MODULE 1

Basic Operations

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INTRODUCTION

In our daily life, we cannot escape from recognizing and using basic operations. As we know, they are essential in science and technology. They can be explored widely in various sources. In this module, we will certainly discuss these operations. Be sure, they are easy to cope with.

When you learned arithmetic in elementary school, you used to solve such problems as $3 + 4 = 7$; $7 - 4 = 3$; $3 \times 4 = 12$, $12 : 3 = 4$; $3^4 = 81$; and so on. In English, each of these operations is called addition, subtraction, multiplication, division, and power respectively. The problem is how to pronounce, elaborate, and use them in the English language.

In this module, you will do a series of learning activities with regard to (1) identifying, (2) differentiating, (3) pronouncing, (4) writing, and (5) operating areas of mathematics. The operation will cover:

1. digits, numbers, and figures;
2. addition, subtraction, multiplication, and division;

3. fractions;
4. powers and roots;
5. proportions, percentages, averages;
6. factors, equations, and formulae.

In order to make you feel easy to explore each of the topics above, you will find that this module is presented to you in six units. Each contains activities covering explanations, practices and exercises.

Throughout these activities you are required to identify, differentiate, pronounce, write, and operate basic operations. You are regarded successful in mastering each unit if you are able to accomplish it with 90 percent of achievement level.

Are you ready to explore them? I believe you are. If so, that is great! Now let us start with our explorations. Feel free to explore the learning items in group, if you wish. Remember, you have to do the exercises by yourself though.

UNIT 1

Digits, Numbers, and Figures

In this unit you are going to learn about Digits, Number, and Figures. After you learn this unit, you will be able to:

1. identify digits, numbers and figures;
2. differentiate digits from numbers and figures;
3. pronounce symbolic representation of digits, numbers, and figures;
4. use digits, numbers, and figures.

A. DIGITS

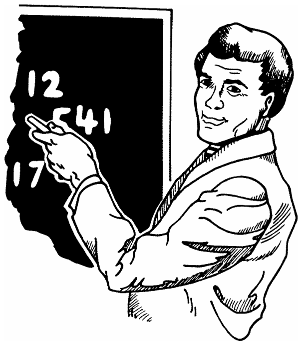
Where do you live? I believe you live in a house located on a street. It must have a number, right? I live on Jalan Pemuda. My house number is 306. What is yours? Write down your answer here: _______________.

Now, look! My house number is 306. This number consists of three digits, i.e. 3, 0, and 6. They are pronounced /θri:/, /oh/, and /siks/ and spelled three, naught, and six respectively. Your house number is ________________. Therefore, it contains _______________ digits, i.e. _______________.

Talking about telephone number, by the way, do you have a telephone in your house? Or a mobile-phone in your pocket? You do, don't you? I am happy to tell you that my telephone number is 8662234. It consists of seven digits; some are the same. Which ones are they? Write down your answer here: _______________ and _______________. If your answers are digits 6 and 2, that is great. If not, be sure that the telephone number mentioned above one digit 8, 3, and 4 and two digits 6 and 2.

Now, suppose you want to call a friend. You forget his/her phone number. What will you do? I am pretty sure, you will call the Information Service. Isn't it right? So, what digits will you dial? Write down your answer here _______________. How many digits are there? (a) one, (b) two, (c) three, or (d) four? I believe your answer is (c) three. They are digit 1, digit 0, and digit 8. So, what is meant by a digit? Of course, a digit is just any numeral from 0 to 9. In order to deepen your understanding about digits, do the Exercise 1 on page 1.7.

B. NUMBERS



You might have known the number of states in the USA. Anyway, I am glad to tell you that there are 50 states there. Fifty states. Now, what about the number of provinces in Indonesia? How many provinces are there in this country? Write down your answer here _______________. I definitely believe, your answer is the same as mine, i.e. 33. Is it right? So, there are _______________ states in the USA and there are _______________ provinces in this country.

We say that 50 (fifty) and 33 (thirty-three) are numbers. They are whole numbers. People also call them integers. How many digits does each of the numbers have? Write down your answer here _______________. That is right: two. Each of the numbers above consists of two digits.

You know, each of the numbers mentioned above, i.e. 50 and 33, denotes quantity. Such numbers are commonly called cardinal numbers or simply cardinals. In other words, a cardinal (number) is a number which denotes quantity. So, suppose you have 32 friends in your hometown. The number – 32 – is also called a _______________ or simply _______________.

By the way, talking again about the number of provinces in this country, which one is the youngest? If I am not mistaken, it is the Province of West Sulawesi. If so, we can say that West Sulawesi is the thirty-third province. Yes, thirty-third. You might now that this number, i.e. 33^{rd} (thirty-third) denotes an order or a certain position in a sequence. Thus, it is commonly called an ordinal number or simply ordinal. Therefore, suppose there are 11 football players in a team and you are the captain. We can say that you are the first player. Again, we call the number, i.e. first, as an ______________ or ______________ because it denotes ______________.

As for the two numbers mentioned above, i.e. 50 and 33, we can say that 50 is an even number while 33 is an odd number. Now, what do you think about the following numbers?

(a) 4, 26, 268, 570
(b) 5, 49, 247, 681

Are they even or odd numbers? Write down your answers here (a) ______________, (b) ______________. I am quite sure, your answers are correct: (a) 4, 26, 268 and 570 are even numbers while (b) 5, 49, 247 and 681 are odd numbers. In order to improve your skill regarding numbers, do the Exercise 2 on page 1.7.

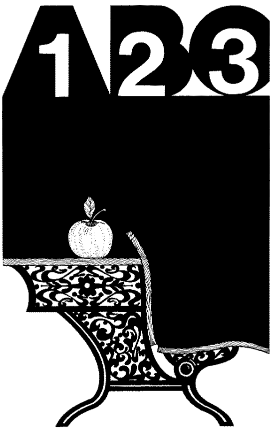
C. FIGURES

Do you still remember the number of states in the USA? Yes, that is correct. Fifty. What about the number of provinces in this country? If I am not mistaken, there are thirty-three. We say that the number of states in the USA is fifty and the number of provinces here is thirty-three. We can, of course, represent the two numbers in digits, i.e. 50 and 33. And we call these representations as figures. So, what is meant by a figure? A figure is the digital representation of a number.

What about the province of West Sulawesi? Remember, it is the thirty-third province. Yes, thirty-fifth. Can you represent this ordinal number in figure? Of course, you can! It is 33rd. Is it right? Good. For your reminder, the followings are samples of numbers with their representation in figure.

Cardinal	
number	figure
one	1
two	2
three	3
four	4
eleven	11
twelve	12
thirteen	13
twenty	20
twenty-one	21
twenty-two	22
twenty-three	23
twenty-four	24
thirty	30
two-hundred two	202

Ordinal	
number	figure
first	1^{st}
second	2^{nd}
third	3^{rd}
fourth	4^{th}
eleventh	11^{th}
twelfth	12^{th}
thirteenth	13^{th}
twentieth	20^{th}
twenty-first	21^{st}
twenty-second	22^{nd}
twenty-third	23^{rd}
twenty-fourth	24^{th}
thirtieth	30^{th}
two-hundred second	202^{nd}



By the way, let me tell you that there are eight persons in my family. Yes, eight persons. I would say, the word 8 (eight) consists of one digit. It shows the whole number of my family, and it is represented in the form of figure 8, rather than letters e-i-g-h-t. Do you still follow me? Great! Since I am the oldest, I can tell you that I am the 1^{st} person in my family.

Now, suppose you have twenty-three books in your house. You can say that the word 23 (twenty-three) consists of _______________ digits, i.e. _______________ and _______________. It shows the _______________ of your books. And it is represented in the form of _______________ 23. And if you lose the last one, you may say that you lose the _______________ book.

In addition, can you write down (a) sixty-seven, (b) four-hundred point twenty-three, (c) twenty-sixth in figures? I guess your answers are (a) 67, (b) 400.23, and (c) 26^{th}. Am I right? Great! Now deepen your understanding on this by doing the Exercise 3 on page 1.8.

EXERCISE

Exercise 1

1) How many digits does each of the following numbers contain? Number one has been done for you.
   a. 67 : two digits
   b. 095 : ______________________
   c. 375 : ______________________
   d. 1007 : ______________________
   e. 00056 : ______________________
   f. 59794 : ______________________
   g. 66767 : ______________________
   h. 376505 : ______________________
   i. 448790 : ______________________
   j. 2509790 : ______________________
   k. 4667978 : ______________________
   l. 556709921 : ______________________

2) Complete the sentences below.
   a. My telephone number is 8662214. It consists of ______________ digits.
   b. My house number is 306. This number has ______________, i.e. ______________, ______________, and ______________.
   c. Suppose your mobile-phone number is 081325626234. This number consists of one digit 0, ______________ digit 1, ______________ digit 0, 4 and 8, ______________ digits 2, ______________ digits 6, ______________ digits 3.

Exercise 2

1) Identify whether each of the numbers below is even or odd. Then, read them out. Item 1 and 2 are given to you as examples.
   a. 4 : (even) four
   b. 11 : (odd) eleven
   c. 16 : ______________________
   d. 43 : ______________________
   e. 95 : ______________________

f. 198 : ____
g. 2,481 : ____
h. 3,114 : ____
i. 4,667 : ____
j. 78,997 : ____
k. 226,987 : ____
l. 690,091 : ____
m. 1,220,092 : ____

2) Complete the sentences below.
   a. 3, 27, and 50 are called _______________; they are also called _______________ or simply _______________
   b. The difference between numbers like 35 and 35th is that 35 denotes _______________ while 35th denotes _______________.
   c. In this case, 35 is called a _______________ or simply _______________, whereas 25th is called an ________________ or _______________.

Exercise 3

1) Write down the numbers below in figures. Item 1 is given to you as an example.
   a. thirty-six : 36
   b. eighty-seventh : __________________________
   c. three-hundred and twenty : __________________________
   d. three-hundred and ninth : __________________________
   e. two-thousand and sixty-four : __________________________
   f. sixty point oh five : __________________________
   g. one hundred and two point one : __________________________
   h. sixty-thousand and sixty-second : __________________________
   i. five-thousand and eight point nine : __________________________
   j. thirty-two point oh one five : __________________________

2) Complete the Sentences below.
   a. The number twenty-seven can be represented as 27, which is called a _______________.

b. Suppose you have three pens. You may say that the word three consists of one _______________. It shows the _______________ of your pens, and it can be represented in the form of _____________ 3.
c. If the last one of the three pens is gone, you may say that you lose the _______________ one.
d. We call the number 3 as a _______________ because it denotes quantity, and 3rd as an _______________ because it denotes _______________.

The Key to the Exercises

Exercise 1

1) a. two digits.
   b. three digits.
   c. three digits.
   d. four digits.
   e. five digits.
   f. five digits.
   g. five digits.
   h. six digits.
   i. six digits.
   j. seven digits.
   k. seven digits.
   l. nine digits.

2) a. seven.
   b. three digits, three, naught, six.
   c. one, one, three, two, two.

Exercise 2

1) a. (even) four.
   b. (odd) eleven.
   c. (even) sixteen.
   d. (odd) forty-three.
   e. (odd) ninety-five.
   f. (even) one-hundred and ninety-eight.
   g. (odd) two-thousand four-hundred and eighty-one.
   h. (even) three-thousand one-hundred and fourteen.

i. (odd) four thousand sis-hundred and sixty-seven.
j. (odd) seventy-eight thousand nine-hundred and ninety-seven.
k. (odd) two-hundred twenty-six thousand nine-hundred eighty-seven.
l. (odd) six-hundred and ninety-thousand and ninety-one.
m. (even) one million two-hundred twenty-thousand and ninety-two.

2) a. figures, cardinal numbers, cardinal.
b. quantity, order.
c. cardinal number, cardinal, ordinal number, ordinal.

Exercise 3

1) a. 36.
b. 87^{th}.
c. 320.
d. 309^{th}.
e. 2,064.
f. 60.05.
g. 102.1.
h. $6{,}062^{\text{nd}}$.
i. 5,008.9.
j. 32.015.

2) a. figure.
b. digit, quantity, digit.
c. third.
d. cardinal number, ordinal number, order.

SUMMARY

To sum up, Unit 1 discusses three points, i.e. digit, number, and figure. Quantities can be represented in numbers using digit, so that it appears in the form of figure. Mathematics jargons used in this unit are, among others, digit, number, figure, whole number, integer, even, odd, cardinal, and ordinal.

FORMATIVE TEST 1

Instructions: Choose one of the appropriate options A, B, C, or D to complete the sentences below.

1) Suppose I say that I live on Jalan Pemuda 104. One, naught, and four here are called ….
   A. digits
   B. numbers
   C. figures
   D. integers

2) The property of cardinal numbers is that they denote ….
   A. quality
   B. quantity
   C. order
   D. digits

3) When I say, Tony is the second oldest child in the family, the word second (2^{nd}) is called a(n) … number.
   A. even
   B. odd
   C. cardinal
   D. ordinal

4) The digital representation of a number such as 304 is commonly called a(n) ….
   A. cardinal
   B. figure
   C. ordinal
   D. integer

5) The number 3309 may be read out as ….
   A. three-three-oh-nine
   B. double-three-zero-nine
   C. three-thousand three-hundred nine
   D. three-thousands three-hundreds nine

6) The expression ‘six hundred ninety second can be represented as ….
   A. 690.2
   B. 692.0
   C. 692^{nd}
   D. 600 and 92

Check your answer with the key provided. Count how many correct answers you have and then apply the following rule to check your understanding level of this learning activity.

$$\text{Level of Understanding} = \frac{\text{Right Answers}}{\text{Sum of Item Test}} \times 100\%$$

Rating Scale : 90 - 100% = very good
80 - 89% = good
70 - 79% = fair
< 70% = poor

If you score 80% or above, you may proceed to the next activity. But if you score below 80%, you should repeat this learning activity, focusing your attention on the part(s) which you feel you need to remedy.

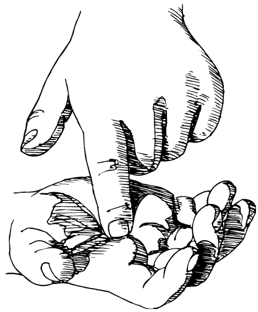
UNIT 2

Addition, Subtraction, Multiplication, and Division

After you learn Unit 2, you will be able to:

1. identify addition, subtraction, multiplication, and division;
2. pronounce the representation of addition, subtraction, multiplication, and division;
3. implement terminology used in addition, subtraction, multiplication, and division

A. ADDITION



Do you think that reading is a good habit? Yes, you do, don't you? I am pretty sure that you do. And I do, too. You know, reading books and other printed materials is necessary for educated people like us. I am pleased to let you know that I read two hours in the morning and three hours in the evening. In other words, I read five hours each day: two hours in the morning and three hours in the evening. How long do you read books and other materials every day? Write down your answer here _______________ hours: _______________ hours in the morning and _______________ in the evening. That is good!

When we add one quantity to another, we normally use the word and/or the symbol [+] (plus). Talking about my reading time, I spend 2 hours plus 3 hours each day. Therefore, the total amount is _______________ hours. We call this operation as an addition, and the total amount as the sum. We indicate the result by the symbol [=] (equals). So, the formulation is $2 + 3 = 5$. Can you read this out? Right! I am sure you read it out: two plus three equals five. Of course you can also utter it: two plus three is equal to five, if you like. Now, suppose your reading time is 7 hours, i.e. 3 hours in the morning and 4 hours in the evening. Can you write it down in mathematic symbols? Write down your answer here _______________. I am sure that your answer is $3 + 4 = 7$. Now, how would you read it out? Write down your answer here ____________________________. Your answer is certainly three plus four equals seven or three plus four is equal to seven, isn't it? That is great! It means that you have followed me seriously. Now, do the following Exercise 1 on page 1.16!

B. SUBTRACTION

I like mangoes very much. You like mangoes too, don't you? Now, suppose you have twelve mangoes in your basket. If your younger brother takes seven out of them, how many mangoes do you still have in the basket? Your answer is five, isn't it? That is absolutely true because 12 – 7 = 5. In other words, the difference between 12 and 7 is five.

In mathematics, such an operation as 12 – 7 = 5 is called subtraction. Once again, subtraction. When we subtract one quantity from another, we use the symbol [–] (minus). And the result is called the difference. So, referring back to the operation about your amount of mangoes, i.e. 12 – 7 = 5, we can read it out as twelve minus seven equals five or twelve minus seven is equal to five. Of course, you can also say twelve subtracted by seven equals five, if you wish. In this operation, the result, i.e. 5 (five) is the difference. Does this explanation make sense to you? If your answer is yes, that is great. However, if it is still unclear to you, just do the Exercise 2 on page 1.16. They will certainly make you understand and skillful about subtraction.

C. MULTIPLICATION

Have you ever suffered from influenza? I am absolutely sure that you have, even once, because such illness is quite common among us. The problem is what we have to do in order to get rid of such a decease. Now, let me tell you my experience. One day, I came down with influenza. Before things were getting worse, I visited a doctor. After taking my temperature and listening to my pulses, the doctor prescribed me a number of pills. He suggested me to take the pills four times a day for three days, one at a time. It was expected that I would get well in three days. To my surprise, however, I had recovered from the illness before I took a half of the pills.

How many pills did the doctor prescribed me? Write down your answer here ______________.

Is your answer 12? If it is, that is correct. I should have taken the pills four times a day for three days. So, by the end of the third day I should have taken 12 pills, i.e. the result of multiplying 4 by 3.

When we multiply one quantity by another, we use the symbol [x] (*multiplied by or times*). Referring back to the pills I took, we can formulate the operation as follows: 3 x 4 = 12. This operation is called a multiplication and its result is named the product. Hence, 3 x 4 = 12 is a _______________, in which 12 is its _______________. We read out this multiplication as three multiplied by four equals twelve or three times four equals twelve, if you like.

Do you catch what I mean? I believe you do because your curiosity is great in this case. In order to increase your skill, however, do the Exercise 3 on page 1.17.

D. DIVISION

You do not smoke, do you? All right. I do not either. But, talking about smoking, suppose you have a packet of cigarettes. It contains 12 pieces. You smoke four times a day, one piece each time. How many days does it take to end up all the pieces of the cigarettes? Write down your answer here _______________. Is your answer three days? I am sure it is. You certainly get the answer from dividing 12 by 4. Is it right? In other words, if twelve is divided by four, the result is three. 12 : 4 = 3.

When we divide one quantity by another, we use the symbol [:] (*divided by*). This operation is called a division, while its result is called the quotient. Hence, in the case of 12 : 4 = 3, we can say that it is a _______________, in which 3 is the _______________. Therefore, we read this operation as twelve divided by four equals three.

Now, notice this: 35 : 7 = 5. (1) What do you call this operation? (2) What is its quotient? (3) Write down your answers here: (1) _______________, (2) _______________. Are your answers (1) division and (2) 5? No doubt they are. Anyway, in order to deepen your understanding on this, do the Exercise 4 on page 1.17.

EXERCISE

Exercise 1

1) Read out the following addition
   a. 6 + 8 = 14
   b. 9 + 7 = _______________
   c. 13 + 5 = _______________
   d. 11 + 3 = _______________
   e. 16 + 6 = _______________
   f. 27 + _______________ = 46
   g. _______________ + 39 = 66
   h. 57 + _______________ = 78
   i. 276 + 483 = _______________
   j. 549 + _______________ = 907
   k. 1,309 + 507 = _______________

2) Complete the sentences below.
   a. When we _______________ one quantity to another we use the symbol [+] (plus).
   b. An operation like 3 + 4 = 7 is called _______________.
   c. The result of adding one quantity to another is called the _______________.
   d. 6 + 13 = 19 can be read out _______________ or _______________.

Exercise 2

1) Read out the subtractions below. Item 1 is given to you as an example.
   a. 12 – 7 = 5 (twelve minus seven equals five)
   b. 29 – 16 = _______________
   c. 51 – 37 = _______________
   d. 253 – _______________ = 169
   e. 604 – _______________ = 299
   f. 1344 – 861 = _______________
   g. _______________ – 439 = 207
   h. _______________ – 812 = 717
   i. 3788 – 1780 = _______________
   j. 5677 – _______________ = 3909

2) Complete the sentences below.
   a. An operation like 12 – 7 = 5 is called _______________
   b. When we _______________ one quantity from another, we use the symbol [–] (minus).
   c. The result of subtracting a quantity from another is called the _______________.
   d. We read out 12 – 7 = 5 as ___________________________________.

Exercise 3

1) Read out the following multiplication. Item 1 is given to you as an example.
   a. 7 x 6 = 42 (seven times six equals forty two)
   b. 9 x 13 = _______________
   c. 11 x _______________ = 77
   d. 15 x _______________ = 90
   e. 23 x 12 = _______________
   f. _______________ x 15 = 225
   g. _______________ x 16 = 386
   h. 25 x 20 = _______________
   i. 14 x 27 = _______________
   j. 26 x _______________ = 1518

2) Complete the sentences below.
   a. When we _______________ one quantity to another, we use the symbol [x] (multiplied by or _______________).
   b. An operation such as 3 x 4 = 12 is commonly called _______________.
   c. The result of multiplying one quantity by another is called the _______________.
   d. We read out 5 x 8 = 40 as follows _______________________________.

Exercise 4

1) Read out the division below. Item 1 is given to you as an example.
   a. 15 : 3 = 5 (fifteen divided by three equals five)
   b. 42 : 6 = _______________
   c. 64 : _______________ = 1
   d. 81: _______________ = 9
   e. 96 : 16 = _______________
   f. 117 : 13 = _______________

g. 153 : _______________ = 9
h. _______________ : 14 = 16
i. _______________ : 23 = 37
j. 752 : 16 = _______________

2) Complete the sentences below.
   a. When we _______________ one quantity by another, we use the symbol [:] (_______________).
   b. An operation like 12 : 4 = 3 is called a _______________.
   c. The result of dividing a quantity by another is called the _______________.
   d. We read out 35 : 7 = 5 as follows ______________________________.

The Key to the Exercises

Exercise 1

1) a. 14
   b. 16
   c. 18
   d. 14
   e. 22
   f. 19
   g. 27
   h. 21
   i. 759
   j. 1,816

2) a. add
   b. addition
   c. sum
   d. six plus thirteen equals nineteen, six added by thirteen equal nineteen

Exercise 2

1) Read out the subtractions below. Item 1 is given to you as an example.
   a. 5
   b. 13
   c. 14

d. 84
e. 305
f. 483
g. 232
h. 1,529
i. 2008
j. 1768

2) a. subtraction
b. subtract
c. difference
d. twelve minus seven equals five.

Exercise 3

1) a. 42
b. 117
c. 7
d. 6
e. 276
f. 15

2) a. multiply, times
b. multiplication
c. product
d. five times eight equals forty (five multiplied by eight equals forty).

Exercise 4

1) a. 5
b. 7
c. 3
d. 3
e. 6
f. 9
g. 17
h. 192
i. 851
j. 47

2) a. divide, divided by
   b. division
   c. quotient
   d. thirty five divided by seven equals five

SUMMARY

This unit elaborates the concepts of basic operations, i.e., addition, subtraction, multiplication, and division. A number of mathematic jargons are introduced in this unit. They are, among others, add, sum, subtract, difference, multiply, product, divide, quotient, equals, and equal to. A lot of examples are presented to clarify the meanings of these jargons.

FORMATIVE TEST 2

Instructions: Choose one of the appropriate options A, B, C, or D to complete the sentences below.

1) Addition, subtraction, multiplication, and division are commonly called ....
   A. mathematics
   B. basic operations
   C. arithmetic
   D. equations

2) In three plus four equals seven, the number seven is the .... of the addition.
   A. result
   B. sum
   C. whole number
   D. difference

3) The result of such a subtraction as 7 - 5 - 2 is called the ....
   A. sum
   B. difference
   C. quotient
   D. factor

4) Forty five ..... fifteen equals three.
   A. subtracted by
   B. multiplied by
   C. added to
   D. divided by

5) The result of the multiplication 3 x 4 = 12 is called the .....
   A. sum
   B. multiple
   C. product
   D. quotient

6) The expression fifteen divided by three equals five can be represented in figures as ....
   A. 3 x 5 = 15
   B. 15 : 5 = 3
   C. 15 : 3 = 5
   D. 3, 5, and 15

7) The operation 3 x 7 = 21 can be read as ....
   A. three times by seven equals one
   B. three times seven equals twenty one
   C. three multiplied seven equals to twenty one
   D. three multiplied by seven is equal twenty one

8) The quotient of sixty three divided by nine is ....
   A. nine
   B. seven
   C. fifty four
   D. sixty

Check your answer with the key provided. Count how many correct answers you have and then apply the following rule to check your understanding level of this learning activity.

$$\text{Level of Understanding} = \frac{\text{Right Answers}}{\text{Sum of Item Test}} \times 100\%$$

Rating Scale :	90 - 100% = very good
	80 - 89% = good
	70 - 79% = fair
	< 70% = poor

If you score 80% or above, you may proceed to the next activity. But if you score below 80%, you should repeat this learning activity, focusing your attention on the part(s) which you feel you need to remedy.

UNIT 3

Fractions

In this unit you will learn about Fractions. After you learn Unit 3 you will be able to:

1. identity vulgar and decimal fraction;
2. pronounce representation of vulgar and decimal fraction;
3. implement terminology used in vulgar and decimal fraction;
4. read out the operations of vulgar and decimal fraction.

A. VULGAR FRACTION

Do you like melons? I am sure you do. You know, during the ‘melon season’, we certainly find vendors selling them almost everywhere. They may be so big that, I believe, you would not manage to eat one up by yourself at a time. Now, suppose you have a pretty big melon. There are five persons who are going to eat it up and each person wants the same portion. How will you divide it? You will divide it into 5, won’t you? So that each gets 1/5. And suppose a friend of yours gives his portion to you, how many parts do you have now? You certainly have 2/5, of course. Can you read out such amount in English?

In mathematics, 1/5 is read out as one-fifth or one over five. It is called a vulgar fraction or simply a fraction. Now, can you read out your amount of melon, i.e., 2/5. Write your answer here _______________ or _______________. Are your answers two-fifth and two over five? Be sure, they are! Now, talking about the fraction 1/5, we call digit 2 as the numerator and digit 5 as the denominator. As for the fraction 2/5, therefore, we also call digit 2 and digit 5 as the _______________ and the _______________ respectively.

In addition to the description above, the fractions 1/2, 1/4, and 3/4 are commonly read out as a half, a quarter, and three quarters respectively. Therefore, the mixed number 3 3/4 is read out as three three-quarters.

What do you think about 9/7? Is it also a fraction? Of course, it is. However, we hardly ever write such a fraction that way. We write it down as 1 2/7, instead. In mathematics, we call 9/7 as an improper fraction, because it is improperly represented. Furthermore, we call 1 2/7 as a mixed number, since it is a combination of an integer (1) and a fraction (2/7). In other words, suppose you have an _______________ like 13/8. We can transform the fraction to 1 5/8, which is called a _______________ number, consisting of the _______________ 1 and the fraction 5/8. The fraction 5/8 itself consists of the numerator ________________ and the denominator ________________. Could you fill up all the blanks along this paragraph? I believe you can. Anyway, in order to improve your understanding and skill concerning vulgar fraction, do the Exercise 1 on page 1.28.

B. THE OPERATION OF VULGAR FRACTIONS

Addition and Subtraction

Talking about the melon in the activity above, you still remember that you got 1/5 and a friend of yours has given his portion (1/5) to you. As a result, you have 2/5 of it. This is yielded by adding 1/5 to 1/5. In mathematics, we represent it as 1/5 + 1/5 = 2/5. Can you read out this operation? I think, you can. If you cannot, I am very pleased to read it out for you. The operation reads one fifth plus one fifth equals two fifths. Now many portions of the melon do your friends get? Write your answer here: _______________. Is your answer 3/5 (three fifths)? That is good. I am sure, you get the answer by subtracting 2/3 from 1, i. e., 1 – 2/5 = 3/5 (one minus two fifths equals three fifths). How can this operation be carried out. It is carried out by firstly transforming the number 1 to the fraction 5/5. Hence, the operation becomes 5/5 – 2/5 = 3/5.

In the two operations above, i.e., 1/5 + 1/5 = 2/5 and 5/5 – 2/5 = 3/5, you see that the denominators are the same, i.e., 5. The operation procedure is only for the numerators to be added or subtracted. In this case, 1 + 1 = 2 and 5 – 2 = 3. So, suppose you have the fraction 5/11. (1) You add 3/11 to it and (2) you subtract 1/11 from it. What are the operations like? Write down your answers here: (1) _______________, (2) _______________. Do not forget to read them out too. Are your answers (1) 5/11 + 3/11 = 8/11 and (2) 5/11 – 1/11 = 4/11? That is good. Be sure that they read (1) five elevenths plus three elevenths equals eight elevenths and (2) five elevenths minus one eleventh equals four elevenths.

What do you think about the following operations (1) 2/3 + 1/6 and (2) 5/7 – 5/14? Can you solve these two problems? Write down your answers here: (1) _______________ and (2) _______________. Are your answers (1) 2/3 + 1/6 = 5/6 and (2) 5/7 – 5/14 - 5/14? Be sure that they are. How can they be like that? Can you explain them to me? All right! We can say that in order to add or subtract vulgar fractions, we must express them in terms of the lowest common denominator. With regard to the two operations above, the lowest common denominators are 6 and 14 respectively. Now, what are the lowest common denominators of the following operations: 4/11 + 1/2 = and 9/13 – 1/4 = _______________?

What are their results? Write down your answers here: (1) ___________ and (2) _______________. Be sure that the given lowest common denominators are 22 and 52 respectively, so that the results of the operations are 19/22 and 23/52.

Multiplication and Division

Talking about the melon again, you have 2/5 of it, don't you? It is the result of adding 1/5 to 1/5. Therefore, we can also say that the number is yielded by multiplying 1/5 by 2. In this way, the operation becomes 1/5 x 2 = 2/5. How can this operation be carried out? What about such a division as 2/5 : 2 = 1/5? You simply multiply 1 by 2 in the first case and divide 2 by 2 in the second case, don't you? In other words, to multiply a vulgar fraction we simply multiply the numerators and denominator. Hence, 1/2 x 2/7 = 2/14. (a half multiplied by two sevenths equals two fourteenths), i.e., by multiplying 1 by 2 and 2 by 7, and 1/6 : 1/5 = 5/6 (one sixth divided by one fifth equals five sixths) i.e., by dividing 1 by 1 and 6 by 5. Remember, in order to make such a division easy you simply transform it to multiplication by reversing the numerator and the denominator of the second fraction (i.e., 1/5 to 5/1), then multiplying the numerators and the denominators. In this way, the division above (i.e., 1/6 : 1/5 = 5/6) becomes 1/6 x 5/1 = 5/6.

Now, can you solve these problems: (a) 2 1/4 x 3 1/6 and (b) 3 2/3 - 2 1/6? It is a bit hard, isn't it? I would like to tell you that there are four steps to solve these problems.

Firstly, we must change the mixed numbers to improper fractions, i.e., (a) 2 1/4 x 3 1/6 = 9/4 x 19/6 and (b) 3 2/3 – 2 1/6 = 11/3 – 13/6. Remember that in order to make the division problem easy to solve, we reverse the second fraction and multiply them. Therefore, 11/3 : 13/6 = 11/3 x 6/13. Then, we cancel where it is possible, i.e. 6 by 3.

After that, we multiply the numerators and the denominators. This results in (a) 171/36 and 22/13 respectively.

Lastly, we express the results as mixed numbers, i. e., 171/36 = 4 27/36 = 4 3/4 and 22/13 = 1 9/13.

Is the explanation clear enough to you? I think it is. If it is not, however, it is advisable that you go through it once more. In order to improve your understanding about these operations do the Exercise 2 on page 1.29.

C. DECIMAL FRACTIONS

Talking about the melon again, you still remember getting two fifths of it, don't you? All right. Now, what does it mean by the fraction 2/5? It surely means two divided by five. If you solve this division problem by means of a calculator, you will definitely see that the result is 0.4 (naught point four). Do you have any intention to try calculating it? That is good. In mathematics, such figures as 0.4, 2.75, and 7.25 are called decimal fractions. Yes, they are called decimal fractions. The main characteristic of a decimal fraction is that they employ the so-called a decimal point (.). The figures 0.4, 2.75, and 7.25 are thus decimal fractions because each has a decimal point (.). Hence, each of them reads naught point four, two point seven five, and seven point two five respectively. Now, how do you read out this decimal fraction 37.675? Write down your answer here ______________________________. Did you write thirty seven point six seven five? I am sure you did, if you didn't, be sure to correct it.

As it is seen in the paragraph above, we can convert a vulgar fraction, i.e., 2/5 to a decimal fraction, i.e., 0.4. To present some more examples, what are the result of converting 1/2, 3/4, and 3 3/8 to decimal fractions? Write down your results here: _______________, _______________, and _______________. Have you finished? Good! I believe your answers are 0.5 (naught point five), 0.75 (naught point seven five), and 3.375 (three point there seven five).

What do you think about this vulgar fraction 2/3? Can you convert it to a decimal fraction? Of course, you can. If you solve this problem using a calculator, you will certainly have 0.6666666666 .... as its result. Because the amount of digit 6 is unlimited, it is enough to write it down as 0.6. This fraction reads naught point six recurring. What are the results of converting 1/3 and 5/6 to decimal fractions? Do you know? Write down your answer here: _______________ and _______________. Are your answers 0.3333333333 and 0.8333333333? Be sure that they are. Of course, you can also simplify the fractions to 0.3 and 0.83. How do you read out these two simplified fractions? Write down your answer here _______________ and _______________. Did you write down naught point three recurring and naught point eight three recurring?

That is right. In order to improve your skill in this matter, do the Exercise 3 on page 1.29.

D. OPERATIONS OF DECIMAL FRACTIONS

Different from addition and subtraction of vulgar fractions, those of decimal fractions are very easy to do. In this case, in order to solve addition as well as subtraction problems we simply add or subtract the numbers in question. For instance, when 1.27 is added to 4.06 the result is 5.33 (five point three-three). We represent the operation as 1.27 + 4.06 = 4.33 (one point two-seven plus four point naught-six equals four point three-three). What is the result of subtracting 3.45 from 5.25? Write down the operation along with your answer here ______________________________. Are you sure about your answer? That is right. Just to convince you, I would like to tell you here that the answer is 5.25 – 3.45 = 1.8 (five point two-five minus three point four-five equals one point eight).

What about multiplication and division? Are they as easy as the two basic operations above? To answer these two questions, consider these operations 2.25 x 10 = 22.5 and 27.5 : 10 = 2.75. They are easy to do, aren't they? We find out here that to multiply or divide a decimal fraction by ten, we simply move the decimal point one place to the right, i.e., from 2.25 to 22.5, or one place to the left, i.e., from 27.5 to 2.75, respectively.

Now, let us have a look at the following problems: 2.5 x 2.2 = 5.5 (two point five multiplied by two point two equals five paint five) and 3.25 x 0.05 = 0.1625. (three point two-five multiplied by naught paint naught five equals naught point one-six-two-five) and 4.5 – 1.25 = 3.6 (four point five divided by one point two-five equals three point six). They are very easy, aren't they?

Now, what is the result of twenty three divided by three in a decimal fraction? Write down your answer here: ______________________________. Is your answer 7.6666666666 Be sure that it is. Here, we see that there are so many 6-s. We can, of course, simplify this figure to 7.67. This decimal fraction reads seven point six-seven correct to two decimal places. So 23 : 3 = 7.67 (seven point six-seven correct two decimal places). Now, can you solve these problems: 7.4 : 2.5 and 4.6 : 1.5? Write down your answer here: _______________ and _______________. Are your answers 2.96 and 3.067? I believe they are. Remember that they read two point nine-six and three point naught-six-seven correct to three decimal places respectively.

In addition to the explanation above, I am pleased to tell you that (phi) symbolizing 22/7, which is common in arithmetic, is equal to 3.14235714236. This fraction is simplified to 3.142 and reads three point one-four-two correct to four significant figures.

Now, improve your skill in operating decimal fractions by doing the exercise below.

EXERCISE

Exercise 1

1) Read out the vulgar fractions below. Item 1 is given to you as an example.
   a. 3/5 : three fifths or three over five
   b. 7/10 : ________________________________
   c. 5/14 : ________________________________
   d. 7/22 : ________________________________
   e. 6/25 : ________________________________
   f. 3 2/3 : ________________________________
   g. 6 1/7 : ________________________________
   h. 9 5/6 : ________________________________
   i. 5 19/20 : ________________________________
   j. 3 5/16 : ________________________________

2) Complete the sentences below.
   a. Such numbers as 2/5 and 1/7 are called ______________ or simply ______________
   b. In the fraction 1/7, 1 is the ______________ and 7 is the ______________
   c. 22/7 is called an ______________ fraction, in which the ______________ is bigger than the ______________
   d. The improper fraction 22/7 can be transformed to 3 1/7, which is called of a ______________
   e. 3 1/7 is a ______________ number consisting of the integer ______________ and the vulgar fraction ______________

Exercise 2

1) Read out the operations below. Item 1 is given to you as an example
   a. 2/5 + 3/10 = 7/10 : two fifths plus three tenths equals seven tenths
   b. 2/3 - 1/5 = 7/15 : ________________________________
   c. 1/4 + 2 7/10 = 5 19/20 : ________________________________
   d. 2 1/3 + 4 1/12 = 6 5/12 : ________________________________
   e. 5/6 x 1/2 = 5/12 : ________________________________
   f. 1 3/4 - 1/2 - 3 1/2 : ________________________________

2) Complete the sentences below
   a. When we add or subtract vulgar fractions, we must express them in terms of the _______________
   b. In the subtraction 2/3 - 2/7 = 3/21, the lowest common denominator is _______________
   c. In order to multiply or divide vulgar fractions we must firstly change mixed numbers to _______________
   d. In multiplication or division of vulgar fractions, whenever possible, we can _______________ the numerators and the denominators.
   e. The results of multiplication as well as division of vulgar fractions must be expressed as _______________

Exercise 3

1) Convert the vulgar fractions below to decimal ones. Read out the results. Item 1 is given to you as an example.
   a. 1/4 = 0.25 (naught point two five)
   b. 3/5 = ________________________________
   c. 7/3 = ________________________________
   d. 1/6 = ________________________________
   e. 5 1/3 = ________________________________
   f. 7 1/3 = ________________________________
   g. 5 4/9 = ________________________________
   h. 12 3/5 = ________________________________
   i. 13 4/7 = ________________________________
   j. 20 3/8 = ________________________________

2) Complete the sentences below
   a. We write a decimal fraction using a decimal _______________
   b. When we _______________ 1/2 into a decimal fraction, the result is 0.5
   c. If we convert 1/3 into a _______________, the result is 0.6666666666 or simply 0.6 which reads ______________________

Exercise 4

1) Solve the problems below and read them out. Item 1 is given to you as example.

a.	2.65 + 3.15	=	5.8	:	Two point six five plus three point one five equals five point eight.
b.	3.6 + 7.02	=	_______________	:	__________________________
c.	5.75 - 4.25	=	_______________	:	__________________________
d.	6.9 x 2.3	=	_______________	:	__________________________
e.	3.3 : 2.2	=	_______________	:	__________________________
f.	12.6 x 9.5	=	_______________	:	__________________________
g.	27.2 - 13.75	=	_______________	:	__________________________
h.	20.5 : 4.2	=	_______________	:	__________________________
i.	7.9 : 0.6	=	_______________	:	__________________________
j.	9.9 x 4.3	=	_______________	:	__________________________

2) Complete the sentences below
   a. To multiply a decimal fraction by one hundred, we simply move the _______________ two places to the _______________.
   b. The decimal fraction 3.6666666666 may be _______________ into 3.67, which reads ______________________________
   c. The result of 3 + 3 can be represented as _______________ correct to three decimal places.
   d. 57.074 correct to _______________ is 57.1.

The Key to The Exercises

Exercise 1

1) a. three fifths or three over five
   b. seven tenths or seven over ten
   c. five fourteenths or five over fourteen

d. seven twenty-seconds or seven over twenty two
e. six twenty-fifths or six over twenty five
f. three two-thirds
g. six one-seventh
h. nine five-sixths
i. five nineteen-twentieths
j. three five-sixteenths

2) a. vulgar fraction or fraction
b. numerator, denominator
c. improper, numerator, denominator
d. mixed number
e. mixed, three, 1/7.

Exercise 2

1) a. two fifths plus three tenths equals seven tenths
b. two thirds minus one fifth equals seven fifteenth
c. a quarter plus two seven-tenths
d. two one-third plus four one-twelveth equals six five-twelveths
e. five sixths plus a half equals five twelveths
f. one three-quarters divided by half equals three and a half

2) a. lowest common denominator
b. 21
c. improper fractions.
d. cancel
e. mixed numbers

Exercise 3

1) a. 0.25
b. 0.6
c. 0.875
d. 0.1667
e. 5.125
f. 7.33
g. 5.44
h. 12.6

2) a. point
b. convert

c. decimal fraction, naught point six recurring

Exercise 4

1) a. 5.8
   b. 10.62
   c. 1.5
   d. 15.87
   e. 1.5
   f. 119.7
   g. 13.45
   h. 4.881
   i. 13.167
   j. 42.57

2) a. decimal point, right
   b. converted, three point six seven recurring
   c. 2.67
   d. three significant figures

SUMMARY

This unit elaborates the concepts of fractions, including vulgar and decimal. The basic operations introduced in Unit 2 are elaborated here to show how they work with fractions. The mathematic jargons used here are among others numerator, denominator, improper fraction, mixed number, lowest common denominator, cancel, decimal point, etc. Besides, this unit also introduces ways of solving problems dealing with fractions, including the ways operations read out.

FORMATIVE TEST 3

Instructions: Choose one of the appropriate options A, B, C, or D to complete the sentences below.

1) Numbers like 2/5, 3/7, and 2/11 are called ....
   A. vulgar fractions
   B. odd numbers

C. decimal fractions
D. mixed numbers

2) The improper fraction 9/7 may be represented as 1 2/7 which is called a(n) ....
A. proper fraction
B. mixed number
C. mixed fraction
D. proper number

3) When we add a fraction to another fraction of the same denominators, we simply add the .... of the two fractions.
A. numerators
B. sums
C. numbers
D. quotients

4) We can solve such operations as 2/7 - 2/8 properly, if we firstly transform 7 and 8 to ....
A. improper fractions
B. mixed numbers
C. the lowest common denominator
D. decimal figures

5) The fraction 2 1/3 may be represented as 2.33 and is read ....
A. two point double three
B. two point three recurring
C. two point three
D. two and three correct to two decimal figures

6) The quotient of dividing 2/3 by 1/4 is ....
A. two point six
B. two point six seven recurring
C. two point six seven correct to two decimal places
D. two point six seven correct to three significant places

Check your answer with the key provided. Count how many correct answers you have and then apply the following rule to check your understanding level of this learning activity.

$$\text{Level of Understanding} = \frac{\text{Right Answers}}{\text{Sum of Item Test}} \times 100\%$$

Rating Scale :	90 - 100%	= very good
	80 - 89%	= good
	70 - 79%	= fair
	< 70%	= poor

If you score 80% or above, you may proceed to the next activity. But if you score below 80%, you should repeat this learning activity, focusing your attention on the part(s) which you feel you need to remedy.

UNIT 4

Powers and Roots

After you learn Unit 4 you will able to:

1. identify powers and roots;
2. pronounce representation of powers and roots;
3. implement terminology used in powers and roots;
4. read out the operations of powers and roots.

A. POWERS

You still remember that in Unit 2, among others, we discussed multiplication. For instance, three times three equals nine. Instead of representing this multiplication as 3 x 3 = 9 we represent it as $3^2 = 9$. What do we call digit 2 in this operation? Do you know? I am pretty sure that you are already familiar with term power. In the operation, the digit is called power or index. What do you think about digit 3, do you know? It is called stem. Now consider these powers: $3^6 : 3^2 = 3^4$ and $x^8 : x^5 = x^3$. Which are the stems and which are the indices? Write down your answers here: Three to the _______________ divided by three _______________ equals three to the ________ of four and x _______________of eight _______________ x to the _______________ five _______________ x _______________. Be sure that your answers are three to the power of six divided by three squared equals three to the power of four, and X to the power of eight divided by X to the power of five equals X cubed.

Now, consider this multiplication: $3a^2$ x $4a^3$. In this problem, we see that the stems are different, the first is 3a while the second is 4a. Do you know how to solve this problem? All right. To solve the problem we simply multiply 3 by 4 and add 2 to 3. So, it results in $12a^5$ (twelve a to power of five). Therefore, the operation is represented as $3a^2$ x $4a^3 = 12a^5$. With regard to a division like $4b^5 : 2b^3$, however, we simply divide 4 by 2 and subtract 3 from 5, so that it results in $2b^2$ (two b squared). Of course, this operation is represented as $4b^5 : 2b^3 = 2b^2$.

Now, can a power be powered? The answer is yes, it certainly is. Consider this examples $(2^3)^2$. In order to solve this problem we simply multiply the indices. Thus, $(2^3)^2$ is equal to 2^{3x2}, so that it results in 2^6 or 64. Can you solve the following problems $(3^2)^2$ and $(a^2)^3$. Write down your answers here: _______________ and _______________. Be sure that your answers are 3^4 or 81 and a^6, which are yielded by multiplying two by two and two by three respectively. So, $(3^2)^2$ = 34 (three squared all squared is equal to three to the power of four) and $(a^2)^3 = a^6$ (a squared all cubed is equal to a to the power of five). In other words, to raise a power to another power, we multiply the indices.

Could you follow me? If you could, that is great! If not, read the explanation again more carefully. To improve your skill with regard to powers, do the Exercise 1 on page 1.38.

B. ROOTS

Do you know what is meant by the word roots? I am sure you do. I our daily life, it generally means "the part of a plant that absorbs water and mineral salts from the soil". In mathematics, however, it means something else. It refers to a quantity that when multiplied by itself a certain number of times equals a given quantity. For instance, 2 is the square root of 4, because when we multiply it by itself twice, the result is 4. Another example: 2 is the fourth root of 16, because when multiplied by 2 four times, it becomes 16. We represent them as $\sqrt[2]{4} = 2$ or simply $\sqrt{4} = 2$ and $\sqrt[4]{}\ 16 = 2$ respectively. Here, the figure 2, which is the result of the calculation, is called the value. What is the cube root of 8? Write down your answer here: _______________. Is your answer 2? That is good. So, we can represent it a $\sqrt[3]{8} = 2$.

Now, consider the following: $\sqrt[3]{27}$, $\sqrt[5]{1024}$, and $\sqrt[2]{4}$. What are the results of the cube root of 27, the fifth root of 1024, and the sixth root of 15625? Write down your answers here: _______________, _______________, and _______________. I believe that your answers are 3, 4, and 5 respectively. Am I right? That is good, but why are they so? Can you answer this last question, especially with regard to the first answer (3)? All right. 3 is the _______________ root of 27, because when the quantity is multiplied by _______________ three times, the result is _______________.

What if you have powers in the roots like these $\sqrt{3^4}$, $\sqrt[3]{5^6}$, and $\sqrt[y]{n^3}$. Can you solve such problems? All right. In order solve each of them, we must divide the index by the root. So, $\sqrt{3^4} = 3^{4-2} = 32, \sqrt[3]{5^6}$, and $\sqrt[y]{n^3} = n^{x-y}$. In other words, if we wish to find the root of $\sqrt[3]{x^6}$. we must divide the index by the root, so that the result is x n^{D-D} or x^{D-D}.

What do you think about the square root of 2? Can you solve this problem? It is a bit hard, isn't it? That is right. That is why in order to solve this problem, it is better to use a calculator. In this way, we find out that $\sqrt{3^4} = 1.4142$ (one point four two correct to five significant figures). Now what is the root of three? Write down your answer here: _______________. Is your answer 1.732? I am sure, it is. Now, to improve your understanding and skill on this topic, do the Exercise 2 on page 1.39.

C. FRACTIONAL AND NEGATIVE INDICES

So far, we have discussed powers and roots in which the indices are integers. They are relatively easy to deal with, aren't they? To solve the problems of multiplication and division with regards to power, we just add or subtract the powers respectively. Furthermore, to solve the problems of root we simply divide the indices by the roots.

Let us talk about this root: $\sqrt[3]{x^2}$. What may be the value of this root, do you know? All right. As you still remember, to find out the value of such a root, we simply divide the index by the root, 2 : 3 = 2/3 (two divided by three equals two third), which is a fraction. Hence, the fraction 2/3 in $x^{2/3}$ is called a fractional index. What are the value of these roots: $\sqrt[3]{3}$, $\sqrt[5]{x^3}$, and $\sqrt["]{a^{"}}$? Write down your answer here: _______________, _______________, and _______________, Can you do them? I am pretty sure that you can. They are relatively easy, aren't they? Anyway, I should let you know that the answers are $3^{1/3}$, $x^{3/5}$, and $a^{"/"}$. Let us read out the operations: the cube root of three is (equal to) three to the power of one third, the _______________ of _______________is a to the _______________ of three _______________, and the nth _______________ of a _______________ power _______________ n is a to the _______________ $a^{m/n\text{-ths}}$ (or m-nths over a).

What do you think about this operation: $(x^{-2} – x^3)$? You still remember that in order to deal with this kind of operation we simply subtract the powers: 2 - 3 = - 1 (2 subtracted by 3 equals minus one). Therefore, we say that $(x^{-2} – x^3) = x^{-1}$ (x squared divided by a cubed equals x to the power of minus one). Here, -1 is called a negative index. Can you find out the value of these operations: ($3^2 – 3^3$), (5^4 – 5^7), and (a^3 – a^6)? Write down your answer here: _______________, _______________, and _______________.

Have you written down your answer? Okay! Be sure that the results are 3^{-1}, 5^{-2}, and a^{-3}. In other words, three squared divided by three cubed equals three to the power of minus one, five to the _______________ of four divided by five to _______________of _______________ equals _______________ to the power _______________ three, and a _______________ divided _______________ a to the power _______________ six _______________ a _______________ power of _______________ three.

Can you follow me? Of course you can, can't you? All right. Now, in order to improve your skill in fractional and negative indices, do the Exercise 3 on page 1.40.

EXERCISE

Exercise 1

1) Read out the following powers. Item 1 and 2 are given to you as examples.

a.	4^3	= 64	: four cubed is equal to sixty four
b.	2^2 x 2^3	= 2^5	: two squared multiplied by two cubed is equal to two to the power of five.
c.	3^2 x 3^5	= ________	: ________________________________
d.	5^3 x 5^2	= ________	: ________________________________
e.	y^3 x y^4	= ________	: ________________________________
f.	$3a^3$ x $2a^4$	= ________	: ________________________________
g.	$3X^2$ x $2X^3$	= ________	: ________________________________
h.	$(x^3)^4 – x^2$	= ________	: ________________________________
i.	$(x - y)^3$	= z^n	: ________________________________

2) Complete the sentences below

a. The digit 3 in a^3 is the _______________ or the _______________

b. To multiply such figures as 2^3 and 2^5, we simply _______________ the _______________

c. To divide 4^5 by 4^3, we simply _______________ the _______________

d. The phrase a to the power of five may be read out as a to the _______________ (_______________) and represented as _______________.

e. To multiply $2a^3$ by $4a^5$, we have to _______________ 2 by 4 and _______________ 3 to 5, so that it results in _______________.

Exercise 2

1) Solve the problems below and read them out. Item 1 is given to you as an example.

a. $\sqrt{2^2}$ = 2 : the square root of two squared is equal to two.

b. $\sqrt[3]{2^3}$ = ________ : ____

c. $\sqrt{16}$ = ________ : ____

d. $\sqrt[3]{a^6}$ = ________ : ____

e. $\sqrt{a^6b^4}$ = ________ : ____

f. $\sqrt[3]{8a^6}$ = ________ : ____

g. $\sqrt[4]{a^8b^4}$ = ________ : ____

h. $\sqrt{a^m}$ = ________ : ____

i. $\sqrt[x]{a^yb^2}$ = ________ : ____

j. $\sqrt[n]{a^xb^y}$ = ________ : ____

2) Complete the sentences below

a. A root refers to a _______________ that when multiplied by _______________ a certain number of times _______________ a given quantity.

b. 2 is the square root of 4, because when we _______________ it by _______________ _______________, the result is _______________.

c. To simplify $\sqrt[D]{x^D}$, we must divide the _______________ D by the _______________ D, so that the result is $x^{\frac{d}{d}}$ or _______________.

Exercise 3

1) Solve the problems below and read them out. Item 1 is given to you as an example.

a. $\sqrt{9} = 9^{\frac{1}{2}} = 3$: The square root of nine is three

b. $\sqrt[3]{8}$ = ________ : ____

c. $2^2 : 2^5$ = ________ : ____

d. $3^4 : 3^6$ = ________ : ____

e. $\sqrt[5]{3^2}$ = ________ : ____

f. $\sqrt[p]{a^q}$ = ________ : ____

g. $X - X^3$ = ________ : ____

h. $a^n + a^m$ = ________ : ____

2) Complete the sentences below

a. In $a^{n/n}$, n/m is called a ________________

b. The cube root of a to the power of one fourths can be represented as ________________

c. The cube root of 27 is 27 to the ________________ of ________________or 3.

d. In a-x, -x is called a ________________.

e. p to the ________________ of five divided by p to ________________ of ________________ equals p to the ________________ of minus one.

The Keys to the Exercises

Exercise 1

1) a. 64

b. 2^5

c. 3^7

d. 5^5

e. y^7

f. $6a^5$

g. $3X^2$

h. x^{10}

2) a. index, power

b. add, indices

c. subtract, indices

d. fifth (power), a^5.

e. multiply, add, $8a^8$.

Exercise 2

1) a. 2
   b. 2
   c. 4
   d. a^2
   e. a^3b^2
   f. $2a^2$
   g. a^2b
   h. $a^{\frac{m}{2}}$
   i. $a^{\frac{y}{x}}b^{\frac{2}{x}}$
   j. $a^{X/n}\ b^{y/n}$

2) a. quantity, itself, equals
   b. multiply, two, twice, four
   c. index, root, $x^{D/D}$

Exercise 3

1) a. 3
   b. 2
   c. 2^{-3}
   d. 3^{-2}
   e. $3^{\frac{2}{5}}$
   f. $a^{\frac{q}{p}}$
   g. x^{-2}
   h. a^{n-m}

2) a. fractional index
   b. $\sqrt[3]{a^{1/4}}$
   c. power, one third
   d. negative index
   e. power, the power, six, power.

SUMMARY

This unit introduces the mathematic concepts of powers and roots, it also present the notions of fractional as well as negative indices. Besides that, this unit also elaborates the ways in which powers and roots work in basic mathematic operations, especially multiplication and division. The scientific jargons introduced here are, among others, squared, cubed, n-th power, indices, square root, cube root, n-th root, fractional indices, and negative indices.

FORMATIVE TEST 4

Instructions: Choose one of the appropriate options A, B, C, or D to complete the sentences below.

1) The digit 4 in such figures as 3^4, 5^4 and 7^4 is commonly called ....
   A. index
   B. power
   C. stem
   D. root

2) The figure 5^7 is read out as five to the power of seven or simply ....
   A. five to seven
   B. five to the seventh
   C. seven to five
   D. seven to the fifth

3) When we power such a figure as 2^3 by a number we simply ....
   A. add the powers
   B. multiply the indices
   C. subtract the indices
   D. multiply the stems

4) Two is the ... root of eight, because when multiplied by 2 three times, the result is eight.
   A. square
   B. fourth
   C. cube
   D. fifth

5) As the result of calculating the fourth root of 31, 3 is called the ... of the root
   A. quotient
   B. difference
   C. sum
   D. value

6) The calculation of $\sqrt[3]{x^2}$ results in a power in which the index is ....
   A. fractional
   B. negative
   C. improper
   D. decimal

Check your answer with the key provided. Count how many correct answers you have and then apply the following rule to check your understanding level of this learning activity.

$$\text{Level of Understanding} = \frac{\text{Right Answers}}{\text{Sum of Item Test}} \times 100\%$$

Rating Scale : 90 - 100% = very good
80 - 89% = good
70 - 79% = fair
< 70% = poor

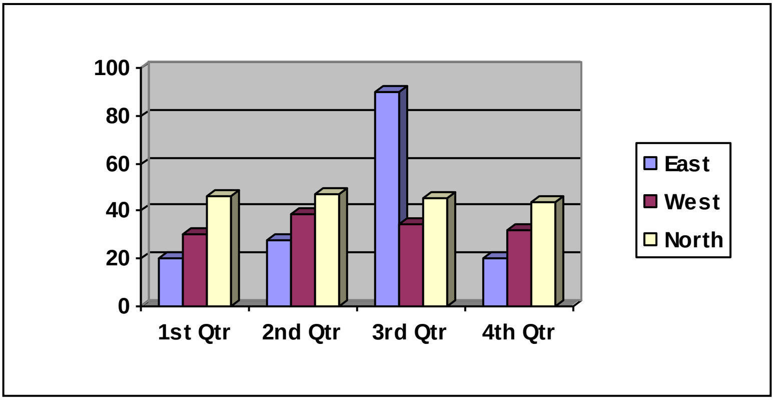
If you score 80% or above, you may proceed to the next activity. But if you score below 80%, you should repeat this learning activity, focusing your attention on the part(s) which you feel you need to remedy.

UNIT 5

Proportions, Percentages, and Averages

After you learn Unit 5, you will be able to:

1. identify proportions, percentages, and averages;
2. pronounce representation of proportions, percentages, and averages;
3. implement terminology used in proportions, percentages, sand averages;
4. read out the operations of proportions, percentages and averages.



A. PROPORTION

Before discussing proportion, do you have any idea about the so-called ratio and scale? Your answer may be either yes or no. Anyway, let us take a glance at these two jargons.

Suppose you stand by a busy road for ten minutes counting the number of cars passing. You find out four buses and twelve sedans. You can say that the ratio of buses to sedans is 4 : 12 or simply 1 : 3 (one to three). It means that the number of sedans is three times the number of buses. Now, if the ratio of the rich to the poor in this country is 1 : 10, what does it mean? It means that the number of the poor is ten times the number of the rich. We can also say that the number of the rich is one-tenth times the number of the poor. So, what is meant by ratio? In mathematics, a ratio is a quotient of two numbers or quantities. In other words, finding the ratio of two quantities is simply finding out the quotient of a division.

What about scale? Do you have any idea about it? All right. If you want to build a house, first of all you have to design it, don't you? Should your design as big or large as your actual house? No, of course, it is not. You have to make the real house to scale. For instance, if your design is made to scale of 1: 20 (one to twenty), it means that one centimeter on the design represents 20 centimeters on the house itself; ten centimeters represents 200 centimeters.

Now, if you look at a map, you will also find one's scale. Suppose you look at the map of Indonesia, with a scale of 1: 10.000.000. Suppose you find out in the map that the distance from Jakarta to Surabaya is 7 cm. What is the actual distance between the two cities? Write down your answer here: _______________. It is 700 kilometers, isn't it? I am sure, it is. In other words, the scale of a map shows the ratio of the distance on the map to the distance on the area covered by the map. On a map, this ratio is called the representative fraction.

Talking about the ratio of buses and sedans again, you still remember that it is 1: 3 (one to three) or 4: 12 (four to twelve). We know that 1: 3 and 4: 12 are two equal ratios. In other words, 1, 3 and 4, 12 are in proportion. We may also say that they are in direct proportion or directly proportional. Now, consider these two ratios: 3 : 6 and 5 : 10. (1) Are they equal? (2) Are they in proportion? Write down your answer here: (1) _______________ (2) _______________. Be sure that both answers are: Yes, they are. They are equal ratios. And 3 : 6, and 5 : 10 are in proportion, in _______________or _______________.

Let us, now, consider this problem. Five men can finish a job within 2 hours, 10 men can finish the same job within 1 hour. Are 5 : 2 and 10 : 1 in these ratios in direct proportion? No, of course, they are not. You see that 5 : 2 and 10 : 1 are not equal ratios. You also see that the more men we have the less time we need or the less men we have the more time we need. They are a kind of inversion, aren't they? Therefore, we can say that the number of men and the time are in inverse proportion. We can also say that they are inversely proportional. What do you think about these quantities: 7 : 3 and 21 : 1? Are they in direct or inverse proportion? Write down your answer here: _______________. Did you answer in inverse proportion? Be sure that you did, because the two ratios are not equal.

Can you follow me? All right. If you can, go on to the exercise below. If you cannot, reread through the explanation and do the practice again before continuing with the Exercise 1 on page 1.49.

B. PERCENTAGE

Nowadays, people like to save their money at a bank. Besides it is safe, they get some interest. Do you like to save your money at a bank, too? You surely do, don't you. Suppose you do. How much interest do you get from your bank annually: 12%, 13%, or 15%? All right. You know that rates of interest fluctuate from time to time.

Talking about percentage, 12% (twelve percent) is actually a fraction with a numerator of twelve and a denominator of one hundred. 13 % and 15% are also fractions. In these cases, 13 and 15 are the numerators and one hundred is the denominator. Now, suppose you save 1,000 rupiahs at a bank with an annual interest of 15%. How much interest would you receive from the bank after one year? Write down your answer here: _______________. You would receive 150 rupiahs, wouldn't you?. You certainly get the product by multiplying 15/100 by 1.000 rupiahs.

Now, suppose you come to a shopping mall. There, you see that everything is sold 20 percent off. What does it mean? It means that the prices of goods which are sold in the mall are decreased by 20%. It also means that the ratio of the new prices to the old ones is 80 : 100 (eighty to one hundred). If you buy a book worth Rp2,000, for instance, you will only pay Rp1,600 for it. This value is yielded by multiplying 80/100 by 2,000. What if you buy a novel worth Rp10,000. How much will you have to pay? Write down your answer here: _______________. Is your answer Rp8.000? I am sure it is, because you are certainly good at counting money.

Now, let us talk about fuel. If a liter fuel costs 7,000 rupiahs, and the government raises the price as much as 10 percent, how much would you have to pay for a liter of the fuel? Write down your answer here: _______________. You have to pay 7,700 rupiahs, don't you. The account is certainly obtained from adding 7,000 to 10% of it, i.e., 10/100 x 7000 = 700, which results in 7700. In other words, if a number is increased by 10 %, the ratio of the new number to the old number is 110 : 100.

Now, suppose you have 7,000 rupiahs in your pocket. You spend 2/5 of it to buy fuel with the old price, i.e. 7000 rupiahs per liter. How much money do you spend for the fuel? Write down your answer here: _______________. Is your answer 2,800 rupiahs? I am absolutely sure that you are right, because, again, you are very good at counting money. How do you obtain the amount? You obtain it by multiplying 2/5 by 7,000, don't you? That is good. Can we express the fraction 2/5 as a percentage? Yes, we can. The fraction 2/5 is expressed as a percentage 40% by means of multiplying it by 100%, i.e., 2/5 x 100% = 40%. Now, how much is 3/8 of 1,000 rupiahs? How many percent is it? Write down your answer here: _______________ or _______________ percent. Is your answer Rp37.5? I believe that they are.

Now that we have talked much about percentage, improve your understanding by doing the Exercise 2 on page 1.55.

C. AVERAGE

Do you remember scoring your work with regard to the exercises in this module? Yes or no? If your answer is *yes*, that is good. If it is *no*, however, it is high time for me to remind you that you should score them by yourself for yourself. Now, let me tell you a bit about your scores. Take Unit I of this module as an example. Suppose you score 70 in Exercise 1, 80 in Exercise 2, and 75 in Exercise 3. What is your average? It is 75, isn't it? This average is obtained by adding all the three scores and dividing the sum (225) by three, i.e., (75 + 30 + 35) - 3 = 75. So, what is meant by an average? *An average is a result obtained by adding quantities in a set and dividing the sum by the number of members in the set*. Talking about average, however, it is not as simple as that. It covers, among other things, mean, median, and mode. Let us look into them one by one.

Suppose we have five integers, i.e., 4, 6, 7, 8 and 10. What is their average? It is seven, isn't. This result (7) is obtained by adding up all the integers and dividing the sum by 5, i.e., (4 + 6 + 7 + 3 + 10)/5 = 7. This operation is called *an arithmetic mean*, i.e. *The average value of a set of quantities which is expressed as their sum divided by their number*. Now, what is the arithmetic mean of 3, 4, and 3? Write down your answer here: _______________. Is your answer 5? That is good.

Talking about median, do you have any idea about it? All right. Considering five integers in the paragraph above, i.e., 4, 6, 7, 8, and 10, we see that 7 is in the middle of the range. In statistics, this number (7) is called the median of the set of numbers. Now, consider this set of data: 2, 4, 4, 6, 6, 7, 7, 7, 9. This set is commonly called a frequency distribution: 2 and 8 have one frequency, 4 and 6 have two, and 7 has three. In this set, the second 6 is the median, because it ties in the middle of two groups of value, i.e., 2, 4, 4, 6, and 7, 7, 7, 9 with equal total frequencies. In other words, *median is the middle value in a frequency distribution*.

Now, what is meant by a mode? Do you know? All right. Take the frequency distribution in the paragraph above as an example, i.e., 2, 4, 4, 6, 6, 7, 7, 7, 9. You see that 2 and 9 only have one frequency, 4 and 6 have two frequencies, and 7 has three frequencies. So, which value has the most frequency? It is 7, isn't it? In statistics, we say that 7 is the mode in the distribution, because it appears most often. Let us, now, consider this set of date: 7, 9, 9, 11, 11, 11, 13, 14, 16. What is its mode? Write down your answer here: _______________. Is your answer 11? That is correct. In other words, a mode is a certain value in a frequency distribution which appears most often.

To deepen your understanding about the topic and to improve your skill in using the statistic jargons, do the Exercise 3 on page 1.51.

EXERCISE

Exercise 1

1) Complete the sentences below.
    a. If a classroom accommodates ten boys and twenty girls, we say that the _______________ of boys and girls is 1 : 2 (_______________ _______________ _______________).
    b. When we build a model car, we make it to _______________.
    c. If a model car is built to a scale of one to twenty, this means that 10 cm on the model _______________ 200 _______________ on the car itself.
    d. On a map the ratio is called the _______________ _______________.
    e. Since 1 : 3 and 10 : 15 are two equal ratios, 1, 3 and 10, 15 are in _______________.
    f. In 1 : 3 and 10 : 15,1, 3, and 10, 15 are in direct proportion or _______________ _______________.
    g. In 1 : 3 and 3 : 1, 1,3 and 3, 1 are in _______________ _______________ or inversely proportional.
2) Answer the questions below.
    a. Which fraction with a denominator of sixteen is in proportion to one fourths?
    b. What is the result of dividing 70 sheep into two groups in the ratio of 3 : 4?

c. The scale of a map is five centimeters to one kilometer. What is the representative fraction of the map?

d. Five families have a total of 100 sheep. How many sheep will six families have if the numbers are in proportion?

Exercise 2

1) Complete the sentences below.

a. If we save our money in a bank, we will certainly receive _______________.

b. The _______________ of interest that a bank provides may _______________ from time to time.

c. When the price of sugar is _______________ by 5 percent, the _______________ between the old ________ and the new one is 105 to _______________.

d. If we say that the ratio of men to women is 45: 55, it means that the _______________ of men is _______________ percent of the total number of people.

e. The fraction 1/10 may be _______________ as a percentage by _______________ it by 100%.

2) Answer the questions below. Write down your answer in the space provided.

1. What is six percent of eight hundred people?

   ____

2. Express four as a percentage of thirty two.

   ____

3. What vulgar fraction is sixty percent?

   ____

4. What decimal fractions is fifty two point five percent?

   ____

5. How much interest will you receive from the bank annually if you save 5.000 rupiahs at a rate of interest of 7.5%.

   ____

Exercise 3

1) Complete the sentences below
   a. A result obtained by adding quantities in a set and dividing the sum by the number of members in the set is called an _______________.
   b. Averages covers, among other things, _______________ _______________, and _______________
   c. The value 6 in this operation (4 + 6 + 7 + 3 + 10) : 5 = 6. is called an _______________
   d. An arithmetic mean refers to an average _______________ of a set of quantities, which is expressed as their _______________ divided by their _______________.
   e. This set of data 2, 4, 4, 6, 6, 7, 7, 8 is commonly called a _______________; 2 and 8 have one _______________, white 4, 6, and 7 have _______________ frequencies.
   f. The median of this set of data 2, 5, 5, 7, 8, 8, 9 is _______________.
   g. A mode may be defined as a value in a _______________ which appears most _______________.
   h. The mode on this set of data 2, 5, 5, 7, 9, 9, 9, 11, 11, 14 is _______________.

2) Answer the questions below.
   a. What is the arithmetic mean of 4, 4, 7, 7, 9, 9, 9, 11, 12?
   b. What is the median of the data set in item 1?
   c. What is its mode?

The Keys to the Exercises

Exercise 1

1) a. ratio, one to two
   b. scale
   c. represent, cm
   d. representative fraction
   e. proportion
   f. directly proportional
   g. inverse proportion

2) a. 4/16
   b. 30 and 40
   c. 1: 20.000
   d. 120

Exercise 2

1) a. interest
   b. rates, fluctuate
   c. increased, ratio, 100
   d. amount, 45
   e. expressed, multiplying

2) a. 48
   b. 12.5%
   c. 3/5
   d. 0.525
   e. 375

Exercise 3

1) a. average
   b. mean, median, mode
   c. arithmetic mean
   d. value, sum, number
   e. frequency distribution, frequency, two
   f. seven
   g. frequency distribution, often
   h. nine

2) a. 3
   b. 9
   c. 9

SUMMARY

This unit deals with three scientific concepts, i.e., proportions, percentages, and averages. They include introduction of mathematic jargons and the ways in which they work in mathematic as well as statistic operations. The terminology introduced in this unit includes, among others, ratio, scale, representative fraction, proportion direct as well as inverse - percentage, rate, interest, average, arithmetic mean, median and mode.

FORMATIVE TEST 5

Instructions: Choose one of the appropriate options A, B, C, or D to complete the sentences below.

1) In arithmetic, the quotient of two numbers or quantities is called a ....
   A. proportion
   B. scale
   C. ratio
   D. difference

2) The ratio of the distance places on a map and on the actual area covered by the map is called the ....
   A. vulgar fraction
   B. representative scale
   C. representative fraction
   D. proportional scale

3) When 3 men can finish a job in 10 hours and 6 men in 5 hours, we say that the ratio between the men and the job is ....
   A. directly proportional
   B. inversely proportional
   C. indirectly equal
   D. inversely rational

4) When everything in a department store is sold 20% off, it means that the prices of goods sold in the store is .... by twenty percent.
   A. increased
   B. reduced
   C. decreased
   D. scaled

5) The average value of a set of quantities which is expressed as their sum divided by their number is called the ... of the set.
   A. average
   B. median

C. mean
D. mode

6) The number 7 in the set of quantities 2, 4, 4, 6, 7, 7, 7, 8, 8, 9, is called the ... of the set.
A. average
B. median
C. mean
D. mode

Check your answer with the key provided. Count how many correct answers you have and then apply the following rule to check your understanding level of this learning activity.

$$\text{Level of Understanding} = \frac{\text{Right Answers}}{\text{Sum of Item Test}} \times 100\%$$

Rating Scale : 90 - 100% = very good
80 - 89% = good
70 - 79% = fair
< 70% = poor

If you score 80% or above, you may proceed to the next activity. But if you score below 80%, you should repeat this learning activity, focusing your attention on the part(s) which you feel you need to remedy.

UNIT 6

Factors, Equations, and Formulae

After you learn Unit 6, you will able to:
1. identify factors, equations and formulae;
2. pronounce representation of factors, equations and formulae;
3. implement terminology used in factors, equations, and formulae;
4. read out the operations of factors, equations, and formulae.

A. FACTORS

You still remember the story about the melon, we discuss in Unit 2, don't you? The melon is divided into five and distributed to five persons, so that each person gets one fifth of it. All right? In mathematics, we say that when 1 is divided by 5, 1/5 is the result. Therefore, it is called the factor of 5, whereas 5 is the multiple of 1. Now, if 8 is divided by 4, which one is the factor and which is the multiple of it? Write down your answer here: _______________ and _______________. Be sure that the 8 is the factor of 4, while 4 is the multiple of 8. In other words, if one number divides exactly into a second number, the first is a factor of the second and the second is the multiple of the first.

B. ALGEBRAIC FACTORS

Let us, now, consider this expression 3a (3a - 5) (three a, bracket three a minus five, bracket). If we expand the expression; we will obtain $9a^2 - 15a$ (nine a squared minus fifteen a) as its result. On the other hand, if we factorize $9a^2$ -

15a, we will obtain the result 3a (3a - 5). In other words, an expression can be expanded and the result can be reversed by factorizing it.

What do you think about ax - ay + bx - by? If we factorize this, expression, we will obtain a(x - y) + b(a - y). In this case, a is the factor of the first two teras and b is the factor of the second. Therefore x and y are called teras. Since (x - y) is common factor, we can factorize a(x - y) + b (x - y) again to obtain the result (x - y) (a - b), which reads x minus y times a minus b.

In addition, an algebraic expression like (x - 3) is called a binomial, because it consists of two teras. Meanwhile, an expression such as (x2 + 3x - 10) is called a trinodial because it is made up of three terms.

C. EQUATIONS

Do you still remember the name of these expressions: (x - 3) and (x^2 + 3x - 10)? All right! It is mentioned in activity 6.1 that they are binomial and trinomial expressions respectively. Suppose each of the two expressions is equal to 0 (zero), i.e., x – 3 = 0 (x minus three equals zero) and x^2 + 3x – 10 = 0 (x squared plus three x minus ten equals zero) we now call them equations.

Let us firstly talk about the binomial equation. Suppose x – 3 = 7 (x minus 3 equals seven) and we want to find out the value of x. We say that we wish to solve an equation. Here, we must find the value of x which satisfy the equation. This can be 10. Factorize x squared plus two xy plus y squared done by adding 3 to each side, so that the equation becomes: x - 3 + 3 - 7 + 3. Therefore, x - 10 9x is equal to 10. To confirm whether the value is correct or not, it may be checked by substituting it for x in the original equation, i.e., 10 – 3 = 7. Is it clear to you? If it is, that is good. If it is not, however, you should reread the explanation again more thoroughly.

Now, consider this trinomial equation x^2 + 3x - 10 = 0. Here, the equation contains a square as the highest power of x, i.e., x^2 (x squared). Therefore, this equation is quadratic and is known as a quadratic equation. To solve this problem of equation, first of all we have to factorize it into (x + 5) (x - 3) = 0. If (x + 5) is equal to zero, x = - 5. One the other hand, if (x - 3) is equal to zero, x = 3. In other words, the value of x is either - 5 (minus five) or 3 (three). We say that the values of a, i.e., - 5 and 3, are the roots of the equation. Since this kind of equation is solved in order to find two unknown values at the same time, it is called a simultaneous equation.

The explanation above is a bit hard to understand, isn't it? I think it is. So you need to read and reread the paragraphs more carefully in order to understand them. To improve your understanding of course, you should also do the exercise on page 1.58.

D. FORMULAE

The ability to solve equation problems such as those in Activity 6.2 is very useful to solve particular problems. As an illustration, take a look at the speedometer while you ride your motorcycle. Pay attention to its hand carefully! It continuously moves, doesn't it? The movement is of course in line with the speed of your motorcycle. For example, when the hand points to 40, it means that your speed is 40 km per hour. The general rule is that average speed is equal to the distance covered divided by the total time taken. If the speed, the distance, and the time are symbolized as, S, D, and T respectively, we represent the rule as the following formula:

$$\boxed{S = D/T}$$

(Speed equals distance divided by time). So, suppose you cover a distance of 100 km in 2 hours, your average speed is 50 km per hour. Furthermore, if you ride your motorcycle at an average speed of 50 km per hour for three hours, it means that you cover a distance of 150 km. Here we see that we change the subject of the formula to:

$$\boxed{D = S \times T}$$

(Distance equals Speed times Time). Now suppose you want to cover a distance of 300 km and you drive your motorcycle at an average speed of 60 km per hour. How long does it take to cover the distance?

Write down your answer here: _______________, it takes 5 hours, doesn't it. This time is obtained by dividing 300 by 60.

Now, let me give you another example. You know that we can take our body's temperature by means of a thermometer; either Celsius or Fahrenheit. Suppose your temperature 35^{o}C (thirty five degrees Celsius). In order to convert the temperature from degrees Celsius to degrees Fahrenheit we need to employ the formula below:

$$\boxed{F = 9/5C + 32}$$

(F equals nine fifths times C plus thirty two). In this way, we find that 350F is equal to 176.6C. Here again we can change the subject in the formula into C, so that the formula itself becomes:

$$\boxed{C = 5/9\ (F - 32)}$$

(C equals five ninths, bracket F minus thirty two, bracket). Therefore, if the temperature of a glass of water is 113^0 F, for instance, it is equal to _______, (Complete the sentence). Did you write down 45^0C? I am sure you did.

If you explore the world of such sciences as physics, chemistry, and statistics, you will certainly find virtually unlimited number of formulae. The following are just some of them: Boyle's law: P = k/V (big P equal: little k over big V); Einstein's law: E = DC2 (Rig E equals little a times little c squared); Arithmetic mean of a set of sample: X = Ex/n (Big x equals sigma little x over little n), calcium dihydroxide: Ca DH twice).

Now, improve your skill in reading out such formulae by doing the exercise below.

EXERCISE

Exercise 1

1) Complete the sentence below
   a. When one number divides exactly into a second number, the first is a _______________ of the second, and the second is the _______________ of the first.
   b. It is very common to express fractions in their _______________ terms.
   c. In the fraction 4/12, 4 and 2 are all factors of both the _______________ and the _______________.
   d. In the fraction 4/4, 4 is the highest _______________.
   e. Integers like 1, 2, 3, 5, 7, 11, 13, etc, are called _______________.
   f. A factor which is also a prime number is called a _______________.
   g. The _______________ _______________ (L.C.M) of 3 and 5 is 15.
   h. If x(x - 2) is _______________, we obtain the _______________ $x^2 - 2x$.

i. If x^2 - 2x x is _______________, we obtain the x (x - 2)
j. Algebraic expressions made up two terms are called _______________.

2) Answer the following questions.
a. What are the prime factors of thirty eight?
b. What is the L. C. M. of six and eight?
c. Expand three x minus four all squared!
d. Factorize x squared plus two xy plus y squared!

Exercise 2

1) Complete the sentences below.
a. If we want to _______________ an equation, we must find the _______________ (usually x) which _______________the equation.
b. When an equation problem is solved, the answer must be _______________, by _______________ it for x in the original
c. Expressions like x^2 + 2x + 4 are called _______________.
d. Equations which are solved in order to find two unknown values are called _______________.
e. The values obtained by solving a problem of simultaneous equation are called the _______________ of the _______________.

2) Answer the questions below
a. What is the value of x this equation: x - 5 - 13?
b. What are the roots of the equation x2 - 5 x + 6?
c. Find number when five, plus three times the number, equals forty one!

Exercise 3

1) Read out the formulae below. Item i is given to you as an example.
a. P = k/V : Big P equals little k over big v.
b. V = u + at : ____
c. C = : ____
d. Log1O7 : ____
e. CO_2 : ____
f. CgH1206 : ____
g. K = x/x 1x2 : ____
h. n = c/2p S/IV : ____

2) Complete the sentences below.
   a. The rule Average speed equals the distance covered divided by the total time taken can be written as the formula: _______________
   b. If we want to find the value of in the formula S - D/T, we will need to _______________ the _______________ of the formula so that it becomes T = _______________.
   c. If E is energy, m is mass, and c is velocity of light, they contain in the formula E = ac2, and we want to find the value of c, we will need to ____________ the subject of the formula to ______________.
   d. The temperature of 60^{o}C is equal _______________^{o}F.

The Keys to the Exercises

Exercise 1

1) a. factor, multiple
   b. lowest
   c. numerator, denominator
   d. common factor
   e. prime numbers
   f. prime number
   g. lowest common multiple
   h. expanded, result
   i. factorized, result
   j. binomial

2) a. 2 and 19
   b. 24
   c. $(3x\ 4)^2 - 3x^2 - 24x + 16$
   d. $x^2 + 2xy + y^2 = (x + y)^2$

Exercise 2

1) a. solve, value, satisfy
   b. checked, substituting, equation
   c. quadratic equations
   d. simultaneous equations
   e. roots, equation

2) a. x 13 + 5 -18
   b. x2 -5x + 6 - (x - 3)(x - 2).
      Hence, x is either 3 x 2
   c. If the given number is x 5 + 3x - 41.
      Hence, 3x ^ 41 - 5, so that x - 36/3 - 12.

Exercise 3

1) a. S = D/T
   b. change, subject, T - D/S
   c. change, c = V E/n
   d. 140^{o}F.

SUMMARY

This unit elaborates the concepts of factors-including arithmetical and algebraic, equations, and formulae. It also looks into the ways in which basic operations works, with regard to item. As for Formulae, this unit presented their operations without pretending to go deeper into the concepts of such sciences as physics and chemistry. Mathematic jargons introduced in this unit are, among other, factor, multiple, H. C. F., L. C. M., binomial, trinomial, simultaneous equations, quadratic equations, and formula (plural: formulae).

FORMATIVE TEST 6

Instructions: Choose one of the appropriate options A, B, C, or D to complete the sentences below.

1) When two is divided by five, two is commonly called the factor of five and five is the ... of two.
   A. numerator
   B. denominator
   C. multiple
   D. index

2) The numerator eight in the fraction 3/24 is called the .... of the fraction.
   A. highest common factor
   B. prime number

C. lowest common multiple
D. prime factor

3) In the expression a (x - 2) - 2b(x + 2), (x + 2) is called the .... of the expression.
A. prime factor
B. prime number
C. index
D. common factor

4) Such an expression as 3 x 2 + 2x - 5 is called a ....
A. simultaneous equation
B. quadratic square
C. quadratic equation
D. simultaneous square

5) The formula F - 9/50 + 32 is read out as ....
A. F equals nine five times C plus thirty two
B. F equals nine fifths times C plus thirty two
C. F equals nine fifths times C plus thirty second
D. F equals nine fifths times C added by thirty seconds

Check your answer with the key provided. Count how many correct answers you have and then apply the following rule to check your understanding level of this learning activity.

$$\text{Level of Understanding} = \frac{\text{Right Answers}}{\text{Sum of Item Test}} \times 100\%$$

Rating Scale : 90 - 100% = very good
80 - 89% = good
70 - 79% = fair
< 70% = poor

If you score 80% or above, you may proceed to the next activity. But if you score below 80%, you should repeat this learning activity, focusing your attention on the part(s) which you feel you need to remedy.

Keys to the Formative Test

Formative Test 1

1) A
2) B
3) D
4) B
5) C
6) C

Formative Test 2

1) B
2) B
3) B
4) D
5) C
6) C
7) B
8) B

Formative Test 3

1) A
2) C
3) A
4) C
5) B
6) C

Formative Test 4

1) A
2) B
3) B
4) C
5) D
6) A

Formative Test 5

1) C
2) C
3) B
4) C
5) B
6) D

Formative Test 6

1) C
2) A
3) D
4) C
5) B

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