

Students' Textbook

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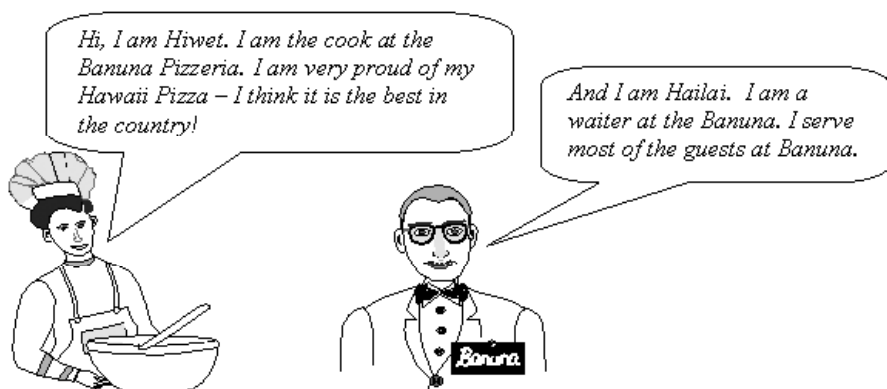
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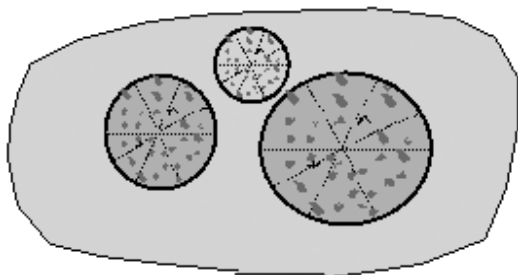
Chapter 1: Welcome to Banuna Pizzeria!



At the Banuna Pizzeria they make the best pizzas in town! They make three different sizes, the small, the medium and the family pizza. And of course they make many different types of pizza. On the price list you can see some of the prices of the most popular ones.

Banuna Pizzeria - try our fabulous pizzas!

		<u>Small</u>	<u>Medium</u>	<u>Family</u>
1.	Margarita	20.00	26.00	50.00
2.	Africana	23.00	28.00	54.00
3.	Napolitani	24.00	29.00	60.00
4.	Hawaii	25.00	30.00	62.50
5.	Calzone	26.00	32.00	62.50
6.	Mama-Mia	24.00		
7.	Asmarino			
8.	Mexicana			
9.	Banuna Special			

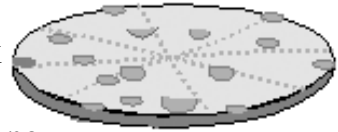


Soft Drinks and Fruit Juices

1.Mai Gaz	4.50
2.Coca Cola, Fanta, Sprite.....	4.00
3.Fruit Juice	12.00
4.Tomato juice	9.00

The Margarita pizza is with tomato and cheese. In addition to these the Hawaii pizza has pineapple and mortadella, the Africana has ground beef, the Napolitani has fish and olives and the Calzone has olives and onion.

1. Which of first five pizzas do you think you would like the best? Ask your partner the same question.



What would you have to pay for one small Margarita pizza and a soft drink for you and your friend?

2. What is the most expensive small pizza among six types listed above? What is the cheapest small pizza among six types? What is the difference?
3. What is the difference between the price of three small Calzone pizzas and one family Calzone pizza?
4. For his grandmother's 60th birthday, Biniam and his family went to the Banuna. They shared one family Hawaii pizza and two medium Napolitani pizzas. They also had 4 bottles of mai gaz. How much did they pay altogether?
5. Find other combinations of pizzas and drinks that Biniam and his family could have had for the same amount of money.

6. What is the difference between 8 bottles of Maigaz and 9 bottles of Coca Cola?
7. For her birthday celebration, Aster and her family went to the Banuna. There were 9 children and 8 adults present. The children had a small Africana pizza each. The adults had a medium size Hawaii pizza each. Everybody had a soft drink. What do all these cost? Did you get the same result as your partner?

8. Imagine that a relative came back from abroad and invited you and your family out for dinner at the Banuna. What do you think it would cost her if you ordered 3 of the small Hawaii pizzas, 2 family Margarita pizzas and 10 soft drinks?

Hello, I am your aunt Senait. I am back from abroad. I will invite you all out at the Banuna



9. Zahra and her 3 friends bought 2 of the small Calzone pizzas, 2 of the small Hawaii pizzas and 4 tomato juice. They shared the cost equally. How much did they pay each?
10. Amar and his friends bought 5 family Napolitani pizzas to share between 9 people. Did they pay more or less per person than Zahra and her friends?
11. The price list on page 1 is partially hidden. Complete the list using the following information:

- a) The price of a small Mama-mia pizza is 24 Nakfa. The medium one costs $1\frac{1}{2}$ times as much as the small one. The family pizza costs $2\frac{1}{2}$ times as much as the small one cost. What do the other Mama- mia pizzas cost?
- b) Each of the Asmarino pizzas is three fourth of each of the Mama Mia pizza. What do the three sizes of Asmarino pizza cost?
- c) The price of a small Mexicana pizza equals the price of six bottles of mai gaz. The medium one costs 5 Nakfa more than the small one. What do the small and medium Mexicana pizzas cost? Based on the information in the rest of the table, what do you expect the family Mexicana pizza to cost?
- d) The Banuna Special is a new type of pizza. They did not make it before at the Banuna. Sara thinks that it should cost approximately the average of the price of the other pizzas. Help her find a proper price for the small one. Also suggest prices for the other sizes of Banuna Special pizza.

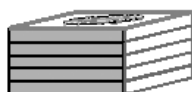


What did they buy? – what did one cost?

You have now found the prices. when guests buy pizzas at the Banuna. Now the task is the opposite: when you know what the total price is, can you find what pizzas were ordered and how much they cost?

1. Mariem bought 3 pizzas and Aster bought 5 pizzas of the same kind. Aster paid 56 Nakfa more than Mariem. Which kind of pizza do you think they bought?

This is 56 Nakfa more!



2. Ahmed and his family bought three small Napolitani pizzas. They also bought four other pizzas. In all they paid 164 Nakfa. What did they pay for each of the other pizzas?
3. Jemila and her friends went to the Banuna Pizzeria. They bought small Napolitani pizzas. How many did they buy if they paid 150 Nakfa and got 25 Nakfa change?
4. A group of four businessmen paid 120 Nakfa at the Banuna. They had some pizzas of the same kind. What do you think they bought?
5. Zahra and Kibra bought 5 pizzas of the same kind. They paid 200 Nakfa and got 40 Nakfa change. Find the cost of each pizza? How much does each of them have to pay, if Zahra is to pay for 3 pizzas and Kibra for 2?

6. To solve the problem in (5) above, Kibra did like this:

5 pizzas and 40 nakfa	200 N
5 pizzas	160 N
1 pizza	32 N

Do you understand Kibra's method?

7. Zahra did like this:

*I called the **price** of the pizza **P** – then I wrote:*

$$5 \times P + 40 = 200$$

*To find the price of one pizza, I first disregard the change
I subtract 40 Nakfa: 5 pizzas cost 160 Nakfa or*

$$5 \times P = 160$$

Then I divide by 5 to find the price of one pizza:

$$P = 32$$

So the price is 32 Nakfa.

Do you understand Zahra's method?

8. Solve tasks (1), (2) and (3) on the previous pages
again using Zahra's method.

Quantity and price – how are they related?

If you buy more, you have to pay more – that is no surprise. But can we describe the relationship between the number of pizzas bought and the total price?

The Banuna often sells many pizzas of the same type. For instance yesterday, a big group of guests ordered 9 of the small Margarita pizzas.

1. How much did the guests have to pay?

Sara and the other waiters want an easy way to find the cost if guests order many of the same type of pizza.

Sara did like this:

Pizza Type	1	2	3	4	5	10
Calzone	32	64				320
Napolitani	29					

2. Help Sara complete the table. Fill in the table for one other type of medium pizza.
3. Would you make the table differently, if you were to do it?

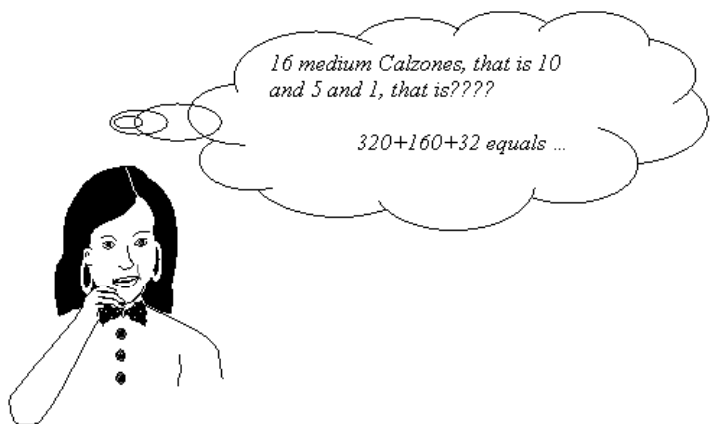
Kidane complains:



Sara responds:



4. How would you find the price of 8 medium Calzones from the table? Can you find different ways of doing it? Did your partner find other ways?
5. Find the price of 27 medium Calzone pizzas using the table.
6. What is the difference between the price of 5 medium Calzones and 5 medium Napolitanis?
7. Ask your partner to find the cost of other numbers of pizzas using the table – remember that you have to have suggestions for solving the tasks yourself, even if you make difficult ones.



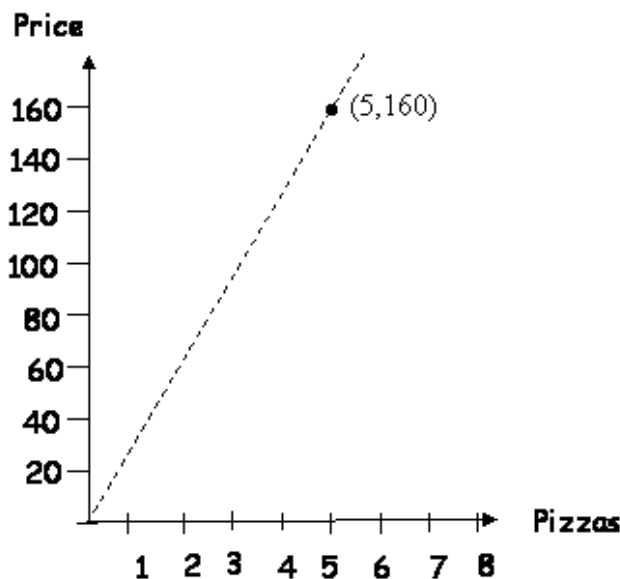
Another waiter, Kidane, used still another method to show the prices. This time it was a graph.

Kidane says:

*We may as well
make a graph. Then
it is much easier!*



Kidane makes a graph like this:



8. Which of the small pizzas do you think this waiter has shown in the graph?
9. Can you use the graph to tell how much 4 pizzas cost?
Is this price correct?

10. Do you think the graph is good enough for finding prices? Is it easy for the waiters to see the relationship between the number of pizzas and the price? Can you suggest ways of improving it?
11. Make a table of the prices of the small Margarita and the small Hawaii pizzas on the price list (like the ones Sara made). Draw the corresponding graphs based on the information in the table on the same pair of axes.
12. Do the two graphs look the same? If they don't, explain why not.
13. Find the difference between the prices of five of the two types of pizza that you have shown in the graph.
14. How does this difference show on the graph?
15. What other information can you find from the graph?
16. What would happen to the graph, if the price of the pizza went up? Why?

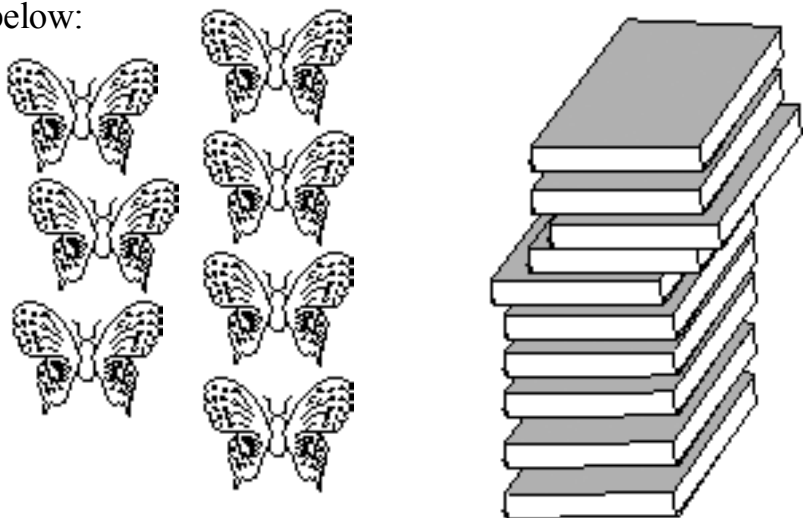
*I think the line will be **steeper**, if the price is higher! – but it is difficult to explain why ...*



Chapter 2: Numbers-Operating on numbers

Numbers

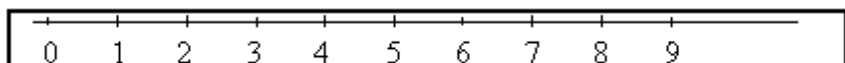
Numbers are the most essential tools in our daily life. We use them to count property, tell time, to record scores and to measure objects among other things. Look at the diagram below:



- a) How many butterflies are there in the flock? _____
b) How many books are there in the pile? _____

Numbers used for counting are called **Counting Numbers**. 1, 2, 3, ... are counting numbers. The counting numbers are also called **Natural Numbers**. We denote the **Set of Counting Numbers** by $N = \{1, 2, 3, ...\}$

Ali wants to measure the length of a table using a ruler.



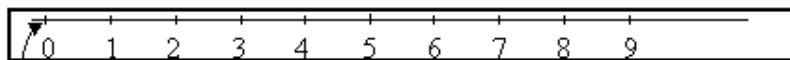
Ali says:



Look at the ruler. From where should I start to measure the length of my table.

Nejat answers:

You have to start from the origin of the ruler. Don't you know that zero is the origin of any measurement?



Origin

The point indicating '0' is called the **origin**. The numbers 0, 1, 2, 3, ... are called **Whole Numbers**. We use the letter **W** for the set of whole number and we write:
 $W = \{0, 1, 2, 3 \dots\}$.

1. Write the lowest ten natural numbers? _____
2. Write the whole numbers less than 8? _____



I realize that every natural number is a whole number!

Reading numbers

Numbers are written in words as well as numerals. For instance, using the digits 1, 3 and 8 we can write several numbers.

Hundred thirty eight: written as 138.

Three hundred and eighty one: written as 381.

Eight hundred and thirteen: written as 813.

The number “3” has different places in 138, 381 and 813.

The ‘face value’ or ‘name’ of 3 is always the same, but the ‘place value’ of 3 is determined by the position it occupies!



Write the numeral 73,548 in expanded form.

Place value of 7 = $7 \times 10,000 = 70,000$

Place value of 3 = $3 \times 1,000 = 3,000$

Place value of 5 = $5 \times 100 = 500$

Place value of 4 = $4 \times 10 = 40$

Place value of 8 = $8 \times 1 = 8$

$73,548 = 70,000 + 3,000 + 500 + 40 + 8.$

Activity 1

- Write the following numbers in words:
a) 24 b) 3,728 c) 82,732 d) 125,674
- Write the following in numerals
a) Ninety four
b) eight hundred and seventy four
c) Four hundred and eight
d) Thirty five thousand and sixty two.
- Write the following numbers in expanded form.
a) 578 b) 6148 c) 8,547
d) 68,052 e) 823, 157
- Write the sum of each of the following:
a) $600 + 50 + 7$ b) $3,000 + 800 + 20 + 4$
c) $10,000 + 50 +$ d) $40,000 + 6,000 + 700 + 50 + 3$
- Fill the table below with appropriate digits. One example from each has already been done.

Number	Hundred	Ten	Unit
381		8	
138	1		
813			3
452		5	

Operating with whole numbers

In previous topics we have discussed many things about numbers. In this section we will learn about some of the operations on whole numbers.

For Christmas, Haile bought a shirt at 85 Nakfa, a pair of shoes for 115 Nakfa and a pair of trousers for 285 Nakfa.

Haile did the following to find the total cost of the three things he bought.



$$\begin{aligned}85 &= 80 + 5 \\115 &= 100 + 10 + 5 \\ \underline{285} &= \underline{200 + 80 + 5} \\ \text{Total} &= 300 + 170 + 15\end{aligned}$$

$$\begin{aligned}&= 300 + 100 + 70 + 10 + 5 \\&= 400 + 80 + 5 \\&= 485\end{aligned}$$

The mathematics teacher asked his students to calculate the cost of 4 mathematics books that cost 17 Nakfa each.

Nura calculated as follows:

$$\begin{aligned}17 &= 10 + 7 \\ \times 4 &\quad \times 4 \\ &= 40 + 28 \\ &= 40 + 20 + 8 \\ &= 68\end{aligned}$$

I multiply 4 by
10 and 4 by 7



Do you understand how Nura did her multiplication?

Activity 2

1. Solve the following tasks using Haile's method for addition?

a) $110 + 489$

b) $237 + 158$

c) $136 + 244$

d) $986 + 255 + 124$

e) $188 + 64 + 8$

f) $652 + 589 + 17$

2. Solve the following using what ever method you prefer:

a) $352 + 447$

b) $637 + 255$

c) $156 + 778 + 87$

d) $1674 + 261 + 85$

e) $43.60 + 28.55$

f) $21.40 + 18.75$

3. Can you solve the following tasks using Nura's method?

a) 28×4

b) 343×8

c) 1761×8

d) 24×18

e) 36×42

f) 19.50×4

4. Solve the following using whatever method you prefer:

a) 48

b) 67

c) 365

d) 18.5

e) 4.76

$\times 23$

$\times 42$

$\times 12$

$\times 16$

$\times 23$

5. Zahra went for shopping. She bought 10 kilograms of potatoes at 6.25 Nakfa per kilogram, 2 kilograms of tomatoes at 2.90 Nakfa per kilogram and 4 kg of onion at 4.5 Nakfa per kilogram.



The shopkeeper calculated the cost as follows:

6.25	2.9	4.5	total sum	62.50
<u>x 10</u>	<u>x 2</u>	<u>x 4</u>		5.80
62.50	5.80	18.0		<u>18.00</u>
				1.30
				15.00
				<u>70.00</u>
			Nakfa	86.30

Zahra, however, made a table to calculate the cost.

Goods	Quantity in Kg.	Price per Kg.	Total Cost
Potato	10	6.25	10x6.25=62.50
Tomato	2	2.90	2x2.90=5.80
Onion	4	4.50	4x4.5=18.00
			Grand Total Nakfa = 86.30

6. Nega and Aster used different methods to find the difference between 723 and 345.

Nega did like this:
723 = 600 + 110 + 13
-345 = <u>300 + 40 + 5</u>
= 300 + 70 + 8
= 378

Aster did like this:
723 6 11 13
-345 <u>-3 4 5</u>
3 7 8
=378

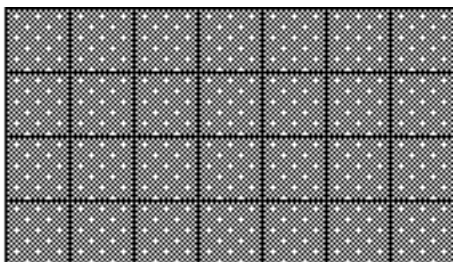
Do you understand Nega's and Aster's methods? Now you find the difference between 432 and 256 using both methods.

7. The school committee bought books for the school library. It bought 50 English books at 12 Nakfa each, 18 History books at 17 Nakfa each, 24 Science books at 13 Nakfa each and 16 mathematics books at 25 Nakfa each. What is the total cost of the books?
8. One Saturday a Butcher bought 50 hens at 45 Nakfa each, 4 goats at 250 Nakfa each, 5 sheep at 300 Nakfa each and 2 cows at 3500 Nakfa each. How much did he pay on that day?
9. Solve the following task using any method:
- a) $112.35 - 16.5$ b) $87.05 - 19.65$ c) $74.50 - 36.41$
d) $96.05 - 69.5$ e) $53.30 - 16.45$ f) $44.15 - 6.08$

Properties of whole numbers

In the previous topics you learned about operations of numbers. Now you will learn properties of whole numbers.

1. How many tiles are there ?



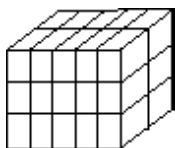
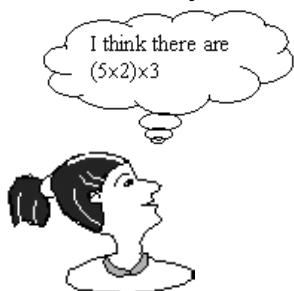
We could either say there are $4 \times 7 = 28$ tiles or $7 \times 4 = 28$ tiles. That is: 4×7 and 7×4 give the same result.



The property $a \times b = b \times a$ is called *Commutative property of multiplication*.

Is there a similar property in addition ? Give two examples.

2. How many boxes are in the picture?



The property $(a \times b) \times c = a \times (b \times c)$
Is *associative property of multiplication*.



Is there a similar property in addition? Give two examples.

Activity 3

1. Tell the property that is used in each of the following tasks:

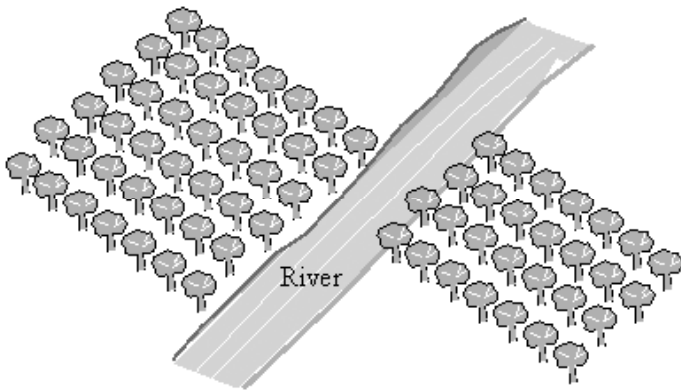
- a) $5 \times 7 = 7 \times 5$
- b) $8 \times (9 \times 4) = (8 \times 9) \times 4$
- c) $(12 + 15) + 8 = 12 + (15 + 8)$
- d) $23 + 47 = 47 + 23$
- e) $34 \times 78 = 78 \times 34$
- f) $(7 \times 6) \times 5 = 7 \times (6 \times 5)$

2. Find the missing value.

- a) $\underline{\hspace{1cm}} \times (7 \times 3) = (2 \times 7) \times 3$
- b) $39 + \underline{\hspace{1cm}} = 89 + 39$
- c) $(5 + 6) + 7 = 5 + (6 + \underline{\hspace{1cm}})$
- d) $24 \times \underline{\hspace{1cm}} = 53 \times 24$
- e) $(45 \times 67) \times \underline{\hspace{1cm}} = 45 \times (67 \times 76)$

An agronomist planted orange trees on two opposite sides of a river for demonstration to farmers.

How many trees are there?



Abel said there are 70 trees altogether.
But he didn't count them one by one.
Instead he used a short method:

$$(7 \times 6) + (7 \times 4) = 42 + 28 \\ = 70$$

There are $7 \times (6 + 4)$
 $7 \times (6 + 4) = 7 \times 10$
 $= 70$ trees



Nejat also found 70 and she used a shorter method. This is what she did:
Since on one side there are 6 rows of 7 trees and on the other side 4 rows of 7 trees, altogether there are 10 rows of 7 trees

The property $7 \times (6 + 4) = 7 \times 6 + 7 \times 4$
Is called distributive property.



Activity 4

1. Tell the property that is used in the following tasks?

- a) $(7 \times 8) + (7 \times 6) = 7 \times (8 + 6)$
- b) $(9 \times 3) + (5 \times 3) = (9 + 5) \times 3$
- c) $(7 \times 11) \times 8 = 7 \times (11 \times 8)$
- d) $6 + (13 + 4) = (13 + 4) + 6$
- e) $25 \times 37 = 37 \times 25$

2. Tell the value of the variable.

- a) $a \times (9 + 6) = (4 \times 9) + (4 \times 6)$
- b) $(35 \times 17) + (b \times 17) = (35 + 42) \times 17$
- c) $c \times 89 = 89$
- d) $48 \times d = 76 \times 48$

3. Use distributive property to evaluate the following:

- a) $9 \times 98 = 9 \times (100 - 2)$
- b) $97 \times 6 = (100 - y) \times 6$
- c) $25 \times 97 = 25 \times (100 - x)$
- d) $82 \times 97 =$
- e) $9 \times 106 = 9 \times (100 + z)$
- f) $107 \times 23 =$

4. Calculate the following:

- a) $7 \times (12 \div 4)$
- b) $3 + (7 \times 5)$
- c) $(5 + 4) \times (3 + 7)$
- d) $9 - 4 + 2$
- e) $12 \times (9 + 8)$
- f) $(56 - 34) \times 12$

5. Haile saves 8 Nakfa every month

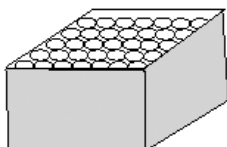
- a) How much will he save in 12 months?
- b) How long will it take him to save 256 Nakfa?

6. Nasir bought 3 pairs of socks at 12 Nakfa each. He also bought a shirt for 45 Nakfa.

- a) How much did he spend altogether?
- b) If he gave the cashier 100 Nakfa, how much change would he receive?

Division:

A woman brought 156 eggs to the market and sold them to three other women. How many did each woman buy?



$$\begin{array}{r} \text{a) } 156 \div 3 \\ \underline{-15} \downarrow 52 \\ 6 \\ \underline{6} \\ 0 \end{array}$$

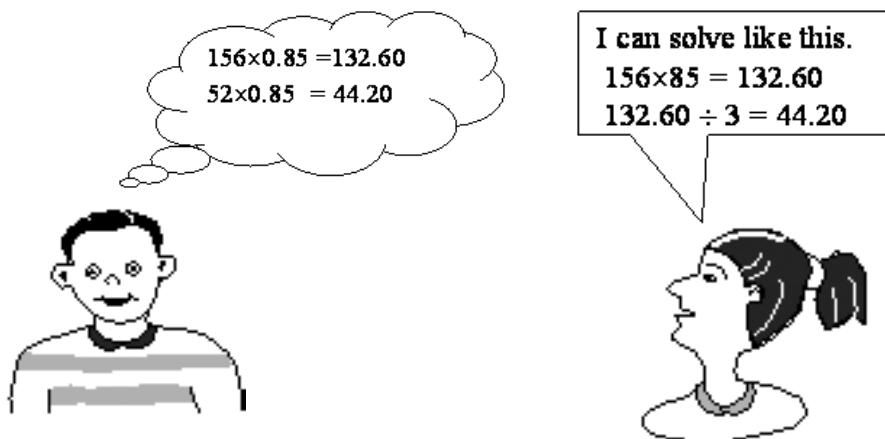
$$\begin{array}{r} 52 \\ \underline{156} \\ \downarrow \\ 6 \end{array}$$



Checking:
 $156 = 3 \times 52$
 $= 156$

Checking :
 $156 = 3 \times 52$
 $= 156$

If the cost of one egg is 85 cent. Find the total cost.
How much did each woman pay?



1. Divide:-

- | | |
|-------------------|-------------------|
| a) $540 \div 70$ | b) $513 \div 9$ |
| c) $6552 \div 28$ | d) $2424 \div 12$ |
| e) $399 \div 31$ | f) $540 \div 8$ |
| g) $509 \div 84$ | h) $756 \div 95$ |

2. On a certain holyday a father gave 120 Nakfa to four of his children. How much did each child receive?

3. 574 pupils were divided into 14 teams. How many pupils were there in each team?

4. Nasir collected 2034 Nakfa from a sale of drama tickets. If each ticket cost 16 Nakfa, how much money did he collect?

5. Find the results in each of the following?

- | | |
|--------------------|--------------------|
| a) 71×29 | b) $76 \div 23$ |
| c) 86×26 | d) $848 \div 16$ |
| e) $56 \div 18$ | f) 690×49 |
| g) 234×45 | h) $225 \div 15$ |

Chapter 3: Integers

From our study of whole numbers we know for example that $3 - 2 = 1$, $5 - 3 = 2$ and $7 - 4 = 3$. What about, if it is $2 - 3$, $3 - 5$, $4 - 7$?

Is the answer the same?

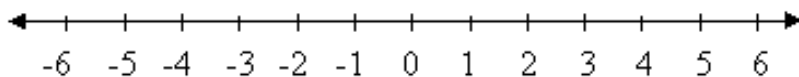
No, the answers are not the same. The answers must be less than zero. Hence they cannot be whole numbers. So we must have other numbers. If we start from 0 and successively add 1 to every number preceding it we get: 0, 1, 2, 3, 4, 5, 6, ...

What do the dots after 6 mean ?

The numbers after zero i.e., 1, 2, 3, 4, 5, 6, ... are called **positive integers**.

Similarly starting from 0 by successive subtraction of 1 we get numbers less than 0. To indicate that these numbers are less than 0, we attach a “-” sign in front of each number. i.e., ...-6, -5, -4, -3, -2, -1. These numbers are called **negative integers**. We read them as: *negative one*, *negative two*, *negative three* etc.

If we plot the positive integers, zero and negative integers on a number line it looks like this:

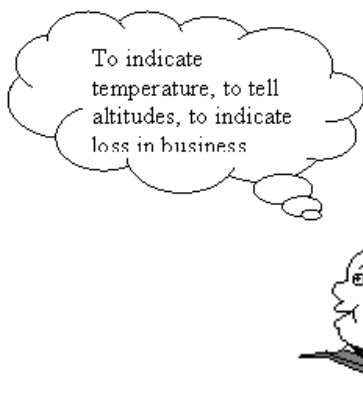


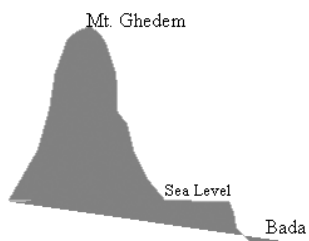
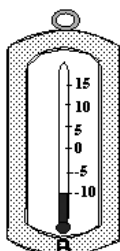
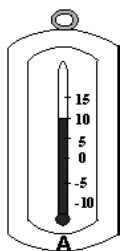
The set of integers consists of negative integers, zero and positive integers. We use the letter **Z** to indicate the set of integers.

$$\mathbf{Z} = \{ \dots -3, -2, -1, 0, 1, 2, 3, \dots \}$$

Activity 1

1. The numbers to the right of zero are _____ and the numbers to the left of zero are _____.
2. The number 3 is 3 units to the right of 0 on the number line. The number -3 is also 3 units to the _____ of 0. Hence 3 and -3 are opposites of each other.
3. Write the opposite for each of the given numbers.
a) 5 b) -7 c) 12
d) -35 e) 0 f) 1





Reading of thermometer
A is 10°C above zero.
 It is 10°C .

Sea level is at 0m.
 Mt. Ghedem is 950m
 above sea level.

Reading of thermometer
B is 10°C below zero.
 It is -10°C .

Bada is 50m below sea
 level. It is at -50m .

4. If I bought a hen for 85 nakfa and sold it for 76 nakfa. I had a loss of 9 Nakfa. I sold it for 9 nakfa less than what I bought it for. This shows $76 - 85 = ?$
5. What is the hottest month in your area? Can you guess the highest temperature of that month?
6. What is the coldest month in your area? Can you guess the lowest temperature of that month?
7. Arrange the following numbers from smallest to largest

a) 3, -4, 0, 5, -6, 1	b) -6, 7, -8, 9, -10, 15
c) -20, 40, -10, 0, 17, -19	d) -12, 0, 11, -5, 4
8. Write down all the integers

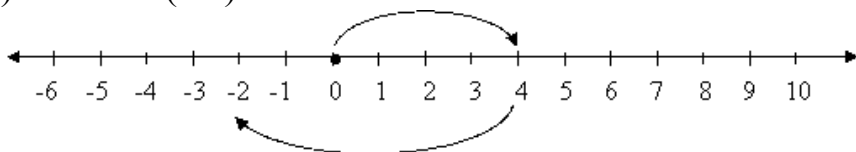
a) between -3 and 5	b) between -4 and 4
c) between -6 and 2	d) between -3 and 3

9. Name a location in Eritrea which is below sea level.
What is its altitude?

Operations on Integers

On a number line, the distance moved from left to right is taken to be positive and the distance moved from right to left is taken to be negative.

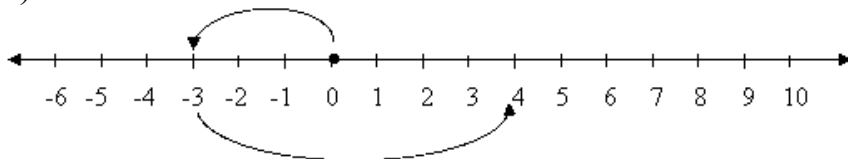
- a) Add $4 + (-6)$ on a number line.



$$4 + (-6) = -2$$

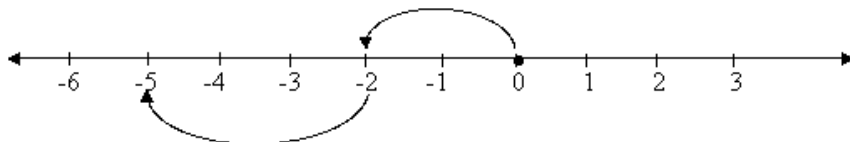
$$4 - 6 = -2$$

- b) Add $-3 + 7$



$$(-3) + 7 = 4$$

How do we add -2 and -3 on the number line?



We start from zero and move 2 units to the left and then follow it by 3 more units to the left. How far does this take us? Five units to the left of zero

$$\text{Therefore } (-2) + (-3) = -5$$



In general, for positive integers m and n
 $m + (-n) = m - n$
 $(-m) + (-n) = -(m + n)$

Activity 2

1. Evaluate the following:

a) $(-5) + (-4) = -(5 + 4) = -9$

b) $6 - 9 = 6 + (-9) = -3$

2. Evaluate the following:

a) $7 + -5$

b) $-8 + (-6)$

c) $17 - 23$

d) $-42 + 56$

e) $-12 + (-6) + 5$

f) $4 + (-11)$

3. Find the following sums:

a) $12 - (-7) + 3$

b) $-19 - 5 - (-6)$

c) $25 - 7 - 8$

d) $[4 - (-5)] - 8$

e) $-[(-5) - 8]$

4. A traveler descended 400 meters from a hill that was 320 m above sea level. At what altitude is she now?

5. The temperature is at 12°C . If it drops by 18°C in the next hour what would the temperature be?

6. The Danakil Depression is 115 m below sea level and Lake Tanganyika is 655 m below sea level. Which place is higher and by how much?

Multiplication of Integers

Who can tell me the product: 4×-3 ?



As (-3) is the opposite of 3, then $4 \times (-3)$ must be the opposite of 12, that is
 $4 \times (-3) = -12$

What will be the product if both numbers are negative $(-3) \times (-4)$?

I know. As $(-3) \times 4 = -12$, then
 $(-3) \times (-4) = 12$.
 -12 is the opposite of 12.



Meriem is right. Can you do the following?

$(-2) \times 3$, $2 \times (-3)$, $-2 \times (-3)$,

Now, for any two integers m and n .

$$(-m) \times n = -(m \times n)$$

$$m \times (-n) = -(m \times n)$$

$$(-m) \times (-n) = m \times n$$



Activity 3

1. Find the following products:

a) -5×4

b) $7 \times (-8)$

c) $-6 \times (-5)$

d) -2×9

e) $-6 \times (-7)$

f) $-3 \times (-2) \times 5$

g) $-4 \times (-2) \times (-2)$

h) $-4 \times 5 \times 2$

2. Find the missing value:

a) $-3 \times \underline{\quad} = 21$

b) $-8 \times \underline{\quad} = -24$

c) $-6 \times \underline{\quad} = -30$

d) $\underline{\quad} \times 13 = -39$

e) $-6 \times \underline{\quad} = 18$

f) $\underline{\quad} \times (-5) = 10$

Division

Let us see how the rules for multiplication lead to those for division.

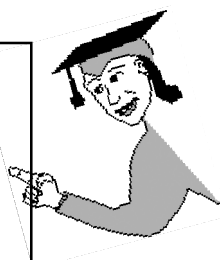
Since $3 \times 4 = 12$, then $12 \div 3 = \underline{\quad}$

Since $4 \times (-3) = -12$, then $-12 \div 4 = \underline{\quad}$

Since $3 \times (-4) = -12$, then $-12 \div (-4) = \underline{\quad}$

Since $-3 \times (-4) = 12$, then $12 \div (-3) = \underline{\quad}$

Now, for any two integers m and n .

$\begin{aligned}(-m) \times n &= -(m \times n) \\ m \times (-n) &= -(m \times n) \\ (-m) \times (-n) &= m \times n\end{aligned}$	
--	---

Activity 4

Compute each of the following.

a) $-18 \div 3$

b) $12 \div -4$

c) $-28 \div 7$

d) $-250 \div -5$

e) $-12 \div -2$

f) $-576 \div -18$

g) $-24 \div -8$

h) $-36 \div 12$

Chapter 4: Finding the Unknown

In chapter 1 you found the price of one pizza, when you knew that for example you had 40 Nakfa change, after paying 200 for five pizzas.

Also, you were told that Juhara did like this:

I called the price of the pizza P – then I wrote:

$$5 \times P + 40 = 200$$

To find the price of one pizza, I first subtract the change - I subtract 40 Nakfa: 5 pizzas cost 160 Nakfa or

$$5 \times P = 160$$

Then I divide by 5 to find the price of one pizza:

$$P = 32$$

So the price of one pizza is 32 Nakfa.

1. Can you still follow each step of Juhara's thinking?

Juhara gave the unknown number 'a name', the letter *P*. This is a very useful idea, when you want to find some unknown value. This is what you are to learn to do now.

Let us look at another example: 134 people are going from Asmara to Keren to watch a football match. They travel by minibuses each carrying 12 passengers. Saleh remarks while he is waiting: *Now we are only 26 people left – I wonder how many buses have left already?*

In this situation, it was the **number** of buses that we wanted to find.

*If there were 3 buses they had taken 12×3 people. If I call the **number** of buses **n** ., they have taken $12 \times n$ people. Also there are 26 people left. That means:*

$$12 \times n + 26 = 134$$

If I subtract the people who are still waiting, I get

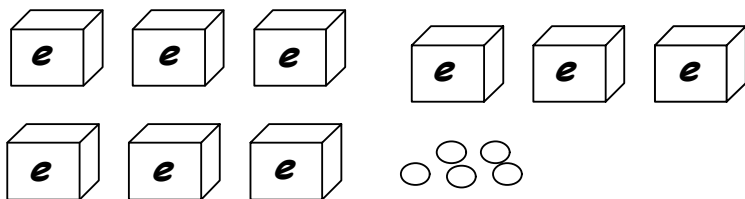
$$12 \times n = 108$$

Now I have to find a number that gives 108 when multiplied by 12. Therefore I have to divide by 12. I get:

$$n = 9$$

So, 9 buses had already left.

2. Do you understand every step of the above example?
3. What if there were 233 people, and 16 people were to be in each Bus. And this time there were 25 still in the queue?
4. Dawit had 365 eggs. He is taking them to the market to sell. When he came to collect them, his mother had packed them in 9 cartons of equal number. If there were 5 eggs left over, how many eggs are there in each carton?



In this situation, it is the **number of eggs** in each carton that Dawit wanted to find. Dawit did like this:

If there were e eggs in a carton then the number of eggs in the nine cartons is $9 \times e$. But there were 5 left unpacked from the total of 365 eggs.

That means:

$$9 \times e + 5 = 365$$

If I subtract the eggs that are left unpacked, I get

$$9 \times e = 360$$

Now I have to find a number that gives 360 when multiplied by 9. Therefore I have to divide by 9. I get:

$$e = 40$$

So, there are 40 eggs in each carton.

Do you understand what Dawit did?

Suppose the question was like this instead:

Dawit had 365 eggs. He is taking them to the market to sell. When he came to collect them, his mother had packed them in cartons of 40 eggs each. If there were 5 eggs left

over, how many cartons were there?

Do this task in the same way as Dawit did the previous task.

In the examples in this chapter, you have found the value of some unknown number.

- First you gave the unknown number a name, a letter.
- Second you wrote an equation using that name and what else you knew about the situation. And
- Third you did some calculations to find the solution to the equation. This is the number or numbers that made the equation true, i.e. it is the value of the unknown.

Go over the examples on the first page of the chapter: Can you recognise each of these three steps?

Sometimes you only have to carry out the last of these three steps. That is the case, if somebody else has set up the equation for you. For instance:

$$8 \times x + 3 = 83$$

This equation may mean many things, such as:

- Amar had 83 bottle tops. He made 8 equal piles and had 3 left over. How many were there in each pile?
- There were 83 students in grade 6 in Afambo School. When they were divided into groups of 8, there were 3 students left. How many groups did they make did they make?

- Dawit works in a shop and is asked to put mai-gaz bottles in boxes. He filled 8 boxes and had 3 bottles left over. How many are there in each box?

Activity

1. What does x mean in each of the three situations?
Explain why they may be represented by the equation.
2. Solve the equation, and interpret the result as an answer to the question asked in each of the three situations.
3. Make up a situation that may have been the reason for setting up this equation (you may adapt some of the situations above or other ones met in this chapter):

$$5 \times x - 9 = 21$$

4. Solve the equation above and interpret the result as the answer to the value of the unknown in the situation you made.
5. Solve the following equations. In each case you should think of a situation that fits and interpret the result in relation to the situation.

a) $2 \times x = 14$

b) $5 \times x + 2 = 12$

c) $3 \times x - 18 = 9$

d) $10 \times x + 9 = 139$

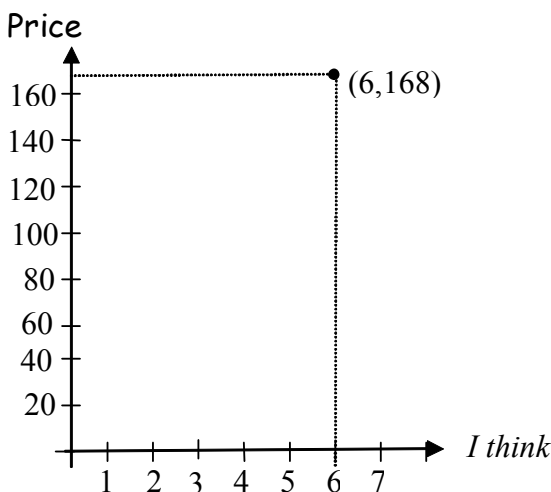
e) $12 \times x - 13 = 35$

f) $2 \times x + 3 = 16$

6. Very often we write $10x$ as a short form for $10 \times x$. Let us use this symbol to solve the following.
 - g) $6x - 13 = 53$
 - h) $11x + 9 = 108$
 - i) $9x - 5 = 22$
 - j) $5x + 10 = 60$
 - k) $5x - 15 = 75$
 - l) $14x + 10 = 150$

Chapter 5: Connections between variables

In chapter 1 you investigated the relationship between the number of pizzas bought at the Banuna Pizzeria and the total price. You also showed the relationship in graphs.



The point (6,168) plotted in the coordinate system indicates that 6 of the medium size Africana pizzas cost 168 Nakfa.

Activity 1

1. Find the price of 1, 2, 3, 4, and 5 medium Africana pizzas.
2. Draw a copy of the coordinate system in your notebook.
3. Show the prices for 1, 2, 3, 4, and 5 medium Africana pizzas in the coordinate system. Draw a graph through the points. What does the graph look like? Can you explain why it looks like this?

4. Make a table of the connection between the number of family size Napolitani pizzas and the total price (You can find the price of 1 pizza in the list in chapter 1).
5. Show the prices from your table in the same coordinate system as before. Draw a graph through the points. What does the graph look like? Can you explain why it looks like this?
6. How can you tell from the graphs that the family size Napolitani pizza is more expensive?

No of pizzas:	<u>1</u>	<u>2</u>	<u>3</u>	...
Price:	28	56	84	...
	28	28	28	28

7. How does this show on the graph?

Matching figures

Zahra made geometric patterns using match sticks. You are to work with her patterns of triangles.

Zahra called the first figure Fig. 0, because there are no triangles, the next one she called Fig. 1, because there is one triangle etc.



Fig. 0



Fig. 1



Fig. 2

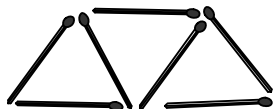


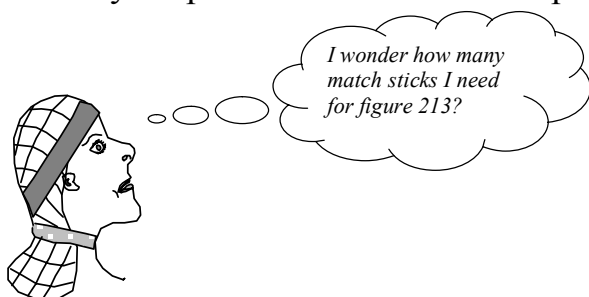
Fig. 3

Activity 2

1. Draw or make these and the next two figures in the pattern. How many match sticks does she need for figure 1? For figure 2? For figure 3? For figure 5? For figure 10?

Zahra had a problem: she wanted an easy way to find the number of match sticks she needed for any figure in the pattern.

2. Work with your partner to solve Zahra's problem.



Zahra solved the problem like this herself:

The number of match sticks I need are 1, 3, 5, 7, ... For every new figure I need two more match sticks:

Figure: 0 1 2 3 ...

Matches: 1 3 5 7 ...

 2 2 2

For instance in figure ③, I need $1 + ③ \times 2 = 7$

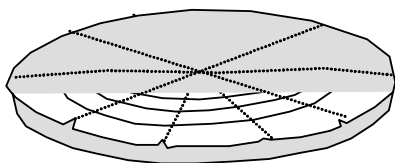
For instance in figure ⑤, I need $1 + ⑤ \times 2 = 11$

But then in figure (n) , I need $1 + n \times 2$

3. Can you follow Zahra's reasoning? Did you find a similar solution? Is her formula right? Why or why not?
4. How many does she need for figure 213? Can you use Zahra's method to find the number match sticks needed for any figure in the pattern? Ask your partner more questions like that!
5. Draw points showing the relationship between the first 8 figures and the number of matches in a coordinate system. What do you notice about their positions? Are they all on the same straight line?

Baking THE ABRAHAM SPECIALS

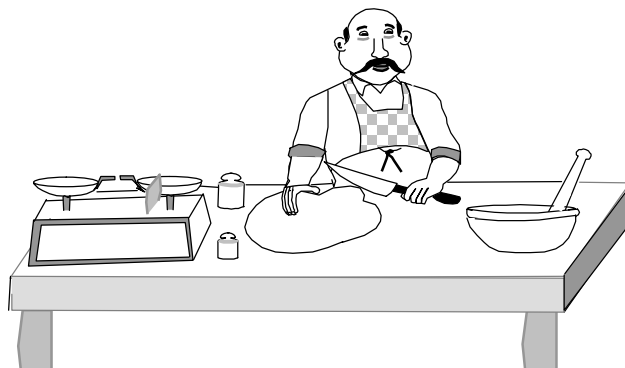
Abraham is a baker. He bakes many different types of bread. He uses his favourite recipe for both *the Abraham Special Loaves* and *the Abraham Special Rolls*.



Abraham Special Loaves



Abraham Special Rolls



Activity 3

1. How much dough does Abraham need for 3 loaves? For 5 loaves? For 7 loaves?
2. Make a table of how much dough he needs for a different numbers of loaves. Show the connection between the number of loaves and the amount of dough he needs in a coordinate system.
3. Draw a graph through the points. Do the points all lie on a straight line? Can you explain why or why not?
4. How much dough does Abraham need for 25 rolls? 50 rolls? Show the connection between the number rolls and the amount of dough in the same coordinate system as above.
5. Draw a graph through the points. Do all the points lie on a straight line? Can you explain why or why not?
6. Compare the two graphs. How are they similar? How are they different?

One morning Abraham made 4950 grams of his favourite dough. He decided to make 3 loaves.

7. How many rolls can he make with the remaining dough? What about if he want to make 3 loaves? 4 loaves? 5 loaves?
8. What numbers of loaves should he make, if he does not want to waste any dough?

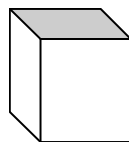
9. Show the connection between the number of loaves he makes and the number of rolls, if he does not want to waste any dough.
10. Why do you think Abraham decided to make 4950 grams of dough instead of 5000 g?

Making cardboard boxes

Rahwa has a factory that produces cardboard boxes. Every box is made of square pieces of cardboard of the same size. In the factory they say that this square has the area 1.

In this section you are to find the connection between the shapes of the boxes and the size of cardboard needed to produce it. This is important for Rahwa, because the price of the box depends on how much cardboard they use.

The smallest box they make at Rahwa's factory is a cube.



Activity 4

1. Look at a cube – for instance a die. How many faces does it have? If one face has the area of 1 how much cardboard is needed to make the cube?

The next type of box is as high as two of the small ones.

2. How many square units of cardboard is needed to make one of these boxes?



3. What if the box is as high as three cubes on top of each other - what is the surface area in this case?

If the height is (1) the area is $2 + \underbrace{1} \times 4 = 6$

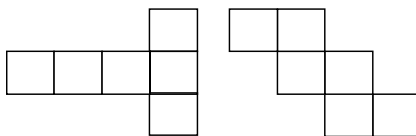
If the height is (2), the area is $2 + \underbrace{2} \times 4 = 10$

But then, if the height is (n), the area is $2 + \underbrace{n} \times 4$

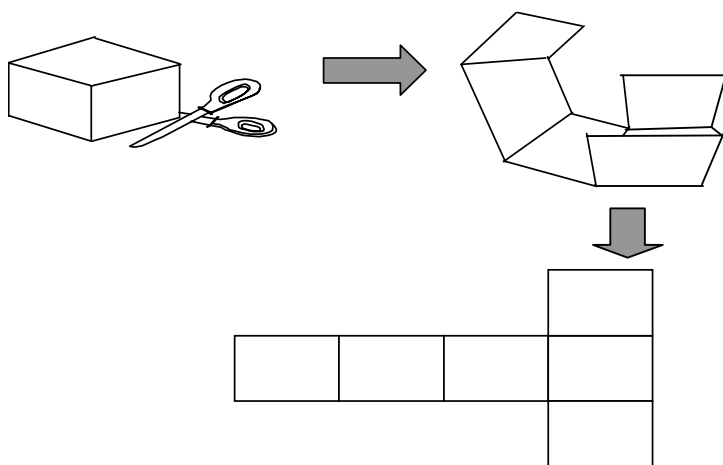
6. Can you follow Zerai's reasoning? Is his formula right?
7. What is the surface area of a box that is 25 high?
8. Is there a tower with the surface area of 69 square units?
9. Zerai has a sheet of cardboard that is 79 square units. What is the height of the highest box he can possibly make?
10. Use a coordinate system to draw points showing the relationship between the height of the box and the surface area of the 5 smallest boxes you have worked with. Are the points all on the same line?
11. If the price of 1 sq.m of card board is 5 Nakfa, find the price for a card with an area 6 sq.m? 10 sq.m? 24 sq.m?
12. Using the above price of cardboard, find the price of a box with height 3m? 4m? 5m? Write a formula for the price of a box in relation to its height.
13. Using your formula calculate the height of a box if the price of the box is 270 Nakfa.

Zerai has to make the boxes out of one piece of cardboard. This piece, then, has to fold into the box. An unfolded piece of cardboard or a drawing of it is called a *net* of the box.

Zerai finds that different nets can be made for each box. For instance he made these for the small one.



He found the first one by unfolding a cube like this:

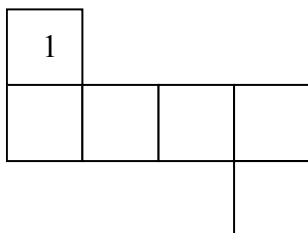


14. Draw and cut the second net. Can you make a cube from it?

Now to you are to make nets of a cube yourself.

15. Look at a cube (for instance a die) or at a picture of a cube. Imagine that you cut the cube along the edges and unfold it. What nets can you make? How many different ones can you make?

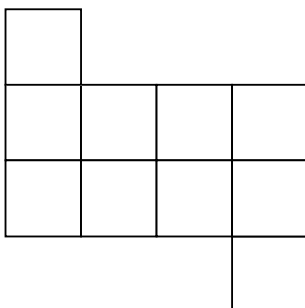
Zerai uses this net:



16. Was this one of the nets that you found?
17. Are you sure that this is in fact a net of the cube? Draw and cut the net. Try to make a cube out of it.

When Zerai makes nets for the boxes that are 2 high, he uses this net:

18. Are you sure that this is in fact a net of the box of height 2? Draw and cut the net. Try to make the box out of it.



19. What do you think Zerai's nets for the boxes that are 3 and 4 high look like? Draw them.
20. Does this correspond well with Zerai's formula?

Chapter 6: Primes – the building blocks of the natural numbers

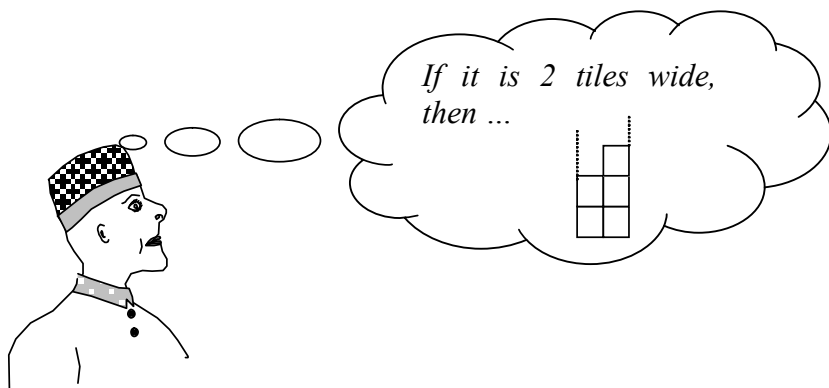
The natural numbers are the numbers 1, 2, 3, ... You know a lot about these numbers already.

In this chapter you are to study them again using multiplication. And as you will see: sometimes numbers are full of surprises ...

Daud wants to make a rectangular terrace in his court yard. He will pave the terrace with square tiles. First we consider the situation when he has 24 of these.

Activity 1

1. Cut a sheet of paper in 24 squares of 4×4 cm. Make different rectangles using 24 of the squares. Draw the rectangles in your notebook.
2. How many rectangles did you make? Are you sure that you have found them all? Do you agree with your partner?



3. What if Daud had 25 tiles – how many different possibilities would he then have? Draw them.
4. Can you find numbers with which he can make only one rectangle? How many such numbers can you find under 30?

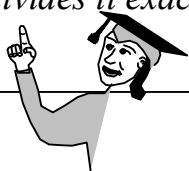
Think again of the situation when Daud has 24 tiles. In order to help him solve his problem, you need to find two numbers that give 24 when multiplied. For instance, Daud may place the tiles in two rows of twelve, because $2 \times 12 = 24$.

The numbers 2 and 12 are called *divisors* of 24, because they are natural numbers that divide 24.

5. Write down all the divisors of 24?
6. Write down all the divisors of 23 and 25.
7. How does the number of divisors relate to your answer to question (4)?

*The divisors of a number are **factors** of that number.*

A factor of a number is a number that divides it exactly.



Multiplication houses

To find divisors of natural numbers rewrite the number as a product of two numbers. For instance, $24 = 12 \times 2$.

$$= 8 \times 3$$

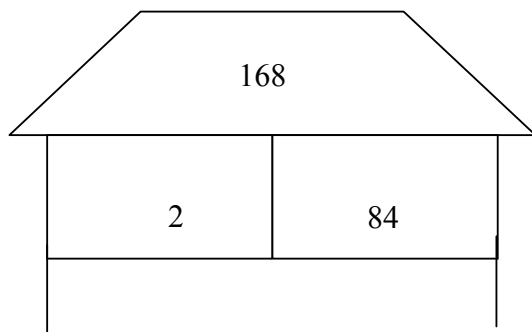
$$= 6 \times 4$$

$$= 24 \times 1$$

1, 2, 3, 4, 6, 8, 12, 24 are factors of 24

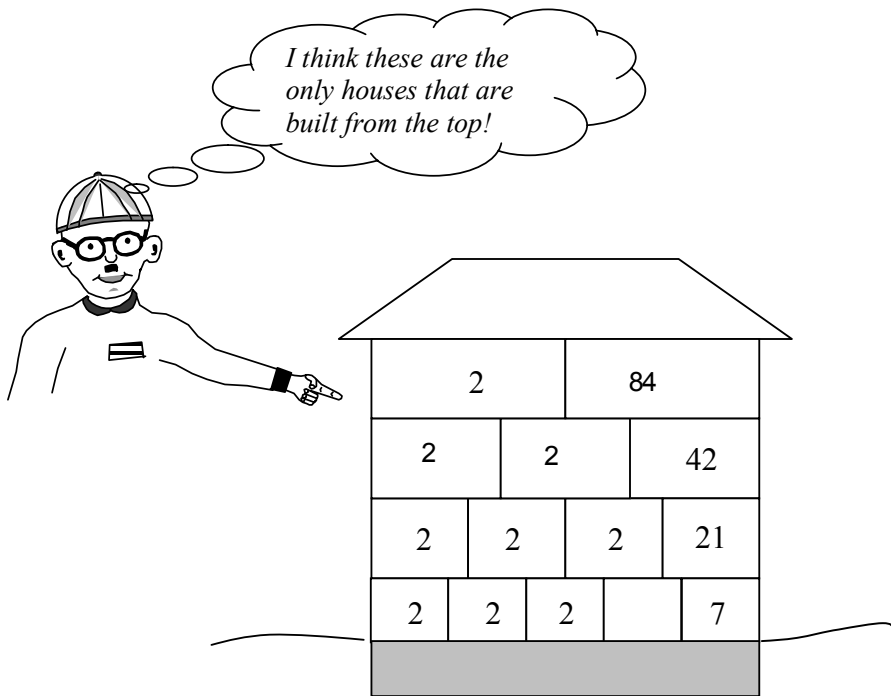
Find all the divisors of 48, 98, 34, and 115.

Numbers can be built by multiplying other numbers. For instance, 168 may be written as 84×2 .



This process may continue: We can ask if any of the numbers in the bottom floor may be split in two divisors. We can then make our way downwards through the storeys.

We shall call the resulting building a *multiplication house*. The multiplication house for the number 168 may look like this:



$$2 \times 2 \times 2 \times 3 \times 7 = 2^3 \times 3 \times 7 = 168$$

9. Build multiplication houses for each of the following numbers – make as many storeys as possible!

- | | | | | |
|-------|-------|--------|-------|--------|
| a) 28 | b) 92 | c) 63 | d) 15 | e) 68 |
| f) 95 | g) 29 | h) 143 | i) 81 | j) 120 |

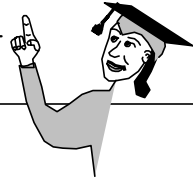
10. List and order the numbers that appear in the ‘ground floor’ (you only have to list each number once).

The numbers in the ‘ground floor’ of a multiplication house are called *prime numbers*. They are sometimes described as the building blocks of the natural numbers.

A number that has only two factors is called a *Prime number*.

A number with more than two factors is called *Composite number*.

1 is neither prime nor composite. It is an exception.

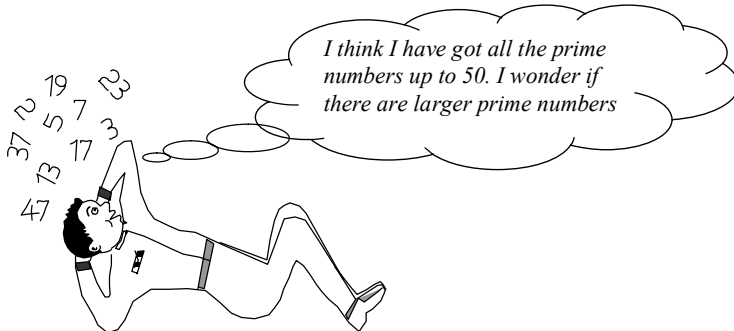


For example 7 is a prime number, its factors are 1 and 7.

Can you name a prime number greater than 7?

Less than 7?

11. Look carefully at your list of prime numbers. Find some characteristics of the list (for instance how many even numbers are there? How many numbers are there from the 3-times table? ... Can you explain your answers?).



All the numbers in the house are factors of the number on the top of the house and the number is a multiple of its factors. For instance, 168 is a multiple of 1, 2, 3, 7, 21, 42, 84, 168. Multiples of 2 are 2, 4, 6, 8,...

12. Write down the first 5 multiples of each of the following:

a) 3 b) 4 c) 5 d) 6 e) 9 f) 10 g) 11

Eratosthenes sieve

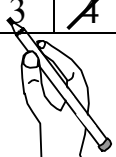
Eratosthenes was a Greek who lived about 2500 years ago. He developed a method for finding prime numbers. This is called *Eratosthenes' sieve*.

If you use the 100-chart, Eratosthenes' sieve is like this:

Activity 2

1. Circle 2 and skip count with 2. Cross out all other multiples of 2.

51	~~52~~	53	~~54~~	55	~~56~~	57	~~58~~	59	~~60~~
41	~~42~~	43	~~44~~	45	~~46~~	47	~~48~~	49	~~50~~
31	~~32~~	33	~~34~~	35	~~36~~	37	~~38~~	39	~~40~~
21	~~22~~	23	~~24~~	25	~~26~~	27	~~28~~	29	~~30~~
11	~~12~~	13	~~14~~	15	~~16~~	17	~~18~~	19	~~20~~
1	②	3	~~4~~	5	~~6~~	7	~~8~~	9	~~10~~



2. Move to the next number that has not been crossed out. That is 3. Circle it, skip count by 3 and cross out all other multiples of 3.
3. Use Eratosthenes' sieve on a 100-chart to find all prime numbers up to 50. Write down the list of numbers.
4. Why does Eratosthenes' sieve work? Why is this list of numbers the same as the lists that you made in N° 4 and N° 10 of Activity 1 above?

When you used Eratosthenes' sieve, you did not have to cross out all the numbers in the 3-times table.

5. Which numbers in the 3-times table did you not have to cross out? Why not? What about the 5-times table – did you cross out all the numbers?

Multiplication magic!

Asmeret was to do 95×105 . She reasoned like this:

*I know that 100×100 is 10000. That should be the same for 105×95 . But magic- It isn't!
That is pure magic! 95×105 should be the same as 100×100 – but it isn't!*

Activity 3

1. Do you understand Asmeret's conjecture? Do you understand? How she justifies the conjecture?
2. Find the answer to 95×195 . How far is Asmeret's conjecture from the answer?



That is pure magic! 95×105 should be the same as 100×100 – but it isn't!

3. What if Asmeret uses the same procedure for calculating 102 and 98? 101 and 99? How far is she from being right in these cases? Try with other pairs of numbers.

Saleh was to do 14×16 . He reasoned like this:

I know that $15 \times 15 = 225$. Then 14×16 should also be 225 – am I right?

4. Do you understand Saleh’s conjecture? Is he right? If he is wrong, how far is his result from being right? Does Saleh’s conjecture work for 13×17 ? Try other numbers.

Asmeret’s and Saleh’s conjectures did not work with numbers around 100 and around 15.

Asmeret and Saleh tried to find out more about their results. They helped each other make a table like this of results:

5. Copy the table in your note book. Fill in more numbers.

Task	Result	Conjecture	Difference
95×105	9975	10000	25
97×103	9991	10000	
98×102			

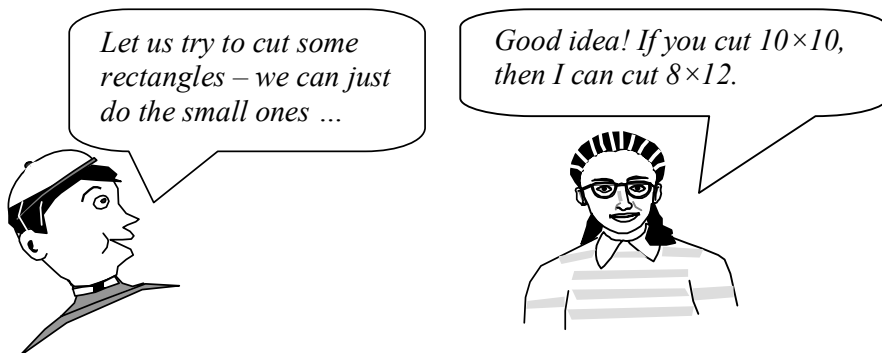
6. Try Asmeret’s and Saleh’s conjecture for multiplication with numbers around 50. Does the conjecture work? What if you use numbers around 30?

7. Make two more tables. Use numbers that you have calculated already. (You can decide with your partner to make tables for different numbers – then you have more tables to compare!)

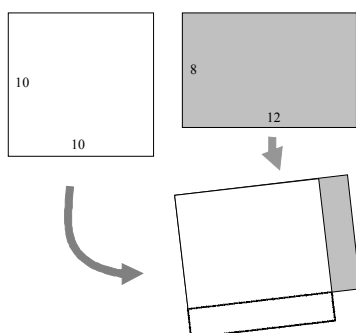
Look carefully at the tables you have made.

8. Can you find a pattern in the differences?

9. Can you use the pattern to conjecture the result to a task like 19×21 ?



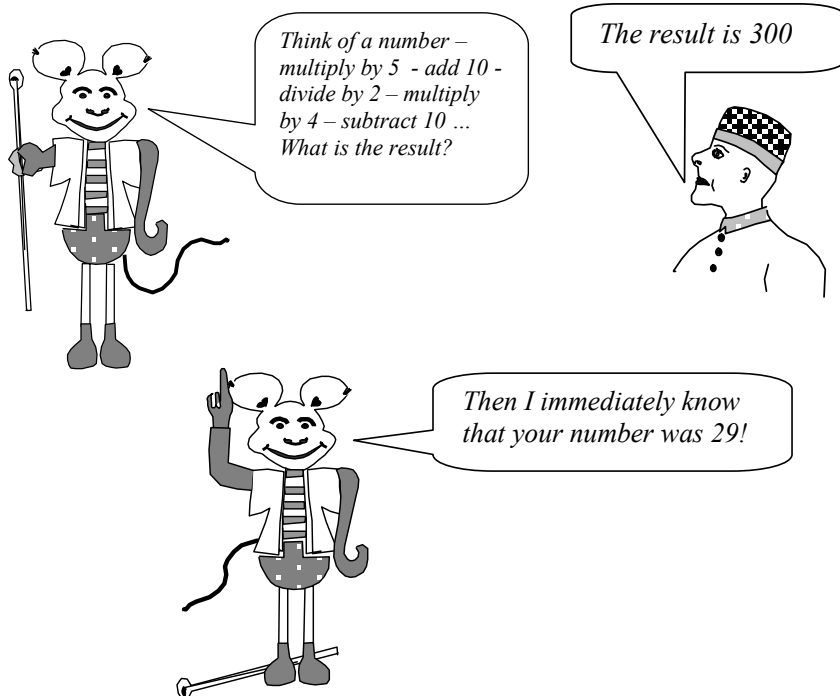
Asmaret and Saleh decided to use rectangles to learn more about their conjecture. To represent 8×12 and 10×10 , they cut the two rectangles.



10. Cut a square of $10\text{ cm} \times 10\text{ cm}$ square and a rectangle of $8\text{ cm} \times 12\text{ cm}$ (you may share the task with your partner and do one each!).
11. Place the two figures on top of each other as in the picture. Compare the sizes of the pieces that are not overlapping. Can you explain why 8×12 and 10×10 is not the same?
12. Draw two rectangles that are 9×11 and 10×10 on top of each other (or cut the two rectangles as before). Compare the pieces that are not overlapping. Can you explain why 9×11 and 10×10 is not the same?
13. Look at the tables you made when doing N° 6 and N° 7 above. Can you explain if and why your conjecture is true?

More magic!

This is a magician – or at least that is what he is trying to make people believe! For instance he claims to be able to read people's minds.



14. Is the magician right? Try it!
15. Choose a number (you should write it down!). Follow the magician's orders (multiply by 5, add 10, etc.). Write down the result.
16. Choose two numbers for your partner and let him or her choose two for you. Write down the numbers. For each number, follow the magician's orders. Write down the result.

Ibrahim organised his numbers in a table

17. Look at the pairs of numbers you have written and at Ibrahim's numbers. Is there a pattern?

Beginning number	Result
7	80
10	110
15	160
32	330
b	

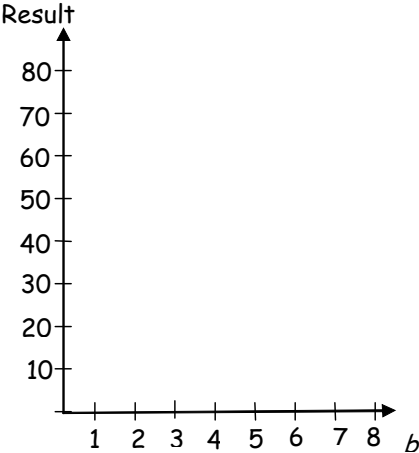
18. Explain in words what happens with the beginning number.

19. What if we name the beginning number b ? Can you write down a formula for the result?

20. Plot pairs of numbers in a coordinate system. Draw a graph through the points.

21. Can you explain why the graph looks like this?

22. Can you explain why the magician's method works?



Greatest Common Factor and Least Common Multiple

Greatest Common Factor:

Let find the factors of 12 and 18

Factors of 12 are 1, 2, 3, 4, 6, 12

Factors of 18 are 1, 2, 3, 6, 9, 18

1, 2, 3, and 6 are common factors of 12 and 18.

6 is called *the greatest common factor* (GCF) of 12 and 18 since it is the largest of the common factors of 12 and 18.

To find GCF we prime factorize the numbers.

$$12 = 2 \times 2 \times 3$$

$$18 = 2 \times 3 \times 3$$

GCF of 12 and 18 is $2 \times 3 = 6$

Least Common Multiple

Multiples of 12 are 12, 24, 36, 48, 60, 72, ...

Multiples of 18 are 18, 36, 54, 72, 90, 108, ...

36 is called *the least common multiple* (LCM) of 12 and 18 since it is the smallest of the common multiples.

To find the LCM let prime factorise the numbers.

$$12 = 2 \times 2 \times 3$$

$$18 = 2 \times 3 \times 3$$

LCM of 12 and 18 is $2 \times 2 \times 3 \times 3 = 36$

Activity 1

1. Find the GCF and LCM of 36 and 60

$$36 = 2 \times 2 \times 3 \times 3$$

$$60 = 2 \times 2 \times 3 \times 5$$

$$\text{GCF} = 2 \times 2 \times 3 = 12$$

$$\text{LCM} = 2 \times 2 \times 3 \times 3 \times 5 = 360$$

2. Find the GCF of the following?

a) 12, 16

b) 8, 18, 24

c) 30, 42, 50

d) 15, 45, 60

e) 50, 75, 125

f) 9, 15, 54

3. Find the LCM of the following?

a) 4, 6

b) 12, 18, 20

c) 15, 45, 60

d) 30, 40, 50

e) 16, 28, 40

f) 25, 50, 150

4. Find the GCF and LCM of the following?

a) 24, 64

b) 16, 30, 42

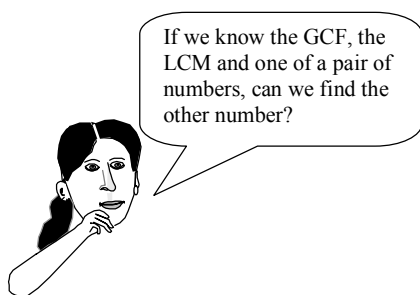
c) 10, 20, 25

d) 242, 330

e) 28, 42, 50

f) 15, 42, 60

GCF and LCM, How are they related?



Semhar and Idris set out to find the relation like this:

Semhar: *The GCF and LCM of two numbers are 2 and 252 respectively. One of the numbers is 18. Can we find the other number?*

Idris: *Let us call the unknown number x . We prime factorize them all.*

$$\text{GCF} = 2$$

$$\text{LCM} = 2 \times 2 \times 3 \times 3 \times 7$$

$$18 = 2 \times 3 \times 3$$

$$x = ?$$

Now I think 2 should be a factor of x . Don't you think so?

Semhar: *Yes, 2 should be a factor of x since 2 is a common factor. But there should be another 2 in x . Do you know why?*

Idris: *Yah, I Know why. Because there are two 2's in the LCM. If they are not in 18 then they should be in x .*

Semhar: *Now we know there are two factors of 2 in x , what else?*

Idris: *What about 3? Can 3 be a factor of x also?*

Semhar: *I don't think so Idris. There should be no 3 in x because if there is then it should be in the GCF of both numbers. Now we are left with 7. Should x contain 7?*

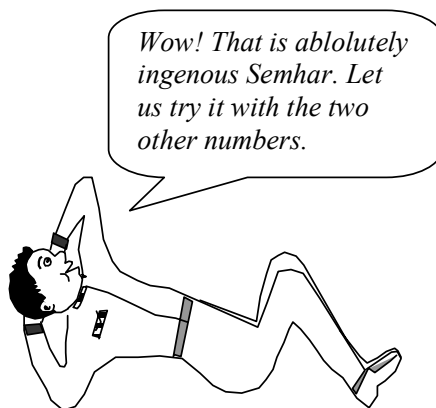
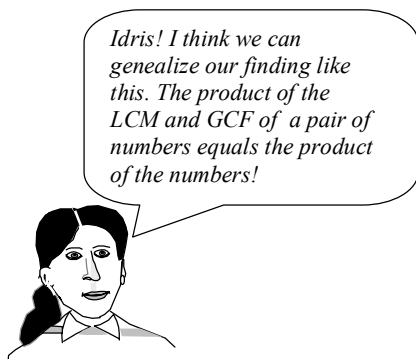
Idris: *Yah, there should be 7 because 7 is in the LCM but it is not in 18. Therefore it should be in x .*

Semhar: *Good Idris, I think now we know all the factors of x !*

Idris: *You are right Semhar. The factors of x are two 2's and one 7.*

Therefore x is equal to $2 \times 2 \times 7 = 28$

Did you understand Semhar's and Idris's reasoning?



In the above example,

GCF and LCM of 18 and 28 are 2 and 252 respectively.

$$\begin{aligned} 18 \times 28 &= 2 \times 252 \\ 504 &= 504 \end{aligned}$$

If the **GCF** and **LCM** of a and b are x and y respectively, then $ab = xy$

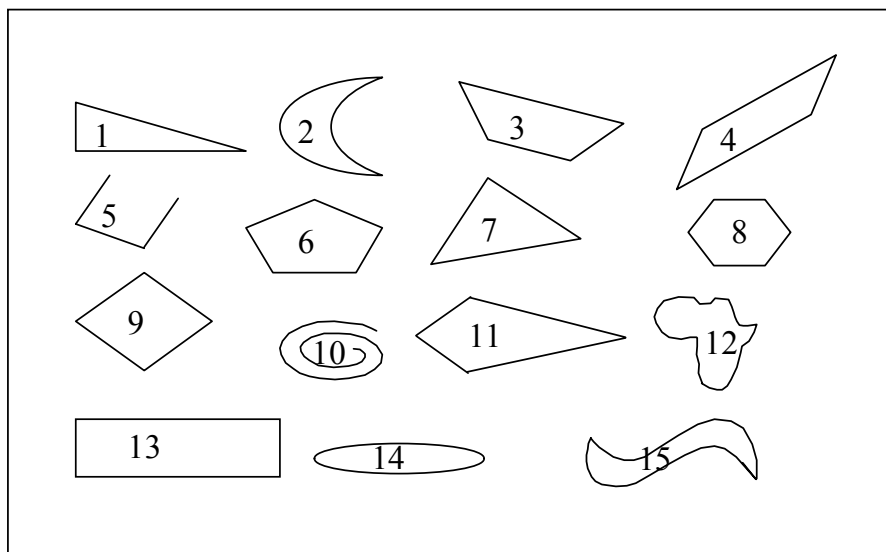


Activity 2

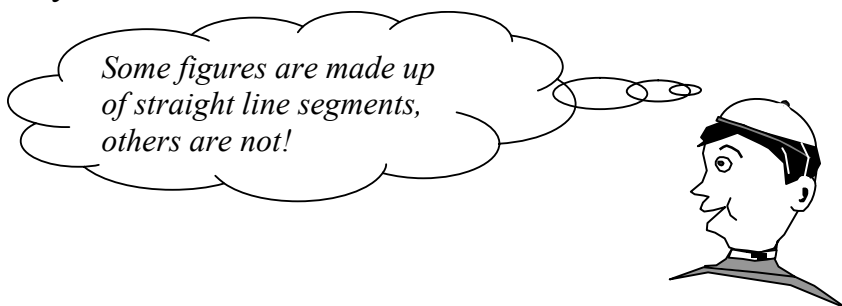
1. The GCF and LCM of x and 28 are 7 and 84 respectively:
 - a) Is 7 a factor of x ? Why or Why not?
 - b) Is 2 a factor of 28? Of 84?
 - c) Is 2 a factor of x ? Why or Why not?
 - d) Is 3 a factor of x ? Why or Why not?
 - e) What is the value of x ?
 - f) Check whether the product of the two numbers is equal to the product of the GCF and LCM.
2. The GCF and LCM of 30 and x are 3 and 630 respectively. Find the value of x ?
3. The GCF and LCM of 12, 18 and x are 6 and 180 respectively. Find the value of x ?

Chapter 7: Plane Figures-1

Sorting plane figures



Ibrahim discovered a method by which the above figures may be sorted.

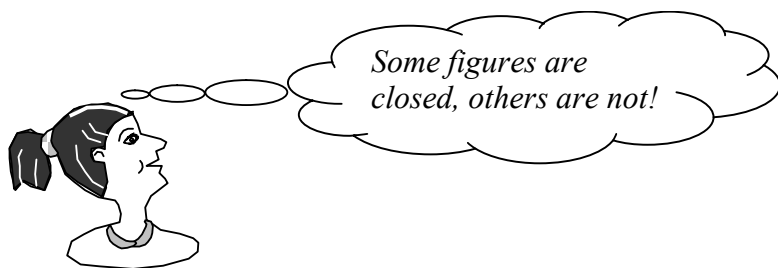


Do you understand Ibrahim's method?

Activity 1

1. Which of the above figures are made up of straight line segments only?
2. In your exercise book draw six figures that are made up of straight line segments only.
3. In your exercise book draw three figures that are made up of curved line segments only.

Zahra came up with another way of sorting the figures.



Do you understand Zahra's method?

Activity 2

1. Which of the above figures are closed?
2. In your exercise book draw four figures that are closed and four figures that are not closed.

Now can you combine Ibrahim's method and Zahra's method to find a third method of sorting the same figures?

Which figures are closed and also made up of straight line segments?

From now on we will call figures that are closed and also made up of straight line segments '**polygons**'.



Names of some common polygons are:

- 3 sides – triangle
- 4 sides – quadrilateral
- 5 sides – pentagon
- 6 sides – hexagon, etc
- n sides – n-gon

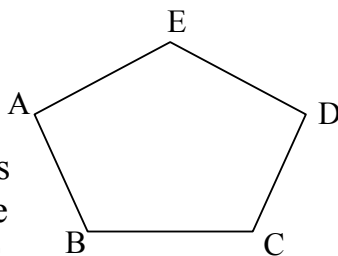
Do other polygons (7 sides, 8 sides etc) also have names like the ones above? Your task is to find out as many names as you can and tell it to the class.

Activity 3

1. Is a rectangle a polygon? Why? Or why not?
2. Is a square a polygon? Why? Or why not?
3. Is a circle a polygon? Why? Or why not?

Vertices and sides

The figure at the right is a polygon. It is also a pentagon. The five corners of the pentagon: A, B, C, D and E are called '**vertices**'. The singular form is '**vertex**'. We use capital letters to name vertices.



The line segments that make up the pentagon: AB, BC, CD, DE and EA are the ‘*sides*’ of the pentagon. A pentagon has 5 sides. In fact pentagon means ‘five-sides’.

A polygon is named by naming its vertices in order (either clockwise or anti-clockwise) starting from any vertex. The above pentagon may be called ABCDE or AEDCB if we start with A. Now you name the pentagon starting from B, from C, from D and from E.

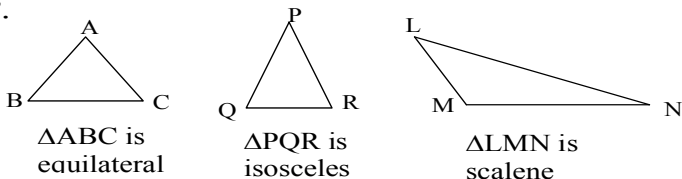
Activity 4

1. Draw a square and label its vertices. Name the square in as many ways as possible.
2. Draw a polygon with the following number of sides
a) 4 b) 6 c) 8

Classifying triangles

A triangle has three sides. In some triangles the three sides are of equal length. In others only the two sides are equal and there are triangles whose sides are all of different lengths. Mathematicians have given names to these three types of triangles.

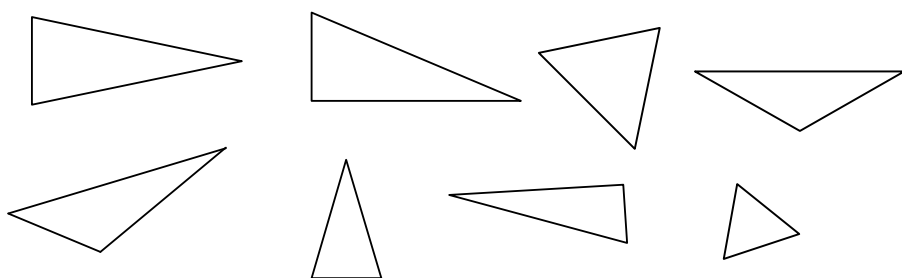
- A triangle with three sides equal is called *equilateral*.
- A triangle with two sides equal is called *isosceles*.
- A triangle with three sides of different length is called *scalene*.



Note: the symbol Δ is used for 'triangle'

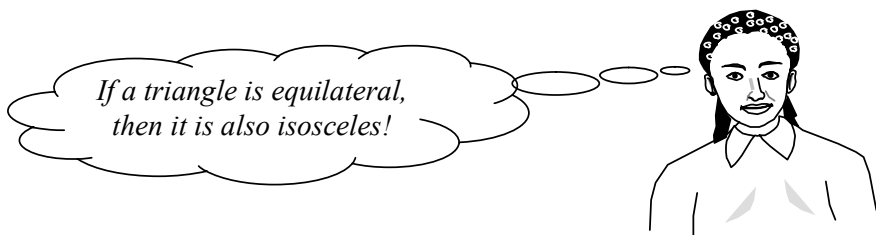
Activity 5

1. Determine which triangle is equilateral, isosceles, or scalene



2. Aiba made the following statement:

If a triangle is equilateral, then it is also isosceles!



Do you agree with Aiba? Explain why or why not.

Points and lines

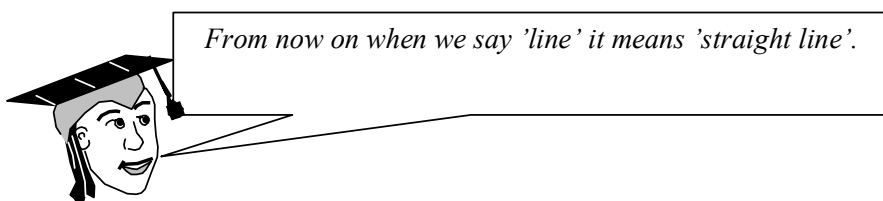
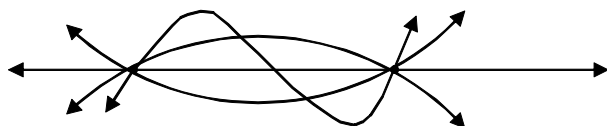
Fatna and her friends wished to find out:

'How many lines could be drawn using a given number of points?'

They started with 1 point. What do you think they found out?

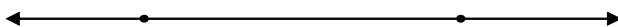
"Through 1 point _____ lines can be drawn".

Then they worked with 2 points. But this time they could not agree among themselves. With your partner, discuss with the help of drawings the possible answers Fatna and her friends could have arrived at.



Your discussion about 2 points should lead you to the following conclusion.

Through 2 points only one straight line can be drawn.



Activity 6

1. Abdu, one of the students working with Fatna, said *“given 3 points, I can always draw one line that contains three of them”*.

Do you agree with Abdu? If not Explain why not using drawing. Inorder for Abdu’s statement to be true what condition should you put on the points?



Points that lie on a straight line are called **collinear** points.

2. With the help of drawing, investigate the following question:

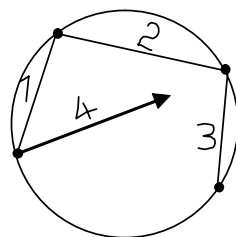
How many line segments join 4 points on a circle?

3. With the help of drawing, investigate the following question:

How many line segments join 5 points on a circle?

4. How many line segments join 6 points on a circle?
Can you tell without drawing?

5. Have you found a pattern? Try your pattern for 7 points; for 8 points.

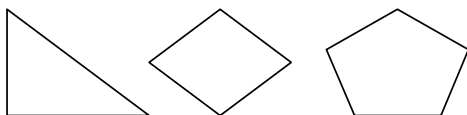


6. What is your pattern? Do you think it is true for any number of points?

*In a polygon, a line segment (that is not the side of the polygon) joining two vertices of the polygon is called a **diagonal**.*



7. How many diagonals has triangle? A quadrilateral?
A pentagon?



8. Complete the following table about the number of sides and the number of diagonals that can be drawn.

No. of sides	3	4	5	6	7
No. of diagonals	0	2			

9. Investigate the number of diagonals in a polygon of n sides.

Chapter 8: Fraction and Decimals

Fractions:

In previous lessons we have learned how to divide one whole number by another whole number. For example, when 24 is divided by 3, the result is 8. We write $24 \div 3 = 8$.

If $a \div b = c$ or $\frac{a}{b} = c$ then,

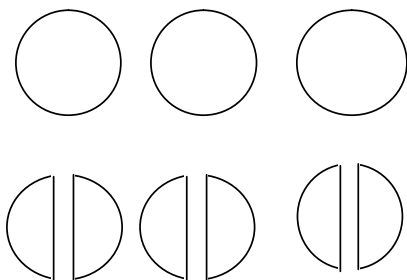
a is called *dividend*

b is called *divisor*

c is called *quotient*

In this section we will learn how to divide one number by another number.

Hatif has three apples. She cut each apple in to half.
How many pieces of apples did she have?



There are 2 halve in one whole.
There are 6 halves in 3 wholes



$3 \div \frac{1}{2} = 3 \times 2 = 6$ there are 6 pieces of oranges

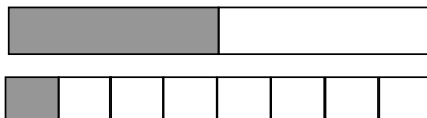
example 1: Divide 2 by $\frac{1}{3}$

Solution: 2 by $\frac{1}{3} = 2 \div \frac{1}{3} = 2 \times 3 = 6$

Example 2: Divide $\frac{1}{2}$ by 4

Solution:

$$\frac{1}{2} \div 4 = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$



*Dividing by 4 is the same
as multiplying by $\frac{1}{4}$*

***Dividing a by b is the same as multiplying
 a by the reciprocal of b ($\frac{1}{b}$)!***



Activity

1. a) $1 \div \frac{1}{4} = 1 \times \underline{\hspace{2cm}}$
 $\hspace{10em} = 4$

c) $4 \div \frac{1}{5} = \underline{\hspace{2cm}}$
 $\hspace{10em} = \underline{\hspace{2cm}}$

b) $2 \div \frac{1}{5} = 2 \times \underline{\hspace{2cm}}$
 $\hspace{10em} = \underline{\hspace{2cm}}$

d) $6 \div \frac{1}{6} = \underline{\hspace{2cm}}$
 $\hspace{10em} = \underline{\hspace{2cm}}$

2. a) $\frac{1}{3} \div 2 = \frac{1}{3} \times \underline{\hspace{2cm}}$
 $\hspace{10em} = \underline{\hspace{2cm}}$

b) $\frac{4}{5} \div 8 = \frac{4}{5} \times \underline{\hspace{2cm}}$
 $\hspace{10em} = \underline{\hspace{2cm}}$

$$\text{c) } \frac{1}{2} \div 3 = \frac{\quad}{\quad} \times \frac{\quad}{\quad}$$

$$\text{d) } \frac{2}{7} \div 2 = \frac{\quad}{\quad} \times \frac{\quad}{\quad}$$

$$\text{3.a) } \frac{2}{3} \div \frac{1}{3} = \frac{2}{3} \times \frac{\quad}{\quad}$$

$$\text{b) } \frac{1}{4} \div \frac{1}{2} = \frac{\quad}{\quad} \times \frac{\quad}{\quad}$$

$$\text{c) } \frac{2}{5} \div \frac{1}{10} = \frac{\quad}{\quad} \times \frac{\quad}{\quad}$$

$$\text{d) } \frac{3}{4} \div \frac{1}{8} = \frac{\quad}{\quad} \times \frac{\quad}{\quad}$$

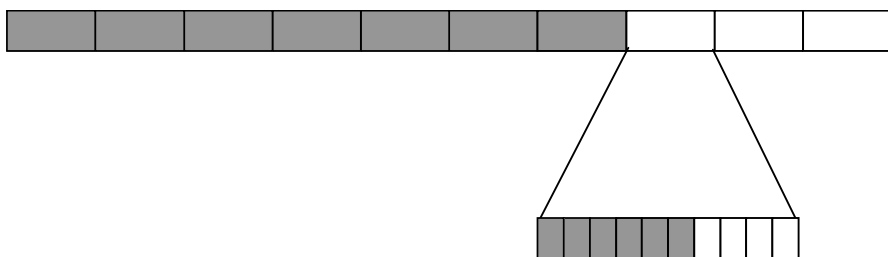
Decimals

Alem jumped a distance of 0.76m in standing broad jump.

*It is not a full meter.
How much did I
jump?*



*Divide 1m to 10 equal
parts. Each part is 0.1m
7 parts make up 0.7m
and 0.76 m is 0.06m
more than 0.7m*



$$0.76 = 0.7 + 0.06$$

1 unit = 10 tenths of a unit

1 tenth of a unit = 10 hundredths of a unit

1 hundredths of a unit = 10 thousandths of a unit

243.67 = 2 hundreds
 4 tens
 3 ones
 6 tenths
 7 hundredths

The numeral 6 stands for '6 tenths' and is equal to $\frac{6}{10}$.

The numeral 7 stands for '7 hundredths' and is equal to $\frac{7}{100}$.

Changing decimal to fraction:

$$\text{a) } 0.25 = 0.2 + 0.05$$

$$= \frac{2}{10} + \frac{5}{100}$$

$$= \frac{20}{100} + \frac{5}{100}$$

$$= \frac{25}{100}$$

$$\text{b) } 0.371 = 0.3 + 0.07 + 0.001$$

$$= \frac{3}{10} + \frac{7}{100} + \frac{1}{1000}$$

$$= \frac{300+70+1}{1000}$$

$$= \frac{371}{1000}$$

Activity 1

1. Write the decimal numeral of each of the following.

- a) 3 tenth and 5 hundredths
- b) 2 ones 7 tenths
- c) 2 ones and 6 hundredths
- d) 3 ones and 4 thousandths

2. Find the value of:

- a) $2.465 + 0.3$
- b) $3.842 - 0.6$
- c) $1.246 + 0.03$
- d) $2.043 - 0.002$
- e) $3.1 + 0.006$
- f) $2.408 - 0.008$

3. Complete the following.

- a) The number 0.001 more than 2.347 is _____
- b) The number 0.01 less than 3.256 is _____
- c) The number 0.5 more than 4.186 is _____
- d) The number 0.02 less than 0.056 is _____

4. Do the following tasks.

- a) Add 4 tenths to 5.256
- b) Add 3 thousandths to 2.431
- c) Subtract 2 hundredths from 3.453
- d) Subtract 4 thousandths from 6.126

5. Complete the following

Numeral	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
24.65			2	4	6	5	
356.024							
1784.25							
6012.074							

1. Write the value as a decimal.

$$\text{a) } 1 + \frac{6}{10} + \frac{3}{100} = 1 + 0.6 + 0.03 = 1.63$$

$$\text{b) } \frac{4}{100} + \frac{2}{1000} = 0.04 + 0.002 = 0.042$$

2. Express 0.025 as a fraction in its simplest form.

$$\begin{aligned} 0.025 &= \frac{25}{1000} \\ &= \frac{1}{40} \end{aligned}$$

3. Express $\frac{2}{5}$ as a decimal.

$$\begin{aligned} \text{Method 1. } \frac{2}{5} &= 2 \div 5 \\ &= 0.4 \end{aligned}$$

$$\begin{aligned} \text{Method 2. } \frac{2}{5} &= \frac{4}{10} \\ &= 0.4 \end{aligned}$$

4. Express $2\frac{3}{5}$ as a decimal.

$$\begin{aligned} \text{Solution: } 2\frac{3}{5} &= 2 + \frac{3}{5} \\ &= 2 + 0.6 \\ &= 2.6 \end{aligned}$$

Activity 2

1. Express each decimal as a fraction in its simplest form:

- | | | | |
|---------|---------|----------|----------|
| a) 0.25 | b) 0.06 | c) 0.345 | d) 0.408 |
| e) 1.15 | f) 2.6 | g) 4.506 | h) 4.025 |

2. Express each fraction as a decimal:

- | | | | |
|-------------------|----------------------|-------------------|------------------|
| a) $\frac{9}{10}$ | b) $\frac{39}{1000}$ | c) $\frac{1}{2}$ | d) $\frac{5}{8}$ |
| e) $\frac{3}{4}$ | f) $\frac{19}{5}$ | g) $\frac{27}{4}$ | h) 5 |

3. Find the value of each of the following:

- a) $0.3 + 0.05 + 0.007$
- b) $0.7 + 0.06 + 0.003$
- c) $3 + 0.2 + 0.004$
- d) $10 + 0.5 + 0.07 + 0.002$
- e) $70 + 2 + 0.03 + 0.009$
- f) $700 + 20 + 5 + 0.4 + 0.03 + 0.006$

4. Write each of the following as a decimal:

- a) $\frac{2}{10} + \frac{3}{100} + \frac{5}{1000}$
- b) $2 + \frac{7}{100} + \frac{5}{1000}$
- c) $35 + \frac{2}{10} + \frac{4}{100} + \frac{3}{1000}$
- d) $5 + \frac{5}{100} + \frac{6}{1000}$

5. Arrange the numbers in increasing order:

a) 0.23, 0.203, 0.023

b) 5.8, 0.583, 0.83

c) 4.25, 4.205, 4.025

d) 10, 9.932, 9.093

6. Arrange the number in decreasing order:

a) 0.035, 3.5, 0.35

b) 2.25, 0.225, 22.5

c) 7.102, 71.02, 710.2

d) 3.129, 4.528, 25.28

Chapter 9: Ratio and Proportion

Expressing Ratio and Fraction

Example 1:

Two sisters Rahel and Edna bought a pizza costing 60 Nakfa. They share the cost. The elder sister Rahel paid 40 Nakfa and Edna paid 20 Nakfa.

- a) Rahel paid twice (2 times) as much as Edna paid.
- b) Edna paid _____ as much as Rahel.

Therefore

$$\frac{40}{20} = 2 \text{ and } \frac{20}{40} = \frac{1}{2}$$

In mathematics we have a name for these numbers and we say:

The ratio of Rahel's share to Edna's is 2, and

The ratio of Edna's share to Rahel's share is $\frac{1}{2}$

The ratio of a to b also written as a: b is the same as $\frac{a}{b}$



Example 2:

A school has 600 boys and 300 girls what is:

- a) the ratio of boys to girls.
- b) the ratio of girls to boys.

Solution:

Number of boys = 600

Number of girls = 300

Ratio of boys : girls = 600 : 300

$$= 6 : 3$$

$$= 2 : 1$$

Ratio of girls : boys = 300 : 600

$$= 3 : 6$$

$$= 1 : 2$$

Activity

1. In a basket there are 3 bananas, 5 oranges and 4 apples.
 - a) The ratio of the number of bananas to the number of apples is ____ : ____
 - b) The ratio of the number of apples to the number of oranges is ____ : ____
 - c) The ratio of the number of oranges to the number of bananas is ____ : ____
 - d) The ratio of the number of oranges to the number of apples and to the number of bananas is ____ : ____ : ____
2. There are 25 red pencils and 35 blue pencils
 - a) The ratio of the number of red pencils to the number of blue pencils is ____ : ____
 - b) Find the ratio of the number of red pencils to the total number of Pencils?



The total number of pencils is $25 + 35 = 60$

3. In a class there are 30 girls and 50 boys.

Complete the following:

- a) The ratio of the number of boys to the number of girls is _____
- b) The ratio of the number of girls to the number of boys is _____
- c) The ratio of the number of boys to total number of students is _____
- d) The ratio of the number of girls to total number of students is _____
- e) The number of boys is _____ of the total number of students.
- f) The number of girls is _____ of the number of boys.
- g) The number of boys is _____ of the number of girls.

4. Fatna's age is $\frac{4}{5}$ of Abdu's age. If Abdu is 20 years old, then find Fatna's age?

5. A sum of money was shared among Halima, Sirak and Awet in the ratio 2:3:5. Awet's share was 100 Nakfa.

- a) Find Sirak's share?
- b) Find Halima's share?
- c) What sum of money did they have all together?

6. Eritrea has about 2600 villages out of which 1680 villages have electricity supply.

- a) Find the ratio of those with electricity to those without electricity.

- b) Express the villages without electricity as a fraction of the total number of villages?
7. The ratio of the number of Ali's marbles to Ibrahim's marbles is 3:2, and the ratio of the number of Ibrahim's marble to Mensur's marble is 4:5.
- a) Find the ratio of the number of Ali's marble to the number of Mensur's marble?
- b) Express the number of Ibrahim's marble as a fraction of the number of all marbles.
- c) If the sum of all the marbles are 150, calculate the share of each person?
8. The ratio of gold and copper in a ring is 24:1. If the ring weighs 5.5 grams, how much copper is there in the ring?

Proportions

Mr. Mohammed is a house builder. He uses a mixture of sand and cement for his construction. In this mixture, the ratio of cement to sand is 4 : 5. Mr. Mohammed made a table like this:

Number of pails of cement	4	8	16	20
Number of pails of sand	5	10	20	25

$$\frac{4}{5} = \frac{8}{10} = \frac{16}{20} = \frac{20}{25}$$

When the ratios are found to be equivalent a **Proportion** is formed.

$$\frac{4}{5}, \frac{8}{10}, \frac{16}{20}, \frac{20}{25} \text{ are proportional !}$$



How many pails of cement are needed for 30 pails of sand?
Let x be the number of pails of cement. Then;

$$\frac{4}{5} = \frac{x}{30} \rightarrow 5x = 4 \times 30$$

$$5x = 120$$

$$x = \frac{120}{5}$$

$$x = 24 \text{ pails of cement are needed}$$

Activity

1. Complete the following table proportions to make bread

Kg. of powder	1	2		16		60	100	
liters of water	2	4	16		48			750

2. Adiam mixed 2 grams of powder to 3 liters of water to make a soft drink for a ceremony.

- Find the amount of powder that mixes to 12 liters of water?
- To make the same drink how many liters of water are needed to be mixed with 10 grams of powder?

3. A painter mixed green paint and yellow paint in the ratio 3:2 for painting job.

- a) If he used 12 liters of green paint, how many yellow paint did he use?
 - b) If he made 20 liters of paint how many liters of green and yellow paint did he use?
4. The ratio of the number of English books to Mathematics books in the Library is 4:7. There is 2200 English and Mathematics books altogether. How many English and how many Mathematics books are there?
5. A sum of money was shared between Lula and Awet in the ratio 2:5. Awet received 36 Nakfa more than Lula. How much money did Lula receive?

Chapter 10: Rate and Speed

Rate:

A machine fills 60 bottles of oil in 5 minutes.

How many bottles of oil can it fill in one minute?

*The machine fills the same
number of bottles every minute.
In 5 minutes it fills 60 bottles
In 1 minute it fill _____ bottles*



$$60 \div 5 = 12$$

The machine fills 12 bottles per minute.

It means the rate is 12 bottles per minute.

2. Water is flowing from a tap at the rate of 100 liters every 4 minutes. Find the rate of flow of water in liters per minute.

100 l in 4 min
____ l in 1 min?



$$100 \div 4 = 25$$

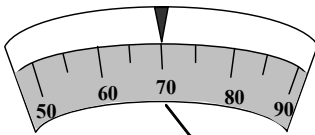
The rate of flow of water is 25 liters per minute.

Activity

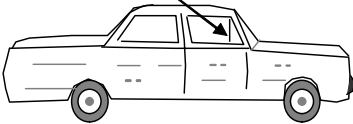
1. Abdu is paid 20 Nakfa for working 4 hours. How much is paid per hour?
2. A lamp can flash 10 times per minute. How many flashes can it make in 10 minutes?
3. Water is flowing from a top at the rate of 25 liters per minute.
 - a) How much water can be collected from the top in 5 minutes?
 - b) How long will it take to fill a container of capacity 100 liters?
4. A machine can print 50 pages per minute. How long will it take to print 2500 pages?
5. A pool is filled with water at a rate of 100 liters in 5 minutes. How long will it take to fill the pool with 1200 liters of water?
6. A car travels 100 km on 8 liters of petrol.
 - a) How far can the car travel on 15 liters of petrol?
 - b) How much petrol will be used if the car travels a distance of 1500 km?

Speed

1. Mr. Awet is driving along a straight road. The speedometer of his car shows that he is traveling at a speed of 70km per hour.



We write 70 km per hour as 70 km/hr. That is the car travels 70 km in 1hr. At this speed how far can the car travel in 3hrs?



In 1hr the car travels 70km

In 3hrs, it travels $70\text{km} \times 3 = 210\text{kms}$

2. A bus traveled 200km in 4 hours. Find the speed.

speed is the average distance traveled per hour



$200\text{km} \div 4\text{hrs} = 50\text{km/hr}$.

Speed = distance $\div$ time



3. A train travels 3 hours at an average speed of 60km/hr.
What was the distance traveled?

$$\frac{60 \text{ km}}{1 \text{ hr}} = \frac{x}{3 \text{ hrs}}$$

$$x = 60 \times 3 = 180 \text{ km.}$$

3. Mr. Ali walked 800m from his house to school. His speed for the journey was 80m/min. How long did he take to walk from his house to school?

$$\frac{80 \text{ m}}{1 \text{ min}} = \frac{800 \text{ m}}{x \text{ min}}$$

$$x = \frac{800}{80} = 10 \text{ min.}$$

Activity

1. Fatna runs a distance of 150m in 30 seconds. Calculate the speed in m/s?
2. A boat travels a distance of 80km in 4 hours. Calculate its speed in km/hr?
3. Rahma took 3 hours to drive from Asmara to Keren which is 90kms. Calculate the speed of her drive.
4. The information below gives the distances between some towns along the Asmara - Massawa road.

Asmara-Nefasit =25 km; Nefasit -Ghindae = 21 km; Ghindae-Massawa = 59 km

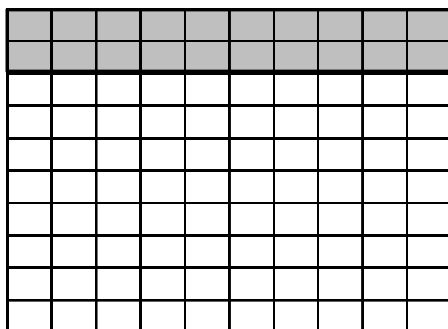
A bus left Asmara at 6:30 A.M and arrived at Massawa 9:30 A.M. Find the speed of the whole Journey?

5. Haile took 6 hours to travel from Asmara to Tesseney?
He drove at a Speed of 60 km/hr. Find the distance
from Asmara to Tesseney?
6. Nejat took 2 hours to cycle from Asmara University to
Mai-Nefhi College of Technology. Her speed of cycling
was 12km/hr. Find the distance between UoA and Mai-
Nefhi College of Technology?
7. A ship travelled from Assab to Massawa at a speed of
30km/hr for 20 hours.
 - a) Find the distance from Assab to Massawa?
 - b) If the speed of the ship increased from 30km/hr to
40km/hr. Find the time it requires to complete the
Journey?

Percentage

Hamado draw a square 10cm by 10cm.

He divided into 100 small
equal squares (look at the
squares) 20 of these 100
squares have been shaded.
We say, 20 per-cent out of
the total number of squares
are shaded, and the rest 80
per-cent of the large square is
unshaded. We write 20% is shaded



1. The tables below shows the enrolment of Arts school in Asmara

Number of boys	180
Number of girls	120
Number of students	300

What percentage of the students are boys?

(Hint: Write 180 out of 300 as $\frac{180}{300}$ and then express it as a percentage.)

$$\frac{180}{300} = \frac{60}{100} = 60\% \quad \frac{180}{300} = \frac{3}{5} = ; \text{ Now } \frac{3}{5} = \frac{x}{100} \\ \Rightarrow x = \frac{60}{100} = 60\%$$

2. Express each of the following as percentage.

200 out of 500 is equivalent to $200/500 = 40/100 = 40\%$

Activity:

1. Express each of the following in percentage.
 - a) 4 out of 50
 - b) 3 out of 25
 - c) 7 out of 20
 - d) 18 out of 200
 - e) 90 out of 600
 - f) 12 out of 72

2. Express each fraction in percentage

a) $\frac{8}{20}$

b) $\frac{30}{75}$

c) $\frac{60}{150}$

d) $\frac{18}{60}$

e) $\frac{3}{4}$

f) $\frac{5}{8}$

g) $\frac{7}{10}$

h) $\frac{1}{2}$

3. Express each decimal as a percentage.

a) 0.9

b) 0.03

c) 0.15

d) 0.006

e) 0.225

4. Express each percentage as decimal

a) 3%

b) 7%

c) 42%

d) 68

e) 24%

Discount, Profit and Loss

Example 1

Ali had 250 Nakfa. He spent 20% of the money on exercise books. How much money is he left with?

$$20\% \text{ of } 250 = 250 \times \frac{20}{100} = 50$$

Therefore he spent 50 Nakfa and he is left with $250 - 50 = 200$ Nakfa

Example 2

Abrhet bought 10 killograms of orange for 60 Nakfa. She sold all the oranges and made a profit of 30%. Find the selling price per kilo?

Selling price = 60 Nakfa + 30% of 60 Nakfa

$$= 60 + \left(60 \times \frac{30}{100}\right)$$

$$= 60 + 18$$

$$= 78 \text{ Nakfa}$$

The selling price of one kilo is:

10 kilo sold at 78 Nakfa

1 kilo sold at $\frac{78}{10} = 7.8$ Nakfa. This means 7 Nakfa and 80 cents.

Example 3

A shop gives a 30% discount during a sale for holydays. Abrhet bought a cloth which cost 60 Nakfa. How much did she pay?

Paid = 60 Nakfa – 30% of 60 Nakfa

$$= 60 - \left(60 \times \frac{30}{100}\right)$$

$$= 60 - 18$$

$$= 42 \text{ Nakfa}$$

Example 4

Haile bought a shirt for 150 Nakfa. He sold the shirt for 120 Nakfa. What is the loss percent.

Loss/Profit = Selling Price – Cost Price

$$= 120 - 150$$

$$= -30 \text{ Nakfa}$$

Note: the minus sign indicates loss of 30 Nakfa.

$$\text{Loss percent} = \frac{\text{Loss}}{\text{Cost}} \times 100 = \frac{30}{150} \times 100\% = 20\%$$

Activity

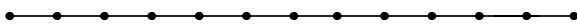
1. The number of students in a school last year was 1400. If the number increased by 10%, how many students are there in the school?
2. The population of Eritrea in 2003 was 4,000,000. The population increases by 5% each year. What will be the population in 2004?
3. Aron bought a car for 70,000 Nakfa. He sold it at a profit of 20%. Find the selling price of the car?
4. A shopkeeper makes a discount of 15% for a television for a holyday. If the cost of the television is 5000 Nakfa find its selling price?
5. Ali has 120 Nakfa. Fatna has 12% more than Ali. How much money does Fatna have?
6. Dawit sold his car for 80,000 Nakfa and makes a profit of 15%. Find the cost price of the car?
7. A school had 80 teachers last year. This year the number of teachers increased to 96. Find the percentage increase?
8. A pieces of cloth that costs 72 Nakfa was sold for 60 Nakfa due to discount. Find the percentage discount?

9. Zebiba bought vegetable for 500 Nakfa and she sold them for 400Nakfa.
- a) What is her loss on doing the business?
 - b) What is the loss percent?
10. A shop keeper sold a television set for 5000 Nakfa that costs 6000 Nakfa.
- a) Did the shopkeeper lose or gain in this sale?
 - b) What is his loss or gain percent?
11. Jemila bought a car for 12000 Nakfa and sold it at a loss of 20%. Calculate the selling price of the car.

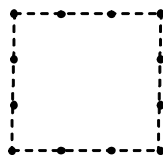
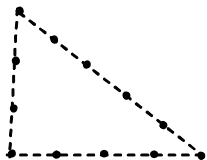
Chapter 11: Plane Figures-2

Perimeter and area: How are they related?

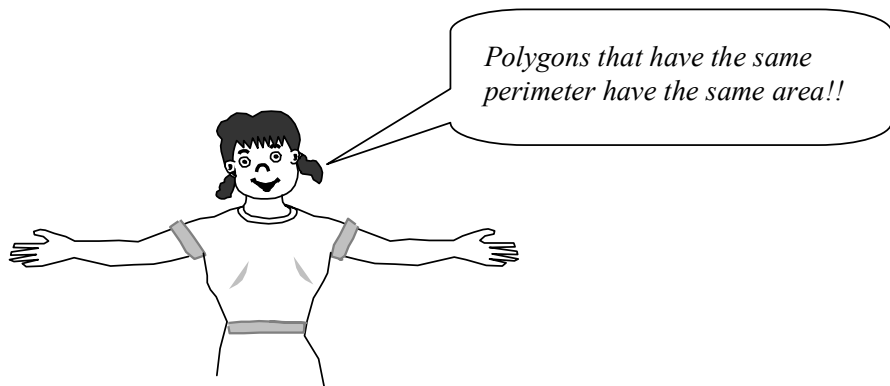
Rahwa had a string that is 12 units long.



She could make different shapes with her string. She could make polygons and non-polygons. For instance she could make rectangles and triangles as well as many different shapes. Some of the shapes she could make are shown below.



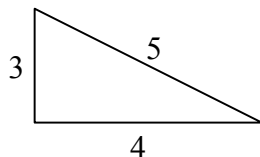
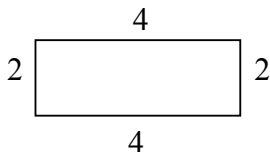
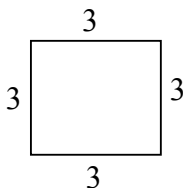
Since Rahwa used the same piece of string to make the three shapes, she thought the areas of the figures she made were equal. This is how Rahwa put her conclusion.



Do you agree with Rahwa?

Activity 1

Let's compare the three shapes she made.



1. What is the perimeter of the square? What is its area?
Explain how you got your answers.
2. What is the perimeter of the rectangle? What is its area?
Explain how you got your answers.
3. What is the perimeter of the triangle? What is its area?
Explain how you got your answers.
4. Which has the largest area?

Rahwa was very much surprised by the result. Were you also surprised?

I got it all wrong. I can't believe it. I always thought same perimeter gives same area!



Rahwa was angry with herself. But she is now determined to answer an even more difficult problem.



OK. I was wrong the first time. Now I will find out which shape gives the maximum area for my string.

Help Rahwa solve the problem.

Activity 2

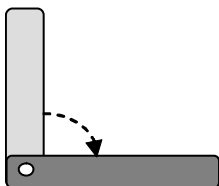
Here below is a table showing how the area of a rectangle with perimeter 12 units varies for different values of length and width.

	Length	Width	Perimeter	Area
1.	5	1	$2(1+5)=12$	$1 \times 5 = 5$
2.	4.5	1.5	$2(1.5+4.5)=12$	$1.5 \times 4.5 = 6.75$
3.	4	2	$2(2+4)=12$	
4.	3.5	2.5		
5.	3	3		

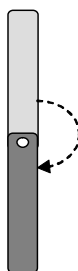
1. Complete the above table.
2. When is the area largest?

Angles

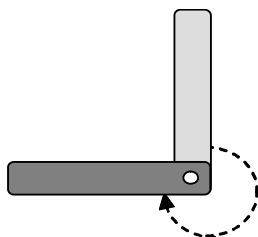
Right Angles



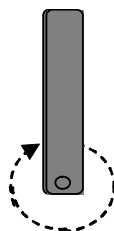
Turning 1 right angle
(a $\frac{1}{4}$ - turn)



Turning through 2 right
angles (a $\frac{1}{2}$ - turn)



Turning through 3 right
angles (a $\frac{3}{4}$ - turn)



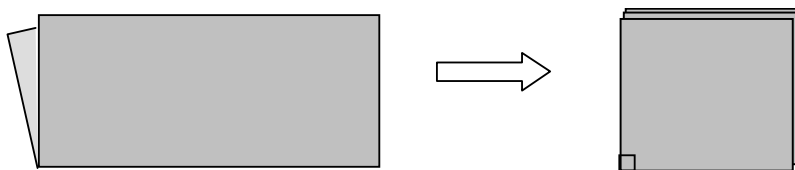
Turning through 4
right angles
(a complete turn)

$\frac{1}{4}$ of a complete turn is 1 right angle
 $\frac{1}{2}$ of a complete turn is 2 right angles
 $\frac{3}{4}$ of a complete turn is 3 right angles
A complete turn is 4 right angles



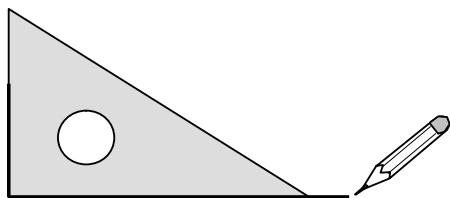
A *right angle* is a very common geometric figure. You see it everywhere around you. The corner of your exercise book is a right angle. So is the corner of the door of your class room. Can you name other objects that have right angles?

Aida folded a piece of paper twice to make a right angle.



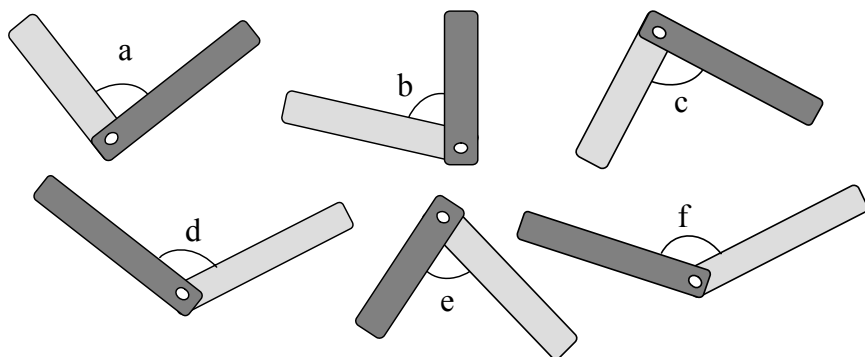
We mark a right angle like this: 

Kemal used a set square to draw a right angle.



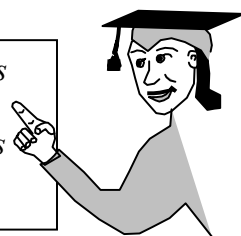
Do you understand both Aida's and Kemal's method?

1. Use a piece of paper and and make a right angle the way Aida did.
2. Use a set square and draw a right angle as Kemal did.
3. a) Which of the following angles are right angles?
b) Which of the following angles are smaller than a right angle?
c) Which of the following angles are greater than a right angle?



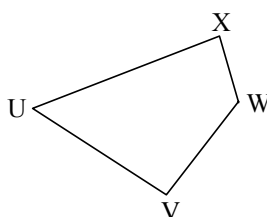
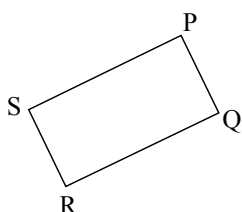
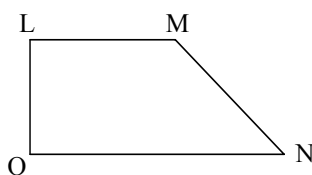
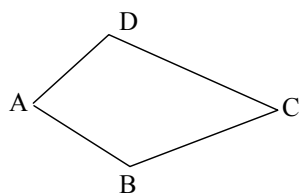
An angle that is smaller than a right angle is called **acute** angle.

An angle that is greater than a right angle is called **obtuse** angle.



4. Here are some quadrilaterals.

- How many angles are there in each figure?
- Which are right angles?
- Which are acute?
- Which are obtuse?



Chapter 12: Circles

Drawing Circles

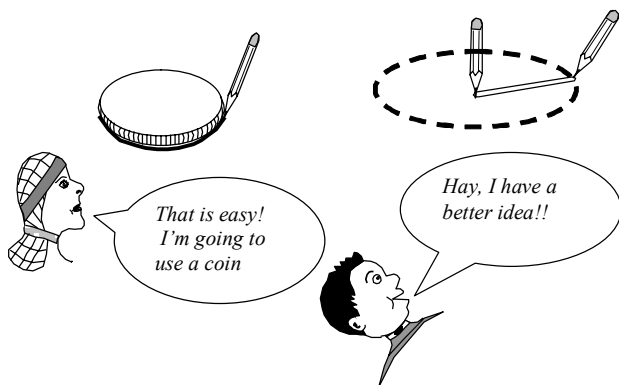
We know that circles are not polygons because they are not made up of straight line segments. But circles are very important geometric figures. Many common objects around us are circular. Bicycle tires are circular. So are plates and dishes. Can you name other objects that are circular in shape?

Do you know how to draw a circle?

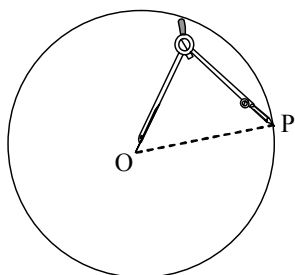
Mr. Osman, the Grade 6 Mathematics teacher, asked his class: *Who can show us or tell us how to draw a good circle.*

Roble said: *I know how! I often use coins to draw circles.* And she used a 50-cent coin and traced a circle.

Huruy said: *I know of another method! You fix one end of a piece of string with a small pencil and trace a circle by stretching the string tightly with another pencil and moving it around.*



Mr. Osman said to the class: I am pleased with what *Roble and Huruy* did. Both methods work reasonably well in many everyday situations. And I am going to show you still another method. I am going to use what we call a **pair of compasses** to draw my circles.



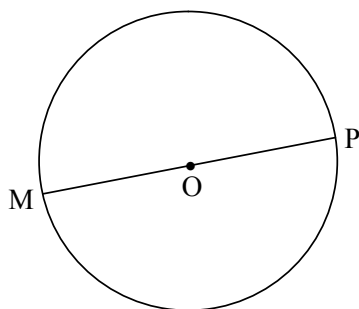
Did you understand what I did?

O is the **center** of the circle.
OP is the **radius** of the circle.



Radius and Diameter: How are they related?

Then Mr. Osman drew a straight line segment MP through the center of the circle.



MP is the **diameter** of the circle.

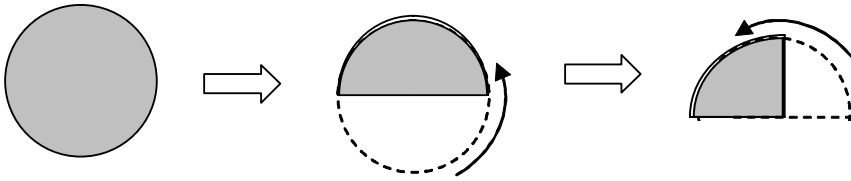


Is MP twice as long as OP?

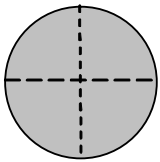
Mr. Osman said: *I am going to ask you another question: Here is piece of paper in the shape of a circle. I want you to find the center of the circle.*

Nejat said: *I can do it!* And she found the center. What do you think Nejat did?

All you have to do is fold the paper twice.



Then unfold the paper circle to find the center



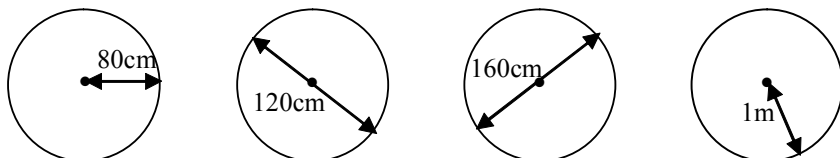
The center of the circle is the point where the two fold lines meet!



Activity 1

1. Draw a circle by using any round object.
2. With a pair of compasses draw a circle of radius 5 cm.
3. Draw a circle of diameter 8 cm.
4. The radius of a circle is 3.5 cm. What is its diameter?
5. The diameter of a circle is 18 cm. Find its radius.

6. The following circles are not drawn to scale.

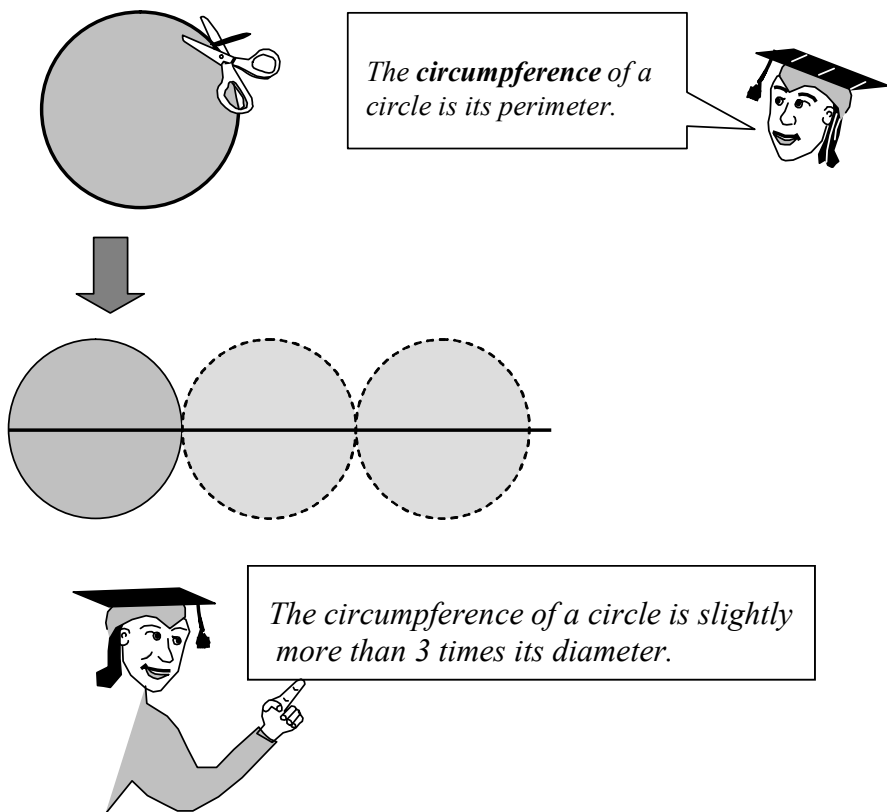


- Which circle is the biggest?
- Which circle is the smallest?
- Copy and complete the table.

Circle	Radius	Diameter
A	80cm	
B		120cm
C		160cm
D	1m	

Circumference and diameter: How are they related?

Use a string to measure the circumference of a circle like this:



Musa drew three circles and measured the diameter and the circumference of three of them. He recorded the results as follows.

Circle	Diameter	circumfrance
A	5cm	15.7cm
B	7cm	22cm
C	10cm	31.4cm

Find the value of **circumference and diameter** for each circle. What do you notice? Did you find that the circumference of each circle is about 3.14 times the diameter.

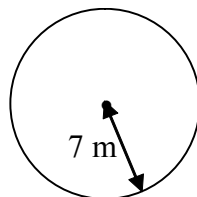
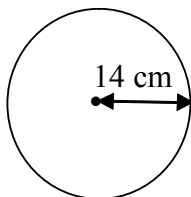
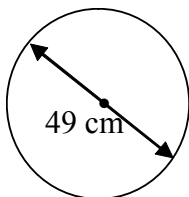


The value of circumference $\div$ diameter is the same for any circle. This value is represented by π (pi) and $\pi \approx 3.14$ or $\frac{22}{7}$

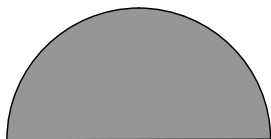
$$\text{Circumference} = \pi \times \text{Diameter}$$

Activity 2

1. The diameter of a bicycle tyre is 60 cm. find its circumference. (Take $\pi = 3.14$)
2. The radius of a medium size pizza is 12 cm. Find its circumference. (Take $\pi = 3.14$)
3. Find the circumference of a circle of diameter 70 cm.
(Take $\pi = \frac{22}{7}$)
4. Find the circumference of each circle.



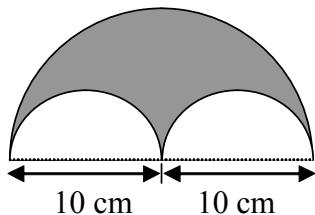
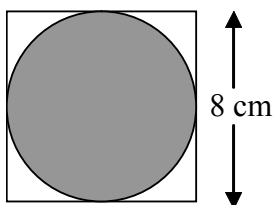
5. The figure shows a flowerbed in the shape of a semicircle. Find its perimeter.



A semi-circle is a half circle.



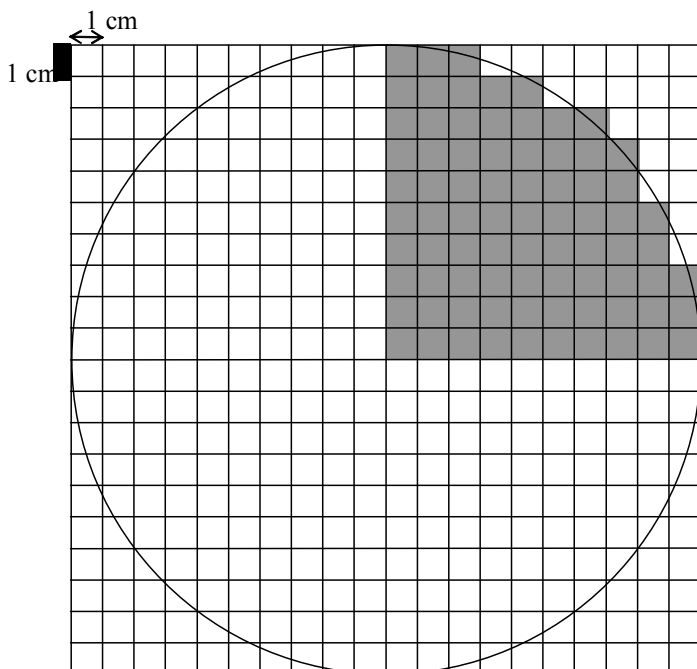
6. The figure shows a circle within a square. Find the circumference of the circle.



7. The figure is made up of 3 semi-circles. Find its perimeter in terms of π . (Take $= 3.14$).

Area of circle

Mr Osman gave another task to his students. He said: *Here is a circle of radius 10 cm. Who has an idea how to find its area.* One of the students, Merhawi, was able to estimate its area by finding how many square centimetres are covered by the circle. This is what Merhawi did:

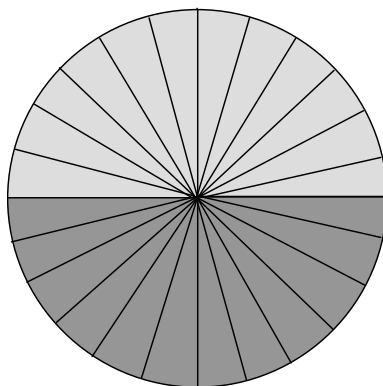


Area of $\frac{1}{4}$ of the circle $\approx 79 \text{ cm}^2$

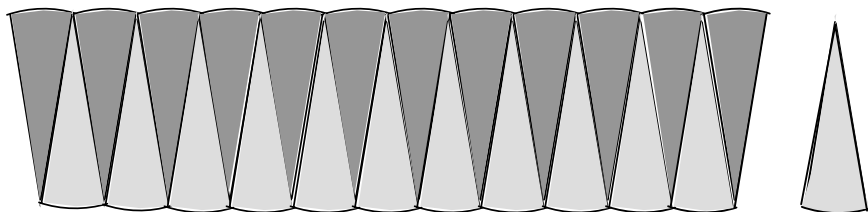
Area of the circle $\approx 4 \times 79 = 316 \text{ cm}^2$

Do you understand Merhawi's method for finding area? Is it accurate enough? Discuss the possible limitations of this method. Hayat had another idea. She cut the circle into 24 equal pieces.

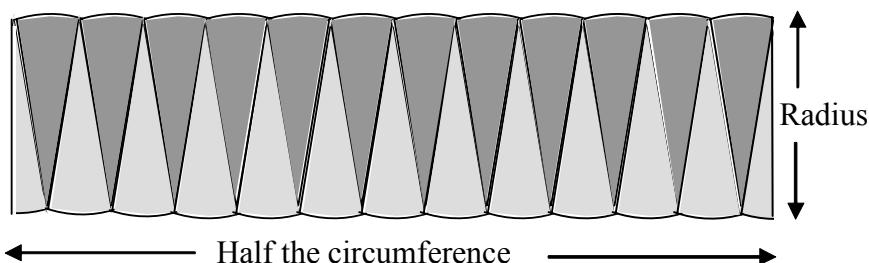
Hayat had another idea. She cut the circle into 24 equal pieces.



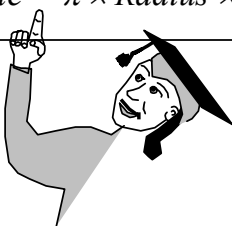
She arranged 23 of these pieces to form a pattern like this:



Then she cut the last piece into halves. She placed one half at each end of her pattern to make it look like a rectangle.



$$\begin{aligned} \text{Half the circumference} &= \pi \times \text{Radius} \\ \therefore \text{the area of the circle} &= \pi \times \text{Radius} \times \text{Radius} \end{aligned}$$



Activity 3

1. Use Hayat's formula to find the area of the circle that Merhawi estimated to be about 316. (Take $\pi = 3.14$).

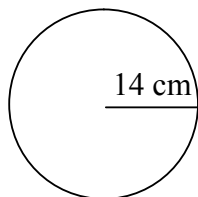
$$\begin{aligned} \text{Area of circle} &= \pi \times 10 \times 10 \\ &= 3.14 \times 10 \times 10 \\ &= \underline{\quad} \text{ cm}^2. \end{aligned}$$

How does this value compare with that of Merhawi?

2. The radius of a circle is 14 cm.

Find its area. (Take $\pi = \frac{22}{7}$)

$$\begin{aligned}\text{Area of circle} &= \pi \times 14 \times 14 \\ &= \frac{22}{7} \times 14 \times 14 \\ &= \underline{\hspace{1cm}} \text{ cm}^2.\end{aligned}$$



3. The diameter of a circle is 8 cm. Find its area.
(Take $\pi = 3.14$).

$$\text{Radius} = 8 \div 2 = 4 \text{ cm}$$

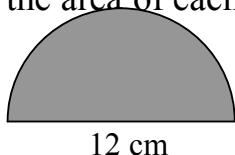
$$\begin{aligned}\text{Area of circle} &= \pi \times 4 \times 4 \\ &= 3.14 \times 16 \\ &= \underline{\hspace{1cm}} \text{ cm}^2.\end{aligned}$$

4. Find the area of a circle of radius 7 m. (Take $\pi = \frac{22}{7}$)

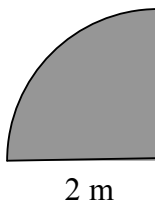
5. Find the area of a circle of diameter 12 m.
(Take $\pi = 3.14$)

6. Find the area of each figure.

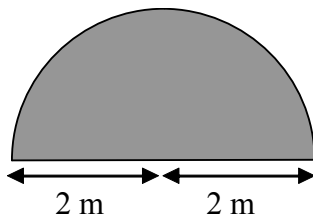
a)



b)



7. The figure shows two semi-circles. Find the area of the shaded part.
(Take $\pi = 3.14$)



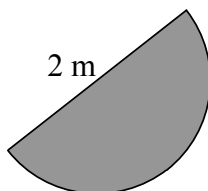
8. A coin has a diameter of 4 cm.

a) What is the circumference of the coin?

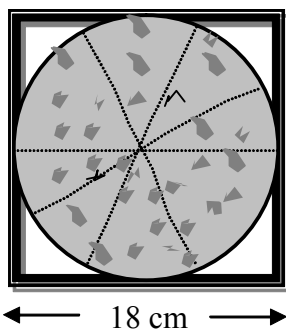
b) What is the area of one face of the coin?

(Take $\pi = 3.14$)

9. Ali has a semi-circular flowerbed. The straight side is 2 m long. What is the area of the flowerbed?



10. At the Banuna pizzeria, if you wish to take away a pizza to eat it at home, they pack it in a box. How big is the pizza in comparison with the base Area of the box? Yohanna claimed that the area of the pizza is approximately $\frac{3}{4}$ of the area of the box in which it is packed.

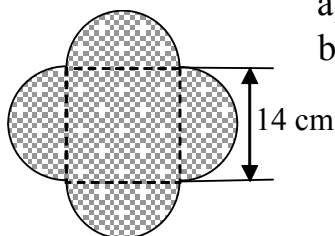


Check Yohanna's claim for a small Africana pizza with diameter 24 cm.

11. A table cover is made up of a square and 4 semi-circles as shown.

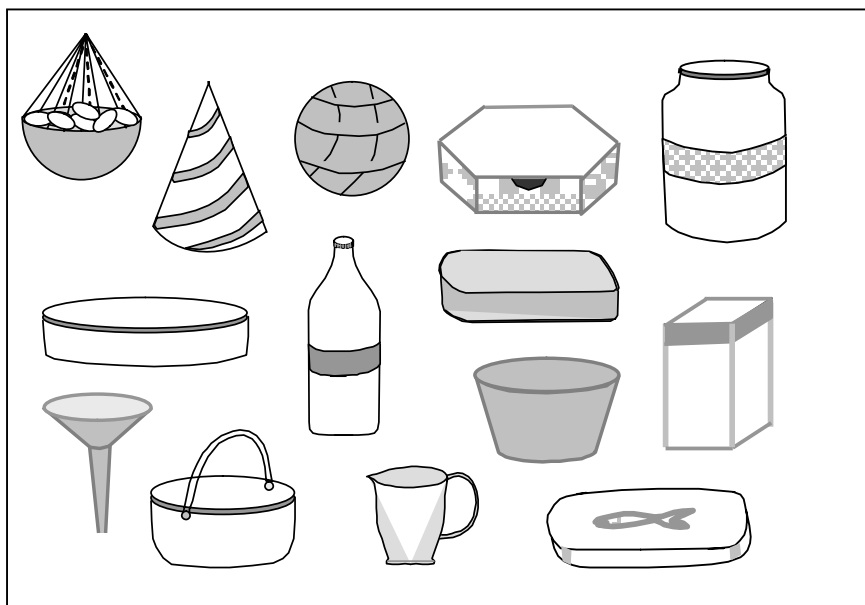
a) What is the area of the table cover?

b) What is its perimeter?



Chapter 13: Sorting Solid Figures

Ali and a group of grade six students did some shopping for the school closing party of their class. The items they bought or brought with them from their homes came in different shapes.



Look carefully at the shapes of the packages. Some shapes have special names.

Study the models shown below.

Activity 1

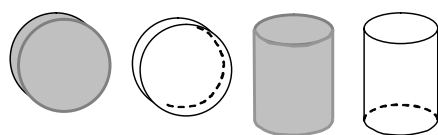
1. a) How are the cylinders alike?
- b) Look at the truncated cones. What does truncated mean?
- c) How are the prisms similar?

d) What are some differences between a prism and a cylinder?

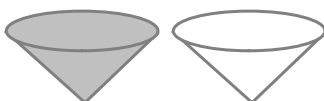
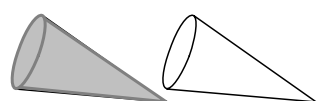
Between a prism and a pyramid?

e) What is the difference between a cone and a pyramid?

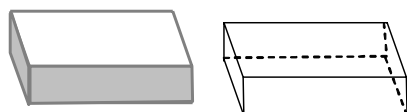
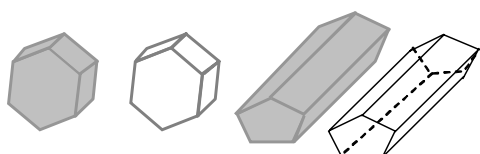
Models



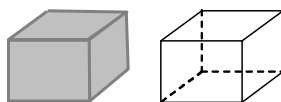
Cylinders



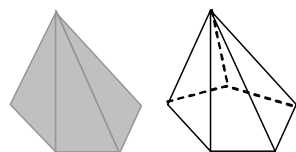
Cones



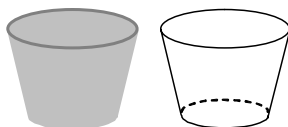
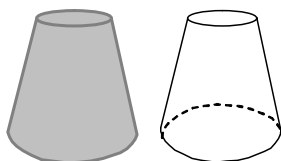
Prisms



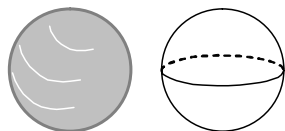
Cubes



Pyramids



Truncated cones



Spheres

2. List the items in Ali's collection that are the following shapes.

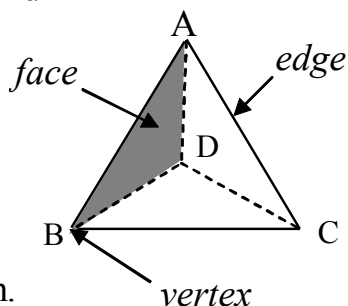
- | | |
|----------------------|-------------------|
| a) rectangular prism | b) cube |
| c) cylinder | d) sphere |
| e) cone | f) truncated cone |
| g) prism | h) pyramid |

3. Look at the pyramid on the right.

a) How many faces has the triangular pyramid. What shape are they? Name them.

b) How many edges has the triangular pyramid? Name them.

c) How many vertices has the triangular pyramid? Name them.



4. How many faces has a cube? What shape are they?

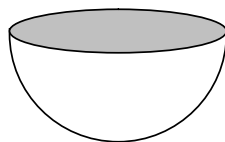
5. How many faces has a rectangular prism? What shape are they?

6. How many faces has a square pyramid? What shape are they?

7. Some of the items in Ali's collection include a combination of two or more shapes. Identify and describe those that are made up of two or more shapes.

8. Draw the following shapes on your exercise books.

- a) a cylinder with a cone on one end.
- b) a cone fitted with
on its base.
- c) a rectangular prism fitted with a
pyramid on one end.
- d) a cylinder with a hemispherical
bottom and a conical end.

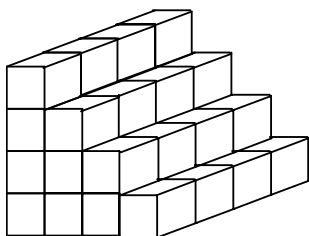


hemisphere

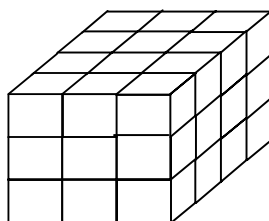
Chapter 14: Cubes and Cuboids

The following solids are made up of 1-cm cubes.

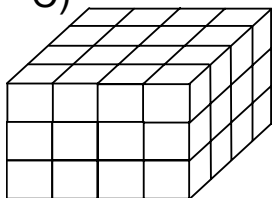
A)



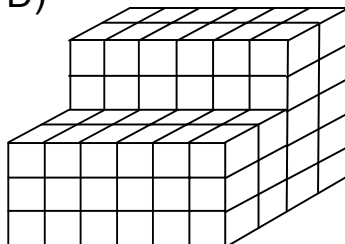
B)



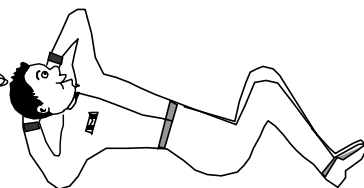
C)



D)

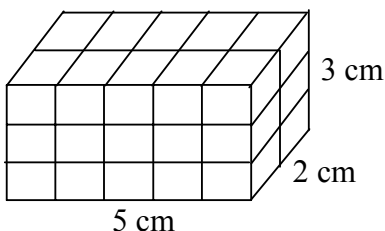


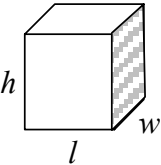
*Which solid figure has
the greatest volume ?*



Activity 1

1. Find the volume of the cuboid which measures 5 cm by 2 cm by 3 cm.

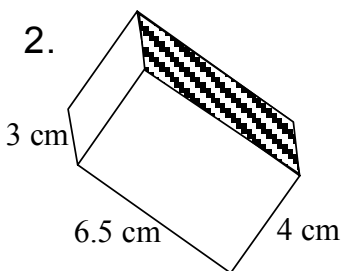




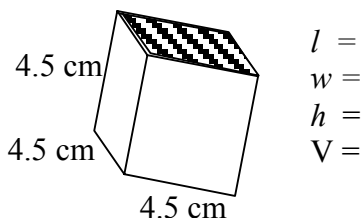
A rectangular prism also called cuboid is l units long, w units wide and h units high. The volume is V cubic units.

Then: $V = \text{---} \times \text{---} \times \text{---}$

If l , w and h are equal, the rectangular prism is called ---



$$\begin{aligned} l &= \\ w &= \\ h &= \\ V &= \end{aligned}$$



$$\begin{aligned} l &= \\ w &= \\ h &= \\ V &= \end{aligned}$$

For each of the following rectangular prisms whose sides are measured in meters and whose volume is measured in cubic meters fill in the blanks.

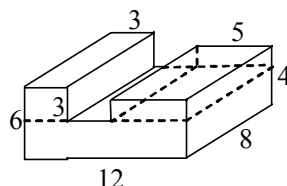
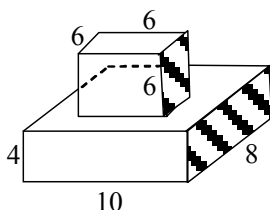
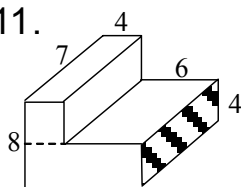
	V	l	w	h
4.		$7\frac{1}{2}$	4	6
5.	96		3	8
6.		15	15	$2\frac{1}{9}$

	V	l	w	h
7.	52.5	3.5		6
8.		4.4	2.2	1.5
9.	12.48	2.6		3.2

10. Find the volume in cubic centimetres of a cube whose sides each measure 1 cm.

Find the volume of these solid figures. Each is made from rectangular prisms. All dimensions are in cm.

11.



Estimating area and volume

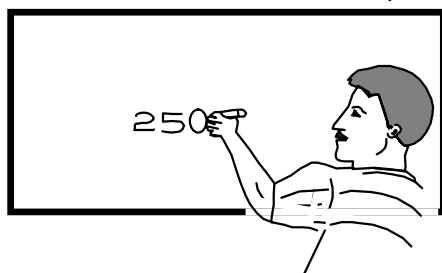
Semere, the grade six maths teacher at Kudob'ur Junior School, asked his class to give him an estimate of the number of classrooms that can be built on a certain piece of land about 250 long. He told them that the classrooms

are to be $7\frac{4}{7}$ metres long.

Semhar was one of the first to arrive at a solution. This is what she did.

She took the numbers 7 and 8 as low and high values of the length.
120

Estimate the number of classrooms!



Taking 7m as the estimate of length, she found a certain number of rooms. Taking 8 m she found another number. Do you understand how she found these numbers?

Using these two estimates Semhar stated that a minimum of _____ rooms and a maximum of _____ can be built.

Was Semhar’s estimate of the number of classrooms good or bad? Why? Can you think of another method?

Activity 2

Use Semhar’s method to complete the table below.

	Number	Low Estimate	High Estimate
	$11\frac{3}{8}$	11	12
1.	3.7		
2.	$5\frac{6}{11}$		
3.	12.45		

Semhar’s method can be used to give a low and high estimate of area and volume given the values of the dimensions.

	l	w	Low Estimate of area	High Estimate of area
	$7\frac{3}{8}$	$4\frac{2}{3}$	$(7 \times 4) = 28$	$(8 \times 5) = 40$
4.	3.7	4.5		
5.	$5\frac{6}{11}$	$4\frac{3}{7}$		
6.	12.45	3.35		

	l	w	h	Low Estimate of volume	High Estimate of volume
	3.8	$4\frac{1}{4}$	$2\frac{1}{2}$	$(3 \times 4 \times 2) = 24$	$(4 \times 5 \times 3) = 60$
7.	2.7	1.8	5.9		
8.	11.4	$12\frac{1}{4}$	$13\frac{3}{4}$		
9.	$34\frac{1}{3}$	$40\frac{2}{3}$	$16\frac{1}{8}$		

10. each side of a cube is $4\frac{7}{8}$ cm long.

- What is a low estimate of its volume?
- What is a high estimate?
- Which of these is nearer to the volume?

11. Each side of a cube is 1.5 cm long.

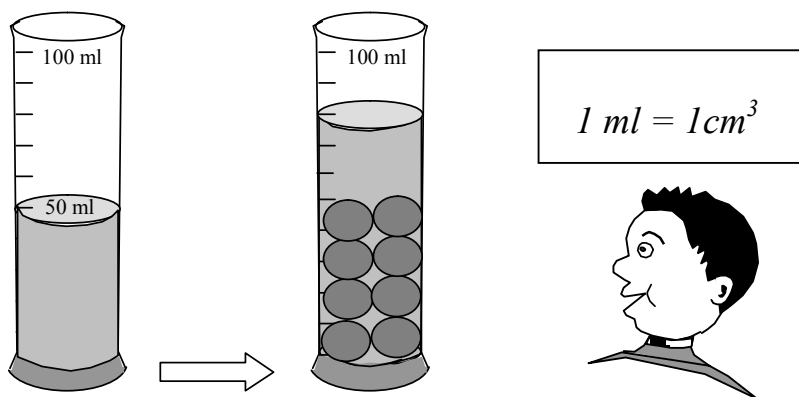
- What is a low estimate of its volume?
- What is a high estimate?
- What is its volume in cubic centimeters?
- Which of these is closer to the volume, the low or the high estimate?

12. 1 meter = _____ centimeters.

Therefore, 1 cubic meter = _____ cubic centimeters.

Finding the volume of a solid

Tekle poured 50 ml of water into a measuring cylinder. Then he put in some marbles and measured the volume of water displaced by the marbles.

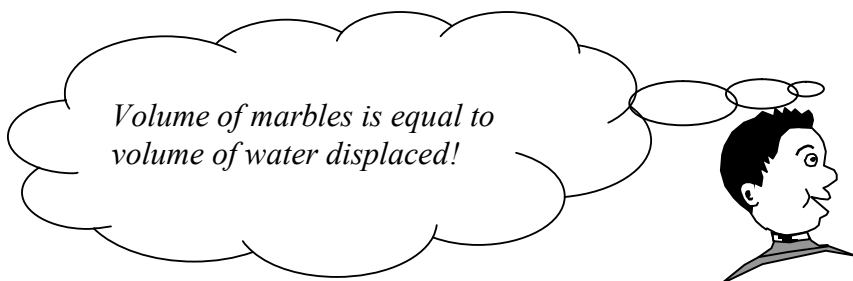


Tekle reasoned as follows:

Volume of water = 50 cm^3

Volume of water and the marbles = 80 cm^3

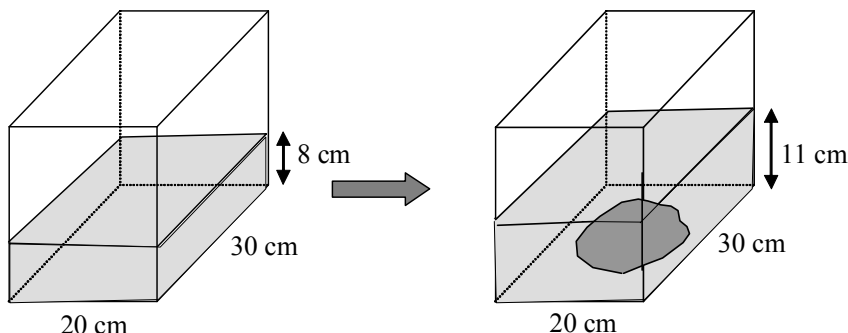
Therefore volume of the marbles = $80\text{ cm}^3 - 50\text{ cm}^3 = 30\text{ cm}^3$



Do you agree with Tekle about the relationship between the volume of a solid put in a container of water and the volume of the displaced water?

Activity

1. A rectangular tank, 30 cm long and 20 cm wide is filled with water to a depth of 8 cm. When a piece of stone was put in, the water level rose to 11 cm. Find the volume of the stone.

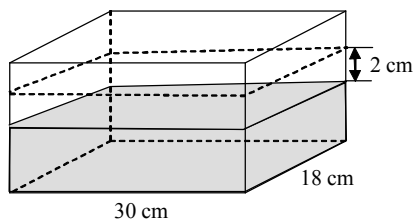


Increase in height of water level = $11 - 8 = 3$ cm

Volume of water displaced = $30 \times 20 \times 3 = \underline{\hspace{1cm}} \text{ cm}^3$

Volume of stone = $\underline{\hspace{1cm}} \text{ cm}^3$.

2. A rectangular tank, 30 cm long and 18 cm wide contained some water and a stone. When the stone was taken out, the water level dropped by 2 cm. Find the volume of the stone.



Decrease in height of water level = 2 cm

Volume of stone = $30 \times 18 \times 2 = \underline{\hspace{1cm}} \text{ cm}^3$

3. A rectangular container, 15 cm long and 10 cm wide, contains water to a depth of 4 cm. When a stone of volume 300 cm^3 is put in, the water level rises. Find the height of the new water level.

Chapter 15: Statistics – describing data in numbers and graphs

The idea in statistics is to find ways of collecting and summarising data. The data should be presented in ways that are easier to grasp and handle the whole data set.

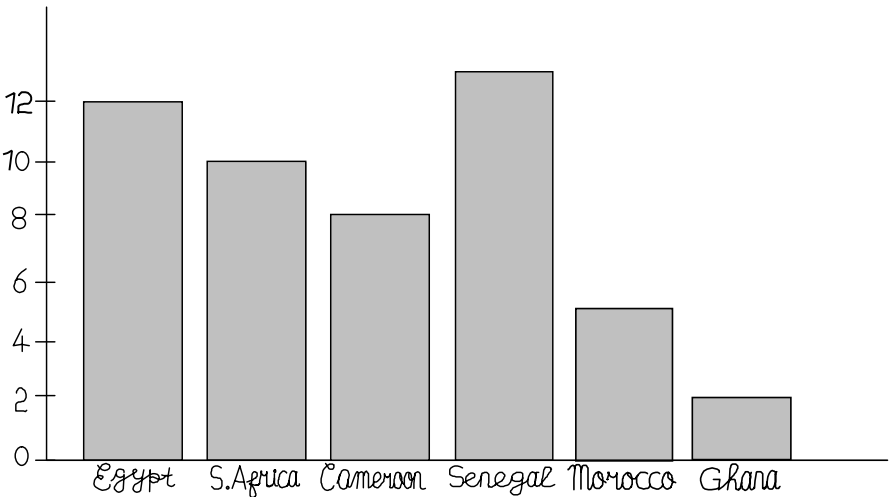
You have worked with statistics before. You have used the mean and the mode as ways to describing the data set with one number. And you have worked with different graphs to represent the information in the data set.

In this chapter you are going to continue this. You are to work both with data sets that you collect yourself and with ones that have been collected already.

Hamadu asked all the students in his class, which country will win the next African Cup in football. He wrote all the names of the students and recorded the answers. This is beginning of the list he made:

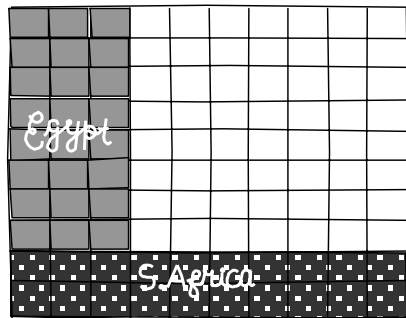
Name	Egypt	S.Africa	Cameroon	Senegal	Morocco	Ghana
Nasir			X			
Berke				X		
Zaid				X		
Nejat	X					
Aziz		X				
Mohammed			X			

When he had finished collecting his data, Hamadu made the following graph:



Activity 1

1. Answer the following
 - a) How many students did Hamadu ask?
 - b) What information do you get from the bar-graph?
 - c) How many percent did Egypt get?
 - d) What was the second most popular country?
 - e) How many votes did North African countries get?



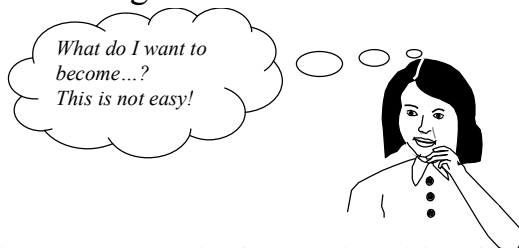
Hamadu made a 10×10 grid.

2. How do you think Hamadu made the 10×10 grid from the data? Help him complete it.
3. What information do you get from the bar-graph that you do not get from the 10×10 grid? What information do you get from the 10×10 grid that you do not get from the bar-graph?

Activity 2

You are now to collect your own data. The task is to find which of five professions your classmates would most like to join. The professions you are to choose from are: lawyer, doctor, farmer, teacher or engineer.

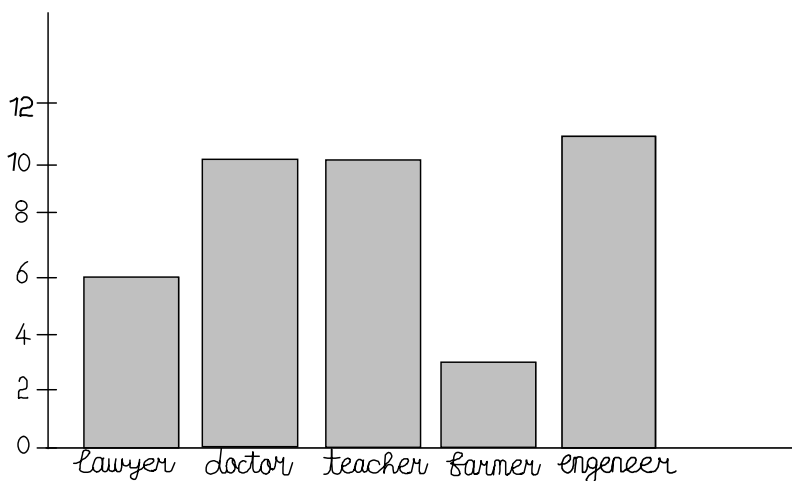
1. Make a table on the blackboard of the professions you and your friends want.



2. Make a bar graph and a 10×10 grid of your data like the ones Hamadu made.
3. What information is lost when you make the graphs for example:
 - a) Can you tell the number of students who want to become doctors?
 - b) Can you tell who want to be teachers?
 - c) Can you find advantages of the graphs in comparison with the table?

Activity 3

In Tirhas' class the students were asked what they wanted to become. She made the graph of their responses.



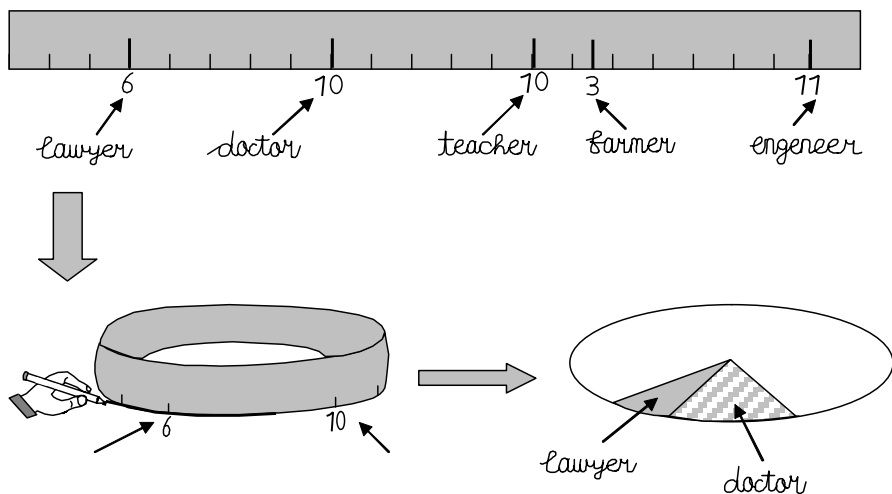
1. Compare your data with Tirhas' data (for example: Do the same number of students want to become teachers? Do the same numbers of the students want to work in the open?)

Tirhas also wanted to make a 10×10 grid of the results. This was not easy with the numbers she had, but she began like this:

$$\frac{6}{40} = 0.15 = 15\% \quad \frac{10}{40} = 0.25 = \dots$$

2. Complete Tirhas' calculations and make a 10×10 grid of her results.
3. Do the percentages make it possible to make better comparisons between the two data sets?

Tirhas also began to make a pie chart:



4. Complete Tirhas' pie chart.

5. Make a pie chart of the data that you and your friends collected.

Interpreting pie charts

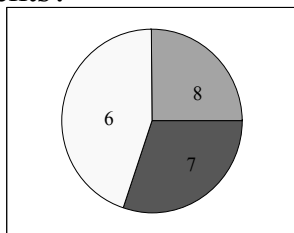
Activity 4

Abraham made a pie chart of the 820 students in the different grades in his junior school. As you can see, he forgot to write the percentages on it.

1. In which grade are there most students?

2. a) Estimate the percent of students in each grade.

b) How can you make your estimates more precise?



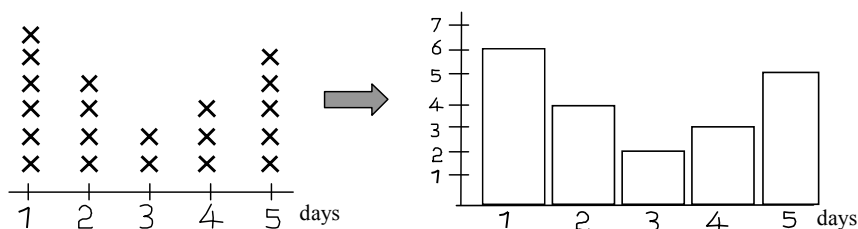
- c) Rank the grades according to size.
 - d) Compare with your partner:
Did you do it the same way?
 - e) Did you get the same results?
3. Use your estimates of the percentages to find the approximate number of students in each group. Make a bar graph of your results.
 4. Think of situations in which it would be valuable to have the numbers of people in each group and other situations in which the percentages would be preferable.

When we are asking about numbers ...

In the examples on the previous pages the information collected concerned people and countries. Sometimes, however, we want to collect information about numbers. This makes the statistics a little different.

Activity 5

Also in Tirhas' class they collect information about the number of days that each individual student is absent. This is the information they got for the month of May:



1. How many students are represented in the bar chart?
2. Find as much information as possible from the graph about how much the students are absent.

25% of the students have been away 3 days or less in May ... The range is...- that is not difficult. But, Tirhas, how do I find the average ... I mean the mean?

First you need to find all the days that they have been absent. I did like this...



$$(1 \times 6) + (2 \times 4) + (3 \times 2) + (4 \times 3) + 5 \times 6$$

3. Do you understand what Tirhas is doing? Can you complete her calculation, using the bar graph?
4. Can you explain why Tirhas suggests dividing by the number of students?

and the result of that has to be divided by the number of students!



5. Find the mean number of days that the students have been absent in the month of May.

In order to find the percentages, it is nice to have a table:

Number of days	Number of students absent
1	6

6. a) Copy and complete the table above.
 b) How many percent of the children were absent 5 days?
 c) How many percent were absent 5 days or less?
 d) What is the maximum number of absentees?
 e) What is the average number of absentees?
7. What other information can you get from the table?
8. Make a 10×10 grid and a pie chart of the days that the students were absent in the month of May.
9. a) How many days have you been absent the last month?
 b) How does that compare to the children in Tirhas' class?
 c) What if you had been absent one more day?

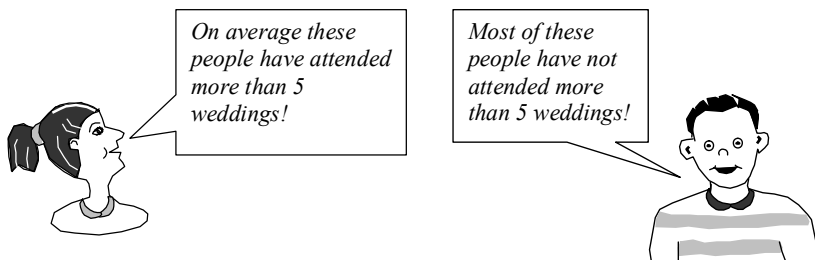
Weddings in Asmara

Kibra asked 25 people in Asmara how many weddings they had attended in the month of May. In the beginning she wrote both the name of the person and the number of weddings: *Tesfai: 2; Rezene: 2;* etc.

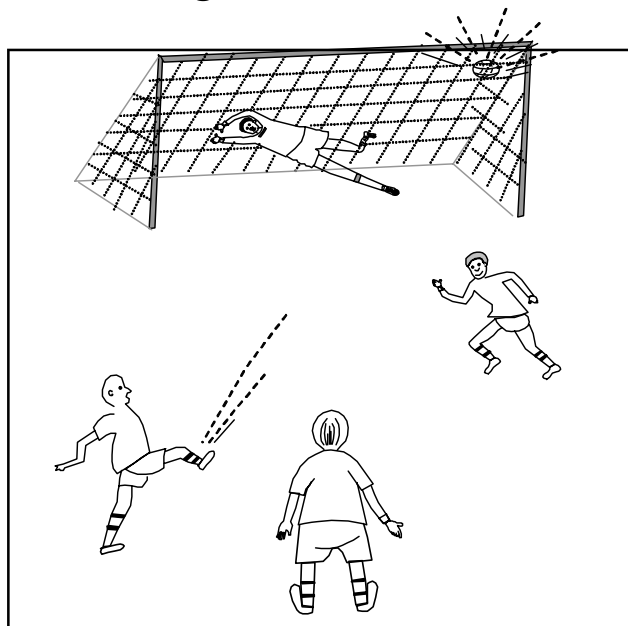
Then she realised that she only needed the numbers as long as she did not ask the same person twice and she records like this: 2, 2, 0, 5, 8, 5, 6, 6, 7, 2, 3, 10, 8, 12, 0, 5, 5, 6, 8, 6, 8, 9, 4, 4, 5.

Activity 6

1. Describe the number of weddings as well as possible. You should use:
 - a) tables
 - b) a bar graph
 - c) a 10×10 grid
 - d) a pie chart and
 - e) descriptors such as the mean, mode and range.
2. Kibra found that the mean number of weddings for these people was more than 5. Did you get the same result?
3. Kibra's friend, Abraham, said: Most of them did not attend more than five weddings. Can they both be right?



The football league



Activity 7

The championship of football match of some of the Zoba Maekel teams in the year of 2003-2004 with the corresponding scores is give below:

No.	Club	No. of play	Win	Draw	Loose	Points
1	Adulis	21	14	5	2	47
2	Keih-Bahri	21	13	5	3	44
3	Denden	21	11	3	7	36
4	Altahrir	21	9	7	5	34
5	Hintsa	20	7	9	4	30
6	Hayli-Ayer	20	7	8	5	29
7	Asmara-Birra	20	7	7	6	28
8	Mai-Anbessa	21	7	4	10	25

1. Use graphs, charts and descriptors like the mean to describe the data.
2. Assume that you attend one of the matches played by Adulis. What is the probability of you watching a match with Draw? or win?
3. What is the most likely number of wins that you will see?
4. The distribution of the blood type of 2000 students in your School is given below.

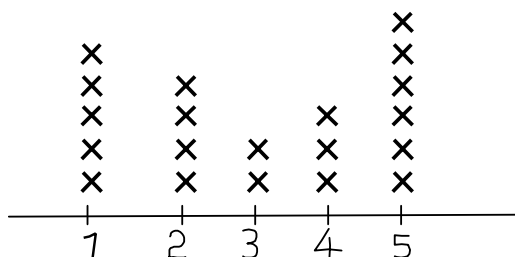
Blood type	O	A	B	AB
Number of students	200	600	400	800

- a. Calculate the percentage of each blood type?
 - b. Draw a Pie – Chart for the data?
5. The age distribution of certain students in a junior secondary school is given below

Age	11	12	13	14	15
Number of Students	50	200	150	300	100

- a) What is the mode of the data?
- b) Which age group has the lowest number of children?
- c) What is the range of the school age?
- d) How many students are there in the school?
- e) Calculate the mean age of the school?
- f) Draw a bar chart for the data?

6. The mean salary of your school teachers is 2200 Nakfa.
At the end of each month the cashier pays 66,000 Nakfa.
- How many teachers are there in your school?
 - If the mean salary of 5 teachers is 2500 Nakfa, and the salary of the 4 teachers is 2300 Nakfa, 2000 Nakfa, 2600 Nakfa and 2700 Nakfa What is the monthly salary of the fifth teacher?
7. The line plot shows the number of times 20 students travelled from Massawa to Asmara.



Calculate:

- the mode
- the range
- the mean