. The formula is :

r% of MP = D

r% = D / MP

Where: r% = discount rate or rate of discount.

D = amount of discount

MP = marked price

Example 1. An umbrella marked P100 was sold at P80. What was the rate of discount?

Given: P100 - marked price (MP)

P80 - sale price (SP)

Find: rate of discount (r%)

Formula: r% = D / MP

Find out if all the needed values in the formula are given. Notice that MP is given but D (discount) is not given. Find the value of D before solving the equation by using the formula D = MP - SP based on the given data.

To find D:

D = MP - SP

D = P100 - P80

D = P20, discount for the umbrella.

Solve now for r% by substituting the formula:

r% = D/MP r% = 0.2 x 100

r% = P20 / P100 r = 20%

r% = 0.2

Example 2. A dozen ruler is marked P35. Find the rate of discount if a discount of P7.00 was given to the customer.

Given: P35 - marked price (MP); P 7 - D (discount)

Find: discount rate (r%)

Formula: r% = D / MP

Find out if all the needed values in the formula are given. Since all the needed values in the formula are given, substitute the formula with the given values. Solve now for r% by substituting the formula:

r% = D/MP

r% = P 7 / P35

r% = 0.2

r% = 0.2 x 100

r = 20% rate of discount for a dozen ruler.

Example 3. A bar of soap is marked P20. If it was sold for P18. What was the rate of discount given?

Given: P20 - marked price (MP)

P18 - sale price (SP)

Find: discount rate (r%)

Formula: r% = D / MP

If you will compare the given data with the formula, you will notice that discount (D) is not

given. So, solve for the value of D first before solving for r% by using the formula, D = MP-SP based on the given data.

Solve for D: D = MP - SP

D = P20 - P18

D = P2, amount of discount of the bar of soap.

Solve now for r% by substituting the formula:

r% = D/MP

r% = P2 / P20

r% = 0.1

r% = 0.1 x 100

r = 10% discount rate for the bar of soap.

Example 4. A school bag is marked P200, it was sold with a P50 discount. What is the discount rate given?

Given: P200 - marked price (MP)

P50 - discount (D)

Find: discount rate (r%)

Formula: r% = D / MP

Solve now for r% by substituting the formula:

r% = D/MP

r% = P50 / P200

r% = 0.25

r% = 0.25 x 100

r = 25% discount rate of the school bag.

PRACTICE TASK

Do the Practice task:

A. Find the discount rate.

1. MP = P34.50
   D = P10.35

2. MP = P22.00
   SP = P17.60

3. MP = P139.50 SP = P125.55

4. MP = P34.00
   D = P3.40

5. MP = P60.00
   D = P7.20

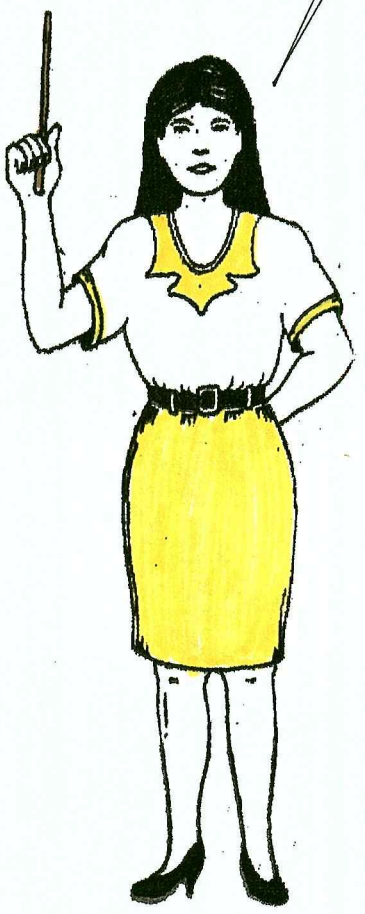
B. Solve for the discount rate of the following:

1. A pair of shoes marked P75 with P11.25 discount.
2. A blouse marked P120 and sold for P96.
3. A toy boat marked P80 with P12 discount.
4. A computer tape marked P200 and sold for P120.
5. A pair of slippers marked P65 with P9.75 discount.

c. Solve the following problems completely:

1. Find the disocunt rate of a product with a marked price of P25 and a discount of P6.50.
2. What rate of discount was given to the buyer of a product with a marked price of P40.00 and a discount of P10.00.
3. Find the discount rate of a product marked P220.00 and was sold at P165.00.

If you are through, ask for the answer key from your teacher and compare your answer with the solutions on the answer key. You must see to it that your answers are the same as those in the feedback to practice task.



Feedback to Practice Task

A. 1. r% = 30% 3. r% = 10% 5. r% = 12%

2 r% = 20% 4. r% = 10%

B. 1. Given: P75 - MP

P11.25 - D

Find: r%

Formula: r% = D/MP

Substitution

r% = 11,25 / P75

r% = 0.15

r% = 0.15 x 100

r = 15%

2. Given: P120 - MP

P96 - SP

Find: r%

Formula: r% = D /MP

D = MP - SP

D = P120 - P96

D = P24

Substitution

r% = P24 / P120

r% = 0.2

r% = 0.2 x 100

r = 20%

5. Given: P65 - MP

3. Given: P80 - MP

P12 - D

Find: r%

Formula: r% = D/MP

Substitution

r% = 12/P80

r% = 0.15

r% = 0.15 x 100

r = 15%

4. Given: P200 - MP

P120 - D

Find: r%

Formula: r% = D/MP

D = MP - SP

D = P200 - P120

D = P80

Substitution

r% = P80 / P200

r% = 0.4

r% = 0.4 x 100

r = 40%

5. Given: P65 - MP

P 9.75 - D

Find: r%

Formula: r% = D/MP

r = 15%

C. 1. Given: P25 - MP

P6.50 - D

Find: r%

Formula: r% = D/MP

Substitution

r% = P6.50 / P25

r% = 0.26

r% = 0.26 x 100

r = 26%

2. Given : P40 - MP

P10 - D

Find: r%

Formula: r% = D/M

Substitute:

r% = P10 /P40

r = 0.25 x 100

r = 25%

Substitute

r% = P9.75 / P65

r% = 0.15

r% = 0.15 x 100

3. Given: P220 - MP

P165 - D

Find: r%

Formula: r% = D/MP

r% = D/MP

D = MP-SP

D = P220 - P165

D = P55

r% = P55 / P220

r% = 0.25 x 100

r = 25%

COMPUTING THE SALE PRICE

To find the sale price (SP), subtract the discount from the marked price. The formula is:

SP = MP - D

Where: SP - sale price

MP - marked price

D - discount

Example 1. Find the sale price of a bicycle marked P800 with a 30% discount.

Given: P800 - marked price (MP)

30% - discount rate (r%)

Find: Sale price (SP) Formula : SP = MP - D

Find out if all the needed values in the formula are given. Notice that the value of D in the formula is not given. First find the value of D by using the formula, D = MP x r% based on the given data before solving for the sale price (SP)

Solve for D: D = MP x r% D = P800 x .30

D = P800 x 30% D = P240, amount of discount

Now solve for SP: Substitute: SP = MP-D

SP = MP - D

Solve: SP = P560, sale price of the bicycle.

Example 2. Find the sale price of a book marked P150 with a 15% discount.

Given : P 150 - (MP) 15% - discount rate (r%)

Find: SP Formula: SP = MP - D

Solve: solve for D

D = MP x r% D = P150 x .15

D = P150 x 15% D = P22.50

Solve for SP: SP = MP - D

SP = P150 - P22.50 SP = P127.50 sale price

Example 3. A radio marked P200 was sold with a 30% discount during a sale. Find the sale price.

Given : P 200 - (MP) 30% - discount rate (r%)

Find: SP Formula: SP = MP - D

Solve: Find for D

D = MP x r% D = P200 x .30

D = P200 x 30% D = P60.00

Find SP: SP = MP - D

SP = P200 - P60 SP = P140 sale price

Example 4. A polo marked P180 was sold with P45 discount. Find the sale price.

Given : P 180 - (MP) 45 - discount (D)

Find: SP Formula: SP = MP - D

Substitute: Solve:

SP = P180 - P45 SP = P135, Sale price of the polo

Example 5. During a sale, a calculator originally marked P400 was sold with P100 discount. What was the sale price?

Given : P 400 - (MP) P100 - discount (D)

Find: SP Formula: SP = MP - D

Substitute Solve

SP = P400 - P100 SP = P300, sale price of the calculator.

PRACTICE TASK

A. Find the Sale Price.

1. MP = P78
   D = P12
2. MP = P120
   r% = 15%
3. MP = P65
   D = P15
4. MP = P55
   r% = 20%
5. MP = P250
   D = P75

B. Solve for the Sale Price of the following;

1. A toy gun P115 with P25 discount.
2. A bracelet marked P350 with 30% discount.
3. A key chain marked P56 with P12 discount.
4. A wall clock marked P475 with 25% discount.
5. A tray marked P138 with P18 discount.

C. Solve the following problems completely:

1. Peter wants to buy a belt marked P250 with a 30% discount. Find the sale price of the belt.
2. A book marked P225 was bought at P45 discount. What was its sale price?
3. Find the sale price.

If you are through, ask for the answer key from your teacher and compare your answers with the solutions on the answer key. You must see to it that your answers are the same as those in the feedback to practice task.

FEEDBACK TO PRACTICE TASK

A. 1. SP = P66

2. SP = P102

3. SP = P50

4. SP = P44

5. SP = P175

B. 1. Given:
P115 - MP
P25 - D
Find: SP
Formula:
SP = MP-D
Substitute
SP = P115-P25
Solve:
SP = P90

2. Given:
P350 - MP
30% - r%
Find: D
Formula:
SP = MP x D
Substitute
Solve for D
D = MP x r%
D = P350 x 30%
D = P350 x .3
D = P105

3. Given:
P56 - MP
P12 - D
Find: SP
Formula:
SP=MP-D
Substitute
SP= P56-P12
Solve:
SP = P44

4. Given:
P475 - MP
25% - r%
Find: D
Formula:
SP= MP x D
Substitute
Solve for D
D = MP x r%
D = 475 x 25%
D = 475 x .25
D = P118.75

5. Given:
P138 - MP
P18 -D
Find: SP
Formula:
SP = MP-D
Substitute
SP=P138-P18
Solve:
SP = P120

Solve for SP

SP = MP - D

SP = P350 - P105

SP = P245

Solve for SP

SP = MP - D

SP = P475 - P118.75

SP = P356.25

C. 1. Given: P250 - MP 30% - r%

Find: SP

Formula: SP = MP -D

Solve for D:

D = MP x r%

D = P250 x 30%

D = P250 x .3

D = P75

Solve for SP:

SP = MP - D

SP = P250 - P75

SP = P175

2. Given: P225 - MP; P45 - D

Find: SP

Formula: SP = MP -D

Substitute:

SP = P225 - P45

SP = P180

3. Given: P90 - MP

35% - r%

Find: SP

Formula:

SP = MP - D

Solve for D:

D = MP x r%

D = P90 x 35%

D = P90 x .35

D = P31.50

Solve for SP:

SP = MP - D

SP = P90- P31.50

SP = P58.50

D. COMPUTING THE MARKED PRICE

To find the marked price (MP) when the Sale price and the of rate discount are given, divide the sale price by the difference of 100% (constant) and the given discount rate. The formula is:

$$MP = \frac{\text{Sale price (SP)}}{100\% - r\%}$$

Where:

MP = marked price

SP = sale price

100% = constant

r% = discount rate given in the problem

Example 1. Find the marked price of a radio that is sold for P350 at 20% discount.

Given: P350 - sale price (SP)

20% - discount rate (r%)

Find: Marked price (MP)

Formula:

$$MP = \frac{\text{Sale price (SP)}}{100\% - r\%}$$

Substitute the formula with the given values:

$$MP = \frac{P350}{100\% - 20\%}$$

Solve the equation by subtracting first 100% -20%

MP = P350 / 80% (Change to decimal)

MP = 350/.80 MP = P437.50, marked price

Example 2. What is the marked price of a hat sold at P30 with 25% discount at bargain sale?

Given:

P30 - sale price (SP)

25% - discount rate (r%)

Find: marked Price (MP)

Solve:

MP = P30 / 75%

MP = 30 / .75

MP = P40, marked price of the hat.

Formula:

$$MP = \frac{SP}{100 - r\%}$$

$$MP = \frac{P30}{100\% - 25\%}$$

Example 3. Find the marked price of a dictionary sold for P70 at 30% discount.

Given:

P70 - sale price (SP)

30% - discount rate (r%)

Find: Marked Price (MP)

Solve:

MP = P70 / 70%

MP = 70 / .70

MP = P100, marked price of the dictionary

Formula:

$$MP = \frac{SP}{100 - r\%}$$

$$MP = \frac{P70}{100\% - 30\%}$$

Example 4. A calulator was sold at P200 at 50% discount during a sale. What was its marked price?

Given:

P200 - sale price (SP)

50% - discount rate (r%)

Find: marked Price (MP)

Formula:

$$MP = \frac{SP}{100 - r\%}$$

$$MP = \frac{P200}{100\% - 50\%}$$

Solve:

MP = P200 / 50%

MP = 200 / .50

MP = P400, marked price of the calculator.

Example 5. A pair of shoes was sold at P150 after a 25% discount. What was its marked price?

Given:

P150 - sale price (SP)

25% - discount rate (r%)

Find: marked Price (MP)

Formula:

$$MP = \frac{SP}{100 - r\%}$$

$$MP = \frac{P30}{100\% - 25\%}$$

Solve:

MP = P250 / 75%

MP = 150 / .75

MP = P200, marked price of the pair of shoes.

PRACTICE TASK

A. Find the marked price.

1. P90 - SP
   10% - r%

2. P23 - SP
   8% - r%

3. P17.60 - SP
   12% - r%

4. P42 - SP
   30% - r%

5. P90 - SP
   40% - r%

B. Solve for the marked price of the following:

1. A soft drink sold at P6.00 with 4% discount rate.
2. A ballpen sold at P5.00 at 20% discount.
3. A magazine sold at P12.00 at 4% discount.
4. A pocket book sold at P24 at 25% discount.
5. An earring sold at P13.80 at 8% discount.

C. Solve the following problems completely:

1. A woman's hat was sold for P25.50 at 15% discount. Find its marked price.
2. Glenda bought an Air pot in a department store for only P280 becuase she was given a 20% discount. What was the marked price of the air pot?
3. Myrna bought a blouse for P80 at 20% discount. What was its marked price?

If you are through, ask for the answer key from your teacher and compare your answers with the solutions on the answer key. You must see to it that your answers are the same as those in the feedback to practice task.

FEEDBACK TO PRACTICE TASK

A. 1. MP = P100 3. MP = P20 4. MP = P150

2. MP = P25 4. MP = P60

B.1. Given: P6.00 - SP

4% - r%

Find: MP

Formula: MP = SP / 100%-r%

Substitute:MP=P6/100%-4%

Solve: MP = P6 / 96%

MP = P6 /.96

MP = P6.25

2. Given: P5.00 - SP

20% - r%

Find: MP

Formula: MP = SP / 100%-r%

Substitute:MP=P5/100%-20%

Solve: MP = P5 / 80%

MP = P5 /.80

MP = P6.25

3. Given: P12 - SP

4% - r%

Find: MP

Formula: MP= SP/100%-r%

Subtitute: MP= 12/100%-4%

Solve: MP = P12 / 96%

MP = P12 /.96

MP = 12.50

4. Given: P24 - SP

25%- r%

Find: MP

Formula: MP= SP/100%-r%

Subtitute: MP= 24/100%-25%

Solve: MP = P24 / 75%

MP = P24 /.75

MP = P32.00

5. Given: P13.80 - SP

8% - r%

Find: MP

Formula: MP = SP / 100%-r%

Substitute:MP=P13.80 /100% - 8%

Solve: MP = P13.80 / 92%

MP = P13.80 / .92 = P15.00

C.1. Given: P25.50 -SP

15% - r%

Find: MP

Formula: MP = SP / 100% - r%

Substitute:

MP = P25.50 /100% - 15%

Solve: MP = P25.50/ 85%

MP = P25.50 /.85

MP = P30

2. Given: P280 - SP

15% - r%

Find: MP

Formula: MP = SP / 100% - r%

Substitute: MP = P6/100% - 4%

3. Given: P80 - SP

20% - r%

Find: MP

Formula: MP = SP/100% - r%

Subtitute:

MP = P80 / 100% - 20%

Solve: MP = P80 / 80%

MP = P80 /.80

MP = P100

Solve: MP = P280/ 80%

MP = P280/.80

MP = P350

Module 1

Lesson 6

PERCENT

BORROWING AND LENDING MONEY

BORROWING AND LENDING MONEY

Objectives:

After reading and studying this lesson you should be able to:

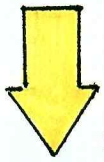
1. Compute for interest when principal, rate of interest and time are given.
2. Calculate the rate of interest when principal, interest and time are given.
3. Compute for principal when rate of interest, time and amount of interest are given.
4. Solve word problems involving borrowing and lending money.

In the previous lesson on problem on percent, you have learned that percent problems can be solved by using the formula;

1st factor x 2nd factor = product or

Rate x Base = Percentage

The lesson mentioned above is very much related to the present lesson because both lessons use the same processes in order to solve problems. Try to study each example carefully. GOOD LUCK!!!



INPUT

BORROWING AND LENDING MONEY

Borrowing and lending money involves interest. Interest is always expressed as a percent and unless it is otherwise stated, the rate is an annual rate. In other words, interest is computed per year. Thus the term at 8% interest means that for every P100 borrowed, you will pay P8.00 interest for every year in the bank. It is different when one borrows at the "5-6" condition that prevails in our communities. In this condition, money is lent for a very brief period like one week or one month, and for every P5 borrowed, the amount paid back is P6. So that if P1,000 is borrowed, P1,200 is paid back. If the term is one month, then the rate of interest paid was actually 240%. In computing interest always take note of the following key points:

1. write interest rate (r) as a decimal
2. write time (t) in years
3. use the formula:

Interest = Principal x Rate x Time or

I = P x r x t

Where:

Interest (I) -> the amount paid for the use of money (P8)

Principal (P) -> the amount borrowed (P100)

Rate (r) -> the percent of interest

being charged (8%).

Time (t) -> the number of years for which the money will be borrowed (1 year).

Take note that "per annum (p.a.)" and "annually" both means for every one year.

There are two types of interest, (a) simple and (b) compound. (A) Simple interest is the interest paid on the principal only.

Look at these Table

	Principal	Rate	Time	Interest
a.)	P100	9% p.a.	1 year	P9
b.)	P100	9% p.a.	2 years	P18
c.)	P100	9% p.a.	3 years	P27
d.)	P100	9% p.a.	4 years	P36

Notice that the interest increases if the rate and the principal remain the same while the time in years increases.

With the steps used in solving problem let us solve the following.

Example 1. Find the interest if P200 for 1 year at 5% per annum.

a.) Write the given data and the unknown.

Given: P200 - principal (P)

1 year - time (T)

5% - rate (r)

b.) Find the Interest or formula

I = P x r x t

c.) Substitute the formula with the given data

I = P200 x 5% x 1

d.) Solve:

I = P200 x 5% x 1

I = P10.00, interest for one year

Example 2. How much interest would be paid on P150 in 2 years if the interest rate is 6%.

Given:

P 150 - principal (P)

2 years - time (t)

6% - interest rate (r)

Find: Interest

Formula: I = P x r x t

Substitute:

I = P150 x 6% x 2

Solve:

I = P150 x .06 x 2

I = 9 x 2

I = P18.00 interest for 2 yrs

Example 3. Find the interest of P300 loan at 7.5% per annum for 1 year.

Given:

P 300 - principal (P)

1 years - time (t)

7.5% - interest rate (r)

Find: Interest

Formula: I = P x r x t

Substitute:

I = P300 x 7.5% x 2

Solve:

I = P300 x.075 x 2

I = P22.50 interest for one year.

Example 4. How much interest would be paid on P500 in 1 1/2 years at 6 1/2% interest rate?

Given: Substitute:

P 500 - principal (P) I = P500 x 6 1/2% x 1 1/2

1 1/2 years - time (t) Solve:

6 1/2%- interest rate (r) I = P500 x.065 x 1.5

Find: Interest I = P32.50 x 1.5

Formula: I = P x r x t I = P48.75 interest for 1.5 yrs

Example 5. Luis borrowed P1000 at 10% interest per annum in a bank. How much interest will he pay the bank after 3 years?

Given: Substitute:

P 1000 - principal (P) I = P1000 x 10% x 3

3 years - time (t) Solve:

10% - interest rate (r) I = P1000 x .1 x 3

Find: Interest I = 100 x 3

Formula: I = P x r x t I = P300 interest for 3 yrs

Sometimes money is borrowed for periods of less than a year - that is for 2 months, 3 months, 4 months and so on. To find the interest for such loans, you need to determine the fractional part of the year for which the money is borrowed. When the time of a loan is expressed in months, the "t" in the formula becomes a fraction - the fractional part of twelve months represented. Thus,

3 months becomes 3/12 or 1/4 6 months becomes 6/12 or 1/2

4 months becomes 4/12 or 1/3 9 months becomes 9/12 or 3/4

Example 6. Richie borrowed P500 at 6% interest per annum for 6 months. How much interest will she pay?

Given:
P 500 - principal (P)
6 months - time (t)
10% - interest rate (r)

Find: Interest

Formula: I = P x r x t

Substitute:
I = P500 x 10% x 6/12

Solve:
I = P500 x .10 x .5
I = P50 x .5
I = P25 interest for 3 months.

Example 7. Wendy deposited P200 in a bank at 8% interest per annum. Find the interest she will receive from the bank after 3 months.

Given:
P 200 - principal (P)
3 months - time (t)
8% - interest rate (r)

Find: Interest

Formula: I = P x r x t

Substitute:
I = P200 x 8% x 3/12

Solve:
I = P200 x .08 x .25
I = P16 x .25
I = P4 interest Wendy will receive.

Example 8. Find the interest of P600 deposit at 4 1/2% interest per annum for 9 months.

Given:
P 600 - principal (P)
9 months - time (t)
4 1/2% - interest rate (r)

Find: Interest

Substitute:
I = P600 x 4 1/25 x 9/12

Solve:
I = P600 x .45 x .75
I = P27 x .75

Formula: I = P x r x t I = P20.25, interest for 9 months

COMPOUND INTEREST:

Compound interest is the interest paid on the principal plus (+) the unpaid interest. It is the interest computed not only on the original principal but also on interest earned in succeeding periods.

Example 1. What is the total amount due after three years for 100 borrowed at 10% interest per annum, compounded annually?

Given: P100 - principal (P) 3 years - time (t)

10% - rate (r)

Find: Total amount due after 3 years

To be able to find the total amount due after three years, first solve for the interest for the first year, and add the principal. So, it will look like this;

(1) Principal x rate x time = interest for the first year

Interest for the first year + Principal = Amount due after the first year.

After solving the amount due after the first year, solve also the amount due after the second year and third year in the same manner as you solve for the first year. It will look like this;

(2) Amount due after the 1st year x rate x time =

interest for the 2nd year.

Interest for the 2nd year + amount due after the 1st year = amount due after the 2nd year.

Do the same for the 3rd year.

So, substituting the formula:

(1) P100 x 10% x 1 = Interest for the 1st year

P100 x .10 x 1 = P10,interest for the 1st year

P10 + P100 = P110, amount due after the 1st year

(2) P110 x 10% x 1 = Interest for the 2nd year

P110 x .10 x 1 = P11,interest for the 2nd year

P11 + P110 = P121, amount due after the 2nd year

(3) P121 x 10% x 1 = Interest for the 3rd year

P121 x .10 x 1 = P12.10,interest for 3rd year

P12.10 + P121 = P133.10, amount due after three years

Example 2. Find the total amount due after 3 years if Mrs. Almeda borrowed an amount of P500 at 20% interest per annum compounded annually

Given: P500 - principal (P) 3 years - time (t)

20% - rate (r)

Find: Total amount due after 3 years

So, substituting the formula:

(1) P500 x 20% x 1 = Interest for the 1st year

P500 x .20 x 1 = P100, interest for the 1st year

P100 + P500 = P600, amount due after the 1st year

(2) P600 x 20% x 1 = Interest for the 2nd year

P600 x .20 x 1 = P11,interest for the 2nd year

P120 + P600 = P720, amount due after the 2nd year

(3) P720 x 20% x 1 = Interest for the 3rd year

P720 x .20 x 1 = P144,interest for the 3rd year

P144 + P720 = P864, amount due after 3 years.

PRACTICE TASK

A. Find the interest on each loan. (Interest rate is annually).

1. Principal: P500
   Rate: 12%
   Time: 2 years

2. Principal: P200
   Rate: 6%
   Time: 1 years

3. Principal: P100
   Rate: 12%
   Time: 9 months

4. Principal: P80
   Rate: 8%
   Time: 6 months

5. Principal: P400
   Rate: 5 1/2%
   Time: 3 years

B. Find the interest earned on each deposit. (Interest is annually)

1. Principal: P1000
   Rate: 9%
   Time: 5 years

2. Principal: P800
   Rate: 10.5%
   Time: 2 years

3. Principal: P2500
   Rate: 7 1/2%
   Time: 6 months

4. Principal: P3000
   Rate: 10%
   Time: 2 1/2 years

5. Principal: P700
   Rate: 7 1/2%
   Time: 18 months

C. Solve the following problem completely.

1. Find the interest of P300 borrowed at 9 1/2% per annum for 2 years.

2. Mr. Lopez deposited P600 in the bank. Find the

interest at 8% per annum for 5 years.

3. Coney deposits P350 in a bank that pays 8 1/2% interest per year. How much interest will she earn in 3 years?
4. Walter borrowed P2000 from a bank that charges 15% interest per annum. How much interest will Walter pay after 1 1/2 years?
5. An amount of P1000 was deposited in the bank at 12% per annum compounded annually. Find the total amount due after 2 years.

If you are through, ask for the answer key from your teacher and compare your answers with the solutions on the answer key. You must see to it that your answers are the same as those in the feedback to practice task.

FEEDBACK TO PRACTICE TASK

A. 1. $I = P \times r \times t$

$I = P500 \times 12\% \times 2$

$I = P500 \times .12 \times 2$

$I = P\ 60 \times 2 = P120$

2. $I = P \times r \times t$

$I = P200 \times 6\% \times 1$

$I = P200 \times .06 \times 1$

$I = P\ 12 \times 1 = P12$

3. $I = P \times r \times t$

$I = P100 \times 12\% \times 9/12$

$I = P100 \times .12 \times .75$

$I = P\ 12 \times .75 = P9$

4. $I = P \times r \times t$

$I = P80 \times 8\% \times 6/12$

$I = P80 \times .08 \times .5$

$I = P\ 3.20$

$I = P\ 22 \times 3$

$I = P66$

5. $I = P \times r \times t$

$I = P400 \times 5\ 1/25 \times 3$

$I = P400 \times .055 \times 3$

B. 1. $I = P \times r \times t$

$I = P1000 \times 9\% \times 5$

$I = P1000 \times .09 \times 5$

$I = P\ 90 \times 5 = P450$

2. $I = P \times r \times t$

$I = P800 \times 10.5\% \times 2$

$I = P800 \times .105 \times 2$

$I = P\ 84 \times 2$

$I = P168$

3. $I = P \times r \times t$

$I = P700 \times 7\% \times 18/12$

$I = P700 \times .07 \times 1.5$

$I = P49 \times 1.5$

$I = P73.50$

3. $I = P \times r \times t$

$I = P2500 \times 7\ 1/2\% \times 6/12$

$I = P2500 \times .075 \times .5$

$I = P187.50 \times .5 = P93.75$

4. $I = P \times r \times t$

$I = P3000 \times 10\% \times 2\ 1/2$

$I = P3000 \times .10 \times 2.5$

$I = P3000 \times 2.5$

$I = P750$

C. 1. Given: P 300 - P

Substitute:

9 1/2% - r

2 years - t

Find: Interest

Formula: I = P x r x t

I = P300 x 9 1/2% x 2

I = P300 x .095 x 2

I = P 57

2. Given: P 600 - P

8% - r

5 years - t

Find: Interest

Formula: I = P x r x t

Substitute:

I = P600 x 8% x 5

I = P600 x .08 x 5

I = P 48 x 5

I = P240

3. Given: P 350 - P

8 1/2% - r

3 years - t

Find: Interest

Formula: I = P x r x t

Substitute:

I = P350 x 8 1/2% x 3

I = P350 x .085 x 3

I = P29.75 x 3

I = P89.25

4. Given: P 2000 - P

15% - r

1 1/2 years - t

Find: Interest

Formula: I = P x r x t

Substitute:

I = P2000 x 15% x 1 1/2

I = P2000 x .15 x 1 1/2

I = P300 x 1.5

I = P450

5. Given: P1000 - P

12% - r

2 years - t

Find: amount due after 2 yrs.

Formula: I = P x r x t

Substitute:

a.) I = P1000 x 12% x 1

I = P1000 x .12 x 1

I = P120 + P1000 =P1120

b.) P1120 x .12 x 1 = I

P134.40 + P1120 = P1,254.40

amount due after 2 yrs.

COMPUTING THE PRINCIPAL (P)

Principal is the amount borrowed. To find the principal when interest, interest rate, and time are known, divide interest by the product of the interest rate (decimal form) and time. The formula is:

Principal = Interest/ rate x time

or P = I / r x t

Example 1. Find the principal if the interest for 2 year at 5% per annum is P50.

Given: 2 year - time 5% - rate

P50 - interest

Find: Principal Formula: P = I/ r x t

Substitute: P = P50 / 5% x 2 P = P50 / 0.1

P = P50 / .05 x 2 P = P500, principal

Example 2. Find the amount borrowed (principal) if a P60 interest was paid at 10% per annum for 1 year.

Given: 1 year - time 10% - rate

P60 - interest

Find: Principal Formula: P = I/ r x t

Substitute: P = P60 /10% x 1

P = P60 / .10 x 1

P = P60 / 0.1

P = P600, amount borrowed

Example 3. Mrs. Miranda paid the bank a P75 interest for an amount borrowed at 7 1/2% per annum for 1 year. How much money did Mrs. Miranda borrowed from the bank?

Given: 1 year - time 7 1/2% - rate

P75 - interest

Find: Principal Formula: P = I/ r x t

Substitute: P = P75 / 7 1/2% x 1

P = P75 / .075 x 1

P = P75 /.075

P = P1,000, amount borrowed by Mrs. Miranda from the bank

Example 4. Find the principal if the interest for 3 years at 5% is P52.50.

Given: 3 years- time 5% - rate

P52.50 - interest

Find: Principal Formula: P = I/ r x t

Substitute: P = P52.50 / 5% x 3

P = P52.50 / .05 x 3

P = P52.50 /.15

P = P350, principal

Example 5. How much was the principal if the interest for 3 months at 20% per annum is P10?

Given: 3 months - time 20% - rate

P10 - interest

Find: Principal Formula: P = I/ r x t

Substitute: P = P10 / 20% x 1/12 P = P10 /.05

P = P10 / .20 x .25 P = P200, principal

PRACTICE TASK

A. Find the principal in each of the following:

1. Interest P21.60
   Rate : 12%
   Time: 2 years

2. Interest P6.00
   Rate : 8%
   Time: 6 months

3. Interest: P60.00
   Rate : 7 1/2%
   Time: 1 years

4. Interest: P47.50
   Rate : 9 1/2%
   Time: 1 years

5. Interest: P30.00
   Rate : 4%
   Time: 9 months

6. Interest: P90
   Rate : 5%
   Time: 3 years

7. Interest: P75
   Rate : 10%
   Time: 1 1/2 years

8. Interest: P100
   Rate : 20%
   Time: 1 years

9. Interest P50
   Rate : 10%
   Time: 1 years

10. Interest: P200
    Rate : 10%
    Time: 1 years

B. Solve the following problems completely:

1. Find the amount borrowed if P200 interest at 4% per annum for 5 years was paid.

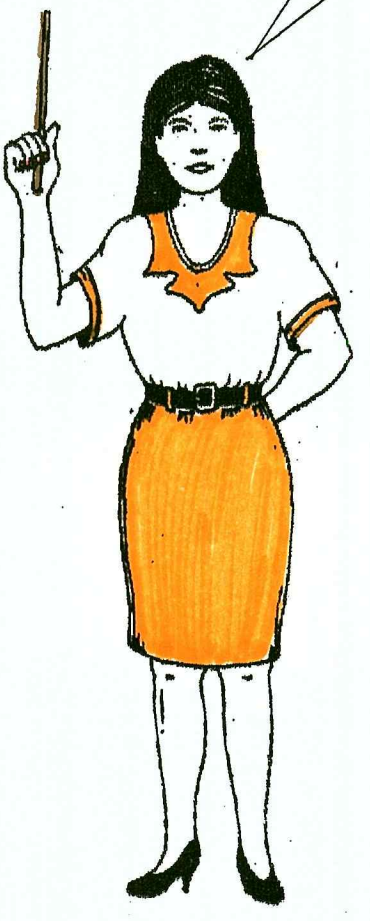
2. How much is the principal if the interest for 2 years at 5% is P80?

3. Mr. Alcober paid an interest of P324 at 12% interest for 3 years for an amount borrowed in a bank. How much money did Mr. Alcober borrowed

from the bank?

4. Angelica received P300 as an interest of her money deposited in a bank for 3 years which gives 10% interest per annum. How much money had she deposited in the bank.

If you are through, ask for the answer key from your teacher and compare your answers with the solutions on the answer key. You must see to it that your answers are the same as those in the feedback to practice task.



FEEDBACK TO PRACTICE TASK

A. 1. $P = \dfrac{21.60}{12\% \times 2}$

$P = \dfrac{21.60}{.12 \times 2}$

$P = 21.60 / 0.24$

$P = 90.00$

2. $P = \dfrac{6.00}{8\% \times 6/12}$

$P = \dfrac{6.00}{.08 \times 0.5}$

$P = 6.00 / 0.04$

$P = 150.00$

3. $P = \dfrac{P60.00}{7\ 1/2\% \times 1}$

$P = \dfrac{P60.00}{7.5\% \times 1}$

$P = P60.00 / .075$

$P = 800$

4. $P = \dfrac{47.50}{9\ 1/2\% \times 1}$

$P = \dfrac{47.50}{9.5\% \times 1}$

$P = 47.50 / .095$

$P = 500.$

6. $P = \dfrac{P\ 90.00}{5\% \times 3}$

$P = \dfrac{90.00}{.05 \times 3}$

$P = 90.00 / .15$

$P = 600$

7. $P = \dfrac{75}{10\% \times 1\ 1/2}$

$P = \dfrac{75}{.10 \times 1.5}$

$P = 75 / .15$

$P = 500$

8. $P = \dfrac{100}{20\% \times 1}$

$P = \dfrac{100}{.20 \times 1}$

$P = 100 / .2$

$P = 500$

9. $P = \dfrac{50}{10\% \times 2}$

$P = \dfrac{50}{.10 \times 2}$

$P = 50 / 0.2$

$P = 250$

5. $P = \dfrac{30.00}{4\% \times 9/12}$

$P = \dfrac{30.00}{.04 \times .75}$

$P = 30 / 0.03$

$P = 1{,}000$

10. $P = \dfrac{200}{10\% \times 1}$

$P = \dfrac{200}{.10 \times 1}$

$P = 200 / .10$

$P = 2{,}000$

B. Problem Solving

1. Given: P200 – interest

4% – rate

5 years – time

Find: Principal

Formula:

$$P = \frac{I}{r \times t}$$

Substitute:

$P = \dfrac{200}{4\% \times 5}$

$P = \dfrac{200}{.04 \times 5}$

$P = 200 / 0.2$

$P = 1{,}000$

2. Given: P80 – interest

5% – rate

2 years – time

Find: Principal

Formula:

$$P = \frac{I}{r \times t}$$

Substitute:

$P = \dfrac{80}{5\% \times 2}$

$P = \dfrac{80}{.05 \times 2}$

$P = 80 / 0.1$

$P = 800$

3. Given: P324 – interest

12% – rate

3 years – time

Find: Principal

Substitute:

$P = \dfrac{324}{12\% \times 3}$

$P = \dfrac{324}{.12 \times 3}$

Formula:

$$P = \frac{I}{r \times t}$$

$$P = 324 / .36$$

$$P = 900$$

4. Given: P300 - interest

10% - rate

3 years - time

Find: Principal

Substitute:

$$P = \frac{300}{10\% \times 3}$$

$$P = \frac{300}{.10 \times 3}$$

Formula:

$$P = \frac{I}{r \times t}$$

$$P = 300 / 0.3$$

$$P = 1{,}000$$

COMPUTING THE INTEREST RATE (r)

Rate is the percent of interest being charged on amount borrowed. To find the interest rate when principal, time, and interest are known, divide the interest by the product of the principal and time. Then, multiply the quotient by 100. The formula is:

Rate = Interest/principal x time or

$$r = \frac{\text{Interest}}{\text{principal} \times \text{time}} \times 100$$

Example 1. Find the interest rate of 600 which earned an interest of P60 for 2 years.

Given: P600 - P

P 60 - I

2 yrs. - t

Find: Interest rate

Formula:

$$r = \frac{\text{Interest}}{\text{principal} \times \text{time}} \times 100$$

Substitute:

$$r = \frac{P60}{P600 \times 2} \times 100$$

Solve:

$$r = \frac{P60}{P1200} \times 100$$

$$r = 0.05 \times 100$$

$$r = 5\%$$

Example 2. What is the interest rate charged for an amount of P250 which incurred an interest of P40 after 2 years?

Given: P250 - Principal

P 40 - Interest

2 yrs. - t

Substitute:

$$r = \frac{P40}{P250 \times 2} \times 100$$

Find: Interest rate

Formula:

$$r = \frac{\text{Interest}}{\text{principal} \times \text{time}} \times 100$$

Solve:

$$r = \frac{P40}{P500} \times 100$$

$$r = 0.08 \times 100$$

$$r = 8\%$$

Example 3. Find the interest rate if the interest on a P500 loan for 1 1/2 years is P75.

Given: P500 - P

P 75 - I

1 1/2 yrs. - t

Find: Interest rate

Formula:

$$r = \frac{\text{Interest}}{\text{principal} \times \text{time}} \times 100$$

Substitute:

$$r = \frac{P75}{P500 \times 1\ 1/2} \times 100$$

Solve:

$$r = \frac{P75}{500 \times 1.5} \times 100$$

$$r = 0.1 \times 100$$

$$r = 10\%$$

Example 4. Find the interest rate if the interest paid on P750 loan for 1 year is P48.75.

Given: P750 - P

P48.75 - I

1 yrs. - t

Find: Interest rate

Formula:

$$r = \frac{\text{Interest}}{\text{principal} \times \text{time}} \times 100$$

Substitute:

$$r = \frac{P48.75}{P750 \times 1} \times 100$$

Solve:

$$r = \frac{P48.75}{P750} \times 100$$

$$r = 0.065 \times 100$$

$$r = 6.5\% \text{ or } 6\ 1/2\%$$

PRACTICE TASK

A. Find the interest rate on each of the following:

1. Principal: P350
   Interest: P45.50
   Time: 2 years

2. Principal: P400
   Interest: P90
   Time: 3 years

3. Principal: P900
   Interest: P45
   Time: 6 months

4. Principal: P750
   Interest: P90
   Time: 1 1/2 yrs.

5. Principal: P500
   Interest: P62.50
   Time: 1 years

6. Principal: P1000
   Interest: P25
   Time: 6 months

7. Principal: P300
   Interest: P60
   Time: 12 months

8. Principal: P400
   Interest: P20
   Time: 1 years

9. Principal: P600
   Interest: P72
   Time: 2 years

10. Principal: P1500
    Interest: P255
    Time: 1 years

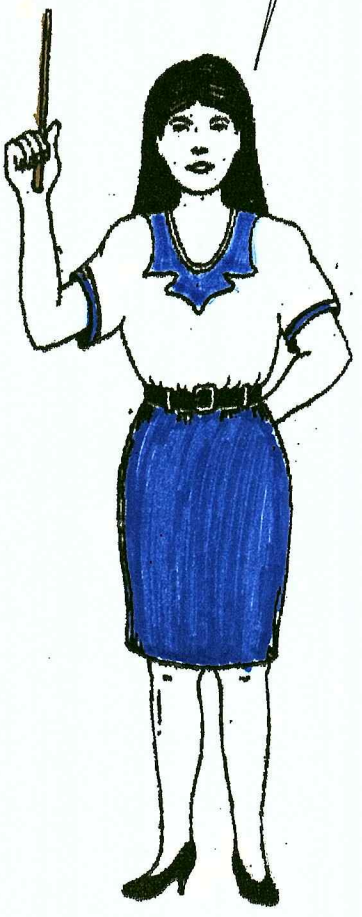
B. Solve the following problems completely:

1. Find the interest rate if the interest paid on P1200 loan for 2 years is P144.

2. What is the interest rate due for P2500 if the interest is P325 for 1 year?

3. Find the interest rate given on P1500 deposit in a bank if P675 interest was paid to the deposited after 3 years.

If you are through, ask for the answer key from your teacher and compare your answers with the solutions on the answer key. You must see to it that your answers are the same as those in the feedback to practice task.



FEEDBACK TO PRACTICE TASK

A. Interest Rate

1. $R = \frac{I}{P \times t} \times 100$

$R = \frac{P45.50}{P350 \times 2} \times 100$

$R = \frac{P45.50}{P700} \times 100$

$R = 0.065 \times 100$

$R = 6.5\%$ or 6 1/2%

2. $R = \frac{I}{P \times t} \times 100$

$R = \frac{P90}{P400 \times 3} \times 100$

$R = \frac{P90}{P1200} \times 100$

$R = 0.075 \times 100$

$R = 7.5\%$ of 7 1/2%

3. $R = \frac{I}{P \times t} \times 100$

$R = \frac{P45.50}{P900 \times 6/12} \times 100$

$R = \frac{P45.50}{P450} \times 100$

$R = 0.1 \times 100$ $R = 10\%$

6. $R = \frac{I}{P \times t} \times 100$

$R = \frac{P\ 25}{P1000 \times 1} \times 100$

$R = \frac{P25}{P1000} \times 100$

$R = 0.025 \times 100$

$R = 5\%$

7. $R = \frac{I}{P \times t} \times 100$

$R = \frac{P60}{P300 \times 12/12} \times 100$

$R = \frac{P60}{P300} \times 100$

$R = 0.2 \times 100$

$R = 20\%$

8. $R = \frac{I}{P \times t} \times 100$

$R = \frac{P20}{P400 \times 1} \times 100$

$R = \frac{P20}{P400} \times 100$

$R = 5\%$

4. $R = \frac{P90}{P750 \times 1\ 1/2} \times 100$

$R = \frac{P90}{P750 \times 1.5} \times 100$

$R = \frac{P90}{P1125} \times 100$

$R = 0.08 \times 100$

$R = 8\%$

5. $R = \frac{I}{P \times t} \times 100$

$R = \frac{P62.50}{P500 \times 1} \times 100$

$R = \frac{P62.50}{P500} \times 100$

$R = 0.125 \times 100$

$R = 12.5\%$ or $12\ 1/2\%$

9. $R = \frac{I}{P \times t} \times 100$

$R = \frac{P72}{P600 \times 2} \times 100$

$R = \frac{P\ 72}{P1200} \times 100$

$R = 0.06 \times 100$

$R = 6\%$

10. $R = \frac{I}{P \times t} \times 100$

$R = \frac{P255}{P1500 \times 1} \times 100$

$R = \frac{P\ 255}{P1500} \times 100$

$R = 0.17 \times 100$

$R = 17\%$

B. 1.) Given: P1200 – Principal; P144 – interest;

2 years – time

Find: Interest Rate

Formula:

$$R = \frac{I}{P \times t} \times 100$$

Substitution

$$R = \frac{P144}{P1200 \times 2} \times 100$$

$$R = 0.06 \times 100$$

$$R = 6\%$$

$$R = \frac{P144}{P\ 2400} \times 100$$

2.) Given: P2500 - Principal; P325 - interest;

1 year - time

Find: Interest Rate

Formula:

$$R = \frac{I}{P \times t} \times 100$$

Substitution

$$R = \frac{P\ 325}{P2500 \times 1} \times 100 \qquad R = \frac{P325}{P2500} \times 100$$

$$R = 0.13 \times 100$$

$$R = 13\%$$

3.) Given: P1500 - Principal; P675 - interest;

3 years - time

Find: Interest Rate

Formula:

$$R = \frac{I}{P \times t} \times 100$$

Substitution:

$$R = \frac{P675}{P1500 \times 3} \times 100 \qquad R = \frac{P675}{P\ 4500} \times 100$$

$$R = 0.15 \times 100$$

$$R = 15\%$$

D. COMPUTING THE TIME (t)

Time is the number of years for which the money will be borrowed. To find the time when principal, interest, and rate are given, divide the interest by the product of the principal and interest rate (decimal form). The formula is:

$$\text{Time} = \frac{\text{Interest}}{\text{Principal} \times \text{time}} \qquad t = \frac{I}{P \times r}$$

Example 1. Find the number of years the amount of P800 was borrowed which earned an interest of P192 at 12% per annum.

Given: P800 - principal
P192 - interest
12% - rate

Find: time

Formula:

$$t = \frac{I}{P \times r}$$

Substitute:

$$t = \frac{P192}{P800 \times 12\%}$$

$$t = \frac{P192}{P800 \times .12}$$

$$t = P192 / P96$$

$$t = 2 \text{ years}$$

Example 2. Find the time for P200 to incur P45 interest at a rate of 5% per annum.

Given: P200 - principal
P45 - interest
5% - rate

Find: time

Substitute:

$$t = \frac{P45}{P200 \times 5\%}$$

$$t = \frac{P45}{P200 \times .05}$$

Formula:

$$t = \frac{I}{P \times r}$$

$t = P45 \ / P10$

$t = 4.5$ years or

4 1/2 years

Example 3. For how many years does P600 was borrowed which incured P108 at 6% rate per annum.

Given: P600 – principal

P108 – interest

6% – rate

Find: time

Substitute:

$$t = \frac{P108}{P600 \times 6\%}$$

$$t = \frac{P108}{P600 \times .06}$$

Formula:

$$t = \frac{I}{P \times r}$$

$t = P108 \ / P36$

$t = 3$ years

PRACTICE TASK

A. Find the time in each of the following:

1. Principal: P300
   Interest: P42
   Rate: 7%

2. Principal: P500
   Interest: P60
   Rate: 12%

3. Principal: P400
   Interest: P45
   Rate: 7 1/2%

4. Principal: P800
   Interest: P96
   Rate: 4%

5. Principal: P200
   Interest: P30
   Rate: 3%

6. Principal: P500
   Interest: P150
   Rate: 20%

7. Principal: P1000
   Interest: P100
   Rate: 10%

8. Principal: P600
   Interest: P72
   Rate: 6%

9. Principal: P2000
   Interest: P300
   Rate: 15%

10. Principal: P300
    Interest: P60
    Rate: 8%

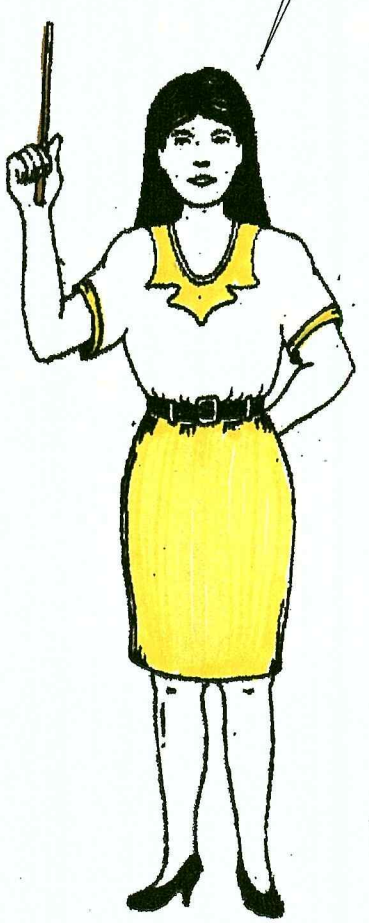
B. Solve the following problems completely:

1. How long does P800 was deposited in a bank which earned an interest of P180 at 15% interest rate per annum?

2. Find the time for P1000 deposit which earned an interest of P260 at a rate of 13% per annum.

3. How many years did Mrs. Balboa borrowed the amount of P700 which incurred an interest of P126 at 6% annual rate?

If you are through, ask for the answer key from your teacher and compare your answers with the solutions on the answer key. You must see to it that your answers are the same as those in the feedback to practice task.



FEEDBACK TO PRACTICE TASK

A. Time

1. $T = \frac{I}{P \times r}$

$T = \frac{P42}{P300 \times .07}$

$T = \frac{P42}{P21}$

$T = 2$ years

2. $T = \frac{I}{P \times r}$

$T = \frac{P60}{P500 \times 12\%}$

$T = \frac{P42}{P500 \times .12}$

$T = \frac{P60}{P60}$

$T = 1$ year

3. $T = \frac{I}{P \times r}$

$T = \frac{P45}{P400 \times 7\ 1/2\%}$

$T = \frac{P45}{P400 \times 7.5\%}$

$T = \frac{P45}{P400 \times .075}$

5. $T = \frac{I}{P \times r}$

$T = \frac{P30}{P200 \times 3\%}$

$T = \frac{P30}{P200 \times .03}$

$T = 5$ years

6. $T = \frac{I}{P \times r}$

$T = \frac{P150}{P500 \times 20\%}$

$T = \frac{P150}{P500 \times .2}$

$T = \frac{P150}{P100}$

$T = 1.5$ yrs

7. $T = \frac{I}{P \times r}$

$T = \frac{P100}{P1000 \times 10\%}$

$T = \frac{P100}{P1000 \times .1}$

$T = \frac{P100}{P100}$

9. $T = \frac{I}{P \times r}$

$T = \frac{P300}{P2000 \times 15\%}$

$T = \frac{P300}{P2000 \times .15}$

$T = 300/300$

$T = 1$ year

10. $T = \frac{I}{P \times r}$

$T = \frac{P60}{P300 \times 8\%}$

$T = \frac{P60}{P300 \times .08}$

$T = \frac{P60}{P24}$

$T = 2.5$ yrs.

T = P 45/ P30

T = 1.5 or 1 1/2 yrs.

T = 1 year

4. $T = \frac{I}{P \times r}$

$T = \frac{P96}{P800 \times 4\%}$

$T = \frac{P96}{P800 \times .04}$

T = P96 / 32= 3 yrs

8. $T = \frac{I}{P \times r}$

$T = \frac{P72}{P600 \times 6\%}$

$T = \frac{P72}{P36}$

T = P72/P36 = 2 yrs

B. Problem Solving:

1. Given: P800 - principal P180 - interest

15% - rate

Find: Time

Formula: $T = \frac{I}{P \times r}$

Substitute:

$T = \frac{P180}{P800 \times 15\%}$

$T = \frac{P180}{P800 \times .15}$

T = P180 / P120

T = 1.5 yrs.

2. Given: P1000 - principal P260 - interest

13% - rate

Find: Time

Formula: $T = \frac{I}{P \times r}$

Substitute:

$T = \frac{P260}{P1000 \times 13\%}$

T = P260 / P130

T = 2 yrs.

$$T = \frac{P260}{P1000 \times .13}$$

3. Given: P700 – principal P126 – interest

6% – rate

Find: Time

Formula: $T = \frac{I}{P \times r}$

Substitute:

$$T = \frac{P126}{P700 \times 6\%}$$

$$T = \frac{P126}{P700 \times .06}$$

T = P126 / P42

T = 3 yrs.

Module 2

Lesson 1

RATIO

RATIO

RATIO

Objectives:

After reading and studyingg this lesson you should be able to:

1. Identify the relationship of two quantities using ratio.
2. Express relations of two quantities using ratio.
3. Solve word problems in ratio.

In the previous lesson of this module, you have learned that percent can be expressed as fractions and as decimal. While fractions and decimals can also be expressed as percent. The present lesson is about the third form of rational number. The ratio. This lesson would be very easy if you had mastered the lesson mentioned above. Study these carefully !!!

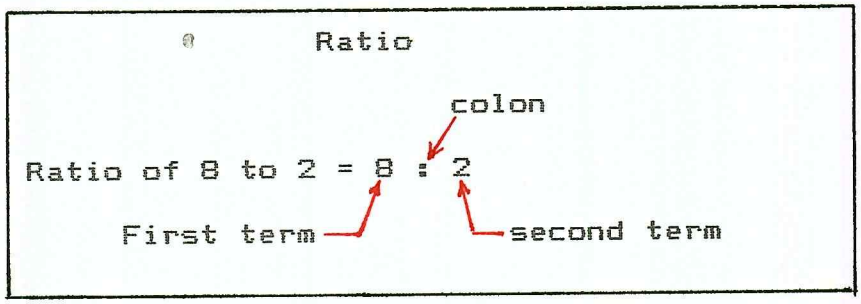
INPUT

RATIO

One of the fundamental skills of the market place is the ability to compare, and the simplest mathematical instrument for comparison is "ratio".

> Ratio is the relationship between two numbers or quantities. It states a compari - son of two groups. It consists of number pairs and describes the relation between the two numbers.

In all ratio calculations, two terms are known. The colon (:) is the symbol used to indicate a relation between terms. For example, the ratio of 8 to 2 is written as the ratio expression 8:2. See figure below:



The ratio of red balls to green balls is "three is to seven". This means, for every three red balls there are seven green balls. We write; 3:7 read as "three is to seven". If we change the position of the numbers to (7:3) the meaning would also be changed. Therefore in ratio expressions order is important.

Suppose we compare the elements of two groups, say group A and B. If group A has one member and B has three, then we say "the ratio of the members of A to the members of B is 1 is to 3 or 1:3".

Let us study the following examples carefully:

A. Expressing relations using ratio:

1. The ratio of 20 boys to 25 girls in a class of 45 students is "20 is to 25" or 20:25.
2. The ratio of 5 yellow roses to 8 pink roses is "5 is to 8" or 5:8.
3. The ratio of 18 balls to 4 holes is "18 is to 4" or 18:4.
4. The ratio of 24 seats to 30 passengers is "24 is to 30" or 24:30.
5. The ratio of 18 apples to 12 children is "18 is to 12" or 18:12.

B. Expressing ratios in fractional form:

A ratio can be expressed as a fraction where the first term is the numerator and the second term is the denominator, (but not all fractions are ratio).

Example 1. The Ratio, 20 is to 25 = 20:25 = 20/25

As in fractions, ratio can also be expressed in simplest form. So, to find the equivalent ratio of 20:25 or 20/25 is to reduce it to lowest term by dividing both numerator and denominator by their

Greatest Common Factor or GCF, as you did in fractions.

Thus,

$$\frac{20}{25} = \frac{20 / 5}{25 / 5} = \frac{4}{5} \text{ or } 4:5$$

5 is the GCF of 20 and 25

Example 2. 10 is to 15 = 10 : 15 = $\frac{10 / 5}{15 / 5} = \frac{2}{3}$ or 2:3

Example 3. 1 is to 4 = 1:4 = 1/4 (1/4 is already in its simplest form)

C. Expressing ratios as decimals or as a quotient:

To find the ratio of two terms, divide the first term by the second term.

A ratio where the first term is smaller than the second term is similar to a proper fraction, the answer is less than 1, resulting in a decimal hundreth or a fraction.

Example 1. 1 is to 2; 1:2 = 1/2 = 0.5

```
      0.5
    -------
2 / 1.0
  / 1.0
    ------
      0
```

Example 2. 3 is to 5; 3:5 = 3/5 = 0.6

```
      0.6
    -------
5 / 3.0
  / 3.0
    ------
      0
```

Example 3. 2 is to 5; 2:5 = 2/5 = 0.4

```
      0.4
    -------
5 / 2.0
  / 2.0
    ------
      0
```

A ratio where the first term is greater than the second term is similar to an improper fraction. The answer is either a whole number or a mixed number.

Example 1. 5 is to 4; 5:4 = 5/4 = 1 1/4

$$\begin{array}{r} 1\ \ 1/4 \\ \hline 4\ /\ 5 \\ /\ \ 4 \\ \hline 1 \end{array}$$

Example 2. 3 is to 1; 3/1 = 3

Example 3. 8 is to 3; 8:3 = 8/3 = 2 2/3

D. Expressing ratio as percent:

Ratio maybe expressed as percent, as you did in fraction and percents.

Example 1. 1 is to 2; 1:2 = 1/2 = 0.5 x 100 = 50%

Example 2. 3 :5 = 3 -5 = 0.6 x100 = 60%

Example 3. 2:5 = 2 - 5 = 0.4 x 100 = 40%

Usually a ratio is an abstract number, that is, it contains no unit of measurement. But if the number compared have units of measurement, they must be expressed in the same unit.

Example: What is the ratio of 1 centimeter to 1 metre?

Centimetre and metre are different units of measure, in order to express this in the same unit of measure we have to change metre to centrimetre. Since there are 100 centrimetre in 1 metre, therefore, ratio of 1 centimetre to 1 metre is:

1: 100 centimetre (as expressed in centimetre)

1/100 : 1 metre (as expressed in metre)

Example 1. The ratio of 1 hour to 15 min. (change hour to minutes).

Note: Always express the ratio in their simplest form.

1 hour = 60 mins

therefore 60 mins. is to 15 mins., or 60:15 or 4:1.

Example 2. The ratio of 4 hours to 2 days.

2 days = 48 hours

Therefore 4 hours is to 48 hours or 4:48 or 1:12.

Example 3. The ratio of 6 seconds to 1 min.

1 min = 60 seconds

Therefore 6 secs is to 60 seconds or 6:60 or 1:10.

Example 4. The ratio of 2 years to 6 months.

2 years = 24 months

Therefore 24 months is to 6 months or 24:6 or 4:1.

Therefore, ratio is the mathematical method of making a comparison between two terms, and it can only be made of numbers with common measures.

The ratio of two numbers, a is to b (written a:b), means that for every number (a) in the first group, there is a corresponding number (b) in the second group. Let us try to study carefully the following examples of word problems in ratio:

Example 1. In a class of 48 students, there are 25 girls

What is the ratio of (a) girls to boys? (b) boys to girls? (c) girls to class?

Given: 48 - number of students in the class

25 - number of girls in the class

Problem: Ratio of;

a.) girls to boys c.) girls to class

b.) boys to girls

To solve the problem you need to find the number of boys by substracting the number of girls (25), from the number of students in the class (48). Thus,

```
   48 - students in the class
 -  25 - number of girls in the class
 -------
   23 - number of boys in the class
```

Solve: a.) ratio of girls to boys is:

25 is to 23; 25:23 or 25/23

b.) ratio of boys to girls is:

23 is to 25; 23:25 or 23/25

c.) ratio of girls to class is

25 is to 48; 25:48 or 25/48

Example 2. Mrs. Alonzo is a dressmaker. she has with her 5 meters white cloth and 8 meters blue cloth. Express the ratio of the white cloth to the blue cloth in decimal form.

Given: 5 meter white cloth; 8 meter blue cloth

Problem: ratio of white cloth to blue cloth in decimal form .

Solution: ratio of white cloth to blue cloth is

5:8 or 5/8 = 0.625 ; the ratio is 0.625

```
      0.625
    -------
8 /5.000
  4 8
  ------
    20
    16
  -----
    40
    40
  -----
     0
```

Example 3. Martin's monthly salary is P1000, while his father's salary is P1500. What is the ratio of Martin's salary to his father's salary?

Given: P1000 - Martin's salary

P1500 - father's salary

Problem: Ratio of Martin's salary to his father's salary.

Solution: P1000 : P1500 or P1000 / P1500 (reduce to lowest term).

$$\frac{P1000 \div 500}{P1500 \div 500} = \frac{2}{3}$$

Thus, 2:3 is the ratio of Martin's salary to that of his father's salary.

Example 4. In a party, the ratio of men to women is 4 is to 5. Express this is percent.

Given: 4 is to 5 - ratio of men to women

Problem: express 4 is to 5 as percent

Solution: 4:5 or 4/5 = $\frac{0.8}{5\,/4.0}$ = 0.8 x 100 = 8%, percent form of 4:5.

$$\begin{array}{r} 4\ 0 \\ \hline 0 \end{array}$$

Example 5. Ramon's money is 25% as much as his sister's Express in ratio. Who has more money, Ramon or his sister?

$$25\% = \frac{25}{100} \text{ or } \frac{25 \div 25}{100 \div 25} = \frac{1}{4}$$

The ratio of Ramon's money to his sister's money is 1 is to 4 or 1:4. Therefore. Ramon's sister has more money. The ratio 1 is to 4 means that for every P1.00 of Ramon, his sister has P4.00.

Example 6. A recipe calls for 4 cups of flour and 1 cup of sugar. What is the ratio of sugar to flour? What is the ratio of flour to sugar?

Given: 4 cups flour; 1 cup sugar

Problem: a.) ratio of sugar to flour

b.) ratio of flour to sugar

Solution: a.) 1:4 b.) 4:1

PRACTICE TASK

A. Express the relations of the following as ratio:

1. 12 boys to 15 girls
2. 4 marbles to 4 children
3. three cakes to six persons
4. 2 cups of sugar to 6 cups flour
5. 3 ballons to every child.

B. Complete the table below. No 1 is done for you

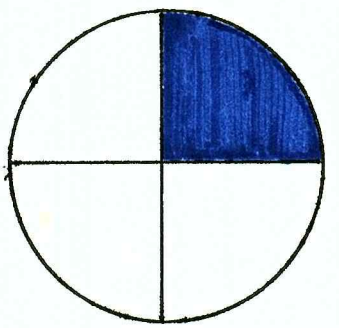
	Ratio	Fraction	Decimal	Percent
1.	2:5	2/5	0.4	40%
2.	4:5			
3.	1:4			
4.	3:6			
5.	3:4			

C. Write the following in their simplest form:

1. 5:1
2. 3:300
3. 10 sec. to 1 min
4. 6 cm. to 1 m
5. 2 days to 12 hrs.

D. Solve the following problems completely.

1. There are 15 boys for every 20 girls. Write the ratio of the number of boys to the number of girls in percent.
2. What ratio compares the shaded portion to the whole circle?



3. Jane adds 2 glasses of juice to 5 glasses of water. What is the ratio of juice to water? Express this in decimal form.

CONGRATULATIONS!!! You have just completed lesson 1 of module 2. Ask for the answer key from your teacher and compare your answers with the solution on the answer key. If you answered 75% of the Practice task correctly, then you have achieved the objectives. If you did not get 75% of the PRACTICE TASK correctly, then you have to go back to lesson 1 of module 2 and do the PRACTICE TASK again.

FEEDBACK TO PRACTICE TASK

A. 1. 12:15 or 4:5
   2. 4:4 or 1:1
   3. 3:6 or 1:2
   4. 2:6 OR 1:3
   5. 3:1

B. Completing the table.

1.	2:5	2/5	0.4	40%
2.	4:5	4/5	0.8	80%
3.	1:4	1/4	0.25	25%
4.	3:6	3/6	0.50	50%
5.	3:4	3/4	0.75	75%

C. Simplified form

1. 1:3 2. 1:100 3. 10:60 sec
4. 6:100 cm 5. 48:12 hrs.

D. Problem Solving

1. Given: 15 boys; 20 girls
   Problem: Ratio of boys to girls in percent
   Solution: 15:20 or 3:4 = 3/4 = 0.75 x 100 = 75%
2. Given: 4 parts-whole circle;
   1 part - shaded portion
   Problem: Ratio of the shaded portion to the whole circle
   Solution: 1:4 or 1/4 of the circle is shaded
3. Given: 2 glasses of juice; 5 glasses of water
   Problem: Ratio of juice to water in decimal form.
   Solution: 2:5 = 2/5 = 0.4 The ratio is 0.4.

Module 2

Lesson 2

RATIO

EQUAL RATIO

EQUAL RATIOS

Objectives:

After reading and studying this lesson you should be able to.

1. Identify equal ratios from other number expressions.
2. Solve for the missing term or number in an equal ratio.
3. Acquire desirable traits of orderliness and neatness.

In the previous lesson you have learned how to express relations of two quantities using ratio. You also learned that ratios can be expressed in simplest form. Expressing ratios in simplest form or finding the equivalent ratio is obtaining equal ratio. This is what you are going to study in the next lesson. It is all about equal ratios or proportions.

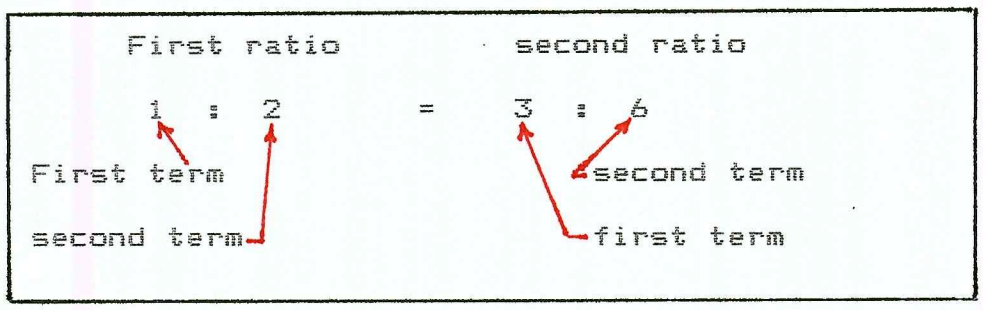
GOOD LUCK!!!

INPUT

EQUAL RATIO

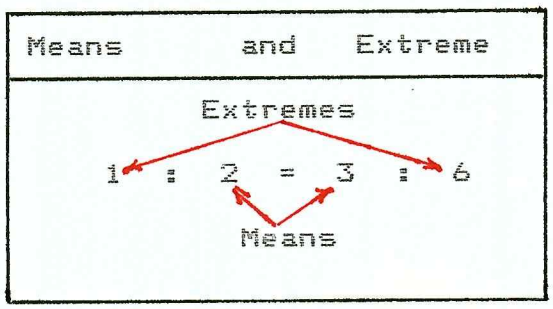
Equal ratios form a proportion.

A proportion is an expression of equality between two ratios. In equal ratios or proportion, two ratios are involved. For example, the ratio expressions 1:2 = 3:6 is an expression of equal ratios. The ratio to the left of the equal sign (1:2) is the first ratio, and the ratio to the rigth of the equal sign (3:6) is the second ratio. Each ratio has a first and second term.



In equal ratios, 4 numbers are involved, namely the end numbers and the middle numbers.

The end numbers are called extremes, while the middle numbers are called means.



Notice that when, the extremes are multipied (1 x 6 = 6), the product is equal to the product of the means (2 x 3 = 6). This is true becuase in any proportion, the product of the means is equal to the product of the extremes. No proportion expression is a true proportion unless the two ratios are equal.

Equal ratios or proportion can also be written in fractional form. For example the equal ratio 1:2 = 3:6 can be written as $\frac{1}{2} = \frac{3}{6}$. To check whether $\frac{1}{2}$ and $\frac{3}{6}$ are equal we apply the process of cross multiplication.

$$\frac{1}{2} \diagdown \quad \diagup \frac{3}{6}$$

$$1 \times 6 = 2 \times 3$$

$$6 = 6$$

Compare the products of the extremes and means to the products in cross multiplication. Which numbers in the fractional notation correspond to the extremes? to the means?

The equality of ratios can be checked through both methods. These methods will be important in finding missing numbers in equal ratios.

The following examples illustrate how to find the missing term or number in an expression of equal ratios.

Example 1. 8:n = 12:6

n, represents the missing number or term. To find the value a) write the ratios in fractional form as in; 8/n = 12/6 b) cross multiply by multiplying the numerator of the first term times the denominator of the second term, and the denominator of the first term times the numerator of the second term as below;

$$\frac{8}{n} = \frac{12}{6}$$

$$n \times 12 = 8 \times 6$$

$$12n = 48$$

c.) divide both sides of the equation by the known mean (12) as in below:

$$\frac{12n}{12} = \frac{48}{12}$$

$$n = 48/12$$

$$n = 4, \text{ therefore } 8:4 = 12:6$$

Check by substituting the equation:

$$8 : 4 = 12 : 6$$

$$4 \times 12 = 8 \times 6$$

$$48 = 48, \text{ since both sides are equal, therefore this is an equal ratio or proportion.}$$

Example 2. 4 : 5 = n : 25

a.) $\frac{4}{5} = \frac{n}{25}$

b.) $5 \times n = 100/5$

$5n/5 = 100/5$

$n = 20$

Check: $4 : 5 = 20 : 25$

$5 \times 20 = 4 \times 25$

$100 = 100$

Example 3. $\frac{6}{10} = \frac{3}{n}$

$6 \times n = 10 \times 3$

$6n/6 = 30/6$

$n = 5$

Check:

$6 \times 5 = 3 : 10$

$30 = 30$

Example 4. $\frac{n}{48} = \frac{1}{4}$

$n \times 4 = 48 \times 1$

$4n/4 = 48/4$

$n = 12$

Check:

$12 \times 4 = 48 : 1$

$48 = 48$

Example 5. $\frac{3}{21} = \frac{1}{n}$

$3 \times n = 21 \times 1$

$3n/n = 21/3$

$n = 21/3 = 7$

Check:

$3 \times 7 = 21 \times 1$

$21 = 21$

Example 6. $\frac{25}{30} = \frac{5}{n}$

$25 \times n = 30 \times 5$

$25n = 30 \times 5$

$25n/25 = 150/25$

$n = 6$

Check:

$25 \times 6 = 30 \times 5$

$150 = 150$

Example 7. $2 : 3 = n : 12$

$$\frac{2}{3} = \frac{n}{12}$$

$3n = 24/3$

$n = 24/3 = 8$

Check:

$3 \times 8 = 2 \times 12$

$24 = 24$

Example 8. $10 : 15 = 2 : n$

$10 \times n = 15 \times 2$

$n = 30 / 10$

$n = 6$

Check:

$10 \times 3 = 15 \times 2$

$30 = 30$

Example 9. $4 : 8 = 12 : n$

$4 \times n = 8 \times 12$

$4n = 96 / 4$

$n = 96/4 = 24$

Check:

$4 \times 24 = 8 \times 12$

$96 = 96$

PRACTICE TASK

C. Identify which of the following are equal ratios or proportions:

a. 3/5 = 4/8
b. 1/2 = 6/12
c. 12/15 = 4/5
d. 10/15 = 3/6
e. 7/14 = 6/12
f. 6/8 = 3/4
g. 18/20 = 10/30
h. 21/35 = 5/7
i. 24/36 = 2/3
j. 8 /12 = 3/4

B. Find the value of n so that each pair will form an equal ratio:

1. 2 : 3 = n : 6
2. 3 : n = 15 : n
3. 4 : 16 = n : 4
4. 27 : n = 9 : 5
5. 1 : 4 = n : 12
6. n : 3 = 10 : 30
7. n : 16 = 5 : 4
8. 10 : 4 = 5 : n
9. 8 : 3 = n : 21
2. 12 : n = 24 : 22

If you are through, ask for the answer key from your teacher and compare your work with that of the answer key. You must see to it that your answers are the same as those in the FEEDBACK TO PRACTICE TASK. If you have answered 75% of the PRACTICE TASK correctly, then you have achieved the objectives. If you did not get 75% of the PRACTICE TASK correctly, then you must go back to lesson 2 of module 2 and do the PRACTICE TASK again.

CONGRATULATIONS!!! you have just completed lesson 2 of module 2.

FEEDBACK TO PRACTICE TASK

A. The equal ratios are

b. $\frac{1}{2} = \frac{6}{12}$

c. $\frac{12}{15} = \frac{4}{5}$

e. $\frac{7}{14} = \frac{6}{12}$

f. $\frac{6}{8} = \frac{3}{4}$

i. $\frac{24}{36} = \frac{2}{3}$

B. Value of n

1. $\frac{2}{3} = \frac{n}{6}$

$3 \times n = 2 \times 6$

$3n/3 = 12/3$

$n = 4$

2. $\frac{3}{n} = \frac{15}{20}$

$n \times 15 = 3 \times 60$

$15n/15 = 60/15$

$n = 4$

3. $\frac{4}{16} = \frac{n}{4}$

$16 \times n = 4 \times 4$

$16n/16 = 16/16$

$n = 1$

4. $\frac{27}{n} = \frac{9}{5}$

6. $\frac{n}{3} = \frac{10}{30}$

$n \times 30 = 3 \times 10$

$30n/30 = 30/30$

$n = 1$

7. $\frac{n}{16} = \frac{5}{4}$

$4 \times n = 16 \times 5$

$4n/4 = 80/4$

$n = 20$

8. $\frac{10}{4} = \frac{5}{n}$

$10 \times n = 4 \times 5$

$10n/10 = 20/10$

$n = 2$

9. $\frac{8}{3} = \frac{n}{12}$

$$n \times 9 = 27 \times 6$$

$$9n/3 = 135/9$$

$$n = 15$$

5. $\frac{1}{4} = \frac{n}{12}$

$$4 \times n = 1 \times 12$$

$$4n/4 = 12/4$$

$$n = 3$$

$$3 \times n = 8 \times 21$$

$$3n/3 = 168/3$$

$$n = 56$$

10. $\frac{12}{n} = \frac{24}{22}$

$$n \times 24 = 264$$

$$24n/24 = 264/24$$

$$n = 11$$

Module 2

Lesson 3

RATIO

PROBLEM SOLVING IN EQUAL RATIO

PROBLEM SOLVING IN EQUAL RATIOS

Objectives:

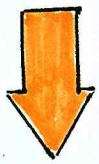
After reading and studying this lesson you should be able to:

1. Express relations of quantities as equal ratios or proportions.
2. Solve word problems applying equal ratios.
3. Show orderliness of solution in problem solving.

Now that you are able to solve for the missing term in an equal ratio or proportion, you are well equipped to solve many practical problems. The present lesson is about the application of equal ratio in real life situations.

Study the examples in the next lesson carefully to see how two equal ratios are used to solve word problems.

Good Luck !!!



INPUT

PROBLEM SOLVING IN EQUAL RATIOS

Application of equal ratios or proportions are presented as problems that gives a statement of certain conditions and an indication of the required answer. In all proportion problems, three of the four numbers, which become terms of the two ratios, are given in the statement of the problem. Remember that a ratio is a comparison of two numbers and a proportion is the equality of two ratios, and a ratio can only be made of numbers with common measures.

Equal ratios or proportion are either direct or inverse.

Direct Proportion

A direct proportion is a statement of equality between two ratios in which an increase in one term results in a proportional increase in the other related term.

In a direct proportion, the second term of the second ratio is an extreme of a proportion.

Following the steps in problem solving let us try to solve the following problems on direct proportion.

Example 1. The pilot of an airplane notes that he has flown 60 miles in 15 minutes. How long will it take him to fly 140 miles at this rate?

a.) Given: The problem expresses two closely similar, or parallel situations;

60 miles in 15 min and

140 miles in n minutes

b.) Form the equation: This can be written in a proportion,

60 miles is to 140 miles as 15 mins is to n mins.

60 : 140 = 15 : n

$$\frac{60 \text{ miles}}{140 \text{ miles}} = \frac{15 \text{ mins}}{n \text{ mins}}$$

Take note, that term of the same unit are on one side of the equation (=). This should always be the format;

$$\frac{\text{less miles}}{\text{higher miles}} = \frac{\text{less minutes}}{\text{higher minutes}}$$

c.) Solve the equation:

Find n by cross multiplication

$$\frac{60}{140} = \frac{15}{n}$$

$60 \times n = 140 \times 15$

$60n / 60 = 2100/60$

Check:

$60 \times n = 140 \times 15$

$60 \times 35 = 140 \times 15$

$2100 = 2100$

It will take 35 minutes to fly 140 miles.

Always remember that the key to setting up the proportion is to determine the parallel situations. Note that in

the first fraction both numerator and denominator tell the number of miles, and in the second fraction the number of minutes. That is, the numerator and denominator of a fraction used in equal ratio or proportion should be expressed in the same unit.

Example 2. Althea would like an enlargement of her 2 inches and 3 inches long photograph. She wants the enlargement to be 12 inches long. How wide will it be?

Given: $\frac{\text{Width} \dashrightarrow 2}{\text{length} \dashrightarrow 3} = \frac{\text{new width} \dashrightarrow n}{\text{new length} \dashrightarrow 12}$

Equation: She then wrote a proportion;

$$\frac{\text{Width} \dashrightarrow 2}{\text{length} \dashrightarrow 3} = \frac{n \dashrightarrow \text{new width}}{12 \dashrightarrow \text{new length}}$$

Solution: Find n by cross multiplication

$$\frac{2}{3} = \frac{n}{12}$$

$$3 \times n = 2 \times 12$$

$$\frac{3n}{3} = \frac{24}{3}$$

$n = 12$ ins. (new width of the enlarged photograph)

Example 3. Amos keeps P1.00 out of every P10 he collects on his paper route as his pay. He collected P40.00 for one week. How much does he keep?

Given: $\frac{\text{He keep} \dashrightarrow \text{P1}}{\text{He collects} \dashrightarrow \text{P10}} = \frac{\text{N} \dashrightarrow \text{He keeps}}{40 \dashrightarrow \text{He collects}}$

Equation: $\frac{1}{P10} = \frac{n}{40}$

Solution: $\frac{1}{10} = \frac{n}{40}$

$10 \times n = 1 \times 40$

$\frac{10\ n}{10} = \frac{40}{10}$

$n = 4$, Amos keeped P4.00

Example 4. The price of bananas in the market is 3 pieces for P1.00. How much will 12 pieces cost?

Given: 3 piece cost P1.00; 12 pieces cost n pesos

Equation: $\frac{3}{12} = \frac{1}{n}$

Solution: $\frac{3}{12} = \frac{1}{n}$

$3 \times n = 1 \times 12$

$3n/3 = 12/3$

$n = 4$; 12 pieces bananas will cost P4.00.

Example 5. Resty can type 150 words in 2 minutes. How many words can he type in 5 mins.

Given: 150 words in 2 mins; n words in 5 mins.

Equation: $\frac{150}{n} = \frac{2}{5}$

Solution: $\frac{150}{n} = \frac{2}{5}$

$$2 \times n = 5 \times 150$$

$$2n/2 = 750 / 2$$

$$n = 375 \text{ words}$$

Inverse Proportion

An inverse proportion is the opposite of direct proportion. An increase in one quantity results in a proportional decrease in the other related quantity.

In an inverse proportion, the first term of the second ratio is the mean of a proportion. To solve for the unknown number of an inverse proportion, find the missing mean. For example, in a two pulley system, if one pulley rotates five times when the larger pulley rotates one time (10-2 = 5). This results in 10 : 2 = 1 :5 which is a false proportion because the ratios are not equal.

To make it a true inverse proportion, the second ratio is inverted to get 10:2 = 5:1. The number of rotations of the pulley is inversely proportional to the diameter of the pulley. Let us study carefully the example below:

Example: If 8 men can finish building a wall in 6 days, how many men are needed to finish the same work in 4 day?

Given: 8 men 6 days

n men 4 days

Always remember that each ratio must have the numbers representing common units of measure, and

make the unknown number the second term in the second ratio.

Equation:

$$\frac{6 \text{ days}}{4 \text{ days}} = \frac{8 \text{ men}}{n \text{ men}} = \frac{6}{4} = \frac{8}{n}$$

Since this is an inverse ratio, invert the second ratio. Thus,

$$\frac{6}{4} = \frac{8}{n} = \frac{6}{4} = \frac{n}{8}$$

Solution: Find the value of n by multiplying the means and the extremes or by cross multiplication.

Thus,

$$4 \times n = 6 \times 8$$

$$\frac{4n}{4} = \frac{48}{4}$$

$$n = 12 \text{ men}$$

PRACTICE TASK

C. Practice Task:

A. Solve the following problems completely:

1. Roberto is 6 feet tall and casts a shadow of 4 feet. How high is the flagpole if it casts a shadow of 10 feet?
2. How many dozens of apples can Rodolfo buy for P18.00, if dozen apples costs P3.60.
3. If you travel 93 miles in 2 hrs, how far can you travel at the same rate in 7 hrs?
4. Two numbers are related to each other as 4 is to 11. The smaller of the two numbers is 32. What is the other number.
5. An airplane pilot found that he had flown a distance of 62 miles in 15 minutes. At this rate, how far would he fly in 45 minutes?
6. An engine makes 350 revolutions per min. How many revolutions will it make in 7 minutes.
7. Mrs. Santos's car used 40 gallons to go 600 miles. How many gallons of gasoline will be use to go 300 miles?
8. Ten men can make a small house in 12 days. How long will it take 15 men to finish the same job?
9. Four gallons of ice cream will serve 25 boys. How many gallons will serve 100 boys?

10. A baseball player hit 8 home runs in 200 times at bat. How many home runs can be expected to hit on 400 times at bat?

CONGRATULATIONS!!! You have just completed lesson 3 of module 2. Ask for the answer key from your teacher and compare your answer with the solution on the answer key. If you answered 75% of the PRACTICE TASK correctly, then you have achieved the objectives of the lesson. If you did not get 75% of the PRACTICE TASK correctly, then you have to go back to lesson 3 of module 2 and do the PRACTICE TASK again.

FEEDBACK TO PRACTICE TASK

1. Given: 6 ft tall --> shadow 4 ft; n --> shadow 10 ft.

   Equation: $\frac{6}{n} = \frac{4}{10}$

   Solution: $n \times 4 = 6 \times 10$ $\quad n = 15$ ft.

   $4n/4 = 60/4$

2. Given: 1 dozen --> 3.60 n dozen --> 18.00

   Equation: $\frac{1}{n} = \frac{3.60}{18.00}$

   Solution: $n \times 3.60 = 1 \times 18$ $\quad n = 5$ dozen

   $3.60n / 360 = 18/3.60$

3. Given: 93 miles --> 2 hors n miles--> 7hrs

   Equation: $\frac{93}{n} = \frac{2}{7}$

   Solution: $n \times 2 = 93 \times 7$ $\quad n = 325.5$ miles

   $2n/2 = 651/2$

4. Given: 4: 11 = 32 : n

   Equation: $\frac{4}{11} = \frac{32}{n}$

   Solution: $4 \times n = 11 \times 32$ $\quad n = 88$ ft.

   $4n/4 = 352/4$

5. Given: 62 miles --> 15 min.; n--> 45 mins.

   Equation: $\frac{62}{n} = \frac{15}{45}$

   Solution: $n \times 15 = 62 \times 45$ $\quad n = 186$ ft.

   $15n/15 = 2790/15$

6. Given: 350 revs --> 1 min.; n rev. --> 7mins

Equation: $\frac{350}{n} = \frac{1}{7}$

Solution: n x 1 = 350 x 7 n = 2450 rev.

7. Given: 40 gallons --> 600 miles; n gallons -> 300 miles

Equation: $\frac{40}{n} = \frac{600}{300}$

Solution: n x 600 = 40 x 300 n = 15 ft.

600n/600 = 12000/600

n = 20 gallons

8. Given: 10 mens --> 12 days; 15 mens --> n days

Inverse proportion

Equation: $\frac{10}{15} = \frac{n}{12}$

Solution: 15 x n = 10 x 12 n = 8 days

9. Given: 4 gallons --> 25 boys; n gallons --> 100 boys

Equation: $\frac{4}{n} = \frac{25}{100}$

Solution: n x 25 = 4 x 100 n = 2450 rev.

25n/25 = 400/25

10. Given: 8 homes runs --> 200 times; n home runs --> 400 times

Equation: $\frac{8}{n} = \frac{200}{400}$

Solution: n x 200 = 8 x 400

$\frac{200n}{200} = \frac{3200}{200}$ n = 16 home runs

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APPENDICES

Appendix A

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

April 19, 1994

The Dean of Graduate Studies
Samar State Polytechnic College
Catbalogan, Samar

M a d a m :

In my desire to start writing my Master thesis, I have the honor to submit for approval one of the following research problems, preferably number one.

1. DEVELOPMENT AND VALIDATION OF MODULE IN RATIO AND PERCENT FOR MATHEMATICS I

2. THE STATUS OF THE MATHEMATICS TEACHERS IN THE PROVINCE OF SAMAR

3. A COMPARATIVE STUDY ON THE ACHIEVEMENT OF MALE AND FEMALE STUDENTS IN MATHEMATICS I IN WRIGHT VOCATIONAL SCHOOL SY 1994-1995

Very truly yours,

(SGD.)VALENTINA W. DACULA
Researcher

Approved:

(SGD.)RIZALINA M. URBIZTONDO, Ed.D.
Dean, Graduate/Post Graduate Studies

Appendix B

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

SCHOOL OF GRADUATE STUDIES

APPLICATION FOR ASSIGNMENT OF ADVISER

NAME: DACULA, Valentina W.
Surname First Name Middle Name

CANDIDATE FOR DEGREE: Master of Arts

AREA OF SPECIFICATION: Math

TITLE OF PROPOSED THESIS/DISSERTATION: DEVELOPMENT AND VALIDATION IN PERCENT AND RATIO FOR MATHEMATICS I

(SGD.)VALENTINA W. DACULA
Applicant

EUSEBIO T. PACOLOR,Ph.D.
Name of Designated Adviser

CONFORME:

(SGD.)EUSEBIO T. PACOLOR
Adviser

APPROVED:

(SGD.)RIZALINA M. URBIZTONDO, Ed.D.
Dean

Appendix C

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

GRADUATE AND POST GRADUATE STUDIES

C E R T I F I C A T I O N

TO WHOM IT MAY CONCERN:

THIS IS TO CERTIFY that Ms. VALENTINA W. DACULA , has finished/complied with all the Academic Requirements of the course leading to the Degree Master of Arts in Teaching (MAT), major in Math last first semester SY 1992-1993 including the Comprehensive Examination last April 12-13, 1993, which she passed.

This certification is issued upon request of the interested party for whatever purpose it may serve.

(SGD.)RIZALINA M. URBIZTONDO, Ed.D.
Acting Dean, Graduate and Post Graduate Studies

NOT VALID
WITHOUT SEAL

OR# 4263381
Date issued August 19, 1993

RMU/jam

Appendix D

Republic of the Philippine
WRIGHT VOCATIONAL SCHOOL
Paranas, Samar

August 22, 1994

Dr. Antonio H. Obsequio
Principal II
Wright Vocational School
Paranas, Samar

S i r :

I have the honor to request permission to conduct a tryout of my modules in Percent and Ratio to Selected First year high school students. The results of this tryout will be used as data for my master thesis entitled "Development and Validation of Modules in Percent and Ratio for Mathematics I".

Your favorable consideration on this request is highly appreciated.

Very truly yours,

(SGD.)VALENTINA W. DACULA
Researcher

Recommending Approval:

(SGD.)NENA T. ABAYAN
Secondary School Head Teacher III

Approved:

(SGD.)ANTONIO H. OBSEQUIO, Ph.D.
Principal II

Appendix E

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

Jan. 20, 1995

Dr. Rizalina M. Urbiztondo
Dean, Graduate Studies
Samar State Polytechnic College
Catbalogan, Samar

M a d a m :

I hereby respectfully request that I be scheduled for an oral defense of my thesis proposal entitled "DEVELOPMENT AND VALIDATION OF MODULE IN PERCENT AND RATIO FOR MATHEMATICS I", on February 4, 1995.

I hope for your kind and favorable action on this request.

Very truly yours,

(SGD.)VALENTINA W. DACULA
Student

(SGD.)EUSEBIO T. PACOLOR, Ph.D.
Adviser

Approved:

(SGD.)RIZALINA M. URBIZTONDO, Ed.D.
Dean, Graduate Studies

Appendix F

Table of Specification for Test Construction
On Percent and Ratio for Math I

Contents \ Domains	K	C	A	Total No. of Items
1. Percent	4	5	5	14
2. Problems on Percent	4	5	5	14
3. Computing Discount, Marked Price, and Sale Price	5	4	4	13
4. Borrowing and Lending Money	4	4	5	13
5. Ratio	4	4	4	12
6. Equal Ratio	5	5	4	14
Total	26	27	27	80

Appendix G

Initial Form of the Test Instrument

Direction: Choose the letter of your best answer by writing it on your answer sheets.

1. Percent means:
   a. 100 c. 1/100
   b. % d. all of the above
2. To change decimals to percent, we move the decimal point:
   a. one place to the right c. one place to the left
   b. two places to the right d. two places to the left
3. In changing fractions to percent, the first thing to do is:
   a. move the decimal point two places to the right.
   b. change the fraction first to its decimal equivalent.
   c. add the percent sign.
   d. express in simplest form.
4. The percent of a number is called:
   a. percentage c. base
   b. product d. rate
5. n in percent problems represents the:
   a. unknown c. product
   b. factor d. percentage
6. In percent problems when the missing number is the first factor or rate the problem is classified as:
   a. Type A c. Type B
   b. Type C d. none of the above
7. When the unknown in percent problem is the product, the operation used is:
   a. addition c. multiplication
   b. subtraction d. division
8. When the percent problem is of Type B, the operation used in solving for the unknown is:
   a. multiplication c. addition
   b. division d. subtraction
9. The regular price of an article is called:
   a. discount c. discount rate
   b. marked price d. sale price
10. A reduction in price of something is called:
    a. discount c. sale price
    b. marked price d. discount rate
11. The price of an article after the discount rate has been deducted is:
    a. marked price c. discount rate
    b. discount d. sale price

12. The discount expressed as percent number is:
    a. sale price
    b. marked price
    c. discount rate
    d. discount
13. The formula for finding the discount, when the marked price and sale price are given is:
    a. D = MP x r%
    b. SP = MP - D
    c. r% = D ÷ MP
    d. D = MP - SP
14. The amount paid for the use of money is:
    a. principal
    b. interest
    c. rate
    d. time
15. The number of years for which the money will be borrowed represents:
    a. rate
    b. interest
    c. time
    d. principal
16. The amount of money borrowed is called:
    a. principal
    b. time
    c. interest
    d. rate
17. The percent of interest being charged on borrowed amount is:
    a. rate
    b. time
    c. interest
    d. principal
18. The relationship between two quantities or terms, which is usually used for comparison in mathematics is:
    a. percent
    b. ratio
    c. rate
    d. proportion
19. The expression 1:3 is a:
    a. proportion
    b. ratio
    c. product
    d. percentage
20. The colon (:) is a symbol used to indicate a relation between terms in:
    a. percent
    b. ratio
    c. fraction
    d. decimals
21. In the relation 2:8, which is the first term?
    a. 2
    b. 8
    c. both 2 and 8
    d. neither 2 or 8
22. An expression of equality between two ratios is:
    a. percentage
    b. proportion
    c. equal ratio
    d. both b and c
23. A sign used between the two ratio expressions to indicate that one expression is equal to the other is:
    a. (:)
    b. (÷)
    c. (=)
    d. (x)
24. The two inner or middle numbers in a proportion or equal ratio is called:
    a. product
    b. quotient
    c. extremes
    d. means
25. The two outer or end number of a proportion or equal ratio is called:
    a. extremes
    b. means
    c. product
    d. addends

26. Which of the following expressions is a direct proportion?
    a. 8:2 = 12:3 c. 8:2 = 3:12
    b. 10:5 = 1:2 d. 10:2 = 1:5
27. Which of the following is the decimal equivalent of 15%?
    a. 1.5 c. .15
    b. .015 d. 15.
28. The percent form of .8 is:
    a. 8% c. 08%
    b. 800% d. 80%
29. The fractional form of 2% is:
    a. 2/10 c. 2/100
    b. 20/10 d. 20/100
30. The percent form of 2¼ is:
    a. 150% c. 225%
    b. 200% d. 250%
31. Which of the following is the fractional form of 62.5%?
    a. 3/4 c. 4/5
    b. 4/8 d. 5/8
32. 10% of 30 is equal to:
    a. 3 c. 2
    b. 30 d. 20
33. 100 is what percent of 200?
    a. 20% c. 100%
    b. 50% d. 200%
34. 5 is 10% of:
    a. 100 c. 50
    b. 10 d. 20
35. 20% of 100 is equal to:
    a. 10 c. 200
    b. 20 d.2
36. What is 75% of 24?
    a. 20 c. 16
    b. 12 d. 18
37. The discount of an album marked ₱150 with a 10% discount is:
    a. ₱10 c. ₱20
    b. ₱15 d. ₱25
38. The sale price of a book marked ₱225 with 25% discount is:
    a. ₱200 c. ₱180
    b. ₱150 d. ₱250
39. The marked price of a blouse sold at ₱80 with a 20% discount is:
    a. ₱90 c. ₱108
    b. ₱110 d. ₱100
40. The discount rate of a dress marked ₱250 with ₱50 discount is:
    a. 2% c. 10%
    b. 20% d. 15%

41. The interest of ₱500 at 12% per annum for 1 year is:
    a. ₱50 c. ₱70
    b. ₱60 d. ₱80
42. The principal with an interest of ₱60 at 10% per annum for 1 year is:
    a. ₱500 c. ₱800
    b. ₱600 d. ₱1000
43. The rate of interest of ₱ which incurred an interest of ₱50 for a year is:
    a. 5% c. 15%
    b. 10% d. 20%
44. The number of years the amount of ₱800 was borrowed which earned an interest of ₱192 at 12% interest rate is:
    a. 1 year c. 4 years
    b. 3 years d. 2 years
45. The ratio of six cookies to a child is:
    a.1:6 c. 6:1
    b. 3:2 d. 2:3
46. The ratio of boys to girls in a class of 45 students where 20 are boys is:
    a. 20:45 c. 45:20
    b. 20:25 d. 25:20
47. The ratio of candies to number of children if there are 4 candies to every child:
    a. 4:2 c. 1:4
    b. 2:4 d. 4:1
48. Which relation expresses the ratio of four buttons to twenty centavos:
    a. 20:4 c. 1:2
    b. 4:20 d. 2:4
49. A ratio equivalent to 3:8 is:
    a. 8:3 c. 9:24
    b. 3:24 d. 15:36
50. Which of the following statements about equal ratios is FALSE?
    a. The product of the extremes equals the product of the means.
    b. The product of the means divided by the extremes gives the other extreme.
    c. The sum of the extremes equals the sum of the means.
    d. a and b only.
51. The value of n in the statement, 7/3 = n/15, is:
    a. 15 c. 35
    b. 21 d. 105
52. The missing number in the statement, 3/5 = n/30, is:
    a. 18 c. 16
    b. 24 d. 28
53. The missing term in the equal ratio, 5:n = 25:30, is:
    a. 8 c. 10
    b. 6 d. 12

54. 10 out of the 50 workers were absent. What percent of the workers were absent?
    a. 5% c. 15%
    b. 10% d. 20%
55. 60% of the students are girls. What is its fractional equivalent?
    a. 4/5 c. 3/5
    b. 2/5 d. 1/5
56. Danilo made 35% hits out of 100 tries. What is its decimal equivalent?
    a. .035 c. 35.5
    b. 3.5 d. .35
57. In a class of 40 students, 40 got perfect score in a test, what percent of the class got perfect?
    a. 1% c. 50%
    b. 10% d. 100%
58. Johnny took a 50-item test in Mathematics I, he got 45 correct answers. What percent of the test did Johnny answered correctly?
    a. 90% c. 50%
    b. 60% d. 80%
59. Sylvia gave Mario ₱250 allowance. 40% of this was for food. How much will be spent for food?
    a. ₱50 c. ₱80
    b. ₱100 d. ₱120
60. Arnel received a salary increase of ₱60. This is 20% of his monthly salary. How much is his monthly salary?
    a. ₱200 c. ₱300
    b. ₱100 d. ₱500
61. Aida spelled 90% of 50 words correctly. How many words were correct?
    a. 30 c. 40
    b. 20 d. 45
62. The Eagle team won 80% of the games in the last athletic competition. If there were 25 games, how many games did they win?
    a. 20 c. 15
    b. 10 d. 18
63. What is the discount of an item marked ₱50 and its discount rate is 10%?
    a. ₱5 c. ₱15
    b. ₱10 d. ₱20
64. A calculator was sold for ₱400 at 20% discount. What was its marked price?
    a. ₱600 c. ₱100
    b. ₱500 d. ₱800
65. A toy car was originally marked ₱250. It was sold at ₱200. Find the rate of discount.
    a. 25% c. 10%
    b. 20% d. 15%

66. A pair of pants is marked ₱450, find the sale price if a 25% discount is given:
    a. ₱237.50 c. ₱257.50
    b. ₱137.50 d. ₱337.50
67. What rate of interest was imposed if ₱10 interest was paid for ₱100 borrowed for one year?
    a. 15% c. 10%
    b. 5% d. 20%
68. A bank offers a 5% interest a year for amount borrowed. Find the interest of ₱2000 for 1 year.
    a. ₱100 c. ₱150
    b. ₱200 D. ₱50
69. Mrs. Roa paid the bank an interest of ₱50 at 10% per annum for 1 year. How much money did she borrow from the bank?
    a. ₱1000 c. ₱1500
    b. ₱500 d. ₱2000
70. M. Cruz borrowed ₱600 from a bank and paid an interest of ₱60 for 2 years. What is the rate of interest on the amount borrowed?
    a. 10% c. 5%
    b. 15% d. 20%
71. There are 10 boys and 15 girls in the class. What is the ratio of boys to girls?
    a. 2:5 c. 5:10
    b. 10:15 d. 15:10
72. Mrs. Estrada use 1½ meters of cloth for sewing a blouse and 2 meters cloth for sewing a skirt. What is the ration of the cloth used in sewing a blouse and in sewing a skirt in decimal form?
    a. .15 c. .75
    b. .25 d. 7.5
73. A box contains 15 balls where 8 are yellow and 7 are red. What is the ratio of the red balls to the yellow balls in percent form?
    a. 87.5% c. 85%
    b. 87% d. 80%
74. A bus having 24 seats has 30 passengers. What is the ratio of the number of seats to the number of passengers in fractional form?
75. Resty can type 150 words in two minutes. How many words can he type in 5 minutes?
    a. 275 c. 375
    b. 300 d. 475
76. Roberto is 6 feet tall and casts a shadow of 4 ft. How high is the flagpole it is casts a shadow of 10 feet?
    a. 10 c. 18
    b. 15 d. 25

77. How many dozens of apples can Rodolfo buy for ₱18.00, if one dozen apples cost ₱3.60?
    a. 10 c. 6
    b. 8 d. 5

For items 78-80 use the graph below:

The graph shows the monthly expenses of the family.

78. What fractional part of the expenses is spent for food?
    a. ½ c. 1/5
    b. 6/8 d. 1/8
79. What percent of the expenses is spent for miscellaneous?
    a. 125% c. 1.25%
    b. 12.5% d. .125%
80. What is the ratio of the expenses for food to the expenses for education?
    a. 1:8 c. 4:1
    b. 1:4 d. 8:1

" T H A N K Y O U "

Prepared by:

Mrs. VALENTINA W. DACULA
Researcher

Appendix H

Final Form of Test Instrument
Pretest/Posttest test

Direction: Choose the letter of your best answer by writing it on your answer sheets.

1. The percent of a number is called:
   a) percentage b) product c) base d) rate
2. In percent problems, n represents the:
   a) unknown b) factor c) product d) percentage
3. In solving percent problems, when the unknown is the product, the operation is used:
   a) addition b) subtraction c) multiplication d) division
4. The regular price of an article is called:
   a) discount b) marked price c) sale price d) discount rate
5. A reduction in price of some items is called:
   a) discount b) marked price c) sale price d) discount rate
6. The discount expressed as percent number is:
   a) sale price b) marked price c) discount rate d) discount
7. The amount paid for the use of money is called:
   a) principal b) interest c) rate d) time
8. The percent of interest being charged on borrowed amount is:
   a) rate b) time c) interest d) principal
9. The relationship between two quantities or terms, which is usually used for comparison is:
   a) percent b) ratio c) fraction d) proportion
10. Which is the first term in the relation 2:8?
    a) 2 b) 8 c) both 2 and 8 d) neither 2 or 8
11. An expression of equality between two ratios is:
    a) percentage b) proportion c) equal ratio d) both b and c
12. A sign used between the two ratio expressions to indicate that one expression is equal to the other is:
    a) (:) b) (÷) c) (=) d) (x)
13. Which of the following is the decimal equivalent of 15%?
    a) 1.5 b) .015 c) .15 d) 15.
14. The percent form of .8 is:
    a) 8% b) 800% c) 08% d) 80%
15. The fractional form of 2% is:
    a) 2/100 b) 20/10 c) 2/100 d) 20/100
16. The percent form of 2¼ is:
    a) 150% b) 200% c) 225% d) 250%
17. 10% of 30 is equal to:
    a) 3 b) 30 c) 2 d) 20
18. 100 is what percent of 200?
    a) 20% b) 50% c) 100% d) 200%
19. 5 is 10% of:
    a) 100 b) 10 c) 50 d) 20

20. The discount of an album marked ₱150 with a 10% discount rate is:
    a) ₱10 b) ₱15 c) ₱20 d) ₱25
21. The sale price of a book marked ₱225 with ₱45 discount is:
    a) ₱200 b) ₱150 c) ₱180 d) ₱270
22. The marked price of a blouse sold at ₱80 with a 20% discount is:
    a) ₱90 b) ₱110 c) ₱108 d) ₱100
23. The interest of ₱500 at 12% per annum for 1 year is:
    a) ₱50 b) ₱60 c) ₱70 d) ₱80
24. The principal with an interest of ₱60 at 10% per annum for 1 year is:
    a) ₱500 b) ₱600 c) ₱800 d) ₱1000
25. The ratio of six cookies to a child is:
    a) 1:6 b) 3:2 c) 6:1 d) 2:3
26. Which relation expresses the ratio of four buttons to twenty centavos:
    a) 20:4 b) 4:20 c) 1:2 d) 2:4
27. A ratio equivalent to 3:8 is:
    a) 8:3 b) 3:24 c) 9:24 d) 15:36
28. The value of n in the statement, 7/3 = n/15, is:
    a) 15 b) 21 c) 35 d) 105
29. The missing term in the equal ratio, 5:n = 25:30, is:
    a. 8 b) 6 c) 10 d) 12
30. In a class of 40 students, 40 got perfect score in a test. What percent of the class got perfect?
    a) 1% b) 10% c) 50% d) 100%
31. Aida spelled 90% of 50 words correctly. How many words were correct?
    a) a. 30 b) 20 c) 40 d) 45
32. A calculator was sold for ₱400 at 20% discount. What was its marked price?
    a) ₱600 b) ₱500 c) ₱700 d) ₱800
33. A toy car was originally marked ₱250. It was sold at ₱200. Find the rate of discount.
    a. 25% b)20% c) 10% d) 15%
34. What rate of interest was imposed if ₱75 interest was paid for ₱500 borrowed for 1 year?
    a) 15% b) 5% c) 10% d) 20%
35. Mrs. Roa paid the bank an interest of ₱50 at 10% per annum for 1 year. How much money did she borrow from the bank?
    a) ₱1000 b) ₱500 c) ₱1500 d) ₱2000
36. There are 10 boys and 15 girls in the class. What is the ratio of boys to girls?
    a) 2:5 b) 10:15 c) 3:5 d) 15:10
37. A box contains 15 balls where 8 are yellow and 7 are red. What is the ratio of the red balls to the yellow balls in percent form?
    a) 87.5% b) 87% c) 85% d) 80%

38. A bus having 24 seats has 30 passengers. What is the ratio of the number of seats to the number of passengers in fractional form?
    a) 24/30 b) 30/24 c) 1/30 d) 1/24
39. Resty can type 150 words in two minutes. How many words can he type in 5 minutes?
    a) 275 b) 300 c) 375 d) 475
40. Roberto is 6 feet tall and casts a shadow of 4 ft. How high is the flagpole if it casts a shadow of 10 feet?
    a) 10 ft. b) 15 dt. c) 18 ft. d) 25 ft.

- - - - G O O D L U C K - - -

Prepared by:

Mrs. V. W. DACULA
Researcher

Appendix I

Computation of Reliability Coefficient

Score	f	d	fd	fd^2
60 - 64	2	3	6	18
55 - 59	6	2	12	24
50 - 54	4	1	4/22	4
45 - 49	15	0		
40 - 44	0	-1	0	0
35 - 39	2	-2	-8	16
30 - 34	11	-3	-33	99
25 - 29	3	-4	-12	48
20 - 24	8	-5	-40	200
15 - 19	1	-6	-6/-99	36
	54		$\Sigma fd = -77$	$\Sigma fd^2 = 445$

$$M = A\,M + (\Sigma fd/N)\,i$$

$$= 47 + (-77/54)\,5$$

$$= 47 + (-1.426)\,5$$

$$= 47 + (-7.13)$$

$$= 39.87$$

$$Sd = i\sqrt{\Sigma fd^2/N - (\Sigma fd/N)^2}$$

$$Sd = 5\sqrt{445/54 - (-77/54)^2}$$

$$Sd = 5\sqrt{8.24 - (1.426)^2}$$

$$Sd = 5\sqrt{8.24 - 2.033}$$

$$Sd = 5\sqrt{6.207}$$

$$Sd = 5\ (2.4913852)$$

$$Sd = 12.457$$

$$P = \frac{\bar{X}}{N} = \frac{39.87}{80} = .498375$$

$$q = 1 - P$$

$$= 1 - .4984$$

$$= 0.5016$$

Formula:

$$r_{11} = \left(\frac{N}{N-1}\right)\left(\frac{S^2 - NPq}{S^2}\right)$$

Where:

r_{11} = reliability coefficient of the test

N = number of items in the test

$P = \frac{\bar{X}}{N}$ = the proportion of the group passing an item and where X is the mean of the test scores

$q = 1 - P$ = the proportion of the group failing an item

S = standard proportion of the test scores

Solving for r_{11}:

$N = 80$

$S = 12.457$

$P = .4984$

$q = .50$

$$r_{11} = \left(\frac{N}{N-1}\right)\left(\frac{S^2 - NPq}{S^2}\right)$$

$$r_{11} = \left(\frac{80}{80-1}\right)\left(\frac{[12.457]^2 - 80\,[.4984][.50]}{[12.457]^2}\right)$$

$$r_{11} = \left(\frac{80}{79}\right)\left(\frac{155.17685 - 80\,[.2492]}{155.17685}\right)$$

$$r_{11} = 1.01266\left(\frac{155.17685 - 19.936}{155.17685}\right)$$

$$r_{11} = 1.01266\left(\frac{135.24085}{155.17685}\right)$$

$$r_{11} = 1.01266\ (.8715)$$

$$r_{11} = .8825$$

Appendix J

Interpretation of the Coefficient of Reliability

Reliability	Degree of Reliability
0.95 - 0.99	Very high, rarely found among teachers' made tests.
0.90 - 0.94	Highly equaled by few test.
0.80 - 0.89	Fairly high, adequate for individual measurement.
0.70 - 0.79	Rather low, adequate for group measurement but not very satisfactory for individual measurements.
below 0.70	Low, entirely inadequate for individual measurement although useful for group average and school survey.

Appendix K

Computation of the t-test Between the Pretest Mean Scores of the Experimental and Control Groups

Pre-test Result

Experimental		Control	
X	X^2	X	X^2
15	225	18	324
15	225	10	100
17	289	16	246
14	196	11	121
13	169	19	361
16	256	20	400
19	361	15	225
12	144	15	225
18	324	19	361
10	100	6	36
11	121	12	144
15	225	19	361
10	100	18	324
8	64	18	324
14	196	16	256
12	144	18	324
21	441	15	225
20	400	10	100
15	225	10	100
17	289	13	169
Σ=292	4494	Σ=298	4736
$\bar{X}$=14.6		$\bar{X}$=14.9	

Difference per pre-test

Experimental

$$S_1^2 = \frac{N_1 \Sigma X^2 - (\Sigma X)^2}{N_1 (N-1)}$$

$$S_1^2 = \frac{20 (4494) - (292)^2}{20 (20-1)}$$

$$S_1^2 = \frac{89880 - 85264}{20 (19)}$$

$$S_1^2 = \frac{89880 - 85264}{380}$$

$$S_1^2 = \frac{4616}{380}$$

$$S_1^2 = 12.15$$

Control

$$S_2^2 = \frac{N_2 \Sigma X^2 - (\Sigma X)^2}{N_2 (N_2-1)}$$

$$S_2^2 = \frac{20 (4736) - (298)^2}{20 (20-1)}$$

$$S_2^2 = \frac{94720 - 88804}{20 (19)}$$

$$S_2^2 = \frac{94720 - 88804}{380}$$

$$S_2^2 = \frac{5916}{380}$$

$$S_2^2 = 15.57$$

Independent Samples:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(N_1-1)\, S_1^2 + (N_2-1)\, S_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

$$= \frac{14.6 - 14.9}{\sqrt{\frac{(20-1)(12.15) + (20-1)\,(15.57)}{20 + 20 - 2} \left(\frac{1}{20} + \frac{1}{20}\right)}}$$

$$= \frac{-0.3}{\sqrt{\frac{(19)(12.15) + (19)(15.57)}{20 + 18}\left(\frac{1}{20} + \frac{1}{20}\right)}}$$

$$= \frac{-0.3}{\sqrt{\frac{230.85 + 295.83}{38}\left(\frac{1}{20} + \frac{1}{20}\right)}}$$

$$= \frac{-0.3}{\sqrt{\frac{526.68}{38}(.05 + .05)}}$$

$$= \frac{-0.3}{\sqrt{\frac{526.68}{38}(.1)}}$$

$$= \frac{-0.3}{\sqrt{13.86\ (.1)}}$$

$$= \frac{-0.3}{\sqrt{1.386}}$$

$$= \frac{-0.3}{1.18}$$

$$t = -0.25$$

Interpretation:

Ho Accepted

$$df = 20 + 20 - 2$$

$$= 38$$

t-value at .05 level
2.04

Appendix L

Computation of the t-test Between the Posttest Mean Scores of the Experimental and Control Groups

Post Test Result

Experimental		Control	
X	X^2	X	X^2
33	1089	21	441
24	576	18	324
25	625	17	289
27	729	16	256
31	961	20	400
26	676	24	576
35	1225	23	529
28	784	21	441
36	1296	20	400
26	676	24	576
23	529	25	625
30	900	26	676
21	441	20	400
16	256	24	576
20	400	25	625
16	256	20	400
38	1444	26	676
38	1444	23	529
18	324	18	324
23	529	22	484
Σ=534	15160	Σ=433	9547
$\bar{X}$=26.7		$\bar{X}$=21.65	

Difference between the mean scores of the experimental and control groups per post-test

Experimental

$$S_1^2 = \frac{N_1 \Sigma X^2 - (\Sigma X)^2}{N_1 (N-1)}$$

$$S_1^2 = \frac{20(15160) - (534)^2}{20 (20-1)}$$

$$S_1^2 = \frac{303200 - 285156}{20 (19)}$$

$$S_1^2 = \frac{18044}{380}$$

$$S_1^2 = 47.48$$

Control

$$S_2^2 = \frac{N_2 \Sigma X^2 - (\Sigma X)^2}{N_2 (N_2-1)}$$

$$S_2^2 = \frac{20 (9547) - (433)^2}{20 (20-1)}$$

$$S_2^2 = \frac{190940 - 187489}{20 (19)}$$

$$S_2^2 = \frac{3451}{380}$$

$$S_2^2 = 9.08$$

t-test for Independent Samples:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(N_1-1)\, S_1^2 + (N_2-1)\, S_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

$$= \frac{26.7 - 21.65}{\sqrt{\frac{(20-1)(47.48) + (20-1)\,(9.08)}{20 + 20 - 2} \left(\frac{1}{20} + \frac{1}{20}\right)}}$$

$$= \frac{5.05}{\sqrt{\frac{(19)\,(47.48) + (19)\,(9.08)}{20 + 18} (.05 + .05)}}$$

$$= \frac{5.05}{\sqrt{\frac{902.12 + 172.52}{38}\ (.1)}}$$

$$= \frac{5.05}{\sqrt{\frac{1074.64}{38}\ (.1)}}$$

$$= \frac{5.05}{\sqrt{28.28\ (.1)}}$$

$$= \frac{5.05}{\sqrt{2.828}}$$

$$= \frac{5.05}{1.682}$$

$t = 3.00$

df = 20 + 20 - 2

= 38

at .05 level

t = 2.04

Interpretation:

Reject Ho

There is a significant difference.

Appendix M

Computation of t-test Between the Pretest and Posttest Results of the Experimental Group

Pretest	Post test	Difference	d^2
15	33	18	324
15	24	9	81
17	25	8	64
14	27	13	169
13	31	18	324
16	26	10	100
19	35	16	256
12	28	16	256
18	36	18	324
10	26	16	256
11	23	12	144
15	30	15	225
10	21	11	121
8	16	8	64
14	20	6	36
12	16	4	16
21	38	17	289
20	38	18	324
15	18	3	9
17	23	6	36
$\Sigma=292$	$\Sigma=534$	$\Sigma d=242$	$\Sigma d^2=3418$
$\bar{X}=14.6$	$\bar{X}=26.7$	$\bar{d}=12.1$	

$$Sd = \sqrt{\frac{N\Sigma d^2 - (\Sigma d)^2}{N\ (N-1)}}$$

$$Sd = \sqrt{\frac{20\ (3418) - (242)^2}{20\ (20-1)}}$$

$$Sd = \sqrt{\frac{68360 - 58564}{20\ (19)}}$$

$$= \sqrt{\frac{9796}{380}}$$

$$= \sqrt{25.78}$$

$$= 5.08$$

$$t = \frac{\bar{d}}{Sd/\sqrt{N}}$$

$$= \frac{12.1}{5.08/\sqrt{20}}$$

$$= \frac{12.1}{5.08/4.47}$$

$$= \frac{12.1}{1.1365}$$

$$= 10.65$$

df = n - 1

= 20 - 1

= 19

t-value at .05 level

t = 1.73

Reject Ho

There is a significant difference.

Appendix N

Computation of t-test Between the Pretest and Posttest Results of the Control Group

Pretest	Post test	Difference	d^2
18	21	3	9
10	18	8	64
16	17	1	1
11	16	5	25
19	20	1	1
20	24	4	16
15	23	8	64
15	21	6	36
19	20	1	1
6	24	18	324
12	25	13	169
19	26	7	49
18	20	2	4
18	24	6	36
16	25	9	81
18	20	2	4
15	26	11	121
10	23	13	169
10	18	8	64
10	18	8	64
13	22	9	81
$\Sigma=298$	$\Sigma=433$	$\Sigma d=135$	$\Sigma d^2=1319$
$\bar{X}=14.9$	$\bar{X}=21.65$	$\bar{d}=6.75$	

$$Sd = \sqrt{\frac{N\Sigma d^2 - (\Sigma d)^2}{N\ (N-1)}}$$

$$Sd = \sqrt{\frac{20\ (1319) - (135)^2}{20\ (20-1)}}$$

$$Sd = \sqrt{\frac{26380 - 18225}{20\ (19)}}$$

$$= \sqrt{\frac{8155}{380}}$$

$$= \sqrt{21.46}$$

$$= 4.63$$

$$t = \frac{\bar{d}}{Sd/\sqrt{N}}$$

$$= \frac{6.75}{4.63/\sqrt{20}}$$

$$= \frac{6.75}{4.63/4.47}$$

$$= \frac{6.75}{1.04}$$

$$= 6.49$$

df = n - 1

= 20 - 1

= 19

t-value at .05 level

t = 1.73

Reject Ho

There is a significant difference.

Appendix O

Computation of RES of the Module

Pages	No. of Words	No. of Sen.	No. of Syllables
1/1/4	100	3	153
1/1/11	100	6	139
1/2/4	100	7	144
1/2/6	100	6	138
1/3/3	100	5	129
1/4/5	100	6	130
1/5/4	100	7	136
1/5/10	100	6	133
1/6/5	100	7	135
1/6/7	100	6	131
1/7/6	100	5	127
1/8/3	100	8	146
1/9/14	100	7	135
	1300	84	1776

Formula:

Reading Ease Score (RES) = 206.835 - (1.05 x average sentence length + 0.846 x average word length)

Where:

$$\text{Ave. sen. length} = \frac{\text{No. of words in all samples}}{\text{Total no. of sentences}}$$

$$\text{Ave. word length} = \frac{\text{No. of syllables in all samples}}{\text{Total no. of sample pages}}$$

$$\text{Ave. sen. length} = \frac{1300}{84} = 15.4762$$

$$\text{Ave. word length} = \frac{1776}{13} = 136.6154$$

Solution:

RES = 206.835 - (1.015 x 15.4762) + (0.846 x 136.6154)

RES = 75.5501 Fairly Easy

Appendix P

Computation of HIS of the Module

Pages	Personal Words	Personal Sentences
1/1/4	2	2
1/1/11	1	1
1/2/4	3	5
1/2/6	3	3
1/3/3	2	2
1/4/5	5	8
1/5/4	4	6
1/5/10	1	1
1/6/5	1	1
1/6/7	1	2
1/7/6	2	4
1/8/3	1	1
1/9/14	2	3
	28	39

Formula:

Human Interest Score (HIS) = (% personal words per 100 words x 3.635) + (% personal sentences x 0.314)

Where:

$$\%\ \text{personal words} = \frac{\text{Total no. of personal words in all samples}}{\text{Total no. of words in all sample pages}}$$

$$\%\ \text{personal sen.} = \frac{\text{Total no. of personal sentences}}{\text{Total sentences in all samples}}$$

personal words = 28

personal sentences = 39

$$\%\ \text{personal words} = \frac{28}{1300} \times 100 = 2.154$$

$$\text{Ave. word length} = \frac{39}{84} \times 100$$

$$= 46.43$$

HIS = (2.154 x 3.635) + (46.43 x 0.314)

HIS = 22.4088 Interesting

Appendix Q

Interpretation of Reading Ease Score and Human Interest Score of the Flesch Formula

Reading Ease Score

RES	Description of Style	Corrected Grade Level
90 - 100	Very Easy	5th grade
89 - 90	Easy	6th grade
70 - 80	Fairly Easy	1st-2nd yr (HS)
60 - 70	Standard	3rd-4th yr (HS)
50 - 60	Fairly difficult	1st-2nd yr (Col)
30 - 50	Difficult	3rd-4th yr (Col)
0 - 30	Very Difficult	College Graduate

Human Interest Scale

HIS	Description of Style
60 - 100	Dramatic
40 - 60	Highly Interesting
20 - 40	Interesting
10 - 20	Mildly Interesting
0 - 10	Dull

CURRICULUM VITAE

NAME	:	VALENTINA WANIWAN DACULA
ADDRESS	:	Bliss, Paranas, Samar
DATE OF BIRTH	:	February 6, 1956
PLACE OF BIRTH	:	Salcedo, Eastern Samar
STATION	:	Wright Vocational School
POSITION	:	Secondary Teacher II
CIVIL STATUS	:	Married

EDUCATIONAL ATTAINMENT

Elementary	Iberan Elementary School Salcedo, Eastern Samar
Secondary	Southern Samar Agricultural College, Salcedo, Eastern Samar, 1974
College	Bachelor of Science in Agricultural Education Southern Samar Agricultural College, Salcedo, Eastern Samar, 1978
Graduate Studies	Master of Arts in Teaching Samar State Polytechnic College, Catbalogan, Samar 1989 to date
Curriculum Pursued	Master of Arts in Teaching
Major	Mathematics

CIVIL SERVICE ELIGIBILITY

BAEX Civil Service Examination, 1978

Professional Board Examination for Teachers, 1979

Career Professional Examination, 1980

SEMINARS AND WORKSHOPS ATTENDED

Level 3 Mass Orientation of Secondary Officials and Teachers for Science and Mathematics on the Mec Textbook project, March, 1979

MECS-KKK Regional Work Conference, September, 1982

Regional Seminar Workshop of FFP-FAHP-FFPCC Association of Adult Leaders and Pre-Work Conference, September 1982

In-Depth Training on Selective Vegetable and Swine Raising, Sab-a Basin, Leyte, August, 1987

Conference-workshop of Technical Vocational Instructors and Supervisors of Technical and Vocational Education, BNVS, Allen Northern Samar, July 1988

Secondary Education Development Program Mass Training for First Year Teachers in Science and Mathematics, SNS, Catbalogan, Samar, April 1989

Secondary Education Development Program Mass Training for Second Year Teachers in Science and Mathematics, SNS, Catbalogan, Samar, May 1990

In-Service Training for Science III & IV and Mathematics III and IV Secondary School Teachers, November, 1993

Evaluation Seminar-Workshop in Secondary Mathematics, GSP Blg., Catbalogan, Samar, March 1994.

LIST OF FIGURES AND TABLES