دولة قطر

المجلس الأعلى للتعليم
SUPREME EDUCATION COUNCIL
هيئة التعليم

SCIENTIFIC ENGLISH

MATHEMATICS AND SCIENCE

GRADE 10

النشيد الوطني

قَسَمًا بِمَنْ رَفَعَ السَّمَـاءْ ● قَسَمًا بِمَنْ نَشَرَ الضِّيَـاءْ
قَطَرٌ سَتَبْقَـى حُـــرَّةً ● تَسْمُو بِرُوحِ الأَوْفِيَـاءْ
سِيـرُوا عَلَـى نَهْـجِ الأُلَـى ● وَعَلَى ضِيَاءِ الأَنْبِيَـاءْ
قَطَرٌ بِقَلْبِي سِيـرَةٌ عِـزٌّ ● وَأَمْـــجَادُ الإِبَاءْ
قَطَرُ الرِّجَـــالُ الأَوَّلِينَ ● حُمَاتُنَا يَوْمَ النِّـــدَاءْ
وَحَمَائِـــمٌ يَوْمَ السَّلَامْ ● جَوَارِحٌ يَوْمَ الْفِـــدَاءْ

لون علم دولة قطر العنابي والأبيض ، وتفصل بين اللونين تسعة رؤوس.

الأبيض : هو رمز السلام الذي يسعى له حكام قطر وأبناؤها.

العنابي : يرمز إلى الدماء المتخثرة، وهي دماء الشهداء من أبناء قطر الذين خاضوا معارك كثيرة في سبيل وحدة دولة قطر وخاصة في النصف الأخيرمن القرن التاسع عشر.

الرؤوس التسعة : ترمز إلى أن دولة قطر هي العضو التاسع في الإمارات المتصالحة من دول الخليج العربية.

علم دولة قطر

رؤية قطر الوطنية 2030

تهدف رؤيــة قطر الوطنية 2030 التي تمت المصادقة عليها بموجب القرار الأميري رقم 44 لسنة 2008، إلى تحويل قطـر بحلـول عام 2030 إلى دولة متقدمة قادرة على تحقيق التنمية المستدامة وعلى تأمين استمرار العيش الكريم لشعبها جيلا بعد جيل. حيث تحدد الرؤية الوطنيـة لدولة قطر النتائج التي يسعى البلد لتحقيقها على المدى الطويـل كما أنها تـوفر إطارا عاما لتطوير إستراتيجيات وطنية شاملة وخطط تنفيذها.

وتستشرف الرؤية الوطنية الآفاق التنموية من خلال الركائز الأربع المترابطة التالية :

التنمية البشرية	التنمية الاجتماعية	التنمية الاقتصادية	التنمية البيئية

الركيزة الأولى ـ التنمية البشرية
الغايات المستهدفة :

سكان متعلمون :

- نظام تعليمي يرقى إلى مستوى الأنظمة التعليمية العالمية المتميزة ويزود المواطنين بما يفي بحاجاتهم وحاجات المجتمع القطري، ويتضمن:
  - مناهج تعليم وبرامج تدريب تستجيب لحاجات سوق العمل الحالية والمستقبلية.
  - فرصا تعليمية وتدريبية عالية الجودة تتناسب مع طموحات وقدرات كل فرد.
  - برامج تعليم مستمر مدى الحياة متاحة للجميع.

- شبكة وطنية للتعليم النظامي وغير النظامي تجهز الأطفال والشباب القطريين بالمهارات اللازمة والدافعية العالية للمساهمة في بناء مجتمعهم وتقدمه، تعمل على:
  - ترسيخ قيم وتقاليد المجتمع القطري والمحافظة على تراثه.
  - تشجيع النشء على الإبداع والابتكار وتنمية القدرات.
  - غرس روح الانتماء والمواطنة.
  - المشاركة في مجموعة واسعة من النشاطات الثقافية والرياضية

- مؤسسات تعليمية متطورة ومستقلة تدار بكفاءة وبشكل ذاتي ووفق إرشادات مركزية وتخضع لنظام المساءلة.
- نظام فعال لتمويل البحث العلمي يقوم على مبدأ الشراكة بين القطاعين العام والخاص بالتعاون مع الهيئات الدولية المختصة ومراكز البحوث العالمية المرموقة.
- دور فاعل دوليا في مجالات النشاط الثقافي والفكري والبحث العلمي.
- استقطاب التوليفة المرغوبة من العمالة الوافدة ورعاية حقوقها وتأمين سلامتها، والحفاظ على أصحاب المهارات المتميزة منها.

Contents

Mathematics

Science

SCIENTIFIC ENGLISH

MATHEMATICS

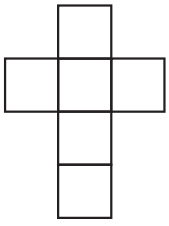
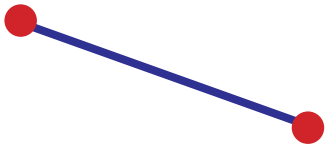
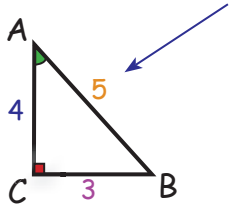
GRADE 10

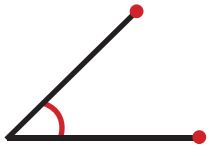
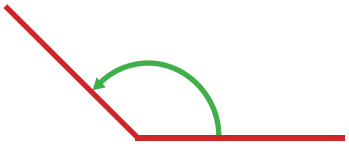
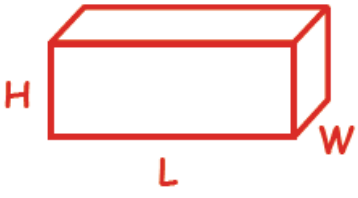
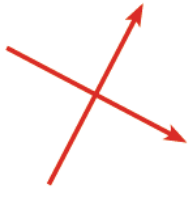
GRADE 9 REVIEW

Task 1: Can you remember the keywords from grade 9?

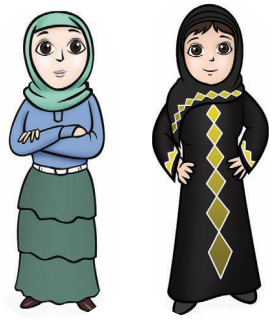
Write the correct keyword for each definition from the box below.

ratio | line segment | radical sign | ordered pairs | hypotenuse | net | acute angle | obtuse angle | perpendicular lines | volume

	KEYWORD	MEANING	PICTURE or EXAMPLE
1		A plan of a shape that folds into a 3D solid shape.	
2		A line that has two end points.	
3		The symbol used to show a square root.	$\sqrt{}$
4		The x and y coordinates that show a point on a graph.	(5,2)
5		The longest side in a right triangle.	

	KEYWORD	MEANING	PICTURE or EXAMPLE
6		Shows the relationship of two or more values.	3 : 1  three blue to one yellow
7		Less than 90°.	
8		More than 90°.	
9		The amount of space that a 3D object takes. This is the length, width and height.	
10		These are lines that are at right angles to each other and make a 90° angle.	

Task 2: MATCHING

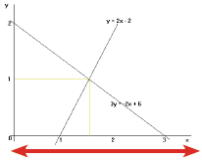


Help us draw lines to match the words with their correct meaning or picture.

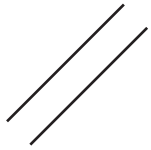
1. parallel lines
2. x-axis
3. Scientific notation
4. quadratic equation
5. simultaneous
6. vertex (corner)
7. edge
8. face
9. rotation
10. base

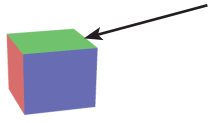
a) $560{,}000 = 5.6 \times 10^5$

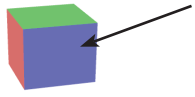
b) at the same time

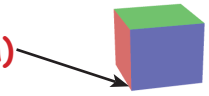
c) 

d) $x^2 + 4x + 4$

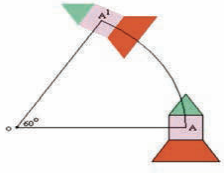
e) 

f) 

g) 

h) 

i) 3^2

j) 

Task 3: MULTIPLE CHOICE!

Complete the sentences. Choose a, b, or c.

1. The answer to a problem is a ..... .

   a) question **b)** problem **c)** solution

2. Scientific notation helps us write very ..... numbers.

   a) large **b)** small **c)** both a and b

3. An obtuse angle is ..... 90°.

   a) less than **b)** more than **c)** equal to

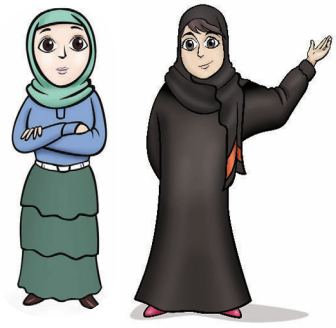
4. A line segment has ..... ends.

   a) 0 **b)** 1 **c)** 2

5. The hypotenuse is the ..... side in a right triangle .

   a) adjacent **b)** opposite **c)** longest

Task 4: FOLDABLES

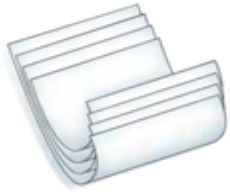


Make this foldable to help you organize your grade 9 review words.

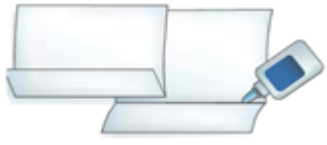
Begin with 4 sheets of A4 paper.

1. **Stack** 4 sheets of paper as shown.

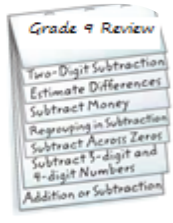
2. **Fold** upward so all layers are the same distance apart.



3. **Crease** well. Open and glue toghether as shown.

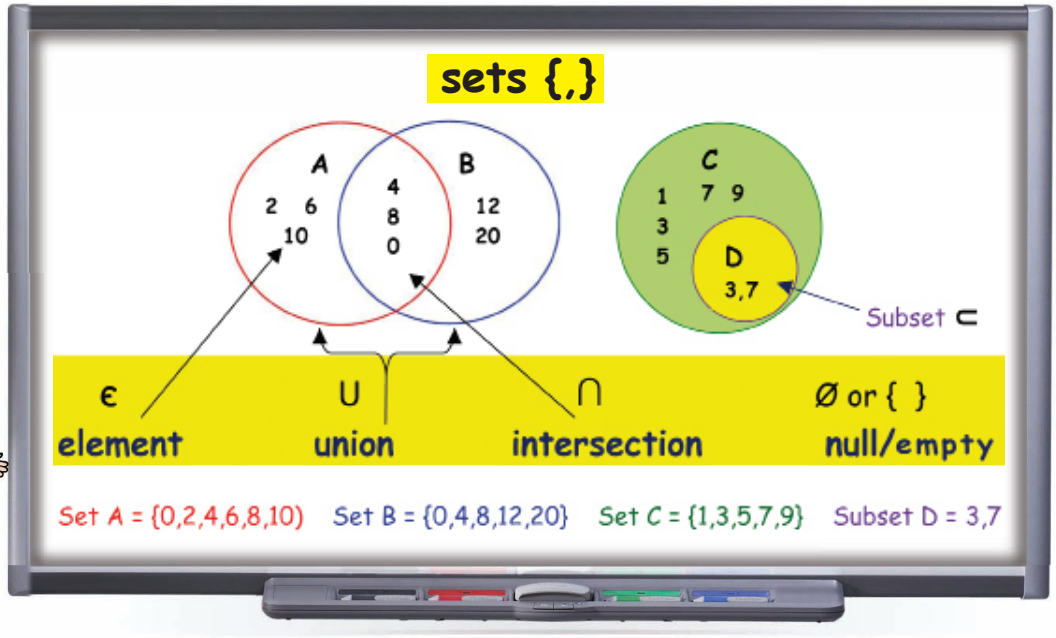


4. **Label** each page with a word. Then write the meaning or draw a picture.



SET THEORY AND NUMBERS

KEYWORDS: {,} set | ∈ element | ∪ union | ∩ intersection | Ø or { } null/empty set | ⊂ subset



A **set** is a group of things collected together. The members or elements are listed in brackets.{ … }.

The **elements** ∈ of Set A are { 0,2,4,6,8,10}. All the elements in both Set A and Set B are the **union** of A and B. This is written A ∪ B = { 0,2,4,6,8,10,12,20}.

The **intersection** is the set of the elements in Set A that are also in Set B. This is written A ∩ B = {0, 4 , 8}.

The union of Set A and Set C is called a **null** or **empty set** because they no elements in common. It is written Ø.

Set D is called a **subset**, because it is completely contained in another set.

Task 1:

Draw lines to match the symbol with its term:

∩	element
∈	union
∪	set
Ø or { }	intersection
{,}	subset
⊂	null/empty

Task 2:

Complete the sentences using the keywords from the box below.

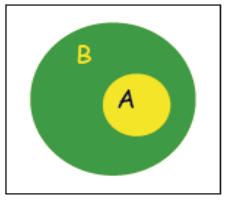
subset **null/empty** **set** **intersection** **union** **element**

1. A ..... is a group of things collected together.
2. The things in a set are called ..... or members.
3. When we list all the members of two sets, this is the ..... of the sets.
4. When we find common elements in two sets, this is the ..... of the sets.
5. When there is no element that belongs in a set, this is called the ..... or ..... set.
6. A small set contained inside of another, larger set is called a ..... .

TODAY'S MATHEMATICS KEYWORDS

Complete the table. Match the keywords listed below with either the meaning, or picture/example. Fill in all blanks in all columns: keywords, meaning, picture or example.

set element union intersection null/empty set subset

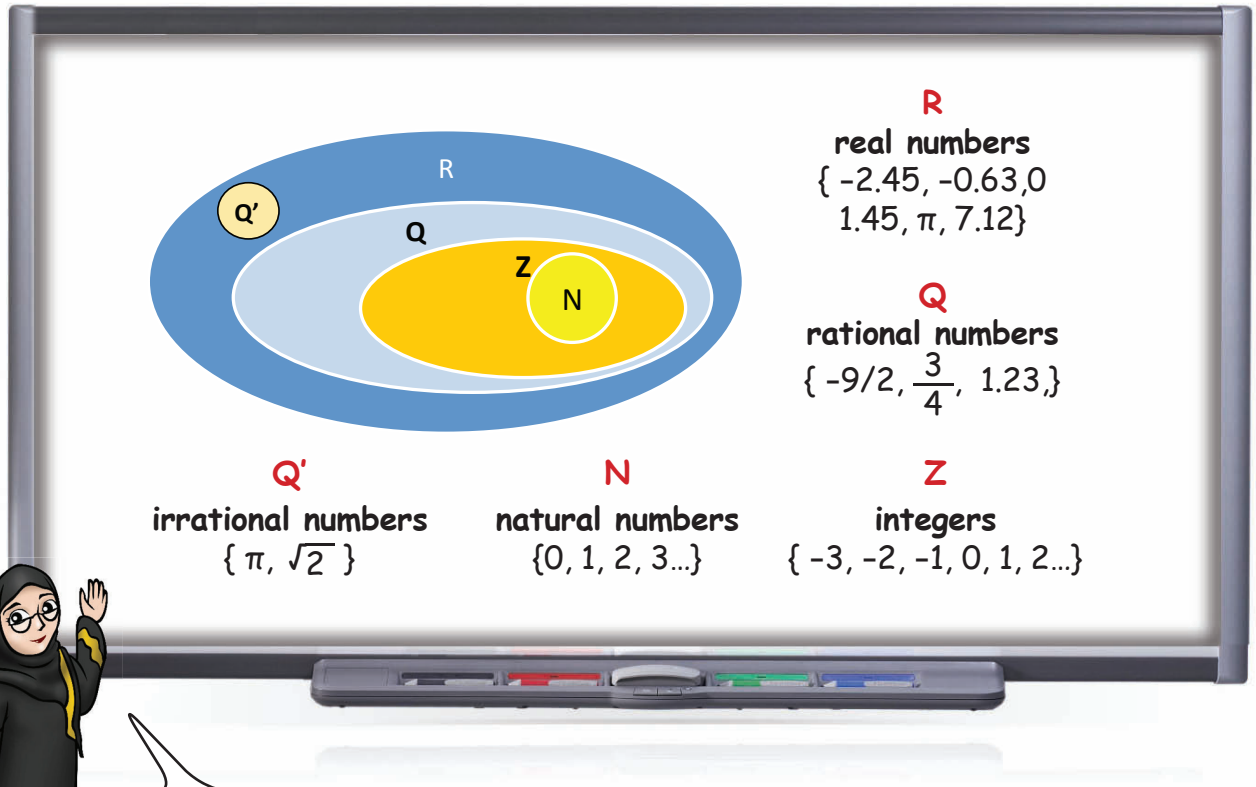
KEYWORD	MEANING	PICTURE or EXAMPLE
	A group of things collected together.	{,}
		 A ⊂ B
	No elements in a set.	
		∩

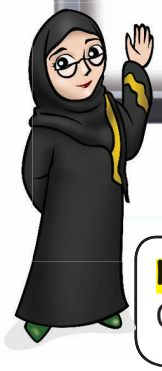
KEYWORD	MEANING	PICTURE or EXAMPLE
	The elements of one set are joined with the elements of another.	
		$\in$

SETS OF REAL NUMBERS

KEYWORDS:

N	Z	Q	Q′	R
natural number	integer number	rational number	irrational number	real number





Natural numbers are our counting numbers 0, 1, 2, 3 and so on. What are integers?

Integers are numbers with no fractional parts that can be positive or negative. Natural numbers are a subset of integers.

Integers are a subset of **rational** numbers. All rational numbers can be written as one integer over another. Rational numbers are a subset of **real** numbers. Real numbers are all numbers that are rational or irrational.

Irrational numbers are numbers that cannot be written as a simple fraction. The decimal goes on forever without repeating.

For example π(pi) is an irrational number .

SETS OF REAL NUMBERS

Task 1:

Draw lines to match the symbol with its term.

Q'	real
R	integer
N	irrational
Z	rational
Q	natural

Task 2:

Draw lines to match the following.

1. Natural numbers
2. Integers
3. Rational numbers
4. Irrational numbers

a) are any numbers that we can make by dividing two integers.

b) have decimals that go on forever.

c) can be positive, negative, or zero, but not decimals.

d) are numbers we count with.

Task 3:

Help Reem choose the correct answer. Is it a, b, or c?

1. A/an ..... number can't be negative.

   a) natural **b)** rational **c)** irrational

2. Pi (π) is a(n) .....

   a) natural number **b)** irrational number **c)** integer

3. ..... is a rational number but not an integer.

   a) -3 **b)** $3\frac{1}{2}$ **c)** 3

4. 100 is not a(n) .....

   a) natural number **b)** irrational number **c)** integer

Task 4:

Work in pairs. Use these jumbled letters to make a question. Then answer the question.

W A H T G E I R E N T S I T O N

S O P T I V I E R O N I T G E V A E ?

Answer: ..... .

Task 5: LET'S TALK!

Work in pairs. Ask and answer these questions about sets of numbers.

What is a rational number?

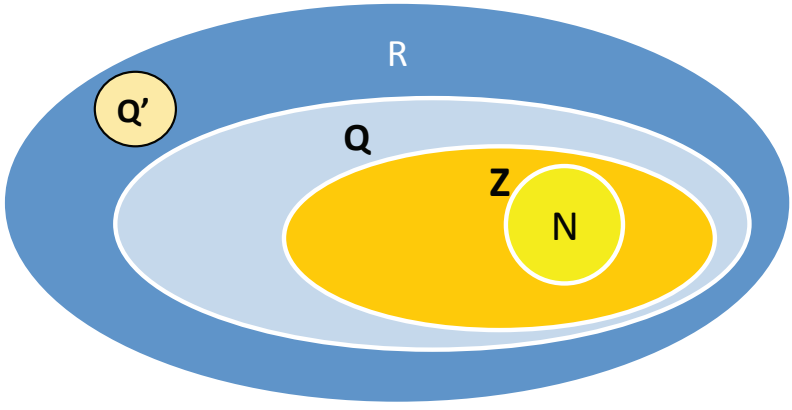
Can integers and natural numbers be negative?

What is an irrational number? Give me an example.

It's a number....

Integers .....

It's a number.... For example...



Task 6: PUZZLE TIME!

Work in teams. Help Reem and Mariam complete the crossword.

Across

1) You can't write an irrational number as a simple .....

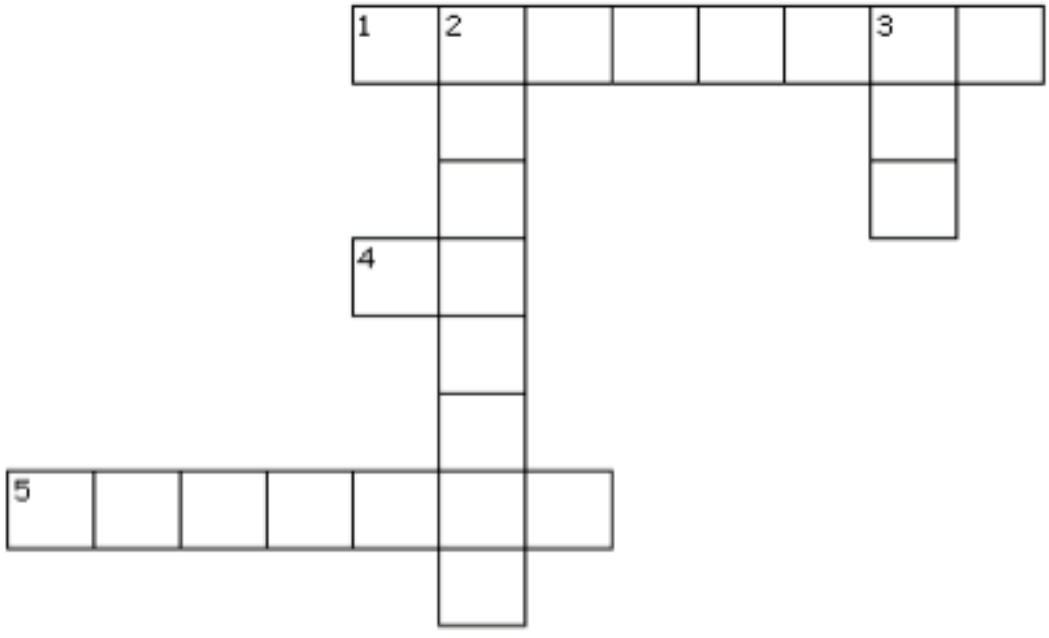
4) This is an irrational number.

5) An integer can be negative, but it can't be a fraction or a .....

Down

2) Any numbers we make by dividing integers are ..... numbers.

3) Natural numbers start here!



Directions for Dominoes Game

1. Cut on the dashed lines. **Do not cut** on the solid blue lines.
2. Place all dominoes face down on a desk and mix them up.
3. Share all the dominoes, so each player has an equal amount.
4. To start the game, place a domino face up.
5. The first player tries to match one end of the domino on the desk.
6. If he/she cannot match either end say 'Pass' and go to the next player.
7. Play continues until all the dominoes are used.

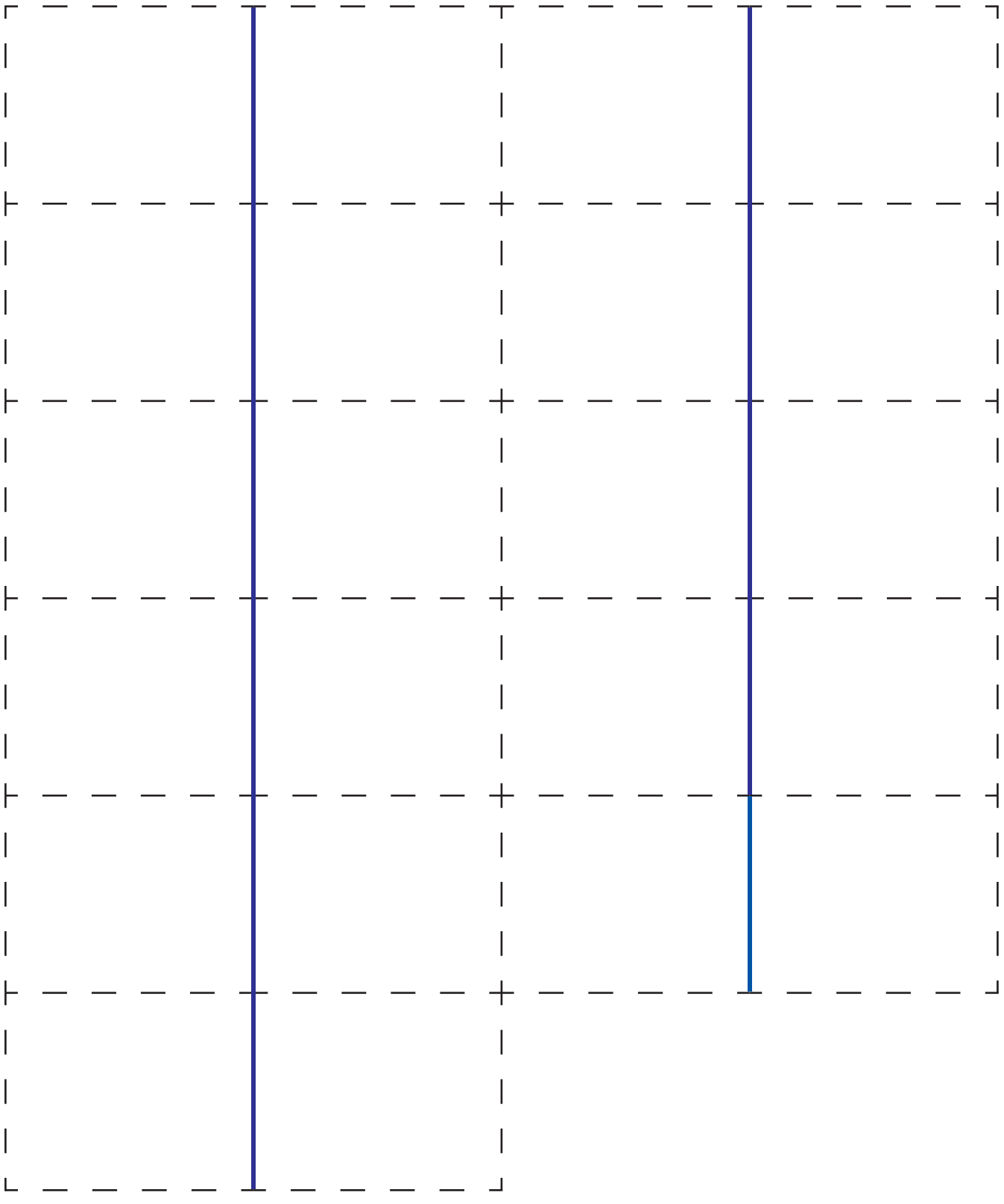
Ø or { }	integer

Ø or { }	integer	Z	subset

null/empty set	Ø or { }	integer	Z	subset
⊂				

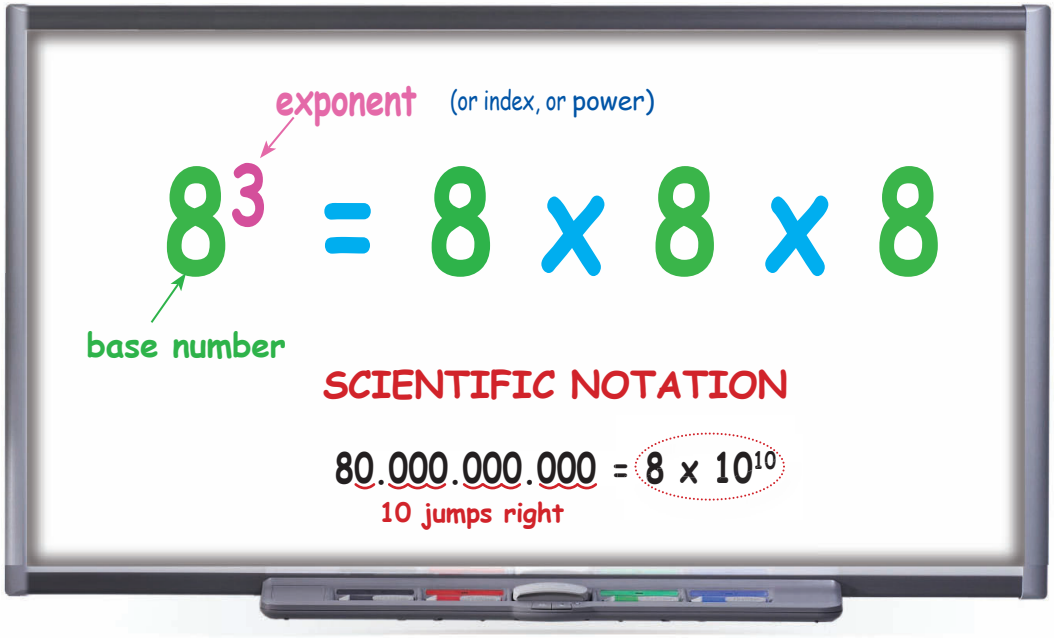
SETS OF REAL NUMBERS

$\mathbb{N}$	rational number	$\mathbb{Q}$	irrational number
$\mathbb{Q}'$	set	$\{,\}$	element
$\in$	intersection	$\cap$	null/empty set
$\emptyset$ or $\{\ \}$	integer	$\mathbb{Z}$	subset
$\subset$	union	$\mathbb{U}$	real number
$\mathbb{R}$	natural number		



SCIENTIFIC NOTATION

KEYWORDS: index, exponent, power, base, scientific notation, surd, conjugate

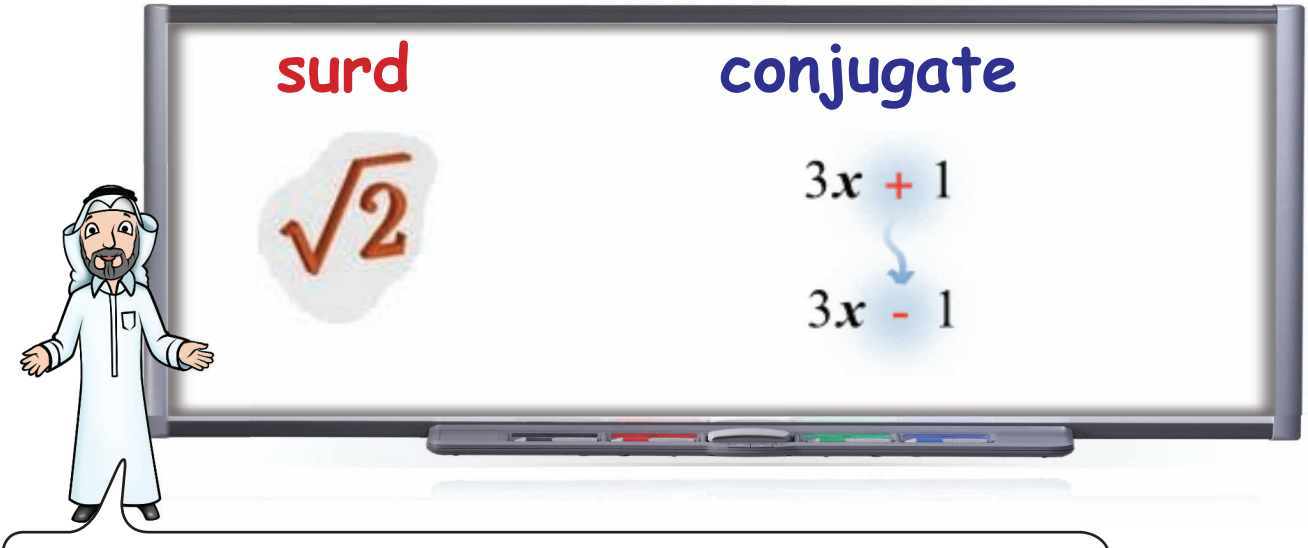


Today, we are going to learn about powers and bases. We will also learn about scientific notation, surds and conjugate. Who can tell me about the index number, exponents and the base?

I can, Dr. Hassan.
The **index** number shows you how many times the base is used as a factor.
It is written as a small number to the right above the base number.
In this example: $8^3 = 8 \times 8 \times 8 = 512$
Another name for index is **exponent** or **power**.
The **base** is the number used as a factor. In 8^3, 8 is the base.

That's right Khalid!
Mohammed, can you tell me what scientific notation is?

Yes Sir! Our book says that **scientific notation** is very useful when we write very large numbers.
This is done with positive powers of 10. $80.000.000.000 = 8 \times 10^{10}$ (10 jumps right)
We also use scientific notation to write very small numbers.
This is done with negative powers of ten. $0.0000003 = 3 \times 10^{-7}$ (7 jumps left)



The conjugate is where you change the sign in the middle of two terms like this:

$$2x + 4 \longrightarrow 2x - 4$$

A surd is an irrational number which has no exact value.

Task 1:

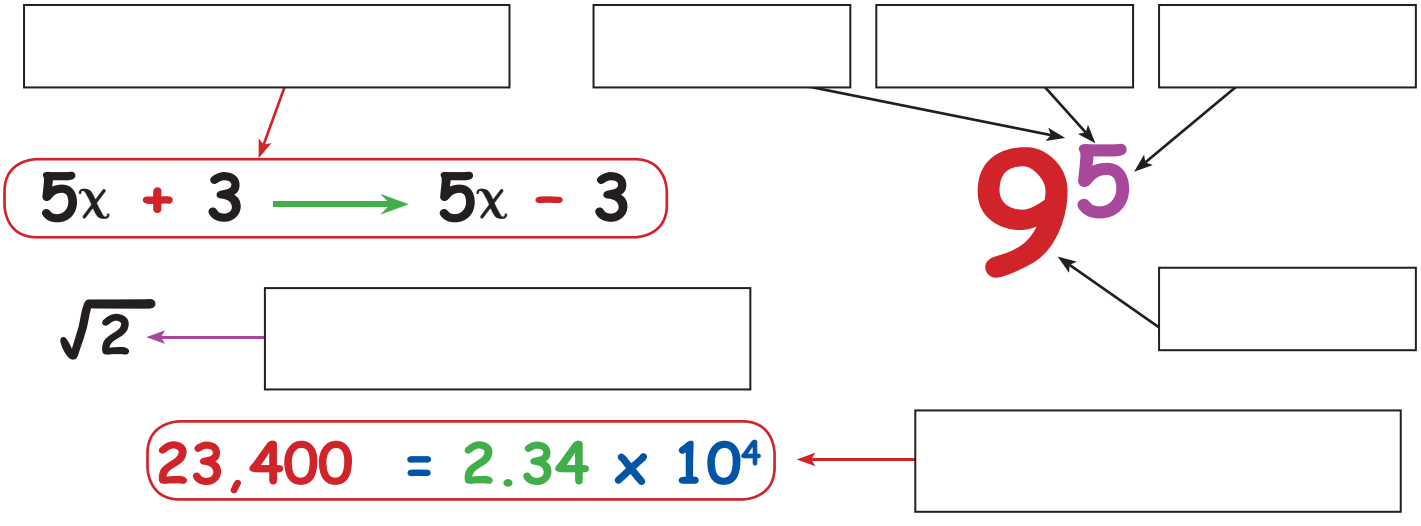
Draw lines to match the words with their correct meaning or picture.

1 exponent	a) $560{,}000 = 5.6 \times 10^5$
2 surd	b) Also known as index or power
3 scientific notation	c) $\sqrt{3}$
4 conjugate	d) $2x + 4x \rightarrow 2x - 4x$
5 base	e) $? \rightarrow 6^2$

Task 2:

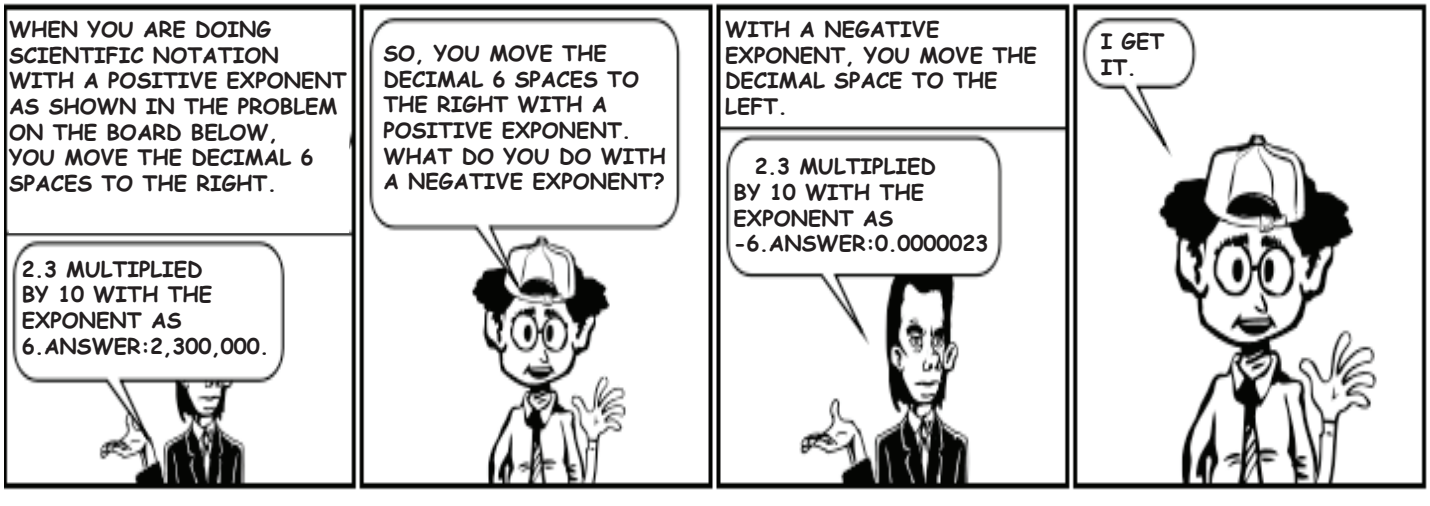
Complete the sentences using the keywords from the box below.

conjugate exponent base index surd power scientific notation

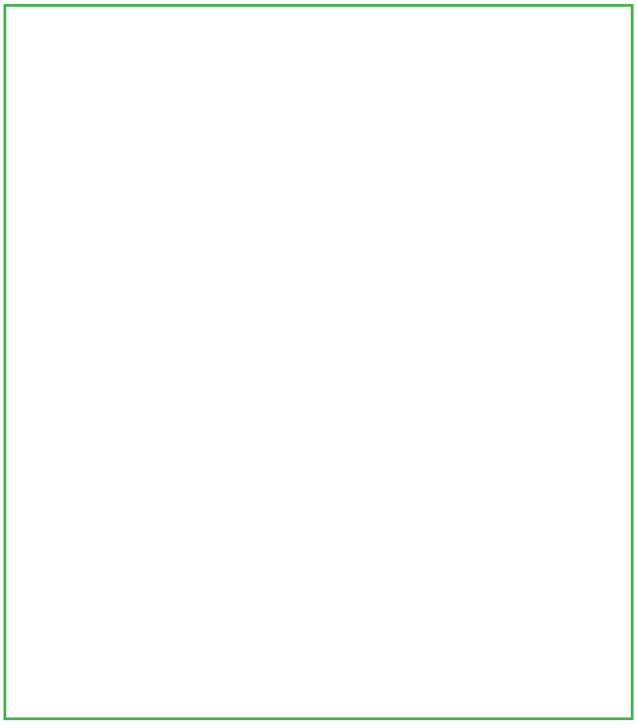


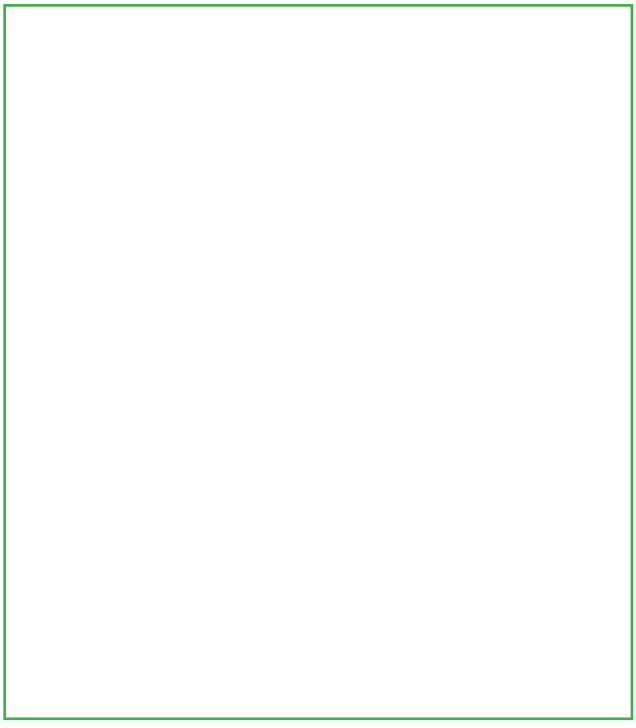
Task 3: COMIC TIME!

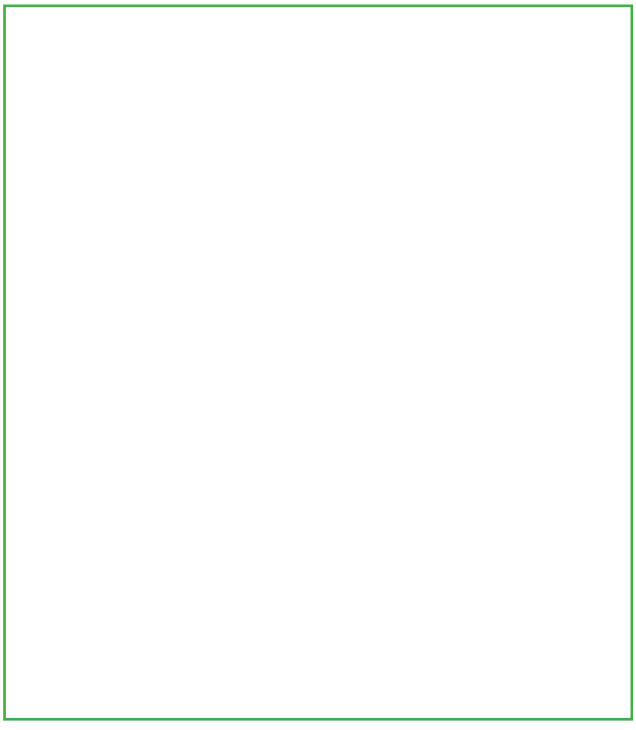
Read the comic strip below



Now, using any of the keywords in today's lesson create your own comic strip.







TODAY'S MATHEMATICS KEYWORDS

Complete the table. Match the keywords listed below with either the meaning, or picture/example. Fill in all blanks in all columns: keywords, meaning, picture or example

index exponent power base scientific notation surd conjugate

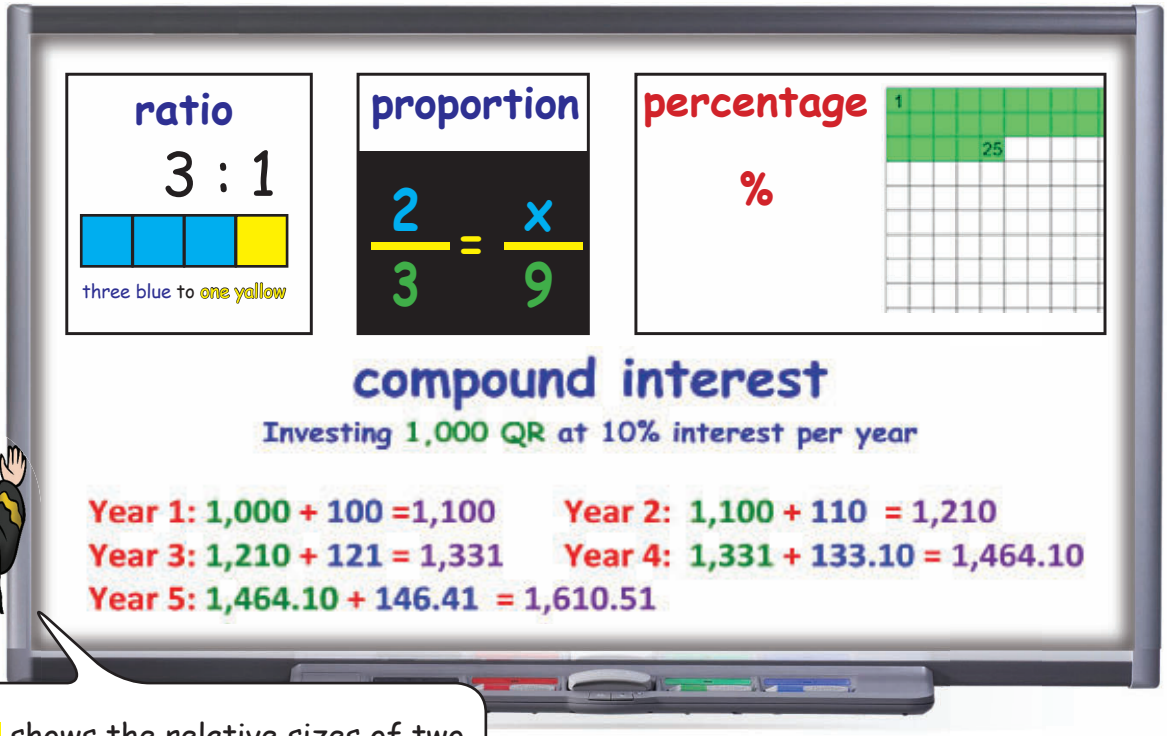
KEYWORD	MEANING	PICTURE or EXAMPLE
	Changing the sign in the middle of two terms.	
		7^2
	Used to write very big or small numbers.	
	Also known as index or power.	

KEYWORD	MEANING	PICTURE or EXAMPLE
		$\sqrt{2}$
	A number that shows how many times to use the base number as a factor.	
		7^2

RATIO AND PROPORTION

KEYWORDS: **ratio** **proportion** **percentage** **compound interest**

Hello class. Today, we are going to talk about **ratio and proportion**.



A **ratio** shows the relative sizes of two or more values.
In the example on the board, we would say, 'There are 3 blue squares to 1 yellow square.'
Ratios can also be written as fractions (to show the relationship of a part to the whole), or as decimals or percents.
What is a proportion?

A **proportion** is simply two ratios that are equal to each other. Proportions are usually used in Algebra to solve for some missing information, which is shown as x on the board.

Percentage means parts per hundred. Often when you invest money, you will earn an extra amount each year as interest on the principal. The interest is figured as a percentage of the amount you invested.

If you leave your money in the bank year after year, you may earn **compound interest**, which is the same as earning interest on both your principal and the added interest per year.
Look on the board for how 1000QR with 10% compound interest grows in 5 years!

Task 1:

Fill in the blanks with the words from the box below.

ratio proportion percentage compound interest

1. We can write a ..... in different ways: 1:3, $\frac{1}{4}$, 0.25, or 25%.
   (one to three, one fourth, twenty-five hundredths, or twenty-five percent)

2. We can solve problems for missing information in algebra with .....
   showing two equivalent ratios.

3. The amount added each year to both the principal and any interest you have earned is called ....

4. ..... means parts per hundred. It is the way interest is calculated for loans or investments.

Task 2:

Unscramble each of the clue words.

M O D U N P O C

S I R T N E T E

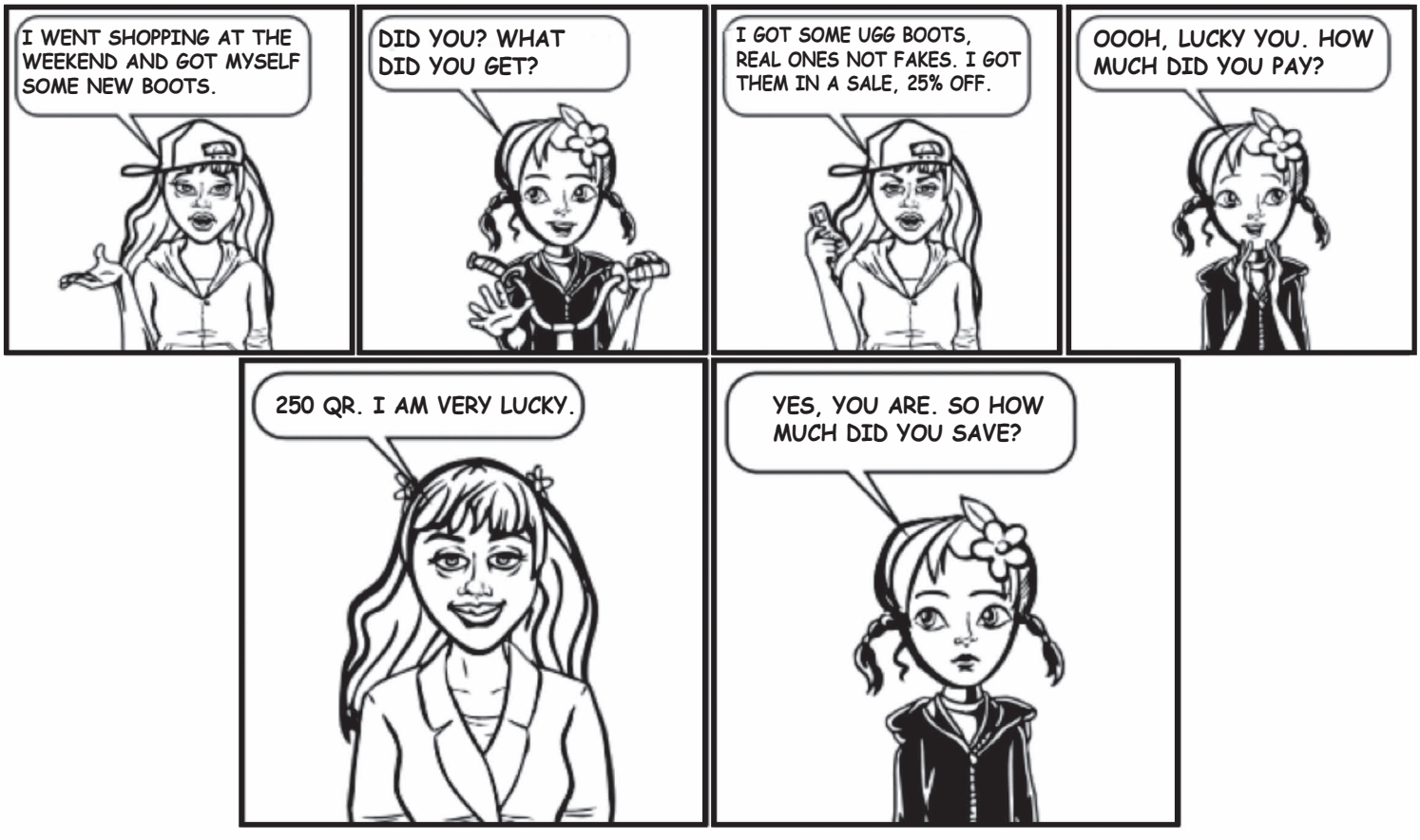
P E E G A E T C R N

P O N P O R R O I T

Take the letters that appear in ◯ boxes and unscramble them for the final message.

Task 3: COMIC TIME!

1 Read the comic strip.



2 Complete the comic strip.

TODAY'S MATHEMATICS KEYWORDS

Look at the keywords in the box below. Write each word in the box below. Next to the word write its meaning and in the last box draw a picture or provide an example.

ratio proportion compound interest percentage

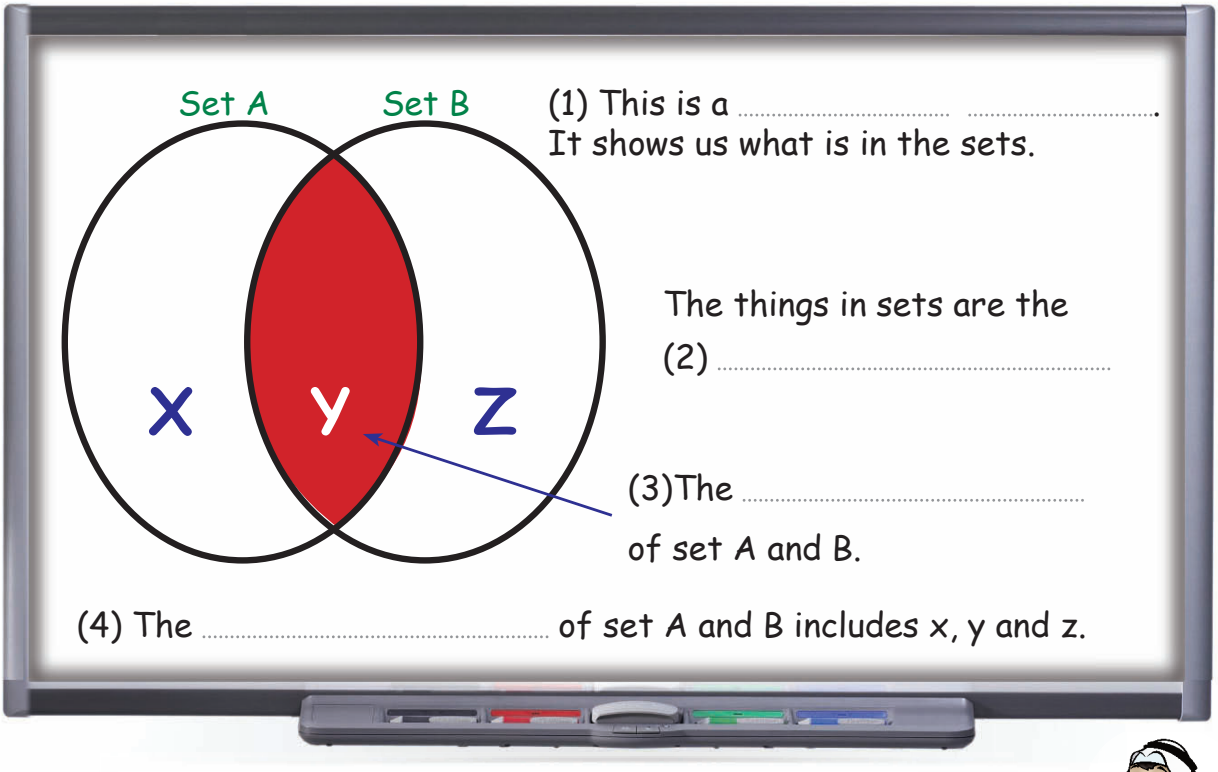
KEYWORD	MEANING	PICTURE or EXAMPLE

REVIEW

KEYWORDS: Venn diagram union intersection elements (members) base power positive/negative exponent index/indices rational and irrational numbers natural numbers integers squared

Read the conversation and help Khalid and Jassim write the answers.

Remember, in a **Venn diagram**, the **elements (members)** are the things in the sets. The **union** is everything in the sets but the **intersection** only has the things that are in both sets.
Now, look at the smartboard below and label (1), (2) (3) and (4)?



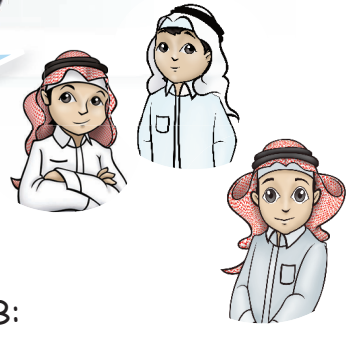
(1) This is a ....
It shows us what is in the sets.

The things in sets are the
(2) .....

(3)The .....
of set A and B.

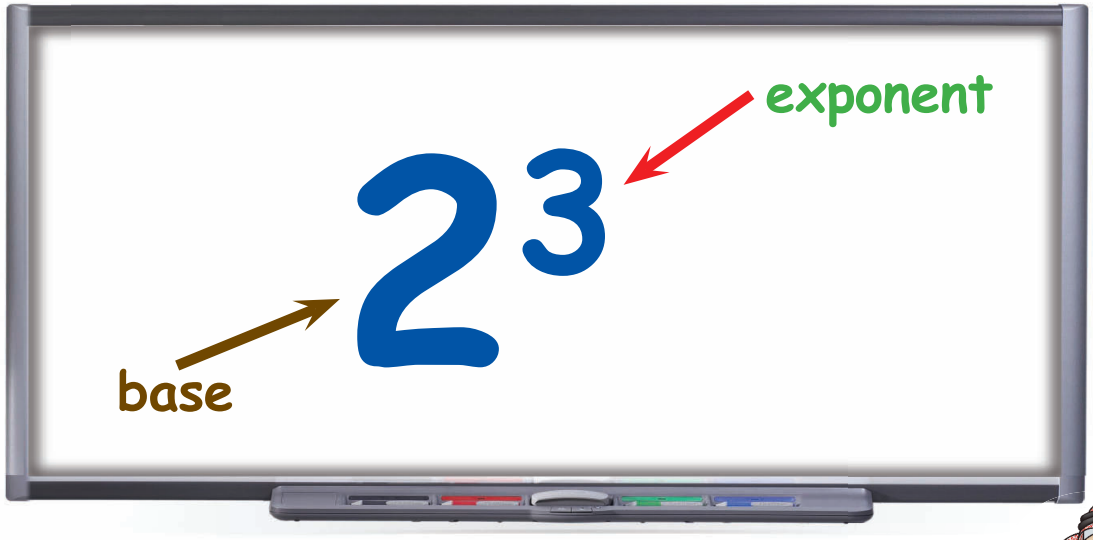
(4) The ..... of set A and B includes x, y and z.

Choose the right letter for the sentences below:



1. The elements (members) of the union of Set A and Set B:
   a) x and y b) y c) x, y and z
2. The elements (members) of the intersection of Set A and Set B:
   a) x and y b) y c) x, y and z
3. The elements (members) of Set A:
   a) x and y b) y c) x, y and z

It's time to revise base numbers and exponents. An **exponent** (or **power**, or **index**) tells us how many times we use the base as a factor. Look at the board. The **base** is 2 and the **exponent** is 3, so that's 2 x 2 x 2 = 8.



That's right! And when the exponent is 2, it's 'squared'. So, 10 to the power 2 is 10 squared!

And the exponent can be **positive** or **negative**. For example, in 10^{-2}, the exponent is negative.

Draw lines to complete the sentences.

1. When the base is 2 and the exponent is 2,
2. When the base is 2 and the power is -2,
3. When the base is 2 and the power is 3,

a) it's 2 x 2 x 2.

b) it is 2 squared.

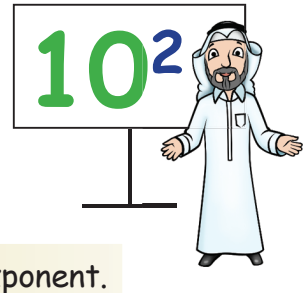
c) there is a negative exponent.

Now, look at my board and fill in the blanks below with a word or number from the box.

exponent/power/index two (2) ten (10) 100 base

Ten is the ..... Two is the .....

This is ..... to the power ..... The answer is .....

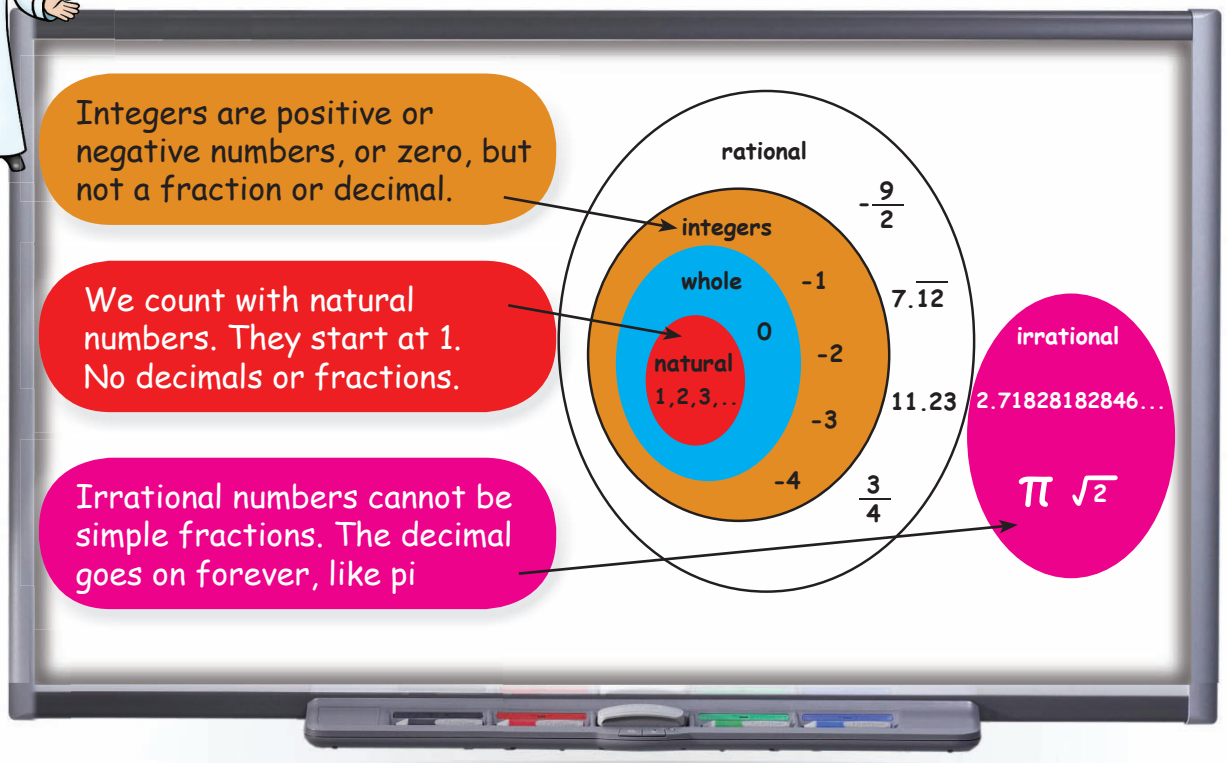


ONE of these sentences is FALSE. Which one? Why?

1. An index is the same as a power and an exponent.
2. Six to the power two is six squared; that's 6 x 6.
3. 8^2 is eight to the power two, or eight squared.

Number ..... is FALSE, because .....

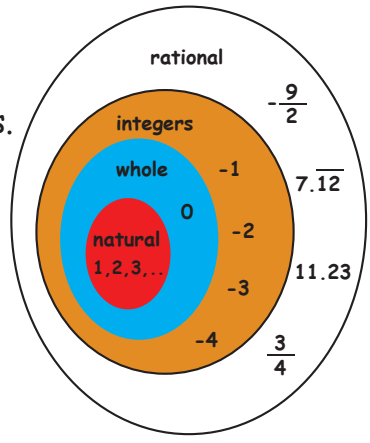
Now, let's revise sets of numbers. What are rational numbers, Moza?



Rational numbers are numbers we can make when we divide one integer by another. They can be whole numbers, fractions or decimals, positive or negative!

Integers are positive or negative too, but not fractions or decimals. **Irrational numbers** have decimals that go on forever. They can't be simple fractions. **Natural numbers** are the numbers we count with, starting at one.

ONE of these sentences is FALSE. Which one? Why?



1. Zero, one, two and three are all natural numbers.
2. Pi (π) is not a rational number.
3. Negative one (-1) is an integer.

Number ..... is FALSE, because .....

Ask and answer these questions about the things we have revised.

What are 'elements'?

What does an exponent tell us?

What's the difference between integers and natural numbers?

They are....

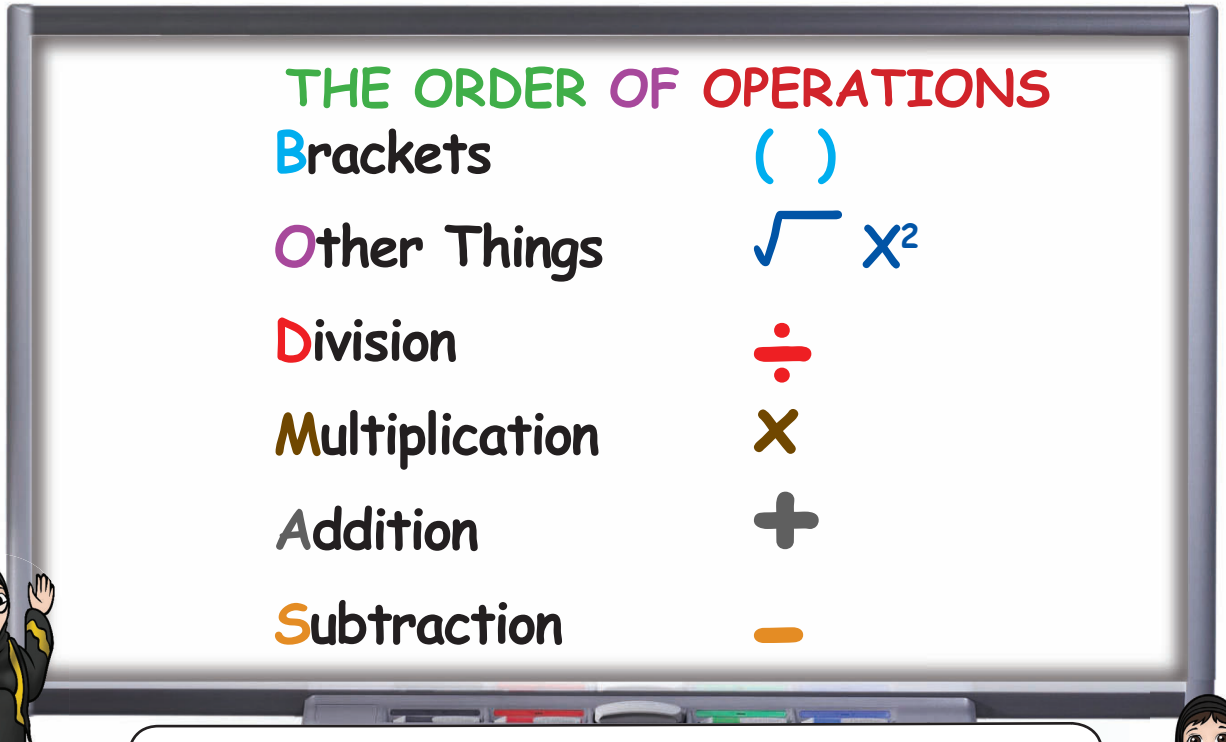
It tells us how many times...

Integers can be... but natural numbers can't.

THE ORDER OF OPERATIONS

KEYWORDS: order of operations, brackets, multiplication, division, addition, subtraction

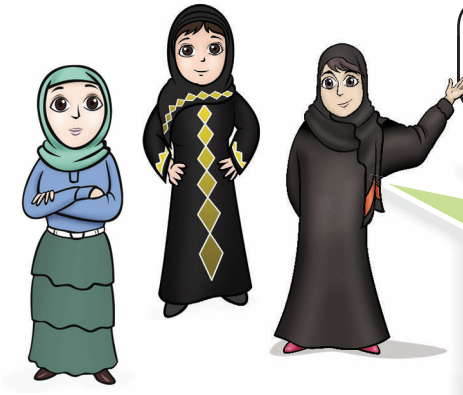
Mrs Hessa is teaching a lesson about **the order of operations**.
Read and listen to the lesson. Then do the activities.



The order of operations tells us what order we are supposed to do things in a math problem.

There are many operations. How do we know where to start?
Shall I start at the left and go to the right?
Or go from right to left?

This is the order of operations and we use these rules. Class, let's say the rules.



The rules are:

B	Brackets first
O	Other things x^2
DM	Division and Multiplication (left-to-right)
AS	Addition and Subtraction (left-to-right)

THE ORDER OF OPERATIONS

A common phrase to remember the order is **BODMAS** !
Bored **O**f **D**oing **M**ath **A**t **S**chool!

Task 1:

Can you fill in the blanks? Use the words provided.

operations	multiplication	subtraction	brackets	division	addition

1. When we arrange an equation with many number operations, we must always begin by removing the .....
2. After the brackets, it is important to solve all ..... numbers.
3. When we have completed division, we must complete any ..... numbers.
4. To help find the next step, we must use ..... and add the numbers in the equation.
5. Lastly, we get rid of the final operation which is ..... and do this to get the answer to the whole equation.
6. We must ensure that we do all the number ..... in this order.

Task 2:

Can you match the words with the operations?

1. addition
2. multiplication
3. subtraction
3. division
5. brackets

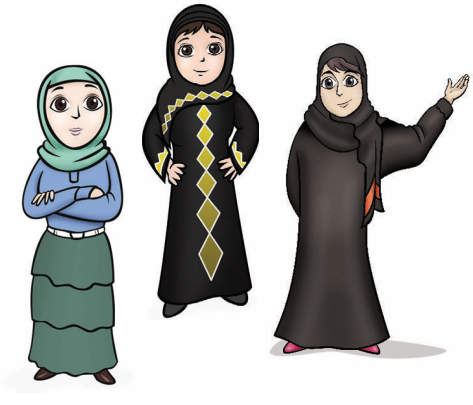
a) 7 - 5 =

b) (3 x 4)

c) 8 ÷ 4 =

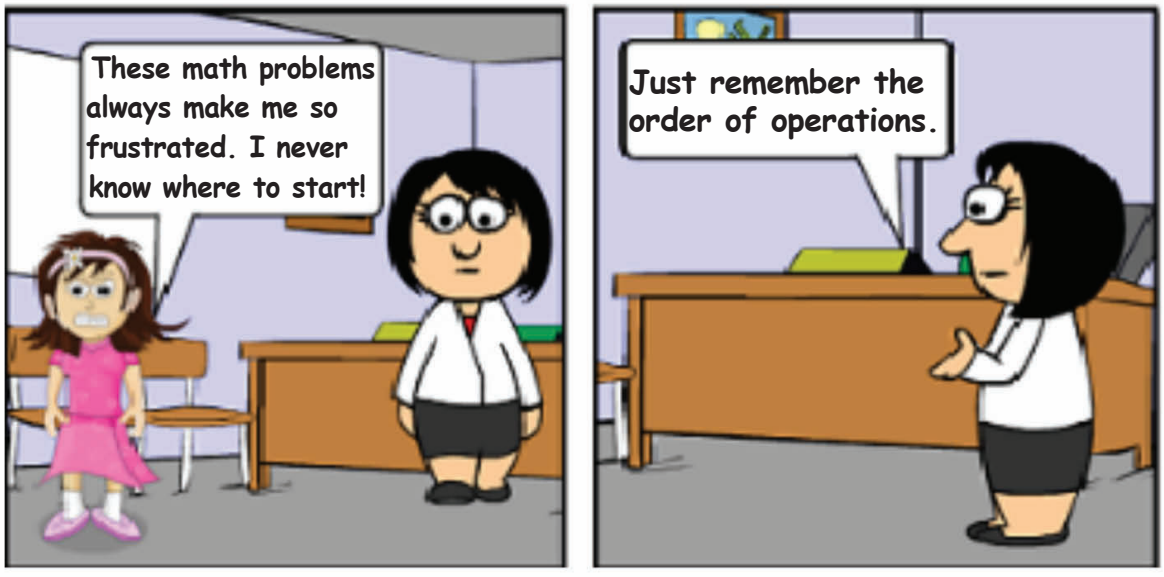
d) 5 + 3 =

e) 6 x 2 =

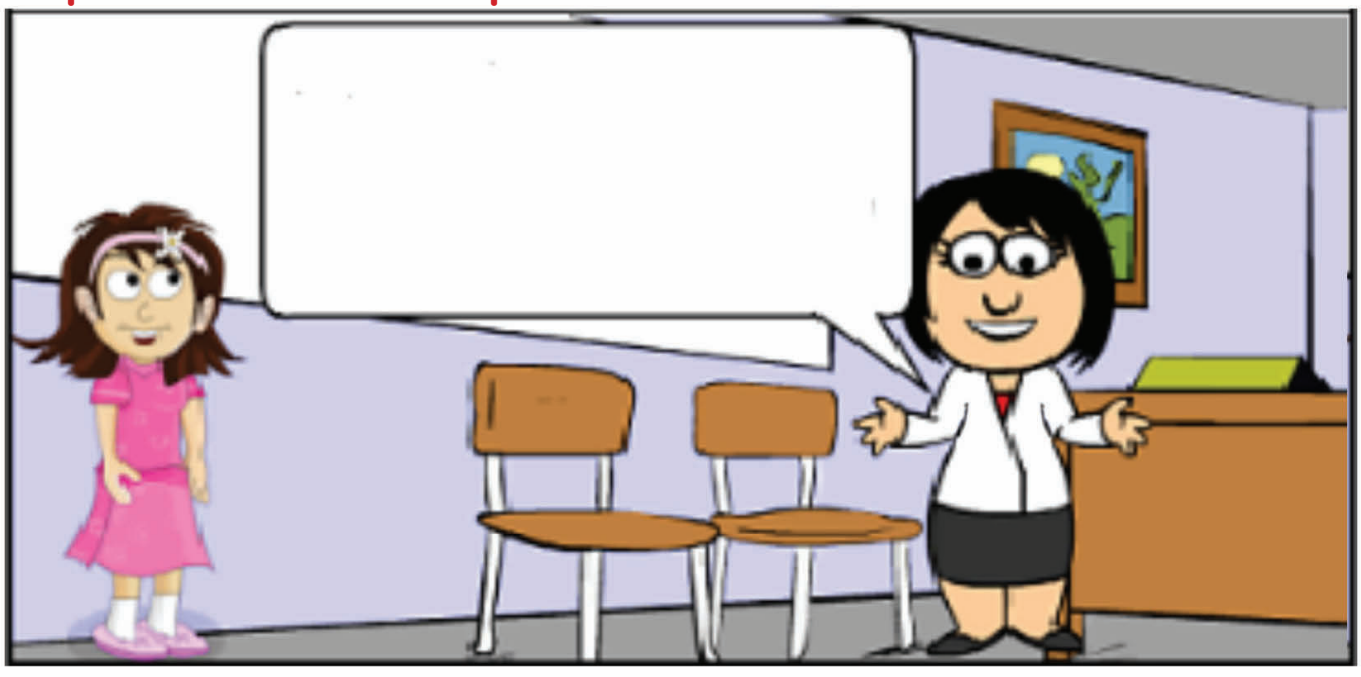


Task 2: COMIC TIME

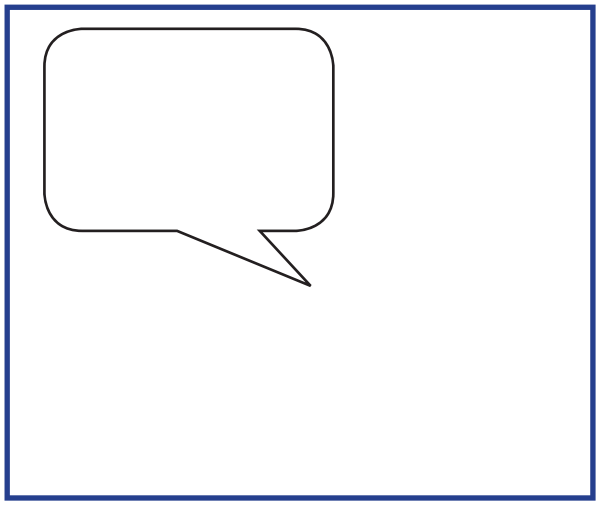
THE ORDER OF OPERATIONS

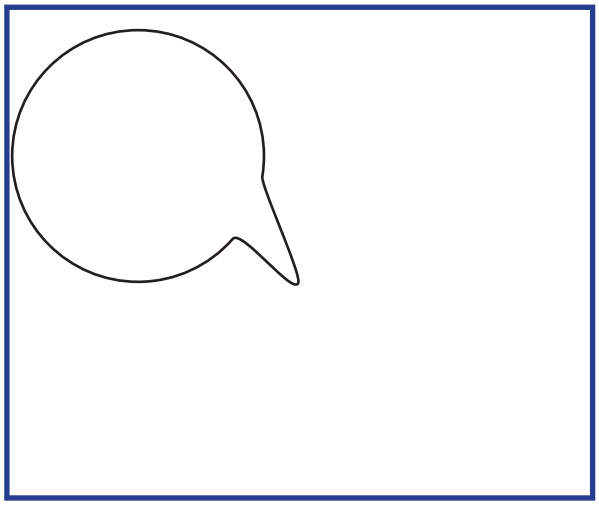


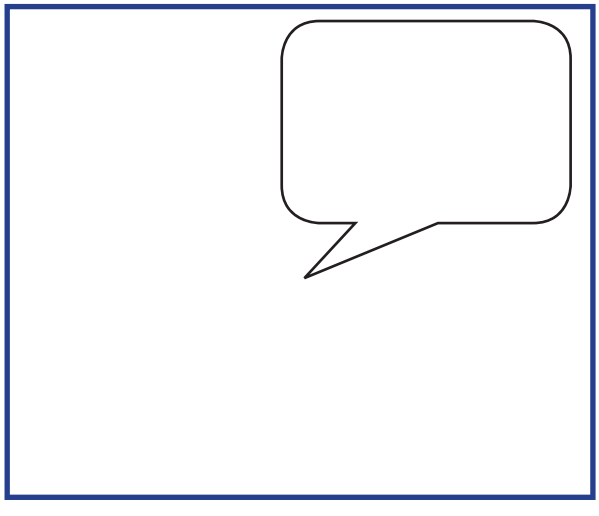
Complete the comic strip.

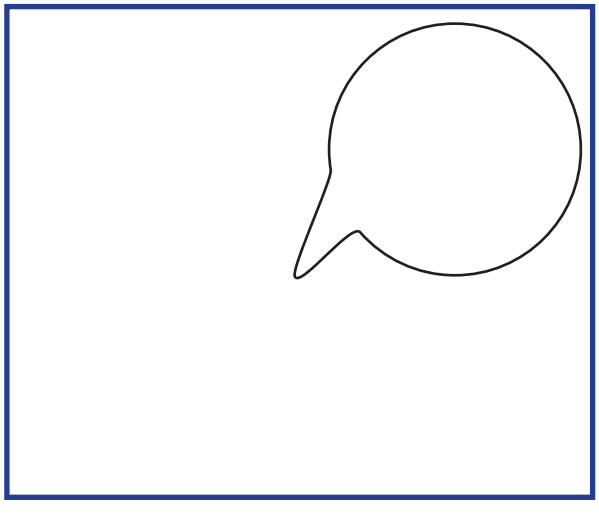


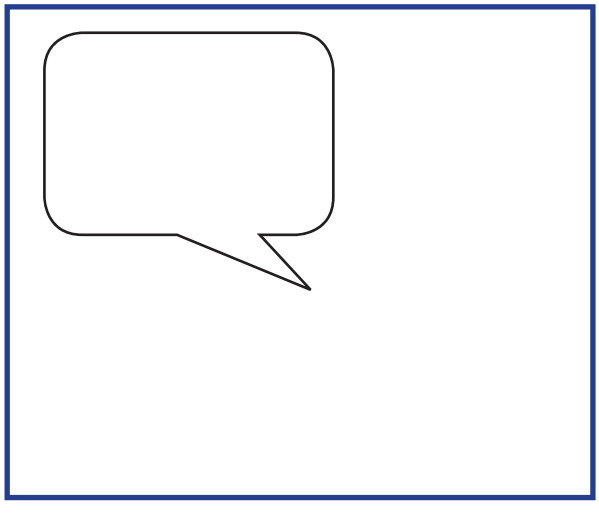
Now, create your OWN comic strip about the order of operations using the template below.

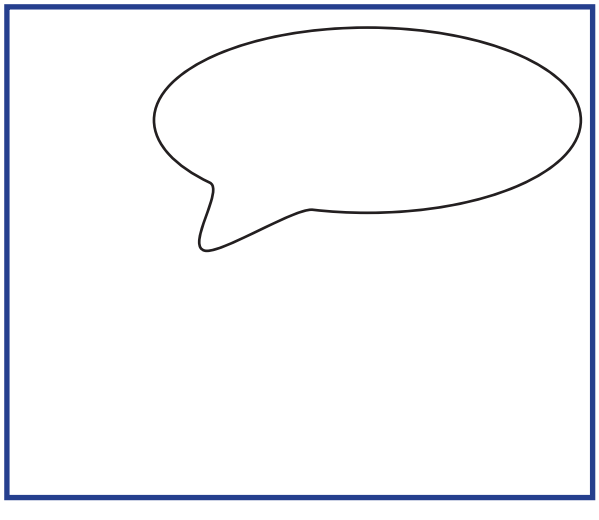










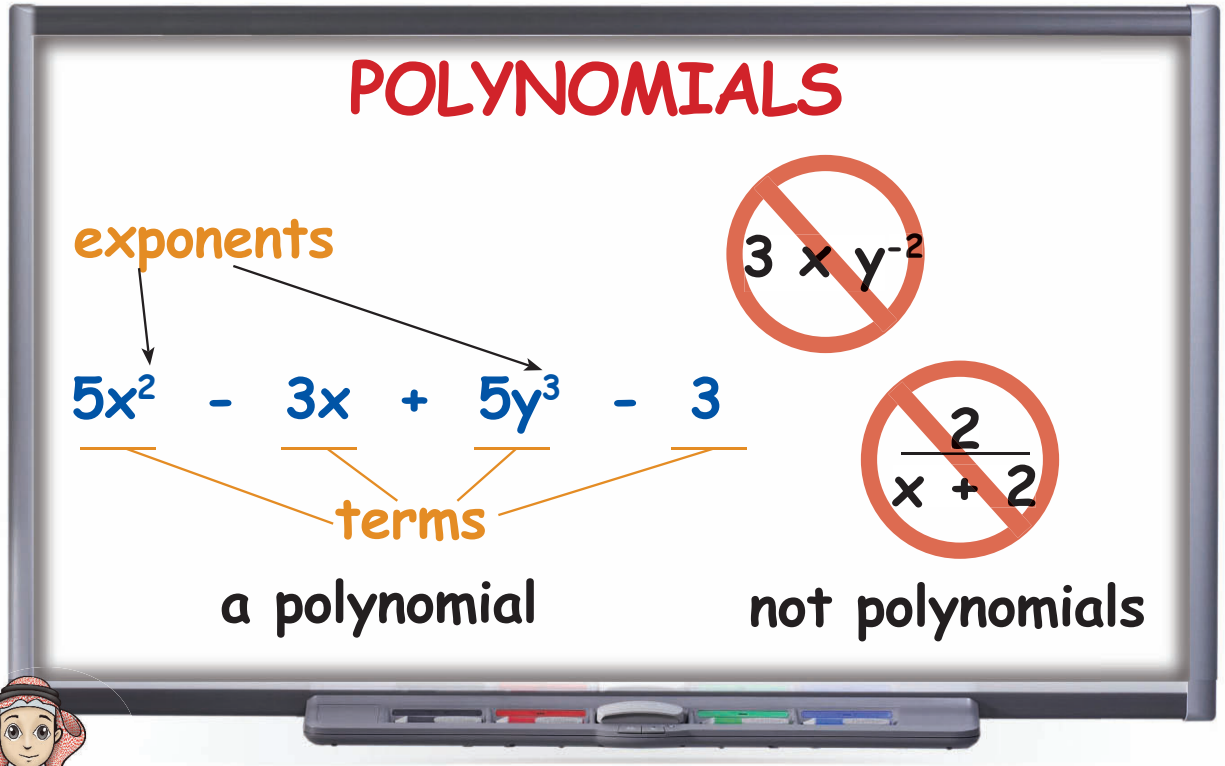


PRODUCT OF POLYNOMIALS

KEYWORDS:

polynomials | highest common factor (HCF) | difference of two squares | factorizing

Dr Hassan is teaching a lesson about **polynomials**.
Read and listen to the lesson. Then do the activities.



Dr Hassan, what is a polynomial ?

Well Jassim, a **polynomial** can have many terms in it. Each term is separated by an operation.

The **difference of two squares** is equal to the sum multiplied by the difference. For example: $a^2 - b^2 = (a + b)(a - b)$

Khalid, what do you think the **highest common factor** is?

PRODUCT OF POLYNOMIALS

Well Dr Hassan, I think the HCF must be the largest common factor among polynomials.

Yes, that is true Khalid. Well done. **Factorizing** is finding the factors that will divide into a polynomial.

Task 1:

Can you fill in the blanks? Use the words in the box below.

difference of two squares	factoring	polynomial

1. A ..... can have many terms.
2. ..... is finding the factors to multiply to get an expression.
3. The ..... is the sum of two squares multiplied by their difference.

Task 2:

Can you match the words with the operations?

1. difference of two squares
2. polynomial
3. factorzing
3. area
5. highest common factor

a) [ ] $x^2 + 5x + 6$

b) The largest number that will divide exactly into two or more numbers.

c) An expression that can have many terms.

d) The sum of 2 squares multiplied by their difference.

e) Finding the factors to multiply to get an expression .

TODAY'S MATHEMATICS KEYWORDS

Look at the keywords in the box below. Write each word in the box below. Next to the word write its meaning and in the last box draw a picture or provide an example.

polynomials highest common factor

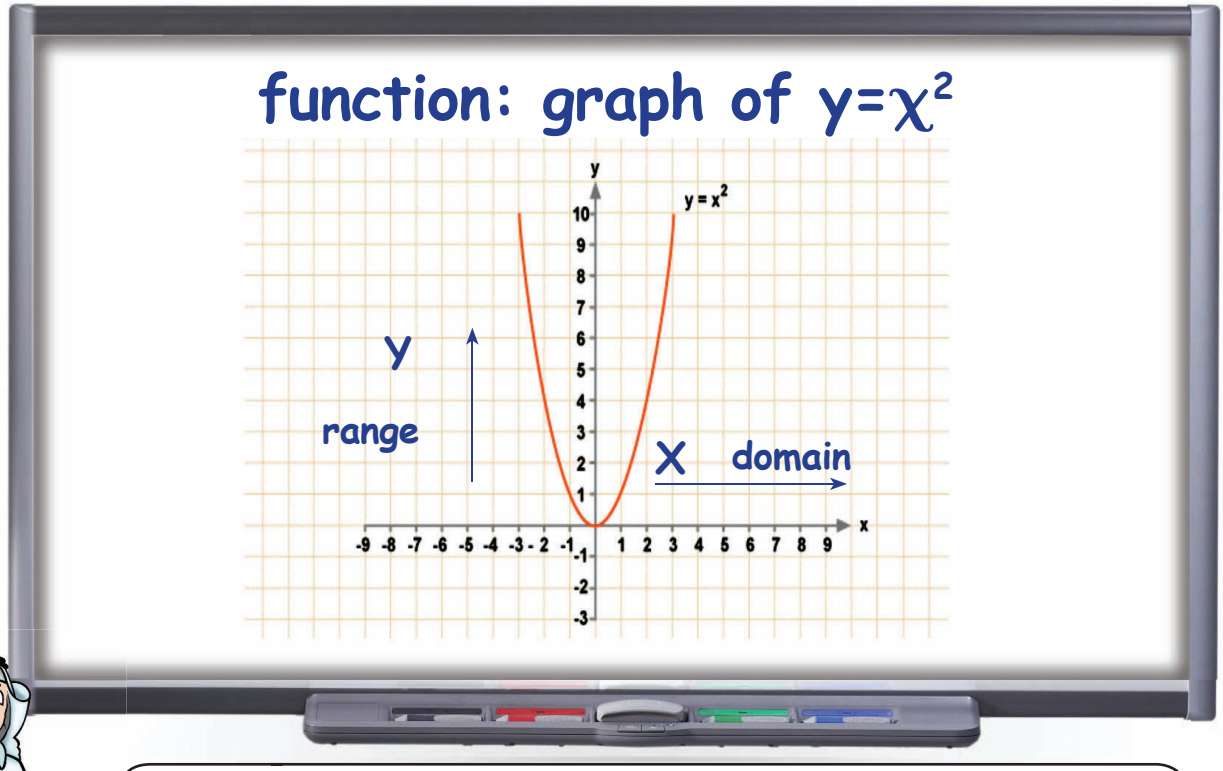
difference of two squares factorizing

KEYWORD	MEANING	PICTURE or EXAMPLE

KEYWORD	MEANING	PICTURE or EXAMPLE

RELATIONS AND FUNCTIONS

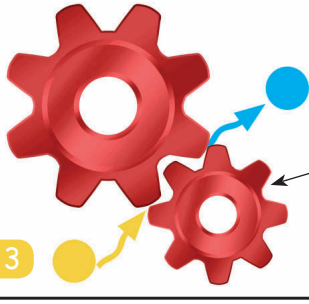
KEYWORDS: formula function domain range graph directly proportional



A **formula** is a maths rule to solve problems. For example, the **formula** for the area of a triangle is $\frac{1}{2}$ base × height.

What is a **function**? What are the **range** and **domain**?

Look at the board. A **function** is the fixed relationship between two sets of numbers. It is what happens to the numbers when you use a **formula**. It's like this:



The **domain** is all the numbers that go into a **function** and the **range** is all the numbers that come out. In this example, there are 1, 2 and 3 for the **domain** and 1, 4 and 9 for the **range**. Then, we can show them on a graph, like the one on the board. A **graph** is a chart that shows relationships between numbers.

I see! What does **directly proportional** mean, Sir?

Directly proportional is when two variables, x and y, increase or decrease together in the same ratio. For example, if the values for x are 1,2 and 3 and the values for y are 10, 20 and 30, we can see that they are directly proportional. The ratio is 1:10.

Task 1:

Draw lines to make correct sentences:

1 The domain is	a) all the numbers coming out of the function.
2 A formula is	b) a maths rule to solve problems.
3 The range is	c) a chart showing the relationship between sets of numbers.
4 A graph is	d) a fixed relationship between two sets of numbers.
5 A function is	e) all the numbers going into the function.

Task 2:

Work in pairs. Choose the correct word to complete the sentences below.

1. When we want to show someone the relationship between two sets of numbers, we draw a ..... .
   a) domain **b)** range **c)** graph
2. The domain is the ..... the function.
   a) input into **b)** output from **c)** website of
3. $\frac{1}{2}$ base × height is a ..... to find the area of a triangle.
   a) formula **b)** graph **c)** domain
4. On the graph on page 42, the ..... is on the vertical axis (going up).
   a) domain **b)** formula **c)** range

Task 3:

Work in pairs. One of these sentences is FALSE. Which one is it? Explain why.

1. A graph of a function needs a domain and a range. **TRUE** **FALSE**
2. x^2 is a domain. **TRUE** **FALSE**
3. 1,2,3 (range) and 30,60,90 (domain) are directly proportional. **TRUE** **FALSE**

Number..... is FALSE, because .....

Task 4:

Work in pairs: Ask and answer questions about FUNCTIONS and GRAPHS.

What is a graph?

A graph is.....

What is a formula?

A formula is...

What is the difference between the range and the domain?

The range is... but the domain is....

Task 5: PUZZLE TIME!

Work in pairs. Complete the crossword.

Across

1) We use a ..... to solve problems. For example, the area of a triangle is $\frac{1}{2}$ base × height.

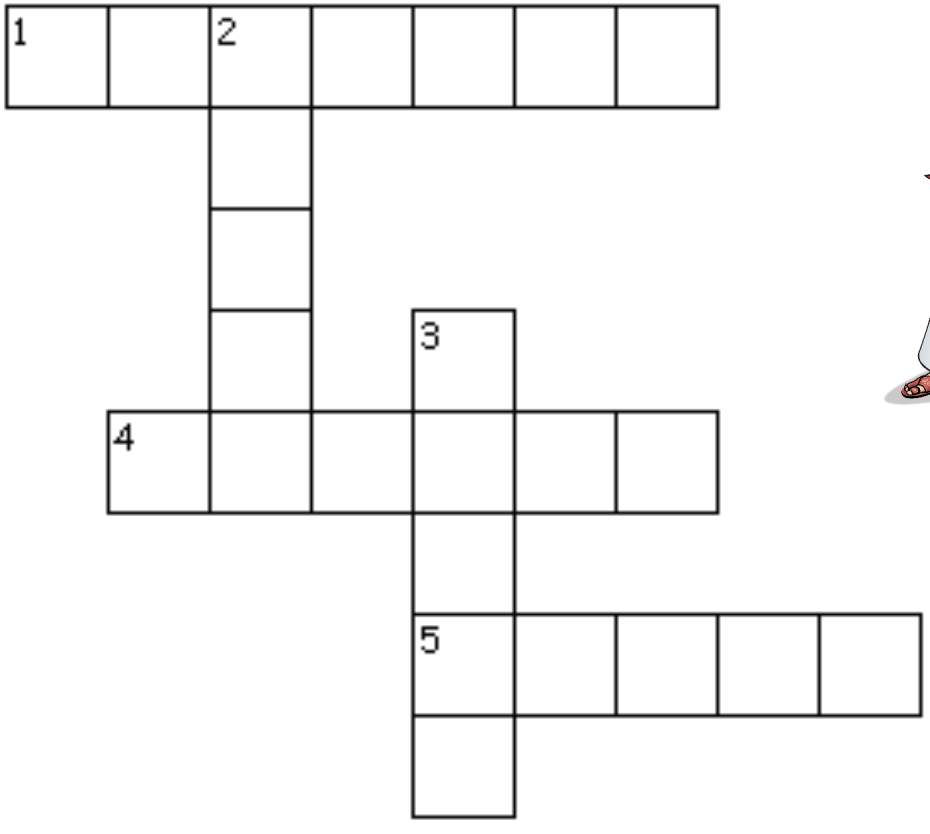
4) This is all the numbers that go into the function.

5) You can draw a ..... to show the relationships between numbers.

Down

2) Values are directly proportional when they increase or decrease and the ..... stays the same.

3) These are the results of the function; the numbers that come out.



TODAY'S MATHEMATICS KEYWORDS

Fill in all blanks in all columns: keywords, meaning, picture or example for today's keywords.

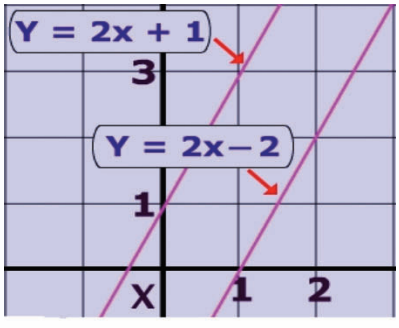
KEYWORD	MEANING	PICTURE or EXAMPLE

KEYWORD	MEANING	PICTURE or EXAMPLE

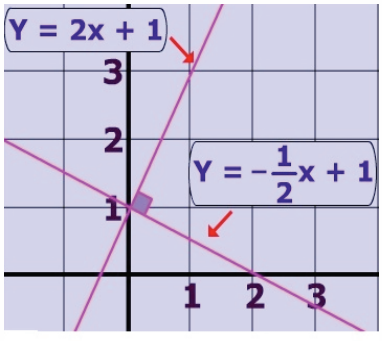
PARALLEL AND PERPENDICULAR LINES

KEYWORDS: parallel perpendicular graphically algebraically elimination

1 parallel lines



2 perpendicular lines



We can solve things graphically, that is with a graph,or algebraically, that's with letters and numbers.

Dr Hassan is giving a lesson on **parrallel and perpendicular lines**. Read and listen to the lesson, then do the activities that follow.

On graph 1, there are two **parallel lines**. They are the same distance apart all the time. They have the same gradient. On graph 2, there are **perpendicular lines**. Do you know what they are, Mohammed?

Yes, Sir. **Perpendicular** lines are lines at right angles to each other. That's 90°.

Yes! The angle where they meet or cross is 90°. Our book says, we can solve equations graphically or algebraically (al-ge-bra-ik-lee). Can you explain that please, Sir?

Certainly, Khalid. We solve equations **graphically** by drawing them. We put them on a graph. We solve equations **algebraically** when we use algebra. We write down numbers and letters. When we solve equations algebraically, we can **eliminate** variables (like x and y). That means we cancel them. We delete them. For example, if there is +2y and -2y, we can eliminate them. This is **elimination**.

Helpful Hint

The symbol || means parallel.

The symbol ⊥ means perpendicular.

PARALLEL AND PERPENDICULAR LINES

Task 1:

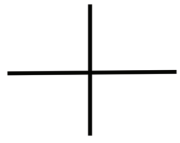
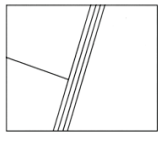
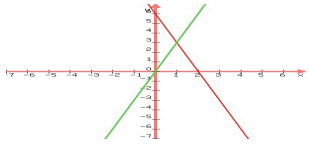
ONE of the following sentences is FALSE. Which one is it? Explain why.

1. Both parallel lines and perpendicular lines are straight . **TRUE** **FALSE**
2. Parallel lines have different gradients. **TRUE** **FALSE**
3. We use both letters and numbers in algebra. **TRUE** **FALSE**

Number ..... is FALSE because ..... .

Task 2:

Now, let's draw lines to label these.

1. This is solved graphically. a) 
2. These lines are parallel. b) 
3. These lines are perpendicular. c)
$$\begin{array}{r} x^2+2y^2=10 \\ \underline{6x^2-2y^2=18} \\ 7x^2=28 \\ x^2=4 \\ x=2 \end{array}$$
4. This is solved algebraically. d) 
5. These are parallel and perpendicular lines. e) 

Task 3:

Work in pairs: Choose the correct words to complete the sentences below.

1. Parallel lines ..... .
   a) make a 90° angle b) make a 60° angle c) never meet
2. Perpendicular lines ..... .
   a) make a 90° angle b) make a 60° angle c) never meet
3. We draw lines to solve things ..... .
   a) algebraically b) graphically c) mentally
4. We use letters and numbers to solve things ..... .
   a) algebraically b) graphically c) mentally
5. When we eliminate something, ...
   a) it goes away b) it gets bigger c) it gets smaller
6. We use elimination when we solve equations ..... .
   a) algebraically b) graphically c) mentally

Task 4:

Work in pairs. Ask and answer these questions about straight lines on graphs:

What are parallel lines? What are perpendicular lines?

Parallel lines are....
Perpendicular lines are....

What is elimination?

Elimination is when we...

What's the difference between solving equations graphically and solving them algebraically?

Graphically is ... and algebraically is ...

Task 5:

Use the words in the box below.

gradient eliminate ninety algebraically graphically

Across

4) We solve equations ..... by drawing them.

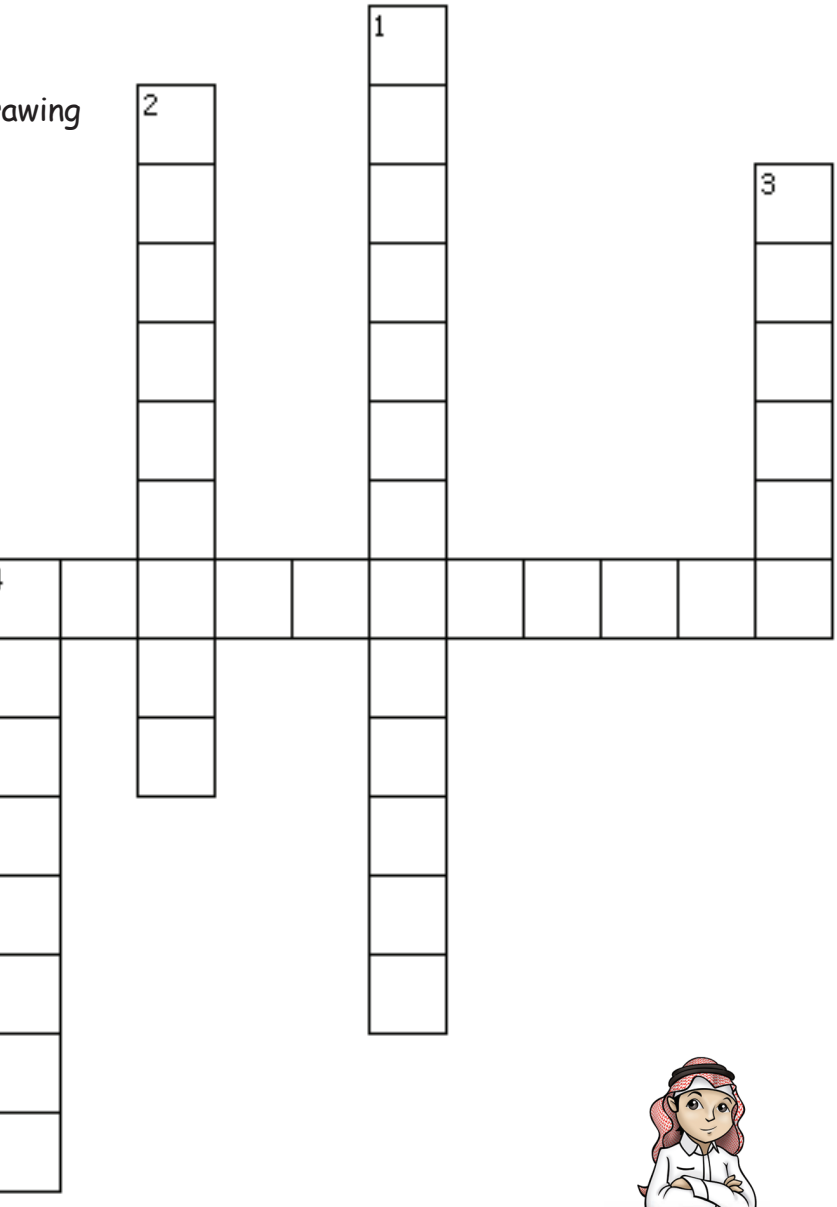
Down

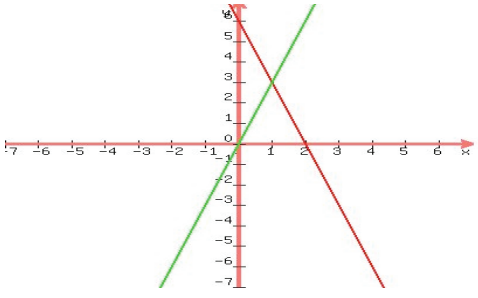
1) We solve equations ..... using numbers and letters.

2) When we ..... something, we cancel it. We delete it.

3) When perpendicular lines meet,they make a..... degree angle.

4) Parallel lines go up and down at the same angle. They have the same .....



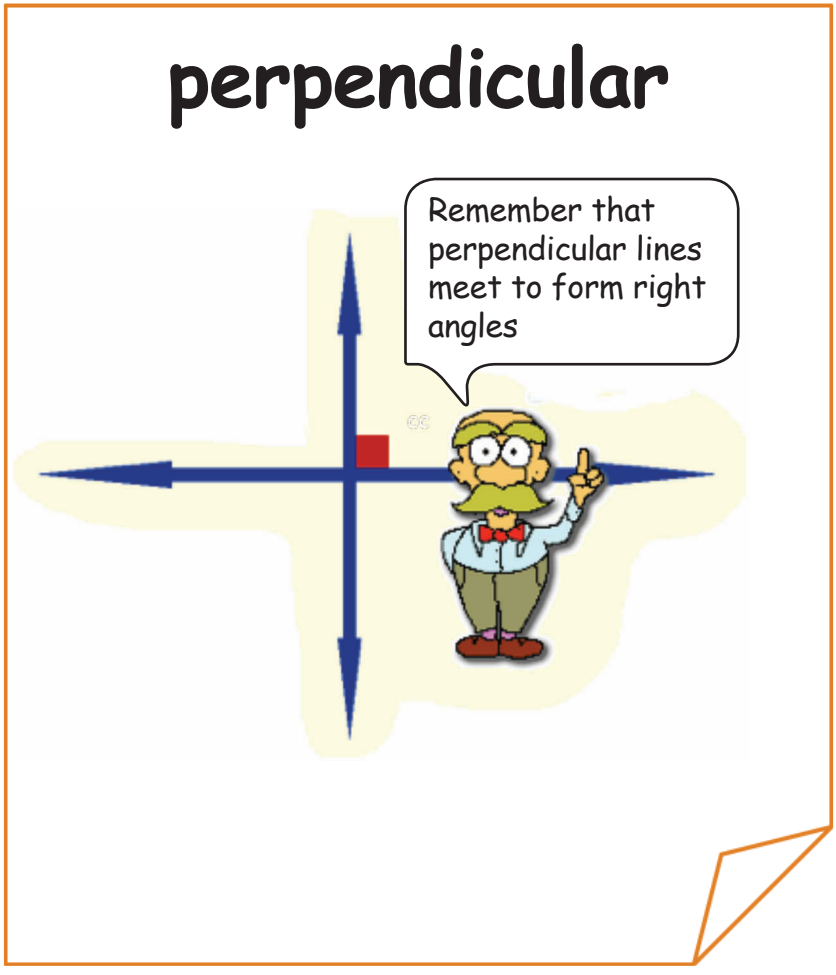


Task 6: ACTIVITY TIME!

Use any keyword to draw your own cartoon.

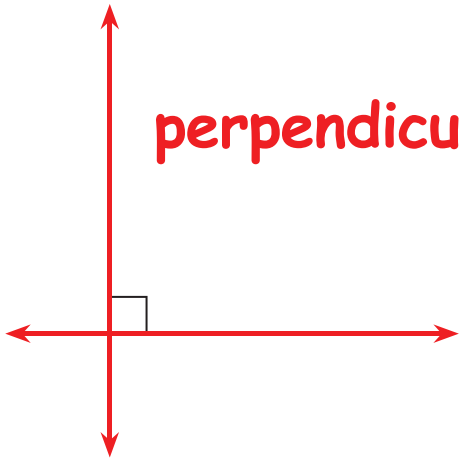
parallel perpendicular graphically algebraically elimination

Example:



parallel ||

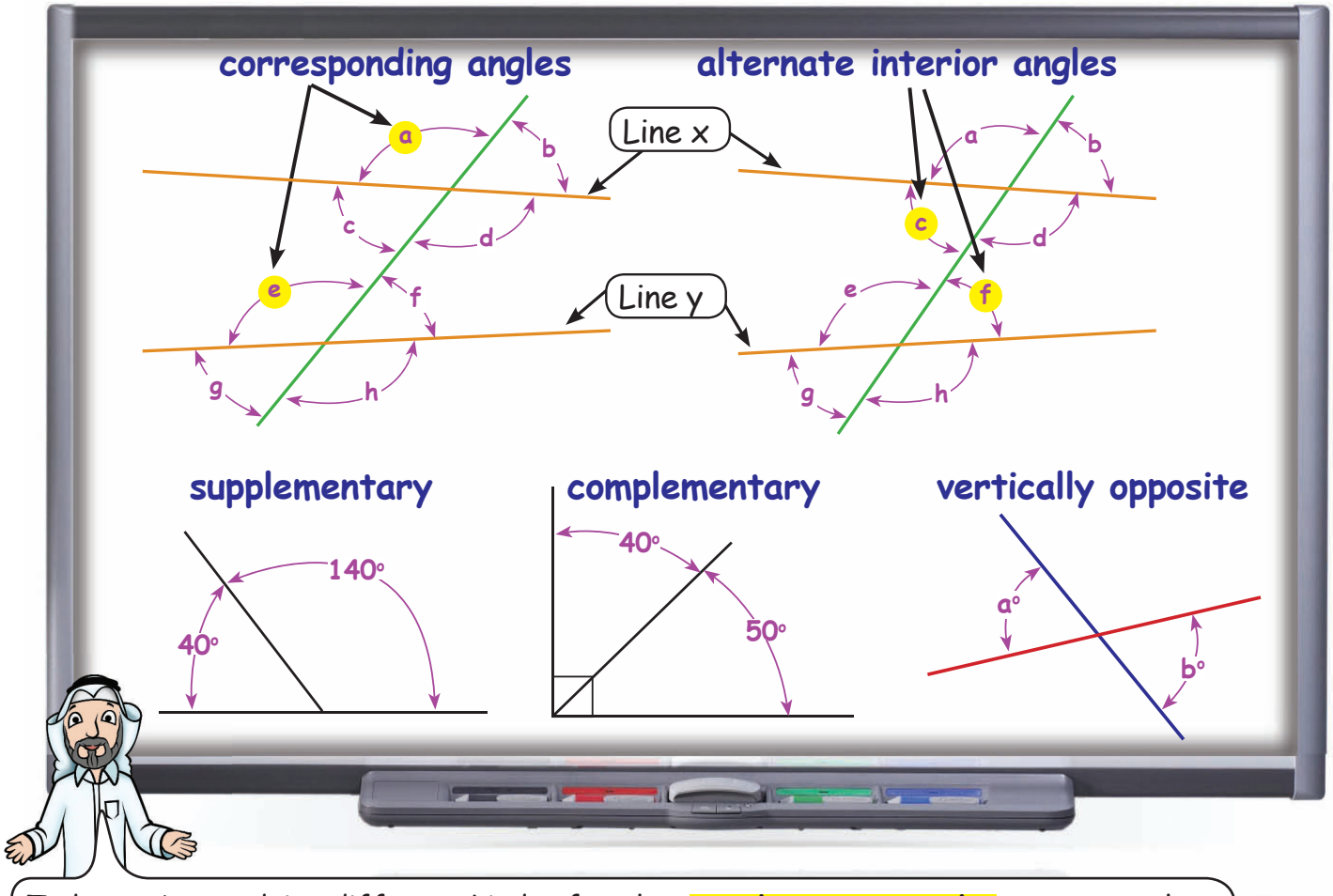
perpendicular ⊥



My keyword

RELATIONS BETWEEN ANGLES

KEYWORDS: angle, vertically opposite angles, supplementary angles, corresponding angles, alternate interior angles, complementary angles



Today, we're studying different kinds of angles. **Supplementary angles** are two angles that add up to 180°. **Complementary angles** are two angles that add up to 90°. Look at the board. Can you tell me about corresponding angles, please?

Yes, Sir. When a line crosses two other lines, like on the board, **corresponding angles** are angles in matching positions; the same place on the other line.

I know that **alternate interior angles** are the angles on opposite sides of the line that crosses, and inside two other lines, like angles C and F on the board. They are inside lines X and Y; that means they are **interior**. But they are on opposite sides of the line that crosses. That means they are **alternate**.

RELATIONS BETWEEN ANGLES

That's right, Khalid! **Vertically opposite angles** are angles opposite each other when two lines cross, like the ones on the board.

That's excellent Sir! Now we, have learned a lot about the different kinds of angles and many new words.

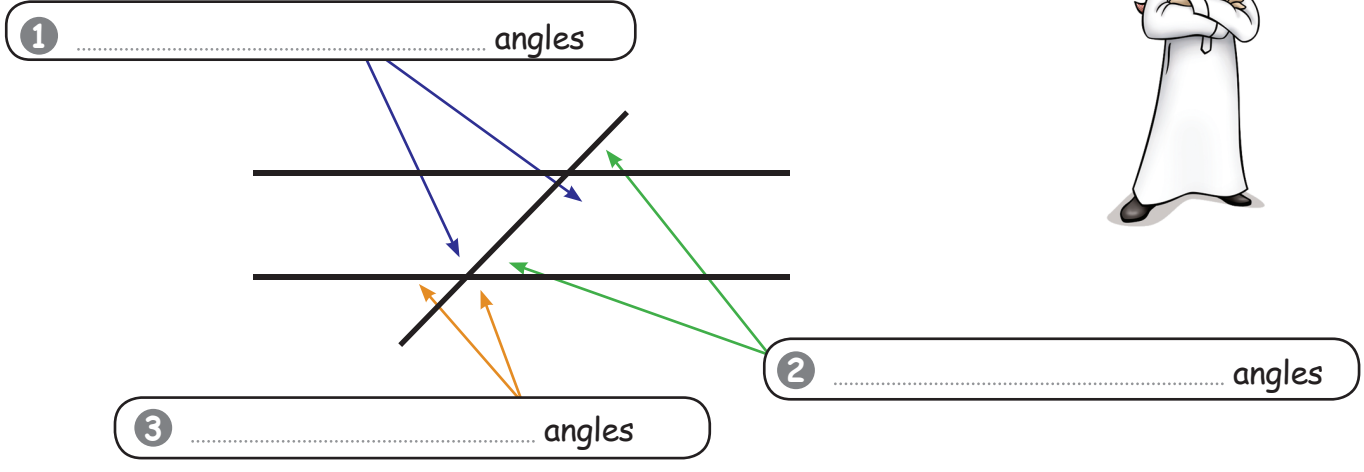
Task 1:

Draw lines to complete the sentences.

1 Supplementary angles	a) are in the same place on different lines.
2 Corresponding angles	b) add up to 180°.
3 Complementary angles	c) are opposite to each other when two lines cross.
4 Vertically opposite angles	d) are inside 2 lines, on opposite sides of the line that crosses.
5 Alternate interior angles	e) add up to 90°.

Task 2:

Work in pairs. Label these angles.



Task 3:

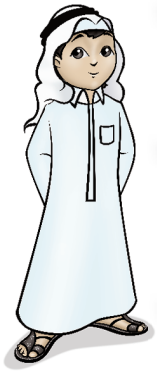
Work in pairs. ONE of these sentences is FALSE. Which one is it? Explain why.

1. When two lines cross, the angles opposite each other are vertically opposite angles.
2. When we add supplementary angles, they make 90°.
3. Alternate interior angles are on opposite sides of the line that crosses.

Number ..... is FALSE because ..... .

Task 4:

Work in pairs. Ask and answer questions about different kinds of angles.



What are supplementary angles?

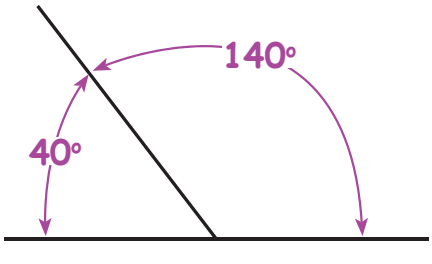
They are angles that...

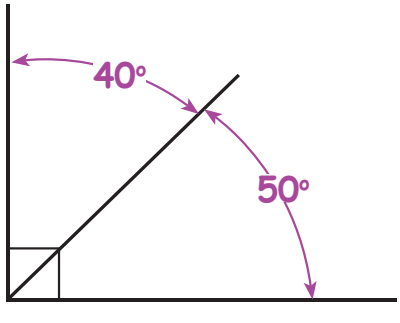
What are corresponding angles?

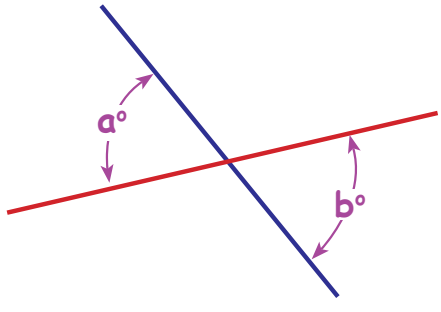
They are angles that...

What's the difference between complementary angles and supplementary angles?

Complementary angles ... but supplementary angles are ...







Task 5: **PUZZLE TIME!**

Now, work in teams. Complete the CROSSWORD below.

Across

4) Angles inside the two lines are ..... angles.

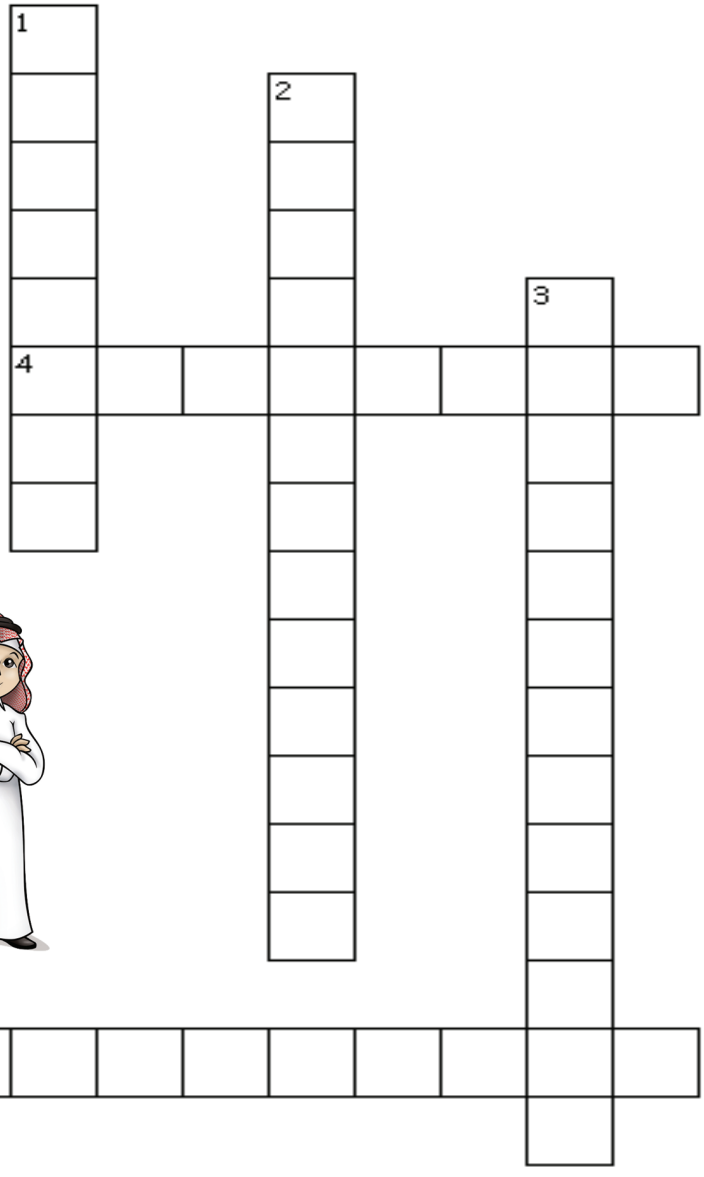
5) ..... angles make 180° .

Down

1) When two lines cross, the angles are vertically ..... to each other.

2) ..... angles are in the same place on different lines.

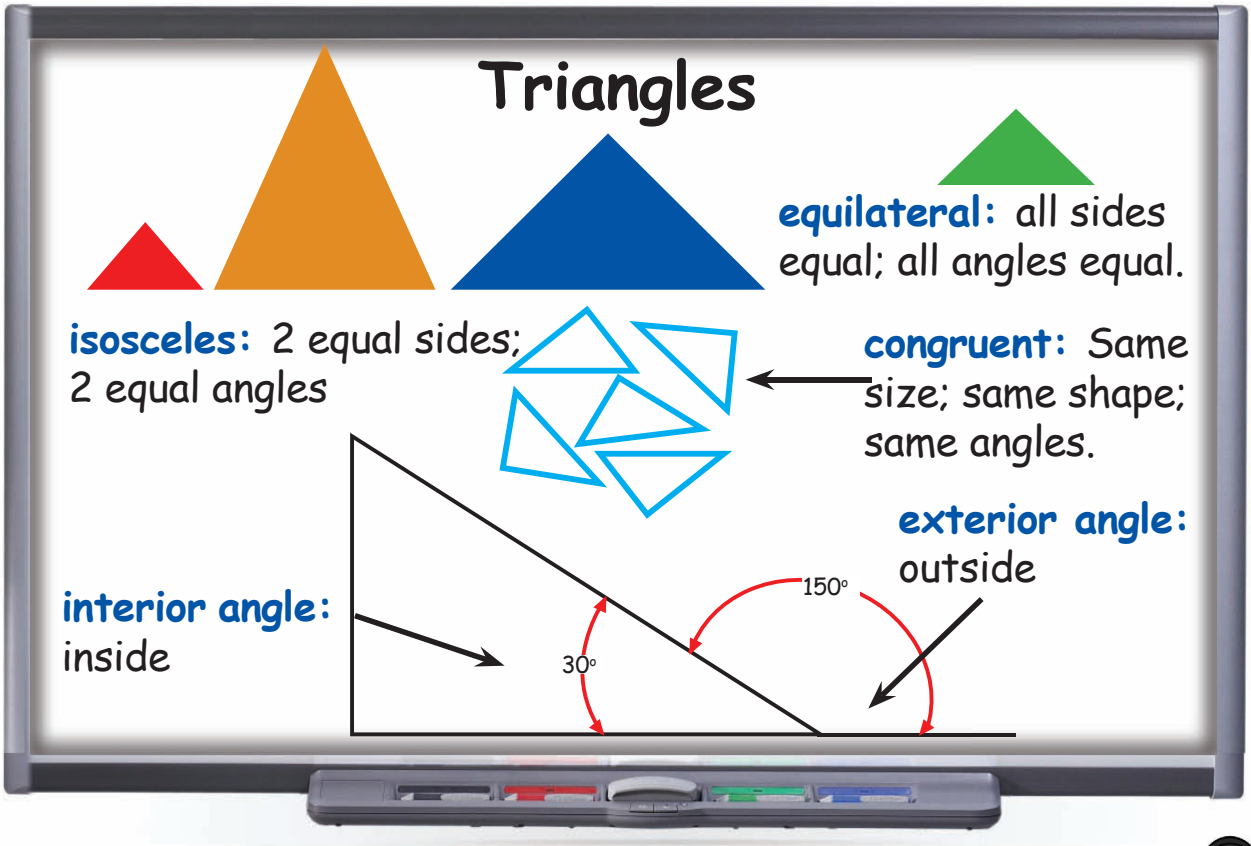
3) ..... angles make 90°.



LET'S REVIEW

KEYWORDS: interior angle, exterior angle, congruent, equilateral, isosceles

Today, Mariam, Reem and Moza are reviewing unit 5 from their math textbook. Read and listen, then do the activities.



Mrs Hessa! Our book says that **congruent** is 'the same'. So does that mean congruent shapes are exactly the same?

Yes, it does. The triangles on the board are congruent. We can also have congruent sides (of equal length) and congruent angles. Can you tell me about an isosceles triangle, Reem?

Yes, Mrs Hessa. An isosceles triangle has 2 equal sides and 2 equal angles. So, two isosceles triangles aren't always congruent!

That's right, Reem!
Well done! And you will see that an **equilateral** triangle has all sides and all angles equal. Does anybody know what the angles are?

Yes, Mrs Hessa! They must be 60°! Because all angles of a triangle add up to 180°!

Exactly! Now, look at the interior and exterior angles. **Interior** is inside and exterior is outside. You can see that the **interior angles** are the ones inside the triangle and the exterior angles are outside. How many degrees do the interior and **exterior angles** on the same line add up to, Moza?

Errrrr.... 30 and 150 is....180°, Mrs Hessa!

Excellent, Moza. That's the bell.
Your homework today is ..... .!

Task 1:

Choose the correct answer.

1. Two triangles that are exactly the same are .....
   a) interior b) exterior c) congruent d) isosceles

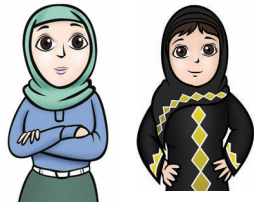
2. An angle on the outside of a triangle is a(n) ..... angle.
   a) interior b) exterior c) acute d) congruent

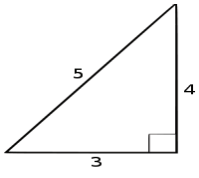
3. A triangle with the same sides and angles is a(n) ..... triangle.
   a) isosceles b) right c) equilateral d) interior

4. A triangle with two sides and angles the same is a(n) ..... triangle.
   a) isosceles b) right c) equilateral d) interior

Task 2: MATCHING

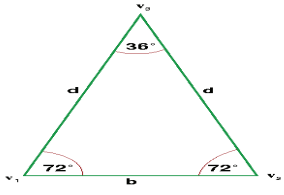
Help Moza and Reem match the triangles to their names and definition.



1 

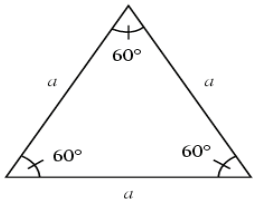
isosceles triangle

All the ..... and angles are the same.

2 

right triangle

One of the angles is ..... °.

3 

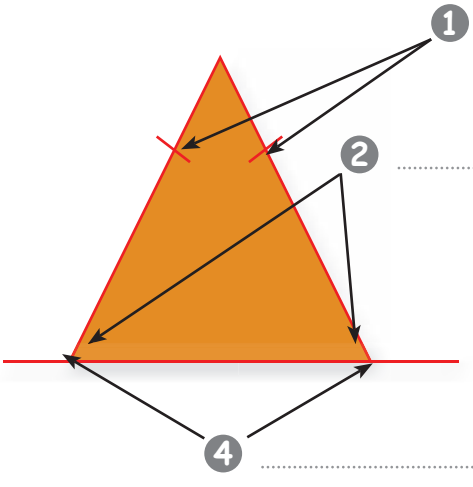
equilateral triangle

..... of the sides are the same. So are ..... of the angles.

Task 3: LABEL THE DIAGRAM

Help me label this diagram with the words in the box and answer the question:

congruent sides | congruent angles | interior angles | exterior angles | isosceles



1 .....

2 ..... and 3 .....

4 .....

5 This is a(n) ..... triangle.

Task 4: LET'S TALK!

Work in pairs. Ask and answer these questions about triangles.

What are congruent shapes?

I know! Shapes that are ....

They are .....

What's the difference between an equilateral triangle and an isosceles triangle?

An equilateral is... but an isosceles is....

Use the jumbled words to make a question.
Then answer the question.

W O H | M A Y N | S E L C E S O I S

N A L R E I G S T | A E R | N O

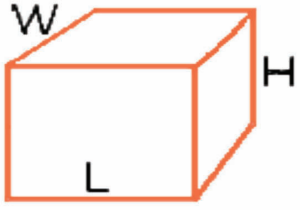
G A E P | 59?

Answer: .....

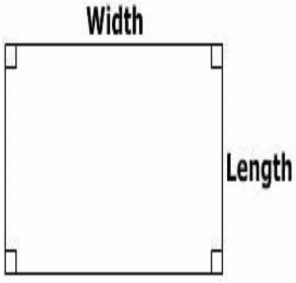
AREA AND VOLUME

KEYWORDS: cube volume area 1D 2D 3D length width height

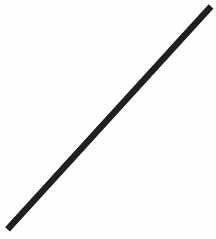
A cube is 3D.
Length, width, height.
A 3D object has volume.



A square is 2D.
Length, and width.
A 2D shape has area.



A line is 1D.
It only has length.



Today, we are studying **area** and **volume**. **Length**, **width** and **height** are dimensions. **Length** is the long distance from end to end and **width** is from side to side. **Height** is the distance from top to bottom. An object with **length**, **width** and **height** is **three-dimensional (3D)**. A **cube** is a **3D** object with all the **dimensions** the same and all its angles 90°. Can you tell me about **area** and **volume** please, Mariam?

Yes, Sir! **Volume** is the space inside a **3D** object. **Area** is the size of the surface of a **2D** object. But I'm not sure about **1D** things! Do you know, Moza?

Yes, I do! As you can see on the board, a line is **1D** and it only has **length**.

Task 1:

Work in pairs. ONE of these sentences is FALSE. Which one is it?

1. A cube has length, width and height and is a 3D object. **TRUE** **FALSE.**
2. 2D objects only have length and width. **TRUE** **FALSE.**
3. A square has volume. **TRUE** **FALSE.**

Number ..... is FALSE, because ..... .

Task 2:

Draw lines to match each word with its definition.

1 volume	**a)** The distance from top to bottom.
2 area	**b)** The distance from end to end.
3 width	**c)** The space in a 3D object.
4 length	**d)** The size of a surface.
5 height	**e)** The distance from side to side.

Task 3:

Choose the correct answer. Is it a, b, or c?

1. A line is ..... .
   a) 3D **b)** 2D **c)** 1D
2. A square is ..... .
   a) 1D **b)** 2D **c)** 3D
3. Height, length and width are all ..... .
   a) shapes **b)** dimensions **c)** areas
4. A flat surface is ..... .
   a) 1D **b)** 2D **c)** 3D

Task 4:

Use these jumbled words to make a sentence. Then, follow the directions.

D A R W A T O W S E L A N D O I M I N

P A E S H T I W H T E H R E S E S D I

L A L H E T A E S M H E L G T N .

1. What shape is this? .....

2. Does it have volume? .....

3. Why or why not? .....

Task 5:

Work in pairs. Ask and answer these questions.

What is a cube?

What's the difference between 2D shapes and 3D objects?

What's the difference between area and volume?

Easy! It's .....

2D shapes..... but 3D shapes....

Area is.....
but volume is...

Task 6: PUZZLE TIME!

Help Reem and Mariam complete the crossword.

Across

1) Volume is the ..... inside a 3D object.

2) This is a 3D object with all the sides the same length and all the angles 90° .

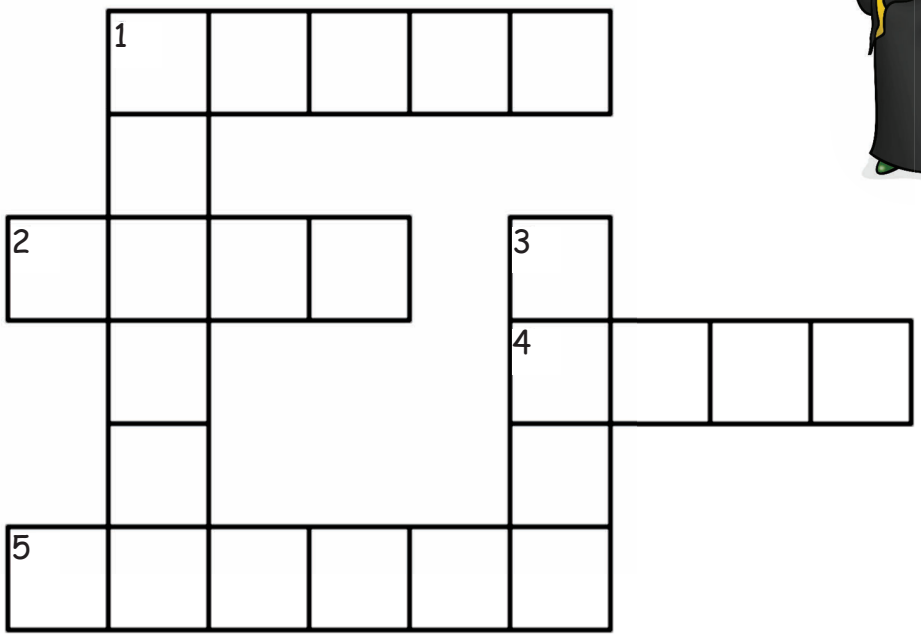
4) A 1D shape is a .....!

5) The dimension that goes from top to bottom is .....

Down

1) This is a 2D shape with all the sides and angles the same!

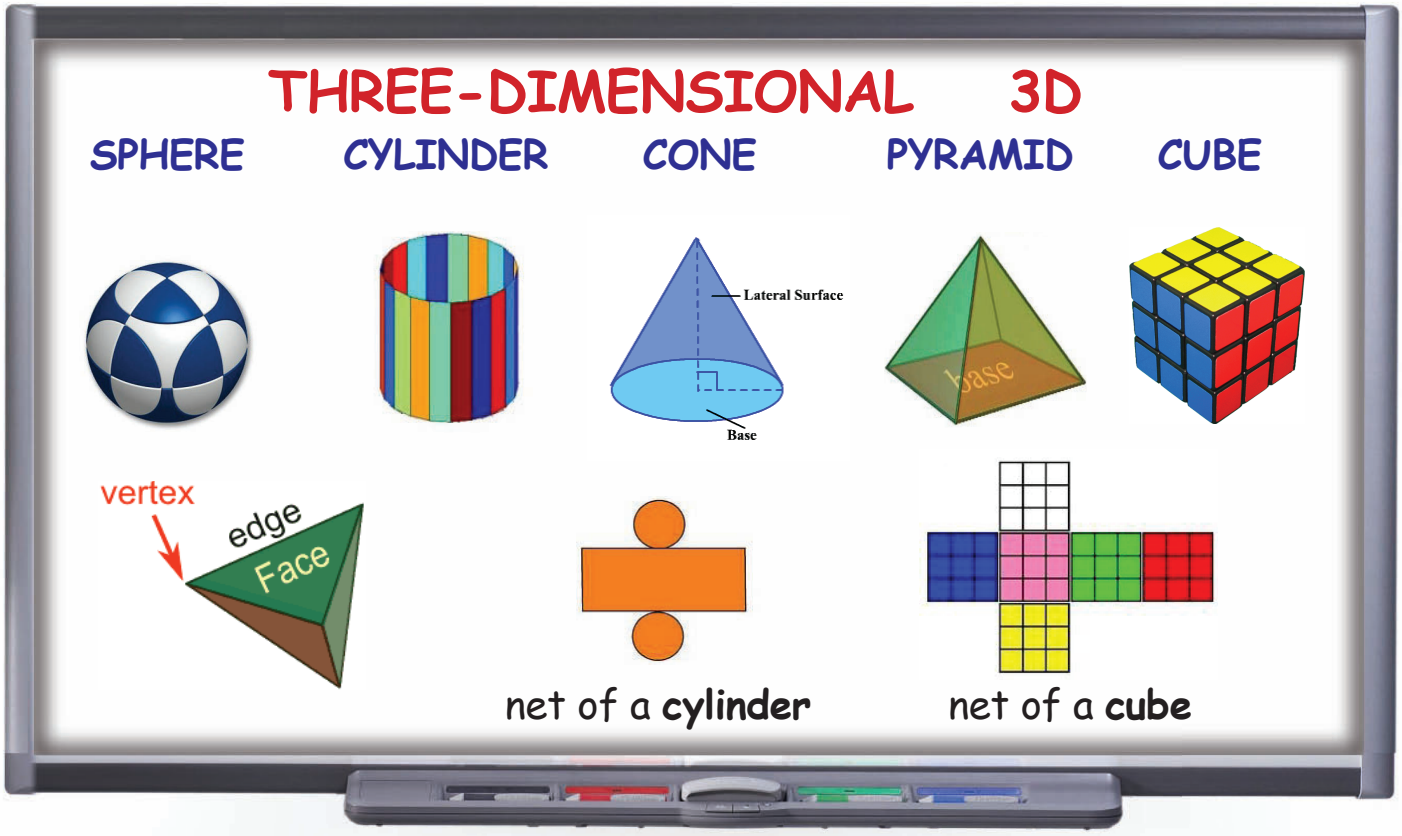
3) 2D shapes are ..... .



VOLUME AND SURFACE AREA

KEYWORDS: cube sphere cylinder cone pyramid face edge vertex net three-dimensional (3D)

Dr Hassan is teaching a lesson about **3D shapes**.
Read and listen to the lesson. Then do the activities.



Hello, Class. Today, we are learning about three-dimensional figures. We often call them 3D shapes. Mohammed, can you tell us what the three dimensions are?

Yes, Dr Hassan! We can measure the length, width and height of 3D shapes. We need to know three more words to describe these shapes. A **vertex** is a corner. An **edge** is where two surfaces meet, and a **face** is an individual surface.

That's correct, Mohammed. A **cube** has six congruent square faces, 8 vertices and 12 edges. The base of a square **pyramid** is a square, and the other 4 faces are triangles. The triangles meet at the vertex. A **cylinder** has two edges, two circular faces and one curved surface.

I love making things!

I can make a cylinder from a net, like the one on the board. A **net** is a pattern that you can cut and fold to make a model of a solid shape.

That is correct, Jassim. Can you describe a cone?

Yes, I can. A **cone** has a circular face that is the base, one curved surface and one vertex. But, how can we describe the sphere? It has no edges or vertices or flat faces.

I'm really good at kicking spheres!

I can describe it! A **sphere** has one curved surface. It is perfectly symmetrical, and all points on the surface are the same distance from the center.

Task 1:

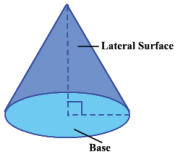
Draw lines to match the words with their correct meanings:

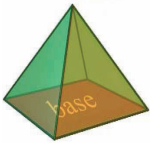
1 3D	a) A corner.
2 vertex	b) An individual surface.
3 edge	c) Three-dimensional.
4 face	d) A pattern you can cut and fold to make a model of a 3D shape.
5 net	e) Where two surfaces meet.

Task 2: PAIR WORK!

Label each shape using the words from the box below.

cylinder sphere cube pyramid cone





....

Task 3:

Fill in the blanks using words from the box.

net vertex faces 3D edges

1. A cube has 6 square ..... and 12 ..... .
2. You can use a ..... to make a model of a 3D shape.
3. The corner where 3 edges meet is a ..... .
4. If you can measure length, width and height the shape is ..... .

Task 4: LET'S TALK!

Work in pairs.

Ask and answer the questions about the words we have studied today.

What shape has no edges or vertices?

A ... has 6 square faces. What shape has triangles that meet at a vertex?

A ... has two flat circular faces and one curved surface.

A... has no edges or vertices. What shape has 6 square faces?

A ... has triangles that meet at a vertex. What shape has two flat circular faces and one curved surface?

Task 5: PUZZLE TIME!

Work in your groups.

Help Mohammed and Khalid complete the Double Puzzle about 3D Shapes.

We can solve this together!
First, let's unscramble each of the clue words.

Then, we'll copy all the letters in the numbered cells to other cells with the same number.

R Y E N I C L D

1 [ ][ ][ ][ ][ ][ ][ ][ ]
8 2

B U E C

2 [ ][ ][ ][ ]
4

R A P D I M Y

3 [ ][ ][ ][ ][ ][ ][ ]
9 6 5

N O E C

4 [ ][ ][ ][ ]
7

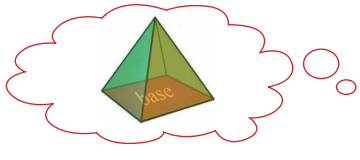
H E P S E R

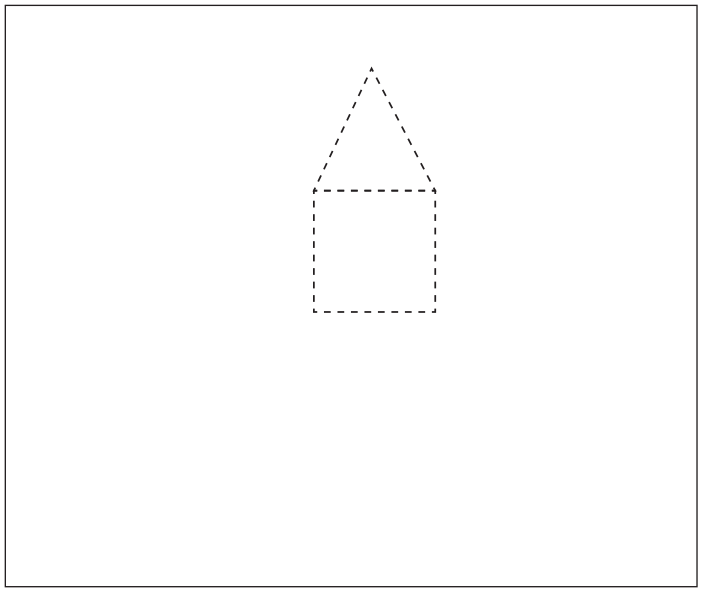
5 [ ][ ][ ][ ][ ][ ]
3 1 10

T																	
1	2	3	4	5	6	7		8		3	1	5	9	10	3		

Task 6: CHALLENGE!

Can you complete Mohammed's drawing of the NET of a square-based pyramid?

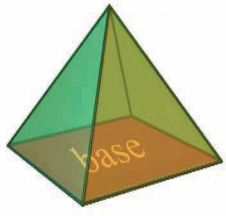




TODAY'S MATHEMATICS KEYWORDS

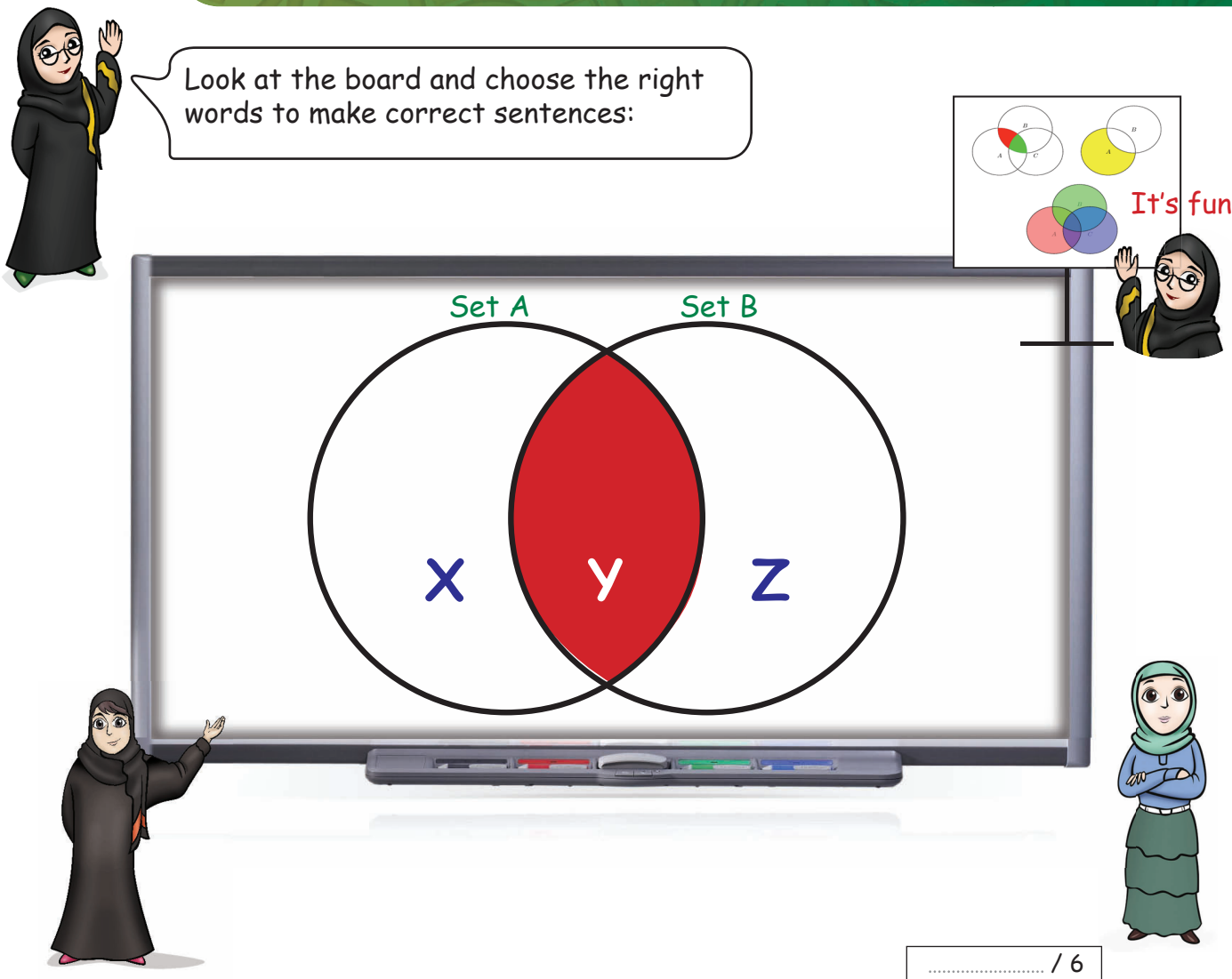
Look at the **keywords** on page 67. Write each word in the box below. Next to the word, write its meaning and in the last box draw a picture or provide an example.

The first one is done for you!

KEYWORD	MEANING	PICTURE or EXAMPLE
three-dimensional (3D)	A shape that can be measured with length, width and height.	

KEYWORD	MEANING	PICTURE or EXAMPLE

QUIZ



..... / 6
(2 marks each)

1. The drawing on the board is a(n) ..... .

   a) Venn diagram b) intersection c) union

2. y is the ..... of Set A and Set B.

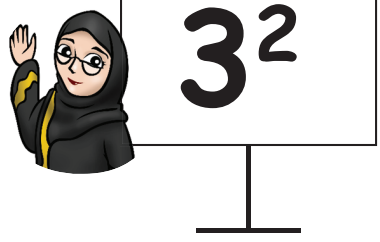
   a) Venn diagram b) intersection c) union

3. χ y z is the ..... of Set A and Set B.

   a) Venn diagram b) intersection c) union

QUIZ

Look at my whiteboard. Draw lines to make correct sentences:



1	The exponent	a)	is nine.
2	The answer	b)	is two.
3	The base number	c)	is three.

..... / 6
(2 marks each)

Choose the correct answer. Is it a, b, or c?

1 ..... numbers start at one. They can't be negative.

a) Natural b) Rational c) Irrational

2 ..... can be whole numbers, fractions or decimals, positive or negative.

a) Natural b) Rational c) Irrational

3 ..... is not an integer.

a) Zero b) -1 c) $\frac{1}{2}$

4 ..... numbers cannot be simple fractions. The decimal goes on forever.

a) Natural b) Rational c) Irrational

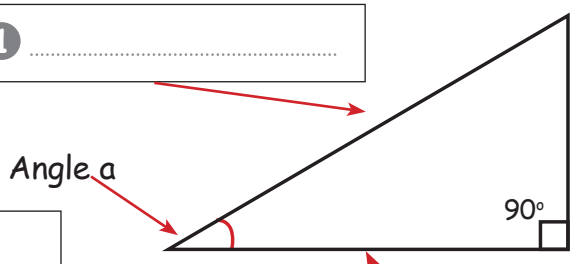
Use the words in the box to label the diagrams.

..... / 8
(2 marks each)

similar | opposite | line segment | congruent | adjacent | hypotenuse

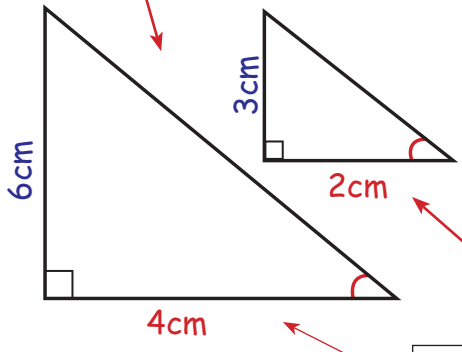
1 .....

2 .....

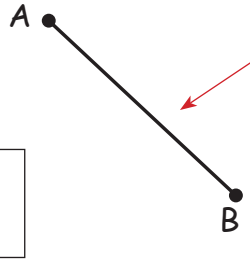


3 .....

4 These triangles are .....



5 This is a .....
It joins two points.



6 These sides are not .....

..... / 6
(1 marks each)

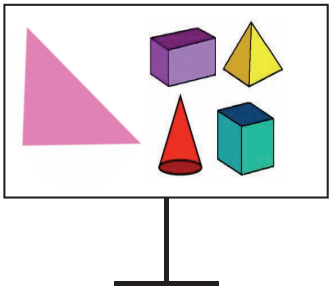
Choose the correct answer. Is it a, b, or c?

1 ..... is the distance from top to bottom.

a) Length b) Width c) Height

2 A square is a ..... shape.

a) 1D b) 2D c) 3D



3 Height, length and width are all ..... .

a) volumes b) shapes c) dimensions

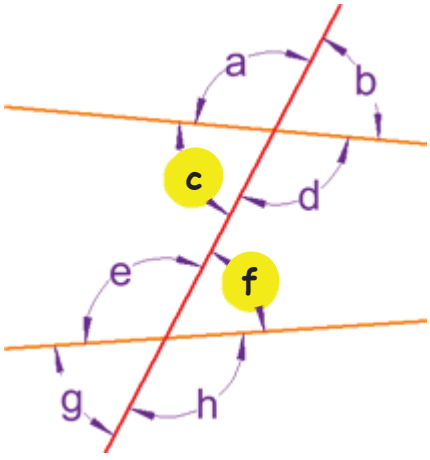
4 A line is .....

a) 1D b) 2D c) 3D

..... / 8
(2 marks each)

QUIZ

Do the crossword about these angles.



Across

3) p and q are ..... angles.

4) Angles p and q add up to ..... degrees.

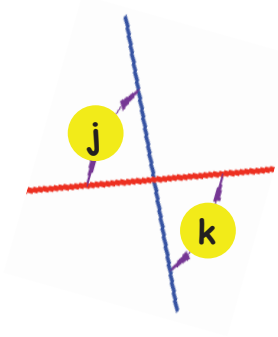
5) c and f are alternate ..... angles.

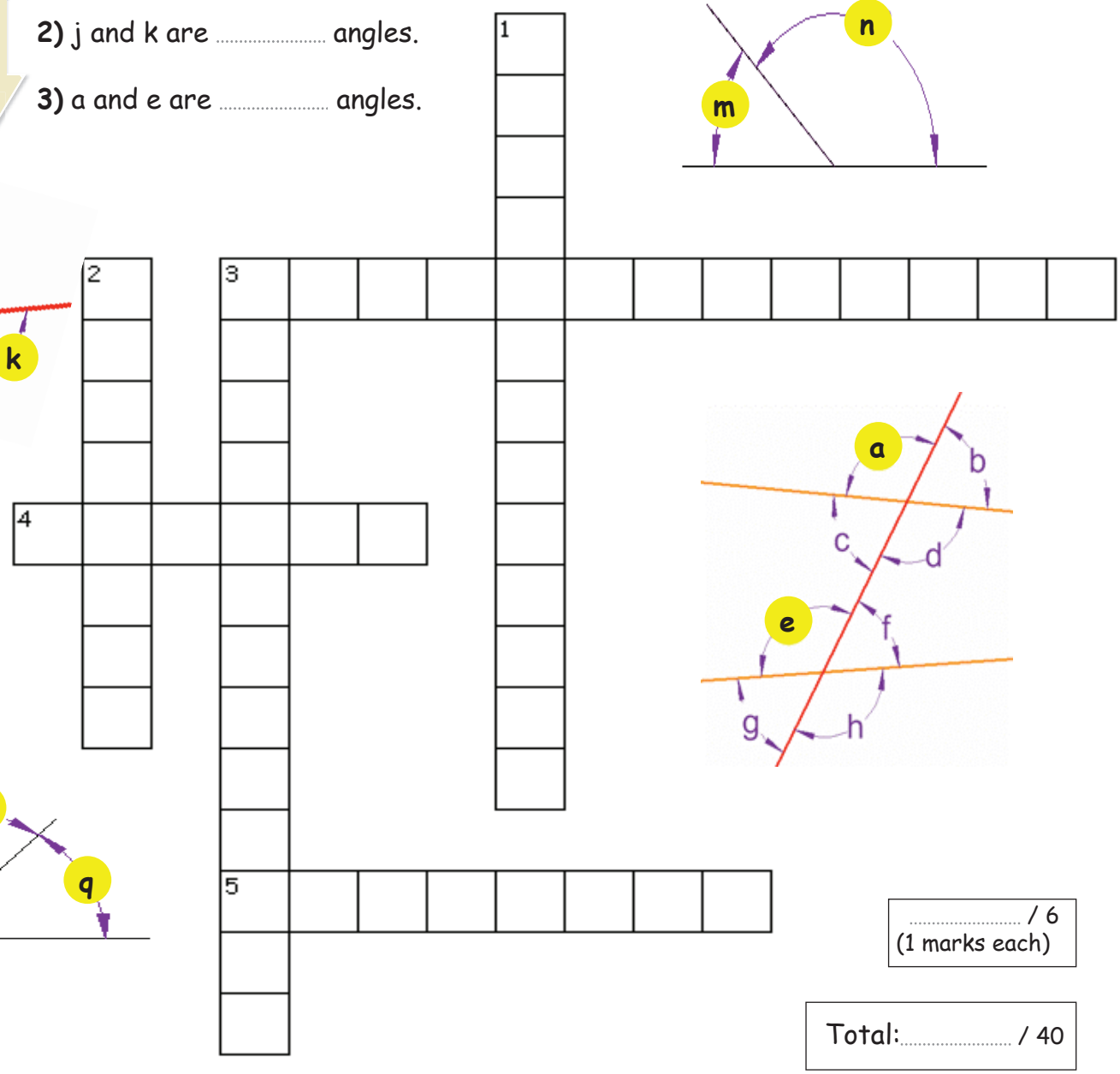
Down

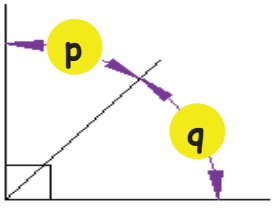
1) m and n are ..... angles.

2) j and k are ..... angles.

3) a and e are ..... angles.







..... / 6
(1 marks each)

Total:..... / 40

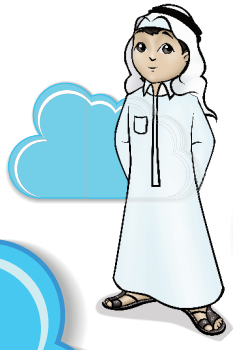
extended ratio

4:3:2

When you compare more than two quantities in a ratio

cube

division

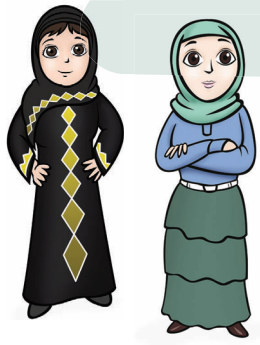


angle

The amount of turn between two straight lines that have a common end point (the vertex).

volume

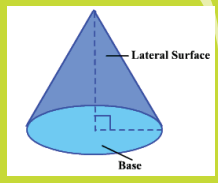
The space inside a 3D object.



null

exponent

cone



A three-dimensional figure with a curved surface and a circular base.

GLOSSARY

A

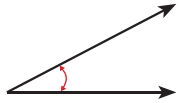
addition $7b + 2b = 9b$
(pg. 35)
Joining of addends and like terms.

algebra/ algebraically $5x + 3 = y$
(pg. 49)
Equations or expressions using numbers, letters and operation signs.

alternate interior angles
(pg 55)

Angles on opposite sides of a transversal and inside two parallel lines.

angle
(pg. 55)



The amount of turn between two straight lines that have a common end point (the vertex).

area
(pg. 63)

The measure in square units, of the inside of a 2D figure.

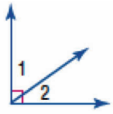
B

base
(pg. 21)
The number used as a factor.
In 4^3 , **4** is the base

brackets ( )
(pg. 35)
Symbols used in pairs to group things together.

C

complementary angles
(pg. 55)

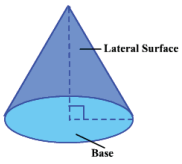


∠1 and ∠2 are complementary angles.

Two angles that add to 90^0 .

compound interest
(pg. 27)
A special interest rate with exponential growth.

cone
(pg. 67)



A three-dimensional figure with a curved surface and a circular base.

congruent
(pg. 59)

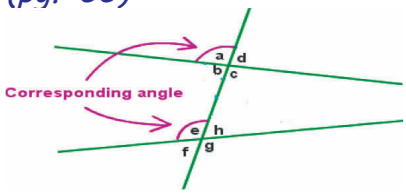
Same size, same shape, same angle.

conjugate
2x + 4 ⟶ 2x - 4

(pg. 21)

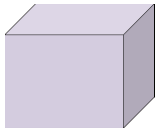
The process of changing the sign in the middle of two terms.

corresponding angles
(pg. 55)



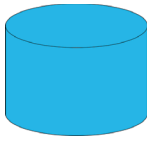
Angles in the same position on another line.

cube
(pg 63)



A three-dimensional shape with 6 equal square faces.

cylinder
(pg. 67)



A three-dimensional shape with two flat circular faces and one curved surface.

D

difference of two squares.
(pg 39)

$a^2 - b^2 = (a + b)(a - b)$

The difference of two squares is equal to the sum multiplied by the difference.

directly proportional.
(pg. 43)

This is when two variables x and y increase or decrease together in the same ratio.

division
(pg. 35)

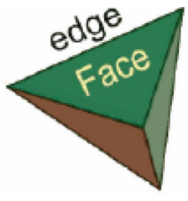
To split into equal parts.

domain
(pg. 43)

The set of x-coordinates in a relationship.

E

edge
(pg.67)



The line where two surfaces meet.

element ∈

(pg. 10)

The members of a set are its elements. They are listed in brackets.

Set A = { 0, 2, 4, 6,...}

eliminate/elimination

(pg. 49)

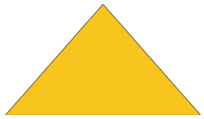
Cancel or delete.

empty set Ø or { }

(pg.10)

A set with no elements.

equilateral triangle



(pg. 59)

A triangle with 3 equal angles (60^0) and 3 equal sides.

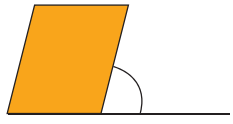
exponent $4^3 = 4 \times 4 \times 4$

(pg. 21)

Tells us how many times to use the base as a factor.

In 4^3, the exponent is 3.

exterior angle



(pg. 59)

The angle outside of a shape.

F

face

(pg.67)

A flat surface of a three-dimensional shape.

factorizing

(pg. 37)

Finding the factor to multiply to get an expression.

formula

(pg. 43)

A formula is a math rule to solve problems. For example the formula for the area of a triangle is $\frac{1}{2}$ base x height.

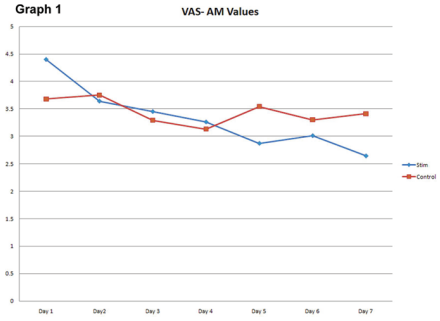
function

(pg. 43)

Is like a machine, it relates the input to the output in a specific way.

G

graph
(pg. 43)



To draw or plot points as ordered pairs. (x,y) on a coordinate plane or grid.

graphically
(pg. 46)

To plot all the points on a graph that satisfy an equation.

H

height

(pg. 63)

The vertical distance from top to bottom of a three-dimensional object.

highest common factor
(pg. 39)

12 = 1,2,3,4,6,12

18 = 1,2,3,6,9,18.

HCF = 6

The largest number that divides exactly into two or more numbers.

I

index $3^2 = 3 \times 3$
(pg. 21)

Tells us how many times to use the base as a factor.
Same as exponent or power.

integer ……-2, -1, 0 1, 2……
(pg. 14)

The set of whole numbers that are negative as well as positive, including zero(0).

interior angle

(pg. 59)

The angle inside a shape.

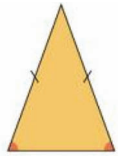
intersection ∩
(pg. 10)

The elements that are found in more than one set.

irrational number
(pg. 14)

Numbers that cannot be expressed as terminating or repeating decimals. The number goes on forever.

isosceles triangle
(pg. 59)



A triangle with 2 sides of the same length.

M

multiplication
(pg. 35)

4 x 3 = 4 + 4 + 4 = 12

A number operation adding the same number many times.
Repeated addition.

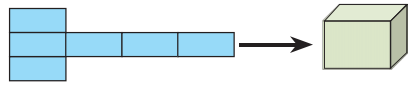
N

natural numbers N
(pg. 14)

N = 1, 2, 3.....

A counting number.

net
(pg. 67)



A pattern that you can fold to make a model of a solid shape.

null Ø or { }
(pg. 10)

A set with no elements.

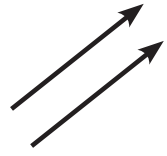
O

order of operations
(pg. 35)

The rules to follow when more than one operation is used in a numerical expression.

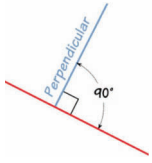
P

parallel
(pg. 49)



Lines in the same plane that do not intersect.
They always remain the same distance apart.

percentage
(pg.24)
Out of 100 parts.

perpendicular


(pg.49)
Lines that intersect to form right angles.

polynomial $5x^2 - 3x + 5y^3 - 3$
(pg. 36)
An expression with one or more terms.

power $6^2 = 6 \times 6$
(pg. 21)
Tells us how many times to use the base as a factor.

proportion
(pg. 27)
An equation that shows that two ratios are equivalent.

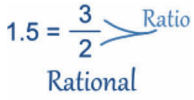
pyramid


(pg. 67)
A three-dimensional object where the base is a polygon and the sides are triangles that meet at the top.

R

range
(pg. 43)
The difference between the greatest and least numbers in a data set.

ratio 3:1
(pg. 27)
Shows the relative sizes of two or more values.

rational number Q


(pg. 14)
Any number that can be made by dividing one integer by another.

real number R
(pg. 14)
All rational or irrational numbers.

S

set { , }
(pg. 10)
A group of things collected together. The members or elements are listed in brackets.

scientific notation
(pg. 21)

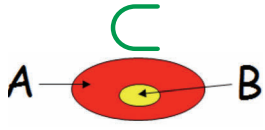
$4.87 \times 10^6 = 4{,}870{,}000$

A way of writing very large or very small numbers.

sphere
(pg. 67)

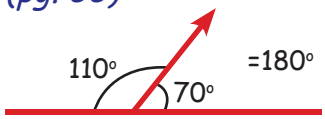
A three - dimensional shape with no edges or vertices (corners). All points on the surface are the same distance from the center.

subset
(pg. 10)



A set contained in another set.

supplementary angles
(pg. 55)



Two angles that add up to 180°

surd $\sqrt{3}$
(pg. 21)

An irrational number with no exact value.

U

union $\cup$
(pg. 10)

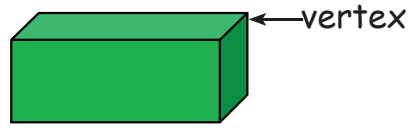
Elements that are in both sets.

Set A = { 1,2,3,4,5}
Set B = { 1 ,3,5,}

The Union of Set A and B is { 1,3,5}
This is written as A ∪ B.

V

vertex
(pg. 67)



The corner of a 3D shape.

vertically opposite angles
(pg. 55)

Angles opposite each other where two lines intersect.

volume
(pg. 63)

The space inside a 3D object.

W

width

(pg. 63)

The distance from side to side of a 2D or 3D shape.

SCIENTIFIC ENGLISH

SCIENCE

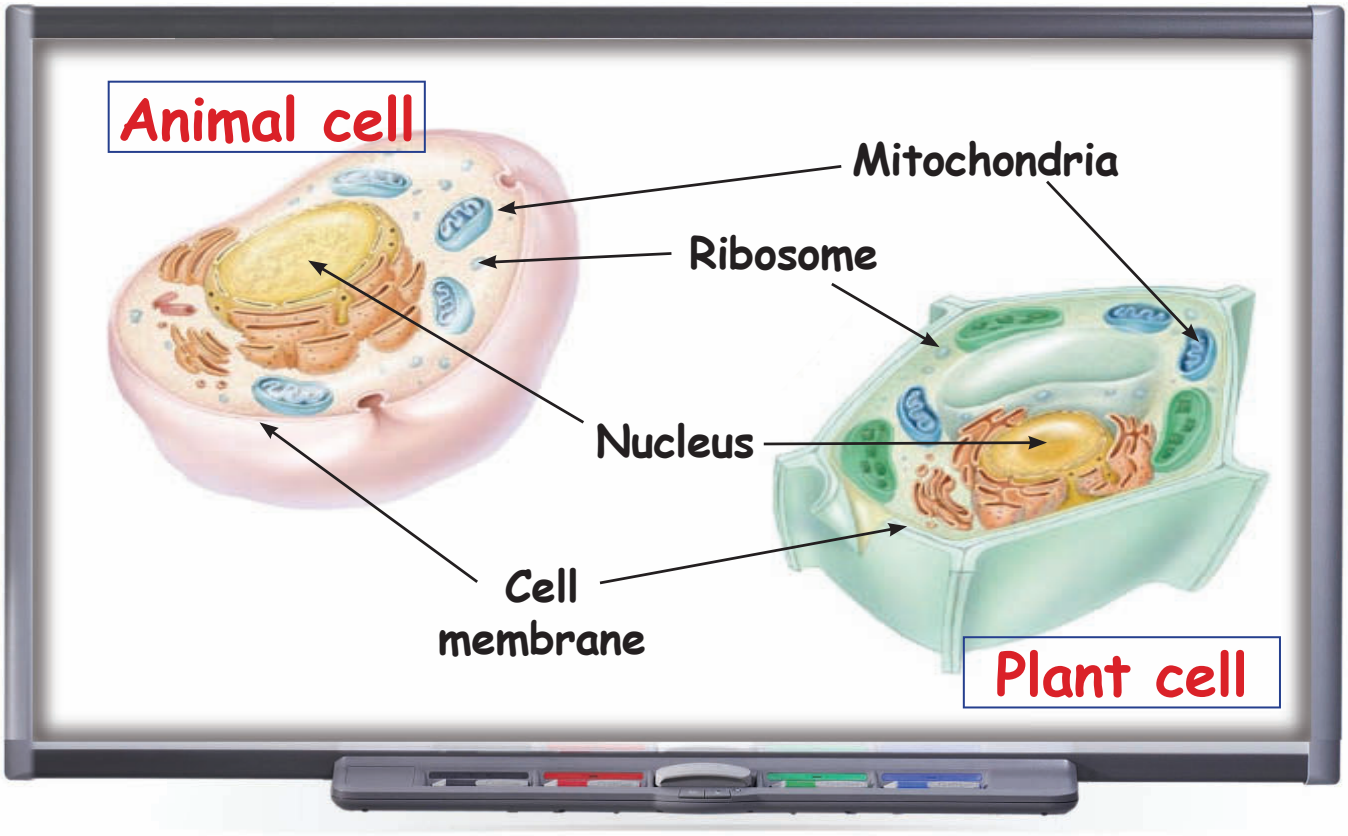
BIOLOGY

GRADE 10

ANIMAL AND PLANT CELLS & THE TWO TYPES OF CELLS

KEYWORDS: organelle nucleus mitochondria cell membrane ribosome

Dr. Hassan is teaching Khalid about **animal and plant cells**.
Read and listen to the lesson, then do the activities that follow.



Yes, Khalid. **Organelle** means "little organ". They are the parts of a cell and each has a specific job. For example **nucleus** is the control centre. It controls what all the organelles do. Do you know anything about the cell membrane?

Please Sir, can you tell me what an organelle is? What does the nucleus of the cell do?

I know the **cell membrane** is a very thin wall that controls the movement of substances into and out of the cell.

But what are ri-bo-somes (ribosomes) and mit-o-chon-dri-a (mitochondria), Sir?

Dr. Hassan: The **mitochondria** make the energy in the cell. That is where aerobic respiration happens. **Ribosomes** make proteins. Every cell has ribosomes. The nucleus, mitochondria, cell membrane and ribosomes are all organelles.

Khalid: Are these organelles in plant cells or animal cells?

Dr. Hassan: Nucleus, mitochondria, cell membranes and ribosomes are in both plant cells and animal cells.

Khalid: Thank you very much, Sir. This is really helpful!

Task 1:

Match the following words with their meanings. Draw lines to connect them.

1	The nucleus	a)	controls what goes in and out of a cell.
2	Ribosomes	b)	make energy.
3	An organelle	c)	make proteins.
4	Mitochondria	d)	controls what happens in a cell.
5	The cell membrane	e)	is a part of a cell that does a specific job.

Task 2:

ONE of these sentences is FALSE. Which one is it? Explain why.

1	Ribosomes and mitochondria are both organelles.	**TRUE**	**FALSE**
2	Ribosomes make energy.	**TRUE**	**FALSE**
3	Both plant cells and animal cells have a cell membrane.	**TRUE**	**FALSE**

Number ..... is FALSE, because .....

Task 3:

Choose the correct words to complete the following sentences. Is it a, b or c?

1. ..... respire(s).
   a) Ribosomes b) Mitochondria c) The nucleus
2. Cells have ..... ribosome(s).
   a) one b) two c) many
3. You can find a cell membrane in a/an ..... cell.
   a) animal b) plant c) nucleus
4. There are ..... in a plant cell.
   a) ribosomes b) mitochondria c) Both a and b

Task 4:

Work in pairs. Ask and answer the following questions about animal and plant cells:

What are organelles? Name two.

Organelles are ...

What does the nucleus do?

The nucleus ...

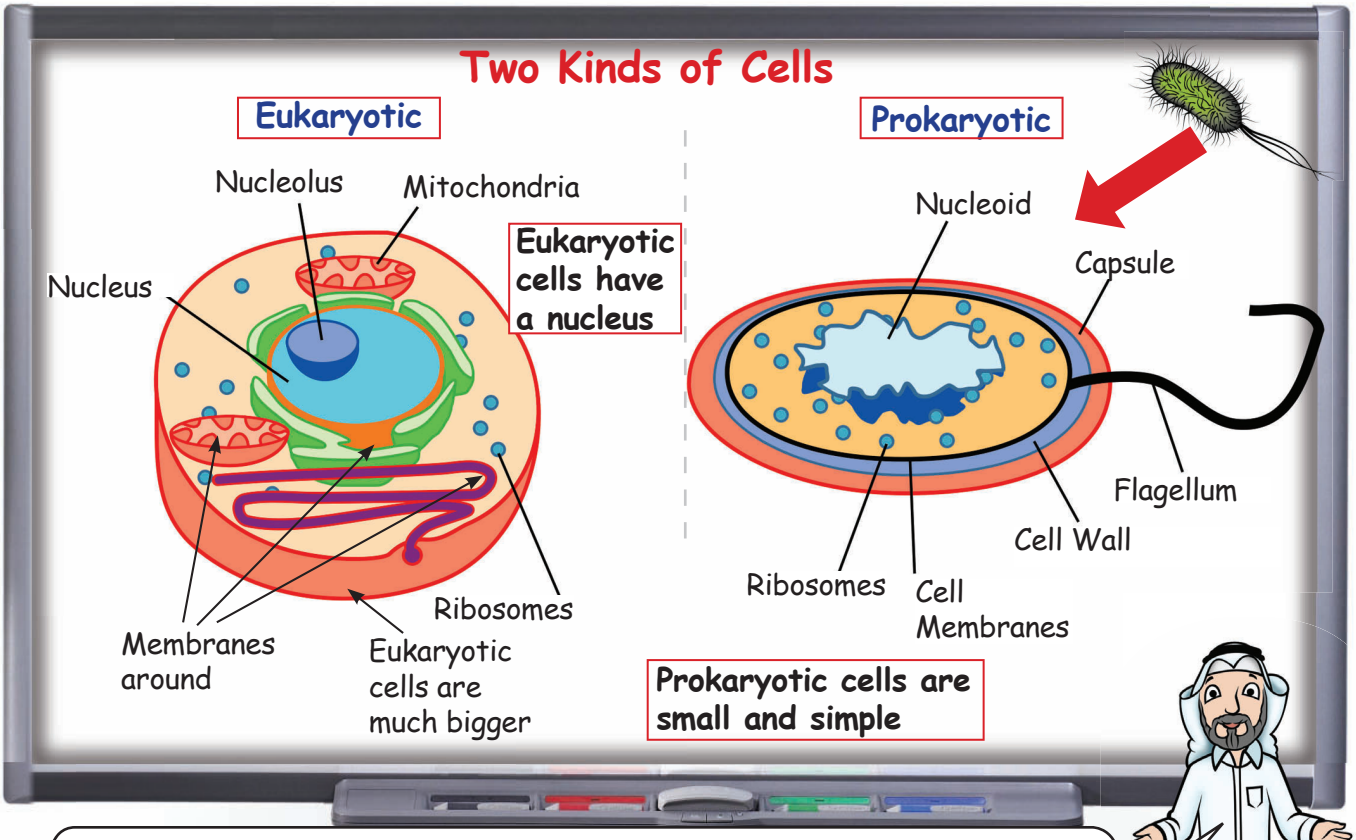
What's the difference between ribosomes and mitochondria?

Ribosomes ... , and mitochondria ...

TWO KINDS OF CELLS

KEYWORDS: **prokaryotic cell** **eukaryotic cell** **membrane** **electron microscope** **ultracentrifuge**

Today, Dr. Hassan is teaching Khalid and Mohammed about **two kinds of cells**. Read and listen to the lesson, then do the activities that follow.



Today, our lesson is about cells. You can see on the board that there are two kinds of cells. They have some important differences. Can you tell me about some of the differences please, Mohammed?

Yes, Sir! **A Prokaryotic** cell (pro-kar-ee-ot-ic) has no nucleus. It is small and simple.

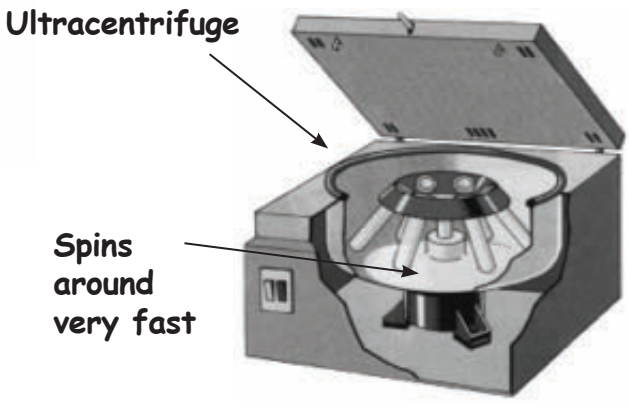
A Eukaryotic cell (you-kar-ee-ot-ic) has a nucleus and many different parts with membranes around them.

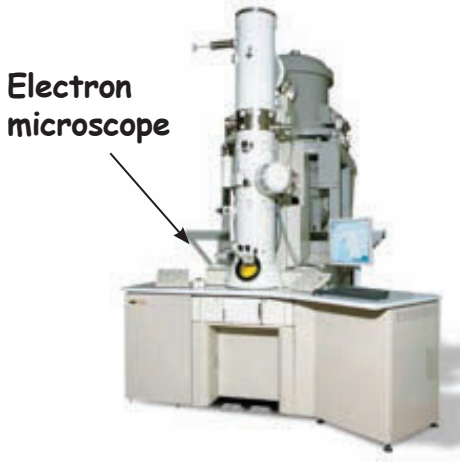
A membrane is a thin boundary around something or between things.

Eukaryotic cells are much bigger. Most living things, such as animals and plants, have eukaryotic cells.

Only bacteria have prokaryotic cells.

Dr. Hassan: That's right! Well done! These cells are very tiny, so we need a special microscope to see them. **An electron microscope** is a microscope with a special kind of light from electrons that helps us see cells more clearly. Another very useful machine is a centrifuge. **An ultracentrifuge** spins things around very fast, so they separate into their parts.





Task 1:

Match the two columns. Draw lines.

1	A eukaryotic cell	a)	has no nucleus.
2	A membrane	b)	has a nucleus.
3	A prokaryotic cell	c)	spins substances to separate them.
4	An ultracentrifuge	d)	lets us see cells more clearly.
5	An electron microscope	e)	is a thin wall.

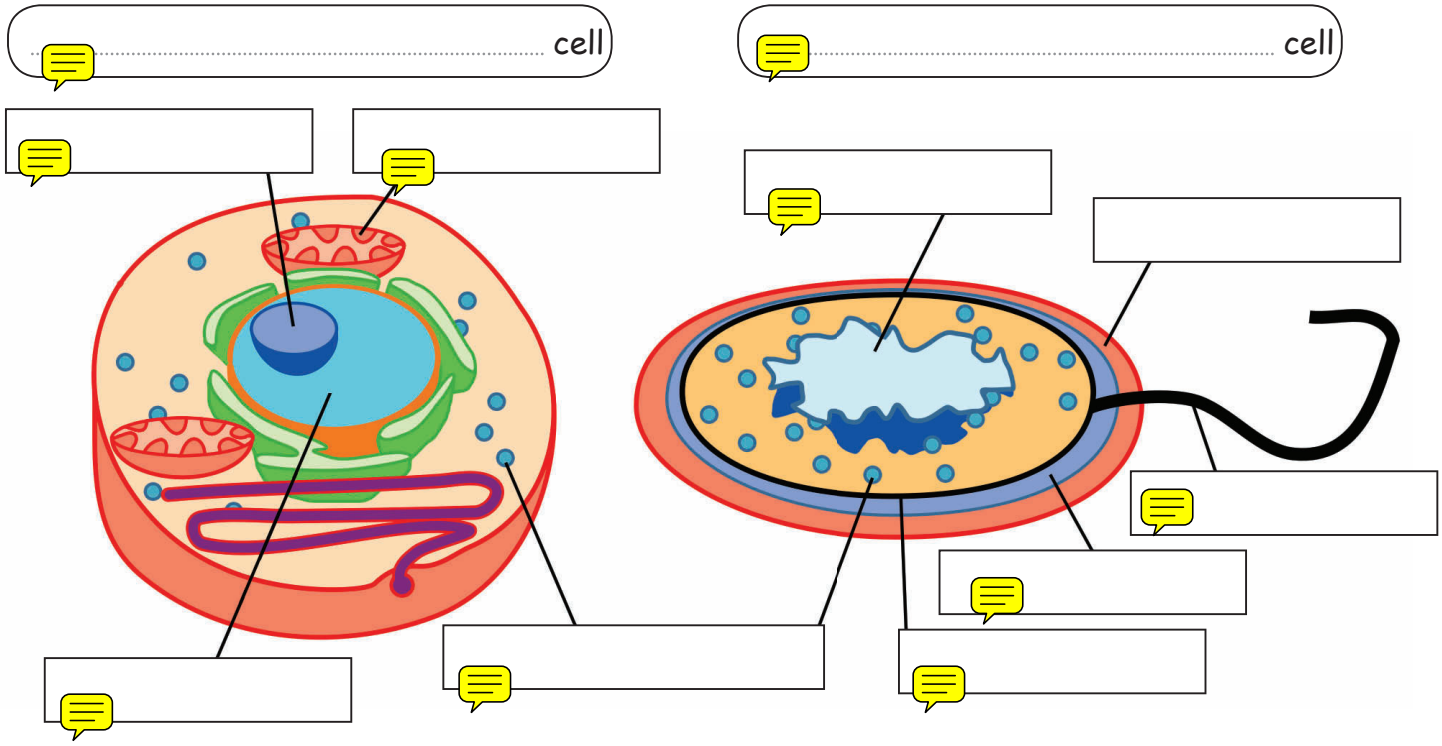
Task 2:

Choose the correct words to complete the sentences. Is it a, b, or c?

1. We can find prokaryotic cells in ..... .
   a) animals b) plants c) bacteria
2. Eukaryotic cells are ..... prokaryotic cells.
   a) bigger than b) as big as c) smaller than
3. ..... cells are simple.
   a) Eukaryotic b) Prokaryotic c) Both a and b
4. An electron microscope ..... .
   a) moves substances b) has a special light c) Both a and b

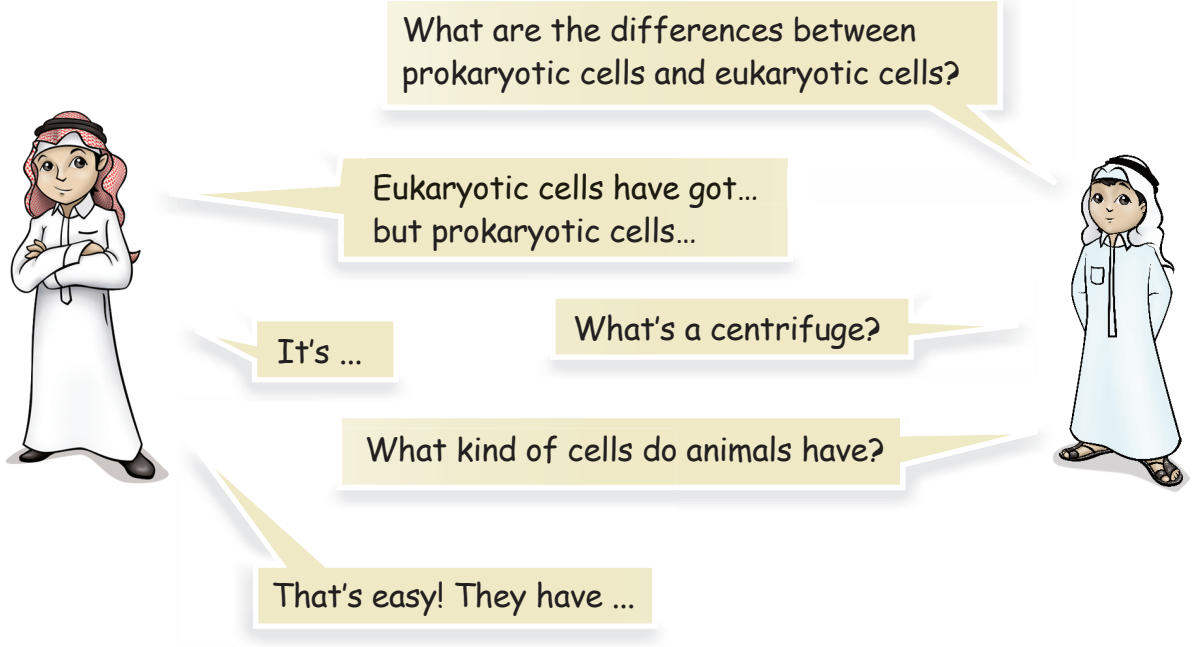
Task 3:

Look at the diagrams below, use the diagrams at the beginning of the lesson to help you label them fully:



Task 4:

Work in pairs. Ask and answer the following questions about today's lesson.



BIOLOGICALLY IMPORTANT MOLECULES

KEYWORDS: **nucleic acids** **proteins** **carbohydrates** **lipids** **triglyceride** **waxes** **phospholipid** **monosaccharide** **disaccharide** **polysacchride** **amino acids**

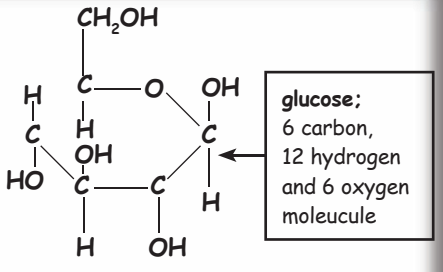
1. Carbohydrates

Carbohydrates are molecules made of sugar;

monosaccharides – a simple sugar

disaccharides – two monosaccharides such as sucrose

polysaccharides – three+ monosaccharides, a complex sugar molecule such as glycogen and starch



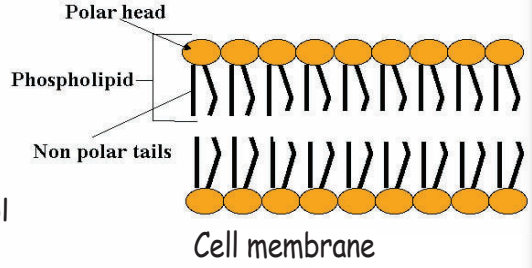
2. Lipids

Lipids are made of **fatty acids** and glycerol

triglycerides – three fatty acid molecules joined to one glycerol

phospholipids – two fatty acids attached to a glycerol molecule linked to a phosphate group

waxes – one long fatty acid chain joined to a long glycerol chain



Cell membrane

3. Proteins

Proteins are organic compounds made of a chain of **amino acids** and provide the cell structure and perform most of the biological activities.

4. Nucleic acids

Nucleic acids are large organic molecules that store and transfer information in the cell. The two major types are deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). Nucleic acids are made of nucleotides.

Today, our lesson is about the molecules of life, otherwise known as bio-molecules. Like the structure of a house (the foundation, framework, bricks and roof), living cells also consist of large complex molecules that form the building blocks of life.

So Mrs Hessa, what are these building blocks called?

Let's study the board. Details about these building blocks are given here.

What do the **carbohydrates** and **lipids** do?

Carbohydrates are a source of energy for living cells, while **lipids** store energy and are considered a major part of biological membranes.

TODAY'S SCIENCE KEYWORDS

Look at the keywords column in the table below (from this lesson). Rewrite each word. Next to the word, write its meaning.

KEYWORD	REWRITE WORD	MEANING
nucleic acids		
proteins		
carbohydrates		
lipids		

KEYWORD	REWRITE WORD	MEANING
triglyceride		
phospholipid		
disaccharide		
polysacchride		
amino acids		

Task 1:

Match the word with the suitable statement to make a complete sentence. Draw lines.

1	Proteins	a)	are known as a simple sugar.
2	Nucleic acids	b)	are made up of a long chain of amino acids.
3	Monosaccharides	c)	store and transfer important information in the cell.

Task 2:

Choose the correct answer. Is it a, b, c or d?

1. Which group of words is associated with carbohydrates?

a) monosaccharide, disaccharide, polysaccharide
b) monosaccharide, cellulose, lipid
c) disaccharide, polysaccharide, steroid
d) polysachharide, amino acid, collagen

2. A phospholipid molecule contains all of the following EXCEPT:

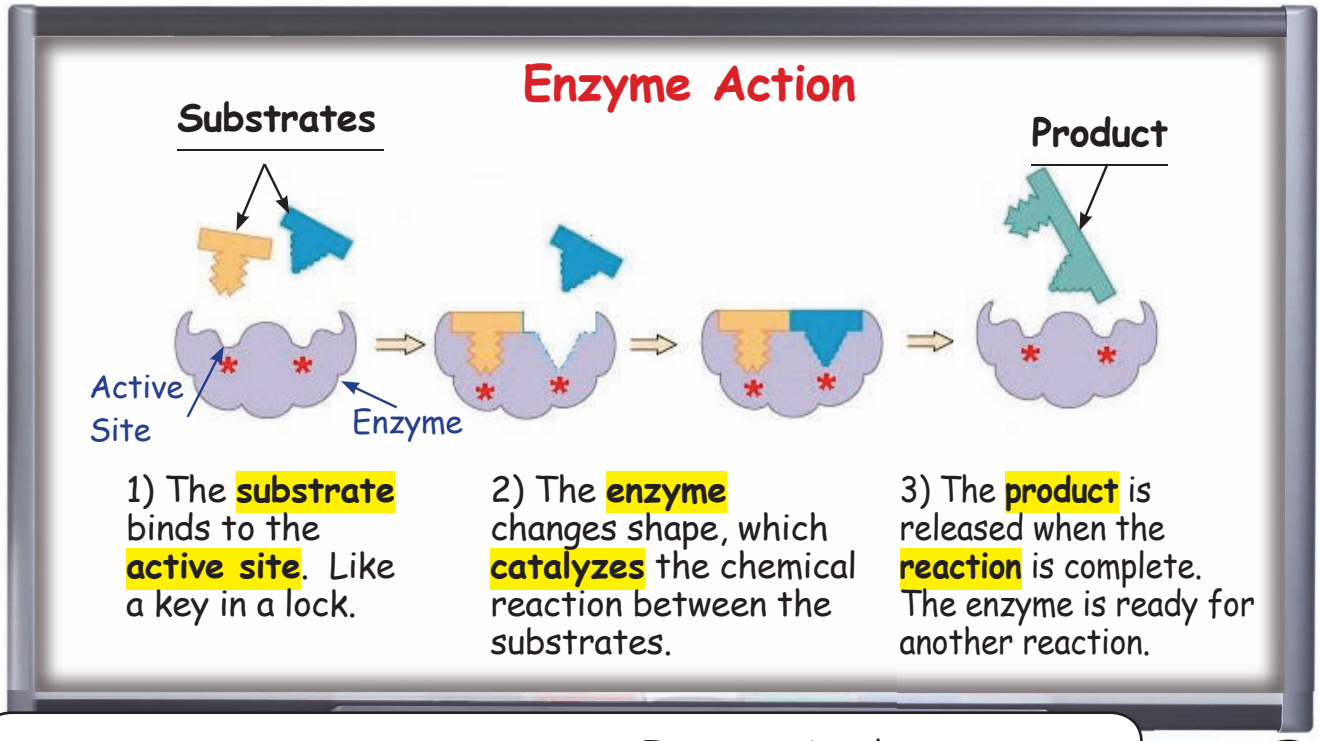
a) two fatty acids b) three fatty acids c) a phosphate group d) glycerol

3. What type of molecule is ribonucleic acid (RNA)?

a) a nucleic acid b) a lipid c) a protein d) a carbohydrate

ENZYME ACTION

KEYWORDS: enzyme catalyst pH substrate product active site reaction



word	meaning
Substrate	A specific substrate on which an enzyme acts.
Enzyme	Acts as a catalyst.
Product	A material produced at the end of a chemical reaction

In our previous lesson, we looked at bio-molecules of living things. Today, we will study the biological reaction that occurs in cells to maintain function and a stable internal environment.

Do you remember the words, substrate, product, and enzyme.

What is the pH?

The **pH** is a value that is used to express the acidity or alkalinity of something. Enzyme reactions are affected by changes in temperature, **pH** and substrate concentration. This can change the shape of the enzymes and the chemical reaction will not work as well.

ENZYME ACTION

Task 1: **Match the words with their definitions. Draw lines.**

1. enzyme
2. product
3. substrate

a) the reactant in chemical reactions.

b) a molecule that acts as a catalyst in chemical reactions.

c) a substance that forms at the end of a chemical reaction.

Task 2: **Circle the correct words to complete the sentences below.**

1. A substrate attaches to the ..... of an enzyme.

   a) peptide bond b) active site c) activator

2. Organic molecules that catalyze reactions in living systems are called ..... .

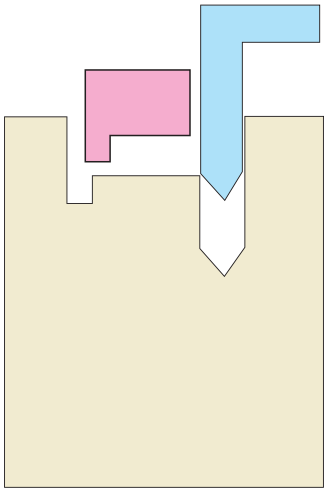
   a) enzymes b) substrates c) carbohydrates d) phospholipids

3. What two factors can affect enzyme activity?

   a) pH and product b) temperature and product c) temperature and pH

Task 3:

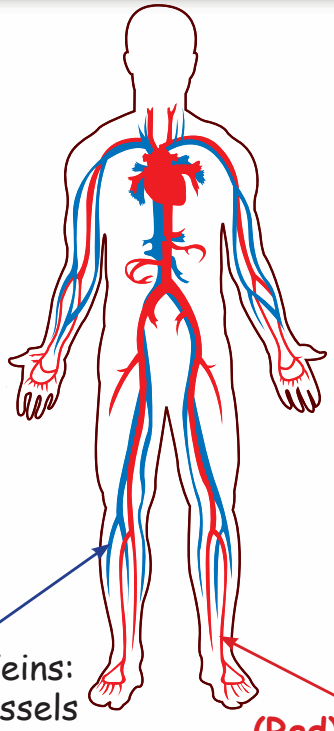
Draw a diagram fully labeled on how a substrate combines to the active site, how the enzyme changes shape and where the product is. The first diagram has been done for you.

Substrate			Product
			

BLOOD CIRCULATION AND THE HEART

KEYWORDS: circulate/circulation veins arteries chambers valves

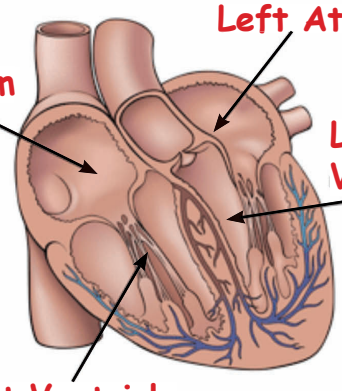
Today, Moza is learning about blood **circulation and the heart**.
Read and listen to the lesson, then do the activities:



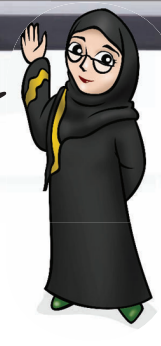
(Blue) Veins: Blood vessels that carry blood towards the heart

(Red) Arteries: Blood vessels that carry blood away from the heart

The heart has 4 chambers



Valves let blood flow in one direction. They prevent back flow of the blood.



Today, we are studying **blood circulation** and the **heart**.

What does 'circulation' mean, Mrs Hessa?

I know! When something **circulates**, it goes round and round. Like the blood in our bodies, and that's what you call blood **circulation**!

Mrs Hessa: Yes it is, Moza! And it's the heart that moves blood round the body. Look at the board. The heart is made of four areas called **chambers**. Together, these chambers move (pump) blood around the body. Between the chambers are valves. Valves are flaps that let blood flow in one direction, but not back.

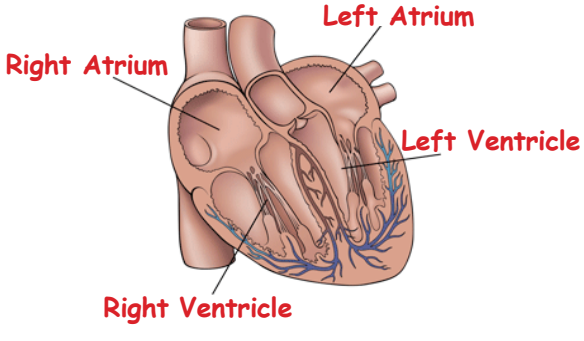
Moza: But what about arteries and veins, Mrs. Hessa?

Mrs Hessa: An **artery** is a thin blood vessel that takes blood away from the heart. The blood in our arteries has oxygen. A **vein** is a blood vessel taking blood towards the heart. The blood in our veins doesn't contain oxygen.

Task 1:

Match the following parts. Draw lines.

1	Veins	a)	carry blood to the heart.
2	Arteries	b)	are areas inside the heart.
3	Chambers	c)	take blood away from the heart.
4	Valves	d)	have flaps that don't let blood go back.



Task 2:

Choose the correct words to complete the sentences.

1. Our ..... take blood away from the heart.

   a) veins b) arteries c) valves

2. ..... control the direction of the flow of blood.

   a) Chambers b) Veins c) Valves

3. Valves let blood flow from one ..... to another.

   a) chamber b) vein c) artery

Task 3: WORK IN PAIRS.

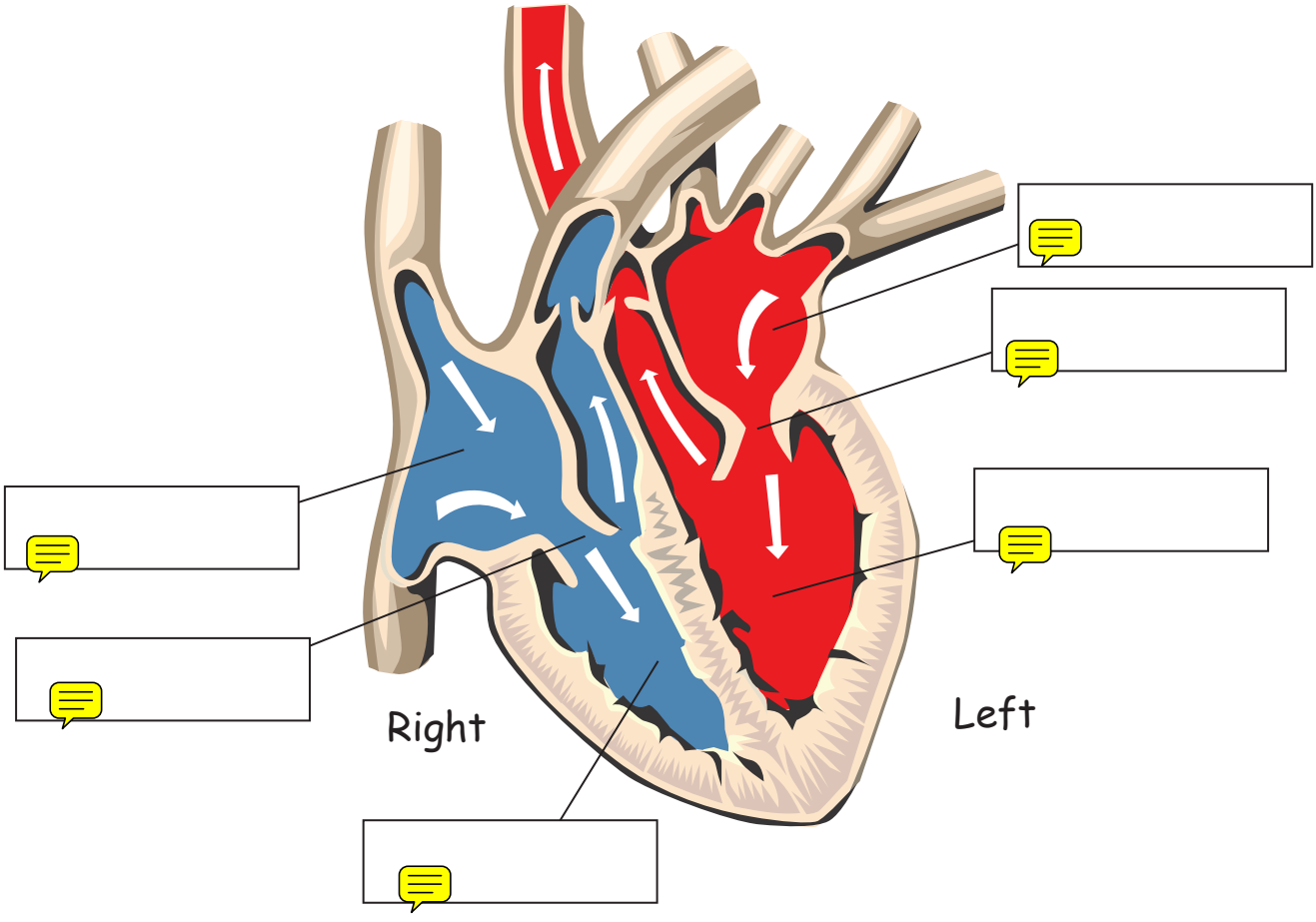
ONE of these sentences is FALSE. Which one is it? Explain why.

1. Veins carry blood toward the heart. **TRUE** **FALSE**
2. Valves move blood around the body. **TRUE** **FALSE**
3. The heart has four chambers. **TRUE** **FALSE**

Number ..... is FALSE, because .....

Task 4:

Look at the diagram below, use the diagrams at the beginning of the lesson to help you label it fully:



Task 5: work in pairs.

Ask and answer the following questions about blood circulation and the heart.

What's the difference between veins and arteries?

Easy! Veins ... but arteries...

Valves ...

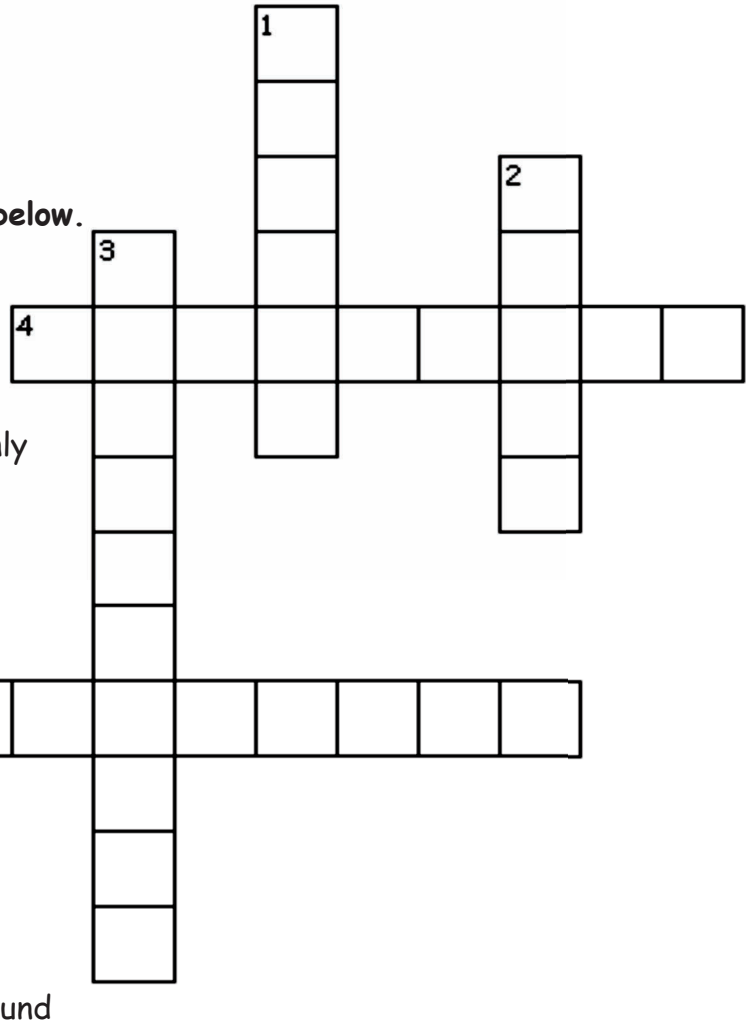
What do valves do?

How many chambers are there? Together, what do they do?

There are... Together, they...

Task 6:

Well done! Now complete the crossword below.
Let's start with 5 across! That's easy!



Across

4) Valves have flaps, so that the blood only flows in one ..... .

5) The heart has four ..... .

Down

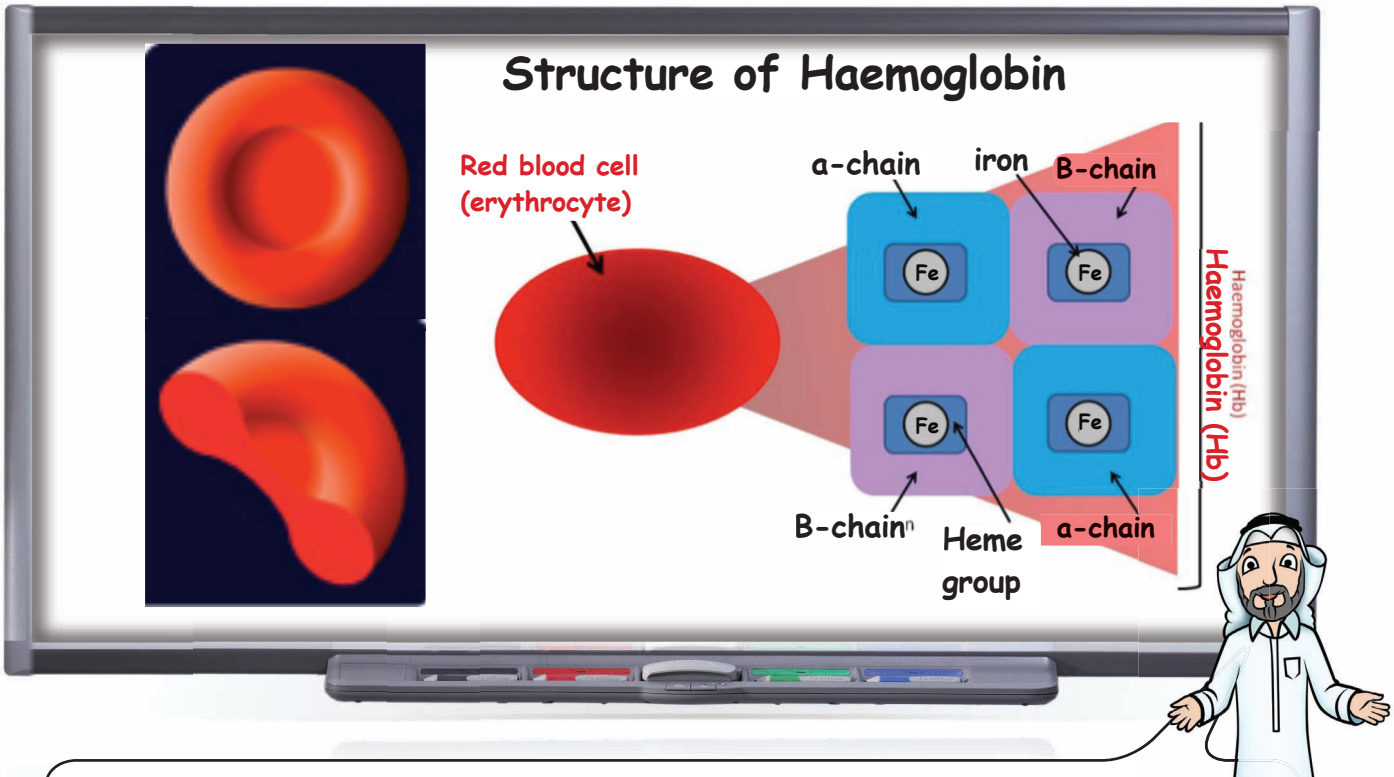
1) The blood in the arteries has ..... in it. (except pulmonary artery)

2) These carry blood to the heart.

3) The blood in your body goes round and round. It ..... .

RED BLOOD CELLS

KEYWORDS: **haemoglobin** **red blood cell** plasma oxyhaemoglobin



Today, our lesson is about four key words. Let's start with **haemoglobin.**

Your blood is made up of a mixture of plasma and blood cells. Red blood cells contain the oxygen carrying molecule **haemoglobin**. This is a special pigment that gives blood its red colour. **Red blood** cells contain **haemoglobin** that is a compound of protein and iron.

Red blood cells are unlike other cells in that they do not contain **a nucleus**. They are really just a bag containing the **haemoglobin**. The cells have a doughnut-shape with a flattened centre instead of a hole.

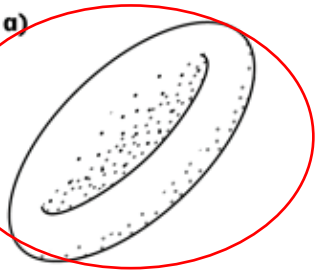
Haemoglobin combines readily with oxygen to form a compound called **oxyhaemoglobin**. It will combine with oxygen where oxygen is plentiful and yet readily lose it where oxygen is scarce, as in the body tissue. Red blood cells are produced in the red marrow of bones. They have no nuclei and wear out in 3-4 months. Do you know what the heme group is?

Yes, Sir. The heme group is a chemical group containing iron atoms at the centre. Wow! So much goes on in our bodies!

Task 1:

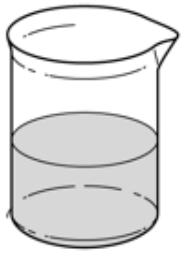
Circle the diagram that looks like a red blood cell.

a)

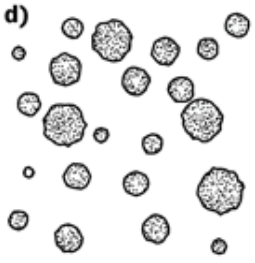


b)

c)



d)



Task 2:

Which statements refer to blood cells? Tick the correct ones.

are disc shaped	help to seal cuts	are fragments of cells	help to protect you from disease
contain haemoglobin	have a nucleus	contain dissolved nutrients	carry oxygen

Task 3:

Use the words in the box below to complete the sentences:

Plasma oxyhaemoglobin haemoglobin reb blood cells

1. This gives blood its red colour ..... .
2. When haemoglobin cobines with oxygen it forms ..... .
3. These cells carry oxygen ..... .
4. Our blood is a mixture of ..... and blood cells.

Task 4:

Find the following words in the wordsearch

BLOOD

CELL

HAEMOGLOBIN

OXYHAEMOGLOBIN

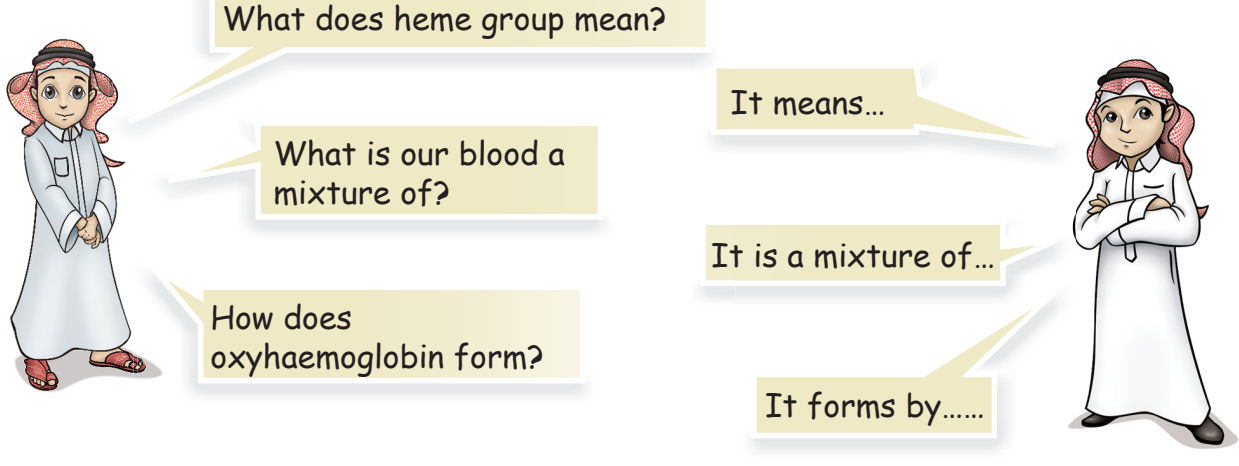
PLASMA

RED

M	I	V	N	M	Q	F	Q	O	I	O	P	D	N	L
V	E	J	V	P	O	K	M	U	U	Q	H	I	T	M
R	Z	T	A	C	Y	E	P	T	B	W	B	X	F	Z
S	P	U	H	A	E	M	O	G	L	O	B	I	N	B
J	F	L	I	K	M	D	E	R	L	E	L	G	M	L
Q	V	Y	A	F	J	H	V	G	E	Z	B	Y	R	O
C	J	N	T	S	R	F	O	F	X	U	P	D	M	O
L	P	O	Z	Q	M	M	E	O	Z	W	X	F	T	D
T	B	N	V	X	E	A	Y	J	B	Z	L	V	W	G
Z	R	N	C	A	C	I	C	Y	Y	H	T	T	N	Y
A	H	Y	H	E	S	P	E	T	H	D	Z	M	C	H
F	X	Y	L	R	B	M	N	T	G	Z	C	C	F	D
N	X	L	B	X	S	B	X	E	U	R	X	D	J	Q
O	D	E	B	M	D	T	Z	E	E	T	Z	J	F	A
E	D	B	B	M	Y	O	E	U	P	F	N	X	U	C

Task 5:

Work in pairs. Ask and answer the questions in pairs:



SCIENTIFIC ENGLISH

SCIENCE

CHEMISTRY

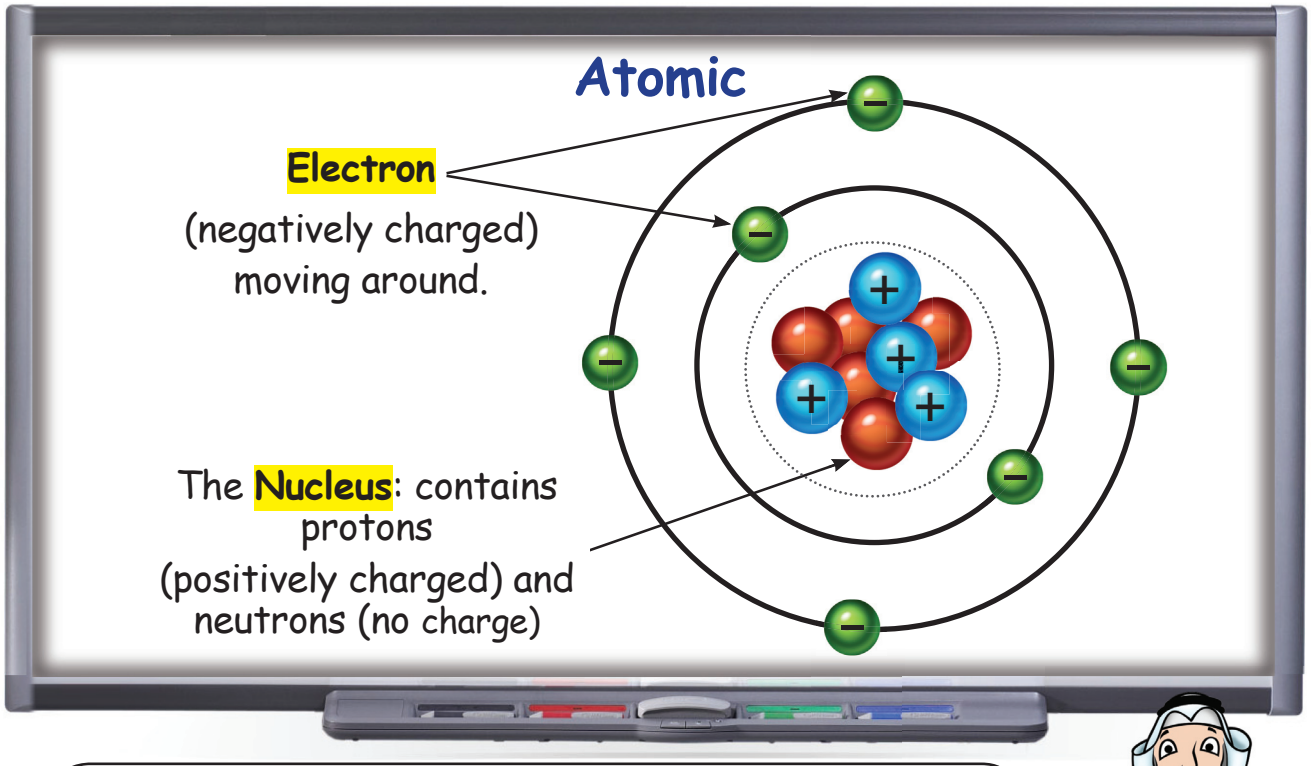
GRADE 10

ATOMIC STRUCTURE 1

KEYWORDS: atoms, electrons, protons, neutrons, nucleus, elements, periodic table

Today, Khalid and Jassim are learning about the **Atomic Structure**.

Read and listen to the lesson, then do the activities that follow.



Today, we are studying the atomic structure. **Atoms** are the basic units of matter. On the board, you can see that atoms consist of: **protons, neutrons** and **electrons**. **Protons** and **neutrons** are in the centre of the atom. They make the **nucleus. Electrons** move around the nucleus. Atoms make elements. Can you tell me about elements, Khalid?

Yes, I can, Sir! An element is a substance made from one type of atom. Scientists often call elements "the building blocks of life".

That's right! Look at the previous page, hydrogen (H), oxygen (O) and iron (Fe) are common elements. There are over 100 elements. You can see them on a **periodic table**.

Task 1:

Work in pairs. Find the incorrect word in each sentence and correct it.

Example: Atoms have ~~ten~~ parts. **three**

1. The nucleus is made of protons and ~~electrons~~. .....
2. Electrons ~~are in~~ the nucleus and have a ~~positive~~ charge. .....
3. You can find all known ~~atoms~~ in the periodic table. .....
4. The basic units of matter are ~~elements~~. .....

Task 2:

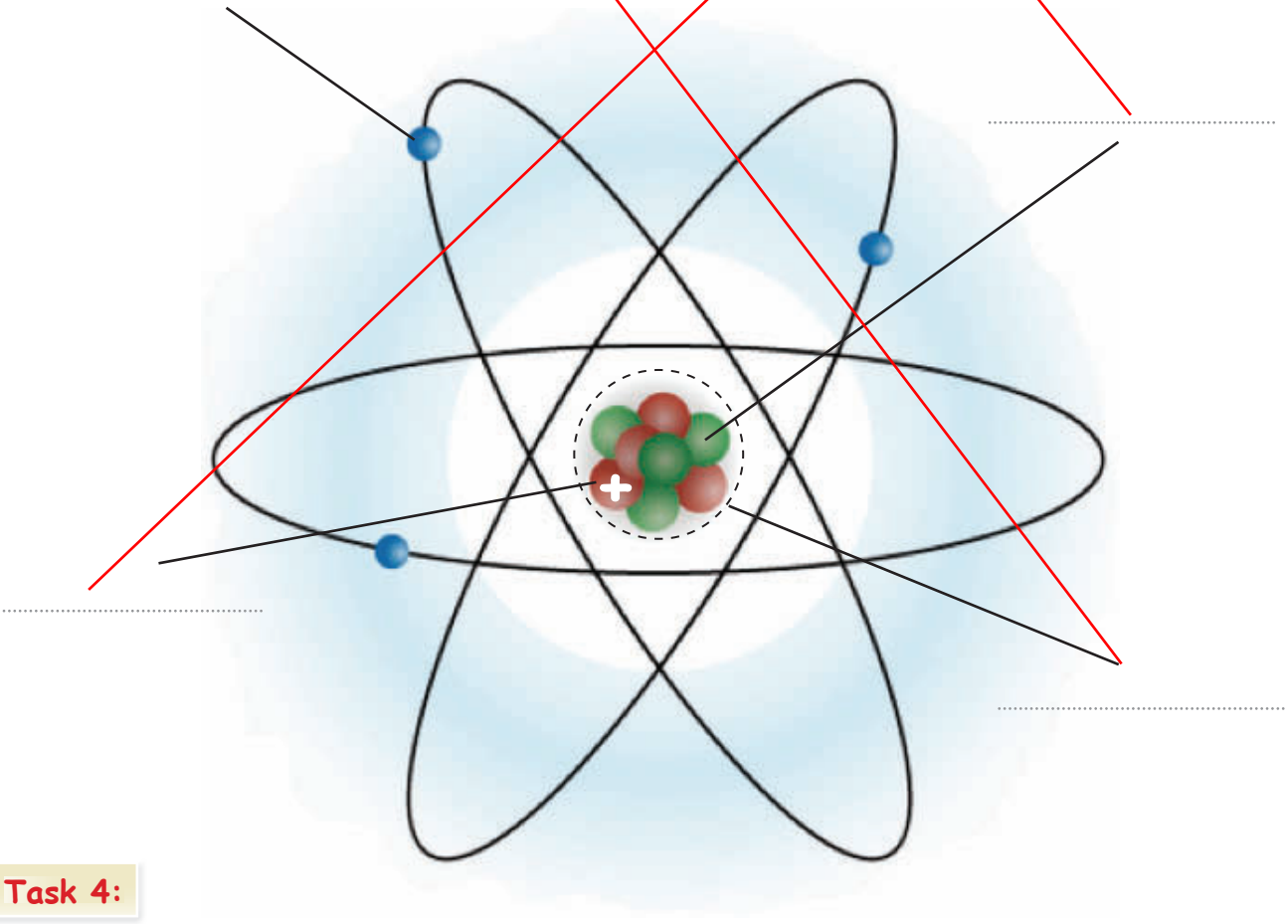
Match the two parts to make correct sentences. Draw lines.

1 An element	a) is made from one kind of atom
2 A proton	b) is always moving.
3 An electron	c) has a positive charge.

Task 3:

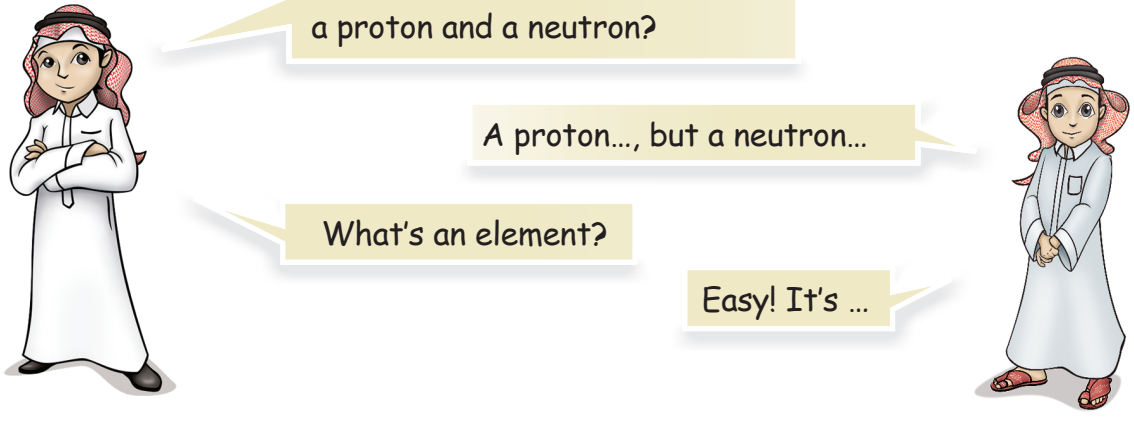
Use the words in the box to label the diagram below:

electron nucleus protons and neutrons.



Task 4:

Work in pairs. Ask and answer the following questions about atomic structure:



ATOMIC STRUCTURE 2

KEYWORDS: allotropy diamond graphite carbon fullerene

Dr. Hassan is teaching the class about **allotropy**.
Read and listen to the lesson, then do the activities that follow.

Al-lot-ro-py! That sounds difficult! Can you explain it to us please, Sir?

Yes, Jassim! It's not difficult at all! **Allotropy** is when the same element exists in more than one form. It means it looks different. Look at the board. **Carbon** is an element. Carbon can be in three forms; diamond, graphite and fullerene.

Are diamonds, graphite and fullerenes similar? Do they look the same and feel the same?

Dr. Hassan: That's the interesting thing, Jassim. No, they don't look the same at all! A **diamond** is a very hard stone. It's the hardest substance known. It's very valuable and useful. We use them to make jewellery, such as rings and necklaces.

Jassim: What about graphite, Sir?

Dr. Hassan: **Graphite** is very soft and slippery! It looks like a rock. You see it every day because we use it to make pencils.

Jassim: Are fullerenes (full-er-eens) soft too?

Dr. Hassan: Yes. Scientists only found out about fullerenes in 1985. **A fullerene** is a spherical carbon molecule.

Jassim: Thank you, Sir. It's very clear now. And it's very interesting.

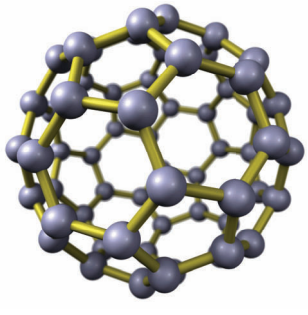
Task 1:

Match the terms with the correct definition.

1	A fullerene	a)	is a soft substance that we can write with.
2	Graphite	b)	is the hardest thing on Earth.
3	A diamond	c)	is in three forms; one hard, two soft.
4	Allotropy	d)	is a spherical carbon molecule.
5	Carbon	e)	is when an element is in different forms.

Task 2:

Label what the objects below represent:



Task 3:

Let's work in pairs. ONE of these sentences is FALSE. Which one is it? Explain why.

1. Diamonds and fullerenes are made from the same element. **TRUE** **FALSE**
2. Diamonds and fullerenes are very similar. **TRUE** **FALSE**
3. A fullerene is a long, thin carbon molecule. **TRUE** **FALSE**

Number ..... is TRUE.

Number ..... is FALSE, because .....

Number ..... is FALSE, because .....

Task 4:

Work in pairs. Ask and answer the following questions about allotropy.

What is allotropy?

Allotropy is .....

What are the properties of diamonds?

They're special because.....

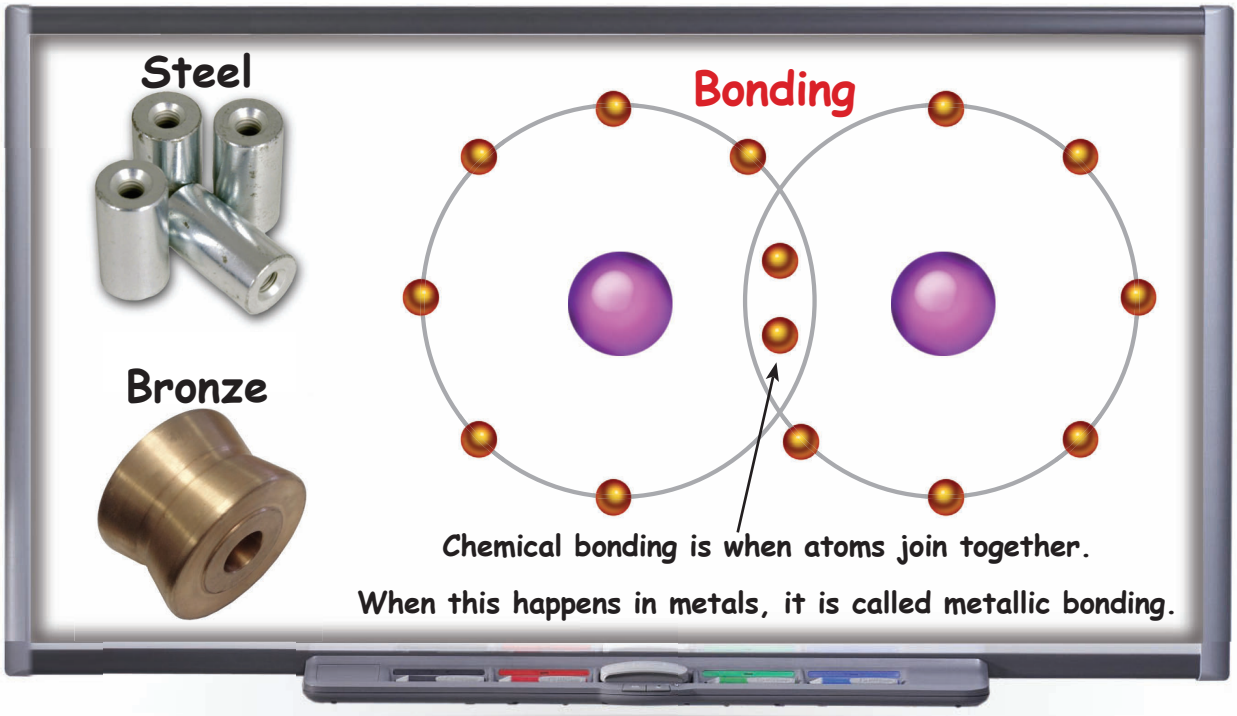
What are the differences between diamonds and graphite?

Diamonds are ..... but graphite is.....

BONDING

KEYWORDS: bonding chemical bonding metallic metallic bonding alloy steel

Today, Reem and Moza are learning about **Chemical bonding and Metallic Bonding**. Read and listen to the lesson, then do the activities that follow.



Today's subject is bonding. **Bonding** is when things join together, and **chemical bonding** is when atoms join or combine together, like those on the board. **Metallic** means with or including metals. **Metallic bonding** is when atoms in metals join together. Did you study metallic bonding before, Reem?

Yes, I did! It's very interesting! When metals mix together, they make something called an **alloy**. It's a kind of new metal. Steel and bronze are examples of alloys. Bronze is made from copper and tin. **Steel** is an alloy made of iron and carbon. Steel is a very useful alloy because it's strong and we can use it to make so many things.

Task 1:

ONE of these sentences is FALSE. Which one is it? Explain why.

1. Atoms join together in chemical bonding. **TRUE** FALSE
2. Copper is an alloy. TRUE **FALSE**
3. We make alloys by joining metals together. **TRUE** FALSE

Number ..... is FALSE, because .....

Task 2:

Match each term with its description. Draw lines.

1. Alloy — **b)** a mixture made from two metals.
2. Chemical bonding — **a)** combine together.
3. Bonding — **c)** when metals join together.
4. Metallic bonding — **e)** when atoms join together.
5. Metallic — **d)** with or including metals.

Task 3:

Choose the correct answer. Is it a, b, or c?

1. ..... is an alloy.
   a) Copper **b)** Bronze **c)** An atom
2. When copper and atoms join together, it is .....
   a) metallic bonding **b)** bonding **c)** Both a and b
3. When copper and tin join together, they make .....
   a) an alloy **b)** atoms **c)** electrons
4. When iron and carbon join together, they make .....
   a) steel **b)** copper **c)** bronze

Task 4:

Work in pairs. Ask and answer these questions about today's lesson:

What is chemical bonding?

What is an alloy?

Easy! It's....

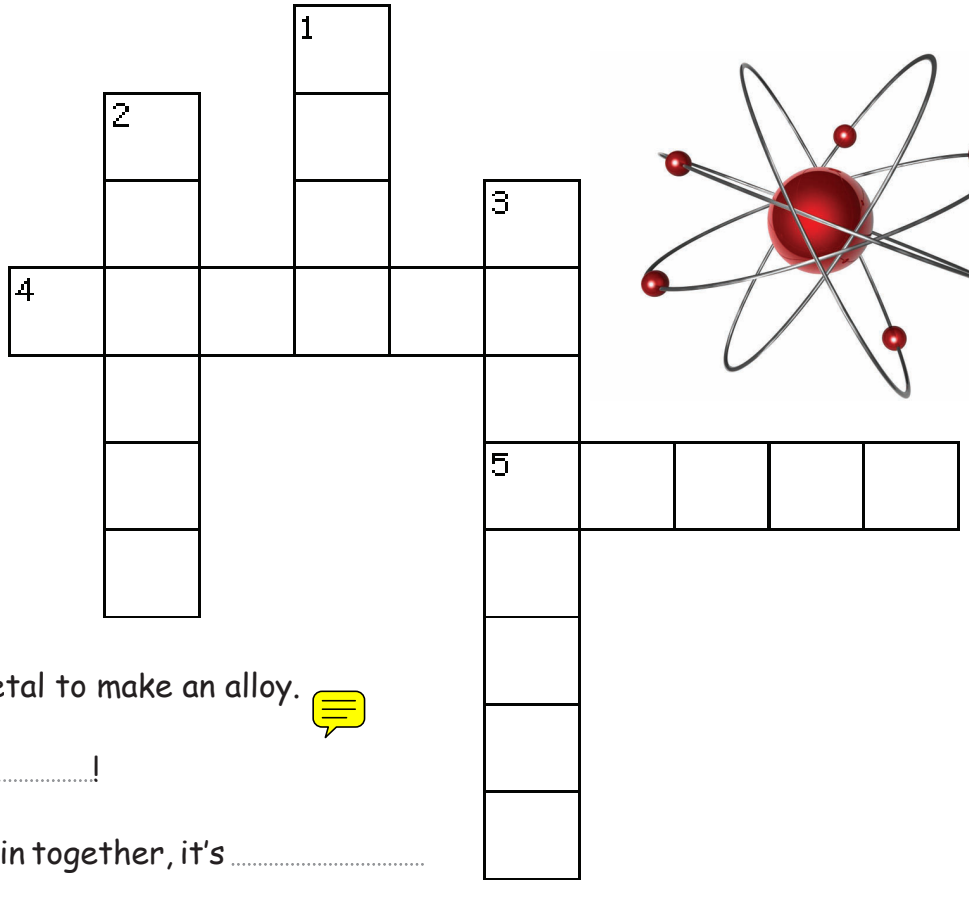
An alloy is..... For example...

Why is steel an important alloy?

Because.....

Task 5:

Nice work! Now complete this crossword about Bonding.



Across

4) An alloy

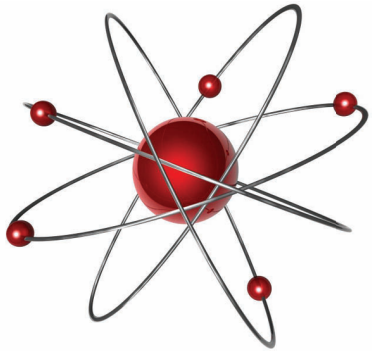
5) Chemical bonding is when ..... join together.

Down

1) We use this metal to make an alloy.

2) Steel is .....!

3) When metals join together, it's ..... bonding



MEASURING ATOMS

KEYWORDS: **mass** **mass spectrometer** **vapor/vaporize** **ions/ionize** **separate** **accelerate**

Today, Dr. Hassan is teaching Khalid and Mohammed about **Measuring Atoms**. Read and listen to the lesson, then do the activities that follow.

Measuring Atoms

Steps:

1. **Vaporize: make into a gas.**
2. **Ionize: make the atoms into ions.**
3. **Accelerate: make the ions move faster.**
4. **Separate the ions.**

Mass spectrometer:

a machine that measures the mass of atoms.

Wow! That's an amazing instrument, Sir. What does it do?

It's a **mass spectrometer**. (spec-trom-e-ter). It measures the mass of atoms. Remember, mass is the amount of matter that is in an object. We put a substance into the instrument. Then, there are 4 stages. First, it **vaporizes** the substance. A vapor is a gas, so that means it changes the solid or liquid into a gas.

Then step 2 is to 'i-on-ize'. What's that?

Ionize is to make the atoms into **ions**. It does that by giving the atoms a positive charge. Then it accelerates the ions. To accelerate something is to make it go faster. The machine makes the ions move faster. Then, it can separate them. When we separate things, we move them apart. Then, we can put them into different groups of size or shape. The spectrometer separates the ions of different masses. Then, we can measure the mass.

Task 1:

ONE of these sentences is FALSE. Which one is it? Explain why.

1. In a mass spectrometer a substance is firstly changed into a gas. **TRUE** **FALSE**
2. A mass spectrometer ionizes in the third stage. **TRUE** **FALSE**
3. A mass spectrometer can make ions move faster. **TRUE** **FALSE**

Number ..... is FALSE, because .....

Task 2:

Match the two parts to make complete sentences. Draw lines

1. accelerate	a) move apart.
2. separate	b) change into a gas.
3. ionize	c) substance in a gaseous state.
4. vapor	d) change into ions.
5. vaporize	e) move faster.

Task 3:

Choose the correct words to complete the following sentences.

1. The mass spectrometer ..... the mass of atoms.
   a) increases b) decreases c) measures
2. We can ..... things into different groups.
   a) change b) accelerate c) separate
3. Things ..... when they increase speed.
   a) accelerate b) measure c) vaporize
4. The mass spectrometer ..... the atoms, by giving them a positive charge.
   a) accelerates b) increases c) ionizes

Task 4:

Work in pairs. Ask and answer these questions about today's lesson:

What does a mass spectrometer do?

I know! It measures...

What are the steps?

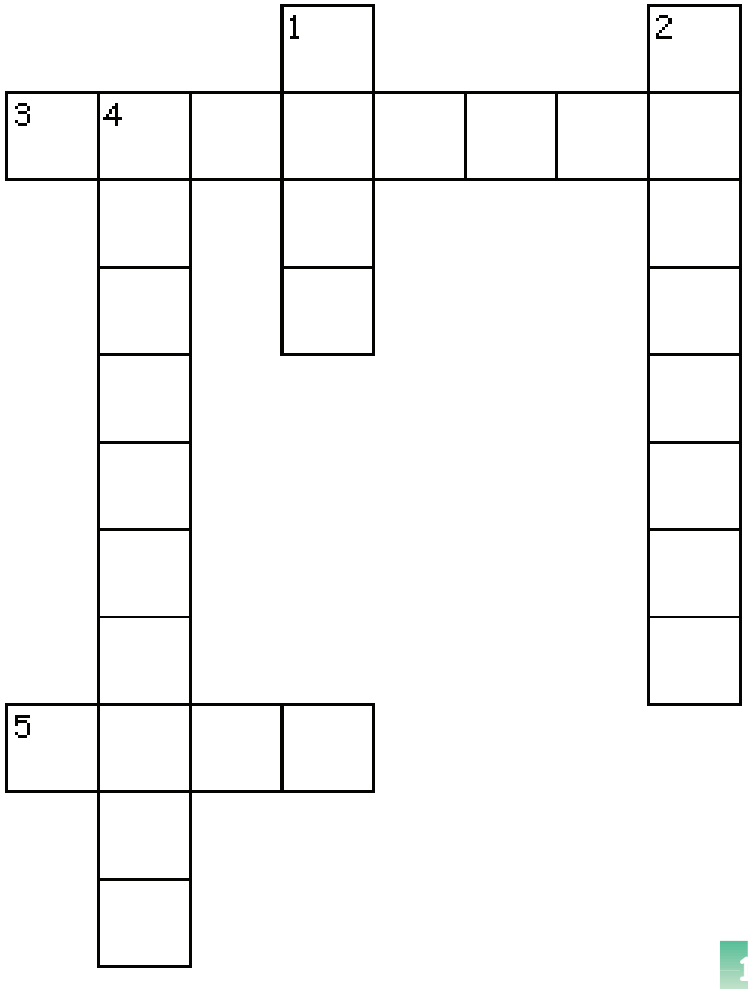
The first step is.. Then.....

What's the difference between 'vaporize' and 'accelerate'?

They're completely different! Vaporize is... whereas accelerate is ...

Task 5:

Now, complete this crossword about the things you have studied today.



Across

3) When we ..... something, we make it into a gas.

5) After all the steps, we can measure the ..... of atoms.

Down

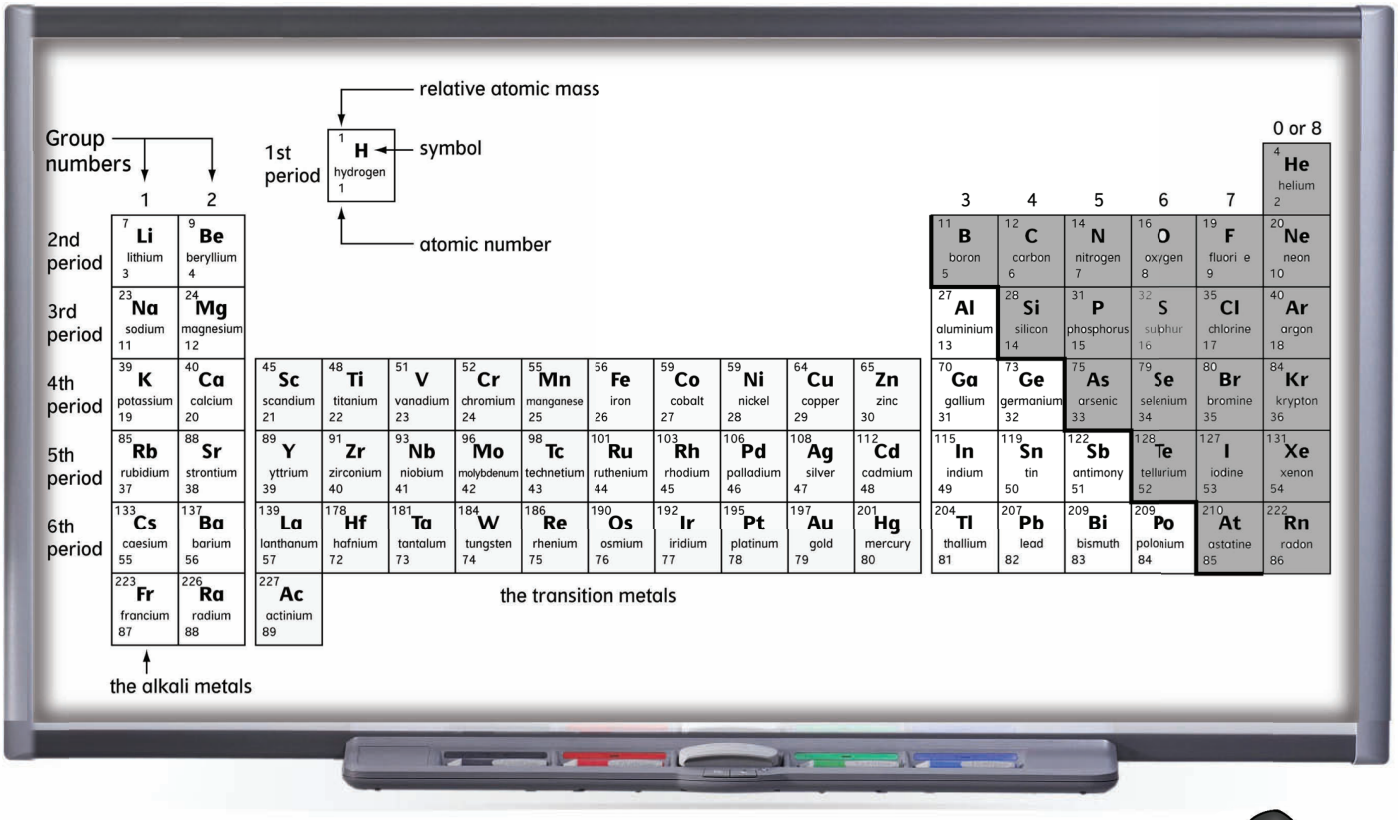
1) The mass spectrometer changes the atoms into positive .....

2) A mass spectrometer can ..... ions of different masses.

4) Go faster.

PERIODIC TABLE

KEYWORDS: elements periodic table properties periods groups metals non-metals



Today we are looking at the **periodic table**. Look at the big table on the board above! A periodic table. There are more than 100 different **elements**. The periodic table is a chart showing all the elements arranged in a particular way. The vertical columns in the periodic table are called **groups**. Each group contains elements that have similar **properties**. The horizontal rows are called **periods** and this is based on the number of electrons the element has.

Ah! So all the elements we know are here! What does properties mean?

Properties depend on how an element looks and feels but also how it reacts in a chemical reaction. Let's look in a bit more detail.

The periodic table has **eight main groups**. For example, group 1 contains very reactive metals such as sodium - **Na** - while group 7 contains very reactive non-metals such as chlorine - **Cl**.

Note that you will never find a compound in the periodic table, because these consist of two or more different elements joined together by chemical bonds.

I can see the parts on the table that are metals (alakali and transition) and non-metals (gases)

1	2											3	4	5	6	7	0
							H										He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg							

Alkali metals
Transition metals
Halogens
Noble gases

Task 1:

a Write down the names and symbols for five transition metals.

b Write down the names and symbols for two Group 1 metals.

Name	Symbol	Name	Symbol

c Write down the names and symbols for five non-metals.

Name	Symbol	Name	Symbol	Name	Symbol	Name	Symbol	Name	Symbol

d Write down the name and symbol for the element that is in Group 1 and in the 4th Period.

Task 2:

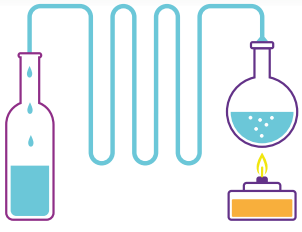
Match the two parts to make correct sentences. Draw lines.

1 Periodic Table	a) Horizontal rows in the periodic table.
2 Periods	b) Vertical columns in the periodic table
3 Groups	c) A table with all known elements
4 Metals	d) Elements from group 4 to 8, 2nd period are examples of .....
5 Non metals	e) These are two types alkali and transition

CHEMICAL INDUSTRY 1

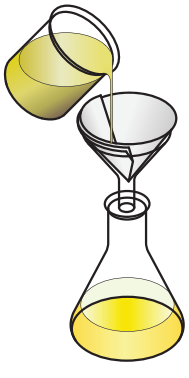
KEYWORDS: **filtration** **evaporation** **simple distillation** **chromatography** **fractional distillation**

Today, Mrs Hessa is teaching Moza about **Chemical Industry**.
Read and listen to the lesson, then do the activities.



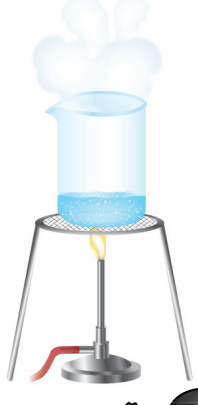
Simple Distillation : This is by boiling a liquid and collecting the vapour by condensing it. So, now we can have the water and the sugar separated.

Chromatography is a process used to separate complex mixtures that have different colors or can be colored. It involves the molecules moving down a gel or paper. The smaller the molecule, the more it moves.



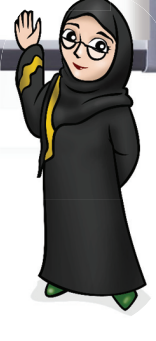
Filtration: When we separate a liquid and an insoluble solid - like sand and water.

Evaporation: Using heat to boil away the liquid so the solid remains, like separating water and sugar.



Wow! That's amazing! So what is **fractionation distillation**?

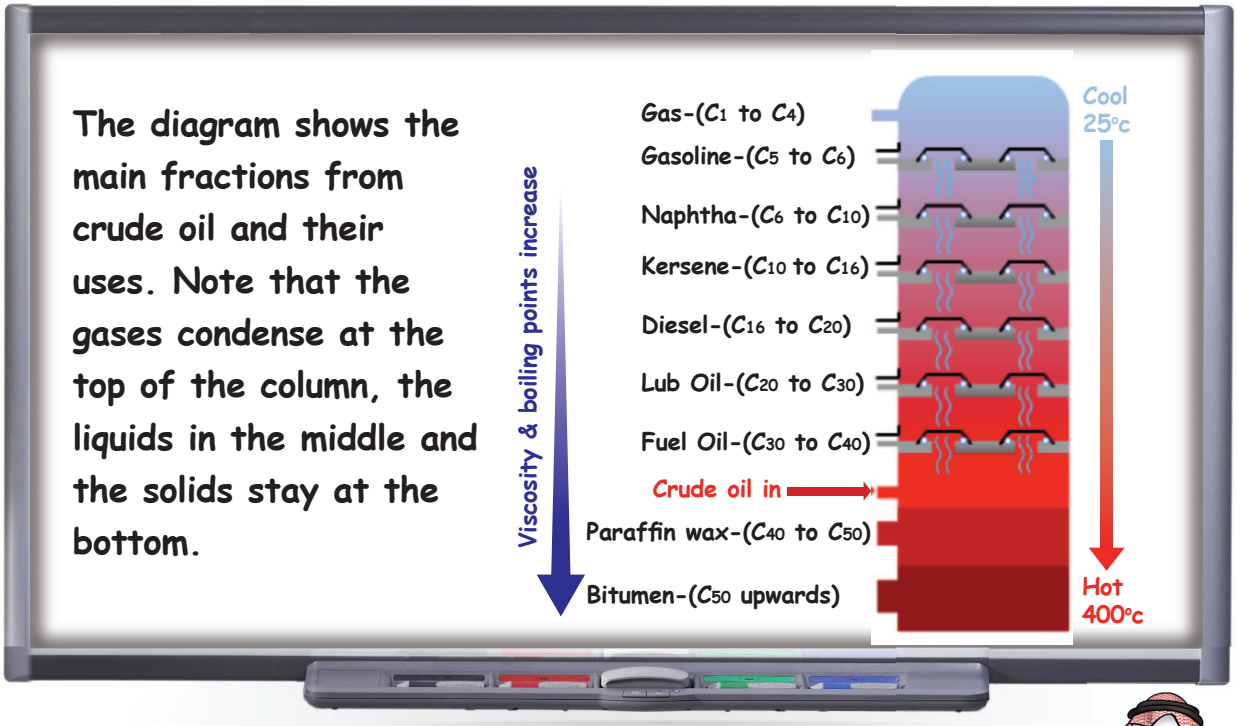
In the chemical industry, it is important for scientists to be able to **separate mixtures**, for example, clean water, iron, aluminum. Let's look at some of the methods used, some are simple, others are more complex.



CHEMICAL INDUSTRY 2

Fractional distillation is like distillation, but this time we separate two or more liquids, depending on the boiling points of each liquid. See the board below.
A good example is: **fractional distillation** of crude oil.
Since they have different boiling points, the substances in crude oil can be separated using **fractional distillation**. The crude oil is evaporated and its vapours are allowed to condense at different temperatures in the fractionating column. Each fraction contains hydrocarbon molecules with a similar number of carbon atoms.

The diagram shows the main fractions from crude oil and their uses. Note that the gases condense at the top of the column, the liquids in the middle and the solids stay at the bottom.



Wow! That looks like a tough process. The temperatures are very high.

Task 1:

ONE of these sentences is FALSE. Which one is it? Explain why.

1. Filtration is a process of separating a substance that is insoluble in a liquid. **TRUE** **FALSE**
2. Water and sugar are separate using chromatography. **TRUE** **FALSE**
3. Distillation takes place by boiling a liquid and collecting the vapor. **TRUE** **FALSE**

Number ..... is FALSE, because .....

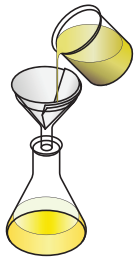
Task 2:

Match the terms with the correct process! Draw lines.

1. Distillation
2. Chromatography
3. Evaporation
4. Filtration

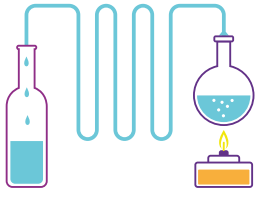
a)

b)



c)

d)



Task 3:

ONE of these sentences is FALSE. Which one is it? Explain why.

1. Give an example of two liquids produced during the fractional distillation of crude oil.

.....

2. Give one example of a gas produced during the fractional distillation of crude oil.

.....

Task 4:

Complete the sentences by using the correct words from the box.

colours	boiling points	heat	filtration

1. Fractional distillation depends on .....
2. Chromatography is a good way to separate mixtures that have different .....
3. Both distiallation and fractional distillation use .....




Task 6:

Find the following words in the wordsearch

BOILINGPOINT

CHROMATOGRAPHY

DISTILLATION

EVAPORATION

FILTRATION

C	F	N	M	K	X	F	U	W	P	J	D	Z	I	D
X	H	W	O	P	E	U	S	Q	J	I	H	D	V	O
P	V	R	E	I	O	W	S	X	S	L	G	K	H	B
E	R	T	O	U	T	E	D	T	V	I	Q	A	Z	O
W	K	A	H	M	E	A	I	V	U	F	D	I	N	I
J	S	N	A	U	A	L	R	Y	M	T	J	J	B	L
K	G	L	A	O	L	T	Z	T	O	Q	S	P	Y	I
I	I	U	G	A	Y	M	O	Y	L	Q	O	H	P	N
I	P	F	T	Z	X	Z	A	G	C	I	I	R	G	G
N	X	I	O	A	H	S	G	X	R	Y	F	B	N	P
E	O	N	O	I	T	A	R	O	P	A	V	E	Z	O
N	M	U	G	P	P	U	H	J	Q	T	P	K	O	I
Y	M	N	L	T	A	E	X	J	J	Y	M	H	J	N
M	N	I	I	N	Y	R	O	K	A	N	D	P	Y	T
Y	L	I	B	K	V	G	N	R	D	J	D	B	R	Z

SCIENTIFIC ENGLISH

SCIENCE

PHYSICS

GRADE 10

MEASURING QUANTITIES

KEYWORDS: **fundamental quantities** **derived quantities** **mass** **magnitude** **balance** **physical quantity** **measure/measurement**

Today, Khalid and Jassim are learning about **Measuring Quantities**.

Read and listen to the lesson, then do the activities that follow.

Measuring Physical Quantities

We can measure length and height in centimeters and meters

When we **measure** something, we find a number that shows the size or the amount of it. This is **measurement**. We measure height and length in meters and centimeters. We measure weight in grams and kilograms. Do you know what a physical quantity is, Khalid?

Yes! My book says a **physical quantity** is an amount we can measure in units, like height, weight and mass. But what is mass? Is it the same as weight?

MEASURING QUANTITIES

The **mass** of an object is how much matter – or substance – it has. We can measure mass in kilograms and grams. On the board, you can see a balance. We use a balance to measure the weight or mass of something. The size of something is its **magnitude**. That's how big it is, or how much there is. Do you know the difference between **fundamental quantities** and **derived quantities**?

Yes I do! Fundamental quantities are ones that cannot be broken down any further, for example, time (in seconds) or distance (in meters). Derived quantities are the ones that come from a combination of **fundamental quantities** for example: force, velocity, density, area.

Task 1: Mark True of False.

1 Height is a physical quantity.	**TRUE**	FALSE
2 A balance can only measure weight.	TRUE	**FALSE**
3 A number that shows the size of something is a measurement.	**TRUE**	FALSE
4 The units for velocity are a fundamental quantity.	TRUE	**FALSE**
5 The units for pressure are a derived quantity.	**TRUE**	FALSE

Task 2:

Match the two parts to make correct sentences. Draw lines.

1 A balance	a) is the size of something.
2 A metre	b) is a unit of measurement of length.
3 Magnitude	c) can be measured in kilograms.
4 Mass	d) measures mass and weight.

Task 3:

Choose the correct words to complete the following sentences.

1. We can measure all physical quantities in .....
   a) meters b) units c) kilograms

2. How much substance or matter there is in an object, is its .....
   a) size b) weight c) mass

3. We can measure ..... in grams.
   a) mass c) weight c) both a and b.

4. We use a ..... to measure mass.
   a) ruler b) balance c) substance

Task 4:

Work in pairs. Ask and answer the following questions about measurement.

What can a balance measure?

It can measure...

What's mass?

I know that! It's ....

What units do we use to measure length and height?

We use.....

PRECISION AND ACCURACY

KEYWORDS: accuracy/accurate, precision/precise, direction, vectors, scalars

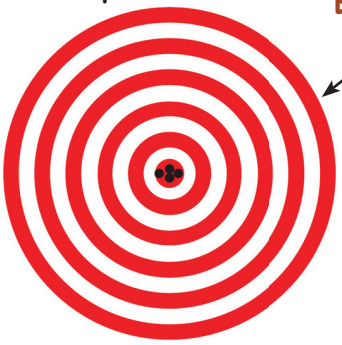
Today, Mariam and Moza are learning about **Precision and Accuracy**. Read and listen to the lesson, then do the activities that follow.

Precison and Accuracy

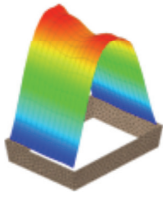
(1)Accurate not precise.

(2)Precise not accurate.

(3)Accurate and precise.



Vectors and Scalars



A scalar is an amount that has only magnitude (size): e.g. length, volume, area,

A vector has magnitude and direction: e.g. 5km north.

Today, we're studying precision and accuracy. They are not the same. **Accuracy** is how near a measurement is to the real value. **Precision** is how near measurements are to each other. Look at the targets on the board. Can you tell us what a target is, Mariam?

Yes, Mrs Hessa. The circles are targets. A target is what we aim at. The centre of the target is the bull's eye. That's what we want to hit.

The targets show us about accuracy and precision. When a shot hits the bull's eye, it is accurate. When shots are close to each other, they are precise. When a measurement is the same as the real value, it is accurate. But when measurements are close to each other, they are precise. Can you explain what vectors and scalars are please, Mrs Hessa?

Yes, Mariam! The key word is direction. **Direction** is when something is moving to a certain place. **Scalars** are quantities that have magnitude – a size or amount – but no direction. For example, '5km' is a scalar. **Vectors** have magnitude and direction, such as north, south, east and west. For example, '5km north' is a vector. It has an amount (5km) and a direction (north). ↑ 50 km North = this is a vetor - it has magnitude and direction

Thank you, Mrs Hessa. It's much clearer now.

Task 1:

Work in Pairs. ONE of the following sentences is FALSE. Which one is it? Explain why.

1. It is possible for measurement to be accurate and precise. **TRUE** **FALSE**
2. When we aim at a target, we want to hit the bull's eye. **TRUE** **FALSE**
3. When shots are close to each other, it shows accuracy. **TRUE** **FALSE**

Number ..... is FALSE, because .....

Task 2:

Match the following. Draw lines.

1. 100 Km/h
2. 150 Km/h south
3. Precise and accurate
4. No precision ~~or accuracy~~
5. vector
6. scalar

a) Vector

b) 

c) Scalar

d) 

e) 50m EAST 

f) 100m 

Task 3:

Choose words from the box below to complete the following sentences:

accuracy precision scalar vector direction

1. A vector has ..... .
2. Five hundred meters is a ..... .
3. ..... is closeness to the real value.
4. When measurements are very near to each other, it shows ..... .

Task 4:

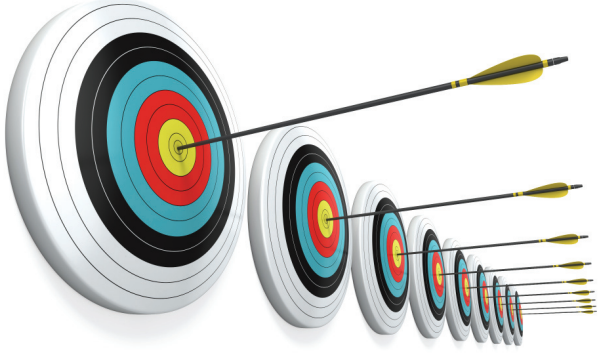
Work in pairs. Ask and answer the following questions about measurement:

What's the difference between precision and accuracy?

Precision is.... but accuracy is....

What's the difference between vectors and scalars?

Scalars have..... but vectors have ...



MECHANICS AND KINEMATICS 1

KEYWORDS: **displacement** **speed** **velocity** **acceleration**

Today, Khalid is learning about the terms related to **Kinematics**.
Read and listen to the lesson, then do the activities that follow.

Kinematics is the study of motion without being concerned with the forces that cause the motion.

The speed of an object tells us how fast an object is travelling and we calculate it using:

speed = distance ÷ time

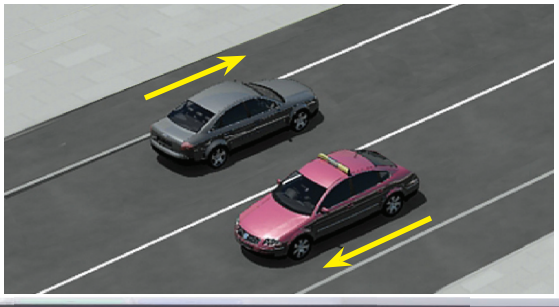
Displacement can be defined as vector quantity which is the length of the shortest path connecting the point where a body starts to move and the point where the body finally reaches.

Here the distance travelled is 200m, but the displacement is 120m!

Both speed and velocity tell us how fast something is travelling. As velocity is a vector, it tells us what direction the object is travelling in.

$$\text{Velocity (m/s)} = \frac{\text{displacement change (m)}}{\text{time taken (s)}}$$

For example, two cars are travelling at 30 m/s along the same road but in opposite directions:
One of the cars has a velocity of +30 m/s
The other car has a velocity of −30 m/s (note the units!)

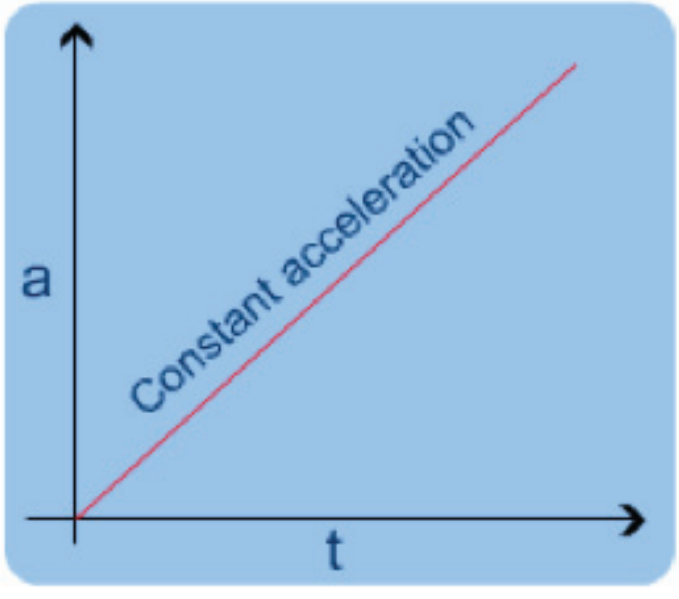


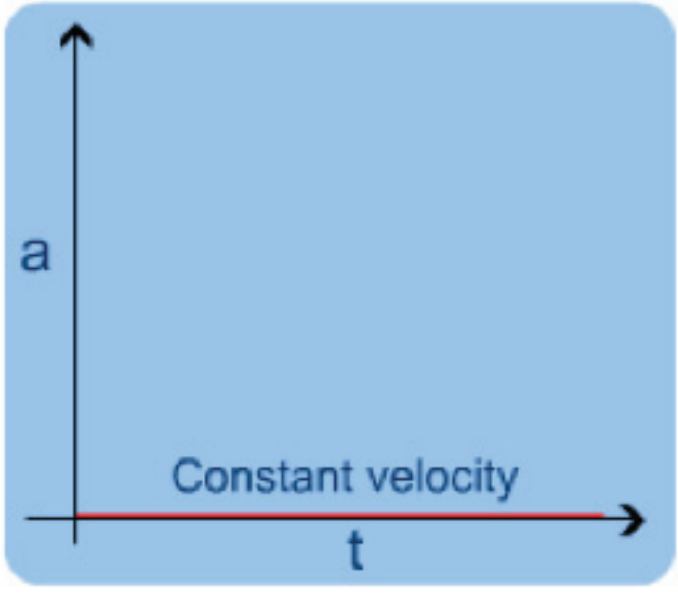
Yes Sir, but what about acceleration?

Acceleration tells us how rapidly something is changing velocity, for instance, the change in velocity in unit time.

Deceleration is the same thing, but has a negative sign. This is when the velocity is decreasing.

Let us look at some graphs, this will help us understand better.





The y axis, represents acceleration, a, and the x axis t represents time (t).

Constant acceleration means getting faster and faster at a uniform rate.

This equation shows the relationship between acceleration, change in velocity and time taken:

$$\text{acceleration (metres per second squared)} = \frac{\text{change in velocity (metres per second)}}{\text{time taken (second, s)}}$$

For example, a car accelerates in 5s from 25m/s to 35m/s.

Its velocity changes by 35 - 25 = 10m/s.

So, its acceleration is $10 \div 5 = 2$ m/s^2 . (note the units!)

Task 1: **Work out the speed in each of the following situations.**

a) A mouse runs 20 m in 3 seconds.

.....

b) A man runs 100 m in 10 seconds.

.....

c) A car reverses 50 m in 10 seconds.

.....

d) A plane flies 90 m in 1 second.

.....

e) A frog jumps 27 m in 9 seconds.

.....

Slowest animal...

.....

.....

.....

.....

.....

.....

.....

.....

Task 2:

Write the names of the animals/objects in task 1, start with the slowest one at the top of the list.

Task 3:

Put the following in order, starting with number 1 being the highest possible acceleration:

Object	Lorry	Jet plane	Sprinter	Motorbike	Beetle
Picture					
Order					

Task 4:

What does the acceleration of an object tell us about the object?

.....

Task 5:

What are the units for acceleration?
Choose the correct answer from this list.

m/s m/s² N.

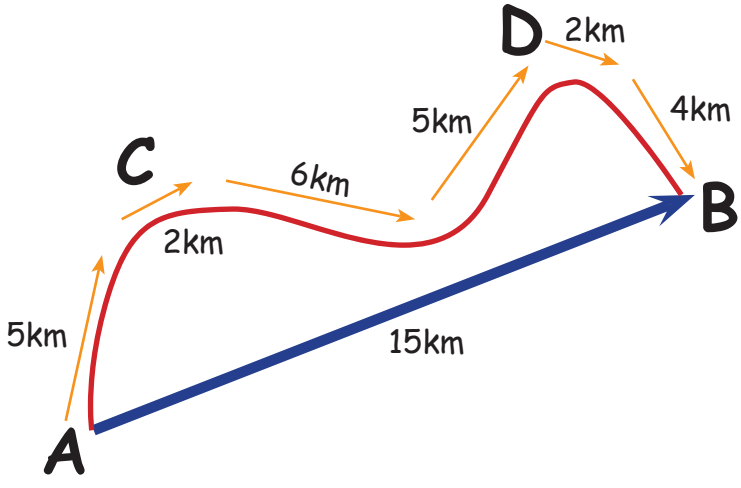
Task 6:

A car accelerates from rest to 30 m/s in 15 s.
What is its acceleration?

- ○ 45 m/s²
- ○ 450 m/s²
- ○ 2 m/s²

Task 7:

Look at the following diagram. Use the letters to describe what the displacement is, and state the distance travelled.



	Journey	distance
The distance travelled is		
The displacement is		

MECHANICS AND KINEMATICS 2

KEYWORDS: **force** **equilibrium** **resultant** **friction** **viscosity** **static** **dynamic** **coefficient of friction**

Today, Mohammed is learning about the terms related to **Mechanics**. Read and listen to the lesson, then do the activities that follow.

Some of the terms are simpler, so we will cover them first.

A **force** can be a push or a pull. You cannot see a force but often you can see what it does. Forces can change the speed of something, the direction it is moving in or its shape. For example, an elastic band gets longer if you pull it. Forces can cause **deformation** in objects. If you look at the football, it is being deformed due to the force of the kick.

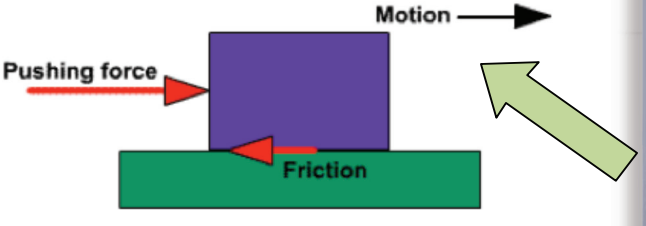
Forces acting on an object can be added together to give a resultant force. Where they are the same and in opposite directions, the object will be in equilibrium.

Example 1

Equilibrium Force #1 = 1

Example 2

Non-equilibrium Force #1 = 2



Rubbing causes **friction**. It can be the surfaces between two solids rubbing, a solid surface and a liquid or a gas, etc. Anything! Whenever an object moves against another object, it feels frictional forces. These forces act in the opposite direction to the movement. Usually, friction makes it harder for things to move.

There are two forms of friction, dynamic and static.

If you try to slide two objects past each other, a small amount of force will result in no motion. The force of friction is greater than the applied force.

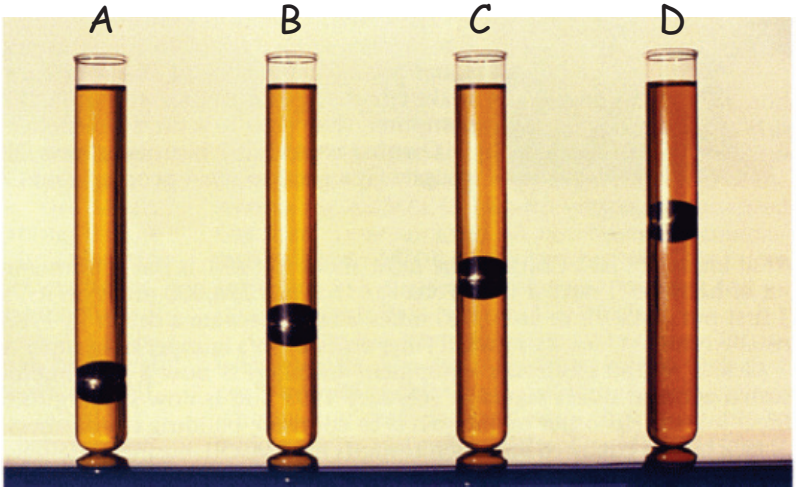
This is **static friction**. If you apply a little more force, the object "breaks free" and slides, although you still need to apply a force to keep the object sliding. This is **dynamic friction**. You do not need to apply quite as much force to keep the object sliding as you needed to originally break free of static friction.

Viscosity is a measure of the resistance of a fluid which is being deformed. It is the "thickness" or "internal friction". Water is "thin", having a lower viscosity, while honey is "thick", having a higher viscosity. The lower viscous the fluid is, the greater its ease of movement (fluidity).

Related to this, is the **coefficient of friction**. The coefficient of friction is a number which represents the friction between two surfaces. Between two equal surfaces, the coefficient of friction will be the same. The symbol usually used for the coefficient of friction is ? The rougher the material, the higher the number is.

Task 1:

Identical steel balls were dropped into test tubes (A, B, C, D) with different oils. The time taken for the ball to drop depends on the viscosity. Which oil is the MOST VISCOUS?



Task 2:

Match the two parts to make correct sentences. Draw lines.

1 A force is	a) they will not change the way it is moving.
2 If balanced forces act on an object	b) the shape of an object, or the way that it is moving.
3 A force can change	c) a push or a pull.
4 Forces are measured	d) each other out.
5 Balanced forces cancel	e) in Newtons (N).
6 Balanced forces are the same size	f) but act in opposite directions.

Task 3:

For each of the following diagrams:

a) calculate the unbalanced force

b) say if the direction of the force is to the right, left, up or down.

1

a) .....

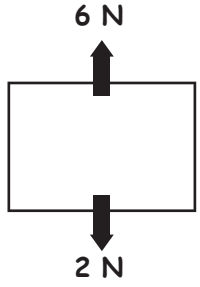
b) .....

2

a) .....

b) .....

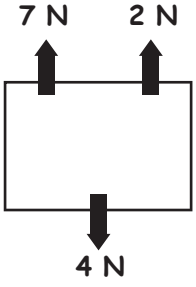
3



a) .....

b) .....

4



a) .....

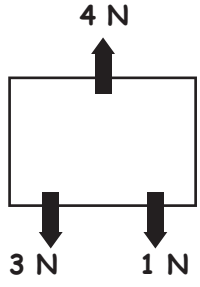
b) .....

5

a) .....

b) .....

6



a) .....

b) .....

Task 4:

Match the two boxes to make correct sentences. Draw lines.

1 When a force acts on an object . . .	a) . . . the object will remain stationary.
2 If no force acts on a stationary object . . .	b) . . . the object will decelerate.
3 If a force acts in the opposite direction to the movement of an object . . .	c) . . . the object will accelerate in the direction of the force.
4 If no force acts on a moving object . . .	d) . . . the object will continue at a steady speed.

Task 5:

Answer the following questions:

1 What is friction?

2 What are the units that friction is measured in?

3 In which direction does friction always act?

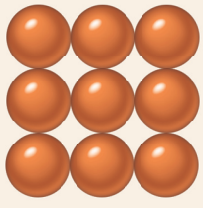
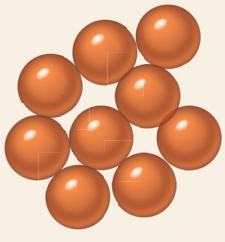
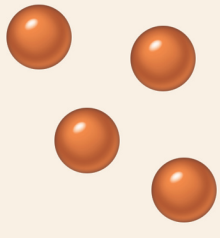
4 What causes friction?

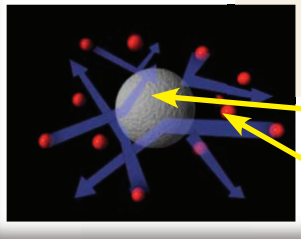
PROPERTIES OF MATTER 1

KEYWORDS: kinetic particle model, expand, freezing, melting, boiling, evaporation, Brownian motion, contract

Dr Hassan is explaining to Khalid the **Properties of Matter**.
Read and listen to the lesson, then do the activities that follow.

Diagram of particle arrangement and movement:

	Solid	Liquid	Gas
Arrangement of particles	close together regular pattern	close together random	far apart random
Movement of particles	vibrate about a fixed position	move around each other	move quickly in any direction
Diagram			



Pollen grain or smoke particle moving around.

Gas Atoms

Now, the **kinetic particle model** explains the properties of the different states of matter. The particles in solids, liquids and gases have different amounts of energy. They are arranged differently and move in different ways. Look at the table

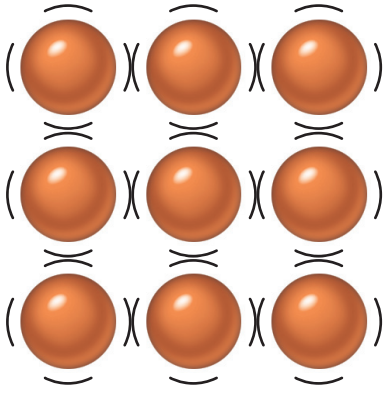
Who is Mr. Brown we sometimes hear or read about?

Ah! About 150 years ago a botanist, Robert Brown, observed pollen grains moving in a random way under his microscope. You can see the same effect with smoke today. We call it **Brownian motion**.

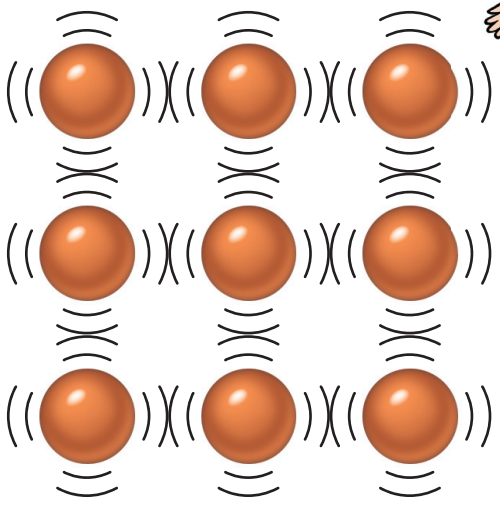
It was explained that the movement was due to collisions between the pollen and millions of smaller (and therefore invisible) gas atoms.

When objects are heated, they expand and when they are cooled, they contract. The particles in a solid start moving more and need more space.

COLD



HOT



In a gas, the particles move around more with more energy. In a liquid, they also start moving around more and need more space.

When a solid gets more and more hot, it turns into a liquid. We call it **melting** – like chocolate does!

When we heat a liquid and it turns into a gas, we call it **boiling**. This is the process of **evaporation**

When we make liquid very cold, it turns into a solid, We call it **freezing**.

Task 1:

Tick the correct answer. What happens to the particles when a piece of chocolate is heated up?

- ○ they get bigger
- ○ they get smaller
- ○ they move around more

Task 2:

Tick the correct answer. What happens to a bar of steel when it is cooled down?

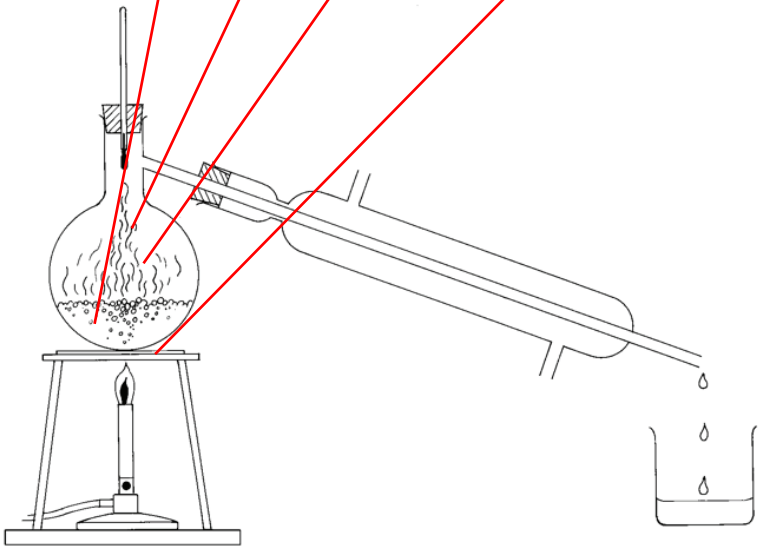
- ○ it gets longer
- ○ it gets shorter
- ○ it stays the same length

Task 3:

Use the following words to label the diagram with arrows.

liquid gas boiling expanding

Circle where evaporation is taking place, write evaporation next to the circle.



Task 4:

Word Search: find the words below

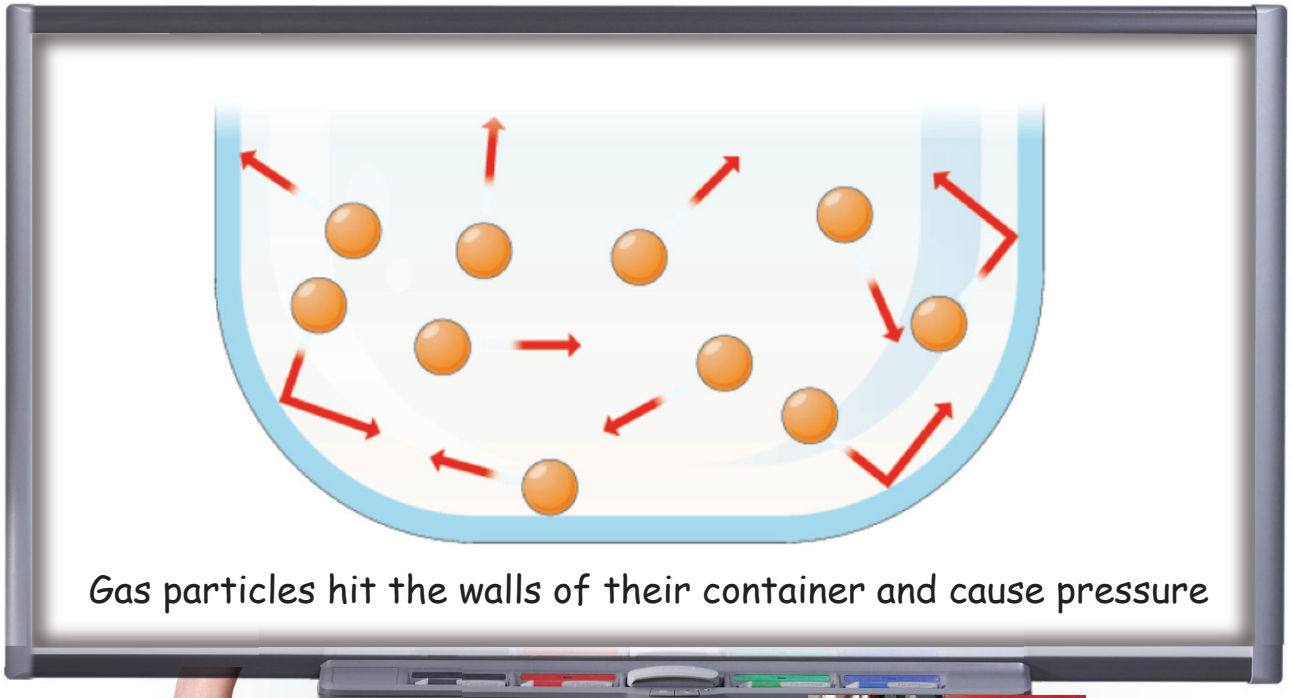
BOILING
BROWNIAN
CONTRACT
EVAPORATION
EXPANSION
FREEZING
KINETIC
MELTING
MODEL
MOTION
PARTICLE

U	C	A	P	P	G	G	O	J	P	N	F	I	H	J
G	O	I	J	A	N	K	U	I	O	G	R	O	F	P
U	W	U	T	I	R	U	S	I	S	O	E	T	K	P
J	Z	U	L	E	C	T	T	X	B	N	E	X	Y	E
M	A	I	R	A	N	A	I	R	I	T	Z	C	D	A
W	O	M	D	T	R	I	O	C	P	P	I	Z	T	F
B	G	Q	F	O	T	W	K	Y	L	W	N	W	A	V
M	E	X	P	A	N	S	I	O	N	E	G	M	J	G
V	O	A	Z	I	M	O	T	I	O	N	S	D	O	N
S	V	D	A	S	O	Z	L	S	G	E	N	X	O	I
E	T	N	E	N	A	M	O	O	U	T	H	E	A	T
C	L	E	O	L	W	T	C	A	R	T	N	O	C	L
W	W	X	W	Z	M	Q	K	Q	X	I	Q	G	Q	E
W	C	V	Y	Q	R	U	M	H	M	L	R	O	I	M
D	Z	L	H	P	Z	Q	L	G	U	A	B	F	U	T

PROPERTIES OF MATTER 2

KEYWORDS: **pressure** **density** **upthrust** **weight**

Mrs Hessa is explaining more about the **Properties of Matter**.
Read and listen to the lesson, then do the activities that follow.



Gas particles hit the walls of their container and cause pressure

Have you ever squeezed a balloon and felt it push back? Have you ever seen a flat tyre? It has hardly any pressure inside it.

Bumping particles

The particles in gas move quickly in all directions, but they don't get far before they bump into each other or to the walls of their container. When gas particles hit the walls of their container, they cause pressure. The more particles that hit the walls, the higher the **pressure**. This is why the **pressure** in a **tyre** or a balloon goes up when more air is pumped in.

Heating increases pressure

If a gas is heated up, its particles move around more quickly. They hit the walls of their container harder and more often. This increases the pressure. Sometimes the pressure gets so great that the container bursts. This is why balloons and tyres burst if you blow them up too much.

Weight is not the same as mass. The mass of a given object is the same everywhere, but its weight can change. The weight depends on the mass of the object and the strength of the gravitational field around it.

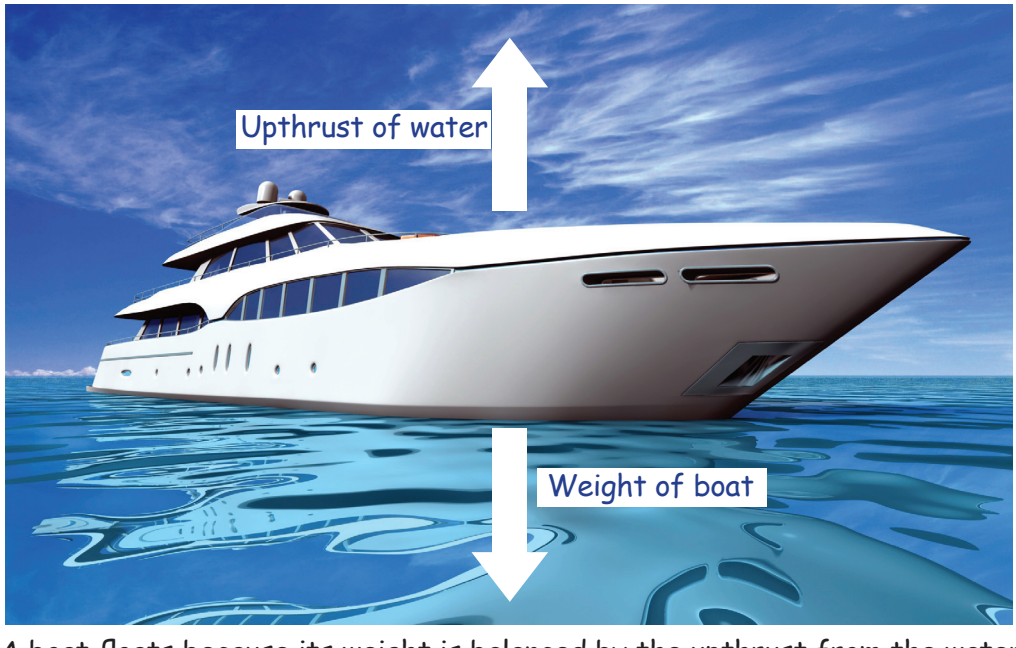
Weight = Mass x Gravitational pull- On earth it is 10m/s^2

The MASS of an object is connected to its VOLUME and DENSITY.

Mass = Density x Volume!

Floating in water

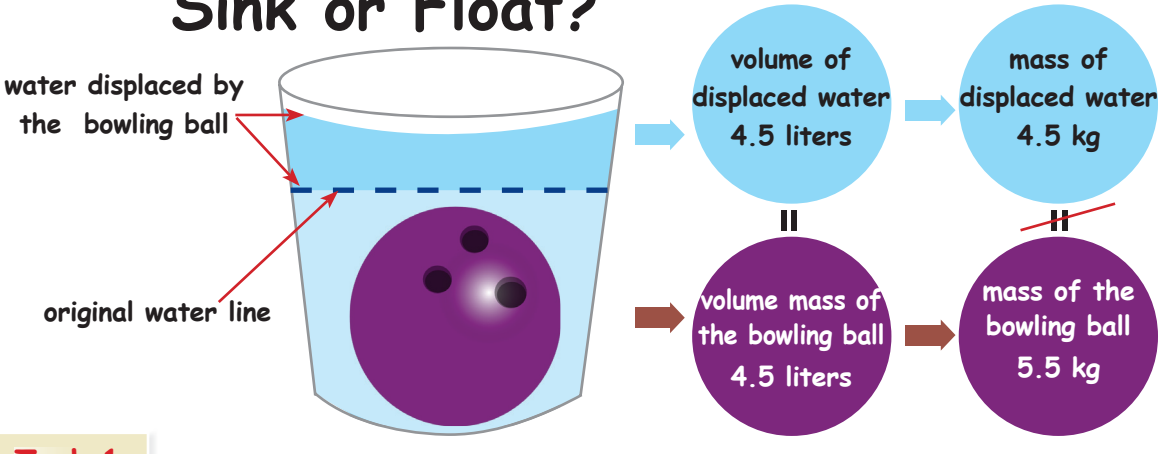
Objects float in water when their weight is balanced by the upthrust from the water. The object will sink until the weight of the water it pushes out of the way is the same as the weight of the object.



A boat floats because its weight is balanced by the upthrust from the water

Think about this:

Sink or Float?



The bowling ball is completely submerged in the water, thus the ball displaces a volume of water equal to the volume of the bowling ball. The mass of the bowling ball is greater than the mass of the displaced water.

Task 1:

Choose the correct answer.

1 What is the unit of force called?

- ○ the Newton, n
- ○ the Newton, N
- ○ the Neutron, N

2 Why does an astronaut weigh less on the moon than on the earth?

- ○ the moon has no atmosphere.
- ○ the moon has no gravity.
- ○ the force of gravity is weaker on the surface of the moon than on the surface of the earth.

3 What is the weight of a 20 kg box on the earth?

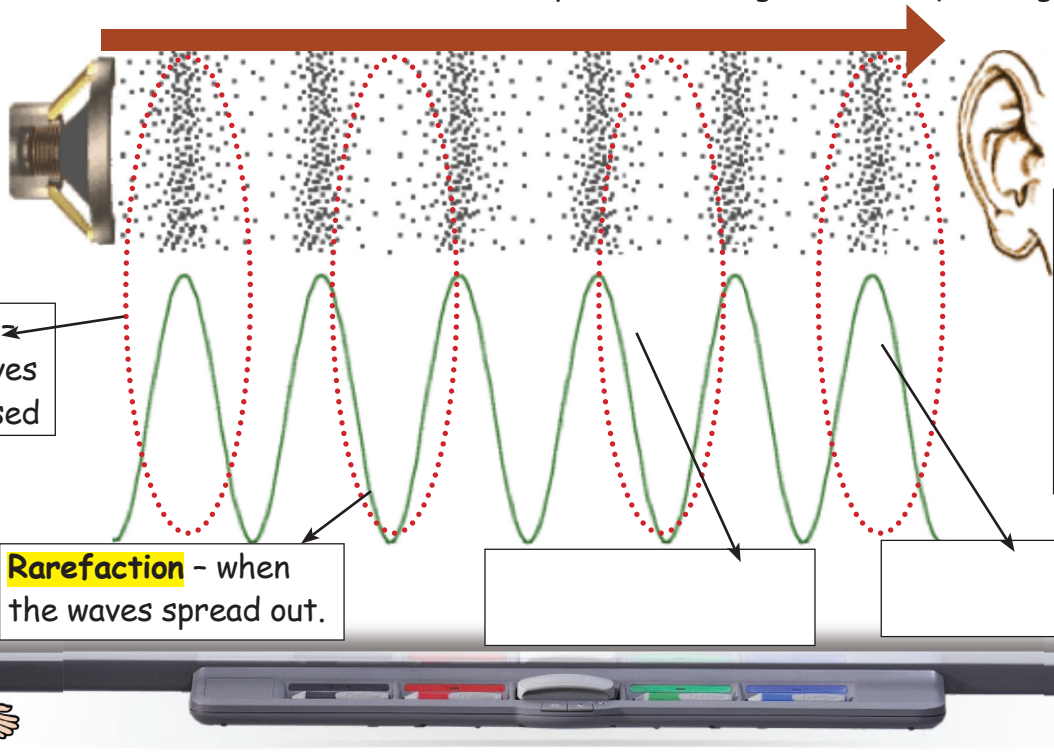
- ○ 2 N
- ○ 20 N
- ○ 200 N

WAVES

KEYWORDS:				
	longitudinal	transverse	radiation	compression
	pitch	amplitude	frequency	eardrum

Today, Dr, Hassan is teaching Khalid and Jassim about **waves and sound waves**.
Read and listen to the lesson, then do the activities that follow

Sound waves are **longitudinal** waves. Their vibrations occur in the same direction as the direction of travel. Sound waves can only travel through a solid, liquid or gas.



Compression – when the waves are compressed

The Ear – the **ear drum** vibrates and sends the vibration to be processed by the brain.

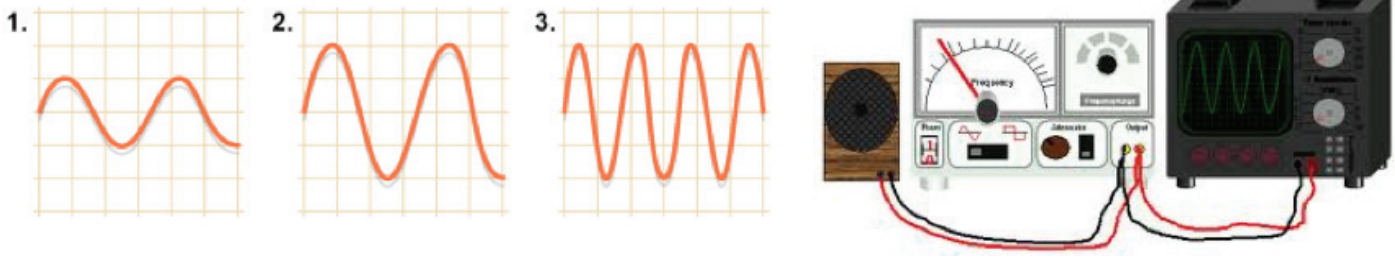
Rarefaction – when the waves spread out.

Sound waves are **longitudinal** waves that must pass through a **medium**. Echoes are reflections of sounds. Light and other forms of **electromagnetic waves** travel as transverse waves. These waves can travel through a vacuum, and they all travel at the same speed in a **vacuum**. Can you label the other parts of the wave?

Vibrations

When an object or substance vibrates, it produces sound:
the greater the **amplitude**, the **louder the sound**;
the greater the **frequency**, the **higher the pitch**.

These diagrams show snapshots from oscilloscope traces of three sounds.



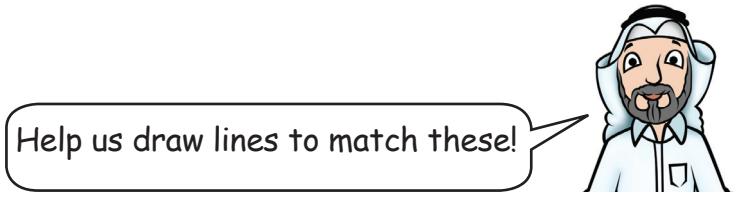
Sounds 1 and 2:

- the sound waves have the **same frequency**, so the sounds have the same pitch
- sound 2 has a **greater amplitude** than sound 1, so sound 2 is **louder**.

Sounds 2 and 3:

- the sound waves have the **same amplitude**, so the sounds have the same loudness
- sound 3 has a **greater frequency** than sound 2, so sound 3 is **higher pitched**.

Task 1:



1 longitudinal	a) When the waves are tight together
2 compression	b) Sound waves travel like this
3 rarefaction	c) When the waves are spread out
4 frequency	d) When we change this, we change the pitch

Task 2:

1. Light waves are, ... waves.

   a) amplitude b) longitudinal c) transverse

2. Where sound waves come close together, we call it ..... .

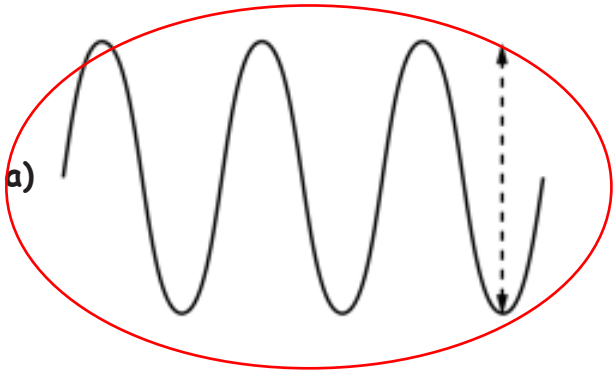
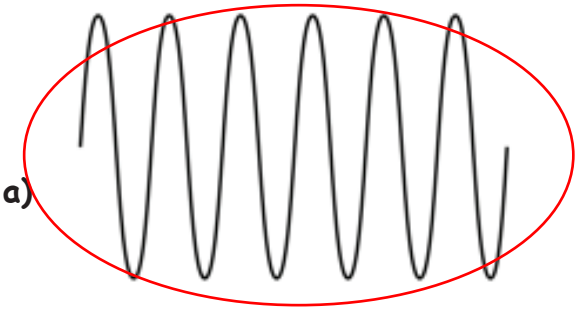
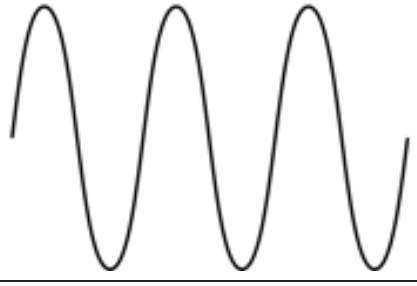
   a) frequency b) compression c) longitudinal

3. ..... can't travel through a vacuum.

   a) Transverse waves b) Light c) Longitudinal waves

Task 3:

Circle the diagram you think is correct.

1) Which one has a larger amplitude?	2) Which wave has a higher frequency?
a) 	a) 
b) 	b) 

Corrections

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