Mathematics

For Sixth form primary

First term

Authors

Dr. / Mohamed Ahmed M. Naser
Professor of Mathematics Education
Faculty of Physical Education
Beni - Suef University

Dr. / Rabie Mohamed Osman Ahmed
Professor of Mathematics Education
Faculty of Physical Education
Beni - Suef University

Revised by

Samir Mohamed Sedawy

2020 -2021
My dear pupils of sixth grade primary... it give us pleasure to introduce this book to you as part of developed mathmastics series. We dedicated many things for you when we composing this book many things were taken in consediration in order to make studying mathematics an interesting popular and useful duty for you:

1. Displaying the topics in the easiest way and clearness using aproprate language that adopt with your information and experiences. So that it will help you to cope in the knowledge and ideas which were involved in each topic alon.

- The given ideas are listed gradually from the simplest to the hardest.
- We ensure forming the new concepts and ideas correctly before setting up associated operations via suitable activates.
- Linking the mathematical lessons with life through realistic Issues and problems in various applications hoping that you will fell the value of the mathematics and studying it thing a useful in life.
- At many points within this book we give you opportunaty to deduce ideas and reach information your self depending on your experiences and thinking to develop searching and self learning.
- At other points we invite you to work in groups with your colleagues to know their ideas and introduce to gather one part work.
- At other points too we want you to check the solution which were introduced to enrich your self confident and increase your ability to the corretness of things.
- The book was divided into units, the units were divided into lessons which involved with Images figures and illustrated diagrams. At the end of each lesson evaluated exercises were put, besides general exercises and unit test.
The book end contains model answers.

- The unit end contains activity to practice (UK) with your teacher help and you will find technological activity to deal with computer.

Finally... my dear pupil, in your classroom with your teacher and classmate, you should act positively. Don’t hesitate to ask questions. Trust that your participating will be appreciated, remember forever, mathematics involve many questions have more than one solution.

We ask Allah that, we did well for our lovely Egypt.

Authors
Contents

Unit 1 : Ratio

Lesson (1) : Meaning of the ratio ................................................................. 2
Lesson (2) : Properties of ratios ................................................................. 6
Lesson (3) : Miscellaneous exercises on ratio and its properties .......... 11
Lesson (4) : Ratio among three numbers ............................................... 15
Lesson (5) : Ratio Applications (Rates) .................................................. 19
General exercises on unit one ................................................................. 21
- Technological activity ................................................................. 22
- Activities on unit one ................................................................. 23
- Unit test ........................................................................ 24

Unit 2 : Proportion

Lesson (1) : The Meaning of proportion .................................................. 26
Lesson (2) : Properties of proportion .................................................... 29
Lesson (3) : Drawing Scale ................................................................. 34
Lesson (4) : The Proportional Division .................................................. 38
Lesson (5) : Percentage ....................................................................... 43
Lesson (6) : Applications on the Percentage ....................................... 48
General exercises on unit two ............................................................... 52
- Technological activity ................................................................. 53
- Activities on unit two ................................................................. 54
- Unit test ........................................................................ 54
Unit 3: Geometry and measurement

Lesson (1): The Relations between the geometrical shapes ................................................. 56
Lesson (2): The Visual patterns .......................................................................................... 61
Lesson (3): Volumes ........................................................................................................... 64
Lesson (4): The Volume of cuboid .................................................................................... 70
Lesson (5): The Volume the cube ..................................................................................... 76
Lesson (6): The Capacity .................................................................................................. 79
General exercises on unit three ......................................................................................... 82
- Technological activity ...................................................................................................... 84
- Activities on unit three ................................................................................................... 85
- Unit test ......................................................................................................................... 86

Unit 4: Statistics

Lesson (1): The Kinds of Statistics data.............................................................................. 88
Lesson (2): Collecting descriptive statistic data ............................................................... 91
Lesson (3): Collecting statistics quantative data .............................................................. 94
Lesson (4): Representing the Quantative Statistics Data by
the frequency curve ........................................................................................................... 98
General exercises on unit four ......................................................................................... 101
- Technological activity .................................................................................................... 102
- Activities on unit four ................................................................................................... 103
- Unit test ......................................................................................................................... 104
General exercises and model exams ................................................................................ 105
Unit 1:

**Ratio**

---

*Lesson (1): Meaning of the ratio*

*Lesson (2): Properties of ratios*

*Lesson (3): Miscellaneous exercises on ratio and its properties*

*Lesson (4): Ratio among three numbers*

*Lesson (5): Ratio Applications (Rates)*

- General exercises on unit 1
- Technological activity
- Activities on unit 1
- Unit test
1 **Meaning of Ratio**

Notice and Discuss what is Ratio?

Ratio is a way of comparing between two similar quantities for example:

(1): Comparing between prices

In the opposite figure, below the price of the blouse is LE 40 and the price of the Trousers is LE 80. We can compare between the prices as follows:

a) The price of the blouse is less than the price of the trousers or the price of the trousers is greater than the price of the blouse.

b) The price of the blouse = $\frac{1}{2}$ the price of the trousers

Because $\frac{\text{price of the blouse}}{\text{price of the trousers}} = \frac{40}{80} = \frac{4}{8} = \frac{1}{2}$

c) The price of the trousers is double the price of the blouse because $\frac{\text{price of the trousers}}{\text{price of the blouse}} = \frac{80}{40} = \frac{8}{4} = 2$

The fraction $\frac{\text{price of the blouse}}{\text{price of the trousers}} = \frac{1}{2}$ is called the ratio of the price of the blouse to the price of the trousers.

Also $\frac{\text{the price of the pair of trousers}}{\text{price of the blouse}} = \frac{2}{1}$ (is called the ratio of the price of the trousers to the price of the blouse.

(11): Comparing between lengths:

From the opposite figure, we can compare between the height of the tree (3 metres) and the height of the house (9 metres) using one of the following methods.

a- The height of the house exceeds the height of the tree or the height of the tree is less than the height of the house.
b- The height of the house is greater than the height of the tree. 
or the height of the tree is less than the height of the house.
c- The height of the house is three times the height of the tree.

Because \[ \frac{\text{The height of the house}}{\text{The height of the tree}} = \frac{9}{3} = \frac{3}{1} = 3 \]
The fraction \( \frac{3}{1} \) is called the ratio 
or the height of the tree is third of the height of the house.

because \[ \frac{\text{The height of the tree}}{\text{The height of the house}} = \frac{3}{9} = \frac{1}{3} \]
The fraction \( \frac{1}{3} \) is called the ratio.

Now we hope that you can recognised the meaning of the ratio
As comparing between two similar quantities or numbers and of the same unit then the 
resultant fraction is called the ratio.

\[ \text{i.e. The ratio between two numbers} = \frac{\text{The first number}}{\text{The second number}} \]

Expressing the ratio
- In the case of the price of blouse and the price of the trousers we could express the ratio in as 
a fraction and is \( \frac{1}{2} \)
and can be written as \( 1 : 2 \) it is read as ( 1 to 2 ) where 1 is called the antecedent of the ratio or 
its first term and the number 2 is called the consequent of the ratio or its second term.
- Similarly in the case of the height of the tree and the height of the house we could express the ratio 
as a fraction to be \( \frac{1}{3} \) and it can be written as \( 1 : 3 \) and it is read as ( 1 to 3 ).

Where 1 is called the antecedent of the ratio or its first term and 3 is called the consequent of the ratio 
or its second term.

Drill (1) Complete:
If Khalid has LE 15 and Ahmed has LE 25 then

The ratio between what Khalid has and what Ahmed has is \[ \frac{15}{25} = \frac{3}{5} \text{ or } 3 : 5 \]

The ratio between what Ahmed has and what Khalid has = \[ \frac{25}{15} = \frac{5}{3} \text{ or } 5 : 3 \]

First Term
Unit 1

Drill (2) Complete:

When we compare between the area of the square and the rectangle in the figure shown then:

\[
\frac{\text{The area of the square}}{\text{The area of the rectangle}} = \frac{4}{12} = \frac{\text{The area of the square \times itself}}{\text{The area of the rectangle = length \times width}}
\]

or \[\ldots : \ldots\]

Remember that:
The area of the square = side length \times itself
The area of the rectangle = length \times width

Drill (3) Complete:

When we compare between the number of small squares in column (A) and the number of small squares in column (B) then the ratio between them is:

(a) \[\frac{\text{The number of squares in column (A)}}{\text{The number of squares in column (B)}} = \frac{3}{9} = \frac{1}{3} \text{ or } 1 : 3\]

(b) \[\frac{\text{The number of squares in column (B)}}{\text{The number of squares in column (A)}} = \frac{\text{The number of squares in column (B)}}{\text{The number of squares in column (A)}} = \frac{\text{The number of squares in column (B)}}{\text{The number of squares in column (A)}} \text{ or } \ldots : \ldots\]

Drill (4):

Express the ratio in each of the following cases by two methods

(a) The ratio between the length of AB and the length of CD

(b) The ratio between the age of Nabeel and the age of Khalid such that:
The age of Nabeel = 40 years
The age of Khalid = 25 years

(c) The ratio between the area of the two rectangles ABCD and XYZL
**Exercise (1 - 1)**

1. Write the ratio between the two numbers 21 and 9 in the simplest form.

2. Complete the following table.

<table>
<thead>
<tr>
<th>The antecedent of the ratio</th>
<th>The consequent of the ratio</th>
<th>The form of the ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>5</td>
<td>( \ldots : \ldots )</td>
</tr>
<tr>
<td>( \ldots )</td>
<td>10</td>
<td>( \frac{7}{5} ) ( \ldots )</td>
</tr>
<tr>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>3 : 11</td>
</tr>
</tbody>
</table>

3. Write the ratio between the two numbers in each of the following in its simplest form:
   -(a) \( \frac{19}{114} \)
   -(b) \( \frac{36}{72} \)

4. In one of the classes of the first grade primary the number of boys is 15 pupils and the number of girls is 20 pupils.
   Calculate:
   -(a) The ratio between the number of boys and the number of girls.
   -(b) The ratio between the number of girls and the number of all pupils in the class.
   -(c) The ratio between the number of boys and the number of all pupils in the class.

5. Write each of the following ratios in its simplest form:
   -(a) 2.5 : 5.75
   -(b) 0.84 : 2 \( \frac{3}{9} \)

6. Express the ratio between the two numbers 8 and 12 by two methods.

7. In the opposite figure complete:
   -(a) number of colored parts : all parts of the figure: ............... 
   -(1) number of non colored parts : all parts of the figure: ...............
   -(2) number of colored parts : number of non colored non colored parts : ...............
2 Properties of ratio

What do you learn from this lesson?
Through your active participation you will come to:
- Ratio has the same properties of the common fraction in:
  - Reduction, to simplify and comparison
- The two terms of the ratio are two integer numbers.
- The unit of each of the two terms of the ratio is the same unit.
- The ratio between two quantities of the same kind has no unit.

The mathematical concepts:
- The terms of the ratio.
- Simplifying and comparing.
- Measuring units.

Participate and discuss
Property (1):
The ratio has the same properties of the fraction as:
reduction, simplification and comparison.

Example (1):
Omar saved 32 pounds and Khalid saved 48 pounds.
Find the ratio between what Omar saved to what Khalid saved.
Solution:
\[
\frac{\text{What Omar saved}}{\text{What Khalid saved}} = \frac{32}{48} = \frac{8}{12} = \frac{2}{3} \text{ or } 2:3
\]
Notice: That we divided each of the two terms of the ratio by 4 then by 4 to simplify the ratio.

Example (2):
Find the ratio between the two fractions \(\frac{3}{4}\) and \(\frac{5}{6}\)
Solution:
\[
\frac{3}{4} : \frac{5}{6} = \frac{3}{4} \times \frac{6}{5} = \frac{9}{10} \text{ or } 9:10 \text{ (reduction)}
\]
Similarly:
\[
6.4 : 16 = \frac{64}{10} : 1 = \frac{64}{10} \times \frac{1}{16} = \frac{4}{10} = \frac{2}{5}
\]
(reduction and simplification)
Example (3):
Compare between the two ratios $\frac{3}{5}$ and $\frac{4}{7}$ (using < or >)

The comparison between two ratios, the same as the comparison between two fractions:

Solution:
Due to there's no simplification we should get the L.C.M (lowest common multiple)
of the denominators for the two ratios become $\frac{21}{35}$, $\frac{20}{35}$

$\frac{21}{35} > \frac{20}{35}$ That means

The first ratio is greater than the second ratio
Then $\frac{3}{5} > \frac{4}{7}$

Drill (1)
Write the ratio between the two numbers 25 and 75.

Compare between the ratios $\frac{3}{4}$ and $\frac{5}{8}$

Property (2)
The two terms of the ratio should be integer numbers:
From the previous two examples in the first property, the final results were as follows respectively.

$2 : 3$ and $9 : 10$ and $2 : 5$

All these numbers are integrated numbers.

Property (3):
When comparing two quantities to form the ratio between them, their measuring units must be the same.

For example:
When comparing between two lengths 160 cm and 2 metres we should firstly convert the measuring units to be the same unit.

This will be carried out by two methods.
The first: We convert 2 metres into 200cm then we use the property of simplification for the ratio becomes:

$\frac{160}{200} = \frac{4}{5}$ or $(4 : 5)$

The second. We convert 160 cm into metres to become $\frac{160}{100} = \frac{16}{10}$ metres.

Then we use the property of reduction and simplification for the ratio becomes:

$\frac{16}{10} + 2 = \frac{16}{10} + \frac{2}{1} = \frac{16}{10} \times \frac{1}{2} = \frac{4}{5}$ or $(4 : 5)$
Example (1):
Find the ratio between \( \frac{1}{2} \) kilogram and 700 grams, then compare between them using \(<\) or \(>\).

Solution:
To convert to the same unit, there is two methods.

The first: Convert \( \frac{1}{2} \) kilogram into 500 grams then the ratio becomes \( \frac{500}{700} = \frac{5}{7} \) or \((5 : 7)\)

The second
Convert 700 grams into kilograms
\[
\frac{700}{1000} = \frac{7}{10} \text{ kilograms}
\]
The ratio becomes \( \frac{1}{2} : \frac{7}{10} = \frac{1}{2} \div \frac{7}{10} \times \frac{10}{7} = \frac{10}{14} = \frac{5}{7} \) or \((5 : 7)\)
then \( \frac{1}{2} \) kilogram \(<\) 700 grams

Drill (2)
Compare between 27 months and 3 years to get the ratio between them

Drill (3)
Compare between 2 kirats, 18 sahms, then find the ratio between them.
(Feddan = 24 kirats / Kirat = 24 sahms)

Property (4):
The ratio between two similar quantities has no unit.
you noticed from the previous property and after converting the two quantities to the same unit that
the ratio in the first case is held between length units either centimeters or metres and in the second
the ratio is hold between weight unit either in grams or in kilograms therefore the result ratio
has no unit in each of the two cases because they are of the same unit.

Drill (4)
The distance between Hosam house and his sporting club is 250 metre, and the distance between his
house and his school is 0.4 kilometres. Find the ratio between the two distances.

Drill (5)
In the opposite figure
A rectangle in which the length = 2 metres and its width = 120 cm. Calculate:
(a) The ratio between the width of the rectangle and its length.
(b) The ratio between the length of the rectangle and its perimeter.
In the figure below, a square of side length 4cm and a rectangle whose dimensions are 6 cm and 3cm Find:

(a) The ratio between the perimeter of the square and the perimeter of the rectangle.
(b) The ratio between the area of the square and the area of the rectangle.
(c) The ratio between the length of the rectangle and its perimeter.

2. Find in the simplest form the ratio between each of the following:
   (a) 250 p.t and 7 ½ pounds.
   (b) 2 ½ hours and 75 minutes.
   (c) The two areas : 12 kirats, 1.25 feddans.
   (d) The two areas : 0.75 kirat, 16 sahms.

3. Write the ratio between the two numbers in each of the following cases:
   (a) \( \frac{1}{2} \) and \( \frac{3}{4} \)
   (b) 18 : 6.3
   (c) 1 \( \frac{3}{5} \) : 2.2

4. Complete the following:
   - The ratio between the side length of the square and its perimeter = ........... : ............
   - The ratio between the circumference of the circle and its diameter length = ........... : ............
   - The ratio between the length of the side of the equilateral triangle and its perimeter = ... : ...

5. The area of a rectangle is 32cm\(^2\) and its width = 4cm. Find:
   - The length of the rectangle.
   - The ratio between the width of the rectangle and its length.
   - The ratio between the length of the rectangle and its perimeter.
A salary of cleaning worker LE 400 monthly. He spends LE 340 and saves the remainder. Find:

a- The ratio between what the worker spends to his salary.
b- The ratio between what he saves to his salary.
c- The ratio between what he spends to what he saves.

The opposite table shows the quantities of the same kind but in different units.

Calculate the ratio between each two quantities in each case and complete the table.

<table>
<thead>
<tr>
<th>1st quantity</th>
<th>2nd quantity</th>
<th>1st : 2nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 gm</td>
<td>( \frac{1}{4} ) kg</td>
<td></td>
</tr>
<tr>
<td>8 hours</td>
<td>2 days</td>
<td></td>
</tr>
<tr>
<td>( \frac{1}{2} ) km</td>
<td>570 m</td>
<td></td>
</tr>
<tr>
<td>18 kirat</td>
<td>( \frac{1}{2} ) feddan</td>
<td></td>
</tr>
</tbody>
</table>

In the opposite figure:

A rectangle with width 3.5 cm and its length = 7 cm. Find:

(a) The ratio between the length and the width.
(b) The ratio between the width to the perimeter.
(c) The ratio between the length and the perimeter.
Introduction:
Sometimes we need to calculate an unknown quantity if we know another quantity and the ratio between them.
And we sometimes need to divide a given quantity into two parts if the ratio between them is known.

Remark:
The given quantity is a specified quantity for example: as the weight of a person or the price of a good or the area of a piece of land or the number of the pupils in a school .... etc.
The unknown quantity is an unspecified quantified and we want to know it for example: the need to specify The weight of a person, the price of goods or the number of boys and girls in a school .... Etc.

Example (1):
If the ratio between the weight of Hani and the weight of Ahmed is 5 : 6 and if the weight of Ahmed is 60 kilogrammes. Calculate the weight of Hani.

Solution
We can solve the example using the idea of the value of the part as follows:

\[
\frac{\text{The weight of Hani}}{\text{The weight of Ahmed}} = \frac{5}{6}
\]

That means : 6 equal parts are equal to 60 kilograms (Ahmed’s weight)
That means the value of one part
\[
\frac{60}{6} = 10 \text{ kilograms}
\]
Then the weight of Hani = 10 × 5 = 50 kilograms
Unit 1

The weight of Hani \[ \frac{\text{The weight of Hani}}{\text{The weight of Ahmed}} = \frac{5}{6} \]

That means

The weight of Hani \( \frac{5}{6} \) The weight of Ahmed thus

The weight of Hani \( \frac{5}{6} \times 60 = 5 \times 10 = 50 \text{ k.g} \)

You can check the solution as follows:

The weight of Hani : The weight of Ahmed

\[
\begin{align*}
50 : 60 & \quad \text{(divided by 10)} \\
5 : 6 & \quad \text{(This is the given ratio in the problem).}
\end{align*}
\]

Example (2):

A primary school has 540 pupils. If the ratio between the number of boys to the number of girls is \( 4 : 5 \), calculate the number of each boys and girls.

Solution:

The number of boys \( \frac{4}{5} \)

Using the idea of the sum of parts we get:

The sum of parts \( 4 + 5 = 9 \text{ parts} \):

That means (540 pupils) equals (9 equal parts).

i.e. The value of one part \( 540 \div 9 = 60 \text{ pupils} \).

i.e. The number of boys \( 4 \times 60 = 240 \text{ boys} \).

The number of girls \( 5 \times 60 = 300 \text{ girls} \).
You can check the solution as follows:

- The number of boys : The number of girls
  - 240 : 300 (Dividing by 10)
  - 24  : 30  (Dividing by 6)
  - 4   : 5   (It is the given ratio in the problem)

**Example (3):**

A rectangular shaped piece of land the ratio between its length and its width is 9 : 7.

If the difference between the length and the width is 18 metres.

Calculate each of the length, the width and the perimeter of the land.

**Solution:**

Notice that the ratio between the length and the width is 9 : 7 that means.

The length is divided into 9 equal parts and the width is divided into 7 equal parts the difference between the number of parts of the length and the number of parts of the width $= 9 - 7 = 2$.

i.e. 2 parts equal 18 metres.

i.e. The value of one part $= 18 \div 2 = 9$ metres

i.e. The length of the rectangular land

$$= 9 \times 9 = 81 \text{ metres}$$

The width of the rectangular land $= 7 \times 9 = 63$ m.

The perimeter of the land $= (\text{The length + the width}) \times 2$

$$= (81 + 63) \times 2 = 144 \times 2 = 288 \text{ m.}$$

**Verifying the solution:**

You can check the solution as follows the length of the land : The width of the land

- $81 : 63$ Dividing by 9
- $9 : 7$ (it is the given ratio)

The difference between the length and the width $= 81 - 63 = 18$ metre.
Unit 1

Drill (1)
The ratio between the heights of two buildings in a town is 4 : 7.
If the difference between their heights is 9 metres. Find the height of each of them.

Drill (2)
Two wire pieces, the ratio between their length is 5 : 9.
If the sum of their lengths is 126 metres calculate the length of each piece.

Exercise (1 - 3)

1. The ratio between a child's age to his father's age is 2 : 13.
   If the child is 6 years, Find father's age.

2. The ratio between the lengths of two roads is 2 : 5 and the difference between their lengths is 21 km. Find the length of each road.

3. If the ratio between the number of successful pupils in Arabic subject to that number in Math is 3 : 7 and if the successful pupils in Math is 21 pupils. Find the number of successful pupils in Arabic.

4. The ratio between the area of two pieces of lands is 5 : 9, if the area of one of them is more than the other by 732 m². Find the area of the other land.

5. The ratio between the money that Ahmed has to that Which Samira has is 7 : 11 if the money that they have were L/E 360. Find the money that each of them has

6. A Perimeter of rectangle equals 140 cm, and the ratio between its dimensions is 3 : 4
   Calculate its area
**Ratio among three numbers**

**Notice and think:**
If Adel, Ahmed and Hani saved three amounts of money which are LE 180, LE 144 and LE 108 respectively.

Then we can find the ratio among what Adel, Ahmed and Hani saved as follows.

| What Adel saved : What Ahmed saved : What Hani saved |
|---------------------------------|---------------------|---------------------|
| 180 : 144 : 108                | (dividing by 12)     |
| 15 : 12 : 9                    | (dividing by 3)      |
| 5 : 4 : 3                      |                      |

**Example (1):**
A family formed from three persons. If the height of the father is 1.8 metre, the height of the mother is 1.6 metre and the height of the son is 1.2 metre. Calculate the ratio among the three heights.

**Solution:**

\[
\begin{align*}
\text{height of father} & : \text{height of mother} : \text{height of son} \\
1.8 & : 1.6 : 1.2 & \text{(multiplying by 10)} \\
18 & : 16 : 12 & \text{(dividing by 2)}
\end{align*}
\]

**Example (2):**
ABC is a triangle in which \(AB : BC : CA = 3 : 5 : 7\)

If the difference between the length of \(AB\) and \(BC\) is 4 cm. Find the lengths of the sides of the triangle and its perimeter.

**Solution:**
The ratio between the lengths of the three sides is \(3 : 5 : 7\) that means that \(AB\) is divided into three equal parts in length.
and BC is divided into 5 equal parts in length and CA is divided into 7 equal parts in length and
all parts are of the same kind.
The difference between the length of AB and the length of BC = 5 – 3 = 2 parts that means that:
2 parts equal 4cm
i.e. the value of each part = 4 ÷ 2 = 2cm
then:
The length of AB = 2 × 3 = 6cm,
The length of BC = 2 × 5 = 10cm
And The length of CA = 2 × 7 = 14cm
Since the perimeter of the triangle = the sum of length of its sides.
Then the perimeter of the triangle = 6 + 10 + 14 = 30cm

Verifying of solution

\[
\frac{AB}{BC} : \frac{CA}{CA} = \frac{6}{10} : \frac{14}{14} = \frac{3}{5} = \frac{7}{7} \quad \text{(divided by 2)}
\]

Example (3):
a, b and c are three numbers such that the ratio a : b = 4 : 3 and the ratio b : c = 2 : 3. Find the ratio
among the three numbers a, b and c.
Solution:
To find the ratio between the numbers a, b and c take the ratio.

\[
\frac{a}{b} = \frac{4}{3} \quad \quad \frac{c}{b} = \frac{3}{2}
\]

then
\[
\frac{a}{b} = \frac{4 \times 2}{3 \times 2} = \frac{8}{6}
\]
\[
\frac{c}{b} = \frac{3 \times 3}{2 \times 3} = \frac{9}{6}
\]
then \(a : b : c = 8 : 6 : 9\)
Another solution (using L.C.M.)

Through the opposite figure

Notice that L.C.M of the two numbers 3 and 2 is 6 that means the consequent of the first ratio is 3 multiplied by 2 then it becomes 6.

Therefore we multiply the antecedent of the first ratio which is 4 by 2 to be 8.

Also multiply the antecedent of the second ratio which is 2 by 3 to be 6.

Therefore multiply the consequent of the second ratio which is 3 by 3 to be 9.

Then the ratio among the three numbers becomes

8 : 6 : 9

Example (4):

If the ratio between the share of Hani and the share of Sherif and the share of Khalid is 3 : 5 : 7 and if the share of Hani is LE 24 calculate the share of each of Sherif and Khalid.

Solution:

The share of Hani = 24 pounds and it equals 3 equal parts

\[ \text{i.e. The value of one part} = \frac{24}{3} = \text{LE 8} \]

Then the share of Sherif = 5 \times 8 = \text{LE 40}

And the share of Khalid = 7 \times 8 = \text{LE 56}

Drill

Find the ratio between the height of Sahar, Noha and Ola if

The height of Sahar : The height of Noha : The height of Ola = 2 : 3 : 6

The height of Noha : The height of Ola = 6 : 5
1. If the ratio between the measures of the angles of a triangle is 5 : 6 : 7 and the measure of the first angle is 50°. Find the measure of each of the other two angles.

2. A fruit seller has three kinds of fruit (banana, grapes and Guava)
   If the ratio between the weight of banana to the weight of grapes is 2 : 3 and the ratio between the weight of grapes to that of guava is 2 : 4. Find the ratio among the weights of banana, grapes and guava.

3. If the ratio between the heights of three buildings is 3 : 4 : 5 and if the height of the first building is 12 metres calculate the heights of the second and the third building.

4. If the ratio between the ages of Hoda, Mona and Ola is 2 : 4 : 5 and if the difference between the age of Hoda and that of Mona is 8 years. Calculate the age of each of Hoda, Mona and Ola.

5. The ratio between the length and the width of a rectangle is 9 : 5. If the perimeter of the rectangle is 56 meters, find out the length and the width of the rectangle, then calculate its area.

6. A triangular piece of land the ratio between the lengths of its side is 4 : 6 : 7.
   If the perimeter of this piece of land equals 51 meters, find the lengths of the sides of the piece land.
Notice and Think

Nabeel held a party for his birthday. He invited 6 friends. He distributed 12 pieces of gateaux on 6 plates as 2 pieces for each plate as shown in the opposite figure.

The ratio between 12 pieces of gateaux to 6 plates is written $\frac{12}{6}$ pieces for each plate the ratio

Activity:

If a car covered 180 kilometres within 3 hours then the speed of this car is $\frac{180\text{ km}}{30\text{ hours}} = 60\text{ km per hour}$

i.e. The car moves with speed 60 km / hour (which is called the rate)

The ratio 60km / hour is the rate of covered distance per hour and it is written as (60km / hour)

From the previous we deduce that:

The ratio between two quantities of different kinds and the unit of rate is the unit of the first quantity per each unit of the second quantity.
Unit 1

**Drill (1)**
Complete the spaces in the following table by writing the suitable rate in front of each statement as in the example:

<table>
<thead>
<tr>
<th>The statement</th>
<th>The rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Symbolically</td>
</tr>
<tr>
<td>A car covers 240km in 3 hours</td>
<td>240/3 = 80 km/hour</td>
</tr>
<tr>
<td>A family spends LE350 in 7 days</td>
<td>..................</td>
</tr>
<tr>
<td>A secretary lady writes 320 lines within 4 hours</td>
<td>..................</td>
</tr>
<tr>
<td>A tap pours 360 litres of water in an hour</td>
<td>..................</td>
</tr>
<tr>
<td>A butcher sells 108 kg of meat within 9 hours</td>
<td>..................</td>
</tr>
</tbody>
</table>

**Drill (2)**
A restaurant’s owner prepares 80 food meals, all are of the same kind, using 20 kg of meat what is the rate of meat needed for preparing one meal. What is the rate of meat needed for preparing 4 meals.

**Exercise (1-5)**

1. Hassan spends LE 45 within three days what is the rate of what Hassan spends per day?
2. A car consumes 20 litres of petrol to cover a distance 250 km. Calculate the rate of consumption of the car to petrol.
3. A plough for agricultural land, ploughs 6 feddans within 3 hours. Find the rate of work of this plough. If another plough, ploughs 10 fedan within 4 hours. Which of them is better than the other.
4. A computer colour printer prints 12 paper each 4 minutes. Find the rate of work of this printer.
5. If Hazem studies 21 hours weekly, then find the rate of his studying daily.
6. A factory produces 6000 pieces of the soap in \(2 \frac{1}{2}\) hours, another factory produces 4500 pieces of the soap in \(1 \frac{1}{3}\) hours. Which factory has more production rate?
General exercises on unit 1

1. Write the ratio between the two numbers in each of the following cases in the simplest form:
   (a) 16 and 64
   (b) 15 and 105
   (c) 16 and 128

2. Write in the simplest form each of the following ratios:
   (a) 2.7 : 18.9
   (b) $\frac{9}{4} : 14.5$

3. Express in two different ways the ratio between each two numbers:
   (a) 14, 128
   (b) 2.4, 18
   (c) 185, 370

4. Write in the simplest form each of the following cases:
   (a) half km : 250 metres
   (b) 125 piasters : 5 pounds
   (c) 150 grammes : a quarter of a kilogram
   (d) 2.25 feddans : 16 kirats

5. Calculate: using the opposite two figures:
   The ratio between the number of circles in figure (A) to the number of circles in figure (B).
   the ratio between the number of circles in figure (B) to the number of all circles in the two figures (A) and (B).

6. An accountant in a bank earns LE 2000 as a monthly salary. He spends $\frac{3}{4}$ of his salary and saves the remainder. Find:
   (a) The ratio between what the accountant spends to his monthly salary.
   (b) The ratio between what he saves to his salary.
   (c) The ratio between what he spends to what he saves.

7. A factory produces 5000 juice cans in 8 hours find the production rate per hour.

8. A water tap is leaking 20 litres of water in 5 hours. Find the leaking rate of water per hour.
   Please advise them:
Unit 1

Technological activity

Calculating the ratio using Excel program

What do you learn from this activity
- Inserting a set of data in Excel cells
- Calculating the ratio between two numbers using the properties of Excel program

Example:
A rectangle, its length = 6 cm, its width = 4 cm calculate its perimeter and its area, then find:
- The ratio between the length of the rectangle and its width.

Practical steps:
1- Click (start) then select program, then select Micro soft Excel.
2- Write the following data in the curtained cells on the screen of Excel program.
3- To calculate the area of a rectangle, determine the cell F4 and write the following:
   (D4 x C4 = ) Then click (Enter) to get (24) which is the area of the rectangle as shown in the following figure.
4- To calculate the ratio between the length of the rectangle to its width, determine the two cells D6, C7 and write the following (D4 C4 / =)
   Then click (Enter) to get (1.5)
Activities:
(1) Cut off a rectangular piece of a card paper with length 28cm and width 16cm shown in the figure.

(a) Calculate the ratio between the length of the piece of paper and its width.
(b) Shears a square from the piece of paper with side length 16cm (figure A), then find:
  * The ratio between the perimeter of the square (figure A) and the perimeter of the whole paper.
  * The ratio between the area of figure (B) and the area of the square (figure A).
(c) Calculate the ratio between the side length of the square and the perimeter of figure (B).

(2) You went to grocery shop and you had LE 30. You asked the grocer about the price of one kg of rice, then he replied: The price is LE 3. Then you asked him about the price of one kg of sugar, he replied, the price of one kg of sugar = $\frac{3}{4}$ the price of one kg of rice then you bought 2 kg of rice, 4kg of sugar. Calculate each of the following:

* The price of one kg of suger.
* The ratio between the price of one kg of rice to the price of one kg of sugar.
* The ratio between what you paid to as a price of rice to what you paid as a price of sugar.
* The ratio between the remainder with you to what you spent.
(1) In an exam of mathematics in one class the ratio among the weak pupils to those who succeeded to the excellent pupils was \(1 : 4 : 1\). If the number of all pupils in the class was 30 pupils. Calculate the number of succeeded pupils and the number of weaked pupils.

(2) The ratio between the lengths of the sides of a triangle is \(2 : 3 : 4\). If the perimeter of the triangle is 54 cm, find the length of each side of the triangle.

(3) A ship for transporting goods among the countries. Consumes 25 litres of fuel to cover a distance 15km. Calculate the rate of consumption of fuel.

(4) Complete try getting the ratio in each of the following cases:
* \(250 \text{ gm} : \frac{1}{2} \text{ kg} = \ldots : \ldots\)
* \(16 \text{ kirat} : 1 \text{ feddan} = \ldots : \ldots\)
* \(2 \frac{1}{2} \text{ m} : 125 \text{ cm} = \ldots : \ldots\)
* \(8 \text{ hours} : 3 \frac{1}{3} \text{ days} = \ldots : \ldots\)

(5) If the ratio between the hight of Khalid to the hight of Ahmed is \(2 : 3\) and the ratio between the hight of Ahmed to the hight of Hani is \(4 : 5\). Calculate the ratio between the hight of Khalid to that of Hani.
Unit 2:

Proportion

Lesson (1) : The meaning of proportion
Lesson (2) : The properties of proportion
Lesson (3) : Drawing scale
Lesson (4) : Proportional division
Lesson (5) : Percentage
Lesson (6) : Applications on percentage
- General exercises on unit 2
- Technological activity
- Activities on unit 2
- Unit test
The meaning of proportion

Think and discuss:
If the price of one juice can is LE 2 in one of commercial shops.
What is the price of two cans?, 3 cans , 4 cans ......?
The following table shows the number of cans and the number of pounds representing their prices in each case.

<table>
<thead>
<tr>
<th>Number of juice cans</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>......</th>
</tr>
</thead>
<tbody>
<tr>
<td>The price in LE</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>......</td>
</tr>
</tbody>
</table>

It is shown from the table that

First: The number of pounds in each case is produced by multiplying each number of juice cans corresponding to it by 2.

In the first case:
The number of cans = 1 then the number of pounds = 1 × 2 = 2
In the second case 2 × 2 = 4
In the third case 3 × 2 = 6 and so on
we can write the ratio between the number of pounds to the number of juice cans in each case as follows

\[
\frac{2}{1} = \frac{4}{2} = \frac{6}{3} = \frac{8}{4} = \frac{10}{5} = \cdots \cdots = 2 \text{ constant value}
\]

We deduce that the ratios are all equal (This form is called a proportion)

Second
The number of juice cans in each case is produced by dividing the corresponding number of pounds by 2
or multiplying it by \( \frac{1}{2} \)
We can write the ratios between the number of juice cans to the number of pounds in each case as follows

\[
\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \cdots \cdots \text{(constant value)}
\]
We deduce that all ratios are equal
this form is called a proportion

From the previous we can define the proportion as follows.
The proportion is the equality of two ratios or more.

**Drill (1)**

If the price of one kg of apple is LE 8

Complete the following table. Then write some of forms of proportion:

<table>
<thead>
<tr>
<th>The weight of apple in kg</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>......</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>The price in pounds</td>
<td>8</td>
<td>40</td>
<td>48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Some forms of proportion are .......... = ...... = ....... = ...........

**Example (1):**

Complete the following table for the numbers in the first column if it is proportional with the corresponding numbers in the second column.

Then write some of forms of proportion

**Solution:**

To calculate the missed number in the second column in the third and fifth row we multiply the corresponding number to each of them by \( \frac{3}{2} \) to be

\[
6 \times \frac{3}{2} = \frac{6}{2} \times 3 = 3 \times 3 = 9,
\]

\[
10 \times \frac{3}{2} = \frac{10}{2} \times 3 = 5 \times 3 = 15
\]

To calculate the missing number for the first column in the second and the fourth row, we divide the corresponding number to each of them by \( \frac{3}{2} \) i.e. multiply \( \times \frac{2}{3} \) to be

\[
6 \times \frac{2}{3} = \frac{6}{3} \times 2 = 2 \times 2 = 4
\]

\[
12 \times \frac{2}{3} = \frac{12}{3} \times 2 = 2 \times 4 = 8
\]

After completing the table the proportion will be

\[
\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15}
\]

Some form of proportion: \( \frac{2}{3} = \frac{4}{6} \)

\[
\frac{2}{3} = \frac{6}{9} = \frac{10}{15}, \quad \frac{2}{3} = \frac{4}{6} = \frac{8}{12}
\]
Drill (2)

Complete the following table for the corresponding numbers if the two rows of the table are proportional, then write some forms of proportion.

<table>
<thead>
<tr>
<th>3</th>
<th>6</th>
<th>......</th>
<th>15</th>
<th>......</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>......</td>
<td>12</td>
<td>......</td>
<td>28</td>
</tr>
</tbody>
</table>

Exercise (2 - 1)

1. Complete the opposite diagram for the corresponding numbers in the two columns of the table are proportional, then complete the form of proportion below the columns.

\[
\frac{4}{16} = \ldots = \ldots = \ldots = \ldots
\]

2. Complete the opposite diagram for the corresponding numbers in the two columns are proportional then complete the form of proportion below the columns and write some forms of proportion.

\[
\frac{6}{15} = \ldots = \ldots = \ldots = \ldots
\]

3. Complete the opposite diagram for the corresponding numbers in the two columns are proportional, then write some of forms of proportion.

\[
\ldots = \ldots = \ldots = \ldots = \ldots
\]
Properties of proportion

What do you learn from this lesson?
Through your active participating you will come to:
- determine the properties of proportion.
- determine the terms of proportion
- determine the two extremes and the two means of any proportion
- find a missed term of proportion using the other given terms

Notice and think through the following figures:

\[
\frac{2}{3} = \frac{8}{12} \quad \frac{21}{33} = \frac{7}{11}
\]

In the first case
We multiply the two terms of the ratio \( \frac{2}{3} \) by 4 to get the proportion
\[
\frac{2}{3} = \frac{8}{12}
\]

In the second case
We divide the two terms of the ratio \( \frac{21}{33} \) by 3 to get the proportion
\[
\frac{21}{33} = \frac{7}{11}
\]

From the previous we deduce the following property.

We can form a proportion if we have a ratio as follows:
- By multiplying the two terms of the ratio by a non-zero number then the resultant ratio is equal to the first one (i.e. we get a proportion)
- Also by dividing the two terms of the given ratio by a non-zero number then the resultant ratio is equal to the first one (i.e. we get a proportion)

Notice that:
In the first case the proportion:
\[
\frac{2}{3} = \frac{8}{12}
\]

The numbers 2, 3, 8 and 12 are called proportional numbers.
The terms of proportion is called as shown in the opposite figure.

The two terms \((2, 12)\) are called the extremes and the two numbers \((3, 8)\) are called the means as shown in the opposite diagram.

\[
2 : 3 = 8 : 12
\]
Drill (1) Notice and complete the following table as in the example

<table>
<thead>
<tr>
<th>Proportion</th>
<th>Terms of proportion</th>
<th>Extremes</th>
<th>Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{1}{4} = \frac{7}{28}$</td>
<td>$1, 4, 7, 28$</td>
<td>$1, 28$</td>
<td>$4, 7$</td>
</tr>
<tr>
<td>$\frac{2}{6} = \frac{6}{18}$</td>
<td>$2, \ldots, 28$</td>
<td>$2, \ldots$</td>
<td>$6, \ldots$</td>
</tr>
<tr>
<td>$\frac{5}{20} = \frac{20}{28}$</td>
<td>$5, 7, \ldots, \ldots$</td>
<td>$5, \ldots$</td>
<td>$\ldots, \ldots$</td>
</tr>
</tbody>
</table>

Drill (2) A library owner sells the colours case for LE 3 complete the opposite diagram of sails.
Then write some of forms of proportion
The proportion is $\ldots = \ldots = \ldots = \ldots = \ldots$

Activity: Think and deduce

<table>
<thead>
<tr>
<th>Proportion</th>
<th>The product of extremes</th>
<th>The product of means</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{3}{5} = \frac{9}{15}$</td>
<td>$3 \times 15 = 45$</td>
<td>$5 \times 9 = 45$</td>
</tr>
<tr>
<td>$\frac{7}{4} = \frac{28}{16}$</td>
<td>$7 \times 16 = 112$</td>
<td>$4 \times 28 = 112$</td>
</tr>
<tr>
<td>$\frac{2}{3} = \frac{24}{36}$</td>
<td>$2 \times 36 = 72$</td>
<td>$3 \times 24 = 72$</td>
</tr>
</tbody>
</table>

Compare between the produce of extremes and the product of means in each proportion and show what you deduce.
You will deduce the following property
If two ratios are equal then
The product of the extremes $=$ the product of the means

Drill (2) Determine which of the following ratios in each case represents a proportion (take the first case as a hint for you).

(1) $\frac{2}{5} : \frac{6}{15}$ represents a proportion because
$2 \times 15 = 30$ and $5 \times 6 = 30$
i.e. The product of the extremes $=$ the product of the means
(2) \( \frac{6}{7} \cdot \frac{18}{21} \) ...... Because \( \ldots \cdot \ldots = \ldots \cdot \ldots = \ldots \) 

i.e. The product of the extremes \( \ldots \). The product of the means.

(3) \( \frac{20}{40} \cdot \frac{4}{8} \) ...... because \( \ldots \cdot \ldots = \ldots \ldots \cdot \ldots \ldots = \ldots \ldots \) 

i.e. The product of \( \ldots \) the extremes \( \ldots \). The product of the means.

**Example (1):**

Find the missed term denoted by \( x \) in the following proportion 
\[
\frac{2}{6} = \frac{10}{x}
\]

**Solution**

We can determine the missed term \( x \) by two methods as follows:

First using the correspondence between numbers in rows and columns

(a) by using the correspondence between numbers in rows

**First row** 2, 10  
**Second row** 6, \( x \)

We notice that 2 became 6  
i.e. it is multiplied by 3  
Therefore multiply 10 by 3 to get  
\( x = 10 \times 3 = 30 \) then the proportion  
because \( \frac{2}{6} = \frac{10}{30} \)

(b) Using the correspondence between the numbers in columns

**First column**  
\[
\begin{array}{c}
2 \\
6
\end{array}
\]

**The second column**  
\[
\begin{array}{c}
10 \\
x
\end{array}
\]

We notice that 2 became 10  
i.e. it is we multiply 6 by 5 to get \( x = 6 \times 5 = 30 \) then  
the proportion becomes \( \frac{2}{6} = \frac{10}{30} \)

**Second:** by using the property of proportion which is the product of extremes = the product of means  
since \( \frac{2}{6} = \frac{10}{x} \) Then we get \( 2 \times x = 6 \times 10 \)  
dividing by 2 for the two sides  
\[
\frac{2 \times x}{2} = \frac{6 \times 10}{2}
\]
We get \( x = \frac{60}{2} = 30 \)  
Then the proportion becomes \( \frac{2}{6} = \frac{10}{30} \)
Unit 2

Example (2):
If the numbers 4, x, 12, 18 are proportional find the value of x

Solution:
Since the numbers are proportional
Therefore we can put it in the form of a proportion which is
\[
\frac{4}{x} = \frac{12}{18}
\]
Using the property of proportion which is the product of the extremes = the product of the means we get
\[
12 \times x = 18 \times 4 \quad \text{dividing by 12}
\]
\[
\frac{12 \times x}{12} = \frac{18 \times 4}{12} \quad \text{we get} \quad x = \frac{18}{3} \times 6
\]
Then we can write the proportion in the form:
\[
\frac{4}{6} = \frac{12}{18}
\]

Example (3):
In a shop for selling juice. 2 kg of orange have been squeezed to get 6 glasses of orange juice to clients If 5 kg of orange have been squeezed, how many glasses of juice will be gotten to offer to clients and how many kg of oranges are needed to get 27 glasses of orange juice to the clients?

Solutions:
Such these type of problems can be solved through representing their data in a table as follows.

<table>
<thead>
<tr>
<th>The weight in kg</th>
<th>2</th>
<th>5</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of glasses</td>
<td>6</td>
<td>x</td>
<td>27</td>
</tr>
</tbody>
</table>

First:
We can get the value of x regarding 2, 6, 5 and x (4 proportional terms)

Then the proportion is in the form
\[
\frac{2}{6} = \frac{5}{x}
\]
(from the property of proportion)
(diving by 2)
\[
\frac{2 \times x}{2} = \frac{5 \times 6}{2} \quad \text{then we get} \quad x = \frac{30}{2} = 15 \text{ glasses and the proportion is in the form}
\]
\[
\frac{2}{6} = \frac{5}{15}
\]
Second:
We can get the value of $y$ regarding $2, 6, y, 27$ are four proportional terms therefore the proportion is $\frac{2}{6} = \frac{y}{27}$ (from the property of proportion).
Then $6 \times y = 2 \times 27$ dividing by $6$

$$\frac{6 \times y}{6} = \frac{2 \times 27}{6}$$
we get $y = \frac{2 \times 27}{6} = \frac{9}{6}$

the proportion is in the form $\frac{2}{6} = \frac{9}{27}$

**Exercise (2-2)**

1. Find $x$ in each of the following proportions
   
   $$(a) \quad \frac{5}{8} = \frac{15}{x} \quad \quad (b) \quad \frac{x}{6} = \frac{20}{30}$$

2. Find the missed number ($x$) for the following numbers to be proportional $6, 8, 3, x$.

3. Ali bought 5 kg of orange, he paid LE 15. How much money does he pay to buy 8 kg?

4. A car consumms 20 litre of Benzin for covering 210 km, How many litre of Benzin does the car consumm to cover 630 km.

5. The ratio between Hany's weight to the weight of his father = 3 : 5
   What is Hany's weight if the weight of his father is 90 kg.

6. A primary school, its building height is 14 metre and the shade of this building at a certain moment is 5m length. What is the height of a tree in the same moment if its shade length is 3 metres?
3 Drawing Scale

What do you learn from this lesson?
Through your active participation you will come to:
- the meaning of drawing scale
- how to calculate the drawing scale in different cases
- the relation between minimization and enlargement with drawing scale
- how to calculate the real length of a thing
- how to calculate the drawing length of a thing.

Mathematical concept
- the real length
- the drawing length
- the drawing scale
- minimization
- enlargement

The meaning of drawing scale
Think and discuss
Khalid made a party for his birthday. During the party, some photo pictures were taken to him and his companies. Afterwards, Khalid measured his length in the picture to be 15cm, while the real length is 150cm that means that 15cm in the picture represents 150cm in reality.

i.e. the ratio between the length of Khalid in the picture to his real length is

\[ 15 : 150 = 1 : 10 \]

i.e. each one cm in the picture represents 10cm in reality.

That means that

\[
\frac{\text{The length of Khalid in the picture}}{\text{The real length of Khalid}} = \frac{15}{150} = \frac{1}{10}
\]

This ratio is called (the drawing scale)

\[ i.e. \text{ the drawing scale} = \frac{\text{The drawing length}}{\text{The real length}} \]

Example (1):
An engineering design for a villa is made. If the height of the fence of the villa in the design is 5cm and its real height is 3 metres find the drawing scale.

Solution:
We should convert the two heights to the same unit.
The height of the fence in the picture = 5 cm
the real height of the fence = 3 m = 3 × 100 = 300 cm
The drawing scale = the drawing length ÷ the real length = $\frac{5}{300} = \frac{1}{60}$
That means that each 1 cm in the drawing represents 60 cm in reality.

Example (2):
Adel took a magnified picture with a camera.
If the length of an insect in the picture is 10 cm and its real length is 2 mm.
Find the drawing scale.

Solution:
We should convert the two lengths to the same length unit
The real length of the insect = 2 mm
The length in the drawing = 10 cm × 10 = 100 mm

The drawing scale = \frac{The drawing length}{The real length} = \frac{100}{2} = \frac{50}{1}

This means that each 50 mm in the drawing represent 1 mm in reality.

Remark:
Now we have a drawing scale less than one which is $\frac{1}{10}$ as in the case of the picture of Khalid and $\frac{1}{60}$ as in the design of the villa. And we have a drawing scale greater than one which is (50 : 1) as in the case of the magnified picture of the insect.

We deduce that:
* If (the drawing scale < 1) this expresses minimization as in the designs of engineering establishments – Maps of countries – pictures of persons or places. …. etc.
* If (the drawing scale > 1) this expresses enlargement as in the case of the picture of the insect – magnifying the picture of a person …… etc.
**Unit 2**

**Example (3)**

If the drawing scale which is registered on a map of some inhabitant’s cities is $1 : 500000$ and if the distance between two cities on this map is $3\text{cm}$. Find the real distance between them.

**Solution:**

Since the drawing scale $= \frac{\text{The length in the drawing}}{\text{The length in reality}}$

That means: $\frac{1}{500000} \times 3 = \frac{3}{500000}$

And from the property of proportion

The product of the extremes $= \text{The product of the means}$

We get

The length in reality $\times 1 = 3 \times 500000$

The length in reality $= 1500000$

And converting the answer into Km

We get

The length in reality $= \frac{1500000}{100000} = 15$ km

**Drill**

In a mapping picture for some cities is drawn by a drawing scale $1 : 400000$. If the real distance between two cities is $46$ km Find the distance between them on the map

We notice from the previous that

The problems which are connected with the drawing scale are determined in three kinds they are:-

First kind:- Calculating the drawing scale

(as in examples 1, 2)

Second kind:- Calculating the real length

(as in examples 3)

Third kind :- Calculating The drawing length

(as in The drill)
Proportion

Exercise (2 - 3)

1. A picture of a building is taken with a drawing scale of 1 : 1000. If the height of the building in the picture is 3 cm, what is its real height?

2. Ahmed draw a picture to his brother Osama with a drawing scale 1 : 40. If the real height of Osama is 160 cm, What is his height in the picture?

3. A magnified picture of an insect was taken with enlargement ratio 100:1. If the length of the insect on the picture is 2.5 cm, what is the real length of the insect?

4. If the distance between two cities on a map is 3 cm, and the real distance between them is 9 km. Find the drawing scale of the map. Then, if the distance between two cities on the same map is 5 cm, calculate the real distance between the two cities.

5. Complete the following table.

<table>
<thead>
<tr>
<th>Description of the case</th>
<th>Drawing scale</th>
<th>Drawing length</th>
<th>Real length</th>
<th>Enlargement minimization</th>
</tr>
</thead>
<tbody>
<tr>
<td>The distance between two squares on a map of a town</td>
<td>1:50000</td>
<td>2 cm</td>
<td>..................</td>
<td>..................</td>
</tr>
<tr>
<td>The length of a playground of a picture of sport playgrounds</td>
<td>1:3600</td>
<td>..................</td>
<td>12 m</td>
<td>..................</td>
</tr>
<tr>
<td>The height of a house on a picture of a quarter</td>
<td>..................</td>
<td>3 cm</td>
<td>18 m</td>
<td>..................</td>
</tr>
</tbody>
</table>

6. A rectangular piece of land of area 1200 m² is drawn with a drawing scale 1:200, if its length in drawing is 20 cm find:
   (a) the real length of the hand
   (b) the real width of the hand

7. If the length of the Suez canal on a map of drawing scale 1:1100000 is 15 cm, find its real length in kilometers.
The proportional division

The meaning of proportional division
Read and think Then discuss Through the following examples

Example 1
A father distributed LE 600 between his sons Maged and Ramez at the beginning of The school year to buy the school uniform in ratio 5:7
What is the share of one of them?

Solution
Magid's share : Ramez's Share
\[
\frac{5}{7}
\]
\[\text{i.e the Sum of parts of distributing the sum} = 5 + 7 = 12 \text{ parts}\]
\[\text{i.e The value of each part} = \frac{600}{12} = \text{LE 50}\]
Magid's Share = \(5 \times 50 = \text{LE 250}\)
Ramez Share = \(7 \times 50 = \text{LE 350}\)

Notice That: In this example the sum of money is distributed by a given ratio 5:7 between two persons. Such as this division called proportional division.

Example 2
A man died and left a piece of land for building, its area is 17 kirats.
We recommended for building an orphan house on area equals 5 kirats. The remainder is distributed between his son and his daughter in the ratio 2:1. Calculate the share of each of them from the land.

Solution
The remainder = 17 - 5 = 12 kirat

The son's share : The daughter's share
\[
\frac{2}{1}
\]
\[\text{i.e the Sum of parts in which the remained land will be distributed} = 3 \text{ parts}\]
that means 12 kirat equal 3 parts
Proportion

i.e the value of each part = $\frac{12}{3} = 4$ kirats
The son's share = $4 \times 2 = 8$ kirats
The daughter's share = $4 \times 1 = 4$ kirats

Notice that in this example, the area of the land has been distributed by a given ratio 2:1
Such as this division is called proportional division.

From the previous we deduce that
The proportional division
Is dividing a thing (money, lands, weights, ....)
With a given ratio

Example 3
The number of pupils in the grades four, five, and six) in a primary school is 399 pupils. If the number of the pupils of the fourth grade equals $\frac{4}{3}$ the number of pupils of the fifth grade and the number of pupils of the fifth grade equals $\frac{6}{5}$ the number of pupils of the sixth grade calculate the number of pupils of each grade.

Solution
The problem will be solved by getting the ratio among the three grades.
Using the idea of L.C.M of (3 and 6) which is 6 we will get that the sum of parts = $8 + 6 + 5 = 19$ parts
That means that 399 pupils equate 19 parts
i.e The value of each part = $\frac{399}{19} = 21$ pupils
The number of pupils of fourth grade = $8 \times 21 = 168$ pupils
The number of pupils of fifth grade = $6 \times 21 = 126$ pupils
The number of pupils of fourth grade = $5 \times 21 = 105$ pupils
Notice that solution is carried out by the idea of L.C.M to get the ratio among three numbers and the solution is completed as previous.

verifying the truth of the solution
You can check the truth of your solution as follows

The number of pupils of 4th grade = $\frac{168}{84} = \frac{12}{9} = \frac{4}{3}$
The number of pupils of 5th grade = $\frac{126}{63} = \frac{9}{3}$
The number of pupils of 5th grade = $\frac{126}{6}$
The number of pupils of 6th grade = $\frac{105}{5}$
Example 4
Three persons participated in a commercial (project) with capital LE 60000. The first paid LE 15000, The second paid LE 25000 and the third paid LE 20000 At the end of the year, the profit was LE 5520 Calculate the share of each of them.

Solution

<table>
<thead>
<tr>
<th>What the 1st paid</th>
<th>what the 2nd paid</th>
<th>what the 3rd paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>15000</td>
<td>25000</td>
<td>20000</td>
</tr>
<tr>
<td>15 : 25</td>
<td>20 : 4</td>
<td></td>
</tr>
<tr>
<td>3 : 5</td>
<td>4 : 4</td>
<td></td>
</tr>
</tbody>
</table>

The sum of parts = 3 + 5 + 4 = 12 parts
That means that
LE 5520 equate 12 parts
The value of each part = \( \frac{5520}{12} \) = LE 460
The share of the First = \( 3 \times 460 = LE 1380 \)
The share of the second = \( 5 \times 460 = LE 2300 \)
The share of the Third = \( 4 \times 460 = LE 1840 \)

In the project

Verifying the truth of the solution

You can check the truth of the solution as follows

<table>
<thead>
<tr>
<th>The share of the first</th>
<th>The share of the second</th>
<th>the share of the third</th>
</tr>
</thead>
<tbody>
<tr>
<td>1380</td>
<td>2300</td>
<td>1840</td>
</tr>
<tr>
<td>138 : 230</td>
<td>184 : 4</td>
<td></td>
</tr>
<tr>
<td>6 : 10</td>
<td>8 : 4</td>
<td></td>
</tr>
<tr>
<td>3 : 5</td>
<td>4 : 4</td>
<td></td>
</tr>
</tbody>
</table>

These are the same ratio among. The paid money by each person

Example 5

A load of apple fruit weighs 280 kg. is distributed among three merchants.

The share of the first = \( \frac{2}{3} \) the share of the second and the share of the second = \( \frac{4}{5} \) the share of the third.

Calculate the share of each of them from this load.
Solution

The share of the 1\textsuperscript{st} : The share of the 2\textsuperscript{nd} : the share of the 3\textsuperscript{rd}

\[
\begin{array}{ccc}
2 & : & 3 \\
4 & : & 5 \\
8 & : & 12 & : & 15
\end{array}
\]

Notice that (L.C.M) of (3,4) is 12 therefore

The sum of parts = 8 + 12 + 15 = 35 parts

That means

280 kg equate 35 parts

i.e The value of each part = \( \frac{280}{35} = 8 \) kg

The share of the first = 8 \times 8 = 64 kg.

The share of the second = 12 \times 8 = 96 kg

The share of the third = 15 \times 8 = 120 kg

Verifying the truth of the of solution you can check the truth of the solution as follows.

<table>
<thead>
<tr>
<th>The share of the first</th>
<th>the share of the second</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>96</td>
</tr>
<tr>
<td>32</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

(divided by 2)

(dividing by 16)

This is the given ratio.

<table>
<thead>
<tr>
<th>The share of the second</th>
<th>the share of the third</th>
</tr>
</thead>
<tbody>
<tr>
<td>96</td>
<td>120</td>
</tr>
<tr>
<td>48</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

(dividing by 2)

(dividing by 12)

This is the given ratio.

Drill

Hoda, Mona and Thanaa participated in a commerce. Hoda paid LE 1500, Mona paid LE 2000 and Thanaa paid LE 2500. At the end of the year the loss of the company was LE 1200 Find the share of each of them from loss.
Exercise (2-4)

1. A piece of building land is distributed between two brothers in the ratio 7:5. If the share of the first one exceeds the share of the second by 80 square metre. Find the area of the land and the share of each of the first and the second.

2. The number of pupils of a primary school in the 1st, the 2nd and the 3rd grades is 240 pupils. If the ratio among the three grades is 5:4:3. Calculate the number of pupils in each grade.

3. A father distributes LE 225 among his three sons. The share of the first was third of the sum and the ratio between the share of the second and the share of the third was 2:3. Find the share of each of them.

4. For solving the illiteracy problem at a village, 3 classes have been opened for solving this problem, the number of learners was 92 Person.

   If the number of learner in the 1st class = \( \frac{2}{3} \) the number of learners in the 2nd class and the number of learners in the 2nd class = \( \frac{5}{7} \) the number of learners in the 3rd class.

   Find the number of learners in each class.

5. In one of our schools, there are 560 students, if the number of girls = \( \frac{3}{5} \) the number of boys find each of the number of boys and girls?
5  **Percentage**

Notice and think
The opposite figure represents a big square divided into 100 small squares, all of them are equal in side length.
The ratio between the shaded part by green colour to the big square $= \frac{28}{100}$ or $28:100$
Notice that the first term in this ratio is 28 and the second term of the ratio is 100 such as this ratio is called a percentage and it is written in the form $28\%$ and it is read 28 percent.

From the previous we deduce that
The percentage is a ratio its second term is 100 and it is denoted by $\%$

Notice from the figure that
The ratio of the unshaded part $= 72\%$ and it is read as 72 percent
The ratio of the shaded part and the unshaded part $28\% + 72\% = 100\%$

**Drill**
Write the percentage which expresses the shaded part and that which represents the unshaded part below each figure

- The percentage of the Shaded part $= \ldots \ldots$
The percentage of the unshaded part $= \ldots$

- The percentage of the shaded part $= \ldots$
The percentage of the unshaded part $= \ldots$

- The percentage of the shaded part $= \ldots$
The percentage of the unshaded part $= \ldots$
Remarks from life

- When you enter a bank or post office and you read the statement. The interest of the saving card is 10% in the year.
  That means that each LE 100 has an interest or profit = LE 10 so the total amount = EL 110. That because the interest (10LE for each LE 100) is calculated as follows $\frac{10}{100} \times 100 = LE 10$ which is add to the sum LE 100.
- When you read the statement (The percentage of the discount is 30%) in a commercial shop. That means that.
  Each LE 100 has a discount = LE 30 and you pay to the shop LE 70 only. That because the percentage of discount (30LE for each LE 100) is calculated as follows $\frac{30}{100} \times 100 = LE 30$ which is discounted from each LE 100 as paying
- When you read on a piece of clothes the following statement (the ingredients 45% wool, 25 % cotton 30% synthetic) that means that the sum of all these ingredients = 45% + 25% + 30% = 100%

Remark
100 % of amount = The all amount.
It means $\frac{100}{100}$ from the amount
  = the total unit of the amount
  i.e the total amount.
  i.e the total amount.

Drill (1)
Explain the meaning of the following statements
- The discount on purchases 22%
- The interest on saving money = 9.5%
- The ingredients 100% Cotton
- The ingredients 55% wool and the remainder is synthetic

Drill (2)
Calculate the paid money for the following purchases in a company.
Which offer discounts or its sails
1. A shirt, its price is LE 65 and the discount is 15%.
2. An Iron, its price is LE 120 and the discount is 20%
3. A computer, its price is LE 2700 and the discount is 9%.
Converting a percentage into a common fraction or a decimal.

Example 1
In a class the number of bogs was 35% from the total number of pupils.
- What is the percentage of girls?
- Convert each of the previous percentage into a common fraction then to a decimal.

Solution
- The percentage of girls = 100% - 35% = 65%
- Converting the percentage into a common fraction
  The percentage of boys is 35% = \( \frac{35}{100} = \frac{7}{20} \) (common fraction)
  The percentage of girls is 65% = \( \frac{65}{100} = \frac{13}{20} \) (common fraction)
- Converting the percentage into a decimal
  The percentage of boys is 35% = \( \frac{35}{100} = 0.35 \) (a decimal)
  The percentage of girls is 65% = \( \frac{65}{100} = 0.65 \) (a decimal)

Drill (3)
An agricultural piece of land. The cultivated part of it by vegetable is 40%
Convert this percentage to common fraction and to decimal.

Converting a common fraction or a decimal into percentage

Example 2
In a village the ratio between the not educated people to those who are educated is 4 : 25
Write this ratio in the form of a percentage
Solution

4:25 is equivalent to \( \frac{4}{25} \)

To convert \( \frac{4}{25} \) to a percentage we should make the second term in this ratio = 100 This will be multiplying the two terms by 4 .

\[
i.e \frac{4}{25} = \frac{4}{25} \times \frac{4}{4} = \frac{16}{100} \quad i.e \quad 16\%
\]

Drill (4)

Convert each of the following Common fractions into percentage as the first case

a) \( \frac{3}{4} \)  

Solution

\[
\frac{3}{4} = \frac{3}{4} \times \frac{25}{25} = 75 \%
\]

b) 0.12 = \( \vdots \) = \( \vdots \)%

c) 0.625 = \( \frac{625}{1000} \times \vdots \)
= \( \vdots \times \frac{\vdots}{\vdots} = \vdots \)%

Example 3

In an English exam, Adel scored 13 marks from 20 marks find the percentage of the scored mark of Adel in English.

Solution

The mark of Adel in the exam = \( \frac{13}{20} \)

The percentage of Adel's mark = \( \frac{13}{20} \times \frac{5}{5} = \frac{65}{100} = 65\% \)
1. In a school trip, 12 pupils from 25 pupils in a class have participated in finding the percentage of the participant pupils.

2. Complete the following table as in the example

<table>
<thead>
<tr>
<th>The fraction</th>
<th>The percentage</th>
<th>The symbol</th>
<th>Verbal expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>$\frac{75}{100}$</td>
<td>75%</td>
<td>75 percent</td>
</tr>
<tr>
<td>0.06</td>
<td>.................</td>
<td>............</td>
<td>6 percent</td>
</tr>
<tr>
<td>.............</td>
<td>.................</td>
<td>............</td>
<td>.................</td>
</tr>
<tr>
<td>$\frac{11}{25}$</td>
<td>.................</td>
<td>............</td>
<td></td>
</tr>
</tbody>
</table>

3. Magid bought a T-shirt, labelled on a small card on it (made of cotton and synthetic). The percentage of the synthetic 40% only calculate the percentage of cotton then find the equivalent fraction to each percentage.

4. If the percentage of the number of girls in a class which is mixed is 67% find the percentage of the number of boys in this class.

5. In a conditioned carriage in a train the number of occupied seats is 48 seats if the number of seats of the carriage is 60 seats. calculate.
   a) The percentage of the occupied seats.
   b) The percentage of the empty seats related to the number of occupied seats.
6

Applications on the percentage

What do you learn from this lesson?
Through your active participating you will come to:
How to calculate the interest, discount, given the percentage of each of them.
How to calculate the percentage of the profit or loss given the value of each of them.
How to calculate the selling price given the buying price and the percentage of profit or loss how to calculate the buying price given the selling price and the percentage of profit or loss.

First: Calculating the interest or discount.

Example 1
Sara deposit LE 9000 in a bank.
The percentage of interest is 11% per year.
What is the amount of this sum after one year.

Solution
The deposit sum = LE 9000
the interest = \( \frac{11}{100} \times 9000 = \) LE 990

The amount of the sum after one year = the sum + the interest
= 9000 + 990 = 9990 pounds

Example 2
In one of commercial shops the percentage of the discount on sails is 20%. If Ahmed bought a trousers,
The price written on it was LE 80 find what Ahmed paid after the discount.

Solution
The essential price of the trousers = LE 80
The discount = \( \frac{20}{100} \times 80 = \) LE 16

What Ahmed paid = The essential price – The discount
= 80 – 16 = LE 64

Drill (1)

In one of commercial shops, the milk box is bought for LE 10. If you bought two boxes there would be a discount = 15 % for every two boxes. Calculate the buying price of 6 boxes of milk.

Is the saved money enough to buy any boxes of milk?
Second
Calculating the percentage of profit or loss

Important remarks
- The profit means = Selling price – (buying price + costs)
- The loss means = (buying price + other costs) – selling price

Example 3
Auto fair owner bought a car for LE 45000 Then he spent LE 5000 for repairing it Then he sold it for 55000 pounds Calculate the percentage of profit.

Solution
The original price of the car = LE 45000
The Costs of repairing it = LE 5000
The profit after selling = The selling price
- ( The baying price + Cost price)
= 55000 – (45000 + 5000)
= 55000 – 50000 = LE 5000
The Percentage of the profit = \( \frac{5000}{50000} = \frac{5}{50} = \frac{10}{100} = 10\% \)

Example 4
A fruit seller bought a load of fruit for LE 20000 After buying it he found a bad part of it because of miss – shopping.
He bought the remainder for LE 18000 find the percentage of his loss.

Solution
The original price of fruit = LE 20000
The selling price = LE 18000
i.e the loss = 20000 – 18000 = 2000 pounds
the percentage of loss = \( \frac{2000}{20000} = \frac{1}{10} \times \frac{100}{100} \)
= 10 %
Third :- Calculating the selling price and the buying price

Example 5

Find the buying price of goods sold for LE 21520 and the percentage of profit is 15% and find the profit.

Solution

<table>
<thead>
<tr>
<th>Buying price</th>
<th>profit</th>
<th>selling price</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>15</td>
<td>115 (number of parts)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21520 (values in pounds)</td>
</tr>
</tbody>
</table>

Since the buying price = \frac{100}{115} \times \text{the selling price}

\frac{100}{115} \times 21520 \approx \text{LE 18713}

The profit = \text{selling price} - \text{buying price}

= 21520 - 18713 = \text{LE 2807}

Drill (2)

Complete the following table.

<table>
<thead>
<tr>
<th>The kind</th>
<th>Buying price</th>
<th>Selling price</th>
<th>profit</th>
<th>Percentage of profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td>1800</td>
<td>2000</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>2400</td>
<td>_</td>
<td>_</td>
<td>12%</td>
</tr>
<tr>
<td>Washing maching</td>
<td>_</td>
<td>3100</td>
<td>175</td>
<td>_</td>
</tr>
</tbody>
</table>

Drill (3)

Heba bought an electric sweeping machine for LE 220, if the discount is 15% Calculate the original price of the sweeping machine before discount.

Drill (4)  Complete the following table.

<table>
<thead>
<tr>
<th>The original price</th>
<th>Percentage of discount</th>
<th>Discount</th>
<th>The price after discount</th>
</tr>
</thead>
<tbody>
<tr>
<td>560</td>
<td>10%</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>_</td>
<td>15%</td>
<td>45</td>
<td>_</td>
</tr>
<tr>
<td>_</td>
<td>_</td>
<td>32</td>
<td>192</td>
</tr>
</tbody>
</table>
Exercise (2 - 6)

1. Calculate the paid value in each of the following purchases in a company which offers discounts on its sales:
   1. A shirt with price LE 65 at 15% discount.
   2. An iron with price LE 120 at 20% discount.
   3. A computer with price LE 2700 at 9% discount.

2. Khaled bought a flat for LE 150000. He sold it at 5% loss. Calculate the selling price of the flat.

3. In a shop, the original price of a blouse was LE 120 and the original price of a dress was LE 350. Hoda bought them at 15% discount. Calculate what Hoda paid after discount.

4. A merchant bought a quantity of frozen meat for LE 200000. After buying it, he found that a part of it was expired due to bad storing. He sold the rest for LE 180000. Find the percent of loss.

5. If the cost price of a set of electric appliances is LE 72000 and it is sold at 12% profit, calculate the selling price.
General exercises on unit 2

1. Complete the following table for the corresponding numbers in the two rows of the table are proportional. Then write some form of this proportion.

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>5</th>
<th>......</th>
<th>8</th>
<th>......</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>......</td>
<td>36</td>
<td>......</td>
<td>60</td>
</tr>
</tbody>
</table>

2. Find the number $x$ in each of the following cases
   
   a) \( \frac{2}{7} = \frac{8}{x} \)
   
   b) If the numbers 9, 21, 3 and $x$ are proportional
   
   c) \( \frac{x}{9} = 15\% \)

   d) \( \frac{x + 18}{9} = 8 \)

3. If the distance between two cities on a map is 10 cm, the real distance between them is 120 km. Find the drawing scale of the map. And if the distance between two other cities on the same map is 6 cm calculate the real distance between them.

4. A picture was take to an artificial scene with a drawing scale 1:100. If the real length of a tree is 8 meter find its length in the picture.

5. Two persons started a commercial business the first paid LE 5000 and the second paid LE 8000. At the end of the year the profit was LE 3900. Calculate the share of each of them from the profit.

6. A company for selling the electric sets It shows T.V for LE 2100. If the percentage of the profit is 12% find the buying price of t.v
A technological activity

The subject of the activity
Converting the decimal to a percentage using Excel programme.

What do you learn from this activity?
- Open Excel programme through the computer.
- Entering data through Excel programme.
- Converting the decimal into a percentage using the properties of Excel programme

An example:-
Convert each of the following decimals into a percentage

(a) 0.26  
(b) 0.058

Practical procedure.
1- Click (start) then select program them select Microsoft Excel.
2- Write the following data in the determined cells on the screen of the program as in the flowing figure:
3- To calculate the percentage of the decimal (0.26) determine the cell D4 and write the following (100/B4 100= )
   Then click (Enter) then the result will appear to 26%
To calculate the percentage of the decimal 0.085, determine the cell D5 and write the following (100/B5 x 100 = ) then click (Enter) to appear the result (5.6%) as show in the following figure.
1- A triangular garden in a school the ratio between its sides lengths is 3:4:5. If the perimeter of the garden is 120 meter. Calculate the lengths of the sides of the garden.

2- Hani travelled with his father from Cairo to Esmaelia. He has a map for Egyptian governorates. His father asked him to measure the distance between the two governorates on the map he found it 1.3cm then he asked the driver about the real distance between the two governorates, he replied 130 km.

Calculate the drawing scale of the map which is with Hani.

3- The opposite figure ABCD is a rectangle in which \( AB = 8 \) cm, CHEF is a square of side length 6 cm. If \( \frac{CH}{HB} = \frac{2}{3} \) find:

(a) the length of AD
(b) A perimeter shaded part of the figure
(c) the ratio between the area of the square to the area of the rectangle
(d) Area of the shaded part (use more than one way).

4- A picture of a butterfly its length of 42mm. has been enlarged so that become a length \( X \) mm. width 6.3 mm find

The magnifying ratio, the value of \( X \) in cm.

---

**The test of the unit**

1- Find the missed number \( x \) if the numbers 3, 4, 9, \( x \) are proportional

2- Write in the form of a common fraction in its simplest form each of the following.

\[ 33\% , \ 12.5\% , \ 75\% \]

3- The number of pupils of grades first, second and third in a primary school is 480 pupils. If the ratio among the number of pupils in the first grade to those of second grade to those of third grade is \( 6 : 5 : 4 \)

Calculate the number of pupils in each grade.

4- Nahed bought an automatic washing machine for LE 3600 and the discount was 10% Calculate the original price of the washing machine. Before discount.

5- An edifice of height 12 meters. It’s shade at a moment was 4 meters. What is the height of a tree neighboured to the edifice if its shade = 2 meter long at the same moment.

6- Hani, Khaled and Fady shared a commercial business, Hani, paid LE 30000, Khaled paid LE 40000 and Fady paid LE 5000.

At the end of the year the loss was 5000 pounds find the share of them from the loss.

7- A shop keeper for electric sets sold a refrigerator for LE 3180 if the percentage of his profit is 6% find the buying price.
Unit 3:

Geometry and measurement

Lesson (1): The relations between the geometrical shapes
Lesson (2): The visual patterns
Lesson (3): Volumes
Lesson (4): The volume of the cuboids
Lesson (5): The volume of the cube
Lesson (6): Capacity
- General exercises on unit 3
- Technological activity
- Activities on unit 3
- Unit test
The relations between the geometrical shapes

Activity 1

Notice and deduce

In the fig 1

ABCD is a parallelogram that means

\[ AB \parallel DC, \quad AD \parallel BC \]

First:

Using the geometric tools in fig 1 Check that

1. \( AB = DC, \quad AD = BC \)
2. \( m(\angle A) = m(\angle C) \)
   \( m(\angle B) = m(\angle D) \)
3. \( m(\angle A) + m(\angle B) = 180^\circ \)
   \( m(\angle B) + m(\angle C) = 180^\circ \)

Second:

Using the geometric tools in fig (2) Check that

\( AM = CM, \quad BM = DM \)

From first and second we deduce that

The parallelogram is a quadrilateral in which:
- Each two opposite sides are parallel and equal in length.
- Each two opposite angles are equal in measure.
- The sum of the measures of any two consecutive angles equals 180°.
- The two diagonals bisect each other.
Drill 1

Study the figures on the square lattice then complete and deduce

ABCD is a rectangle
In which
AD // ......
AB // ......

XYZL is a square in which
XL // ......
XY // ......

EFLN is a rhombus in which
EF // ......
FL // ......

From the cases 1, 2 and 3 we deduce that

Each of the rectangle, the square and the rhombus is a parallelogram.

We can summarize that is the following sketch of concepts.

Drill 2

Discus with your group
The opposite figure
ABCD is a trapezium in which m(∠B) = 90°,
AD = 7 cm, AB = 4 cm
BC = 10 cm, DC = 5 cm
Locate the point X on BC for the figure ABXD is a rectangle In this case there will be
Unit 3

AB = ...... = ...... cm , AD = ...... = ...... cm
then the perimeter of \( \triangle DxC = ...... \) cm

Example 1
In the opposite figure \( m(\angle A) = 53^\circ, m(\angle D BC) = 45^\circ \)
AM = 6 cm, AB = 5 cm, BC = 8 cm
Calculate without using measuring tools each of
1- \( m(\angle ABD) \)
2- \( m(\angle D) \)
3- AC
4- AD, DC using the properties of the parallelogram.

Solution
The first required:-
Finding \( m(\angle ABD) \)
Since \( m(\angle A) + m(\angle B) = 180^\circ \) (two consecutive angles)
Then \( m(\angle ABD) = 180^\circ - (53^\circ + 45^\circ) = 82^\circ \)
The second required.
\( M(\angle D) = m(\angle B) \) (two opposite angles)
The \( m(\angle D) = 82^\circ + 45^\circ = 127^\circ \)
The third required
AC = AM + CM = 6 + 6 = 12 cm
(The two diagonals bisects each other)
The fourth required
AD = BC = 8 cm (The two opposite sides are equal in length)
DC = AB = 5 cm

Drill 2
In the opposite figure

\( \overline{AD} // \overline{BC} , \overline{AB} // \overline{DC} \)
\( \overline{DF} // \overline{CL} \)
Name and write 3 parallelograms
In the figure
Name and write 3 trapeziums in the figure
Name and write 3 triangles in the figure
Exercise (3-1)

1. Complete the following due to what you studied about the properties of quadratic geometric shapes:
   
a) The four sides are equal in length in each of ..., .......
b) The two diagonals are equal in length in each of ..., .......
c) The two diagonals are perpendicular in each of ..., .......
d) The four angles are right in each of ..., .......
e) The two opposite angles are equal in each of ..., .......
f) The two diagonals bisect each other in each of ..., .......
g) The sum of measures of the two consecutive angles equals 180° in each of ..., .......

2. In the opposite figure try to use the geometric tools:
   
   To get the greatest possible number of parallelogram
   
   Colour the resulting parallelograms in different colour
   

3. The opposite figure shows a parallelogram in which:

   \[ M(\angle B) = 110°, \ m(\angle DAC) = 30° \]
   
   Find \( m(\angle D) \), \( m(\angle BAC) \)
   \( m(\angle ACD) \)
In the opposite figure

ABCD is a parallelogram in which

AB = 9 cm, BC = 6 cm. Determine the point X on the side AB such that AX = BC

And determine the point Y on the side DC such that DY = BC

Complete the following

- The figure AXYD represents .......... Because ...........
- The figure ABCY represents .......... Because ...........
- The figure XBCY represents .......... Because ...........
- The type of the triangle AXY according to its sides is .................. because ..................

5. Complete the following sketch of concepts using the key words below it

---

The parallelogram

- its opposite sides are equal
- its opposite angles are equal

If ................

One of its angles is right and the two diagonals are equal in length

If ................

Its adjacent sides are equal in length and its angles are right

If ................

Its sides are equal in length or the two diagonals are ..........

---

The key words

A square
A rectangle
are Perpendicular
If
is the two dimensions are equal
the two diagonals are equal in length

---

Mathematics for sixth form primary
2 The visual patterns

What do you learn from this lesson?
Through your active participation you will recognize
- The concept of visual pattern
- Discreet the visual pattern
- Discovering visual patterns and completing its repetition.
- Forming visual patterns from geometric shapes
- Discovering the visual patterns in our natural life.
- Forming repetition of the pattern and colouring it suitably to form on an art figure

Think and discuss
In the previous years you have studied the visual patterns and the numerical patterns
- the visual pattern is a consequence of shapes or symbols according to a certain rule.

The following examples represents visual patterns and its description is below it.

![Visual Patterns Example 1](image1)

(The description of the pattern is repetition of)

![Visual Patterns Example 2](image2)

(The description of the pattern is repetition of)

Drill 1
Discover the pattern in the following, then write its description and complete its repetition twice

![Pattern Drill Example 1](image3)

( the description of the pattern ...........)

![Pattern Drill Example 2](image4)

( the description of the pattern ...........)

First Term
Unit 3

Drill 2
Discuss with your group, then draw the next shape in each pattern in each of the following.

1- ........................................

2- ........................................

3- ........................................

4- ........................................

Drill 3
Study the following geometric shapes, form visual patterns from it then describe each pattern and repeat it twice

the shapes  

Example  

(the description of the pattern is repeating ● ● ●)

1- ........................................ (the description of the pattern..................................................)

2- ........................................ (the description of the pattern..................................................)

Drill 4
In our natural life there are many visual pattern, discover the pattern in each case in the following then colour it with suitable colour.
Exercise (3.2)

1. Discover the pattern in each case of the following and describe it then complete its repetition twice.

![Pattern 1]

![Pattern 2]

![Pattern 3]

2. Discover the pattern, describe it, then complete by repeating it (twice).

![Repetition Pattern]

3. Discover the pattern and colour its repetition in each shape alone with different colours to get an art figure.

![Art Figure Patterns]
3 Volumes

1- The solid
You studied in the previous years the solids and you knew that.
all the following represents a solid.
The case of geometrical instruments – the pen, The match case – mobile set, the water bottle, the cube games, the ball bus, the car the house in which you live .... tc
this means that solid which occupies a room in the space.

Notice that
The solid are two kinds
- The geometric solid such as:

Mathematical concepts
The solid
The volume
The decimeter cube
The meter cube
The millimeter cube.

And other solids which has no geometric shape as.
collapsed house a Car seashell a piece of stone
this year we will give importance to two solids which are.

The cuboid

- It has six faces each of them is a rectangle.
- It has 12 edges and 8 vertices.
- Each two opposite faces are equal in area and they are parallel.
- Each two adjacent faces intersect at a line segment which is called an edge.

The cube

- It has six faces each of them is a square (They are all equal in all measures. (congruent))
- It has 12 edges, they are equal in length. It has 8 vertices.

B- The volume

If the solid is any thing occupying a room in the space then.

The volume is the magnitude of this room which the solid occupies in the space.

How can we measure the volume?

We can consider any solid as a unit for measuring the volume as.
Match case – cube game – a bloc of soap – Juice can …… etc.

In this case, the volume of the solid is the number of these units contained by the solid.

The number of blocks of soap = 25
The volume of the solid = 25 cases

The number of juice cases = 18
The volume of the solid = 18 cases

The number of match - cases = 9 cases
The volume of the solid = 9 cases
Each of Nada, Maryam, Omar and Magid builds a solid from cubes. Considering one cube is a unit for the volume, complete the following table.

<table>
<thead>
<tr>
<th>Solid of Maryam</th>
<th>solid of Omar</th>
<th>solid of Nada</th>
<th>solid of Magid</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of Cubes = ........</td>
<td>The number of Cubes = ........</td>
<td>The number of Cubes = ........</td>
<td>The number of Cubes = ........</td>
</tr>
<tr>
<td>The volume =</td>
<td>The volume=</td>
<td>The volume=</td>
<td>The volume=</td>
</tr>
</tbody>
</table>

From the previous table compare
- The solid formed by Omar occupies a room in space ........ that the solid of Nada.
- The solid formed by Magid occupies room in space ........ than the solid of Maryam.
- The solid formed by Omar occupies a room in space ........ Than the solid Maryam.

Notice That

The previous units used to measure the volume (soap blocks – Match cases, cube games …..) not international units to measure the volume because the volume of the solid changes if we change the used unit in measure and depends on the person who does the measure.

Then it is necessary to search for constant units agreed by the whole world to use them to measure the volume.

It is agreed to consider the cube whose edge length = (1 cm) as shown in the figure is the unit for measuring the volume.

i.e The unit which is used for measuring the volume is

The centimeter cube

It is the volume of a cube of edge length equals 1 cm
It is denoted by 1 cm³
Example 1

Find the volume of the following solids consider the unit of measure of the volume is cm$^3$ (1cm$^3$)

![Fig. (1)](image1) ![fig. (2)](image2) ![fig. (3)](image3) ![fig.(4)](image4)

**Solution**

- In fig. (1) the number of cubic units = 5 units
  - The volume of the solid = 5 cm$^3$
- In fig (2) The number of cubic units = 8 units
  - The volume of the solid = 8 cm$^3$
- In fig (3) The number of cubic units = 16 units
  - The volume of the solid = 16 cm$^3$
- In fig (4) The number of cubic units in each Layer = 9 cubic units
  - The solid consists of 3 layers
  - The number of cubic units in the solid = 3 x 9 = 27 units
  - The volume of the solid = 27 cm$^3$

**Another units for measuring the volumes**

(a) In the case of great volumes

1- The decimeter cube

It is the volume of a cube of edge length one decimeter (1 dm) as shown in the figure. It is denoted by (dm$^3$) It is used sometimes to measure the volume of solids as the iron boxes, the carton case of television, washing machine or computer .... Etc

21 is formed from 10 layers in each of them 100 cm$^3$

2- The meter cube

It is the volume of a cube of edge length (1m) as shown in the figure. It is denoted by (metre$^3$) or (m$^3$) it is used sometimes to measure the volume of containers of factories or water tanks or edifices .... etc, it consists of 10 layers in each of them there are 100 dm$^3$

(b) In the case of small volumes

The millimeter cube

It is the volume of a small cube of edge length 1 millimeter

It is denoted by (m m$^3$)

It is used to measure the small volumes
Unit 3

Now we deduce that.

\[1 \text{ m}^3 = 1000 \text{ dm}^3 = 1000000 \text{ cm}^3 = 1000000000 \text{ mm}^3\]

large unit \[1 \text{ dm}^3 = 1000 \text{ cm}^3 \]

small unit \[1 \text{ cm}^3 = 1000 \text{ mm}^3\]

Notice that as converting from a large unit of volume to smaller unit of volume we use multiplication operation.
As converting from a small unit of volume to larger unit of volume we use division operation.

Example 2: convert each volume’s unit in the following to the opposite volume’s unit

1. \(4 \text{ m}^3 = \ldots \ldots \ldots \ldots \ldots \text{ dm}^3\)
2. \(700.5 \text{ cm}^3 = \ldots \ldots \ldots \text{ mm}^3\)
3. \(300 \text{ mm}^3 = \ldots \ldots \ldots \text{ cm}^3\)
4. \(6500 \text{ dm}^3 = \ldots \ldots \ldots \text{ m}^3\)

Solution

1. \(4 \text{ m}^3 = 4 \times 1000 = 4000 \text{ dm}^3\)
2. \(700.5 \text{ cm}^3 = 700.5 \times 1000 = 700500 \text{ mm}^3\)
3. \(300 \text{ mm}^3 = 300 \div 1000 = 0.3 \text{ cm}^3\)
4. \(6500 \text{ dm}^3 = 6500 \div 1000 = 6.5 \text{ m}^3\)

Drill 1

Calculate the volume of each of the following solids consider the volume unit is cm³

Fig (1)

The number of cubic units = .......
The volume of the solid = .... cm³

Frg. (2)

The number of cubic units = .......
The volume of the solid = .... cm³

Frg. (3)

The number of cubic units = .......
The volume of the solid = .... cm³

Fig (4)

The number of cubic units = .......
The volume of the solid = .... cm³
Exercise (3-3)

1. Find the volume of each solid in the following considering the volume's unit is cm³:

Fig (1)
The volume of
The solid = ............cm³

Fig (2)
The volume of
The solid = ............cm³

Fig (3)
The volume of
The solid = ............cm³

Fig (4)
The volume of
The solid = ............cm³

Fig (5)
The volume of
The solid = ............cm³

Fig (6)
The volume of
The solid = ............cm³

2. Find the volume of each of the following solids considering the volume's unit is the game's cube whose volume is 8 cm³.

3. Convert each of the following volumes into the opposite volume’s units:

(a) 120dm³ = ............cm³

(b) 8200mm³ = ............cm³

(c) 3m³ = ............mm³

(d) 2.1cm³ = ............mm³

(e) 56000cm³ = ............dm³
The volume of the cuboid

What do you learn from this lesson?

Through your active participation you will come to:
- How to calculate the volume of a cuboid by different ways.
- Solving miscellaneous applications on the volume of the cuboid.

Think and discuss

The teacher of mathematic asked his students to make groups, each consists of 2 pupils to work in pairs to use games cubes for making a cuboid of dimensions the length 4 cubes, the width 3 cubes, the height 2 cubes. After giving the suitable chance the teacher selected the design of (Ola and Nabeela) as in figure (1). He asked them to show their idea to their companions.

Ola: We thought together to form the first layer which is formed from 3 rows in each row 4 cubes, then the length of the layer became 4 cubes and its width became 3 cubes as shown in figure 2.

Nabeela: We formed the second layer in the same way and put it on the first, then we get the required cuboid. Fig (1)

The teacher: Thanks for you all, the question now is: How can we calculate the volume of the resultant cuboid?

Mohamed: The volume is the room occupied by the cuboid in the space.

The teacher: Wonderful, but How can we calculate this room?

Adel: We count the volume units used which is the games cubes.

The teacher: Good answer – but How can we carry out this operation?

Merna: We count the volume units in the first layer which is 3 rows and each row contains 4 cubes, then its volume is $4 \times 3 = 12$ cubes.

The teacher: Very good – Then what afterwards?

Ahmed: We count the volume units in the second layer in the same way i.e. its volume $= 4 \times 3 = 12$ cubes.

The teacher: Very good. What else?
Omar: We add the volume cubes in the two layers, the volume of the cuboid = 12 + 12 = 24 cubes.
The teacher: Excellent answer. Who can get the same answer by another way?
Karmina: We multiply the volume of one layer by 2.
Then the volume of the cuboid = \((4 \times 3) \times 2 = 24\) cubes.
The teacher: Very good. But what do we mean by \(4 \times 3 \times 2\)?
Mina: It represents the product of the length \(\times\) the width \(\times\) the height.
The teacher: That is best. Who can express this result in another form?
Khalid: The product of the three dimensions.
The teacher: Excellent answer. But what's meant by (the length \(\times\) the width) ?
Fady: It represents the area of the base.
The teacher: Very good. Who can express the volume of the cuboid in another way?
Zeinab: The volume of the cuboid = The base area \(\times\) The height.
The teacher: That is a correct answer and now who can summarize the mathematic statements of the volume of the cuboid?
Mustafa: There are four correct statements which are.

The volume of the cuboid.
\[\text{= The number of the volume units which form it.}\]
\[\text{= The product of length } \times \text{ width } \times \text{ height.}\]
\[\text{= The product of the three dimensions.}\]
\[\text{= The base area } \times \text{ The height.}\]

The teacher very good - What is the volume of the cuboid in fig (1) if it is rotated as in the figure (3).
Nady: The volume = the base’ area \(\times\) the height. \(= (4x2) \times 3 = 24\) cubes
The teacher very good answer what does that mean upon your own views.
Hassan: the volume does not change
That means
We can consider any face of the cuboid as a base for it.
The volume of the cuboid = the area of any face \( \times \) the corresponding height.

The teacher: Excellent answer
And now what about if the units of volume became the \((\text{cm}^3)\) instead of gams cubes as in fig. (4).
What is its volume?
Shady: \(\text{cm}^3\) is the unit of measuring the volume
In this case the volume of the cuboid = \(4 \times 3 \times 2 = 24 \text{ cm}^3\)
The teacher: Excellent answer and thanks for you all.

Example (1) find the volume of the cuboid in each of the following cases.

Solution
In fig. (1) the volume of the cuboid = length \( \times \) width \( \times \) height.
\[= 4 \times 2 \times 3 = 24 \text{ cm}^3\]

In fig. (2) the volume of the cuboid = the area of the base \( \times \) the height
\[= (9 \times 3) \times 7 = 189 \text{ cm}^3\]

Notice from fig. (2)
The area of the base of the cuboid = \(\frac{\text{the volume of the cuboid}}{\text{the height}}\)

The height of the cuboid = \(\frac{\text{the volume of the cuboid}}{\text{the area of the base}}\)
Example 2 In the opposite figure
A cuboid of volume is 2128 cm$^3$
Its length is 19 cm, its height is 14 cm
Find the area of its base and its width

Solution
The volume of the cuboid = The area of the base x The height
i.e. 2128 = The area of base x 14

That means
The base area = \( \frac{2128}{14} \) = 152 cm$^2$

Since the base area = length x width i.e. 152 = 19 x width
That means The width = \( \frac{152}{19} \)
i.e. The width = 8 cm

Example 3
A box made of cartons in the shape of a cuboid, its internal dimensions are 50, 40 and 30 cm. How many blocks of soap can be put inside it to be full completely if the dimension of each block of soap are 8, 5 and 3 cm.

Solution
The volume of the box = 50 x 40 x 30 = 60000 cm$^3$
The volume of a block of soap = 8 x 5 x 3 = 120 cm$^3$
The number of blocks of soap = the volume of the box/ The volume of
= \( \frac{60000}{120} \) = 500 block of soap

Example 4
A building worker used 1500 bricks to build a wall. Calculate the volume of the wall in m$^3$ if the brick is in the shape of a cuboid of dimensions 25, 12 and 6 cm.

Solution
The volume of a brick = 25 x 12 x 6 = 1800 cm$^3$
The volume of the wall = 1800 x 1500
= 2700000 cm$^3$
i.e. The volume of the wall in m$^3$
= \( \frac{2700000}{1000000} \) = 2.7 m$^3$
Example 5

8400 cm$^3$ of water is poured into a vessel in the shape of a cuboid with internal dimensions 20, 35 and 45 cm

**Find:**
1. the height of water in the vessel.
2. The volume of water needed to be added for the vessel becomes filled with water completely.

**Solution**

The water poured in the vessel is in the shape of a cuboid.

1. **The volume of water in the vessel**
   
   $= \text{The base area x height}
   
   i.e \ 8400 = (35 \times 20) \times \text{The height}
   
   i.e \ \text{The height of water} = \frac{8400}{35 \times 20} = \frac{8400}{700} = 12 \text{ cm}$

2. *The volume of water needed to be added for the vessel becomes filled with water completely* can be obtained by two methods

   **The first method**

   The volume of the whole vessel
   
   $= 20 \times 35 \times 45 = 31500 \text{ cm}^3$

   i.e **The volume of the added water**
   
   $= 31500 - 8400 = 23100 \text{ cm}^3$

   **The second method:**

   We calculate the volume of the empty part of the vessel

   The volume of the added water
   
   $= 35 \times 20 \times (45 - 12) = 35 \times 20 \times 33$
   
   $= 23100 \text{ cm}^3$
1. Which is greater in volume?
A cuboid of dimensions 70, 50 and 30 cm or a cuboid whose base area = 2925 cm² and its height = 35 cm.

2. How many cm³ are enough to form a cuboid of dimensions 17, 13 and 11 cm.

3. Complete the following table.

<table>
<thead>
<tr>
<th>The dimensions of the cuboid</th>
<th>The area of the base</th>
<th>The volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>Width</td>
<td>Height</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>21.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. A Juice case in the shape of a cuboid.
Its base is square shaped of side length 6cm and its height is 15 cm. Calculate the volume of juice which fills the case completely.

5. A sweet case in the shape of a cuboid its internal dimensions are 21, 18 and 6 cm. It is wanted to fill it with pieces of chocolates each of them is a cuboid of dimensions 3, 3 and 1 cm, calculate the number of pieces of chocolates which fill the case completely.

6. A Truck for transporting goods.
Its dimensions are 3.2, 1.5 and 2 metre. It is wanted to fill it with cartoons boxes for mineral water bottles to distribute it to the commercial shops. The dimensions of one cartoons box are 40, 25 and 25 cm. Calculate.
   a- The greatest number of cartoon boxes of can be carried by the truck.
   b- The cost of transportation if the cost of transporting one cartoon is 0.75 pounds.

7. A swimming pool, its internal dimensions are 30, 15 and 2 metres. 405 m³ of water are poured into it.
Find:
   a- The height of water in the swimming pool.
   b- The volume of water which is needed to fill the swimming pool completely.
The volume of the cube

What will you learn from this lesson?
- Through your active participation you will come to:
  How to calculate the volume of the cube by different methods.
  How to solve miscellaneous applications on the volume of the cube.

Mathematic concepts
The volume of the cube

Fig. (1)  

Fig. (2)

The fig. (1) is a cuboid consists of 4 layers, each layer has 3 rows and each row has 3 cubes. What is the resulting solid if we remove the upper layer as in fig. (2)

Notice that the resultant solid as you know is a cube because its faces are congruent and its edges are equal in length.

That means that
The cube is a special case of the cuboid when the length = the width = The height

i.e
The cube is a cuboid with equal dimensions

The volume of the cuboid = length \times width \times height
The volume of the cube = The edge length \times it self \times it self

Example 1
Find the volume of a cube of edge length 4 cm.

Solution
The volume of the cube
- edge length \times it self \times it self
- \( = 4 \times 4 \times 4 = 64 \text{cm}^3 \)
Example 2
The sum of lengths of all edges of a cube is 132cm calculate its volume.

Solution
The cube has 12 equal edges in length
i. e The edge length = \( \frac{132}{12} \) = 11cm.
The volume of the cube = 11 x 11 x 11 = 1331 cm\(^3\)

Example 3
The sum of faces area of a cube 54 cm\(^2\).
Calculate its volume.

Solution
The cube has 6 faces equals in its area
The area of each face = \( \frac{54}{6} \) = 9 cm\(^2\)
Where area of each face = side x side
\[ 9 = \ldots\ldots \times \ldots\ldots \quad \text{i.e.} \quad 9 = 3 \times 3 \]
Then the side length = 3 cm
Then the volume of cube = 3 x 3 x 3 = 27 cm\(^3\)

Example 4
A metallic cube of edge length 9cm It needs to be conveted it into ingots in the shape of cuboids each of them has the dimensions 3, 3 and 1cm. calculate the number of ingots that are obtained.

Solution
The volume of the metallic cube
\[ = 9 \times 9 \times 9 = 729 \text{ cm}^3 \]
The volume of one ingot = 3 x 3 x 1 = 9cm\(^3\)
\* The number of the obtained ingots
\[ = \frac{\text{the volume of the metallic cube}}{\text{the volume of one ingot}} \]
\[ = \frac{729}{9} = 81 \text{ ingots} \]
Exercise (3 - 5)

1. Complete the following table

<table>
<thead>
<tr>
<th>The edge length cm</th>
<th>The perimeter of the base cm</th>
<th>The area of the base cm²</th>
<th>The sum of lengths of all edges cm</th>
<th>The volume cm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>20</td>
<td>49</td>
<td>216</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. We have an amount of rice, its volume is 2700 cm³. It is need to put it in a carton box. Show which of the following boxes is the more suitable and why?
   a. A cuboid with dimensions 45, 40 and 15 cm.
   b. A cube, its internal edge length = 20 cm.

3. A commercial shop shows a cubic case with edge length 12 cm, it is filled with honey. Calculate the amount of money that a person pays for buying 3 cases of honey of one cm³ is sold for 0.05 pounds.

4. A box of carton in the shape of a cube. Its external edge length is 30 cm
   An antique made of glass is put inside it. And for protecting it from damage, the box is put inside another box of carton in the shape of cube, its internal edge length is 36 cm, the empty part between the two boxes is filled with sponge form all over sides. Calculate the volume of sponge.

5. A cube of cheese, its edge length is 15 cm. It needs to be divided into small cubes the edge length of each is 3 cm for presenting them through meals. Calculate the number of the resulting small cubes.

6. An aquarium for fish is cube shaped. It has a lid. The internal edge length of the aquarium is 35 cm. The aquarium is made of glass. Find the volume of the glass given now that the thickness of the glass is 0.5 cm.
The Capacity

Think and discuss:

the capacity
Is the volume of the inner space for any hollow solid
In the case of vessels:
The capacity of the vessel:
It is the volume of the liquid which fills the vessel completely
The capacity of vessel is measured by a unit called litre.

What is the litre?
The previous figure shows a mineral water bottle with capacity “1” litre and an empty container in the shape of a cube of edge length 1 dm (10 cm) - As pouring the liquid from the bottle to the container we find that it is filled completely.

From the previous we deduce that
The unit of measuring the capacity is the litre = dm³ = 1000 cm³
Notice That The milliliter is a common unit (a part of the litre) for measuring the capacity.
The milliliter = cm³ and It is denoted by ml that means that 1 litre = 1000 milliliter.

Example 1
A box of milk of capacity 2 litres. And another box of capacity 200 milliliters.
How many boxes of the second kind are needed to be filled with the milk of the first box completely.

Solution
The number of required boxes = the capacity of the large box/ the capacity of the small box
= \frac{2000}{200} = 10 \text{ boxes}
The relation between the units of volume and the units of capacity

- $\text{dm}^3 = 10\text{cm} \times 10\text{cm} \times 10\text{cm} = 1000 \text{ cm}^3 = 1 \text{ litre}$
- $\text{m}^3 = 10\text{dm} \times 10\text{dm} \times 10\text{dm} = 1000 \text{ dm}^3 = 1000 \text{ litre}$
- $\text{cm}^3 = 10\text{mm} \times 10\text{mm} \times 10\text{mm} = 1000 \text{ mm}^3 = 1 \text{ ml}$

Example 2
Convert each of the following to litres

(a) $5600 \text{ cm}^3$  
(b) $0.23 \text{ m}^3$  
(c) $9.52 \text{ dm}^3$

Solution

(a) $5600 \text{ cm}^3 = 5600 \times \frac{1}{1000} = 5.6 \text{ litre}$

(b) $0.23 \text{ m}^3 = 0.23 \times 1000 = 230 \text{ litre}$

(c) $9.52 \text{ dm}^3 = 9.52 \text{ litre}$

Example 3
Convert each of the following into cm$^3$

(a) $4.63 \text{ litre}$  
(b) $55 \text{ ml}$  
(c) $0.66 \text{ m}^3$

Solution

(a) $4.63 \text{ litre} = 4.63 \times 1000 = 4630 \text{ cm}^3$

(b) $55 \text{ ml} = 55 \text{ cm}^3$

(c) $0.66 \text{ m}^3 = 0.66 \times 1000000 = 660000 \text{ cm}^3$

Example 4
A swimming pool in the shape of a cuboid whose internal dimensions are 40m, 30m, 1.8m Find its capacity in litres.

Solution

The volume of the swimming pool = $40 \times 30 \times 1.8$
$= 1200 \times 1.8 = 2160 \text{ m}^3$

The capacity in litre = $2160 \times 1000 = 2160000 \text{ litre}$. 
Exercise (3-6)

1. Write the suitable unit from the units (m³, cm³, dm³, litre, ml) to measure the following.
   - The capacity of a water tank on the roof of a house. ( )
   - The volume of cereals container. ( )
   - The capacity of oil bottle. ( )
   - The volume of an amount of medicine in a syringe. ( )
   - The capacity of a swimming pool in a sport club. ( )
   - The volume of a box of carton of T.V set. ( )

2. A cube shaped vessel, its internal edge length is 30cm. It is filled with food oil.
   a- Calculate the capacity of the vessel.
   b- If the price of one litres of food oil is 9.5 pounds calculate the price of all oil.

3. A container has 12 litre of honey. It is wanted to put them in smaller vessels (bottles) the capacity of each of them is 400cm³. Calculate the number of bottles which is needed for that.

4. A patient take a medicine spoon of capacity 3ml daily in the morning and at evening. After how many days does the patient take 240 cm³ from this medicine.

5. A container in the shape of a cuboid, its internal dimensions are length = 25cm, the width = 30 cm, The height = 42cm. An amount of solar is Put in it, its height = \( \frac{1}{3} \) the height of the container. Calculate
   a- The volume of solar in the container
   b- The total price of solar in the container if the price of one litre of solar = 1.2 pounds.
### General exercises on unit 3

1. Write the name of the figure through the following descriptive statement.

<table>
<thead>
<tr>
<th>No</th>
<th>The descriptive statements for the figure</th>
<th>The name of the figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The figure $ABCD$ in which $AB = BC = CD = DA$, the two diagonals are perpendicular and not equal, $m(\angle A) \neq m(\angle B)$</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The figure $XYZL$ in which $XY = ZL$, $YZ = XL$, $XY \neq YZ$, the two diagonals are equal.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>The figure $DEFL$ in which $DE = LF$, $EF = DL$, $DE \neq EF$, the two diagonals are not equal, $m(\angle D) \neq m(\angle L)$</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The figure $ABCD$ in which $AB = BC = CD = DA$, the two diagonals are equal, and perpendicular.</td>
<td></td>
</tr>
</tbody>
</table>

2. In the opposite figure $XYZL$ is a rectangle in which $XY = 5cm$, $YZ = 7cm$, Show in steps how you can draw a square inside the rectangle such that $XY$ is one of its sides.
   - Write all the parallelograms which are obtained in the figure.

3. The opposite figure $ABC$ is a right angled triangle at $B$ in which $AB = 5cm$. Try to draw a parallelogram in the following cases:
   a. A parallelogram such that $AB$ is a diagonal of it.
   b. A parallelogram such that $AC$ is a diagonal of it.
4. A lorry for transporting building materials, the internal dimensions of the container are 5m, 1.8 and 0.6m. Its wanted to fill it completely by bricks of dimension 25cm, 12cm and 6cm. Calculate:
   a. The greatest number of bricks can be Put in the container of the lorry.
   b. The cost of transporting the bricks if the cost of transporting 1000 bricks is 35 pounds.

5. Which is greater in volume and why?
   A cuboid whose dimensions are 12cm, 10cm and 8cm or a cube of edge length 10cm.

6. A tin in the shape of a cube, its internal edge length is 36cm, is filled with maize oil. It is wanted to put it in small tins in the shape of cubes, its internal edge length is 9cm. Find the number of small tins needed to that.

7. The sum of all dimensions of a cuboid is 48cm and the ratio among the length of its dimensions is 5: 4: 3. Find its volume.

8. A cuboid, its base is a rectangle whose perimeter = 40cm. The ratio between its length to its width = 3 : 2. Calculate its volume if its height is 10cm.

9. A box of cartoons its internal dimensions are 50, 40 and 30cm. It is wanted to fill it with boxes of tea in the shape of cuboids, the dimension of each box are 10cm, 5cm and 6 cm. Calculate the greatest number of tea boxes can be put in the box.
(1) from the opposite figure and using the geometric tools answer the following:
   a- Write the greatest number of parallelograms you can draw in the figure.
   b- Write the greatest number of trapeziums you can draw in the figure.

(2) from the opposite figure and complete:
   - Three parallelograms
     They are ..........., ..........., ............
   - Three Trapeziums
     They are ..........., ..........., ............
   - The number of triangles in the figure = ...........
   - Three triangles in the figure
     They are ..........., ..........., ............

(3) The opposite figure is a rectangle the pattern is:
   joining the mid points of the consecutive sides
   a- Complete by drawing three internal figures due to this pattern.
   b- Colour the obtained figure by different colours to get an art figure.

(4) The opposite figure is a regular pentagon the pattern is joining the mid- points of the consecutive sides.
   a- complete by drawing three internal figures due to the same pattern.
   b- colour the obtained figure by different colours to get art figure.
A technological activity

Drawing geometric figures and solids using word programme.

What do you learn from this activity.

Using word programme to
- Draw a group of geometric figures (rectangle - square - parallelogram)
- Draw a group of geometric solids (cuboid - cube)

Example

Using word programme draw the following geometric figures and solids
(a rectangle - a square - a parallelogram, a cuboid - a cube)

The procedure

1- Click (start) then select program then select Microsoft word. And open new document.
2- Press the symbol at drawing tape below the screen. Then click by the mouse in an empty region I the word page and through drawing and estimating the size of the rectangle and leaving out, the rectangle will appear.
3- press second time the same symbol then click shift and go on pressing, during this press in an empty region, then through drawing and leaving when you get the required square.
4- Select auto shapes which exists at the drawing tape, then select Basic shapes then select the figure parallelogram , and draw the parallelogram through drawing and leaving out due to your estimation.
5- to draw a cube and a cuboid. Select Auto shapes then select basic shaper then select the shape to the solid, then draw the cube and the cuboid and leaving out due to your estimation, you will obtain the following figure.
The unit test

(1) Complete the following
a- The rectangle is a parallelogram ...................

b- 120 dm$^3$ = ................ = ................ cm$^3$

c- 2580000 mm$^3$ = ................ = ................ m$^3$

d- the volume of the cuboid = ................ × .............

e- 2.65 litre = ............ = ................ cm$^3$

(2) The opposite figure

![Diagram of parallelogram XYZL]

XYZL is a parallelogram in which
\[ m(\angle Y) = 118^\circ, m(\angle XYZ) = 35^\circ \]

Find \[ m(\angle L), m(\angle LXZ) \]

(3) Discover the pattern in each of the following cases, then describe it and complete its repetition twice

a- .............................................................. (the pattern is ............)

b- ![Pattern diagram]

.............................................................. (the pattern is ............)

(4) How many cm$^3$ are enough to fill a box in the shape of a cuboid, its internal dimensions are 50cm, 35cm, 20cm.

(5) In the opposite figure

![Diagram of cuboid]

A cuboid of volume 6480 cm$^3$

Its height = 15 cm, its width= 18cm

Calculate its length.

(6) A box of milk in the shape of a cube of edge length 12cm. It is wanted to put a number of these boxes in a box of carton in the shape of a cube of edge length 60cm. How many boxes of milk can be put in the cartoon box?

(7) A vessel in the shape of a cube with edge length 15 cm is filled with honey.

a- Calculate the capacity of the vessel.

b- If the price of one litre is LE 8. Calculate the price of honey.
Unit 4:

Statistics

Lesson (1) : The Kinds of statistics data
Lesson (2) : Collecting the descriptive statistics data
Lesson (3) : Collecting the quantitative statistics data
Lesson (4) : Representing data by frequency curve
- General exercises on unit 4
- Technological activity
- Activities on unit 4
- Unit test
1 The Kinds of Statistics data

What do you learn from this lesson?
Through your active participation you will come to:
- The meaning of descriptive data.
- The meaning of quantitative data.
- Completing writing descriptive and quantitative data.

Notice and deduce

Hany is a pupil in sixth grade. He went with his mother to the hospital for medical examination.
The employee asked him to complete the data in the sheets of medical examination.
Hany asked his mother about the required data. His mother replied. There are some data require writing digits as:
age, the date of examination, the birthday, height, the weight, the degree of temperature….. etc.
There are other data required writing words or Statement as:
The name, sex (male, female), social case (married, single), educational case (not educated, educated), the birth place, the address, blood species (O, A, B) ….. etc.
Through the discussion between Hany and his mother it shows that:
The statistics data which we use in our daily life are two kinds.

1 - Descriptive data: they are data written in the form of description to the case of the persons in the society as: the favorite colour, favorite food, the birth place, the social case, the education case, profession case….. etc

2 - Quantitative data: they are data written in the form numbers to express a certain phenomenon as: age, height, weight, the shoes size, number of sons, the student's mark in the examination ….. Etc.

Drill (1)
The opposite figure shows the sheet-model of requisition for one of your fellows to join with a sport activity during the summer holiday in a sports club near to his house.
Examine it well then answer the following.

(a) There are in the sheet. Model a descriptive data as 

(b) There are in the sheet- model a quantitative data as 

(c) Register your name in the card, then complete one of the descriptive data and one of quantitative data.

Notice that

The data requisition sheet is a sheet contains a set of data some of them is descriptive and the other is quantitative belong to a certain person or a thing.

Drill (2)

MR. Khaled is the superior of a class in the sixth grade in a primary school. He wanted to set up data base about his pupils. He designed the following table

<table>
<thead>
<tr>
<th>Series number</th>
<th>The name</th>
<th>Age</th>
<th>height in cm</th>
<th>How to arrive to school</th>
<th>Favourite activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Month</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Ahmed Omar</td>
<td>6</td>
<td>147</td>
<td>Walking</td>
<td>School broad casting</td>
</tr>
<tr>
<td>2</td>
<td>Adel Said</td>
<td>12</td>
<td>150</td>
<td>Bus</td>
<td>Scouts</td>
</tr>
<tr>
<td>3</td>
<td>Naseem Nabeel</td>
<td>7</td>
<td>141</td>
<td>Taxi</td>
<td>School press</td>
</tr>
</tbody>
</table>

Look at the previous table and answer the following.

1- Determine which column represents descriptive data and which one represents quantitative data.
2- Complete the two missed columns in condition that one of them for descriptive data and the other for quantitative data.
3- Consider yourself one of MR. Khalid's pupils and register your data.

Notice that:

Data base is a set of descriptive data and quantitative data belong to some persons or establishment or administrations... or authorities ............
Exercise (4-1)

1. Read the data on the box of milk then classify the data registered on it into descriptive data and quantitative data.
   - The descriptive data are ......................
   - The quantitative data are ......................

2. The opposite figure shows a model sheet to one of personal cards of a pupil in a school. Look at it well and then extract from it descriptive data and quantitative data.
   Write your own personal data on this sheet.

3. In the following the model sheet of data base to the members are participating in a sport club.

<table>
<thead>
<tr>
<th>No</th>
<th>The name</th>
<th>Age</th>
<th>The date of participating</th>
<th>Favorite game</th>
<th>Blood species</th>
<th>The address</th>
<th>Telephone number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Determine which columns represent descriptive data and which one of them represents quantitative data.
- Consider yourself one of members of this club and register your name from today and complete the data.
2 Collecting descriptive statistic data

Notice and deduce

A class contains 36 pupils. The superior of pupils to register the hobbies which each of them prefers selecting it from five hobbies (singing, drawing, acting, reading, playing music) for making a competition concerned with these hobbies.

The data were as follows.


The tally frequency data table.

<table>
<thead>
<tr>
<th>The hobby</th>
<th>Tallies</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singing</td>
<td>+++</td>
<td>5</td>
</tr>
<tr>
<td>Drawing</td>
<td>+++</td>
<td>10</td>
</tr>
<tr>
<td>playingMusic</td>
<td>+++</td>
<td>5</td>
</tr>
<tr>
<td>Acting</td>
<td>+++ /</td>
<td>7</td>
</tr>
<tr>
<td>Reading</td>
<td>+++ /</td>
<td>9</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

How can you deal with these data?

You may notice that all these data are descriptive data. In order to collect them we should use the tally frequency data table. As you studied in fifth grade as follow.

If we take away the column of tallies from the previous frequency data table we will get the distribution frequency table as follow

<table>
<thead>
<tr>
<th>The hobby</th>
<th>singing</th>
<th>drawing</th>
<th>acting</th>
<th>reading</th>
<th>music</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pupils</td>
<td>5</td>
<td>10</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>36</td>
</tr>
</tbody>
</table>

This table represents the distribution of the pupils of a class in six the grade due to their hobbies.
The previous table is called the simple frequency table because all data which it contains are distributed due to one description which is the preferable hobby in this activity.

Through the previous table answer the following.

- What is the hobby which the most pupils prefer? and what is its percentage?
- What is the hobby which is the least preferable? And what is its percentage?
- What is your advice to the director of this school? And the superior of this class to do about these hobbies?
Exercise (4-2)

1. The following table shows the distribution of the number of foreign tourists in millions who visited Egypt in 2009 due to their nationalities.

<table>
<thead>
<tr>
<th>Nationality</th>
<th>French</th>
<th>German</th>
<th>British</th>
<th>Russian</th>
<th>Italian</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of tourists in million</td>
<td>0.8</td>
<td>1.2</td>
<td>1.34</td>
<td>2.35</td>
<td>1.04</td>
<td>6.37</td>
</tr>
</tbody>
</table>

a- What are the countries from which the most tourists visited Egypt? What is their percentage?
b- What are the countries from which the least tourists visited Egypt? How many tourists from these countries visited Egypt?
c- What is the number of German tourists? What is their percentage?

2. If the public score of 40 students in Arabic language in a university is as follows.
   very good - good - pass - good - excellent - good - good
   very good - good - very good - good - good
   excellent - very good - excellent - excellent - pass
   good - good - very good - good - pass
   very good - very good - good - very good - pass - good
   very good - good - pass - very good - excellent
   pass - pass - excellent - good - pass

   Form the Tally frequency table. Then form the frequency table for the previous results then answer the following questions.
   - What is the most common score of the students?
   - What is the least score of the students?
   - What is your advice to the students in this important educational stage?
Collecting The statistics quantative data

What do you learn from this lesson?
Through your active participation you will come to:
- putting the quantitive data in the tally frequency table.
- forming the frequency table of equal sets from the frequency table of quantitive data.
- Extracting information table of equal sets.

Notice and deduce

Think and discuss. The scores of the pupils of a class of sixth grade in mathematics at the end of the year had been Collected for 42 pupils their marks were as follows given the fall mark is 60.

\[
\begin{align*}
\end{align*}
\]

These marks are called raw marks. That means the marks of pupils after correction to their exam. Papers as they are scattered.

For example:
what is the number of excellent pupils?
and what is the number of pupils of low level?
And what is the number of pupils of intermediate level?

Notice that

The only thing that can be extracted from these raw marks is the least mark = 20 and the maximum mark = 59 that means that the marks of mathematics of the pupils of that class are distributed in range = 59 - 20 = 39 marks.

In order to deal these marks by studying and analyzing we should put them in a frequency table. That will be carried out through the following steps.

1 - Determine the highest and the lowest value.

In this example
The maximum mark = 59
The minimum mark = 20
2 – determine the range of this distribution it is = The maximum mark – the minimum mark
In this example the range = 59 – 20 = 39
3 – Summarise these data by dividing it into a Suitable number of sets by determining a Suitable length for each set say 5 marks in this example.
   - We start with the smallest mark and finished at the greatest mark.
   Then we obtain 8 sets. As follows
First set contains the marks of pupils from 20 marks to less than 25 marks it is expressed as 20-
Second set contains the marks of pupils from 25 marks to less than 30 marks It is expressed as 25-
The third set Contain the marks of pupils from 36 marks less than 35 marks
It is expressed as 30-
And so on till the last set which will be
The eighth set contains the marks of pupils from 55 marks to less than 60 marks
It is expressed as 55-

Notice that

The number of sets can be calculated by the following relation
The number of sets = \frac{\text{the range}}{\text{the length of set}}
In this example
The number of sets = \frac{39}{5} = 7 \cdot \frac{4}{5} \approx 8 \text{ sets.}

In this way. The sets contained all raw marks of the pupils
4 – putting these data in a tally frequency table as in the opposite table.

<table>
<thead>
<tr>
<th>Sets</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-</td>
<td>//</td>
<td>2</td>
</tr>
<tr>
<td>25-</td>
<td>///</td>
<td>3</td>
</tr>
<tr>
<td>30-</td>
<td>////</td>
<td>4</td>
</tr>
<tr>
<td>35-</td>
<td>/// ##</td>
<td>6</td>
</tr>
<tr>
<td>40-</td>
<td>/// ###</td>
<td>8</td>
</tr>
<tr>
<td>45-</td>
<td>/// ###</td>
<td>9</td>
</tr>
<tr>
<td>50-</td>
<td>/// ##</td>
<td>6</td>
</tr>
<tr>
<td>55-</td>
<td>///</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>42</td>
</tr>
</tbody>
</table>
5 – we take away the tally column from the previous table to get the frequency table of equal sets as in the following table.
It is call as thus because the data contained in it has been distributed into sets.
Therefore it is called

The distribution of the marks of the pupils in mathematics in a class of the school.

<table>
<thead>
<tr>
<th>Sets of marks</th>
<th>20-</th>
<th>25-</th>
<th>30-</th>
<th>35-</th>
<th>40-</th>
<th>45-</th>
<th>50-</th>
<th>55-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pupils</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>9</td>
<td>6</td>
<td>4</td>
<td>42</td>
</tr>
</tbody>
</table>

Answer the following questions.
- What is the number of pupils who get 50 marks or more? What is the percentage of them?
- What is the number of pupils who get the least marks as your point of view? And what is their percentage?

What do you advise your fellow pupils in mathematics?

Drill (I)
During a trip to a factory of clothes has been hold by the pupils of school in the governorate Hend and Nabeela collected data about the wages of the works weekly, the number of workers was 60 person. Hend and Nabeela registered these data in a frequency table of sets as follows.

<table>
<thead>
<tr>
<th>The weekly wages</th>
<th>50-</th>
<th>60-</th>
<th>70-</th>
<th>80-</th>
<th>90-</th>
<th>100-</th>
<th>110-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of workers</td>
<td>4</td>
<td>7</td>
<td>12</td>
<td>18</td>
<td>11</td>
<td>5</td>
<td>3</td>
<td>60</td>
</tr>
</tbody>
</table>

The distribution of the weekly wages of the workers in the factory.

Read the table well with your group members then answer the following questions
- The least weekly wage which the worker gets.
- The weekly wage which the maximum number of workers obtain lies between ................. and .................
- The percentage of the number of workers who obtain the least weekly wage is ...% 
- The number of workers whose weekly wages are L.E 100 and more is ....
And their percentage is ......%
Exercise (4-3)

1. In a competition of an acceptance exam for joining a sport college the heights of 48 students who presents to the competition in cm were as follows:
   Form the frequency table of sets to the previous heights, then answer the following questions:
   - what is the number of students who have the highest heights?
   What is their percentage?
   - what is the number of students whose heights are less than 165 cm.
   What is the percentage?
   - what is your advice to those students

2. The following frequency table of sets show the shares of money in pound held by the pupils of a class in the project of building a hospital near the school study it and answer.

<table>
<thead>
<tr>
<th>The shares in pounds</th>
<th>20-</th>
<th>30-</th>
<th>40-</th>
<th>50-</th>
<th>60-</th>
<th>70-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pupils</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>12</td>
<td>7</td>
<td>4</td>
<td>40</td>
</tr>
</tbody>
</table>

1. what is the number of pupils who shared with an amount of money lies between 40 and 50 pounds?
2. what is the number of pupils who shared with the least amount of money? what is their percentage?
3. what is the number of pupils who shared with an amount of money = 60 pound and more? what is their percentage?
4. what is the least share held by the pupils? And what is their number in each case?
Representing the Quantitative Statistics
Data by the frequency curve

What do you learn from this lesson?
- through your active participation you will c:
  - How to represent a frequency table of sets by frequency polygon.
  - How to represent a frequency table by a frequency curve
  - Extraction information's from frequency table and its frequency curve.

Notice and deduce

Adel sat in the neighbour of his father who works at a hospital to receive the patients for two hours.

He formed a frequency table of sets to the ages of patients who were registered to enter the hospital within this period.

It was as follows.

<table>
<thead>
<tr>
<th>The age</th>
<th>10-</th>
<th>20-</th>
<th>30-</th>
<th>40-</th>
<th>50-</th>
<th>60-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>6</td>
<td>8</td>
<td>12</td>
<td>15</td>
<td>10</td>
<td>9</td>
<td>60</td>
</tr>
</tbody>
</table>

When Adel shows this table to his teacher of the class, he asked him and from other pupils to draw a frequency polygon to represent these data. (as what had been done in 5th grade) Adel graphic the following figure.

When the teacher asked Adel How did he draw the frequency polygon

Adel replied.

I followed the following steps.

1 - I draw the horizontal axis and the vertical axis.

2 - I divided each of them into equal parts which are suitable for the given data.

3 - determined the centre of each set as follows.

The centre of the set (10-) is \( \frac{10+20}{2} = 15 \)

The centre of the set (20-) is \( \frac{20+30}{2} = 25 \)

And so on till the set (60-)

Its centre is \( \frac{60+70}{2} = 65 \)
1 - the points where determine on the lattice where for every set there is an ordered pair which is (the centre of the set, its frequency) for example the set.
- (10 - ), the point which represents
It is (15,6) where 15 is the center.
And 6 is its frequency.
- the set (20 - ), the point which represents it is (25,8) …… and so an.
Then the frequency table becomes as in the opposite figure.

2 - using the pencil and the ruler I drew a line segment joining each tow consecutive points of the determined points by the previous steps thus I got the graph of the frequency polygon.

The teacher: very well but if you and your fellow pupils joined the points by the bencil with out lifting it up the sheet without using the ruler then you will get another graph. What is it?

If you got the red line in the previous graph then you are correct and you got the frequency curve which passes through the most of points.

This new graph is called
The frequency curve which
Can by drawn directly new
As in the opposite graph
And it is another form
For representing the statistics data
Drill:

Ola and Nargis registered the temperature degrees which are expected for 30 cities in one of summer days through watching the news in television. They formed the following frequency table.

<table>
<thead>
<tr>
<th>Temperature degree</th>
<th>24-</th>
<th>28-</th>
<th>32-</th>
<th>36-</th>
<th>40-</th>
<th>44-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cities</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>2</td>
<td>30</td>
</tr>
</tbody>
</table>

Draw the frequency curve of the previous table.
Then answer the following questions.
(a) What is the number of cities whose temperature's degree are 40 degree and more? What do you advice these cities' inhabitants.
(b) What is the number of cities which are suitable for summer season on that day?
(c) What are the number of cities whose temperature's degrees are mild on that day from your own view?

Exercise (4 - 4)

1. The following table shows the extra money which 100 workers got in a month in a factory. they as are follows.

<table>
<thead>
<tr>
<th>The extra money</th>
<th>20-</th>
<th>30-</th>
<th>4-</th>
<th>56-</th>
<th>60-</th>
<th>70-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of workers</td>
<td>20</td>
<td>15</td>
<td>30</td>
<td>25</td>
<td>10</td>
<td>5</td>
<td>100</td>
</tr>
</tbody>
</table>

- What are the number of workers who obtained extra money less than 50 pounds.
- Draw the frequency curve of this distribution.

2. In a goodness party for orphans day a group of contributors paid sums of money in pounds as shown in the following table.

<table>
<thead>
<tr>
<th>The sum</th>
<th>50-</th>
<th>60-</th>
<th>7-</th>
<th>80-</th>
<th>90-</th>
<th>100-</th>
<th>110-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of contributors</td>
<td>5</td>
<td>7</td>
<td>10</td>
<td>12</td>
<td>10</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

- What is the number of contributors by L. E 80 and more.?
- Represent the previous data by the frequency curve.

3. The following Table shows The marks of 100 students in one month in malh

<table>
<thead>
<tr>
<th>Marks</th>
<th>20-</th>
<th>30-</th>
<th>40-</th>
<th>50-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>15</td>
<td>30</td>
<td>40</td>
<td>15</td>
<td>100</td>
</tr>
</tbody>
</table>

Draw The frequency curve for this distribution
Examine each of the front envelope page of mathematic book and the last page of the art features of the book, then extract from them at least three descriptive data and another three quantitative data.

In a competition held by sport's teacher for jumping in the place.
The number of jumps carried out by the pupils of a class were as follows.

30 - 18 - 21 - 25 - 14 - 19 - 7 - 8 - 11 - 26 - 22 - 16 - 17 - 35 - 33 - 16 - 27 - 6 - 30 - 26 - 16 -

(a) Form the frequency table of sets for the previous jumps.
(b) Represent these data using the frequency curve.
(c) Answer the following questions.
   - What is the number of students of most number of jumps? What is their percentage?
   - What is the number of students of the least number in jumps? What do you advice those pupils?

The following table shows the number of air flights which done in Cairo airport in the period from 12 at noon till 8 in the morning of the next day.

<table>
<thead>
<tr>
<th>Time</th>
<th>12 p.m</th>
<th>4 p.m</th>
<th>8 p.m</th>
<th>12 p.m</th>
<th>4 a.m</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of flights</td>
<td>32</td>
<td>41</td>
<td>42</td>
<td>19</td>
<td>13</td>
<td>147</td>
</tr>
</tbody>
</table>

Represent these data by frequency curve then answer the following questions.
- In what time the Cairo air port is most crowded? Why?
- In what time the Cairo air port is the least crowded?
- what is the percentage of the number of flights coming to Cairo air port in the period from 12 at noon till 4 p.m.
- what is the percentage of the number of flights coming to Cairo air port after 12 a.m?
A technological activity.

The activity’s subject
Representing data by frequency curve through Excel program in the frequency curve.
What do we learn from this activity?
- Inserting tabular data in cells. Of Excel programme.
- Drawing the frequency curve of tabular data using Excel programme.

Example
The following table shows the number of hours spent by a number of pupils dealing with computers.
The required is representing these data by the frequency curve using Excel program

<table>
<thead>
<tr>
<th>Number of hours</th>
<th>1 -</th>
<th>2 -</th>
<th>3 -</th>
<th>4 -</th>
<th>5 -</th>
<th>6 -</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pupils</td>
<td>8</td>
<td>11</td>
<td>15</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>46</td>
</tr>
</tbody>
</table>

The practical procedure
1 - Click start, select programme then select Excel.
2 - Write the data of the first row in the previous table (number of hours) in cells of the column A.
3 - Write the data of the second row in the previous table (number of pupils) in cells of the column B.
4 - Determine the quantitative data exist in the two columns A and B using the mouse.
5 - From the menu (Insert) select chart then select custom types.
6 - Write the number of pupils in the cell existing down
7 - Write the number of hours in the down cell then click next then finish
If the steps are correct the following graph will appear.
1. Read data registered on the national number card to one of your family (your father – your mother – your brother – your sister) then extract from it descriptive data and quantitative data.

2. Choose one of canned (food stuff) goods which your mother uses (oil – rice – sugar – tea – detergent – butter – … etc) then extract from it descriptive data and quantitative data).

3. Carry out a study in the area in which you live and collect data about the ages of persons who live in this area. Then form a frequency table of sets for the obtained data.

<table>
<thead>
<tr>
<th>Ages</th>
<th>0-</th>
<th>10-</th>
<th>20-</th>
<th>30-</th>
<th>40-</th>
<th>50-</th>
<th>60-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of persons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Represent these data by the frequency curve then answer the following.

1. What is the most common age in the alive?

2. What is the number of children whose age are less than 10 years?

3. What is the number of persons whose ages are 50 years or more?
Unit 4

The unit test

1- Classify the set of the following data into quantitative data and descriptive data age – the colours of the nation’s flag – Marks of the exam. In math – weight – social case – temperature degrees – tallness – nationality – sex – score in science – the kind of the book that you real – the colour of school uniform suit – the preferable hoppy – the number of sisters – the number of bages of Arabic book.

2- A sample is taken from a tourists group coming to Luxor in one day in winter the number of sample was 33 tourists the nationalities of the tourists the nationalities of the tourists were as follow.


* Form a simple frequency table for the previous descriptive data then answer the following questions.
  - Which nationality has the greatest number in this group? Express that by a percentage.
  - Which nationality has the smallest number in this group? Express that by a percentage.
  - What do you advice the responsible about tourism in Luxor.

3- In a competition for passing the acceptance exam. To a sport college., The weights of 40 student presenting to this completion were as follow.


(a) Form the frequency table of sets for the previous weights
(b) Draw the frequency curve of the obtained table then answer the following questions ,
  - What is the number of the students who have the greatest weights? What is their percentage?
  - What is the number of students whose weights are less than 60kg? What is their percentage?
Guide answers to the general tests of the units and the model of test of first term.

The first unit test (the ratio)
1- (20.5) 2- (10, 15, 20cm) 3- (5 litre/3 km)
4- (a) 1 : 2, (b) 2 : 3, (c) 6 : 5, (d) 1 : 10
5- (8 : 15)

The second unit test (proportion)
1- (-12), 2- (\(\frac{33}{100}, \frac{1}{8}, \frac{3}{7}\)) 3- (192, 160, 228)
4- (LE 3740), 5- (6 metre), 6- (40 litre)
1- (a) one of its angles is right, (b) 12000 cm³
(c) 0.00258 m³, (d) the base area \(\times\) height
(e) 2650 cm³
2- 118, 35.
3- (a) the pattern is \(\square\) \(\square\)
(b) the patterns
4- 35000 cm³
5- the length = 24 cm
6- 125
7- 3.375 litre, 27 pounds

The 4th unit test (statistics)

<table>
<thead>
<tr>
<th>Sets</th>
<th>50-</th>
<th>55-</th>
<th>60-</th>
<th>65-</th>
<th>70-</th>
<th>75-</th>
<th>80-</th>
<th>85-</th>
<th>90-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>40</td>
</tr>
</tbody>
</table>

The answer of the model test

First question:
1- 1 / 3 2- 6 3-age 4- 4.5
5- 216 6- 5

Second question:
1- The first number / The second number
2- The parallelogram, the square, the rectangle the rhombus.
3- The edge length \(\times\) itself \(\times\) itself
4- The volume of the liquid which fills the vessel completely.
5- 60 - 20 = 40
6- 8 / 40 = 1 / 5 = 20%

Third question:
a) 1500, 2400 b) 11 metre
c) = 8765 cm³ d) 80, 70, 21 cm

Fourth question:
a) 2880, 1920, 1440
b) 8 kirats, 4 kirats

5th question:
2 pupils, from 3 – 4 hours 40 %

First Term
(Question 1) Complete the following statements:

1. 39 days = ................ weeks.

2. The volume of a Cuboid is 64 cm\(^3\) and the area of its base 16 cm\(^2\), then its height = ................ cm

3. If the real length of an insect is 0.3 mm and its length in a picture is 4.5 cm, then the drawing scale = ............... : .............

4. The area of the Triangle = \(\frac{1}{2} \times \) ................ \times .................

5. If A : B = 2 : 3, B : C = 3 : 5, then A : C = .................

6. The opposite table shows the Marks of 40 students in one test, then the number of students who got less then 30 marks = .................

<table>
<thead>
<tr>
<th>Marks</th>
<th>10 -</th>
<th>20 -</th>
<th>30 - 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Students</td>
<td>10</td>
<td>13</td>
<td>17</td>
</tr>
</tbody>
</table>

(Question 2) Choose the Correct Answer:

1. The range of the set of values 7, 3, 6, 9 and 5 is ................ (2, 4, 6, 12)

2. \(\frac{3}{4} = \) .................. (decimal form) (0.2, 0.5, 0.25, 0.75)

3. An agricultural tractor ploughs 28 feddans in 4 hours, the time which needed to ploughs 42 feddans is ................. (4, 6, 7, 8)

4. In the opposite figure : ABCD is a paralellogram, \(m (\angle ACD) = \) ...............° (35°, 45°, 100°, 180°)

5. If \(\frac{2}{5} = \frac{X}{15}\), then X = ................. (2, 5, 6, 15)

6. The following data are descriptive data except (favorite colour, age, birth place, blood specie)
(Question 3)
(a) A contains has 12 litres of oil, it is wanted to put it in small bottles the Capacity of each of them is 400 cm³. Calculate the number of bottles which needed.
(b) If the buying price of electric sets is LE 72 000 and sold at 12% profit, Calculate the selling price.

(Question 4)
(a) The ratio among the measures of the angles of a triangle is 2 : 3 : 4 find the measure of each angle in this triangle.
(b) A metallic cube of edge length is 12 cm it needs to be converted into ingots in the shape of Cuboid each of them of dimensions 3, 4, and 6 cm Calculate the number of ingots that are obtained.

(Question 5)
(a) Two persons started a commercial business the first paid LE 5000 and the second paid LE 8000, at the end of the year the net profit was LE 3900. Calculate the share of each of them from the profit.
(b) The following table shows the marks of 100 students in one month in maths test.

<table>
<thead>
<tr>
<th>Marks</th>
<th>10 -</th>
<th>20 -</th>
<th>30 -</th>
<th>40 - 50</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>15</td>
<td>30</td>
<td>40</td>
<td>15</td>
<td>100</td>
</tr>
</tbody>
</table>

Draw the frequency curve of this distribution.
Model (2)

(Question 1) Choose the Correct Answer:

(1) If one angle of a parallelogram is right, then it is called a ......................
   (rectangle, square, rhombus, cube)

(2) \( \frac{24}{5} = \) ..............
   (4 \( \frac{1}{5} \), 3 \( \frac{2}{5} \), 4 \( \frac{4}{5} \), 2 \( \frac{4}{5} \))

(3) If the marks of 6 students in one exam is 29, 33, 57, 40, 36, 49 then the range of
    these marks = .................
    (32, 33, 28, 86)

(4) If \( \frac{4}{6} = \frac{12}{x} \), the \( x + 2 = \) .................
    (16, 18, 20, 22)

(5) \( 1 \frac{3}{4} = \) ................. %
    (25, 50, 75, 175)

(6) \( \frac{513}{614} \) ................. \( \frac{432}{145} \)
    (>, <, =, \leq)

(Question 2) Complete the following statements:

(1) The data: the age, the tall, the weight and favorite food are quantative data except .........

(2) A wooden box in the form of a Cube, its external volume is 1000 cm\(^3\). Its capacity is 729 cm\(^3\), then the volume of the wood of the box = ................. cm\(^3\).

(3) The following table shows the marks of 50 students in one month in maths, the
    number of pupils whose marks less than 40 is .................

<table>
<thead>
<tr>
<th>Marks</th>
<th>10 -</th>
<th>20 -</th>
<th>30 -</th>
<th>40 - 50</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>5</td>
<td>15</td>
<td>20</td>
<td>10</td>
<td>50</td>
</tr>
</tbody>
</table>

(4) If the height of the fence of the villa in the design is 5 cm and its real height is 6
    meters then the drawing scale is .............. : ..............

(5) \( \frac{3}{4} + 5 \frac{1}{2} = 7 \) ..............

(6) A Car Consumes 20 litres of Petrol to Corer a distance 250 km, then the rate of
    consumption of the Car = .................
(Question 3)
(a) Three persons started in business. The first paid 15000 pounds, the second paid 25000 pounds and the third paid 20000 pounds. at the end of the year the net profit was 5520 pounds. Calculate the share of each of them.
(b) 10 Litres of water were poured in a vessel in the shape of a cuboid, its base is square of side length is 25 cm find the height of the water in the vessel.

(Question 4)
(a) In one of our schools, there are 360 students, if the ratio between the boys and the girls was 1 : 2 find each of the number of boys and girls.
(b) In the opposite figure : ABCD is a parallelogram in which AB = 6 cm, BC = 7 cm, BM = 3.8 cm, \( m(\angle C) = 70^\circ \). Without using geometrical instraments find:
\( m(\angle ADC) \), the perimeter of \( \triangle BCD \).

(Question 5)
(a) Heba bought a Mobil for 660 pounds with a discount 15%. Calculate the price of this mobil before the discount.
(b) The following table shows the number of hours which spent by 46 pupils to study their lessons daily:

<table>
<thead>
<tr>
<th>Number of hours</th>
<th>1 -</th>
<th>2 -</th>
<th>3 -</th>
<th>4 -</th>
<th>5 - 6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pupils</td>
<td>6</td>
<td>3</td>
<td>8</td>
<td>12</td>
<td>11</td>
<td>40</td>
</tr>
</tbody>
</table>

Represent these data using the frequency curve.
(Question 1) Complete the following statements:

2. \(\frac{3}{10} = .............. \%\)
3. The volume of a Cuboid = the area of base \(x \) .................
4. 3 Litres = ............... \(cm^3\).

(Question 2) Choose the correct Answer:

1. The range of the set of values 50, 25, 35, 20 is ................. \(\begin{array}{c}
(10, 20, 30) \\
(6, 15, 20) \\
\text{rectangle, square, parallelogram} \\
(1 : 10, 1 : 1000, 1 : 100)
\end{array}\)
2. If \(\frac{2}{3} = \frac{10}{x}\), then \(x = .................\)
3. The diagonals are perpendicular in a .................
4. If the real length is 6 m and the drawing length is 6 cm then the drawing scale is ................. \(\begin{array}{c}
(1 : 10, 1 : 1000, 1 : 100) \\
\end{array}\)

(Question 3) Choose from Column (A) to a the suitable one from the Column (B):

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Cube has ................ edges</td>
<td>* minimization</td>
</tr>
<tr>
<td>2. If (The drawing scale &lt; 1) this expresses ................</td>
<td>* 12</td>
</tr>
<tr>
<td>3. The ratio between the side length of the square and its perimeter = ................ : ................</td>
<td>* 90°</td>
</tr>
<tr>
<td>4. All the angles of the rectangle are equal in measure and the measure of any of them = ................</td>
<td>* 1 : 4</td>
</tr>
</tbody>
</table>
(Question 4) Put true (✓) or false (✗):

(1) The numbers 1, 2, 6 and 12 are proportional numbers ( )

(2) If the number of bays was 35% from the total of the number of pupils, then the number of the girls is 20% ( )

(3) The favorite colour is descriptive data ( )

(4) The Volume of a Cube of edge length 3 cm = 9 cm² ( )

(Question 5)

(a) Complete the following statements:

(1) If \( A : B = 2 : 3 \), \( B : C = 3 : 5 \)

\[ A : C = \ldots : \ldots \]

(2) In the opposite figure:

\( ABCD \) is a parallelogram,

\[ m(∠D) = \ldots° \]

(b) The following table shows the marks of 50 students in one month in maths:

<table>
<thead>
<tr>
<th>Marks</th>
<th>10 -</th>
<th>20 -</th>
<th>30 -</th>
<th>40 - 50</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>6</td>
<td>10</td>
<td>20</td>
<td>14</td>
<td>50</td>
</tr>
</tbody>
</table>

Complete:

(1) The number of pupils whose marks are less than 20 = ................. pupils

(2) The number of pupils whose marks are 40 or more = ................. pupils
المواصفات الفنية

<table>
<thead>
<tr>
<th>رقم الكتب</th>
<th>التجريد</th>
<th>طباعة الفلاف</th>
<th>طباعة المتن</th>
<th>ورق الفلاف</th>
<th>ورق المتن</th>
<th>عدد الصفحات بالفلاف</th>
<th>المقاس</th>
</tr>
</thead>
<tbody>
<tr>
<td>21/3/2011</td>
<td>15/10/15/11</td>
<td>4444 لون</td>
<td>4444 لون</td>
<td>4444 200 جرام</td>
<td>4444 80 جرام</td>
<td>4444 244 1/8 (2054)</td>
<td></td>
</tr>
</tbody>
</table>

http://elearning.moe.gov.eg

صندوق تأمين ضباط الشرطة
صندوق تأمين ضباط الشرطة