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Ministry of Education and
Technical Education
Central Administration of
Book Affairs

Mathematics

Fifth Primary

5

Student's Book
First Term



2019-2020

غير مصرح بتداول هذا الكتاب خارج
وزارة التربية والتعليم والتعليم الفني

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**غير مسموح نهائياً استخدام
الآله الحاسبه فى امتحانات
الفصل الدراسى الأول**

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Dear students:

It is extremely great pleasure to introduce the mathematics book for fifth primary. We have been specially cautious to make learning mathematics enjoyable and useful since it has many practical applications in real life as well as in the other subjects. This gives you a chance to be aware of the importance of learning mathematics, to determine its value and to appreciate the mathematicians roles.

This book sheds new lights on the activities as a basic objective. Additionally, we have tried to introduce the subject simply and excitingly to help attaining mathematical knowledge as well as gaining the patterns of positive thinking skills which pave your way to creativity.

This book is divided into units, each unit contains lessons. Colors and pictures are effectively used to illustrate some mathematical concepts and the properties of figures. Lingual level of previous study has also been taken into consideration.

Our great interest here is to help you get the information by yourself in order to develop your self-learning skills.

Calculators and computer sets are used when there's a need for. Exercises, practices, general exams, Activities, unit test, general tests, and final term tests attached with model answers have been included to help you review the curriculum completely.

Eventually, we hope getting on the right track for the benefits of our students as well as for our dearest Egypt hoping bright future to our dearest students.

Authors



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
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List of Symbols

C	Set of counting numbers	\leq	Less than or equal to
E	Set of even numbers	$=$	Equal to
O	Set of odd numbers	\neq	Not equal to
P	Set of prime numbers		Open curve
\emptyset or $\{ \}$	Null set or empty set		Closed curve
\in	Belonging		Circle
\notin	Not belonging	r	radius
\subset	Inclusion	π	Approximate ratio
$\not\subset$	Not inclusion	\overline{AB}	Line segment \overline{AB}
\cup	Union	\overrightarrow{AB}	Ray \overrightarrow{AB}
\cap	Intersection	$\longleftrightarrow AB$	Straight line $\longleftrightarrow AB$
U	Universal set	\sphericalangle	Angle
X'	Complement set	$m(\sphericalangle B)$	Measure angle (B), $m(\sphericalangle B)$
X-Y	X difference Y	$P(E)$	Probability of event E $P(E)$
N	Set of natural numbers	\equiv	Congruent
$>$	More than	\triangle	Triangle
\geq	More than or equal to	(X, Y)	Ordered pair X, Y (X, Y)
$<$	Less than		

Unit One

Fractions

1



11
22
33
44
55
66
77
88
99
00

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99
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99999999
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00

Revision

Revision

- 1 Convert the following fractions to fractions with denominator 10, then convert to the decimal form:

Example : $\frac{14}{5} = \frac{28}{10} = 2.8$

A $\frac{5}{2} = \frac{\dots}{10} = \dots$

B $\frac{36}{30} = \dots = \dots$

C $\frac{55}{50} = \dots = \dots$

D $\frac{14}{20} = \dots = \dots$

E $\frac{45}{50} = \dots = \dots$

F $\frac{95}{25} = \dots = \dots$

- 2 Write down the following numbers in the form of decimal numbers (as shown):

Example : $12 \frac{23}{50} = 12 \frac{46}{100} = 12.46$

A $8 \frac{3}{25} = \dots$

B $37 \frac{1}{4} = \dots$

C $\frac{129}{50} = \dots$

D $\frac{115}{500} = \dots$

- 3 Write down the following numbers in the form of an integer number and a fraction (as shown):

Example : $3.28 = 3 \frac{28}{100} = 3 \frac{7}{25}$

A $7.35 = \dots$

B $6.07 = \dots$

C $12.56 = \dots$

D $9.003 = \dots$

- 4 Put the following numbers in their appropriate places inside the rectangles below:

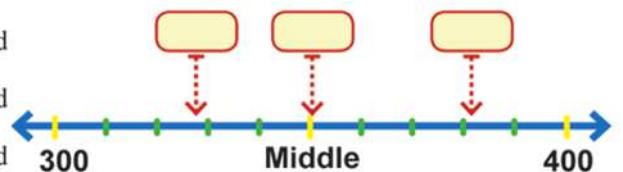
328 , 382 , 350

Then complete:

$328 \approx \dots$ to the nearest hundred

$382 \approx \dots$ to the nearest hundred

$350 \approx \dots$ to the nearest hundred



5 Complete the following table:

Number	Number to the nearest 10	Number to the nearest 100	Number to the nearest 1000	Number to the nearest unit
4723.6
7259.2
64345.97

6 Match each number with its approximated value to the nearest unit:

75.57	76	47.39
$47\frac{2}{3}$	47	$75\frac{3}{7}$
$75\frac{4}{9}$	48	47.71
	75	

7 Approximate the following numbers to the nearest tenth:

A 63.23

B 432.76

C 7023.54

D $367\frac{3}{4}$

E $24\frac{3}{20}$

F $\frac{7}{50}$

8 Find the sum of the following operations, then approximate the sum according to the approximation required:

A $32.27 + 13,5 = \dots \approx \dots$ to the nearest tenth.

B $18.07 + 421,45 = \dots \approx \dots$ to the nearest unit

C $854.49 - 32.71 = \dots \approx \dots$ to the nearest ten

D $743.65 - 512.28 = \dots \approx \dots$ to the nearest tenth

Approximating to the nearest hundredth and thousandth

First: Approximating to the nearest hundredth

* You will learn *

- ☺ To approximate to the nearest hundredth.
- ☺ To approximate to the nearest thousandth.



Think and discuss

The teacher asked Fared and Huda to approximate 172.476 to the nearest hundredth.

Fared answered:



The number 172.476 is between **172.47** and **172.48**

However, it is closer to **172.48** than **172.47**
Therefore, $172.476 \approx 172.48$ approximated to the nearest hundredth.

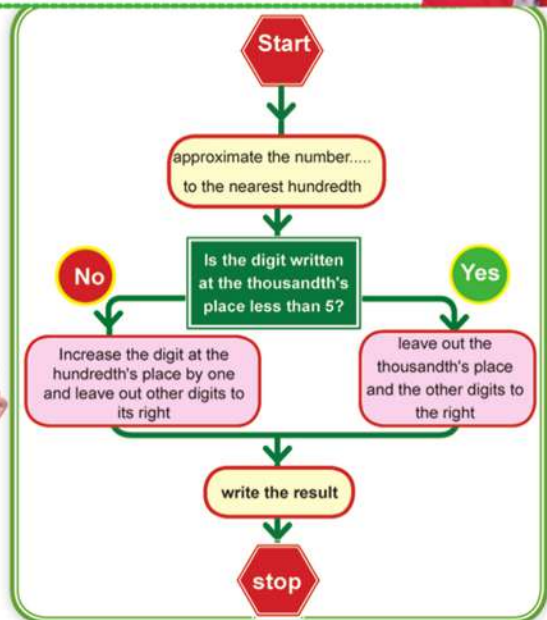


Key Terms

- ☺ Approximating
- ☺ Hundredth
- ☺ Thousandth

Hoda suggested:

Using the opposite **flow chart** to approximate the number to the nearest hundredth.




Practice

1 Approximate the following numbers to the nearest hundredth:

A $76.514 \approx 76.51$

B $52.608 \approx 52.61$

C $175.325 \approx \dots\dots\dots$

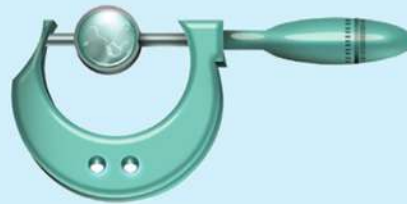
D $69.743 \approx \dots\dots\dots$

E $0.737 \approx \dots\dots\dots$

F $3\frac{17}{500} \approx \dots\dots\dots$

2

The capacity of a
cola bottle = 0.192 liters
 ≈ 0.19 liters
(to the nearest
hundredth)



A micrometer is a device used for
precise measuring. It is used to
measure the thickness of a paper and
it was 0.136 mm.

Complete: the thickness of the paper
 $\approx \dots\dots\dots$ mm.

(to the nearest hundredth)



The reading of the opposite gas meter
 $\approx \dots\dots\dots$ cubic meter
(approximate to the nearest
hundredth.)



Second: Approximating to the nearest thousandth



Think and discuss



The teacher asked Hend to approximate the number 31.6452 to the nearest thousandth.

Hend answered



The number 31.6452 is between 31.645, and 31,646 However, it is closer to 31.645 than 31,646

Therefore, $31.6452 \approx 31.645$



Practice

In the opposite figure: Complete the flow chart to represent the steps followed to approximate to the nearest thousandth.

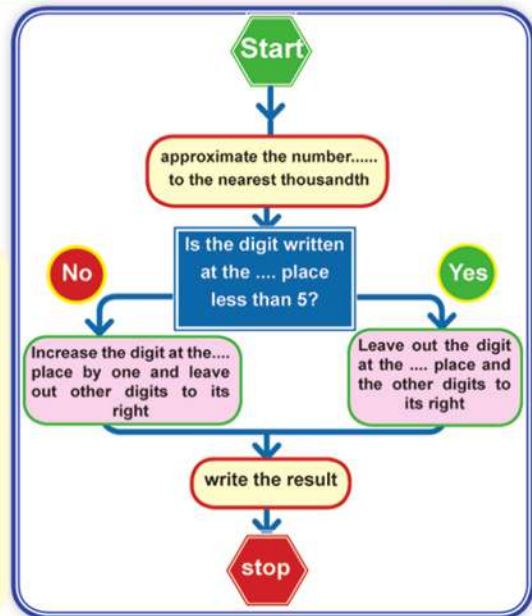
Example

Approximate 4.6798 to the nearest thousandth.

Result:

The digit at the thousandth's place is 9, the digit at the ten thousandth's place is 8 which is greater than 5.

Therefore, we increase the digit at the thousandth's place by one. Then, it will be $\approx 4.6798 - 4.680$



Note that

When approximating to the nearest thousandth, the result of approximating must include 3 decimal digits even if the digit at the thousandth's place is equal to zero.

Practice

1 Complete the following table:

Number	approximate to the nearest hundredth	approximate to the nearest thousandth
43.5426	43.54	43.543
537.2983
21.84792
0.38327
6.5297

2 Complete:



The length of a cell measured by a microscope = 0.3527 mm
 \approx mm
 to the nearest thousandth



Each tablet contains some ingredients as shown in the following table:

compound	weight in (gm)	weight approximated to the nearest thousandth
A	0.0032	.....
B	0.0546	.....
C	0.1379	.....

Example

Given that $L = 52.3723$, $M = 21.7494$. Estimate the sum of $L+M$ then compare your estimation with the sum to the nearest hundredth.

Result:

$$\begin{aligned} L &= 52.3723 \\ M &= 21.7494 \\ L + M &= 52.3723 + 21.7494 \\ &= 74.1217 \end{aligned}$$

≈ 74.12 Since the value is closer to the estimate, the value is acceptable.

Estimate the result

Estimate of $L = 52$
 Estimate of $M = 22$
 Estimate of $(L + M) = 74$



Ahmed bought some stuff from a shopping center. Can you estimate the total of what he paid in LE approximating it to the nearest ten pounds?

Make sure that your estimation is acceptable for the actual sum.



Receipt

price (LE)	item
15.25	soap
68.75	washing powder
64.75	perfumes
98.25	meat
170.5	clothes
28.25	vegetables

Exercises

- Approximate 4.7398 to the nearest

A hundredth **B** thousandth
- Choose the correct answer from parantheses:

A $736.592 \approx 736.59$ to the nearest
(tenth - hundredth - thousandth).

B $82.497 \approx 82.50$ to the nearest.....
(tenth - hundredth - thousandth).

C $3\frac{1}{8} \approx$ to the nearest hundredth .
(3.10 - 3.12 - 3.13)

D $13.376 + 15.75 \approx$ to the nearest hundredth.
(29.13 - 29.12 - 29.10)

E $37.4289 - 14.081 \approx \dots\dots\dots$ to the nearest hundredth.
(23.350 - 23.348 - 23.248)

F $8.657 \text{ meters} \approx \dots\dots\dots$ to the nearest centimeter.
(866 - 8.66 - 8.6)

3 Write down the smallest decimal fraction that includes the digits (2, 5, 7, 8), then approximate that number to the nearest hundredth and nearest thousandth.

4 Complete:

A The number $4.559 \approx 4.6$ to the nearest

B The difference between $\frac{41}{500}$, $0.473 = \dots\dots\dots \approx \dots\dots\dots$ to the nearest tenth.

C $3\frac{3}{4} - 1\frac{3}{200} = \dots\dots\dots \approx \dots\dots\dots$ to the nearest hundredth.

D $4357 \div 1000 = \dots\dots\dots \approx \dots\dots\dots$ to the nearest hundredth.

5 A road extends for 74389 meters. Find its length in kilometers approximating the result to the nearest hundredth.



6 Complete:

A 39 days $\approx \dots\dots\dots$ weeks.

B 255 hours $\approx \dots\dots\dots$ days.

C 12.4658 kilometers $\approx \dots\dots\dots$ kilometers.

D 67 months $\approx \dots\dots\dots$ years.

7 Given that: $X = 13.452$, $Y = 7.273$

Find $X + Y$ approximating the sum to the nearest hundredth.

Estimate the sum of $X + Y$. Is your estimation acceptable? Explain.

Comparing fractions

You will learn

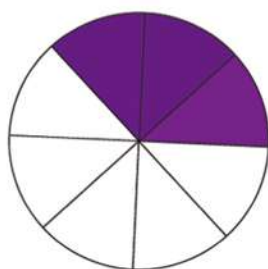
☺ To compare fractions.

Key Terms

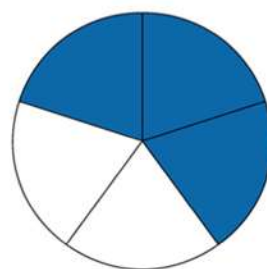
- ☺ greater than >
- ☺ less than <
- ☺ Equal to =



Think and discuss



The fraction graphed by the colored section = $\frac{3}{8}$



The fraction graphed by the colored section = $\frac{3}{5}$

put (> , < or =)

$$\frac{3}{8} \dots\dots 1$$

$$\frac{3}{8} \dots\dots 0.5$$

$$\frac{5}{8} \dots\dots \frac{3}{8}$$

put (> , < or =)

$$\frac{3}{5} \dots\dots \frac{3}{8}$$

$$\frac{3}{5} \dots\dots \frac{1}{2}$$

$$\frac{3}{5} \dots\dots \frac{6}{10}$$

When the numerator is the same in the two fractions

$$\frac{8}{17} < \frac{8}{11}$$

because $17 > 11$

When the denominator is the same in the two fractions

$$\frac{8}{11} > \frac{5}{11}$$

because $8 > 5$



Practice

1 put (> , < or =) to have a true sentence:

$$\frac{7}{13} \dots\dots \frac{5}{13}$$

$$\frac{8}{25} \dots\dots \frac{8}{13}$$

$$\frac{7}{9} \dots\dots 2 \frac{1}{9}$$



Mental Math

- 1 Rearrange the following fractions ascendingly (from the smallest to the greatest):

$$\frac{7}{18}, \quad \frac{5}{18}, \quad \frac{1}{18}, \quad \frac{25}{18}, \quad \frac{13}{18}$$

- 2 Rearrange the following fractions descendingly (from the greatest to the smallest)

$$\frac{13}{7}, \quad \frac{5}{7}, \quad \frac{9}{7}, \quad \frac{4}{7}, \quad \frac{11}{7}$$

- 3 Find the possible values of X which satisfy the following relations, where X is an integer.

A $\frac{4}{7} < \frac{x}{7} < \frac{8}{7}$

B $\frac{5}{8} < \frac{5}{x} < 1$

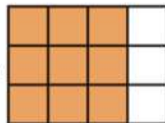
- 4 Rearrange the following fractions once ascendingly and the other descendingly. You can use the number line:

$$\frac{11}{12}, \quad \frac{5}{12}, \quad \frac{2}{3}, \quad \frac{3}{4}, \quad \frac{5}{6}$$

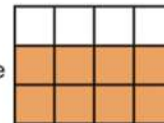
Comparing two fractions with different denominators

Which is greater $\frac{3}{4}$ or $\frac{2}{3}$?

the fraction $\frac{3}{4}$ graphed by the colored section.



the fraction $\frac{2}{3}$ graphed by the colored section.



$$\frac{3}{4} = \frac{9}{12}$$

$$\frac{2}{3} = \frac{8}{12}$$

$$\frac{9}{12} > \frac{8}{12} \text{ because } 9 > 8$$

i.e. $\frac{3}{4} > \frac{2}{3}$

Note that:

$$\frac{3}{4} = \frac{3 \times 3}{4 \times 3} = \frac{9}{12}, \quad \frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

i.e. To compare two fractions with different denominators, we find their common denominator. In other words, we find the least common denominator (LCD).

Which is greater $\frac{3}{5}$ or $\frac{4}{7}$?

(LCD) of the two denominators 5 and 7 = $5 \times 7 = 35$

$$\frac{3}{5} = \frac{3 \times 7}{5 \times 7} = \frac{21}{35} \quad , \quad \frac{4}{7} = \frac{4 \times 5}{7 \times 5} = \frac{20}{35}$$

Then : $\frac{21}{35} > \frac{20}{35}$ i.e. $\frac{3}{5} > \frac{4}{7}$

Practice

Compare the following fractions:

A $\frac{3}{4}$, $\frac{2}{5}$

B $\frac{7}{9}$, $\frac{3}{4}$

C $\frac{3}{5}$, $\frac{5}{8}$

D $\frac{7}{12}$, $\frac{4}{5}$

E $\frac{4}{5}$, $\frac{3}{7}$

F $\frac{7}{8}$, $\frac{6}{7}$

Comparing fractions and decimals

You can convert common fractions into decimals and you can compare them as you have learned in the approximating lesson (using your calculator)

Example

Rearrange the following numbers ascendingly: $3\frac{1}{2}$, 5 , 3.2 , $4\frac{1}{3}$, $4\frac{2}{7}$.

Note that: 1 The smallest number is 3.2, while the greatest number is 5.

2 To compare $3\frac{1}{2}$, 3.2

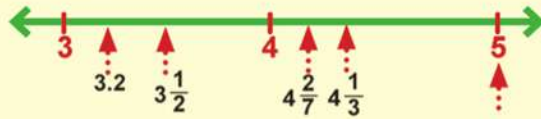
We compare $\frac{1}{2}$, 0.2 i.e., we compare 0.5, 0.2
 $0.5 > 0.2 \rightarrow 3\frac{1}{2} > 3.2$

3 To compare $4\frac{1}{3}$, $4\frac{2}{7}$ proceed as follows:

$$\frac{1}{3} = \frac{7}{21} , \frac{2}{7} = \frac{6}{21} \text{ then } 4\frac{1}{3} > 4\frac{2}{7}$$

Therefore, the ascending Rearrange is: 3.2 , $3\frac{1}{2}$, $4\frac{2}{7}$, $4\frac{1}{3}$, 5

That Rearrange can be shown on the number line:



Rearrange the following fractions:

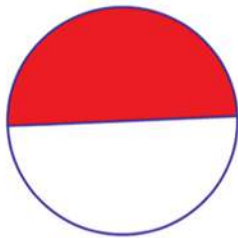
first: rearrange $7\frac{1}{6}$, 5.3 , $7\frac{2}{11}$, $5\frac{4}{7}$, 6 descendingly.

second : rearrange 8.11 , $\frac{4}{5}$, $12\frac{3}{7}$, $\frac{61}{7}$, 12.4 ascendingly.

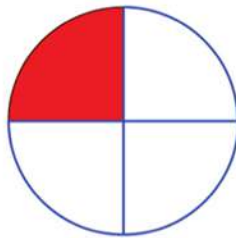
Exercises

- 1 State what the colored section represents in each figure, then rearrange the fractions ascendingly

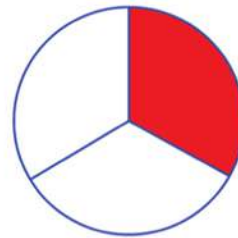
A



.....
.....



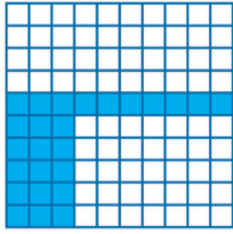
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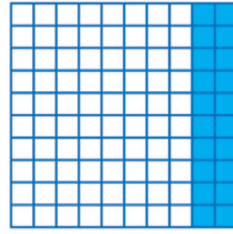
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Ascending Rearrange

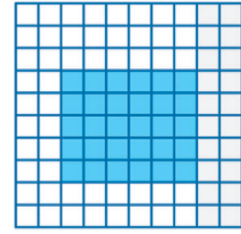
B



.....
.....



.....
.....



.....
.....

Ascending Rearrange:

2 put (✓) or (✗):

A $4376 < 0.407$ ()

B $50.61 > 0.501$ ()

C $\frac{7}{8} > 0.775$ ()

D $3.5 > 3\frac{4}{9}$ ()

E $2\frac{7}{9} < 2.7$ ()

F $\frac{1}{4} = 0.25$ ()

3 Find the values of a, b, and c if:

A $\frac{2}{5} = \frac{a}{15}$

B $\frac{b}{8} = \frac{15}{24}$

C $\frac{2}{3} = \frac{16}{c}$

4 Rearrange the following numbers ascendingly:

A $\frac{12}{15}, \frac{12}{7}, \frac{12}{17}, \frac{12}{13}, \frac{12}{15}$

B $\frac{3}{2}, \frac{3}{5}, \frac{3}{8}, \frac{6}{8}, \frac{3}{7}$

Multiplication

1-3

Multiplying fractions and decimal numbers by 10, 100, 1000

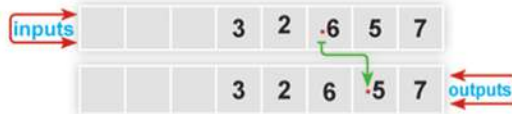


Let's work together



Work with your classmate using the calculator:

- Enter **32.657** on your calculator as illustrated on the opposite figure, then multiply that number by 10. Notice the change of the position of the decimal point within the result.



How many places has the decimal point moved to the right direction?

- Enter **73.2541** on your calculator, then multiply that number by 100. Notice the change of position of the decimal point within the result.

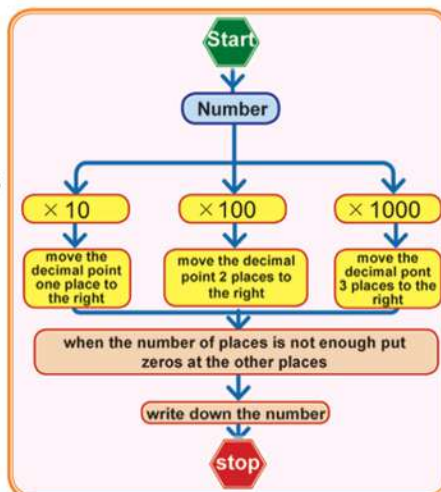


How many places has the decimal point moved to the right direction?



If we multiply that number by 1000. How many places will the decimal point move to the right direction?

Notice the flow chart illustrating the operations within that lesson:



You will learn

- To multiply fractions and decimal numbers by 10, 100, 1000

Key Terms

- Decimal fraction
- Decimal number


Practice
Complete:

$35.321 \times 10 = \dots\dots\dots$, $27.134 \times 100 = \dots\dots\dots$

$12.3 \times 1000 = \dots\dots\dots$, $7.5621 \times 10000 = \dots\dots\dots$

Exercises
1 Complete:

A $3.18 \times 10 = \dots\dots\dots$

B $3.2 \times 10 = \dots\dots\dots$

C $5.748 \times 100 = \dots\dots\dots$

D $72.14 \times 100 = \dots\dots\dots$

E $9.7 \times 100 = \dots\dots\dots$

F $3.2172 \times 1000 = \dots\dots\dots$

G $62.819 \times 1000 = \dots\dots\dots$

H $0.341 \times 1000 = \dots\dots\dots$

I $7.32 \times 1000 = \dots\dots\dots$

J $(72.12 + 2.7) \times 10 = \dots\dots\dots$

K $(8.35 - 2.14) \times 100 = \dots\dots\dots$

L $(2.35 \times 10) - 11.1 = \dots\dots\dots$

2 Choose the correct answer from the parentheses:

A $98.7 \times 100 = \dots\dots\dots$ (987 - 9870 - 0.987 - 0.0987)

B $0.067 \times 1000 = \dots\dots\dots$ (6.7 - 67 - 0.067 - 670)

C $21.3 \times 10 = \dots\dots\dots$ (2130 - 2.13 - 213 - 0.0213)

3 Put (< , > or =) in the empty spaces:

A 4.72×10 0.472×100

B 3.251×100 325.1×100

C 72.15×10 0.07215×1000

4 Complete:

A 3.002 Kilograms = grams. **B** LE 728.9 = piasters.

C 37.3 decimeters =centimeters. **D** 3.6 Kilometers = meters

Multiplying a fraction or a decimal number by an integer



Let's work together

The math teacher asked the groups in the class to find the area of a rectangle in which the lengths of its sides are 23.25cm and 15cm. Each group drew the rectangle and calculated its area in a different method. Fill in the blanks to find the area.

The first group

$$\begin{aligned} \text{Area} &= 23.25 \times 15 \\ &= \frac{2325}{100} \times 15 \\ &= \square \square \square , \square \square \text{ cm}^2 \end{aligned}$$



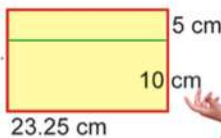
The second group

$$\begin{aligned} \text{Area} &= 15 \times 23.25 \\ &= 15 \times \frac{2325}{100} \\ &= \square \square \square , \square \square \text{ cm}^2 \end{aligned}$$



The third group:

$$\begin{aligned} \text{Area} &= 23.25 \times (10 + 5) \\ &= 23.25 \times 10 + 23.25 \times \dots \\ &= \dots + \frac{2325}{100} \times \dots \\ &= \square \square \square , \square \square \text{ cm}^2 \end{aligned}$$



The teacher said: Despite the difference of the solutions, all the answers are correct.

Explain that by completing the following sentences:

- $23.25 \times 15 = 15 \times \dots$ what do you observe?
- $23.25 \times (10 + \dots) = 23.25 \times \dots + 23.25 \times 5$, what do you observe?

You will learn

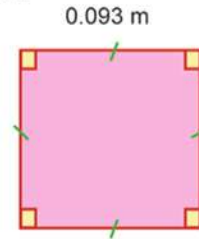
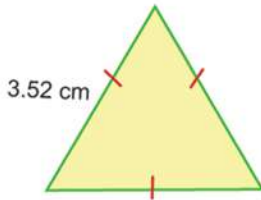
- To multiply a fraction or a decimal number by an integer

Key Terms

- Decimal fraction
- Decimal number


Practice

Find the perimeter of each of the following shapes:


Exercises

- 1 If: $326 \times 7 = 2282$, $37 \times 52 = 1924$, then complete the following without multiplying:

A $3.26 \times 7 = \dots\dots$	B $0.0326 \times 7 = \dots\dots$	C $32.6 \times 7 = \dots\dots$
D $3.7 \times 52 = \dots\dots$	E $0.37 \times 52 = \dots\dots$	F $0.326 \times 7 = \dots\dots$
G $0.0037 \times 52 = \dots\dots$	H $37 \times 5.2 = \dots\dots$	I $0.00326 \times 7 = \dots\dots$
J $3.26 \times 17 = 3.26 \times (7 + \dots\dots) = 3.26 \times 7 + \dots\dots \times \dots\dots = \dots\dots$		

- 2 Find the result of each of the following:

A $2.37 \times 5 = \dots\dots$	B 0.251×9	C $\begin{array}{r} 0.819 \\ \times 8 \\ \hline \dots\dots\dots \end{array}$
D $34.2 \times 7 = \dots\dots$	E 1.352×11	F $2.15 \times 7 + 2.15 \times 3$

- 3 The price of a bar of chocolate is LE 2.75, what is the cost of 15 bars of the same kind?

- 4 Ahmed bought 12 cans of juice. The price of each can was LE 1.75. What is the total cost of the juice? How much would the seller pay back to Ahmed if he paid him LE 30?

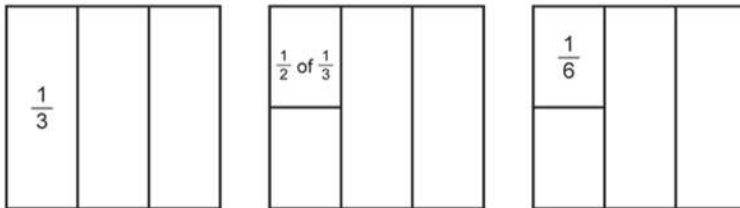


Multiplying common fractions



Think and discuss

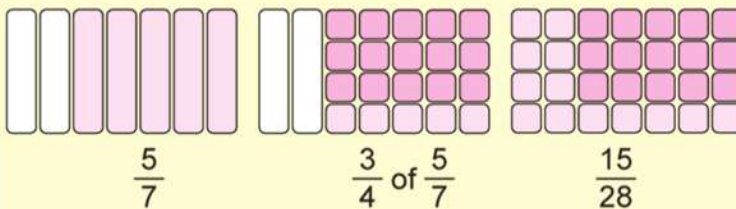
Soad wanted to deduce the product of $\frac{1}{2} \times \frac{1}{3}$. She used a piece of paper and divided it according to the following steps:



$$\text{i.e.: } \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$$

Example

Find the product of $\frac{3}{4} \times \frac{5}{7}$:



$$\text{i.e.: } \frac{3}{4} \times \frac{5}{7} = \frac{3 \times 5}{4 \times 7} = \frac{15}{28}$$

In general:

$$\frac{3}{5} \times \frac{3}{8} = \frac{3 \times 3}{5 \times 8} = \frac{9}{40},$$

$$\frac{2}{9} \times \frac{5}{7} = \frac{10}{63} \quad \text{and so on...}$$

You will learn

- ☺ Multiplication of common fractions

Multiplying decimal fractions

You will learn

☺ To multiply a decimal fraction by a decimal number.

Note that

(1)

$$0.6 = 6 \text{ tenths}$$

$$0.6 = \frac{1}{10} \times 6$$

$$0.4 = \frac{1}{10} \times 4$$

$$0.6 \times 0.4 = \frac{1}{10} \times 6 \times \frac{1}{10} \times 4 \\ = \frac{1}{100} \times 24$$

$$0.6 \times 0.4 = 0.24$$

(2)

$$0.6 = \frac{6}{10}, 0.4 = \frac{4}{10}$$

$$0.6 \times 0.4 = \frac{6}{10} \times \frac{4}{10} \\ = \frac{24}{100}$$

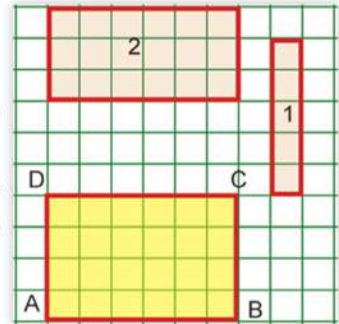
First: Multiplying a decimal fraction by a decimal number



Think and discuss

In the opposite figure:

The length of the rectangle ABCD is 6 tenths and its width is 4 tenths. The area of the rectangle at the figure = The number of square units inside the shape = 24 hundredths



Complete using the shape:

The rectangle	length	width	area	
ABCD	0.6	0.4	0.24	$0.6 \times 0.4 = 0.24$
SHAPE (1)	.....	0.1	.....	$\dots \times \dots = 0.05$
SHAPE (2)	.....	0.3	.....	$\dots \times 0.3 = \dots$

Practice

Find the result of:

3.7	→	one decimal number	0.53	1.29
× 0.6	→	one decimal number	0.32	0.34
<u>□.□□</u>	→	Two decimal numbers	<u>□□□</u>	.....
			<u>□□□</u>
			<u>□□□□</u>

2 Observe and Complete:

$$\frac{3}{5} \times \frac{1}{2} = 0.6 \times 0.5 = \dots \text{ or } \frac{3}{5} \times \frac{1}{2} = \frac{3 \times 1}{5 \times 2} = \frac{\dots}{\dots} = \dots$$

Second: Estimating the products of multiplying a fraction, or a decimal number by a fraction or a decimal number.

Example

Find the result: 7.6×2.2

$$\begin{aligned} \text{A } 7.6 \times 2.2 &= \frac{67}{10} \times \frac{22}{10} \\ &= \frac{1672}{100} \\ &= \boxed{1} \boxed{6}, \boxed{7} \boxed{2} \end{aligned}$$

Estimating

<p>B 7.6 is estimated to 8</p> <p>2.2 is estimated to 2</p> <p>The estimation of the result of $8 \times 2 = 16$</p>	<p>C</p> $\begin{array}{r} 76 \\ \times 22 \\ \hline 152 \\ 152 \\ \hline 1672 \end{array}$ <p>the result 16.72</p>
--	--

- Numbers can be multiplied as integers, and we find the position of the decimal point in the result.

Practice

- 1** First: estimate the following products, then compare your estimation to the actual result:

A	5.89×6.1	Estimated result	actual result
B	28.7×3.1	Estimated result	actual result
C	3.9×0.704	Estimated result	actual result

Exercises

- 1** Find the result:

A $0.12 \times 0.3 = \dots$	B $0.625 \times 0.7 = \dots$	C $7.2 \times 0.9 = \dots$
D $1.2 \times 0.37 = \dots$	E $1.25 \times 0.24 = \dots$	F $0.36 \times 0.75 = \dots$

- 2** Compare the products of the following by putting $<$ or $>$ or $=$:

A 7.3×0.28	<input type="text"/>	0.73×2.8
B 0.342×1.2	<input type="text"/>	3.42×0.12
C 172×0.003	<input type="text"/>	0.172×0.3

3 Find the result:

$$\begin{array}{r} 0.67 \\ \times 2.8 \\ \hline \end{array}$$

$$\begin{array}{r} 2.03 \\ \times 0.07 \\ \hline \end{array}$$

$$\begin{array}{r} 9.72 \\ \times 0.46 \\ \hline \end{array}$$

4 Put ($>$ or $<$ or $=$) to make the following sentences true:

- | | | | |
|----------|--------------------|----------------------|------------------------------|
| A | 12.35×2.5 | <input type="text"/> | 12.35×0.25 |
| B | 48.2×3.7 | <input type="text"/> | 4.82×37 |
| C | 4.2×1.53 | <input type="text"/> | 4.2×15.3 |
| D | 0.206×1.5 | <input type="text"/> | $2.06 \times 0.3 \times 0.5$ |

5 Find the result:

- A** 2.3×7.4 **B** 7.4×0.59

Use the resulted products to find the value of:

First: $(2.3 \times 7.4) \times 0.59$. Second: $2.3 \times (7.4 \times 0.59)$, what do you observe?

6 Find the results of:

- | | | | |
|----------|-----------------------------|----------|------------------------------|
| A | $23.17 \times 0.75 = \dots$ | B | 1.34×3.2 |
| C | $(26.2 \times 4.7) - 3.14$ | D | $(5.32 \times 0.15) + 0.146$ |

7 If the price of one meter of cloth is L.E 6.45, what is the cost of 2.4 meters of cloth?

8 If the price of a can of juice is L.E 19.25 what is the total cost of 25 cans of the same kind ?

9 Estimate the products of the following operations, then compare your estimation to the actual result:

- | | | | | | |
|----------|------------------|----------|-------------------|----------|-------------------|
| A | 5.3×2.7 | B | 18.8×7.1 | C | 7.82×4.3 |
|----------|------------------|----------|-------------------|----------|-------------------|

10 Salwa bought a piece of cloth with 3.75 meters in length. If the price of one meter of cloth was L.E 33.75, find the cost of cloth approximating it to the nearest pound.

Division

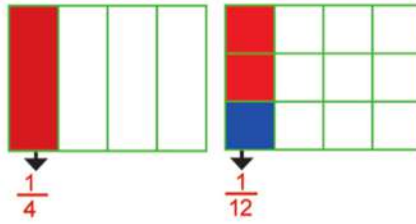
1-7

(I) Dividing Fractions



Think and discuss

Samy wanted to find the quotient of dividing $\frac{1}{4}$ by 3. He used a rectangular piece of paper and divided it into 4 equal parts, then divided the piece of paper into 12 equal parts.



After drawing, samy noticed that:

$$\frac{1}{4} \div 3 = \frac{1}{12}$$

Would you agree with Samy? why?

Note that

$$\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

$$\therefore \frac{1}{4} \div 3 = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

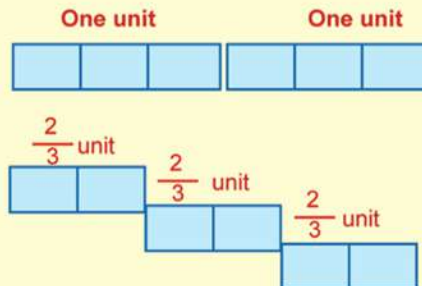
Example

Divide $2 \div \frac{2}{3}$

Divide each unit into 3 equal parts, then construct parts where every part is equal to $\frac{2}{3}$ unit.

$$2 \div \frac{2}{3} = 3$$

i.e. $2 \div \frac{2}{3} = 2 \times \frac{3}{2} = 3$



* You will learn *

- ☺ To divide an integer by a common fraction.
- ☺ To divide a common fraction by an integer.
- ☺ To divide a common fraction by another common fraction.

Key Terms

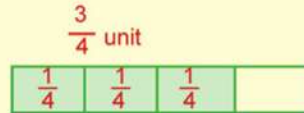
- ☺ Fraction
- ☺ Division

Example

Divide: $\frac{3}{4} \div \frac{1}{4}$

Result:

$$\frac{3}{4} \div \frac{1}{4} = \frac{3}{4} \times \frac{4}{1} = 3$$



What do you observe?

Can you find the quotient of $\frac{2}{5} \div \frac{3}{5}$
Practice
1 Find the quotient of:

A $\frac{4}{5} \div \frac{1}{2} = \dots\dots$

B $\frac{3}{8} \div \frac{3}{4} = \dots\dots$

C $\frac{1}{2} \div \frac{1}{12} = \dots\dots$

D $\frac{2}{7} \div \frac{5}{7} = \dots\dots$

2 Complete:

A $1 \frac{1}{2} \div 3 \frac{3}{4} = \frac{1+2}{2} \div \frac{3+\dots\dots}{4} = \frac{3}{2} \div \frac{\dots\dots}{4} = \frac{3}{2} \times \frac{\dots\dots}{\dots\dots} = \frac{\dots\dots}{5}$

B $5 \frac{1}{2} \div 3 \frac{2}{3} = \frac{11}{2} \div \frac{\dots\dots}{3} = \frac{11}{2} \times \frac{\dots\dots}{\dots\dots} = \frac{3}{\dots\dots}$

3 Divide:

A $\frac{3}{4} \div \frac{9}{10}$

B $\frac{2}{5} \div \frac{7}{10}$

C $\frac{1}{2} \div \frac{3}{10}$

D $\frac{9}{10} \div \frac{3}{10}$

E $\frac{7}{10} \div \frac{9}{10}$

F $\frac{4}{10} \div \frac{6}{10}$

(2) Dividing fractions and decimal numbers by 10, 100, 1000



Think and discuss

A charity donor wanted to divide L.E 297.5 by 10 families equally. What is the share of each family?

$$\begin{aligned} \text{The share of each family} &= 297.5 \div 10 = \frac{2975}{10} \times \frac{1}{10} = \frac{2975}{100} \\ &= \text{LE } 29.75 \end{aligned}$$

What do you observe regarding the number of places moved by the decimal point, and in which direction?

You can also discover the pattern of changing the position of the decimal point to the left while dividing by 10, 100, 1000 using the calculator.



* You will learn *

- ☺ To divide a decimal fraction or a decimal number by 10, 100, 1000.

Using the calculator	Explanation
$32.57 \div 10 = 3.257$	$\frac{3257}{100} \times \frac{1}{10} = \frac{3257}{1000} = 3.257$
$95.74 \div 100 = 0.9574$	$\frac{9574}{100} \times \frac{1}{100} = \frac{9574}{10000} = 0.9574$
$64.39 \div 1000 = 0.06439$	$\frac{6439}{100} \times \frac{1}{1000} = \frac{6439}{100000} = 0.06439$

Have you observed a specific pattern? what is that pattern?

Saeed said:

When dividing by 10, the decimal point moves one place to the left.

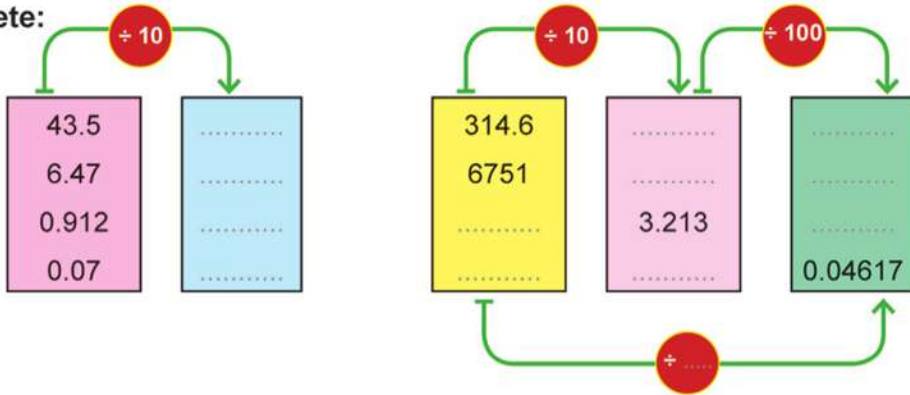
When dividing by 100, the decimal point moves two places to the left.

When dividing by 1000, the decimal point moves three places to the left.




Practice

Complete:



Exercises

1 Complete:

A $64.43 \div 10 =$

B $32.57 \div 100 =$

C $49.21 \div 1000 =$

D $537.1 \div 10 =$

E $6.243 \div 100 =$

F $659.1 \div 1000 =$

2 Choose the correct answer from the parentheses:

A $1.7 \div 10 = \dots\dots$ (17 , 0.17 , 1.7 , 0.017)

B $75.3 \div 100 = \dots\dots$ (753 , 7.53 , 7530 , 0.753)

C $8.76 \div 1000 = \dots\dots$ (87.6 , 8.76 , 0.00876 , 8760)

3 Put the suitable sign ($<$ or $>$ or $=$) in each of the following:

A $4.532 \div 10 \dots 45.32 \div 100$

B $3721 \div 1000 \dots 0.3721 \times 100$

4 Complete:

A 3237 grams \simeq kgs.

B 354 meters \simeq cm.

C 325 meters \simeq kilometers.

D 743 mm \simeq cm.

E 54 kilograms \simeq tons.

F $734 \text{ cm}^3 \simeq$ liters.

5 A car consumes one liter of gasoline to travel 10 Kilometers. How many liters of gasoline does it need to travel a distance of 534.8 Kilometers?

(3) Dividing an integer by a 3-digit number without having a remainder



Think and discuss

The librarian at the school asked the students to help him arrange the library. He asked them to put 178 books on 7 shelves equally.



You will learn

😊 to divide an integer by a 3-digit number without having a remainder.

Ahmed thought: How many books should we put on every shelf?

Sameir answered: We divide 178 by 7, then the quotient is: **25 books and the remainder is 3 books.**

Ahmed said: i.e.,

$$\begin{array}{ccccccc}
 178 & = & 7 & \times & 25 & + & 3 \\
 \downarrow & & \downarrow & & \downarrow & & \downarrow \\
 \text{dividened} & & \text{divisor} & & \text{quotient} & & \text{remainder}
 \end{array}$$

Note that

The dividened = (the divisor × the quotient) + the remainder
 The remainder is always less than the divisor.

Practice

number of operation	division	dividened	divisor	quotient	remanider	Relation among the elements of divison
Example	$32 \div 5$	32	5	6	2	$32 = 5 \times 6 + 2$
1	$73 \div 8$	.....	.....		.....	.....
2	$42 \div 6$	.....	.....		.....	.....
3	$\div \dots$	.....	.....		.....	$= 9 \times 6 + 8$
4	$\dots \div \dots$	.....	14	5	zero	.....
5	$92 \div \dots$	.....	9		.....	$= 9 \times \dots + 2$

Note that If the remainder is zero, then the division is without a remainder.

Example

Find the quotient of $3978 \div 234$

Result:

1 Estimating the quotient to check the reasonability of the answer.

dividened	③978	→	4000	The reasonable estimation to the quotient is 20
divisor	②34	→	200	

estimation

2 Do the division:

The tens digit

$$234 \times \dots < 397 < 234 \times \dots$$

$$234 \times 1 < 397 < 234 \times 2$$

The units digit:

$$234 \times \dots < 1638 < 234 \times \dots$$

$$234 \times \boxed{7} = 1638$$

$3978 \div 234 = 17$ The quotient is close to the estimation. The answer is reasonable.

$$\begin{array}{r}
 \boxed{1} \quad \boxed{7} \\
 234 \overline{) 3978} \\
 \underline{- 234} \\
 1638 \\
 \underline{- 1638} \\
 0000
 \end{array}$$

Exercises

1 Without doing the division, choose the correct answer from the parentheses:

A $11664 \div 216 = \dots$ (54 - 58 - 62 - 68)

B $19708 \div 379 = \dots$ (48 - 52 - 54 - 62)

C $37440 \div 234 = \dots$ (160 - 170 - 200 - 190)

2 Find the quotient of the following:

A $15345 \div 165$ B $62160 \div 296$ C $11183 \div 211$ D $37961 \div 493$

3 The result of multiplying 2 numbers is 9088. If one of them is 284, find the other number.

4 An owner of packing food factories wanted to pack 5904 kilograms of sugar equally in 492 packs. What is the weight of each pack?

(4) Division by a decimal fraction and by a decimal number

First: Division by a decimal fraction without a remainder.



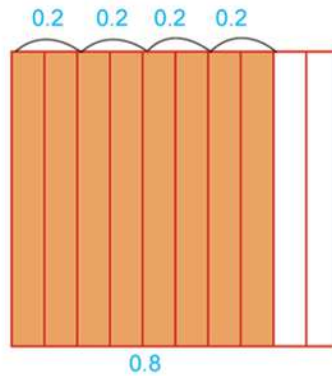
Think and discuss

Find the quotient of the following:

First: $0.8 \div 0.2$

Result:

$$\begin{aligned} 0.8 \div 0.2 &= \frac{8}{10} \div \frac{2}{10} \\ &= \frac{8}{10} \times \frac{10}{2} = \frac{8}{2} = 4 \end{aligned}$$



Second: $0.75 \div 0.15$

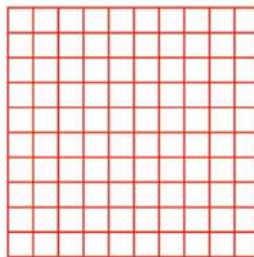
Result:

$$\begin{aligned} 0.75 \div 0.15 &= \frac{75}{100} \div \frac{15}{100} \\ &= \frac{75}{100} \times \frac{100}{15} = \frac{75}{15} = 5 \end{aligned}$$

$$\begin{array}{r} 5 \\ 15 \overline{) 75} \\ \underline{- 75} \\ 00 \end{array}$$

Draw the hundreds chart and illustrate the operation of division on it.

$$\begin{aligned} 0.75 \div 0.15 &= \frac{0.75}{0.15} \quad (\text{Both the dividend and the divisor can be multiplied by 100 to make the denominator an integer}) \\ &= \frac{0.75 \times 100}{0.15 \times 100} = \frac{75}{15} = 5 \end{aligned}$$



You will learn

- ☺ To divide a decimal fraction by a decimal fraction.
- ☺ To divide a decimal number by a decimal fraction.
- ☺ To find the quotient of infinite division to the nearest tenth or nearest hundredth.

Key Terms

- ☺ Infinite division

Example

Find the quotient in each of the following:

A $4.86 \div 0.9$

B $4.384 \div 0.32$

Result:

A To find the quotient of $4.86 \div 0.9$ make the divisor an integer by multiplying both of the dividend and the divisor by 10

$$\text{The quotient} = \frac{4.86 \times 10}{0.9 \times 10} = \frac{48.6}{9} = 5.4$$

$$\begin{array}{r} 5.4 \\ 9 \overline{) 48.6} \\ \underline{45} \\ 36 \\ \underline{36} \\ 00 \end{array}$$

Find the quotient of $3978 \div 234$ Estimation $4.86 \rightarrow 5$ The estimation is (5) $0.9 \rightarrow 1$ The answer is acceptable

B To convert the divisor into an integer, multiply both the dividend and the divisor by 100

$$\text{The quotient} = \frac{4.384 \times 100}{0.32 \times 100} = \frac{438.4}{32} = 13.7$$

$$\begin{array}{r} 13.7 \\ 32 \overline{) 438.4} \\ \underline{- 32} \\ 118 \\ \underline{- 96} \\ 224 \\ \underline{- 224} \\ 000 \end{array}$$

Estimation:The dividend $4.384 \rightarrow 4$ The divisor $0.32 \rightarrow 0.3$ The estimated quotient $\frac{4 \times 10}{3} \rightarrow 13$

Therefore, the answer is acceptable


Practice

- 1 Divide $0.1932 \div 0.92$ and check reasonability of the quotient.

Result:

$$\begin{aligned} 0.1932 \div 0.92 &= \frac{0.1932 \times \dots}{0.92 \times \dots} \\ &= \frac{\dots}{92} \\ &= \dots \end{aligned}$$

Estimation:

The dividened 0.1932 → 0.2

The divisor 0.92 →

The estimated quotient Answer

- 2 Without doing the division, estimate the quotient in each of the following:

A $8.018 \div 0.19$

B $6.235 \div 0.58$

Check the reasonability of your estimation using your calculator.

Practice

- 1 Find the quotient in each of the following:

A $0.416 \div 0.8$

B $0.0874 \div 0.46$

C $1.155 \div 0.35$

D $36.18 \div 0.09$

E $357 \div 0.7$

F $0.7595 \div 0.31$



- 2 Find the quotient in each of the following:

A $(92.36 - 63.25) \div 0.41$

B $(19.645 - 4.73) \div 0.38$

- 3 Find a number when multiplied by 0.64, then the result is 075.52

- 4 Which of the following relations is true and which is false? what do you conclude?

A $3.6 \times 1.3 = 1.3 \times 3.6$

B $0.8 \div 0.04 = 0.04 \div 0.8$

- 5 A bundle of paper has a height of 4.5 cm. If all its papers were of equal thickness where the thickness of each paper was 0.090 milimeters, find how many papers does the bundle include?

Second: division by a decimal number without having a remainder

Example

Find the quotient of each of the following:

A $3.375 \div 13.5$

B $77.728 \div 6.94$

Then discuss the reasonability of your answer.

Result:

A $3.375 \div 13.5 = 33.75 \div 135$

$3.375 \rightarrow 3$ **The estimated quotient is 0.3**

$13.5 \rightarrow 10$ **The quotient is 0.25**

the quotient is close to the estimation. Therefore, the answer is reasonable.

B $77.728 \div 6.94 = 7772.8 \div 694$
 $= 11.2$

Estimation: $7\text{⑦},728 \rightarrow 80$

$6\text{⑥},94 \rightarrow 7 \rightarrow \frac{80}{7} \rightarrow 11$

The quotient is close to the estimation. Therefore, the answer is reasonable.

$$\begin{array}{r}
 0.25 \\
 135 \overline{) 33.75} \\
 \underline{-270} \\
 675 \\
 \underline{-675} \\
 000
 \end{array}$$

$$\begin{array}{r}
 11.2 \\
 135 \overline{) 7772.8} \\
 \underline{-694} \\
 832 \\
 \underline{-694} \\
 1388 \\
 \underline{1388} \\
 0000
 \end{array}$$

Practice

1 Convert the following to the decimal forms.

A $\frac{3}{4} = \dots\dots$

$4 \overline{) 3.00}$

B $\frac{1}{8} = \dots\dots$

$8 \overline{) 1.00}$

C $\frac{7}{40} = \dots\dots$

$40 \overline{) 7.00}$

D $\frac{4}{25} = \dots\dots$

- 2 Complete the following to estimate the quotient in each of the following operations:

A $\frac{7.56 \times 4.2}{15.7}$ The estimation = $\frac{8 \times \dots}{16} = \dots$

B $\frac{9.8 \times 9.7}{4.6 \times 4.8}$ The estimation = $\frac{\dots \times \dots}{\dots \times \dots} = \dots$

- 3 Find the quotient of each of the following:

A $2.67 \div 1.2$

B $0.171 \div 1.9$

C $65.7 \div 6.57$

D $7.452 \div 621$

E $38.64 \div 8.4$

F $21.528 \div 93.6$

- 4 Find the result:

A $(25.42 \div 3.1) + 1.8$

B $3.62 - (55.25 \div 32.5)$

- 5 The length of a roll of cloth is 53.55 meters. It was divided into equal parts where the length of each part is 3.15 meters. Find the number of these parts.

- 6 Without doing the mathematical operations, estimate the result of each of the following:

A $(5.3 \times 11.2) \div 2.1$

B $(20.9 \div 7.1) \times 5.2$

- 7 Find the quotient:

A $94.5 \div 3.5$

B $2.64 \div 0.2$

Third: Finding the quotient of infinite division to the nearest tenth and nearest hundredth.

Example

Write down each fraction in the decimal form:

A $\frac{3}{8}$

B $\frac{2}{3}$ to the nearest hundredth

Result

A To convert from a common fraction to a decimal fraction:

divide $3 \div 8$

Note that the division has no remainder. Therefore, we say the division is finite.

B To find $\frac{2}{3}$ in the form of a decimal fraction:

divide $2 \div 3$

Note that: in that case, the division has a remainder. Therefore, we call it infinite division.

We can continue on division. However, the required is to find the quotient approximated to the nearest hundredth. Therefore, it is enough to divide till we have three decimal digits, then we apply the rules of approximation.

$\frac{2}{3} \approx 0.67$ to the nearest hundredth.

$$\begin{array}{r} 0.375 \\ 8 \overline{) 3.000} \\ \underline{-24} \\ 60 \\ \underline{-56} \\ 40 \\ \underline{-40} \\ 00 \end{array}$$

$$\begin{array}{r} 0.666 \\ 3 \overline{) 2.0000} \\ \underline{-18} \\ 20 \\ \underline{-18} \\ 20 \\ \underline{-18} \\ 2 \end{array}$$

Practice

Complete:

A $\frac{7}{3} \approx \dots$ to the nearest $\frac{1}{10}$

B $\frac{5}{9} \approx \dots$ to the nearest $\frac{1}{100}$

C $\frac{3}{11} \approx \dots$ to the nearest $\frac{1}{100}$

D $\frac{9}{7} \approx \dots$ to the nearest $\frac{1}{10}$

Example

Find the quotient of $546.8 \div 53$ to the nearest tenth.

Result:

$$\begin{array}{r} \textcircled{5}46.8 \\ \hline 53 \end{array} \rightarrow \begin{array}{r} 500 \\ \hline 50 \end{array} \rightarrow \begin{array}{c} \text{estimated quotient} \\ 10 \end{array}$$

$$\begin{array}{r} 10.31 \\ \hline 53 \overline{)546.80} \\ \underline{53} \\ 16 \\ \underline{168} \\ 159 \\ \underline{159} \\ 90 \\ \underline{90} \\ 53 \\ \underline{53} \\ 37 \end{array}$$

☺ Find the tens digit: $53 \times 1 < 54 < 53 \times 2$

Then, write it above the tens digit

☺ Find the units digit:

Note that $16 < \text{the divisor}$. Therefore, the units digit = zero.

☺ Place the decimal point in its original position.

☺ Find the tenth digit $53 \times 3 < 168 < 53 \times 4$

Then, write it above the tenth digit.

☺ Find the hundredth digit $53 \times 1 < 90 < 53 \times 2$

Then, write it above the hundredth digit.

It is enough to divide until you get 2 decimal digits because it is required to approximate the quotient to the nearest tenth.

$$\therefore 546.8 \div 53 = 10.3 \text{ to the nearest tenth.}$$

Note that: the estimated quotient is close to the actual quotient.

Therefore, the answer is reasonable.

General Exercises

- 1 Divide the following then approximate the quotient to the nearest $\frac{1}{10}$

A $53.27 \div 2.1$

B $24.31 \div 9.07$

C $1.623 \div 0.152$

D $12.46 \div 0.517$

- 2 Find the results and approximate them to the nearest hundredth.

A $7.034 \div 1.7$

B 1.775×0.15

C $(3.425 + 1.07) \div 2.8$

D $7.52 \div (14.73 - 11.58)$

- 3 Place a suitable sign ($>$, $<$ or $=$):

A $0.46 \div 4.6$ 0.01

B 17.17×1.7 39

C $53.7 \div 3.5$ $5.37 \div 0.35$

D $845 \div 4.9$ $(84.5 \div 49) \times 0.1$

- 4 Find the quotient in each of the following:

A $9.568 \div 9 \frac{1}{5}$

B $2 \frac{1}{8} \div 0.125$

C $2 \frac{3}{25} \div 0.012$

D $\frac{17}{40} \div 0.85$

- 5 The area of a rectangle is 9.43cm^2 , and its width is 2.45cm . Find its length and approximate it to the nearest hundredth of centimeter.

- 6 Fill in the blanks:

A $4.25 \div \dots = 8 \frac{1}{2}$

B $\dots \div 9 = 4.5$

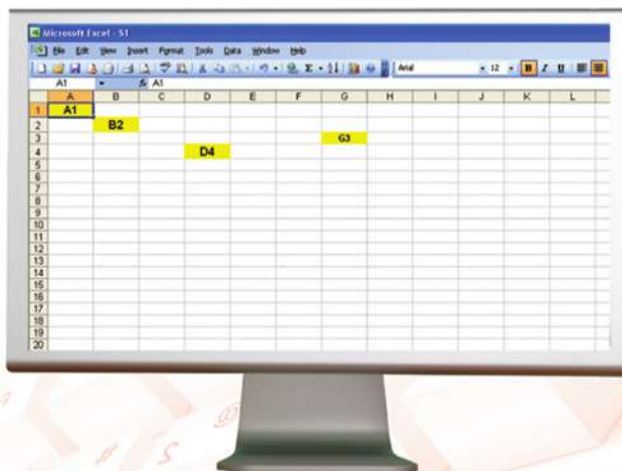
- 7 Find the quotient of $458.62 \div 35.2$ to the nearest hundredth.
- 8 Divide 375 by 0.5 then add $5 \frac{1}{4}$ to the quotient.
- 9 The area of a rectangle is 10.25 square meters, and its length is 4.1 meters. Find its width and perimeter.
- 10 The side length of a square is 5.06 meters. Find its area approximating it to the nearest hundredth.

Technology

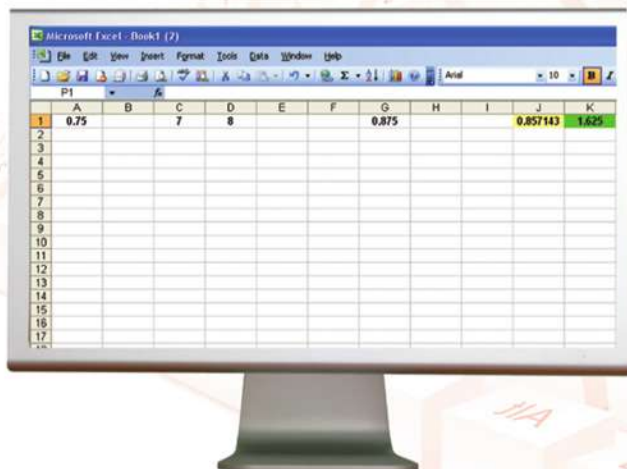


How do you deal with Excel?

Click the **start** menu, then choose **programs**. On programs click on **office**, then choose **Excel** (the spread sheets). A table will appear on the monitor, it is divided into rows and columns. Each space within the table is called a cell. For example, B_2 denotes the element located in row number 2 and column B while cell D_4 denotes the element located in the row number 4 and the column D.

**Example:** Use the spread sheets

program (Excel) to find the quotient of $0.75 \div \frac{7}{8}$



1 Enter the number 0.75 in cell A_1 , then enter the number 7 in cell C_1 and 8 in cell D_1 .

2 Do a mouse click on cell G_1 and write = then click on C_1/D_1 and press **Enter**.

3 Do a mouse click on cell J_1 and write = then click on A_1/G_1 and press **Enter**, The quotient appears.

Find by yourself:

$$0.75 \times \frac{7}{8}$$

(Note that the multiplication symbol is $*$) and division symbol is $/$).

To find the sum of : $0.75 + \frac{7}{8}$

Do a mouse click on cell K_1 and write = then write $A_1 + G_1$ and press **Enter**
The quotient appears.

History Tip

Giza pyramids were built more than 5000 years BC. Khufu pyramid is the largest one as it has a height of 146 meters, where the base area is as equal as the area of 10 football playgrounds.



- 1 Each stone used in building the pyramid weighs about 3.2 tons. What is the weight of 108 stones in kilograms?
- 2 Some huge stones used in building the pyramid weigh 15.3 tons each. If an elephant weighs 3 tons, what is the number of elephants which the total of their weight is equal to the weight of one stone?
- 3 If the process of glazing each stone in a pyramid takes 25 minutes. Will the process of glazing 8 stones take 3 hours? Explain.

Use the knowledge resources (i.e., library, Internet, ...) to write a ten-line paragraph about Giza pyramids.

Test

Unit Test

- 1 Find the results of each of the following operations approximating them to the nearest hundredth.

A $65.384 + 63.427$

B $729.72 - 122.743$

C 75.32489×100

D $26.4392 \div 10$

- 2 A truck can hold 125 boxes of oranges at a time. How many times are needed to deliver 4375 boxes by that truck?



- 3 A Which is greater $\frac{5}{8}$ or 0.5734? Find the difference between the two fractions.

B Find a number that if multiplied by 0.37, then the result is 17.8932.

- 4 A Rearrange the following fractions descendingly : $\frac{1}{2}$, 0.8, $\frac{1}{4}$, 0.3

B The length of a rectangle is 25.4cm while its width is 18.09cm. Find its perimeter and its area.

unit 2

2

Sets



11
22
33
44
55
66
77
88
99
00

11
22
33
44
55
66
77
88
999

9999

1
2
33
55
666
7777
8888
9999
0000
1111
2222
3333
4444
5555
6666
7777
8888 1111
9999 2222
0000 3333
4444
5555
6666
7777
8888
9999

What is a set?

you will learn

- To define the mathematical concept of a set.

Key Terms

- The set
- The elements of a set



Think and discuss

- What are the days of the week? The days of the week are: Saturday, Sunday, Monday, Tuesday, Wednesday, Thursday and Friday.
- What are the letters of the word "Hosam"? The letters of the word Hosam are : **H, O, S, A, M.**
- What are the digits of the number **71536**? The digits of the number 71536 are: **7, 1, 5, 3, 6.**

Monday	
31	10
Aug.	Ramadan
2009	1430

All of the above collections are called "A set" So, we say:

The set of the days of the week, **the set** of the letters of the word "Hosam" and **the set** of the digits of the number 71536 .

The set: it is a collection of known objects that are clearly defined, and they have a certain property in common.

Note that The beautiful flowers in your school garden do not form a set since the property of beauty differs from a person to another.

The elements of a set

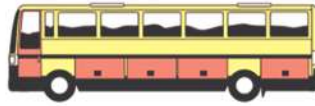
The set of the letters forming the word "Magdy" are: M, A, G, D, Y. Each letter is called an element of the elements in the set of the letters forming the word Magdy.

Practice

- The set of the colors that appear in the traffic signal has the following elements: Red,.....and



- 2 **Complete:** In the following figure, the set of the means of transportation has the following elements: the plane, the train, and



Exercises

- 1 **Complete the following table as illustrated in the example:**

The expression	A set/not a set
The months of the Hegri year.	a set
The tall students in your class.	Not a set
The seasons of the year.	.....
The letters of the word "Egypt"	.....
The beautiful stories	.....
The prime numbers between 5 and 25	.....

- 2 **write down all the elements in the following sets:**

THE SET	THE ELEMENTS
The set of the digits in the number 3072
The set of the colors in Egypt's flag
The set of the days in the week
The set of the year's months that have less than 30 days.
The set of 2-digit numbers and each is like the other.
The set of the months in the Hegri year.

Mathematical expression of a set

First: The listing method

you will learn

- ☺ To write a set if you know its elements.
- ☺ To express a set using the listing method.
- ☺ To express a set using the description method.
- ☺ To represent the sets using a Venn diagram.

Key Terms

- ☺ The listing method.
- ☺ The description method.

To express a set, write all the elements of the set between two braces {.....}, then place the mark "," between every two elements. The set is symbolized by one of the alphabetic letters written in capital font like: X, Y, Z,

Examples

- 1 Write down the set X where X is the set of the letters forming the word (Ahmed).

Solution :

$X = \{a, h, m, e, d\}$. It can be written also as:

$X = \{h, d, a, e, m\}$

- 2 Write down the set Y where Y is the set of the digits in the number 1717.

Solution :

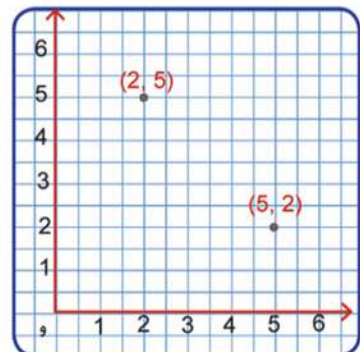
$Y = \{7, 1\}$. It can be written also as: $Y = \{1, \dots\}$

Note that

- 1 It is not important to pay attention to the order of the elements when writing a set.

- 2 Any set does not have a repeated element.

- 3 In the opposite figure, the ordered pair (2,5) is different from the ordered pair (5,2) while the set {2,5} is the same as the set {5,2}.



Second: The description method

In that method, we define the property which distinguishes and determines the elements of a set.

For example, The set: {c, a, r, e} can be expressed as follows: **The set of the letters forming the word care.** or **the set of the letters forming the word (race),** or **the set of the letters forming the word (acre).**

It can be written in the following form: **{x : x is one of the letters forming the word care},** and it is read as the set of all x where x is one of the letters forming the word care.



Write down the set X where $x = \{2, 3, 5, 7, 11, \dots\}$. Use the description method.



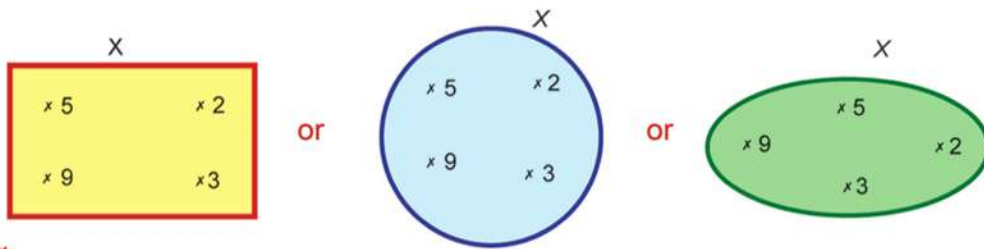
Complete the table to express the following sets:

THE LISTING METHOD	THE DESCRIPTION METHOD
{c, a, r}	The set of the letters forming the word car
{east, west, north, south}	.....
{	The set of the colors forming Egypt's flag
{	The set of the digits in the number 46421.
{Abo Bakr, Omar, Othman, Ali}	.....
.....	The set of the letters of the word (Series)
{2, 4, 6, 8, 10}	.....
{1, 3, 5, 7, .....	.....
{0, 2, 4, 6, 8, .....	.....

Representing sets using Venn diagrams

Scientist Jan Venn, could represent every element in a set by placing a point or an (X) mark in any closed geometric shape such as (a triangle, a circle, a rectangle, etc),

For example: The set $X = \{2, 3, 5, 9\}$ can be represented by using a Venn diagram as follows:



Practice

Complete the following table:

The set	Venn diagram
$X = \{2, 5, 8\}$	
The listing method $Y = \{ \dots \}$ The description method is	
$Z =$ the set of the letters forming the word (Stairs)	
$X = \{ \dots \}$ $Y = \dots$ The set of the elements found in X and Y is	

Belonging of an element to a set



Think and discuss

If the football team of your class consists of Samy, Hatem, Khaled, Yasser, Hany and Maher. Write down the set X which represents the football team of your class.

$X = \{ \dots \dots \dots \}$



1 Is Khaled one of the players of the football team of your class?

2 Is Khaled an element of the elements of the football team in your class? We can say that Khaled belongs to the set of the football team in your class.

This can be symbolized as follows: $\text{Khaled} \in X$

Similarly, $\text{Samy} \in X$, $\text{Hatem} \in X$, ... and so on.

The symbol \in denotes "the belonging of an element to a set"

Note that

Ahmed is not a player in that team so, Ahmed does not belong to X , This is symbolized as $\text{Ahmed} \notin X$.

The symbol \notin denotes "The not belonging of an element to a set"

Example: If $Y = \{4, 5, 7, 9, 11\}$,

Then $4 \in Y$, $5 \in Y$ and $11 \in Y$,

while $8 \notin Y$ and $12 \notin Y$.



If $3 \in \{2, x\}$ Then $x = \dots \dots \dots$

* you will learn *

- ☺ Belonging of an element to a set
- ☺ Not-belonging of an element to a set.

Key Terms



- ☺ Belonging \in
- ☺ Not belonging \notin

Exercises

- 1 Write each of the following sentences using one of the symbols \in or \notin .

The sentence	The symbol
6 is an element of the set X	$6 \in X$
5 belongs to the set Y
B does not belong to the set M
7 does not belong to the set N
B is an element of the set K

- 2 If X is a set where $X = \{2, 3, 5, 6\}$

Place the suitable symbol \in or \notin in the blanks to make each sentence true:

- A $3 \dots X$ B $5 \dots X$ C $7 \dots X$ D $6 \dots X$
 E $0 \dots X$ F $2 \dots X$ G $1 \dots X$ H $32 \dots X$

- 3 Place the suitable symbol \in or \notin in the blanks to make each sentence true:

- A $2 \dots \{3, 1, 7\}$ B Y \dots the set of the letters forming the letters of the word Egypt.
 C $3 \dots$ The set of the odd numbers D $7 \dots$ the set of the days of the week
 E The month march \dots the set of the seasons of the year. F $3 \dots \{13, 33, 330\}$

- 4 Fill in using a suitable number:

- A If $4 \in \{2, x, 5\}$ Then $x = \dots$
 B If $5 \in \{7, 9, x\}$ Then $x = \dots$
 C If $5 \in \{3, 4 + x\}$ Then $x = \dots$
 D $\dots \in \{3, 5, 10\}$ and belongs also to the set of the prime factors of the number 6.

Types of sets



Think and discuss

How many elements are there in the set $X = \{a, h, m, e, d\}$?

The number of the elements in the set $X = \dots\dots\dots$

So, we call that set a finite set.

The finite set

It is a set that has a limited number of elements.

i.e., the number of its elements can be listed.

Similarly The set $X = \{g, b, r\}$ is a finite set that has three elements.

The set $Y =$ the set of the days of the week is also a finite set that has 7 elements.

The infinite set

It is a set that has an unlimited number of elements i.e., the number of its elements can not be listed.

For example: The set of the even numbers $\{0, 2, 4, 6, \dots\}$ is an infinite set because the number of its elements can not be listed.

Similarly, The set of the decimal numbers between 2 and 3 is an infinite set where some of its elements are 2.1 , 2.534 , 2.91 ,

The null set

It is a set that has no elements. It is denoted by the symbols $\{\}$ or \emptyset and read as (Fai).

For example: The set of the students in your class that are 30 years old or the set of the months in a year that have 35 days.

you will learn

- ☺ Finite set
- ☺ Infinite set
- ☺ Null set (empty set)

Key Terms



- ☺ Finite set
- ☺ Infinite set
- ☺ Null set \emptyset

Note that

The **null set** is a **finite set** in which the number of its elements = zero.

The set $\{\}$ has a number of elements that is equal to zero, while the set $\{0\}$ has a number of elements that is equal to 1 **and it is not a null set.**

Exercises

- 1 Which of these sets is a finite set and which of them is an infinite set. Write the elements of every finite set:

The set	finite	Number of elements	Infinite
The set of the days in a week	✓	7	✗
The set of the months in a gregorian year			
The set of the odd numbers			
The set of the prime numbers less than 20.			
The set of the letters forming the word (sondos).			
The set of the factors of the number 3.			
The set of the alphabets in the English language.			

- 2 Which of these sets is a null set and which of them is not a null set:

- A The set of students in your class who made a trip to the moon. ()
- B The set of the Egyptian governorates in Asia. ()
- C The set of those numbers divisible by 7 and are between 8, 15. ()
- D The set of the factors of 15 which are divisible by 2. ()
- E The set of those numbers divisible by 5 and are between 5, 10. ()
- F The set of the governorates in upper Egypt that are located on the Mediterranean sea. ()

Equal sets



Think and discuss

Complete: The set of the letters forming the word (Magd) are.....
The set of the letters forming the word (Gmad) are

What do you observe ?

If the set $X = \{2, 3, 7\}$ and the set $Y = \{7, 3, 2\}$ **What do you observe in those two sets?**

Note: Do not pay attention to the order of the elements in a set.

We observe that the elements of the set X are the same elements in the set Y

The set X = The set Y

If the two sets have the same elements exactly



Practice

If X is the set of the letters forming the word (month) while, Y is the set of the letters forming the word (months). Are the two sets equal? State the reason.

Example

Find the values of a and b that make each sentence true.

1 $\{a, 7\} = \{b, 2\}$

2 $\{5, a, 8\} = \{b, 9, 8\}$

3 $\{3, 6, a\} = \{6, 3, 4\}$

Solution:

1 $\{a, 7\} = \{b, 2\}$ when $a = 2$, $b = 7$

2 $\{5, a, 8\} = \{b, 9, 8\}$ when $a = 9$, $b = 5$

3 $\{3, 6, a\} = \{6, 3, 4\}$ then $a = 4$

you will learn

☺ Equality of two sets

Key Terms



☺ Equality of two sets

Exercises

1 Put (✓) for the true sentence and (✗) for the false one:

- A $\{1, 2, 5\} = \{21, 5\}$ ()
- B $\{a, r, c\} =$ the set of the letters forming the word (car) ()
- C $\{1, 2, 3, 6\} =$ the factors of the number 6. ()
- D $\{x, 2, 5\} = \{2, 5, 3\}$ where $x = 3$. ()

2 If $X =$ the set of the letters forming the word (lab), $Y =$ the set of the letters forming the word (ball), is $X = Y$?

3 If $\{x, 2, 7\} =$ the set of the digits in the number 2257, find the value of x .

4 Match the equal sets in the following columns:

$\{6, 8, 9\}$

$\{10, 12, 14, \dots, 98\}$

$\{3, d\}$

$\{z, l, e, w, L\}$

the set of the seasons of the year.

\emptyset

the set of the letters forming the word (ziwel)

the set of the digits of 9688

$\{\text{Summer, winter, spring, autumn}\}$

the set of the months in a year that have 35 days

$\{d, 3\}$

the set of the even numbers that have 2 digits.



5 place (✓) for the true sentence and (✗) for the false sentence:

- A $\{0, 2, 4, 6\} =$ the set of the even numbers less than 6. ()
- B $\{77, 99\} =$ the set of the digits of 9977. ()
- C $\{3, 6, 9, \dots\} =$ the set of the counting numbers that are divisible by 3. ()

Inclusion and subsets



Think and discuss

If X = the set of the letters forming the word (pie) and Y = the set of the letters forming the word (pier).

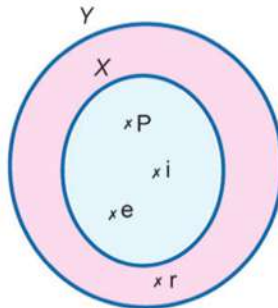
Write each of the two sets using the listing method.

$X = \{p, i, e\}$, while $Y = \{p, i, e, r\}$

Are all the elements of the set x found in the set Y ? Draw a Venn diagram which represents the two sets X and Y .

Yes, all the elements of the set x are found in the set y .

So, we say:



X is a subset of Y .
(or) X is included in Y

This is denoted by: $X \subset Y$
The symbol \subset denotes the inclusion of one set in another set

If $X = \{1, 2\}$, $Y = \{2, 3, 4, 5\}$. Is $X \subset Y$?

we note that: $1 \in X$ while $1 \notin Y$

Therefore, X is not a subset of Y because all the elements in X are not included in Y , so we say that X is not a subset of Y :

X is not included in Y

and that is written as $X \not\subset Y$

where the symbol $\not\subset$ denotes the non inclusion of a set in another set.

you will learn

- 😊 Inclusion
- 😊 Non inclusion
- 😊 Subsets

Key Terms



- 😊 Inclusion \subset
- 😊 Non inclusion $\not\subset$
- 😊 Subsets

Examples

1 Fill in the blanks using one of the two symbols \subset or $\not\subset$ to make each sentence true:

- A $\{1, 2\} \dots \{1, 2, 3\}$ B $\{7\} \dots \{77\}$ C $\{7, 8\} \dots \{7, 9, 11\}$ D $\{2\} \dots \{2\}$

Solution:

A $\{1, 2\} \subset \{1, 2, 3\}$

B $\{7\} \not\subset \{77\}$ as the first set has only one element which is 7 while the second set has only one element which is 77.

C $\{7, 8\} \not\subset \{7, 9, 11\}$ because $8 \in \{7, 8\}$ while $8 \notin \{7, 9, 11\}$

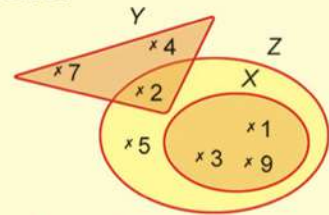
D $\{2\} \subset \{2\}$ i.e., any set X is a subset of itself $X \subset X$

2 In the opposite Venn diagram:

write X, Y and Z, using the listing method, what do you observe?

Solution:

$X = \{1, 3, 9\}$, $Y = \{2, 4, 7\}$ and $Z = \{1, 9, 3, 2, 5\}$



Note that

$X \subset Z$ while $Y \not\subset Z$

The symbols \subset and $\not\subset$ refer to the relation between a set and another set while the symbols \in , \notin refer to the relation between an element and a set.

The null set is a subset of any set i.e., $\emptyset \subset X$, $\emptyset \subset Y$ and $\emptyset \subset Z$

3 Write down all the subsets of $X = \{1, 2, 3\}$:

Solution: the subsets are:

The null set \emptyset .

The sets which have one element each: $\{1\}$, $\{2\}$ and $\{3\}$.

The sets which have 2 elements each: $\{1, 2\}$, $\{1, 3\}$ and $\{2, 3\}$.

The sets which have 3 elements each: $\{1, 2, 3\} = X$

4 Write down all the subsets in each of the following sets:

A $X = \{3\}$

B $Y = \{5, 6\}$

Solution:

A The subsets of the set X are : \emptyset and $\{3\}$

B The subsets of the set Y are : \emptyset , $\{5\}$, $\{6\}$ and $\{5, 6\}$

Exercises

1 Complete the table:

Set X	Set Y	Use \subset or $\not\subset$
{7, 9, 10}	{6, 7, 8, 9, 10}	X Y
{a, b, c}	{a, b, d, e}	X Y
{1, 2, 3}	The set of the prime numbers	X Y
The letters of (Ragb)	the letters of (Gabr)	X Y
{January, March}	The months of the gregorian year	X Y
{London}	The set of the capitals of all the world's countries	X Y

2 Look at the opposite Venn diagram, then complete the following using one of the symbols \subset , $\not\subset$, \in or \notin

A y X

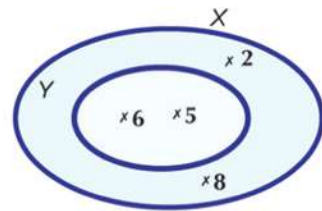
B 2 X

C $\{5\}$ Y

D 6 Y

E 4 X

F $\{6, 8\}$ X



3 Find the subsets for each of the following sets:

A $\{8\}$

B $\{\emptyset\}$

C $\{3, 5, 9\}$

D $\{99\}$

E The set of the letters forming the word (blbl).

4 State whether each sentence is true or false:

A $\{0\} \subset \{100\}$

B $\{100\} \subset \{0, 10\}$

C $\emptyset \subset \{0\}$

D $9 \in \{99\}$

Intersection of two sets



Think and discuss

you will learn

- 😊 To find the intersection of two sets.

Key Terms



- 😊 Intersection of two sets (\cap)

Look at the opposite Venn diagram and complete

$X = \{ \dots \}$

$Y = \{ \dots \}$

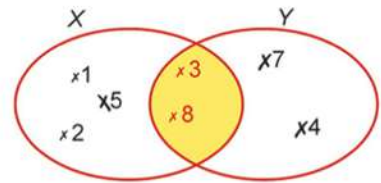
Are there any common elements in the sets X and Y? What are they?

Yes, there are common elements in the two sets X and Y where

$3 \in X$, $3 \in Y$, similarly $8 \in X$ and $8 \in Y$

i.e. each of the two elements 3 and 8 belong to the two sets X and Y.

Therefore, $\{3, 8\}$ is the set of the intersection of the two sets X and Y. This relation is written as $X \cap Y = \{3, 8\}$



The intersection of two sets = the set of all Common elements in the sets X and Y

In the above Venn diagram that represents the two sets,

$X \cap Y$ is represented by the colored section.

Examples

- 1 If $X = \{1, 2, 3, 4, 5\}$,
 $Y = \{\text{the set of the digits of } 6315\}$
 Represent the two sets X and Y by a Venn diagram, then find: $X \cap Y$ and $Y \cap X$, what do you observe?

Solution:

$X = \{1, 2, 3, 4, 5\}$ $Y = \{5, 1, 3, 6\}$

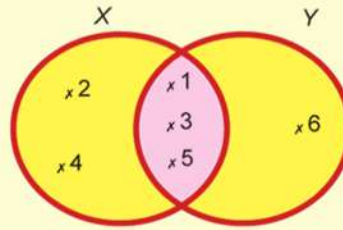
$X \cap Y = \{1, 3, 5\}$

$Y \cap X = \{1, 3, 5\}$

From the above, we notice that:

$X \cap Y = Y \cap X$

(The commutative property)

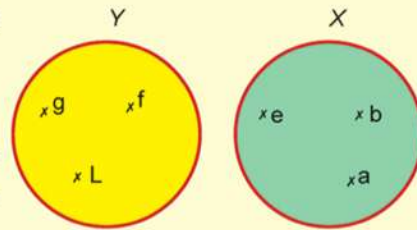


- 2 Use a Venn diagram to represent the two sets: $X = \{a, b, e\}$,

$Y =$ the set of the letters forming the word (flg) then find: $X \cap Y$ and $Y \cap X$

Solution:

We notice that there are not common elements in X and Y . So, we say X and Y are two disjoint sets, then $X \cap Y = \emptyset$ $Y \cap X = \emptyset$

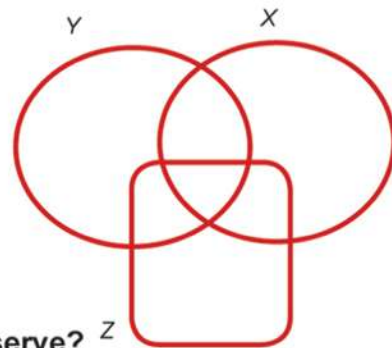


if $X = \{1, 2, 3\}$ find $X \cap \emptyset$.

Exercises

- 1 In the opposite Venn diagram:

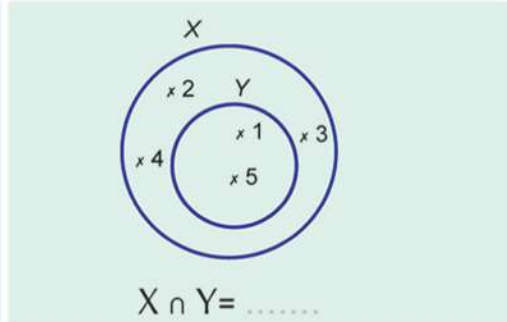
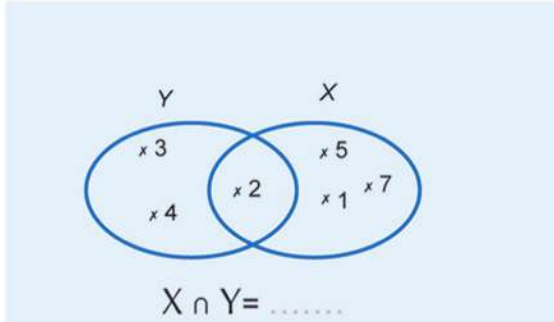
- A Color $X \cap Y$ in red.
- B Color $X \cap Z$ in green.
- C color $Y \cap Z$ in yellow.
- D Find: $(X \cap Y) \cap Z$ and $X \cap (Y \cap Z)$, what do you observe?



- 2 Complete:

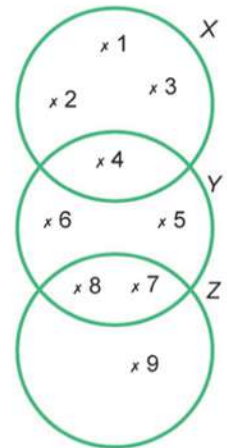
- A $\{5, 6\} \cap \{4, 5\} = \dots\dots\dots$
- B $\{1, 2, 9\} \cap \{1, 2, 4, 9\} = \dots\dots\dots$
- C $\{1, 7, 14\} \cap \{2, 14, 1\} = \dots\dots\dots$
- D $\{3, 2, 5\} \cap \{4, 23, 55\} = \dots\dots\dots$

3 Complete:



4 Look at the opposite Venn diagram and write down X, Y and Z using the listing method, then find the following:

- A $X \cap Y = \dots\dots\dots$
- B $X \cap Z = \dots\dots\dots$
- C $Y \cap Z = \dots\dots\dots$
- D $\{5, 6, 7, 8\} \cap Z = \dots\dots\dots$
- E $\{3, 2\} \cap X = \dots\dots\dots$
- F $\{2, 5, 8\} \cap Y = \dots\dots\dots$



5 Place the suitable symbol \in , \notin , \subset or $\not\subset$ to make each of the following sentences true:

- A If $X = \{1, 2, 3\} \cap \{2, 4, 6\}$ then $3 \dots\dots\dots X$
- B If $Y = \{2, 3, 5\} \cap \{1, 3, 5\}$ then $\{1, 2, 3, 5\} \dots\dots\dots Y$
- C If $Z = \{3, 4, 5\} \cap \{2, 3, 4\}$ then $4 \dots\dots\dots Z$
- D If $R = \{2, 5, 6\} \cap \{3, 5\}$ then $R \dots\dots\dots \{2, 5\}$
- E If $M = \{5, 2, 3\} \cap \{1, 5\}$ then $M \dots\dots\dots \{2\}$

6 If $X = \{1, 2, 3\}$, $Y = \{2, 3, 5, 6\}$ and $Z = \{1, 2, 5\}$. Represent each of X, Y and Z using a Venn diagram, then find the following:

First: $(X \cap Y) \cap Z$ Second: $X \cap (Y \cap Z)$

What do you observe?

Union of two sets

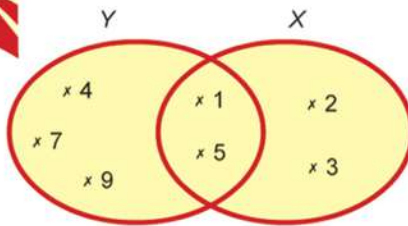


Think and discuss

Look at the opposite Venn diagram and complete:

$$X = \{ \dots \}$$

$$Y = \{ \dots \}$$



The set that has all the elements in X or Y or in X and in Y is = {...}

The union of the two sets X and Y is represented by the colored section in Venn diagram. This relation can be written as

$$X \cup Y$$

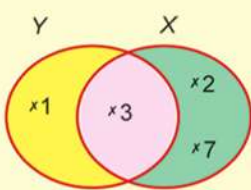
The colored section represents the set which includes all the elements in X or Y or both of them.

The set of elements which belongs to x or to Y is called the union of the two sets X and Y. It is written as:

$$X \cup Y = \{1, 2, 3, 4, 5, 7, 9\}$$

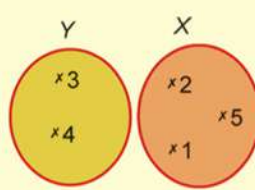
Example

Find each of $X \cup Y$ and $X \cap Y$ in the following cases:



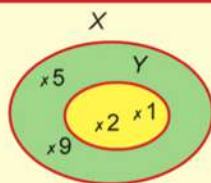
$$X \cup Y = \{2, 7, 3, 1\}$$

$$X \cap Y = \{3\}$$



$$X \cup Y = \{1, 2, 5, 3, 4\}$$

$$X \cap Y = \emptyset$$



$$X \cup Y = \{1, 2, 5, 9\} = X$$

$$X \cap Y = \{1, 2\} = Y$$

Notice that $Y \subset X$

you will learn

To find the Union of two sets.

Key Terms

Union of two sets (\cup)

 Practice

Given that $X = \{1, 2, 3, 4\}$ and $Y = \{4, 5, 6\}$. Find $X \cup X, X \cup \emptyset, X \cup Y$ and $Y \cup X$. What do you observe?

Exercises

1 Complete:

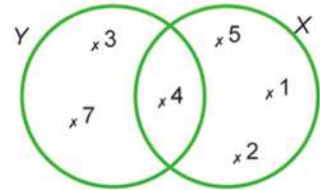
A $\{2\} \cup \{4\} = \dots\dots\dots$

B $\{1, 5\} \cup \{1, 3\} = \dots\dots\dots$

C $\{1, 2, 12\} \cup \{2, 3, 12\} = \dots\dots\dots$

D $\{1, 4, 6\} \cup \emptyset = \dots\dots\dots$

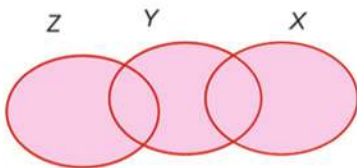
2 Look at the opposite Venn diagram, then find $X \cup Y$ and $Y \cup X$. What do you observe?



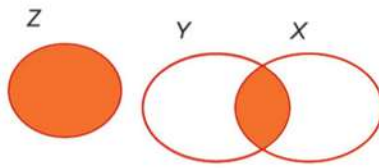
3 Given that $X = \{1, 2, 3\}$, $Y = \{2, 3, 5, 6\}$ and $Z = \{1, 2, 5\}$

Find each of: $(X \cup Y) \cup Z$ and $X \cup (Y \cap Z)$. What do you observe?

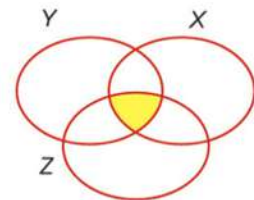
4 In each of the following Venn diagrams, write what the colored section represents:



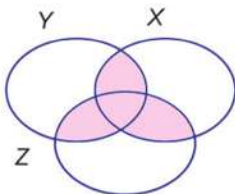
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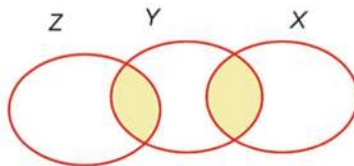
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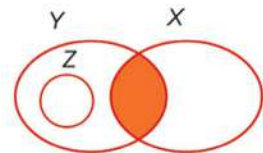
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The Universal set



Think and discuss

If x = The set of the football team in your class.

Y = The set of the basketball team in your class.

Then, we can choose a huge set that represents all the given sets in the problem where the given sets are subsets of it. That huge set is called the universal set and it is denoted by the symbol U .

Example : The universal set can be the set of the students in your class or the set of all the students in the fifth grade in the school or simply the set of all the students in the school.

The universal set (U) is the mother set which includes all the given subsets.

The universal set may be represented by a rectangle on the Venn diagram while its subsets are represented by closed Curves inside the rectangle.

Examples



1 If $X = \{\text{Egypt, Libya, Sudan}\}$,

$Y = \{\text{Sudan, Somalia}\}$

U is possibly the set of Arab countries.

Think of another description for the universal set U .

you will learn

☺ The universal set

Key Terms



☺ Universal set (U)

2 If $X = \{5, 7, 9, 11, \dots\}$.

U is possibly the set of the odd numbers.

Think of another description of U.

Exercises

The given sets in each of the following cases represent subsets, write down a suitable universal set for each case:

1 $X = \{\text{Cairo, Helwan, 6}^{\text{th}} \text{ of October city}\}$,

$Y = \{\text{Sharqya, Alexandria}\}$

U=

2 X = The set of Math teachers at your school.

Y = the set of science teachers at your school.

U=

3 $X = \{2, 5, 8\}$

$Y = \{2, 3, 7, 8\}$

U= (represent U by Venn diagram)

4 $X = \{\text{Taha Houssen, Youssef Idrees, Tawfik Al-Hakeem}\}$

U=

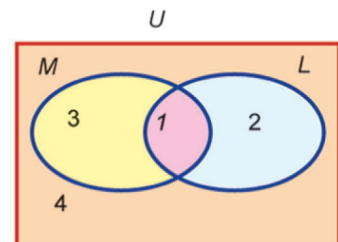
5 The opposite Venn diagram represents the two sets L, M and the universal set U. If we give each different section within the Venn diagram one of the following numbers: 1, 2, 3, 4. Can you represent the following sections using the two sets L, M and the symbols \cap and \cup .

A Section 1

B Sections 2, 1 and 3

C Sections 1 and 3

D Sections 2 and 1



The Complement of a set

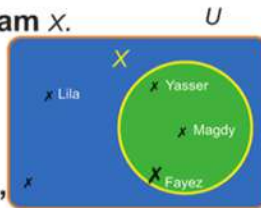


1 If the set of the music team at school is:
 $U = \{\text{Magdy, Yasser, Fayez, Lila, Souad}\}$

Then, the set of boys in the team X .

$X = \{\text{Magdy, Yasser, Fayez}\}$

Note that $X \subset U$



However, if the set of the girls is X' , then:

$X' = \{ \dots \}$

Therefore, the set X' is the complement of the set X .

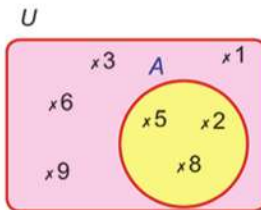
Complete $X \cup X' = \dots$, $X \cap X' = \dots$

2 If the universal set

$U = \{1, 2, 3, 5, 6, 8, 9\}$

and the set $A = \{2, 5, 8\}$

where $A \subset U$



Then, we call the set $\{1, 3, 6, 9\}$ **The complement of the set A** with regard to the set U . That set is written as $A' = \{1, 3, 6, 9\}$ and it is defined as a set of the elements in U that does not belong to the set A . It is denoted by the symbol A' and written as $A' = \{1, 3, 6, 9\}$

The complement of a set A with regard to the set U is

$$A' \text{ where: } A \cup A' = U, \quad A \cap A' = \emptyset$$

you will learn

To find the complement of a set.

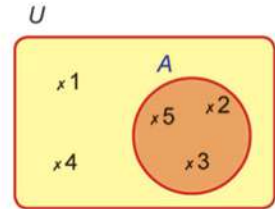
Key Terms

The complement of set X

Exercises

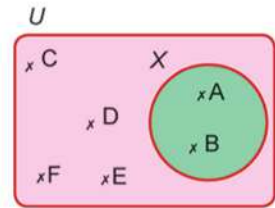
1 Look at the opposite Venn diagram then complete:

$U = \dots\dots\dots$ $A = \dots\dots\dots$ $A' = \dots\dots\dots$



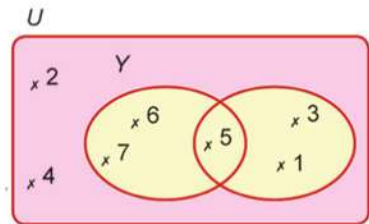
2 Look at the opposite Venn diagram then complete:

$U = \dots\dots\dots$ $X = \dots\dots\dots$
 $X' = \dots\dots\dots$ $X \cap X' = \dots\dots\dots$
 $X \cup X' = \dots\dots\dots$



3 Look at the opposite Venn diagram then complete:

$U = \dots\dots\dots$ $X = \dots\dots\dots$
 $Y = \dots\dots\dots$ $X' = \dots\dots\dots$
 $Y' = \dots\dots\dots$ $Y \cup X = \dots\dots\dots$
 $Y \cap X = \dots\dots\dots$ $(Y \cup X)' = \dots\dots\dots$



4 If U is the set of the even numbers less than 16, $A = \{4, 6, 10, 12\}$ and $B = \{2, 6, 8, 14\}$. Find each of the following: $A \cup B$, $(A \cup B)'$, $A \cap B$ and $(A \cap B)'$.

5 If U is the set of the factors of 12 and A is the set of the factors 6. find A' .

6 If $U = \{1, 2, 3, 4, 5, 6\}$, $X = \{3, 4, 5\}$ and $Y = \{1, 2, 3\}$.

Find each of the following sets:

- A X'
- B Y'
- C $X \cap Y$
- D $(X \cap Y)'$
- E $X \cup Y$
- F $(X \cup Y)'$
- G $X' \cup Y'$
- H $X' \cap Y'$

The Difference of two sets



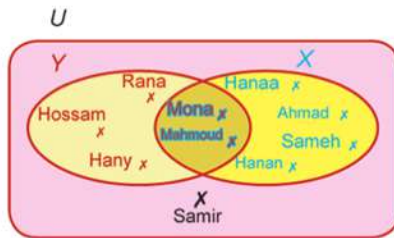
Think and discuss



A survey has been applied on 10 students from class 5/1 showed that only 4 students read Al-Gomhoria newspaper. Those students are **Ahmad, Sameh, Hanay, and Hanaa**. However, only 3 students read Al-Akhbar newspaper. Those students are: **Rana, Hossam, and Hany** while two students read both the newspapers; Mona and Mahmoud, and only one student does not read any newspaper: **Samir**. This can be illustrated using the opposite Venn diagram.

$X = \{\text{Ahmed, Sameh, Hanaa, Hanan, Mona, Mahmoud}\}$

$Y = \{\text{Mona, Mahmoud, Rana, Hany, Hossam}\}$



The set of students who read Al-Gomhoria newspaper and do not read Al-Akbar newspaper is = $\{\text{Ahmed, Sameh, Hanaa, Hanan}\}$

i.e., The set of elements that belongs to X and does not belong to Y. This set is called (X difference Y) and it is written as $X - Y$

Complete: $X - Y = \{\dots, \dots, \dots, \dots\}$

$Y - X = \{\dots, \dots, \dots\}$ What do you observe?

Note that

$X - Y$ is not equal to $Y - X$

you will learn

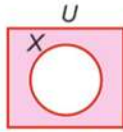
☺ To find the difference of two sets

Key Terms

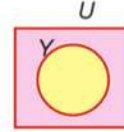
☺ The difference of two sets (-)



$U - X = \dots\dots\dots$



$U - Y = \dots\dots\dots$



Note that

$X - X = \emptyset$ while $X - \emptyset = X$

Exercises

$X - Y = \dots\dots\dots$
 $Y - X = \dots\dots\dots$

$X - Y = \dots\dots\dots$
 $Y - X = \dots\dots\dots$

$X - Y = \dots\dots\dots$
 $Y - X = \dots\dots\dots$

$X - Y = \dots\dots\dots$
 $Y - X = \dots\dots\dots$
 $X - Z = \dots\dots\dots$
 $Z - Y = \dots\dots\dots$

General Exercises

1 Place the suitable symbol \in , \notin , \subset or $\not\subset$ in the blanks:

A $8 \dots \{5, 7\}$

B $\{3\} \dots \{1, 3, 2\}$

C $2 \dots \{22, 44\}$

D $\{1, 2\} \dots$ The set of prime numbers

E $\emptyset \dots \{0\}$

F $(X \cap Y) \dots X$

2 Complete each of the following sentences to have a true sentence:

A If $X = \{2, 3\}$, $Y = \{3, 5\}$, then $X \cap Y = \dots$

B If $\{1, X\} = \{2, Y\}$, then $X = \dots$, $Y = \dots$

C If $X \subset Y$, then $X \cup Y = \dots$, $X \cap Y = \dots$

D $\{1, 2, 4\} - \{2, 4, 6\} = \dots$

E If $4 \in \{2, X, 7\}$, then $X = \dots$

3 Choose the true sentence from the parentheses:

A $\{1, 7\} \dots \{0, 1, 2, 3, 4, \dots\}$ (\in or \notin or \subset or $\not\subset$)

B $X - X = \dots$ (\emptyset or zero or $\{0\}$ or $\{1\}$)

C If $\{2, 5, 7\} = \{5, A, 2\}$ then $A = \dots$ (2 or 5 or 7 or 0)

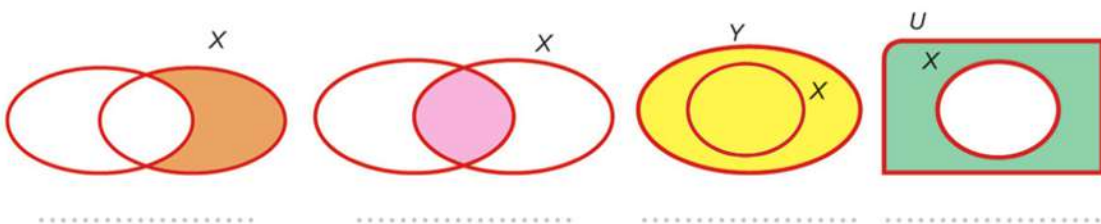
D $\{5\} - \{1, 2, 5\} = \dots$ ($\{5\}$ or $\{1, 2\}$ or \emptyset or $\{1, 2, 5\}$)

E The number of subsets for the set $\{5\}$ is \dots (0 or 1 or 2 or 3)

4 If $U = \{1, 2, 3, 4, 5, 6\}$, $X = \{2, 3, 5\}$ and $Y = \{3, 4, 5\}$. Represent the sets by Venn diagram, then write each of the following by the listing method.

$X \cup Y$, $X \cap Y$, $X - Y$ and X'

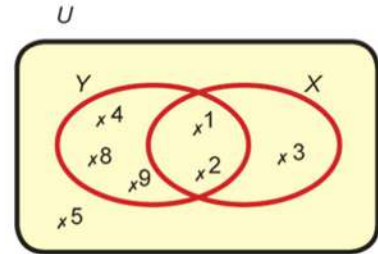
5 Describe the colored section in each of the following shapes:



Exercise

- 6 Look at the opposite Venn diagram and find the following sets using the listing method:

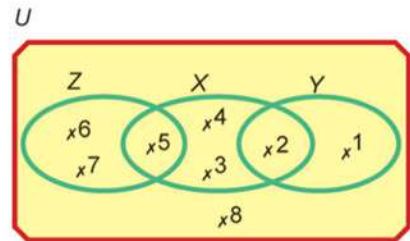
- A $X \cup Y$ B $X \cap Y$
 C $X - Y$ D Y'
 E $(X \cup Y)'$



- 7 Write down all the subsets for the set $X = \{a, b, c\}$

- 8 Look at the opposite Venn diagrams, then find the following sets using the listing method:

- A $X \cap Z$ B $X - Y$
 C $Y - Z$ D $X \cup Z$
 E $Z - X$ F X



- 9 If $X = \{3, 4, 5\}$, $Y = \{2, 3, 4\}$

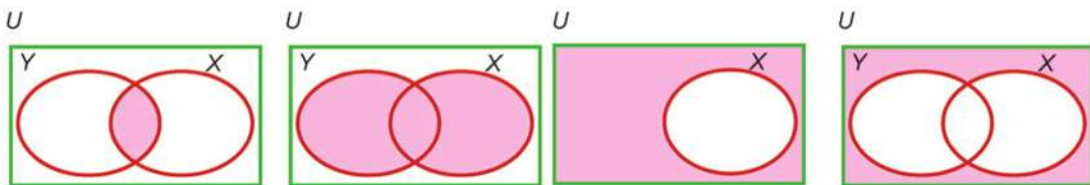
place the suitable symbol \in or \notin or \subset or $\not\subset$ in the blanks.

- A $2 \dots X$ B $\{3, 5\} \dots X \cap Y$
 C $\{3, 2\} \dots X \cup Y$ D $5 \dots X - Y$
 E $\emptyset \dots Y$ F $\{2, 3, 4\} \dots X$

- 10 Find the value of x to make each of the following sentences true.

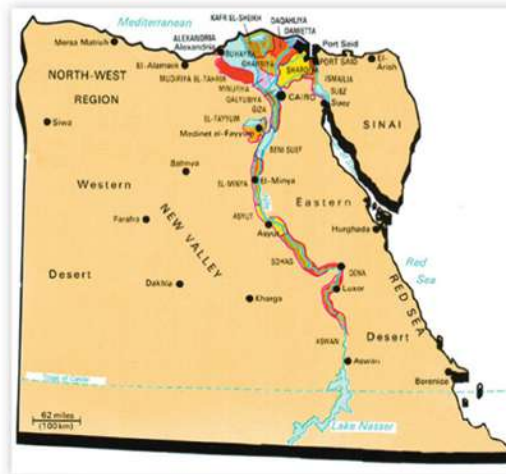
- A $3 \in \{5, 7, x + 1\}$ B $X \in \{2, 5\} \cap \{3, 5\}$
 C $\{2, X\} \cap \{3, 7\} = \{3\}$

- 11 Write down what each colored section represents in the following Venn diagrams.



- 12 Find all the subsets for the set $X = \{a, b, c, d\}$ where each subset has 2 elements. Find the number of those sets.

Activity



- 1 Use the map of ARE, with the help of your teacher of geography then write down the following sets:

X the set of Egyptian coastal governorates

Y the set of the governorates in upper Egypt

Z the set of the governorates in lower Egypt (Delta)

Find: $X \cap Y$, $Y \cup Z$ and $X - Y$

Is the set of the capitals of the world's countries a finite set? Explain why.

- 2 Form a team work with your classmates, then find:

X The set of the students in your class who are older than 10 years.

Y The set of the students in your class who are younger than 10 years.

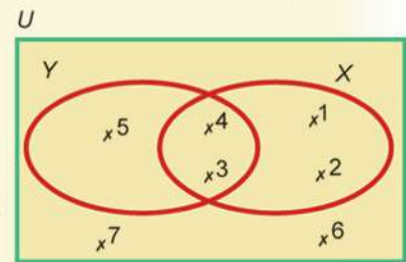
Does $X \cup Y$ represent the set of the students in your class?

1 Place the suitable symbol \in or \notin or \subset or \subsetneq in the blanks to make each of the following sentences true:

- A $\{52\} \dots \{2, 5\}$. B $\{3\} \dots \{1, 3\}$.
 C $5 \dots$ the set of the digits in the number 2513. D $4 \dots \{44\}$.

2 Look at the opposite Venn diagram, then find each of the following:

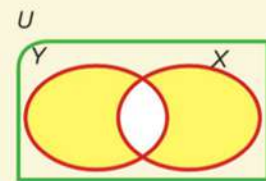
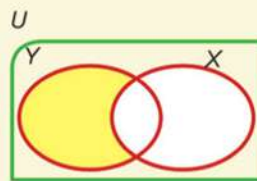
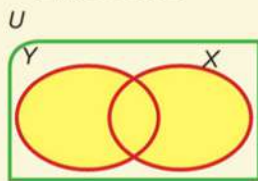
- A $X \cap Y$ B $X \cup Y$
 C $X - Y$ D $Y' - X$
 E Y' F $(X \cup Y)'$



3 Choose the correct answer from the parentheses in each of the following sentences:

- A If $\{2, 3, 4\} = \{3, 4, x\}$ then $x = \dots$ (2 or 3 or 4 or 5)
 B $\emptyset \dots \{0\}$ (= or \subset or \subsetneq or \in)
 C If $X \subset Y$ then $X \cap Y = \dots$ (X or Y or \emptyset or U)
 D $X - X = \dots$ (0 or $\{0\}$ or \emptyset or X)
 E If $a \in X$ then $a \dots X'$ (\subsetneq or \notin or \in or \subset)

4 Write down what the colored section in each of the following Venn diagram represents:



5 IF $U = \{1, 2, 3, 4, 5, 6, 7\}$, $X = \{1, 2, 3, 4\}$ and $Y = \{1, 2, 5, 6\}$

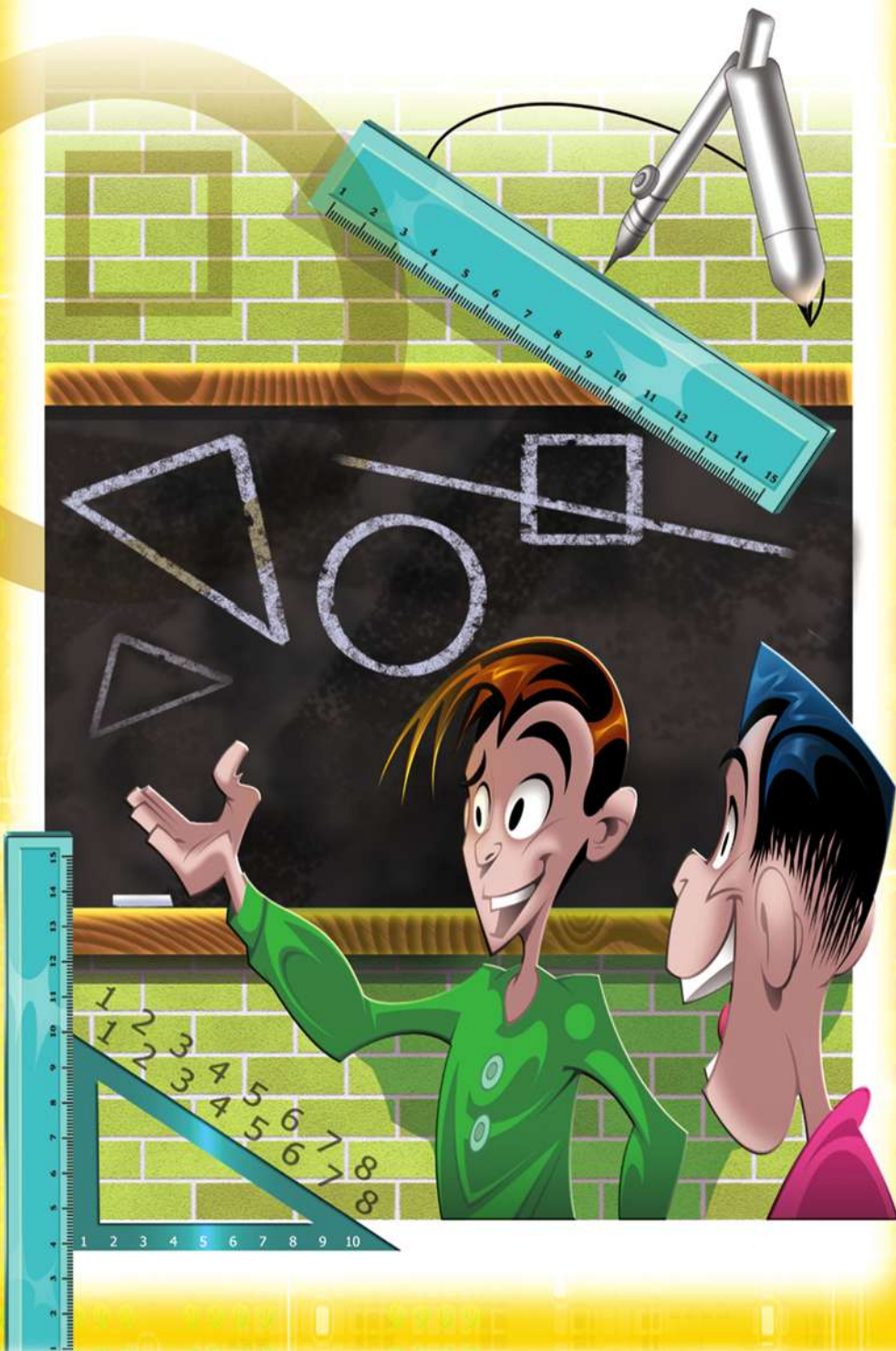
Write down each of the following sets using the listing method:

- A $X \cup Y$ B $X \cap Y$ C $X - Y$
 D X' E Y' D $(X \cap Y)'$

Unit 3

Geometry

3



The Circle

You will learn

- 😊 To define a circle.
- 😊 To draw a circle.

Key Terms

- 😊 Circle
- 😊 The center of a circle
- 😊 The radius of a circle
- 😊 The diameter of a circle
- 😊 The chord of a circle

Hossam has become a new member in the scouts team. He has fixed a stake in the ground and tied a rope to the stake. Then, he fixed another stake at the other end of the rope. He completely pulled the rope, and turned a full turn around the fixed stake to draw a curved line on the ground.



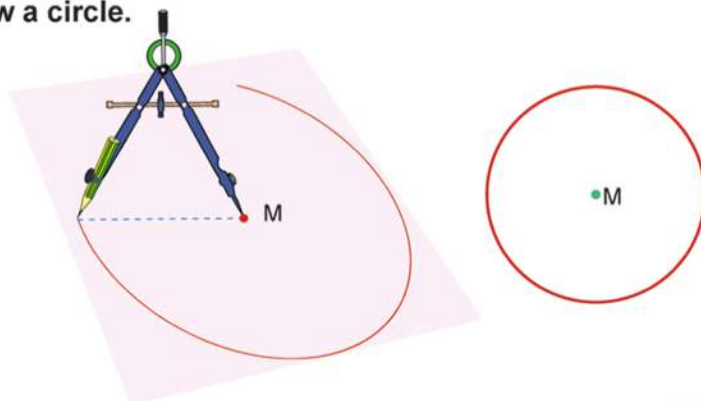
Take part with your physical education teacher at school and draw the circle on the football playground, then mark it using lime.

This closed curve is called a "circle".

The point in which the stake is fixed is called the center of the circle.

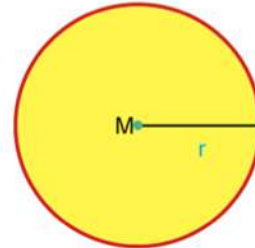
How to draw a circle

Use the compasses as illustrated in the following figure to draw a circle.



The red curved line represents the circle **M**.

The point **M** is called the center of the circle. The distance between the sharp point of the compasses and the pencil which draws the circle is called:

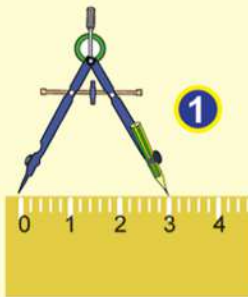


the length of the radius and it is denoted by the symbol (**r**)

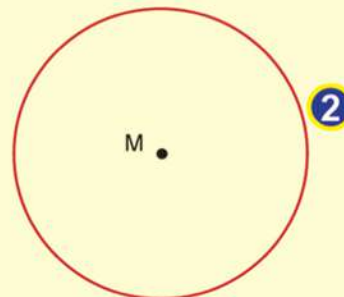
Example

Draw a circle of a radius 3 cm.

solution



adjust the compasses to the distance of 3 cm.



Draw the circle using the compasses.

Note that

In the opposite figure: a circle of a radius (**r**)

First: The points **A**, **B**, **X** are located on the circle

i.e. $a \in \text{Circle}$, then $MA = r$

$b \in \text{Circle}$, then $MB = r$

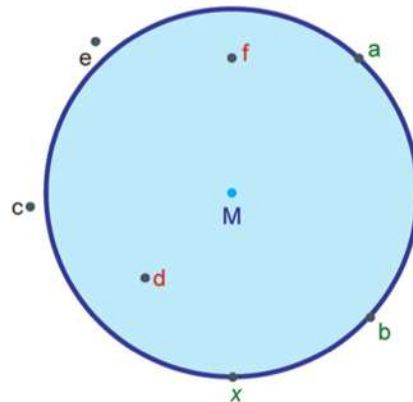
Complete: $x \in \text{Circle M}$, then

Second: The point **f** is located inside the circle **M**.

So, **Mf** is shorter than the length of the radius.

i.e., $Mf < r$

Complete: **d** is located inside the circle **M**, then



Third: The two points **c** and **e** are located outside the circle so, $Mc > r$ and similarly $Me > r$.

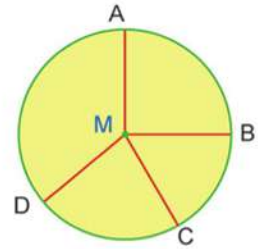
Key Terms

The radius:

The radius of a circle is a line segment whose endpoints are the center of the circle, and any point \in the circle.

Ex.: \overline{MA} , \overline{MB} , \overline{MC} , \overline{MD}

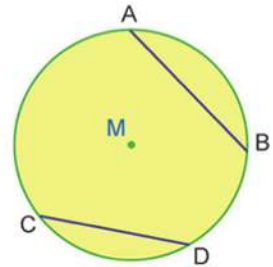
So, $MA = MB = MC = MD = r$

**The chord of a circle:**

The chord of a circle is a line segment that connects between any two points on the circle.

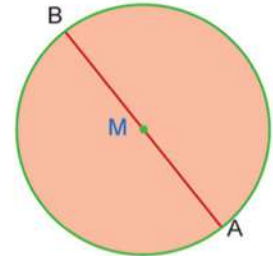
Ex.: Draw \overline{AB} , \overline{CD} , Draw each: \overline{AC} , \overline{AD}

Complete \overline{AC} is called, \overline{AD} is called



The diameter of a circle: The diameter of a circle is a chord that crosses the center of the circle.
diameter = 2 x Radius = 2r

The diameter is the longest chord in a circle.


 Practice

- 1 A Draw a circle of a radius 2cm where M is the center of the circle.
- B On the same paper on which you drew the circle, label the following points A, B, C where $MA = 1.5\text{cm}$, $MB = 3\text{cm}$, $MC = 2\text{cm}$
- C Complete by choosing (on, outside, or inside) the circle to make each sentence true:

Point A is located	the circle.	Point B is located	the circle.
Point C is located	the circle.	Point M is located	the circle.

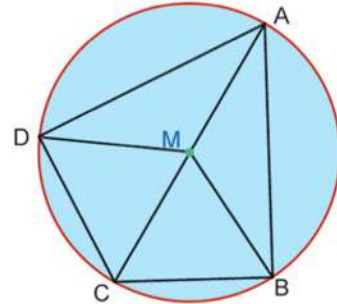
Exercises

- 1** In the opposite figure, there is a circle whose center is M. Complete:

The radii of the circle are,,,

The diameter of the circle is

The chords of the circle are,,,

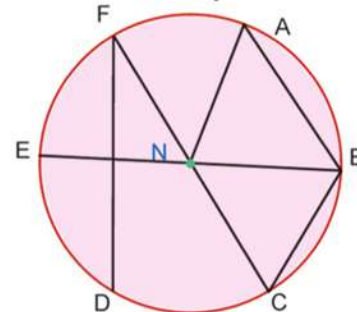


- 2** In the opposite figure, there is a circle whose center is N. Complete:

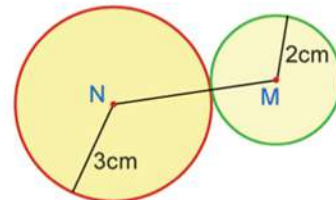
The radii of the circle are

The diameters of the circle are

The chords of the circle are



- 3** In the opposite figure; M, N are two circles. Find the length of \overline{MN}



- 4** Draw a circle whose center is M and its diameter is 6cm, then draw a straight line that passes through the point M and intersects the circle at A, B. Draw another straight line that passes through the point M and intersects the circle at C, D

Complete:

- A** \overline{AB} is called in the circle.
B \overline{CD} is called in the circle.
C \overline{MB} is called in the circle.
D Put a suitable sign ($>$, $<$ or $=$)
 AB CD , MC 3cm , BD 6cm

Drawing a triangle given the lengths of its three sides

You will learn

- ☺ To draw an equilateral triangle.
- ☺ To draw an Isosceles triangle.
- ☺ To draw a scalene triangle.

Key Terms

- ☺ Equilateral triangle
- ☺ Isosceles triangle
- ☺ Scalene triangle

You have learned to draw a triangle in the following two cases:

- 1 Given the lengths of two of its sides and the measure of the included angle.
- 2 Given the length of one of its sides and the measures of two angles.

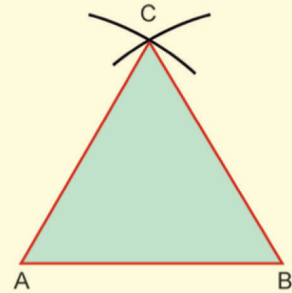
Now, you will learn to draw a triangle given the lengths of its three sides using a ruler and a compasses.

Example 1

Draw the equilateral triangle ABC in which the length of every side is 4cm.

Solution:

- 1 Draw the line segment \overline{AB} of length 4cm.
- 2 Adjust the compasses to a distance equal to 4cm, then place the sharp point at A and draw an arc.
- 3 Using the same distance, place the compasses at B, then draw another arc that intersects the first arc at C.
- 4 Draw \overline{AC} , \overline{BC} So, you will have the equilateral triangle ABC.



Practice

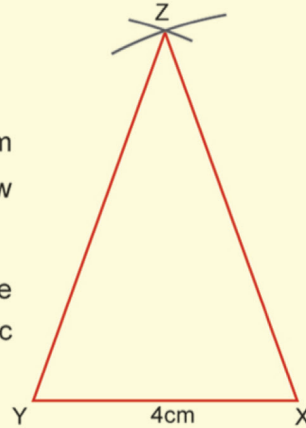
Draw the equilateral triangle LMN whose perimeter is 9cm.

Example 2

Draw the isosceles triangle XYZ in which the length of the base = 4cm, and the length of each of its two other sides = 6cm.

Solution:

- 1 Draw the line segment \overline{XY} where $XY = 4\text{cm}$.
- 2 Adjust your compasses to a distance equal to 6cm and with the tip of the compasses at X and draw an arc.
- 3 Place the sharp point to Y. Using the same distance to draw another arc that intersects with the first arc at Z.
- 4 Draw each of \overline{XZ} , \overline{YZ} , so, you will have the isosceles triangle XYZ.



Practice

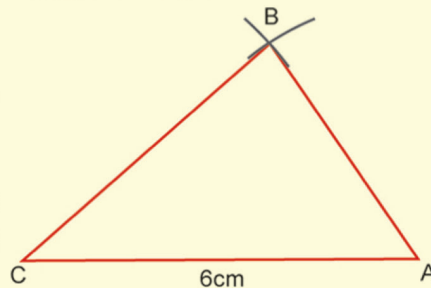
Draw the isosceles triangle in which $BC = 5\text{cm}$, $AB = AC = 4\text{cm}$.

Example 3

Draw the triangle ABC in which $AB = 4\text{cm}$, $BC = 5\text{cm}$, $AC = 6\text{cm}$

Solution:

- 1 Draw the line segment \overline{AC} with length = 6cm.
- 2 Adjust your compasses to a distance equal to 4cm, then place the sharp point at A and draw an arc.
- 3 Adjust your compasses to a distance equal to 5cm, then place the sharp point at C and draw another arc that intersects the first arc at B.
- 4 Draw \overline{AB} , \overline{BC} so, you will get the triangle ABC.



Exercises

- 1 Draw the triangle ABC in which $AB = 3\text{cm}$, $BC = 4\text{cm}$, $AC = 5\text{cm}$. What do you observe?
- 2 Draw the triangle XYZ in which $XY = YZ = 7\text{cm}$, $XZ = 4\text{ cm}$.
- 3 Draw the triangle LMN in which $LM = 8\text{cm}$, $MN = 5\text{cm}$ $NL = 6\text{cm}$.
- 4 Draw a circle of a radius 2.5cm and draw \overline{AB} as its diameter, then complete drawing the equilateral triangle ABC, then choose the correct answer:
 - A The point C is located the circle (inside - outside - on)
 - B \overline{AC} is (a chord - a radius - something else).
- 5 Draw the triangle ABC in which: $AB = 4\text{cm}$, $BC = 6\text{cm}$ $CA = 8\text{cm}$. Then draw a circle whose center is B and its radius is equal to 4cm , then complete the following:
 - A The point A is located the circle.
 - B The point C is located the circle.
 - C The is called the radius of the circle.
- 6 Draw the equilateral triangle ABC whose side is equal to 4cm , then draw a circle whose center is A and radius is equal to 4cm , then complete the following:

\overline{AB} is called in the circle.

\overline{AC} is called in the circle.

\overline{BC} is called in the circle.

Drawing line segments from the vertices of a triangle perpendicular to its opposite sides

Introduction

Drawing a line segment from a point, perpendicular to a straight line.

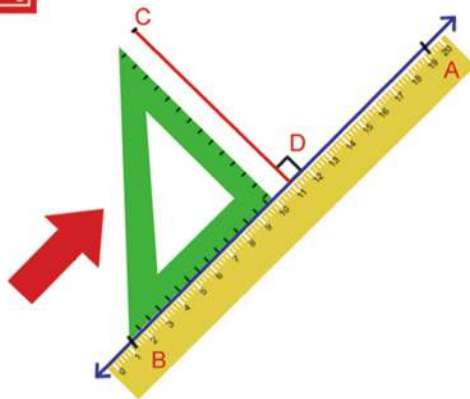
If \overleftrightarrow{AB} is a straight line, $C \notin \overleftrightarrow{AB}$

Required: drawing a line segment from point C perpendicular to \overleftrightarrow{AB}

Materials

The ruler - the right triangle

Method



- Put the ruler on \overleftrightarrow{AB} .
- Put one of the right angle sides of the set square on the ruler as illustrated above in the figure.
- Move the set square in the direction of the arrow. The set square will slide on the ruler till it reaches the point C.
- Draw CD then $\overline{CD} \perp \overleftrightarrow{AB}$.

* You will learn *

- To draw a line segment from a vertex of a triangle, perpendicular to the opposite side.
- To define the altitudes of a triangle.

Key Terms

- The altitudes of a triangle

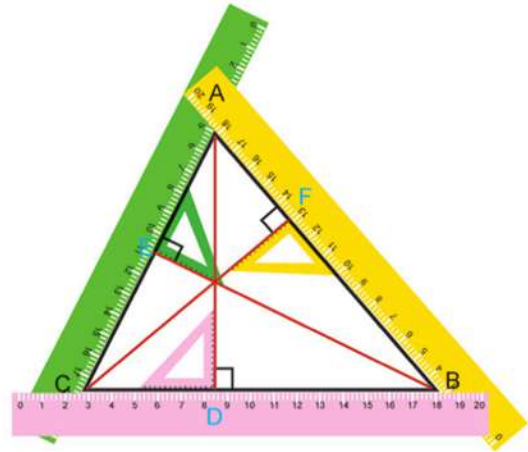
The altitudes of a triangle

First: The altitudes of the acute triangle:

In the opposite figure, ABC is an acute triangle. Follow the same previous steps to draw:

$$\overline{AD} \perp \overleftrightarrow{BC} \quad \text{and} \quad \overline{BE} \perp \overleftrightarrow{AC},$$

$$\overline{CF} \perp \overleftrightarrow{AB}.$$



Note that

- 1 \overline{AD} , \overline{BE} , \overline{CF} intersect at one point located **inside** the triangle ABC.
- 2 The line segments \overline{AD} , \overline{BE} , \overline{CF} are called the altitudes of the triangle ABC.

Practice

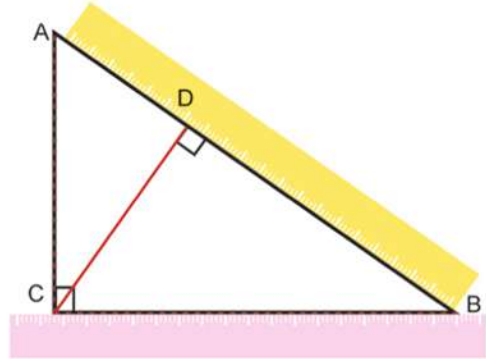
- 1 Draw the equilateral triangle ABC whose side is equal to 6cm. Then from its vertices, draw the segments \overline{AD} , \overline{BE} , \overline{CF} perpendicular to the opposite sides: \overline{BC} , \overline{CA} , \overline{AB} respectively. Then, measure the lengths of \overline{AD} , \overline{BE} , \overline{CF} . What do you observe?
- 2 Draw the triangle LMN in which $LM = 4\text{cm}$, $MN = 5\text{cm}$, $NL = 6\text{cm}$. Then, draw a perpendicular from L to \overline{MN} that intersects it at X. Also draw a perpendicular from M to \overline{LN} that intersects it at Y, then measure the lengths of \overline{LX} , \overline{MY} .

Second: The altitudes of the right triangle.

In the opposite figure, ABC is a right triangle in C.

Follow the same steps.

Draw a line segment from A perpendicular to \overleftrightarrow{BC} , then the line segment will be \overline{AC} .



Draw a line segment from B perpendicular to \overleftrightarrow{AC} , then the line segment will be \overline{BC} .

Draw a perpendicular line segment from C to \overleftrightarrow{AB} , The perpendicular segment is \overline{CD} .

Note that

- 1 \overline{AC} , \overline{BC} , \overline{CD} intersect at point C (the right vertex).
- 2 The altitudes of the triangle are \overline{AC} , \overline{BC} , \overline{CD} .

Practice

- 1 Draw the isosceles triangle ABC whose right angle is B and in which $AB = 5\text{cm}$, then draw the line segment \overline{DB} from point B perpendicular to \overline{AC} and find the length of that line segment.
- 2 Draw a circle whose center is M and radius is equal to 4cm. Draw the diameter \overline{AB} and label the point $C \in$ the circle M, then draw the triangle ABC and the line segments from its vertices and perpendicular to the opposite sides of the triangle ABC, then label the point of intersection for these line segments.
- 3 Draw the triangle ABC in which $AB = 6\text{cm}$, $BC = 3\text{cm}$, $m(\angle B) = 60^\circ$, then measure the altitudes of that triangle.

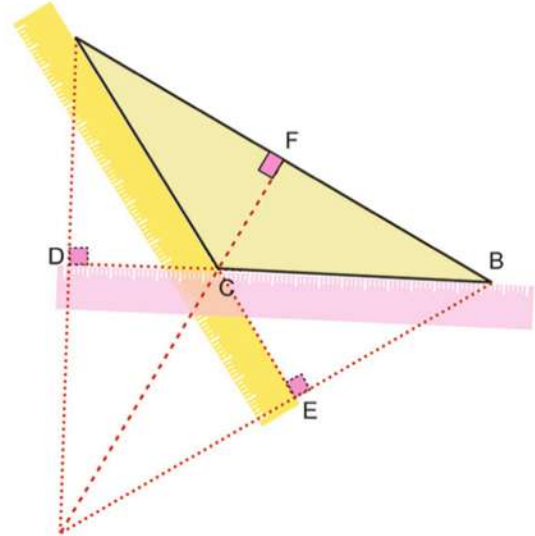
Third: The altitudes of the obtuse triangle:

In the opposite figure, ABC is a triangle whose angle C is obtuse. Follow the same previous steps:

Draw $\overline{AD} \perp \overleftrightarrow{BC}$.

and similarly $\overline{BE} \perp \overleftrightarrow{AC}$,

$\overline{CF} \perp \overleftrightarrow{AB}$


Note that

1 The altitudes of the triangle are the segments: \overline{AD} , \overline{BE} , \overline{CF} .

2 \overleftrightarrow{AD} , \overleftrightarrow{BE} , \overleftrightarrow{CF} intersect at one point which is located outside the triangle ABC .

Practice

1 Draw the triangle ABC in which $AB = 5\text{cm}$, $BC = 6\text{cm}$, $m(\angle B) = 120^\circ$. Then, draw \overline{AD} perpendicular to \overleftrightarrow{BC} , and measure the length of \overline{AD} . Draw also \overline{BE} perpendicular to \overleftrightarrow{AC} and measure the length of \overline{BE} .

Are \overleftrightarrow{AD} and \overleftrightarrow{BE} intersected at one point?

2 Draw the rectangle $ABCD$ in which $AB = 3\text{cm}$, $BC = 5\text{cm}$, then label the point $X \in \overrightarrow{DA}$ where $AX = 2\text{cm}$. How many locations can be labeled for the point X on the ray \overrightarrow{DA} . Draw the triangle XBC then draw \overline{XY} perpendicular from X to \overleftrightarrow{BC} .

Can you know the length of \overline{XY} without measuring it by a ruler?

General Exercises

1 Put (✓) for the true sentence and (✗) for the false one:

- A The length of the diameter of a circle $>$ the length of any chord which doesn't pass through its center. ()
- B The right triangle has only one altitude. ()
- C The line segments drawn from the vertices of the acute triangle perpendicular to the opposite sides intersect at one point inside the triangle. ()
- D Only one diameter can be drawn from any point on the circle. ()
- E The diameter of the circle divides it into two equal halves. ()

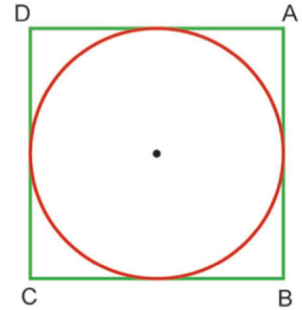
2 Draw a circle whose center is N and diameter is 6cm. Then draw the diameter \overline{AB} and the chord \overline{AC} in the circle. Draw \overline{BC} . Use the protractor to find the measure $\angle ACB$ then draw $\overrightarrow{CD} \perp \overline{AB}$ that intersects it at D and the circle at E, then choose the correct answer:

- A The triangle ABC is (a right triangle -an acute triangle -an obtuse triangle)
- B \overline{CE} is in the circle(chord - diameter - radius).
- C The intersection point of the perpendicular line segments drawn from the vertices of the triangle ABC to the opposite sides is (C - D - E)

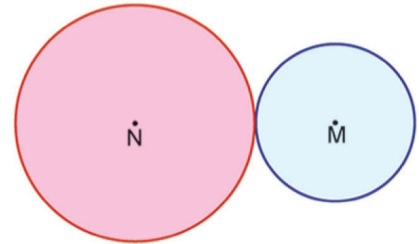
3 Draw a circle whose center is M and radius 4cm then draw two radii \overline{MX} , \overline{MY} and the included angle between them measures 60° then draw \overline{XY} and find the length of \overline{XY} .

- 4 Draw the triangle ABC in which $AB = 7\text{cm}$, $BC = CA = 6\text{cm}$. Then, draw the line segment from point C that is perpendicular to \overline{AB} and find its length.
- 5 Draw the triangle XYZ in which $XY = 3\text{cm}$, $YZ = 5\text{cm}$, $ZX = 7\text{cm}$. Determine the type of the triangle according to the measures of its angles, then draw the perpendicular segment from X to \overline{YZ} and measure its length.

- 6 In the opposite figure, find the perimeter of the square ABCD given the length of the circle's radius = 3cm

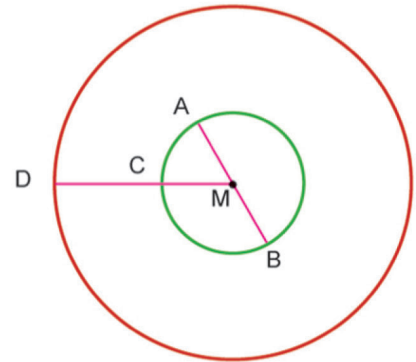


- 7 In the opposite figure, M, N are two circles where their diameters are 4cm, 6cm. Find the length of \overline{MN} .



- 8 In the opposite figure, there are two circles with the same center M. If their radii were 2cm, 5cm. Complete:

- A The length of \overline{CD} = cm
- B The length of \overline{AB} = cm



Draw the ray \overrightarrow{DC} from D which intersects the small circle at E and intersects the large circle at F, then find the length of \overline{DF} .

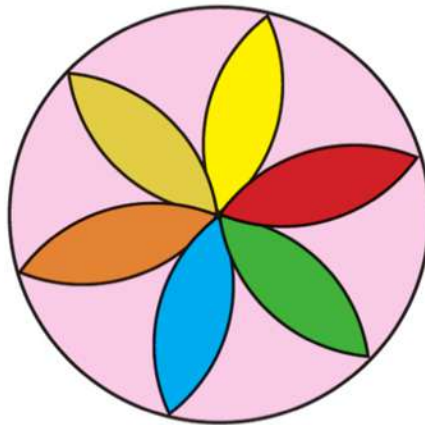
- 9 Draw the triangle ABC in which $AB = 6\text{cm}$, $BC = 8\text{cm}$ and $AC = 10\text{cm}$. Draw the circle M in which \overline{AC} is the diameter and find the length of \overline{MB} .

Activity

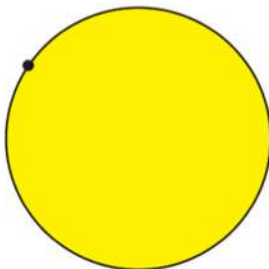


Play with the compasses

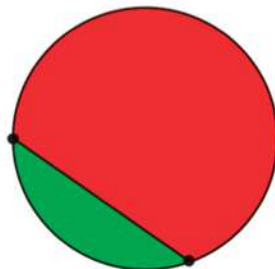
- 1 Draw the following figure, and innovate other decorative figures.



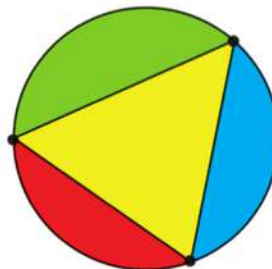
- 2 Notice the pattern by placing points on the circle. Draw the line segments that connect every two points, then you will be able to determine the number of zones which are included in the surface of a circle.



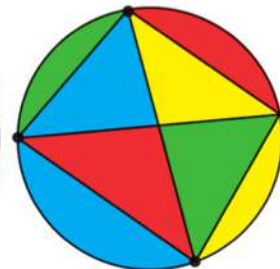
one point
one zone



two points
two zones



three points
four zones



four points
..... zones

How many zones are there on the circle in case of having five points?

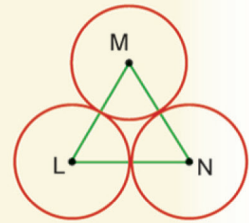
Unit Test

1 Complete the following to have true sentences:

- A The chord of a circle is a line segment that connects
- B The longest chord in a circle is called
- C The midpoint of any diameter in a circle is of the circle.
- D is used in drawing the circle.

2 Choose the correct answer from the parentheses:

- A If M is a circle whose diameter is 8cm where $MA = 7\text{cm}$ then the point A is located (inside - outside - on) the circle.
- B If A, B belong to the circle M where $M \in \overline{AB}$ then \overline{AB} is called a (chord - diameter - radius) in the circle.
- C The number of altitudes in any triangle = (1 - 2 - 3).
- D If \overline{AB} , \overline{AC} are two chords in a circle, then \overline{BC} is a (chord Center radius) in the same circle.
- E In the opposite figure, if the length of each radius in the three circles is 3cm, then the perimeter of the triangle $MLN = (6 - 9 - 18)\text{cm}$



- 3 A Draw a circle whose centre is M and radius is 2.5cm. Then draw its diameter \overline{AB} and draw its chord \overline{AC} of length 3cm. Draw \overline{BC} then find its length.
- B Draw the isosceles triangle ABC in which $BC = 4\text{cm}$, and $AB = AC = 6\text{cm}$. Then, draw perpendicular segments from their vertices to their three sides.

Unit four Probability

4



Shorouk for Modern printing

4-1

Experimental Probability



Let's play

* You will learn *

- ☺ To find the probability from an experiment or a sample.
- ☺ To predict using a given probability.

📢 Key Terms

- ▶ Experimental probability
- ▶ Experiment
- ▶ Sample
- ▶ Prediction

When you toss one coin there are two possible ways the coin can land either head **H**  or tail **T** .

The class is divided into groups. Each group tosses a coin 10 times, 20 times, 50 times and 100 times then observe the results and record them in the following table:

number of tossing a coin	number of occurrence of heads	number of occurrence of tails
10 times
20 times
50 times
100 times

What do you notice?

Notice:

Increasing the number of tossing a coin tells the fact that the number of occurrence of heads is nearly equal to the number of occurrence of tails.

For instance, tossing a coin 1000 times

the numbers of occurrence of heads may be 506 times while the number of occurrence of tails may be $1000 - 506 = 494$ times.

It is said: the probability of occurrence of heads in 1000 times = $\frac{506}{1000} = 0.506$ while the probability of occurrence of tails in 1000 times = $\frac{494}{1000} = 0.494$





Is it possible to predict the number of occurrence of heads when tossing a coin 10000 times? Explain.

Example

The opposite table shows the result of a survey of asking 40 students about their favorite breakfast.

What is the probability of choosing fowl and tamaya?

What is the probability of choosing pies?

What is the probability of choosing cheese and dessert?

If the number of student is 400 students. How can you predict about the number of students choosing fowl and tamaya?

Breakfast	
Fowl and tamayia	20
Pie	4
Cheese and dessert	16

Solution

$$\text{Probability of choosing fowl and tamaya} = \frac{20}{40} = \frac{1}{2}$$

$$\text{Probability of choosing pie} = \frac{4}{40} = \frac{1}{10}$$

$$\text{Probability of choosing cheese and dessert} = \frac{16}{40} = \frac{2}{5}$$

Thus, the prediction about the number of students choosing fowl and tamaya
 $= 400 \times \frac{1}{2} = 200$ students.



If the number of students in the survey applied was 800 students. How can you predict:

- A The number of students choosing "Pie"?
- B The number of students choosing "Cheese and Dessert"?



Exercises

- 1 Electric lamps manufacturing company keeps track of 1000 lamps of its production to know the maximum working hours before tearing down. The following table lists these data:

Maximum working hours	less than 150 h	150 – 400 h	400 – 1000 h	more than 1000 h
Number of lamps	80	250	350	320

If you bought a lamp at this company, what is the probability to tear down?

- A Before 150 working hours
- B After 400 working hours.

- 2 Rolling a number cube numbered from (1 to 6) 250 times.
How many times are predicted to get an even number?



- 3 A survey was applied to ask 10 students about the foreign language they prefer to study. 5 students prefer English, 3 students prefer French and 2 students prefer German. If the total number of students in the school is 600 students.



How many students are predicted to prefer studying German?

- 4 Eman, Aml and Maha clean their school in turns. They roll a number cube with two faces numbered 1, two faces numbered 2 and two faces numbered 3.

Eman does the cleaning if the faces numbered 1 appear.

Aml does the cleaning if the faces numbered 2 appear.

Maha does the cleaning if the faces numbered 3 appear.

How often do you predict each one does the cleaning within a 30-day month?

Theoretical Probability



Think and Discuss

Discuss with your teacher the following experiments, their outcomes and the sample space of each:

Experiment 1:

Tossing a regular coin and observing the outcomes.

Outcomes: There are 2 possible ways the coin can land: heads (H) or tails (T).

Sample space: $S = \{H, T\}$



Experiment 2:

Rolling a regular number cube numbered from 1 to 6.

Outcomes: All possible outcomes are 1, 2, 3, 4, 5, or 6

Sample space: $S = \{1, 2, 3, 4, 5, 6\}$



Experiment 3:

Having a baby and determining the gender of the newborn baby.

Outcomes: a boy (B) or a girl (G).

Sample Space: $S = \{B, G\}$



Experiment 4:

Playing a football game and determining the result of a team. Outcomes: All possible outcomes are win, or or

Sample Space: $S \{ \dots, \dots, \dots \}$



* You will learn *

☺ To find an event.

Key - terms

- ▶ Theoretical probability
- ▶ Outcomes of an experiment
- ▶ Sample space

Experiment 5:

To spin a spinner divided into 6 sections

Outcomes: all possible outcomes are 1, 2, 3, 4, 5, 6.

Sample space: $S = \{\dots, \dots, \dots, \dots, \dots, \dots\}$

To spin an odd number is a subset of the sample space. This individual outcome is called an event and the subset = $\{1, 3, 5\}$



An event is a subset of the sample space

In experiment 5:

The probability of spinning an odd number = $\frac{\text{number of outcomes of an event}}{\text{Number of all possible outcomes}} = \frac{3}{6} = \frac{1}{2}$

Examples

- 1 A bag contains 5 white marbles, 7 black marbles and 3 red marbles. All marbles are equally likely in size. Randomly a marble is selected.



Calculate the probability of selecting:

- A A black marble
 B A yellow marble
 C A white or red marble

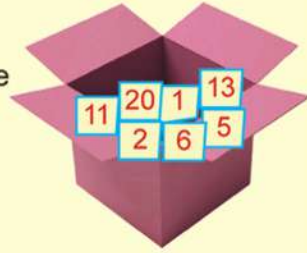
white	black	red	total
5	7	3	15

Solution

- A $P(\text{black}) = \frac{\text{Number of black marbles}}{\text{Number of all possible outcomes}} = \frac{7}{15}$
 B $P(\text{yellow}) = \frac{0}{15} = 0$ (impossible outcome)
 C $P(\text{white or red}) = \frac{5}{15} + \frac{3}{15} = \frac{5+3}{15} = \frac{8}{15}$

- 2 A box contains 20 cards numbered from 1 to 20. Randomly a card has been selected. Calculate the probability of selecting:

- A A prime number
B A number divisible by 7



Solution

$S = \{1, 2, 3, \dots, 20\}$

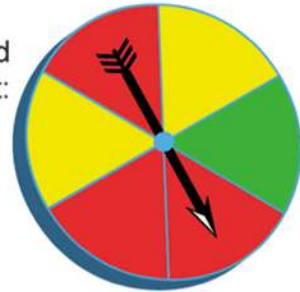
Number of elements in $S = 20$

- A The event of selecting a prime number = $\{2, 3, 5, 7, 11, 13, 17, 19\}$,
with number of elements = 8 $P(\text{prime number}) = \frac{8}{20} = \frac{2}{5}$
- B The event of selecting a number divisible by 7 = $\{7, 14\}$, with number
of elements = 2 $P(\text{divisible by 7}) = \frac{2}{20} = \frac{1}{10}$

Practice

- 1 In the opposite figure: the spinner is divided into 6 colored sections. What is the probability that the spinner stops at:

- A Red.
B Black.
C Green.



- 2 Circle the true answer:

- A Tossing a regular coin, the probability of landing head = ...
 $(\frac{1}{3}, \frac{1}{2}, \frac{3}{4}, 1)$
- B Rolling a regular number cube, The probability of getting a number divisible by 3 is
 $(\frac{1}{3}, \frac{1}{2}, \frac{3}{4}, 1)$
- C A classroom holds 40 students, 25 are boys and the rest are girls. A student has been randomly selected, the probability of getting a girl is
 $(\frac{3}{8}, \frac{5}{8}, \frac{3}{5}, 1)$

General Exercises

1 Complete:

A A box contains 24 lamps, 3 lamps are defective. A lamp has been randomly selected, the probability of getting a functional lamp =

B The probability of failing a student is $\frac{2}{15}$. The probability of success =

C A card has been drawn out of 5 cards containing the numbers:

32

25

14

63

27

The probability of selecting a number that the sum of its two digits is 9 =

D Rolling a regular number cube. The probability of getting an even number = ...

The probability of getting an odd number =

The probability of getting a prime number =

The probability of getting a number greater than 6 =



2 The following table lists the results of a survey applied on 100 spectators of T.V.

Program	arabic films	foreign films	series	news	football matches
Number of spectators	19	20	15	10	36

A spectator has been randomly selected. Find the probability of selecting a spectator prefers

A football matches. B foreign films C series D news

3 A card has been randomly drawn out of 10 cards numbered from 1 to 10.

Find the probability of getting:

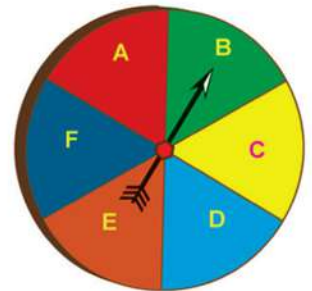
A An odd number B A prime number.

C An even number greater than 6

4 A spinner is divided into 6 equal sections.

A What is the probability of spinning on any section?

B Spinning the spinner 60 times. How many times are predicted to get the letter (A) as an outcome?



Activity

A survey has been applied to ask 50 students about their favorite games:

- A What is the probability that football is the favorite game?
- B If the number of your school students is 500 students, then predict the number of students preferring football games.
- C What is the probability that basketball is the favorite game?
- D In your opinion, how many students out of 500 students would prefer a basketball game?

Students favorite Games	
Game	Number of students
Football	25
Basketball	7
Table tennis	8
Swimming	10



Test

Unit Test

- 1 The following table lists the number of 120 volunteers in 3 groups to make uniforms for the cleaners.

Group	Design	Printing	Distribution
Number of volunteers	30	30	60

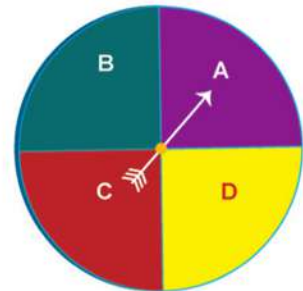
A volunteer has been randomly selected. What is the probability to be one of the printing group?

- 2 **A** Rolling a regular number cube. What is the probability of getting an even number and not divisible by 3?
- B** A card has been randomly selected out of cards numbered from 1 to 25. What is the probability of getting a prime number?

- 3 Tourists successively visit Egypt. A tourist company has organized a trip for 100 tourists to visit Egypt, 40 from Arab countries, 30 from Europe, 10 from America and 20 from Asia. The number of tourists who visited Egypt in this month was 15000 tourists. What is the predicted number of tourists from Europe who visited Egypt in this month?



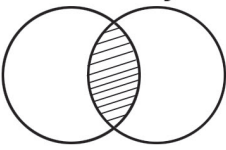
- 4 A spinner is divided into 4 equal sections.
- A** What is the probability of spinning the letter B?
- B** Spin the spinner 400 times. what is the predicted number of getting letter A?



Model tests

Model (1)

First : Choose the correct answer:

- ① The triangle whose measures of their angles $50^\circ, 90^\circ, 40^\circ$ is
 (an acute angled triangle, an obtuse angled triangle, a right angled triangle, otherwise)
- ② $4 \frac{1}{8} \times 2 \frac{2}{3} = \dots\dots\dots$ (1 , 10 , 11 , 111)
- ③ If $\{ 7, 10 \} \subset \{ 10, x + 4 \}$, the $x = \dots\dots\dots$ (3 , 4 , 5 , 6)
- ④ $3.75 \times 1000 = \dots\dots\dots$ (0.375 , 0.0375 , 3750 , 37.5)
- ⑤ $\frac{1}{2} \square \frac{1}{3}$ (< , > , = , \geq)
 x y
- ⑥  The Shaded part is
 ($x \cap y$, $x \cup y$, $y \subset x$, $x \subset y$)
- ⑦ $55.241 \times 100 \square 552.41 \times 10$ (< , > , = , \geq)
- ⑧ $\frac{2}{3} \times \dots\dots\dots = 1$ (1 , 2 , 3 , $\frac{3}{2}$)
- ⑨ 43 day \simeq to nearest week (4 , 6 , 5 , 7)
- ⑩ Any chord passing through the centre of a circle is called
 (a diameter , a radius , a side , an other wise)

11 { 52 } { 5,2 }

{ ∈ , ∉ , ⊂ , ⊄ }

12 12.3 x = 1230

(10 , 100 , 1000 , 10000)

13 $Y = \{ 2, 4, 6 \} \cap \{ 1, 2, 3 \}$, then 6.....y

(∈ , ∉ , ⊂ , ⊄)

14 $\frac{5}{8}$ 0.5734

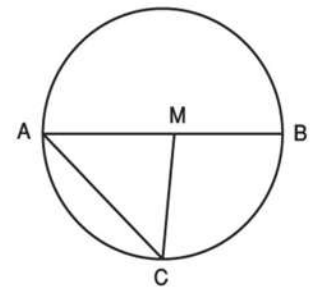
(< , > , = , ≥)

15 Second: Complete:

In the opposite figure:

a) MA = =

B) The longest chord in the circle is.....



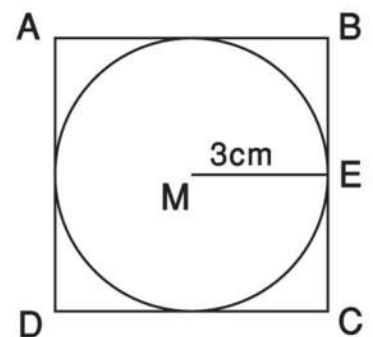
16 $\frac{4}{12} \div \frac{6}{12} = \dots\dots\dots$

17 The probability of the sure event =

18 If $\frac{x}{8} = \frac{15}{24}$, then x =

19 2.4 decimeter =cm.

20 In the opposite figure :
if ME = 3cm , then the perimeter of the square
= cm



21 $65.384 - \dots = 65$

22 $\frac{3}{25} \div \dots = \frac{25}{3}$

23 Draw the triangle ABC where :
AB = 4cm , BC = 6cm , CA = 8cm then draw a circle its centre B and its radius 4cm.

- 24 From the table, find the probability that a pupil play basket ball

Game	football	basketball	handball
number of pupils	50	40	10

- 25 Arrange in descending Order :

$$5 \frac{1}{2}, 6 \frac{1}{4}, 5 \frac{3}{4}, 5 \frac{2}{5}$$

- 26 Find the width of a rectangle whose area is 10.25 metre square, its length is 4.1 metre, then find its perimeter.

Model (2)

First : Choose the correct answer:

① $3.36 \text{ km} = \dots\dots\dots \text{ m}$ (3.36 , 33.6 , 336 , 3360)

② $9 \frac{3}{25} \simeq \dots\dots\dots$ to the nearest tenth (0.9 , 9.2 , 9.1 , 9)

③ $\frac{5}{6} \div 1 \frac{1}{6} = \dots\dots\dots$ ($\frac{5}{7}$, $\frac{2}{6}$, $\frac{3}{7}$, $\frac{7}{6}$)

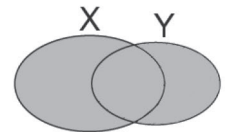
④ $0.312 \times 100 \dots\dots\dots 312 \div 10$ ($>$, $<$, $=$, \leq)

⑤ The smallest number from the following is..... (0.111 , 0.12 , 0.123 , 1.023)

⑥ $10 \times 4.72 \square 100 \times 0.472$ ($<$, $>$, $=$, \geq)

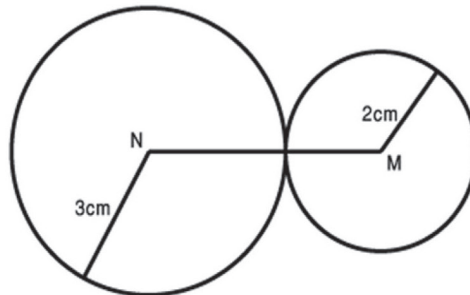
⑦ $\frac{3}{5} \times 1.6 > 1.6 \times \dots\dots\dots$ (0.6 , 1.6 , $\frac{5}{3}$, 0.3)

⑧ the shaded part represents ($x \cap y$, $x \cup y$, $X - Y$, $Y - X$)



⑨ If $y = \{ 2 , 3 , 5 \} \cap \{ 1 , 3 , 5 \}$, then $\{ 1 , 2 \} \dots\dots Y$ (\subset , $\not\subset$, \notin , \in)

⑩ In the opposite figure :



$MN = \dots\dots \text{ cm}$ (2 , 3 , 6 , 5)

11 The length of the diameter of any circle the length of any chord in it does not passing through the centre

(> , < , = , ≥)

12 {0} {1, 2, 5, 8}

(⊂ , ⊄ , ∈ , ∉)

13 The number 736.592 ≈ 736.59 to the nearest
(tenth hundredth, thousandth)

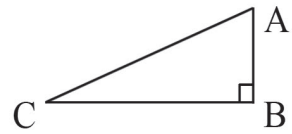
14 If $\frac{2}{3} = \frac{16}{c}$, then the value of c = (2, 3, 12, 24)

Second: Complete

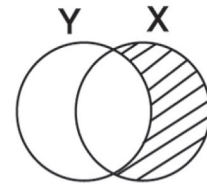
15 If the probability of a pupil succeed in an exam is $\frac{8}{10}$,
then the probability his fail =

16 If $x \subset y$, then $x \cap y = \dots\dots\dots$

17 in the opposite figure . the corresponding height the base \overline{BC} is



18 The shaded part represents



19 A circle its radius = 1cm ,then its diameter= cm

20 $4.6798 \approx \dots\dots\dots$ (to nearest thousandth)

21 $2\frac{1}{4} \times \frac{\dots\dots\dots}{\dots\dots\dots} = 1$

22 $3978 \div \dots\dots = 3.978$

23 If $U = \{ x: x \text{ is an odd number } < 15 \}$, $X = \{ 1, 3 \}$, $Y = \{ 1, 5, 9, 13 \}$.
draw a Venn diagram that represents the sets U , X , Y then find $X \cap Y$

- 24** Draw a Circle of radius 2.5 cm . then draw the diameter \overline{AB} and the chord \overline{AC} of length 3 cm .
join \overline{BC} measure its length
- 25** A box contains identical balls where 5 balls are white ,
9 red and 6 black .
If one ball is chosen randomly, what is the probability
that the chosen ball is white
- 26** A rectangle its length is 4.1cm and its width 3.5cm ,
calculate its area

Model (3)

(خاص بطلاب الدمج)

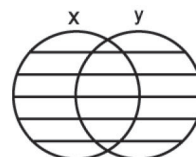
First : choose the crrect answer :

① $\frac{1}{3} \times \frac{3}{4} = \dots\dots\dots$ $(\frac{1}{3}, \frac{1}{2}, \frac{1}{4})$

② IF $3 \in \{ x, 5 \}$, then $x = \dots\dots\dots$ $(5, 3, 8)$

③ $312 \div 10 =$ $(3.12, 0.312, 31.2)$

④ the shaded part is $(x \cup y, x \cap y, x - y)$



⑤  \overline{AB} is called a..... $(\text{diameter, radius, Side})$

⑥ $14.4 \times 10 \square 144$ $(>, <, =)$

⑦ In any triangle there are heights $(1, 2, 3)$

⑧ $\{ 5 \} \dots\dots\dots \{ 5, 8 \}$ $(\subset, \notin, \not\subset)$

⑨ When tossing a coin once the probability of appearing a tail = $(1, \frac{1}{2}, \frac{1}{4})$

⑩ $\frac{1}{2} = \dots\dots\dots$ $(5, 0.5, 0.05)$

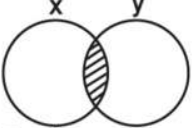





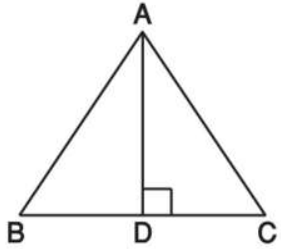

Second: Use the following answers to Complete the questions below :

($\frac{1}{6}$, 12.1 , 2 , 4.9 , { 1,5 })






- ① 4.85 \simeq to nearest tenth
- ② when tossing a die once, the probability of appearing the number 3 =
- ③ 48.4 \div 4 =
- ④ A circle of diameter = 4cm , then its radius = cm
- ⑤ If $X = \{ 1, 2, 5, 7 \}$, $Y = \{ 1, 5, 3 \}$ the $X \cap Y =$

Third : Match

A

<p>①  </p> <p>the shaded part is</p>
<p>② $\frac{1}{2}$  $\frac{1}{3}$ </p>
<p>③ $4 \frac{25}{100} \approx$ to  nearest tenth</p>
<p>④ the probability that Samir win a match is  $\frac{1}{2}$, then the probability of loss =</p>
<p>⑤  </p> <p>\overline{AD} is called</p>

B

 $>$
 $\frac{1}{2}$
 xny
 altitude
 4.3

المواصفات الفنية

الرياضيات ص ٥ ابتدائي E ف ١			
٤ لون	الوان الطبع للمتن	١٢٠ صفحة	عدد الصفحات بالغلاف
٤ لون	الوان الطبع للغلاف	٨٢ × ٥٧ سم	مقاس الكتاب
جانبي	التجليد	٢٧ × ١٩,٥ سم	المقاس النهائي
٨٠ جم ابيض	وزن المتن	٢٠٠ جم كوشيه	وزن الغلاف
رقم الكتاب : ١٥٠٦/١٠/١٥/١١/٥/١			
الكمية المسندة: ٤٠,٠٠٠			

<http://elearning.moe.gov.eg>

رقم الإيداع
٢٠١٩ - ١٣٢٨٧