دولة قطر

المجلس الأعلى للتعليم
SUPREME EDUCATION COUNCIL
هيئة التعليم

SCIENTIFIC ENGLISH

MATHEMATICS AND SCIENCE

GRADE 9

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.

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SCIENTIFIC ENGLISH

MATHEMATICS

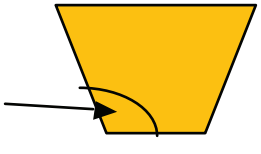
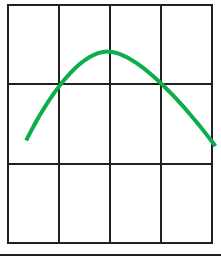
GRADE 9

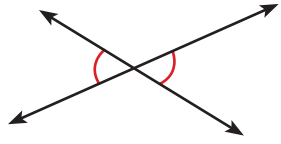
REVIEW

Task 1: Can you remember the keywords from below?

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

interior angle | vertically opposite angles | line graph | tally chart | data | median | range | statistics | sample | survey

	KEYWORD	MEANING	PICTURE or EXAMPLE
1		To count in groups of five.	Item / Tally / Total: car / 𝍸 \ / 6
2		An angle inside a shape	
3		A collection of facts and numbers.	4, 18, 6, 35, 27, 16
4		This graph uses points connected by lines to show data.	
5		The middle mark in a set of data.	1 2 3 4 5

	KEYWORD	MEANING	PICTURE or EXAMPLE
6		The difference between the highest and lowest numbers	2,4,6,8,10 10 – 2 = 8
7		We use a few people but not the whole group	6 students in our class.
8		We collect information or ask many people some questions.	1. QUESTION: 2. QUESTION:
9		Getting information from numbers – surveys and questionnaires.	TOYOTA 16 BMW 12 SUZUKI 6
10		Angles that are opposite each other	

Task 2: MATCHING

Help us draw lines to match the words with their correct meanings.

1	Expression	a)	A line that goes up and down.
2	Coordinates	b)	A line that goes from left to right through zero.
3	Terms	c)	Two lines that stay the same distance apart.
4	Variable	d)	To form a right angle where two lines meet.
5	Origin	e)	A line that is parallel to the floor.
6	Vertical	f)	Gives us the exact position on a graph or grid.
7	Parallel	g)	Has numbers, variables and signs
8	Perpendicular	h)	Where the x-axis and y-axis intersept.
9	Horizontal	i)	Numbers or letters separated by + or – signs.
10	X- axis	j)	A letter that takes the place of a number.

Task 3: MULTIPLE CHOICE!

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

1. The power and ..... mean the same thing.

   a) exponent b) numbers c) base

2. We use the ..... sign to show a square root.

   a) equals b) greater than c) radical

3. We use time and distance to show .....

   a) height b) length c) speed

4. The measure across the circle through the centre is the .....

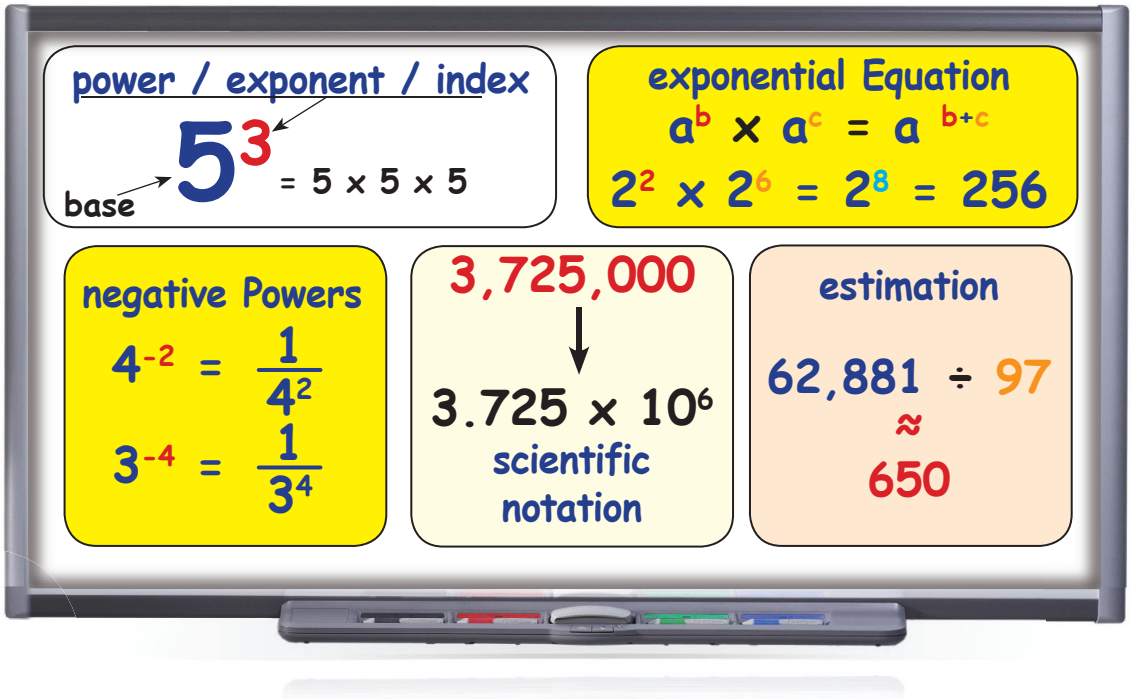
   a) circumference b) diameter c) radius

5. The shape ..... has eight sides.

   a) octagon b) hexagon c) pentagon

INDICES

KEYWORDS: base, power/index/exponent, negative power, scientific notation, estimation, exponential equation



The **base** is the number you use as a factor index form.

Exponent, **index** and **power** all mean the same thing. They tell you how many times to use the base as a factor.

What is an exponential equation?

An **exponential equation** is a non-linear equation. It has exponents. Did you know that powers, or indices, or exponents can be positive or negative?

Yes. Since positive and negative are opposites, with a positive power, you must do repeated multiplication. But with a **negative power**, you do repeated division.

This isn't hard. Just invert the number and change the sign to a positive. When could we use **scientific notation**?

That is easy! **Scientific notation** helps us write numbers that are very large or very small. We write the number as a product of a number between 1 and 10 and a multiple of 10.

Is **estimation** just a wild guess?

No. When you **estimate** an answer, you use calculations to find a value that is close enough to the right answer.

Task 1:

Use the words from the box below to complete each sentence

power	base	negative power	scientific notation
estimation	exponential equation		

1. In the expression 4^{-2}, the small number next to the base is a ....
2. You must know the properties of powers to solve an ....
3. .... is a way of writing very large or very small numbers.
4. We can make a close guess to the answer of a problem using ..... .
5. If I say eight to the power of four, you know that eight is the ..... .
6. Exponent and index are other words for a ..... .

Task 2:

Write or draw an example of your own for each term. Explain your work to a partner.

negative power	exponential equation	index number
estimation	**base**	**scientific notation**

Task 3:

Draw lines to match the words with the pictures or examples.

1. index or power
2. negative power
3. exponential equation
4. estimation
5. scientific notation

a) 4^{-2}

b) $6x^2 + 13x + 6 = 0$

c) 5^3

d) $375 \div 18 \approx 19$

e) 3.658×10^5

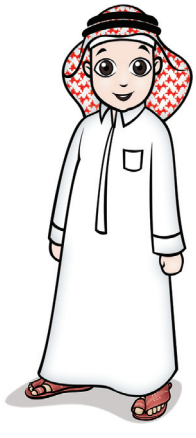
TODAY'S MATHEMATICS KEYWORDS

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.

base power / index / exponent negative power
scientific notation estimation exponential equation

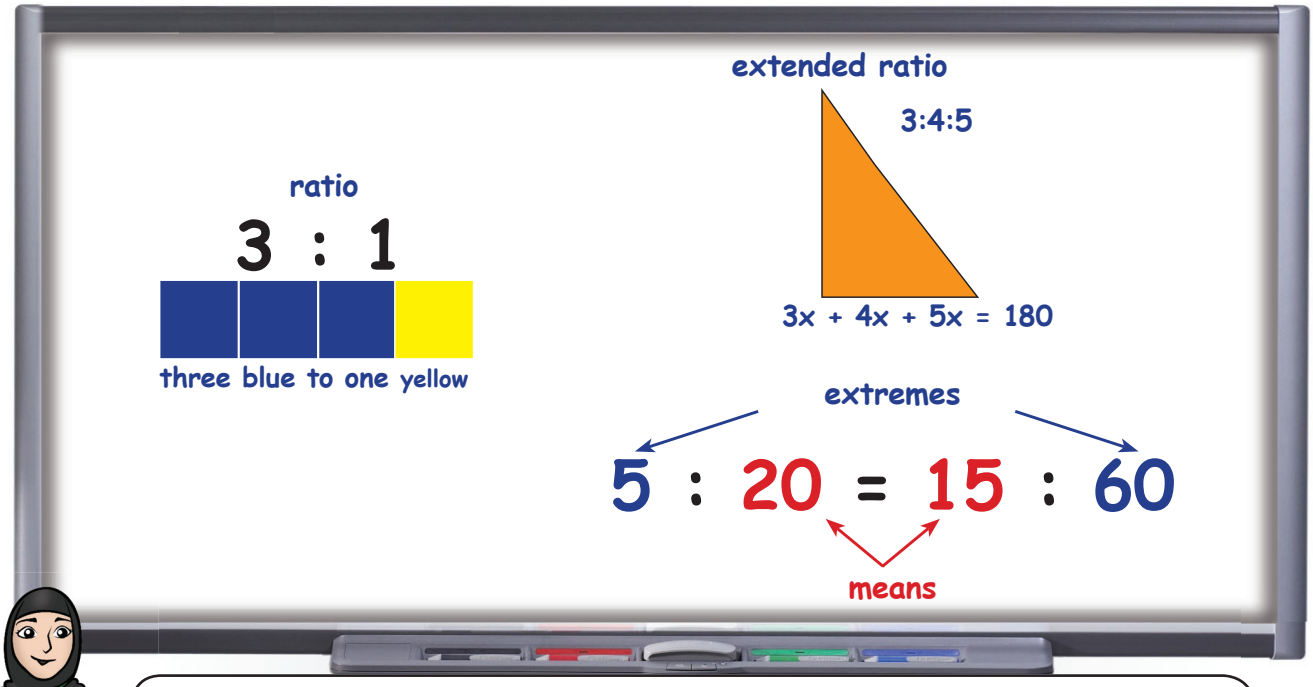
KEYWORD	MEANING	PICTURE or EXAMPLE
	This helps us to write numbers that are very large or very small.	
exponential equation		
	A mental method like rounding to get close to the correct answer.	
		2^{-4}

KEYWORD	MEANING	PICTURE or EXAMPLE
base		
	What three names tell you how many times to use the base as a factor.	



RATIO AND PROPORTION

KEYWORDS: ratio proportion means extremes extended ratio constant of proportionality



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. The **constant of proportionality** is the unit rate.

In a **proportion**, when we write the **ratios** with a colon (:), the outer terms are called the **extremes**. The inner terms are the **means**. Look at the board.

Sometimes you compare more than two quantities in a ratio. We call that an **extended ratio**. **Extended ratios** are used very often in geometry problems like the one on the board.

Task 1:

Use the words from the box below to complete each sentence.

ratio	proportion	means	extremes	extended ratio
constant of proportionality				

1. In the proportion 3:4 = 12:16 the numbers 3 and 16 are the ..... .
2. An .... compares three or more quantities.
3. 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)
4. The inner terms in a proportion are called the ..... .
5. We can solve problems for missing information in Algebra with a ..... showing two equivalent ratios.
6. The unit rate is the ..... .

Task 2:

Draw lines to match the terms in the proportion 3:4 = x:20

3:4 = x:20	extremes
only **3** and **20** in the example above	proportion
only **4** and **x** in the example above	ratio
3:4	means
2:3:4	extended ratio

Task 5: **PUZZLE TIME!**

Complete the crossword puzzle.

Across

3) Shows the relative sizes of two or more values.

5) An .....ratio can compare more than two values.

Down

1) Two ratios are equal to each other.

2) The inner terms of a ratio.

4) The outer terms in a ratio.

TODAY'S MATHEMATICS KEYWORDS

Complete the table. Fill in all blanks in all columns: keywords, meaning, picture or example.

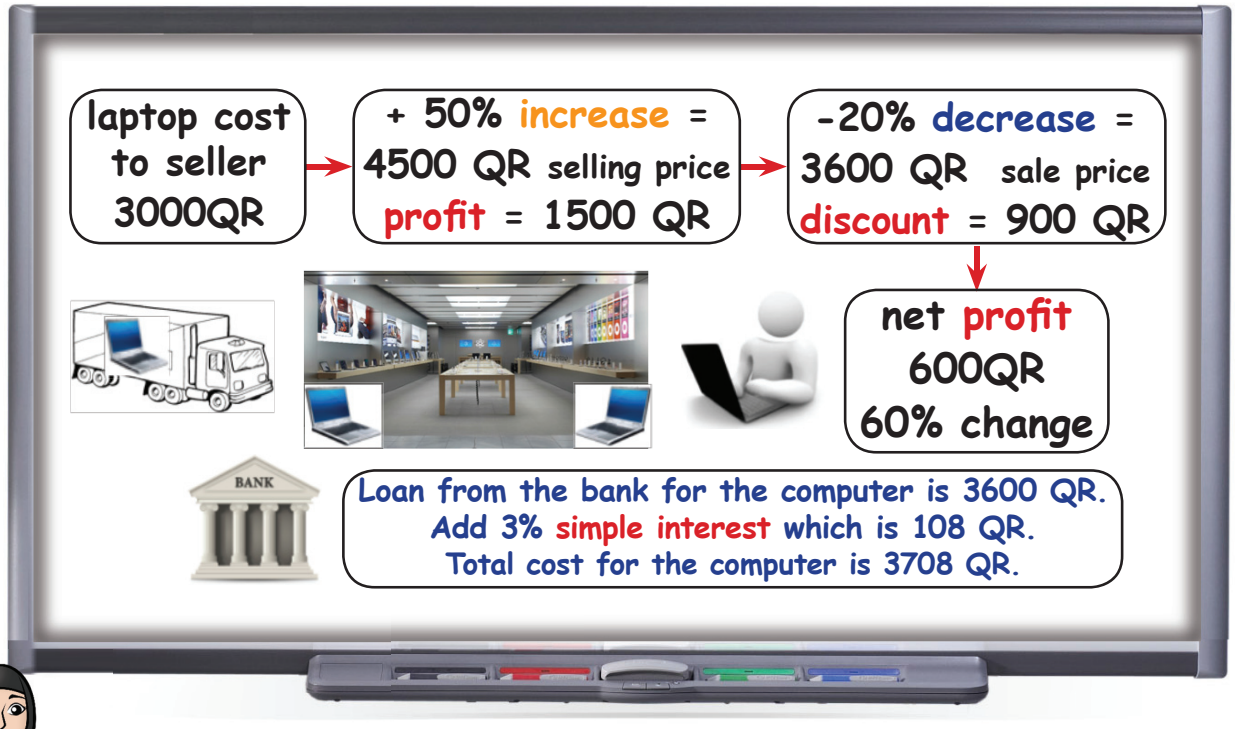
ratio proportion means extremes extended ratio constant of proportionality

KEYWORD	MEANING	PICTURE or EXAMPLE

KEYWORD	MEANING	PICTURE or EXAMPLE

PERCENT

KEYWORDS: percent, percent of change, percent of increase, percent of decrease, profit, discount, simple interest



Good morning, students. Today's lesson is about **percent of change** when buying things.
Sheikha, please remind us what you are selling.

Yes, Mrs. Aisha. I sell computers. My cost for one laptop is 3000QR. I add 50% **increase** to the cost so, I can make a **profit** of 1500 QR.

Thank you, Sheikha. I want to buy a computer but 4500 QR is too much. Maybe I can get a **discount**.

Yes, Maha, this computer has been in the store for months so, we will **decrease** the price by 20%.

I only made a **profit** of 600QR. That is still a 60% change, and I still made a profit.

Wow! The price is only 3600QR. I can borrow that from the bank and they will only charge 3% **simple interest**. So my cost will be 3708 QR.

Task 1: MULTIPLE CHOICE!

Choose the correct answer.

1. When a ..... is given then the profit is decreased.

   a) simple interest b) discount c) percent of increase

2. The bank charges added to the money borrowed is the ....

   a) percent of change b) percent of decrease c) simple interest

3. When a profit is added to an item, this is called the .....

   a) percent of increase b) profit c) simple interest.

4. In a sale a store is likely to give a ....

   a) simple interest b) percent of change c) percent of decrease

5. The purpose of buying and selling is for the seller to always make a .....

   a) profit b) percent of decrease c) discount

Task 2:

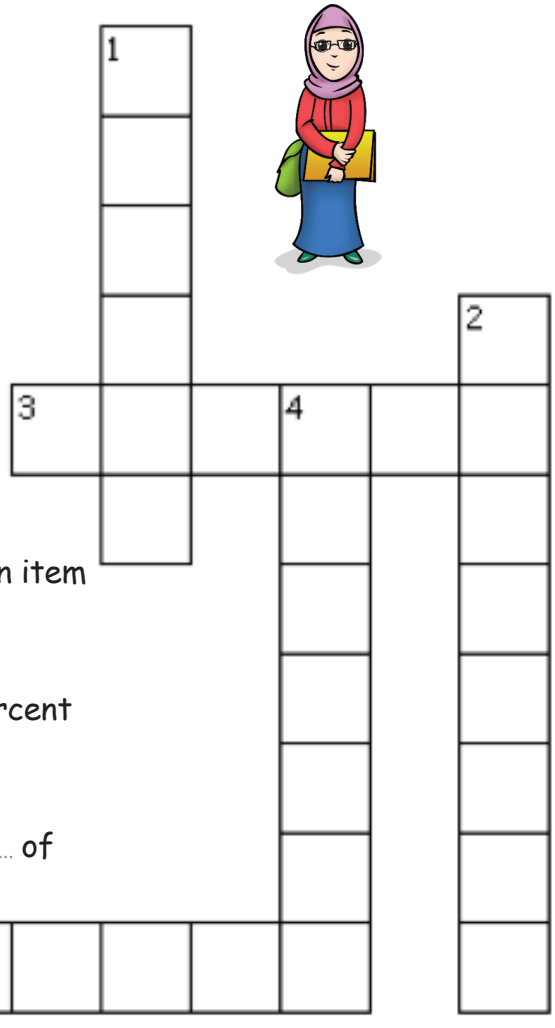
Use the words to help me fill in the blanks.

percent of change	discount	percent of decrease
simple interest	percent of increase	profit

1. The amount added to the cost is the ..... .
2. You can calculate the profit as a ..... of ..... .
3. The bank adds a .... to the amount you borrow.
4. You can calculate a ..... as a ..... of .....
5. When a price is changed, the difference in price can be calculated as a ..... of ..... .

Task 3: PUZZLE TIME!

Help Maha to complete this crossword.



Across

3) A set interest rate is called ..... interest.

5) A percent taken off the price is called ..... .

Down

1) The amount of money made after selling an item is called ..... .

2) The amount an item is reduced is called percent of ..... .

4) The amount of loss or profit. ..... of change.

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.

simple interest discount profit percent of change
percent of increase percent of decrease

KEYWORD	MEANING	PICTURE or EXAMPLE
	Bank charges added to money borrowed.	
		
	An amount taken off the price.	

KEYWORD	MEANING	PICTURE or EXAMPLE
percent of increase		
		 I made 1500QR when I sold this boat.
percent of change		




ALGEBRA

KEYWORDS: term variable constant expression equation common factor coefficient

Terms in algebra

A **common factor** goes into BOTH numbers. 4 is a common factor of 12 and 8.

equation ⟶ $3y+2=10$

constant: 2, 10 variable: y coefficient: 3

Today, we are going to revise some of the important algebra words you have learned. Look at the board. Tell me about the **equation** $3y+2=10$, Khalid. Why is it an **equation**?

Yes, Sir. It's an **equation** because it has an equal sign. A term is a number, letter or a number with a letter. The **variable** is a letter, so that's y, and the **constants** are the numbers, 2 and 10.

What is a coefficient, Mohammed?

The **coefficient** is the number before the variable. We multiply the variable by the coefficient. Terms without an equal sign are an **expression**, like 3y+2. When we solve the problem, we find the value of the variable.

Task 1:

Work in pairs. Look at the terms in the equation: 6x + 4y = 12
Are the sentences TRUE or FALSE? If they are FALSE, say why.

1. This is an expression. **TRUE** **FALSE.**
2. There are three constant terms. **TRUE** **FALSE**
3. The coefficients are 12 and 4. **TRUE** **FALSE**
4. 2 is a common factor for all these terms. **TRUE** **FALSE**
5. There are three variable terms. **TRUE** **FALSE**

Task 2: MATCHING.

Draw lines to match the definitions with the numbers.

1. An expression with only constant terms.
2. An expression with a variable term and a coefficient.
3. An expression with two variable terms and two coefficients.
4. An equation with variable terms and constant terms.

a) 2x

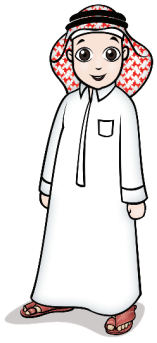
b) 3x + 3y

c) 4 + 4

d) 5x + 5y = 5 + 10

Task 3:

Choose the correct word to complete the sentences below:



1. A constant term is a ..... . It has a fixed value.
   a) letter b) number c) sign
2. A coefficient is a ..... which multiplies a variable term.
   a) letter b) number c) sign
3. A/An ..... can divide two or more numbers exactly.
   a) common factor b) inverse operation c) coefficient

Task 4:

Work in pairs. Use these jumbled letters to make a question and then answer it.

T A W H S I A C O M N O M

C O A T R F O F T H E S E N C I O F F C I E T

N I S I H T S X S O R P E I N E ?

9x+15y

Answer: ..... .

Task 5: LET'S TALK!

Work in pairs. Ask and answer these questions about the words we studied today.

How is an equation different from an expression?

What are variable terms?

What is a common factor?

I know! An equation has.....

They are ..

It is a number that...

Task 6: PUZZLE TIME!

Work in teams. Complete this crossword about the terms in the box! Remember not to look back.

10x+15y=35

Across

4) The common factor is .....

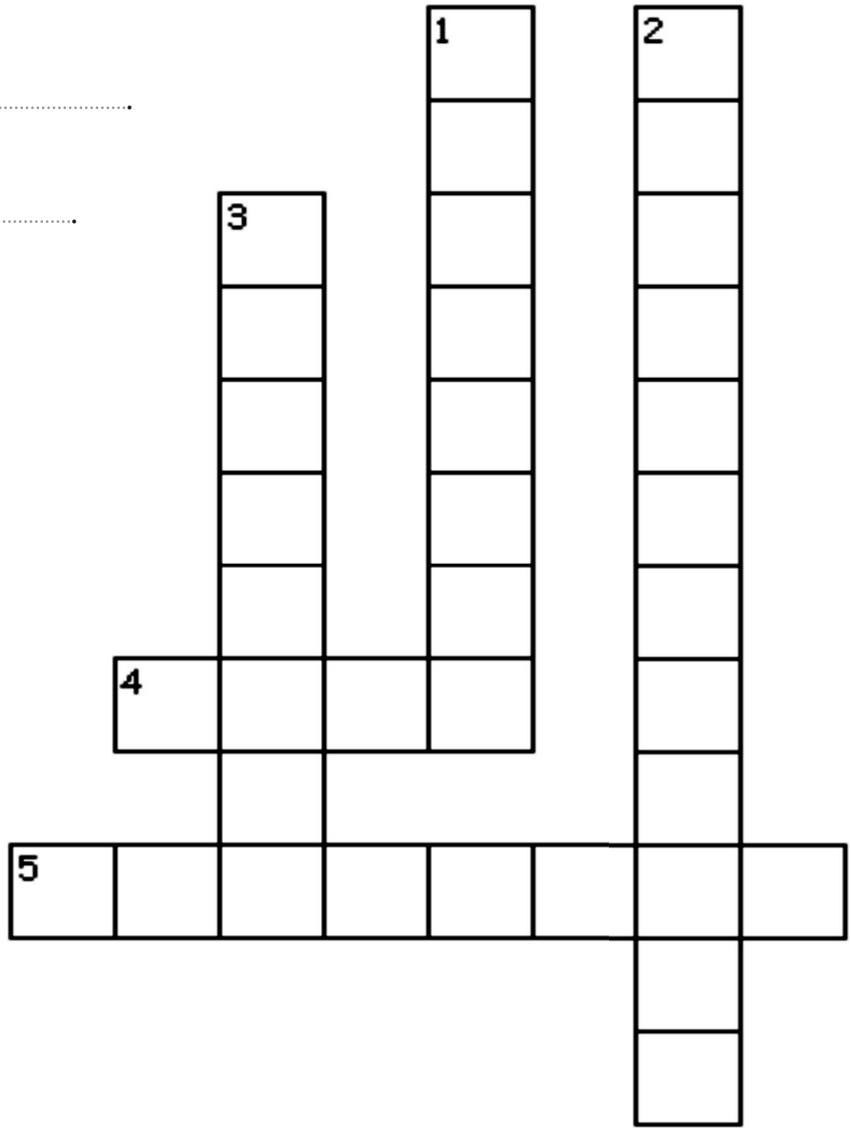
5) 35 is a ..... term.

Down

1) y is a ..... term.

2) 10 and 15 are .....

3) This is an .....



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.

variable terms constant terms expression equation
common factor coefficient

KEYWORD	MEANING	PICTURE or EXAMPLE
	Terms without an equal sign.	
	A number with no coefficient.	
expression		
	A letter that represents an unknown value.	x or y

KEYWORD	MEANING	PICTURE or EXAMPLE
		$3y + 2 = 10$
common factor		

ALGEBRAIC EXPRESSIONS

KEYWORDS: algebraic term, algebraic expression, monomial, binomial, expand/expansion, factor/factorize/factorization, common factor

Today Mohammed and Rashid are learning about **algebraic expressions**. Read and listen to the lesson. Then do the activities.

algebraic expression:
numbers (20, 16) letters (x, y) and signs (+ , -)

$16x + 20y$

ONE term = monomial (mono = 1)
TWO terms = binomial. (bi = 2)

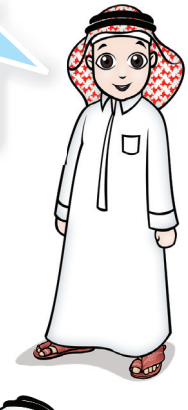
common factor: a number that divides 2 or more other numbers exactly. The common factors here are 2 and 4.

expand: take away the brackets → $x^2 - 5x + 6$

$(x - 2)(x - 3)$ ← **factorize**: put into brackets

Good morning, class. Did you know an **algebraic term** is a number multiplied by one or more variables (x, y..), for example 2x. One term is a **monomial**, two terms with sign (e.g.+,-) is a **binomial**. An **algebraic expression** is an expression with numbers, variables (x, y) and signs (+,-), such as 3x+2y. We can factorize these expressions. Can you tell me about factors and common factors, Rashid?

Yes, Sir. A factor is a number that divides exactly into another number. A **common factor** is a number that divides two or more other numbers exactly, like the ones on the board.



Our book says that we **factorize** an expression by putting it into brackets. We **expand** an expression by taking it out of the brackets. To expand means to make bigger. That's **expansion**!

That's absolutely right, Mohammed. You can see the examples on the board. We factorize when we write a number as its factors, for example, 10 is 2 x 5. We can write algebraic expressions as factors by putting them into brackets. That's **factorization**!

Task 1:

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

1. When we expand something, we make it bigger. **TRUE** **FALSE**
2. 24y is an algebraic expression. **TRUE** **FALSE**
3. A common factor can divide two or more numbers. **TRUE** **FALSE**

Task 2: MATCHING.

Draw lines to match the two parts.

1. factorize	a) Numbers, letters and an operation (+, -...)
2. expand	b) Put into brackets the things we multiply.
3. algebraic term	c) A letter (or letters) multiplied by a number
4. algebraic expression	d) Take out of brackets after multiplying.

Task 3:

Choose the right words, terms or expressions to complete the sentences:

1. ..... is an algebraic expression.
   a) 2x b) 2xy c) 2x + y
2. ..... is an algebraic term.
   a) 2xy b) 2x - y c) 2x + y
3. A monomial has ..... term(s)
   a) one b) two c) three
4. 2 is a ..... of 30.
   a) binomial b) factor c) common factor
5. 2x + 9y is a(n) ..... .
   a) binomial b) algebraic expression c) both a and b

Task 4:

Work in pairs. Use these JUMBLED LETTERS to make a sentence. Is the sentence TRUE or FALSE? Tell your partner why.

T O W	S I	A	M O O N C M

R O T F A C	F O	N I E N	N A D	N E T

This is **TRUE** **FALSE**.

Task 5:

Work in pairs. Ask and answer these questions about the things we have studied today:

What is a common factor?

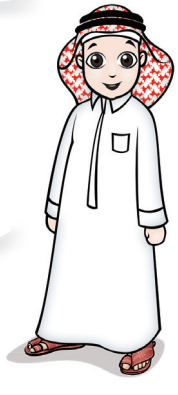
What is an algebraic expression?

What's the difference between a monomial and a binomial?

A common factor is a number that ....

It's ....

A monomial has ....
But a binomial has.....



Task 6: PUZZLE TIME!

Now work in pairs. Complete the crossword about factorization and expansion:

Across

1) ..... means 'two'.

2) Three is a .... of six and nine (2 words).

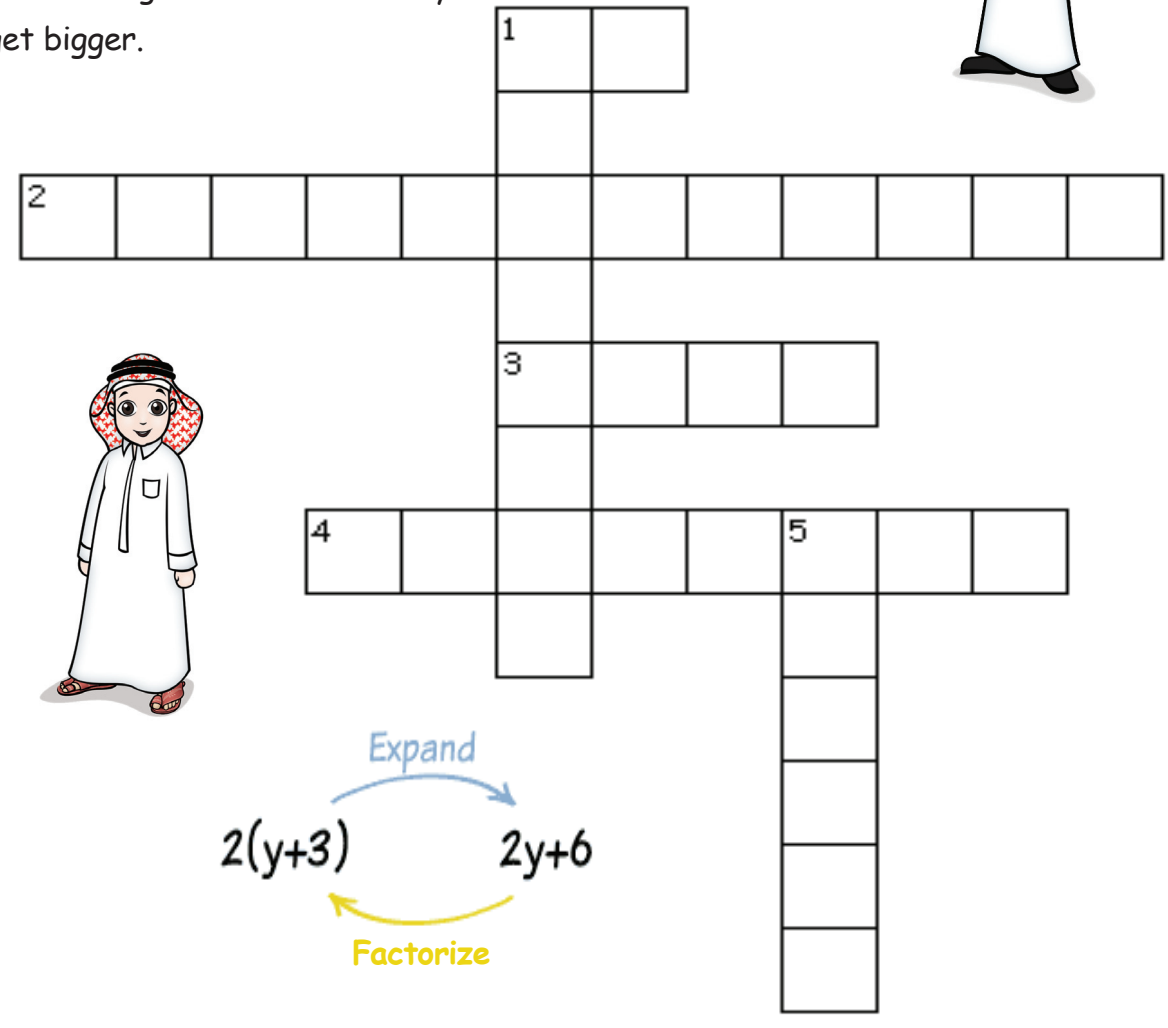
3) ..... means 'one'.

4) When we factorize algebraic expressions, we put terms into b ..... .

Down

1) **5x-2** is a ..... and an algebraic expression.

5) When things ..... they get bigger.



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.

algebraic term algebraic expression monomial binomial
expand/expansion factor/factorize/factorization common factor

KEYWORD	MEANING	PICTURE or EXAMPLE
	A number multiplied by one or more variables	
common factor		
	Take out the brackets in an expression	
monomial		

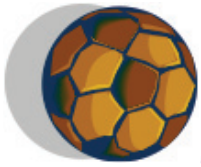
KEYWORD	MEANING	PICTURE or EXAMPLE
		$4x + 3y$
algebraic terms		
		$(x - 2)(x - 3)$ $= x^2 - 5x + 6$

GRADE 9 REVIEW- LESSONS 2-6

Task 1: Can you remember the keywords from Lesson 2-6?

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

exponent negative power estimation
scientific notation extremes percent percent of increase
algebraic expression discount simple interest

	KEYWORD	MEANING	PICTURE or EXAMPLE
1		A way to show very big or very small numbers.	2.456×10^5
2		An amount taken off as a percent to give a lower price.	 Less 20%
3		An exponent with a negative sign.	3^{-2}
4		This means out of 100.	$\frac{45}{100} = 45\%$
5		Bank charges added.	3% on 4,000QR = 120 QR

	KEYWORD	MEANING	PICTURE or EXAMPLE
6		The outside numbers in a ratio.	4:8 = 3:6
7		An expression with variables and numbers	4x + 2y
8		An amount added to the price as a percent	400 QR +10% = 440 QR
9		To use a process like rounding to get a solution close to the correct answer.	468 x 57 =30,000
10		A power or index number that tells how many times to multiply a base number by itself.	4^3 = 4 x 4 x 4

Task 2:

GAME TIME!

Look at the **keywords** on the bottom of the page. Write one word in each box. Listen as your teacher reads out a definition. Put an X on the box if you have the matching word. Three in a row is BINGO!

	BINGO	

variable terms constant terms expression equation common factor

coefficient terms factor algebraic term power monomial

binomial expand expansion factorize factorization base

extended ratio ratio proportion means power

index percent of decrease profit

Task 3: MATCHING

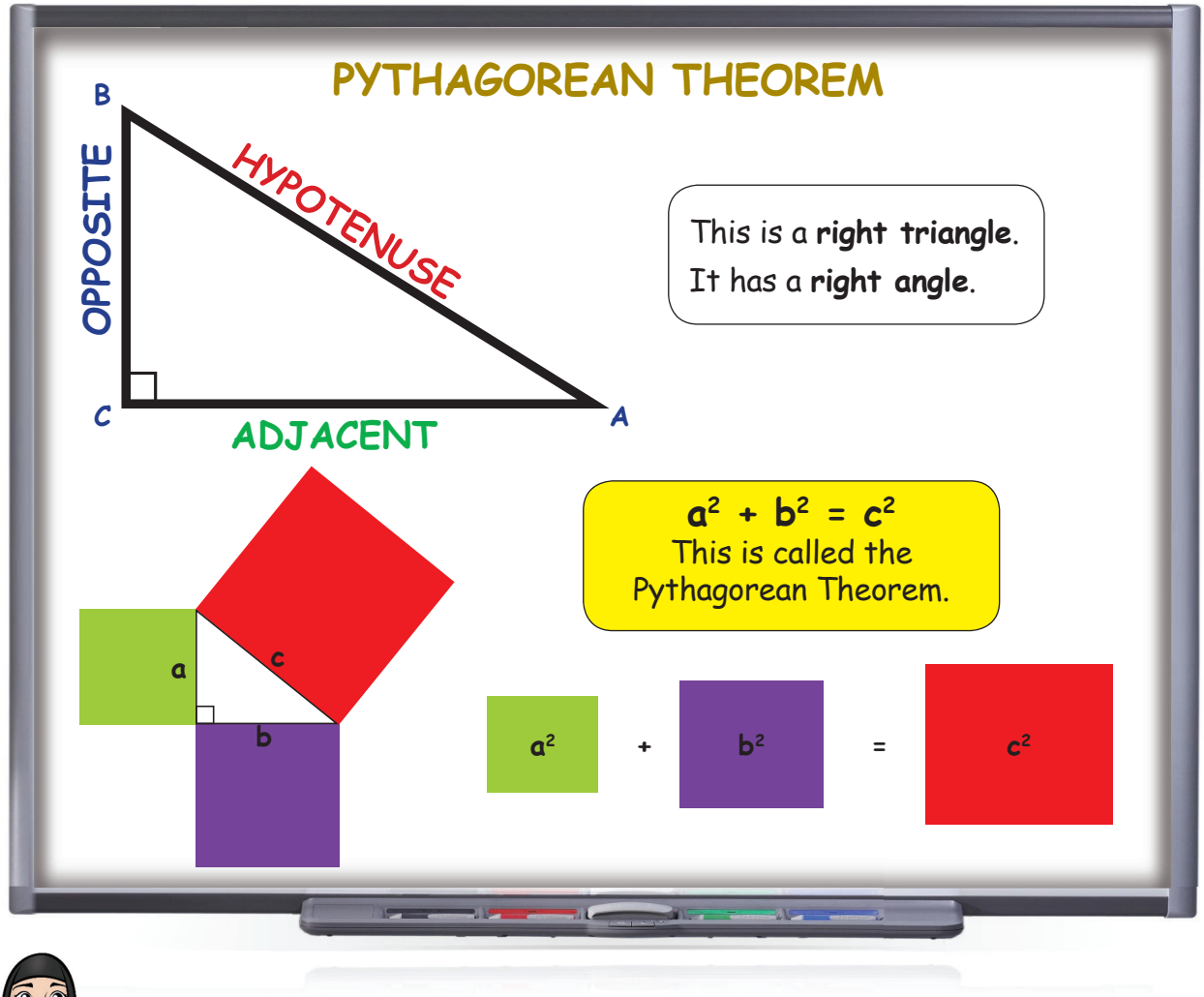
Can you match the symbols with the meaning?

1 expression	a) $4x + 12 = 20$
2 coefficient	b) $4:10 = 6:15$
3 base	c) $3x$
4 equation	d) 3^2
5 means	e) $5y + 3a$

PYTHAGOREAN THEOREM

KEYWORDS: Pythagorean Theorem, right triangle, opposite, hypotenuse, adjacent, obtuse, acute

Mrs. Aisha is teaching the class about **Pythagoras' Theorem**.
Listen and read. Then do the activities.



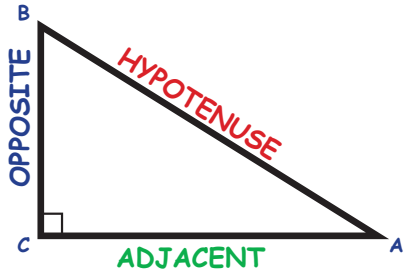
A **right triangle** is any triangle with a right angle in it. That's a 90° angle.

But what is Py-thag-or-as?

PYTHAGOREAN THEOREM

You mean 'who'. I'm reading about him! He was the Greek philosopher who found a great way of calculating the sides of a right triangle.

Mrs. Aisha: Yes, Maha! Pythagoras found an amazing fact about right triangles. But first let's learn the names of the sides. Look at the board.



The **opposite** is the side facing angle A. Adjacent means next to. The **adjacent** is the side next to angle A. It is between angle A and the right angle.

The **hypotenuse** is always the longest side.

Pythagoras said that the square of the hypotenuse is equal to the sum of the squares on the other two sides.

This is the **Pythagorean Theorem** $a^2 + b^2 = c^2$

I know that one angle of a right triangle is 90°, but what about the other angles? Are they acute or obtuse?

They are always acute, Huda!
An **acute** angle is an angle less than 90°.
An **obtuse** angle is more than 90°. Right triangles never have obtuse angles because the sum of the other two angles must also add to 90°!

Task 1:

Draw a line to match the following words with their correct meanings.

1 An acute angle	a) means next to.
2 Adjacent	b) is the longest side of a right triangle.
3 Opposite	c) is less than 90°.
4 The hypotenuse	d) means facing.

Task 2:

Choose the correct words to complete the following sentences.

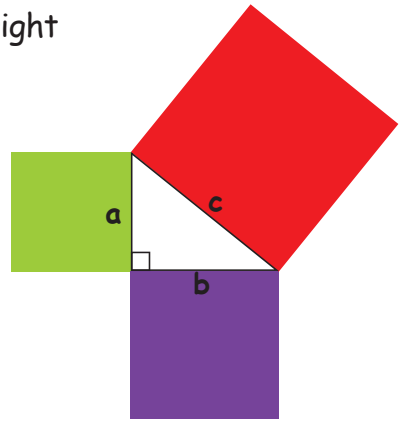
1. A/An ..... angle is more than 90°.
   - **a)** acute
   - **b)** obtuse
   - **c)** right

2. A/An ..... angle is less than 90°.
   - **a)** acute
   - **b)** obtuse
   - **c)** right

3. A/An ..... angle is exactly 90°.
   - **a)** acute
   - **b)** obtuse
   - **c)** right

Task 3: PAIR WORK!

Work in pairs. ONE of Huda's sentences is FALSE. Which one is it? Explain why.



1. The adjacent and the opposite are shorter than the hypotenuse.
2. A right triangle has two acute angles.
3. The adjacent is next to angle A.
4. The square of the opposite is equal to the square of the hypotenuse plus the square of the adjacent.

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

.....

Task 4: LET'S TALK!

Work in pairs:

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

How many right angles are there in a right triangle?

What does 'opposite' mean?

What's the longest side in a right triangle?

How many obtuse angles are there?

There are /is...

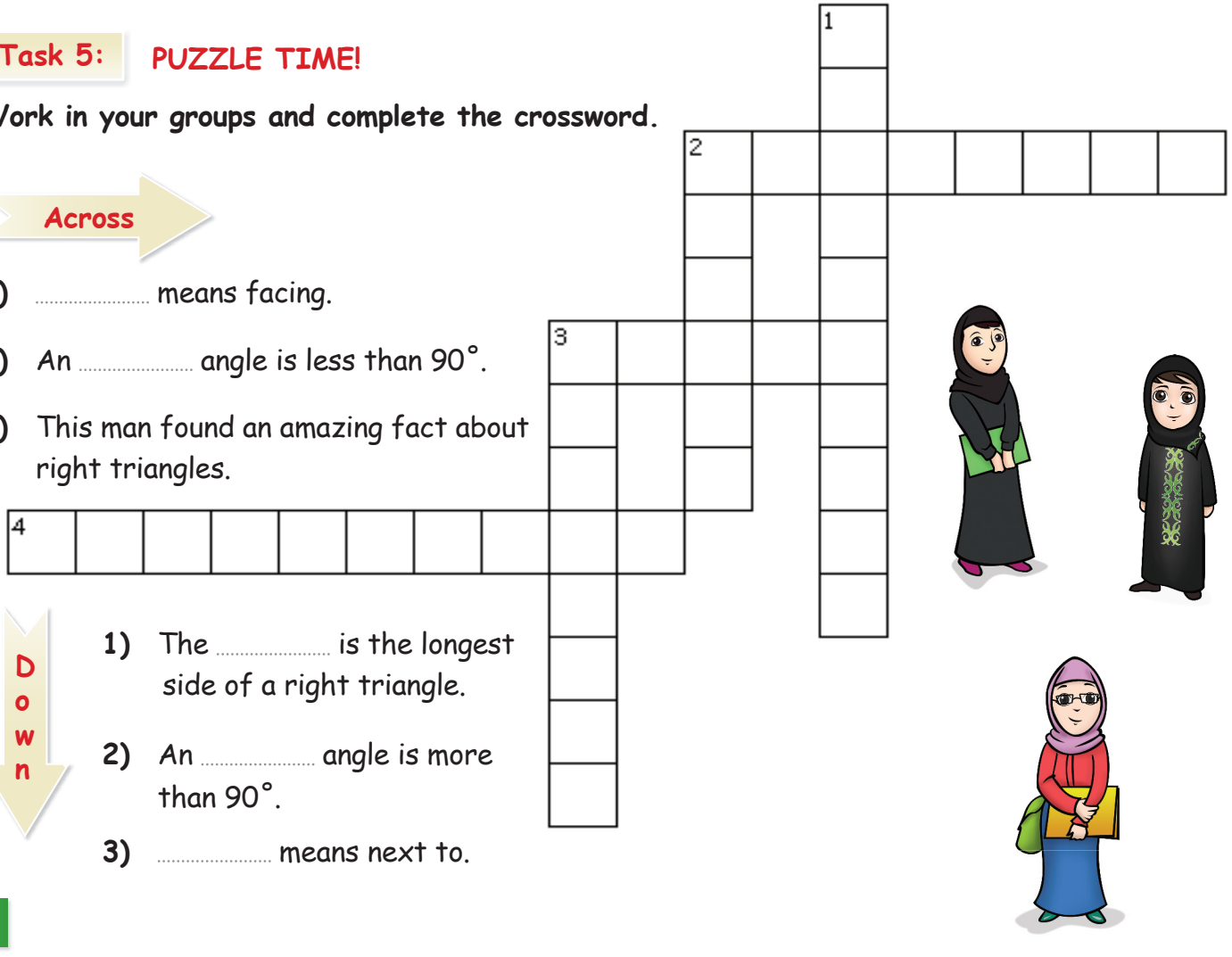
It means....

It's the ...

There are .....

Task 5: PUZZLE TIME!

Work in your groups and complete the crossword.



Across

2) ..... means facing.

3) An ..... angle is less than 90°.

4) This man found an amazing fact about right triangles.

Down

1) The ..... is the longest side of a right triangle.

2) An ..... angle is more than 90°.

3) ..... means next to.

TODAY'S MATHEMATICS KEYWORDS

Complete the table. Write a definition <u>and</u> draw a picture or give an example to match each keyword on this chart.

KEYWORD	MEANING	PICTURE or EXAMPLE
Pythagorean Theorem		
right angle		
opposite		
hypotenuse		

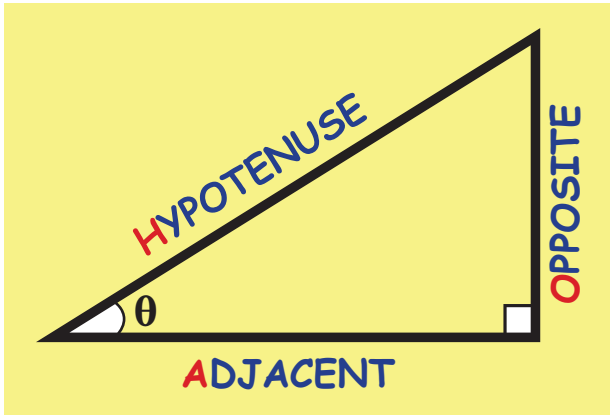
KEYWORD	MEANING	PICTURE or EXAMPLE
adjacent		
obtuse		
acute		

TRIGONOMETRY RATIOS

KEYWORDS: hypotenuse opposite adjacent sine cosine tangent

Today, Mrs. Aisha is teaching the class about **sine, cosine and tangent** .
Read and listen to the lesson. Then do the activities.

SINE, COSINE AND TANGENT



$$\text{Sin}\theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

$$\text{Cos}\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\text{Tan}\theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

SOHCAHTOA is a memory word used to help you remember the trigonometry ratios.

Sine, cosine and tangent are all ratios. We use them when we study right triangles. Look at the board. A right triangle has three sides. The **opposite** is always facing the angle. The **adjacent** is always the short side next to the angle and the **hypotenuse** is always the longest side.

So, the **sine** of the angle is the opposite divided by the hypotenuse!

The **cosine** is the adjacent divided by the hypotenuse.
The **tangent** is the opposite divided by the adjacent!
An easy way to remember is SOHCAHTOA!

Thank you very much, Mrs. Aisha. It's really clear now.

Task 1: PAIR WORK!

ONE of the sentences is FALSE. Which one is it?

Tell your partner why, and then write it down.

1. A sine is a kind of ratio. **TRUE / FALSE**
2. The adjacent is always shorter than the hypotenuse. **TRUE / FALSE**
3. We use sines, cosines and tangents when we study all shapes. **TRUE / FALSE**

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

.....

Task 2:

Draw lines to make correct sentences.

1. The hypotenuse is always	a) the short side next to the angle.
2. The adjacent is always	b) the side facing the angle.
3. The opposite is always	c) the longest side.

Task 3: **Choose the correct answer to complete the following sentences.**

1. ..... is short for sine equals opposite over hypotenuse.

   a) SOH b) CAH c) TOA

2. ..... is short for tangent equals opposite over adjacent

   a) SOH b) CAH c) TOA

3. ..... is used to find the cosine of angle θ.

   a) SOH b) CAH c) TOA

Task 4: **PUZZLE TIME!**

Work in pairs.

Help Shiekha and Maha use these JUMBLED LETTERS to make a sentence. Then write the answer below.

M E N A	H E T	S E G N O T L	D E S I

N I	A	G R I T H	G R E T I N A L

Answer : .....

Task 5: **PAIR WORK!**

Work in pairs.

Ask and answer the questions about today's lesson.

What are the sides of a right triangle? Which one is the longest?

What are the equations to find the sine, cosine and tangent of an angle?

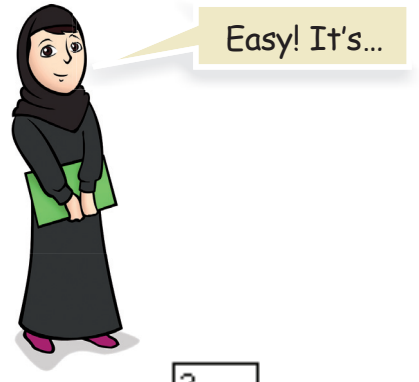
They are ... The longest side..

Sine equals opposite over....

Task 6: PUZZLE TIME!

Work in your groups.

Help Huda and Maha complete the crossword about sine, cosine and tangent:

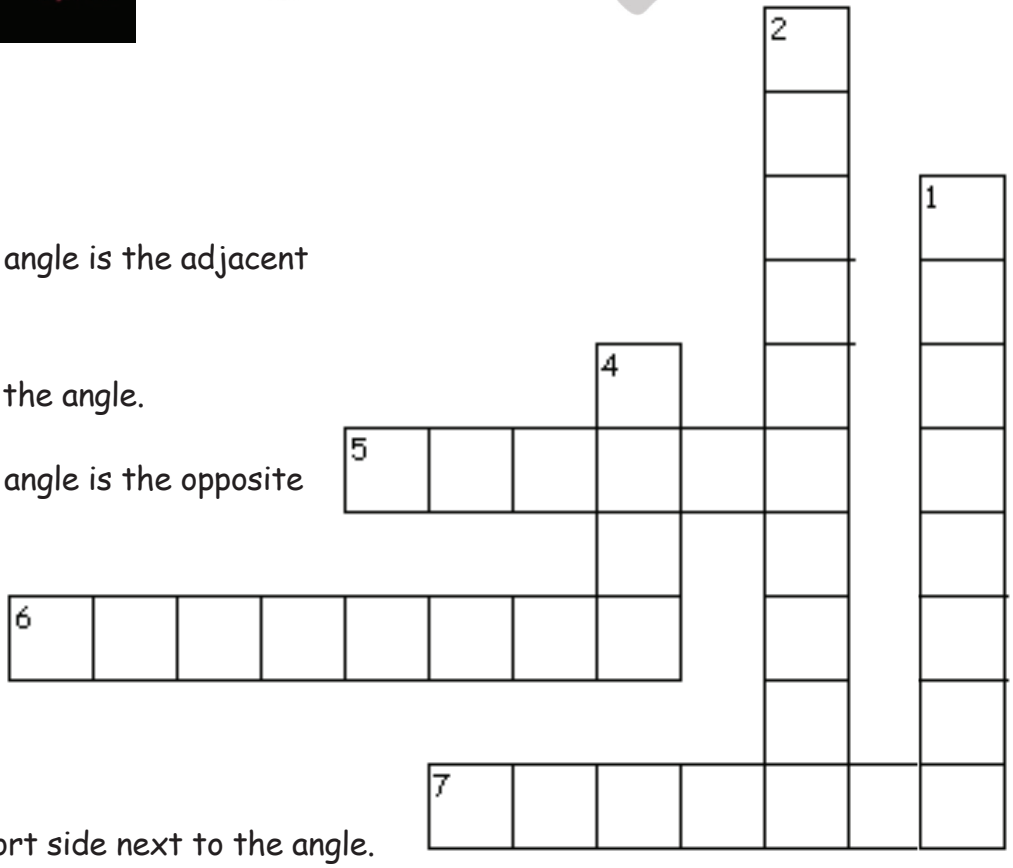


Across

5) The ..... of the angle is the adjacent over the hypotenuse.

6) This is the side facing the angle.

7) The ..... of the angle is the opposite over the adjacent.

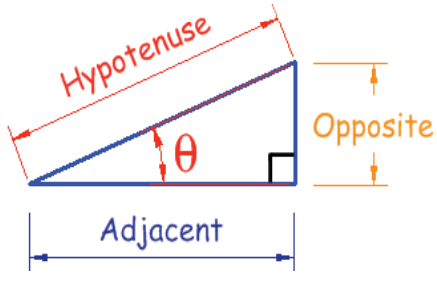


Down

1) This is the short side next to the angle.

2) This is the longest side in a right triangle.

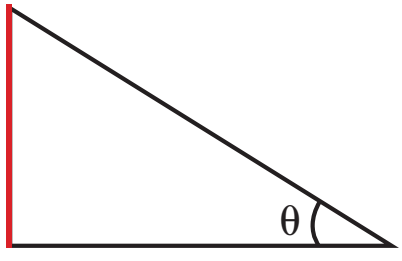
4) The ..... of the angle is the opposite over the hypotenuse.

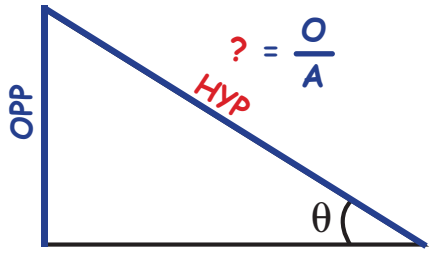


TODAY'S MATHEMATICS KEYWORDS

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.

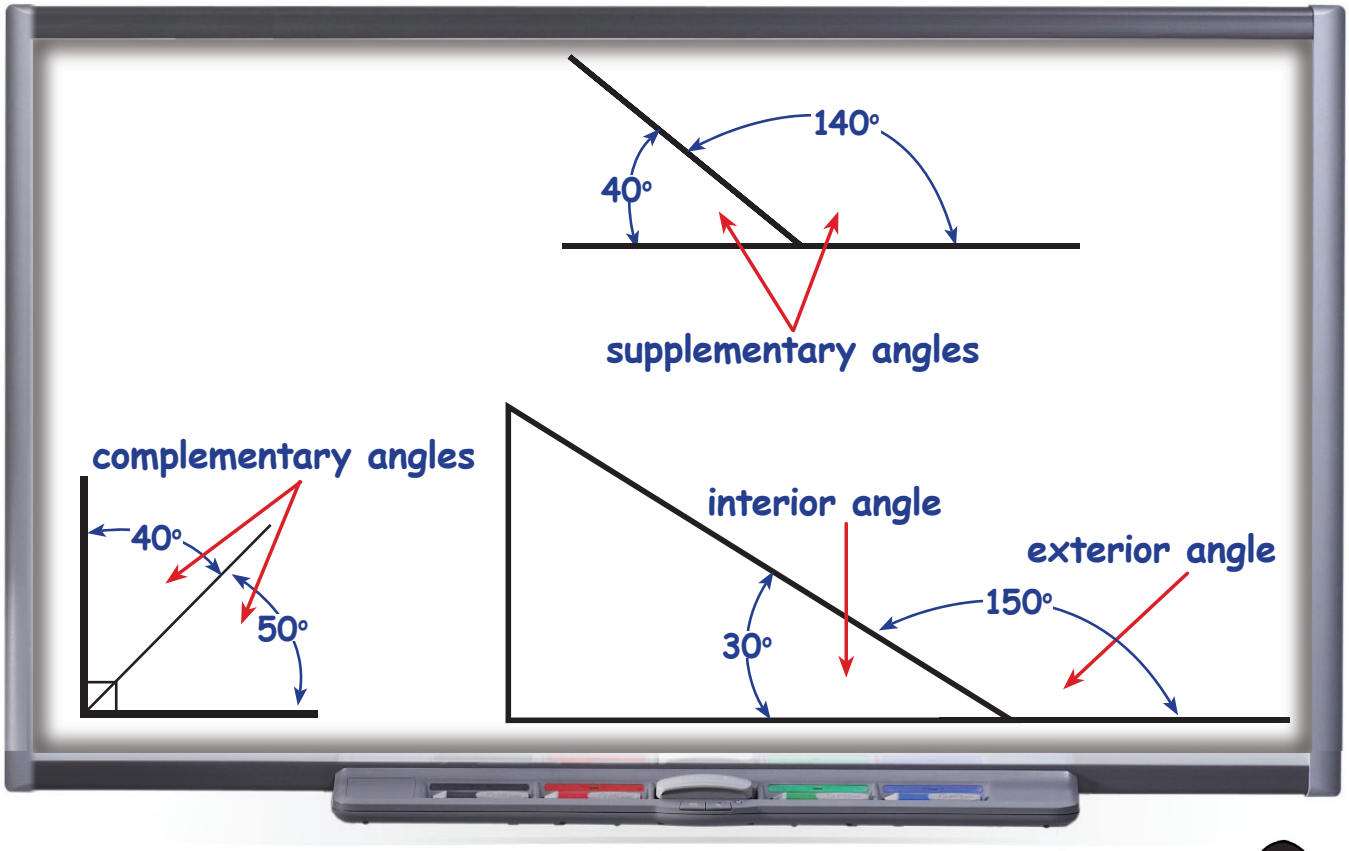
adjacent hypotenuse opposite sine
cosine tangent

KEYWORD	MEANING	PICTURE or EXAMPLE
	The short side next to angle.	
hypotenuse		
		
	The opposite side divided by the hypotenuse.	

KEYWORD	MEANING	PICTURE or EXAMPLE
cosine		
		

ANGLES 1

KEYWORDS: interior angle exterior angle supplementary angle complementary angle



Hello girls! Today, we are going to talk about angles. Look at the board and tell me about these angles.

Yes, Mrs Aisha! An **interior angle** is the angle inside a shape.
An **exterior angle** is the angle outside a shape.
Complementary angles are two angles that add up to 90°.
Supplementary angles are two angles that add up to 180°.

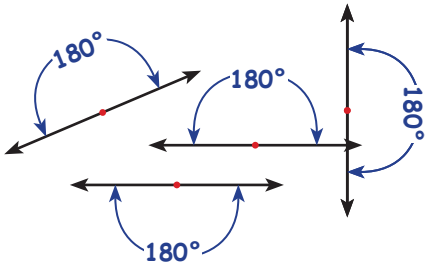
How can we remember that?

C for Complementary stands for **C**orner of 90°.

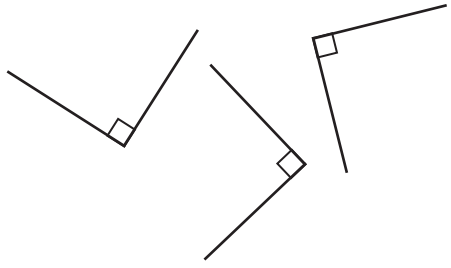
S for Supplementary stands for **S**traight angle of 180 °.

Label the diagrams: Are they right angles or straight angles?

..... angles



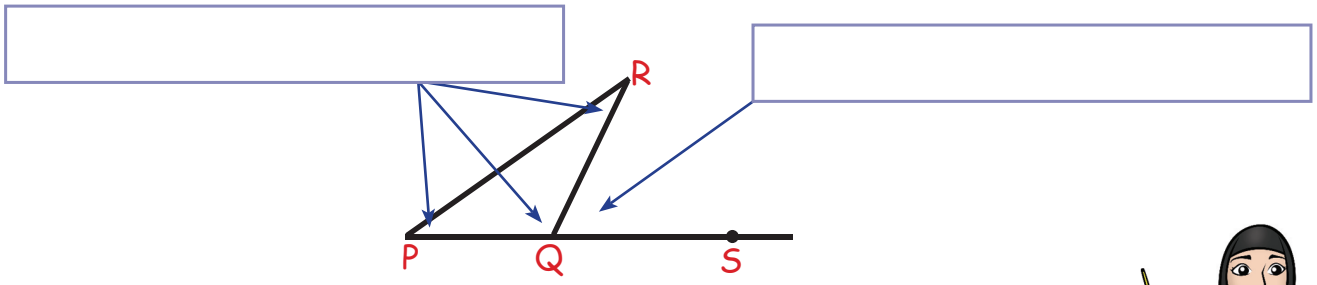
..... angles

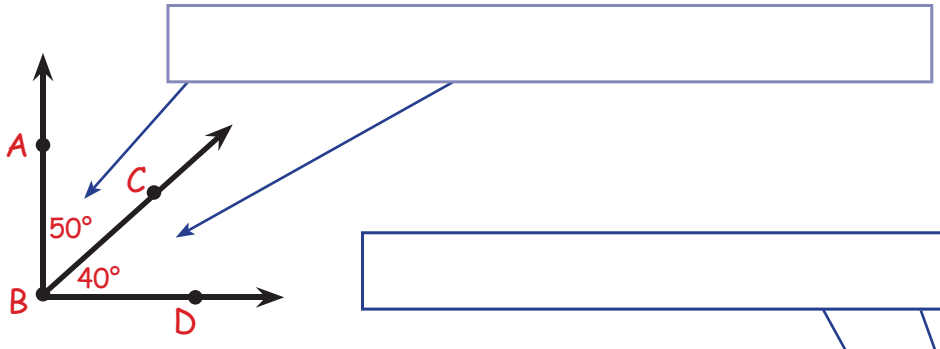


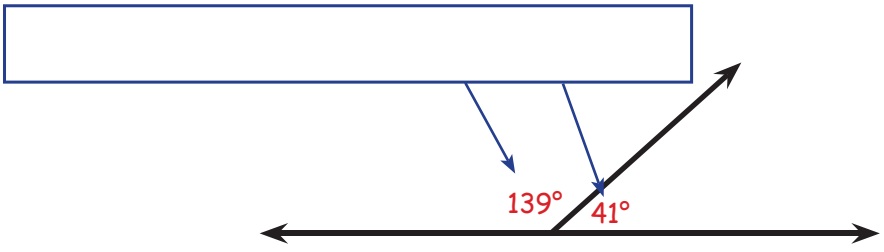
Task 1:

Use these terms to label the angle.

supplementary angle	interior angle
complementary angle	exterior angle







Task 2: PUZZLE TIME!

Work in pairs. Do the crossword.

Across

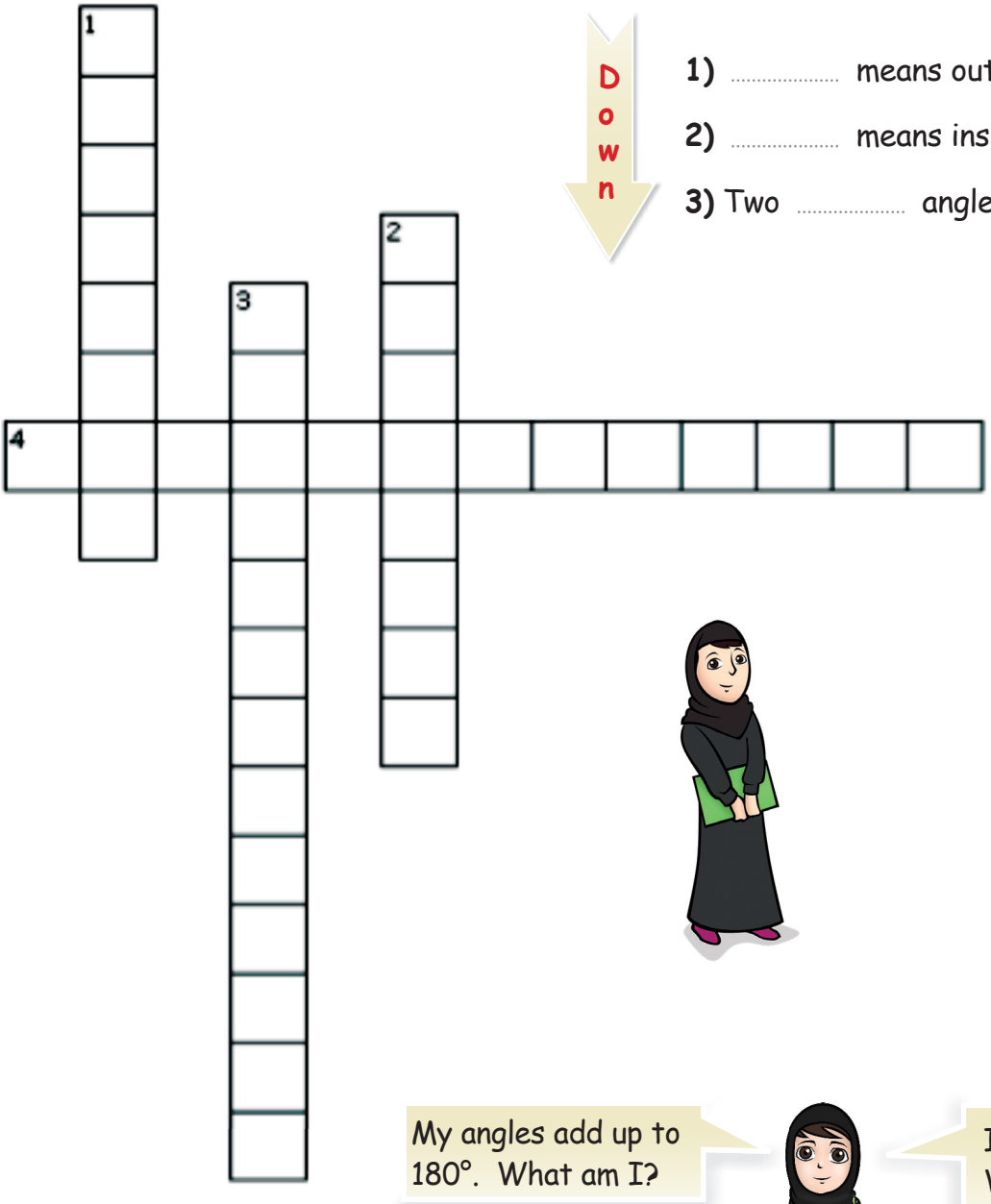
4) Two ..... angles equal 90°.

Down

1) ..... means outside.

2) ..... means inside.

3) Two ..... angles equal 180 °.



My angles add up to 180°. What am I?

I am outside a shape. What am I?

My angles add up to 90°. What am I?

I am the angle inside a shape. What am I?

Task 3:

Use these words to complete the sentences.

outside supplementary straight corner inside right

1. A supplementary angle makes a ..... line.
2. A complementary angle makes a ..... angle.
3. When we add two ..... angles together we get a straight angle.
4. An interior angle is ..... a shape.
5. An exterior angle is ..... a shape.
6. When we add two complementary angles together we, make a ..... angle.

Task 4: LET'S MATCH!

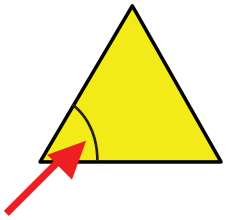
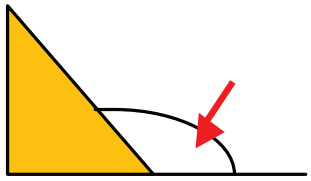
Draw lines to match the words with the pictures or examples.

1. An angle of 40^0 and an angle of 50^0 makes this angle.	a) Interior angle
2. An angle of 120^0 and 60^0 makes this type of angle.	b) Straight line
3. An angle inside a shape is called an ..... angle.	c) Exterior angle
4. An angle outside a shape is called an ..... angle.	d) A straight angle
5. An interior angle and an exterior angle added together.	e) A right angle

TODAY'S MATHEMATICS KEYWORDS

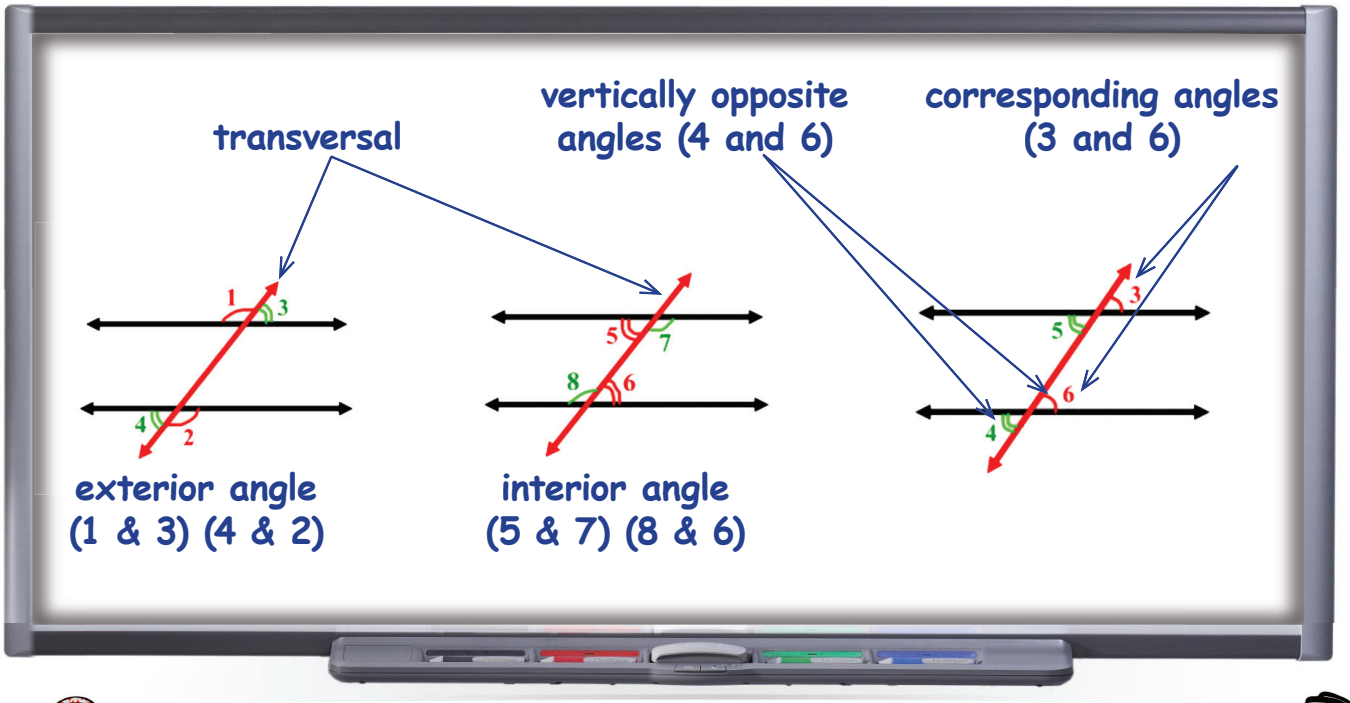
Complete the table. Match the keywords listed below with either the meaning or picture/example. Fill in all blanks in all columns: keywords, meaning, picture or example.

interior angle exterior angle supplementary angle
complimentary angle

KEYWORD	MEANING	PICTURE or EXAMPLE
	The angle inside a shape	
exterior angle		
supplementary angle		
	Two angles that add up to 90^0 .	

ANGLES 2

KEYWORDS: transversal, interior angle, exterior angle, corresponding angles, vertically opposite angles



Sir, can you tell us about different kinds of angles?... and what is a **transversal**?

Look at the board. A **transversal** is a line that crosses two or more lines. **Interior** means inside, so an **interior angle** is inside a shape. **Exterior** means outside, so an **exterior angle** is outside a shape. Now, can you tell me about **corresponding angles** and **vertically opposite angles**?

Correspond means 'matches with', so **corresponding angles** are angles in the same position on another line and they are equal. When two lines cross each other, they make **vertically opposite angles**. These are two sets of angles that are opposite and equal to each other.

Task 1: LET'S MATCH!

Draw lines to match the terms with their meanings.

1 exterior	a) a line that crosses other lines
2 vertically opposite	b) inside
3 correspond	c) outside
4 transversal	d) match with
5 interior	e) opposite and equal to each other

Task 2:

Choose the correct words from the box to complete the sentences. Use each word once.

exterior	transversal	interior	corresponding

1 ..... angles are inside a shape.

2 ..... angles are outside a shape.

3 ..... angles are equal to each other.

4 The ..... is a line that intersects two or more lines.

Task 3:

Draw lines to label the pictures.

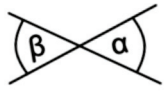
1 corresponding angles

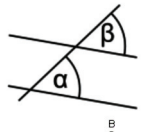
2 vertically opposite

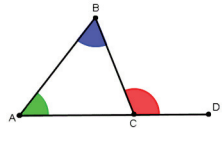
3 Interior angles (x2)

4 Exterior angle

5 Transversal







Task 4: PUZZLE TIME!

Work in pairs. Do the crossword puzzle.

Across

3) A ..... is a line that crosses two or more lines.

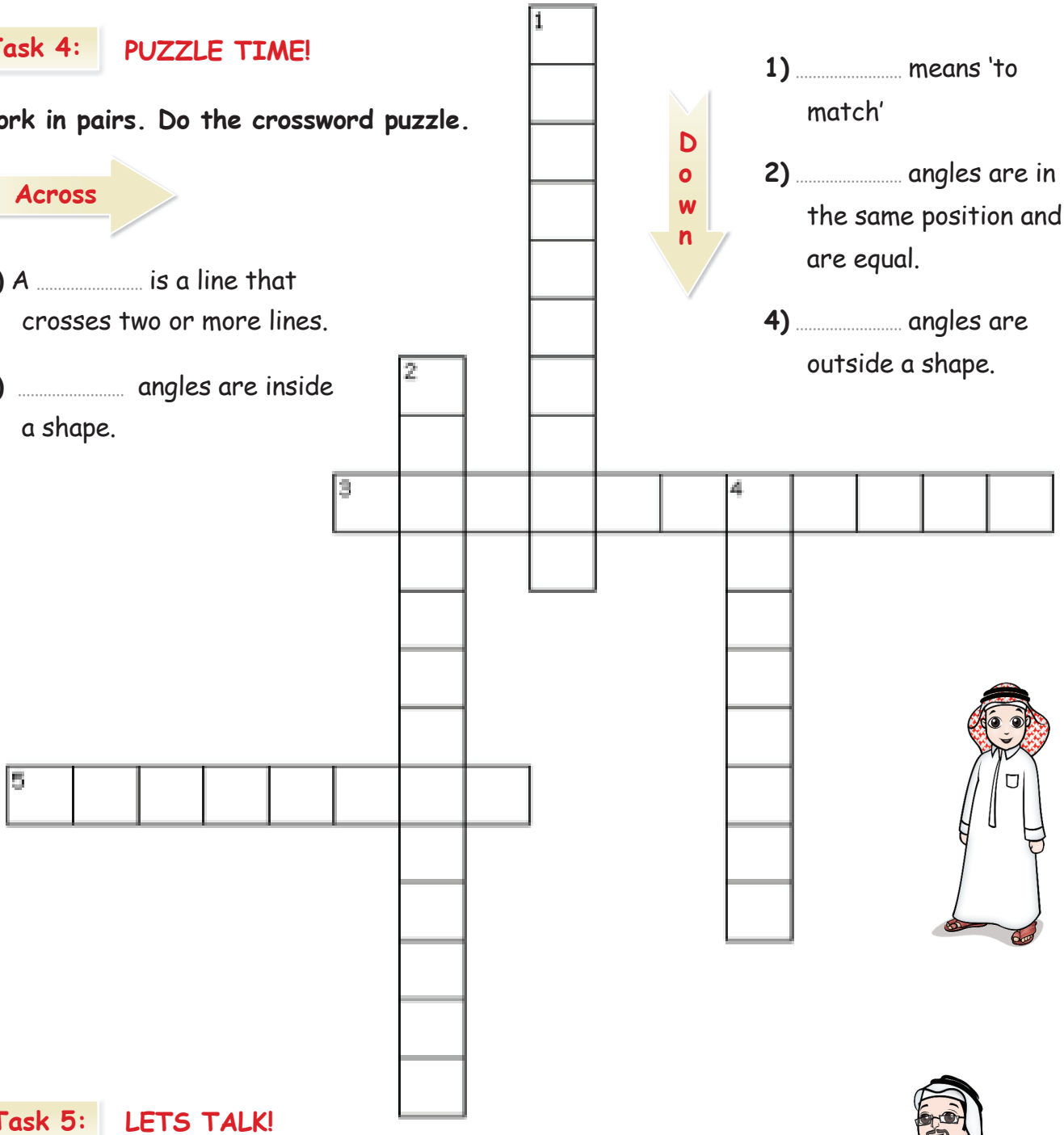
5) ..... angles are inside a shape.

Down

1) ..... means 'to match'

2) ..... angles are in the same position and are equal.

4) ..... angles are outside a shape.



Task 5: LETS TALK!

Ask and answer the following questions with your friend.

What is another word for 'matches with'

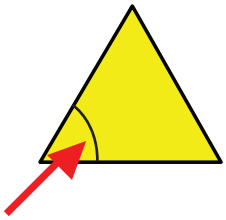
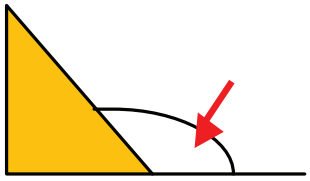
What does exterior mean?

What's the opposite of interior?

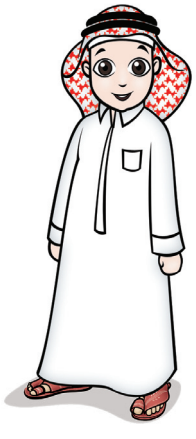
TODAY'S MATHEMATICS KEYWORDS

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.

interior angle exterior angle corresponding angles
transversal vertically opposite angles

KEYWORD	MEANING	PICTURE or EXAMPLE
	The angle inside a shape	
exterior angle		
corresponding angles		

KEYWORD	MEANING	PICTURE or EXAMPLE
transversal	A line that crosses two or more lines.	
vertically opposite angles		



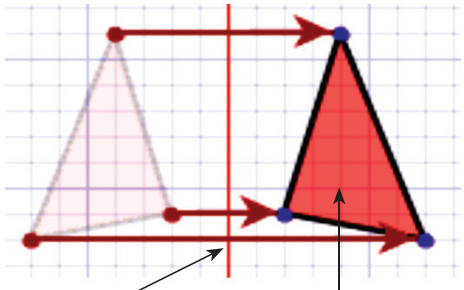
REFLECTION AND ROTATION

KEYWORDS: mirror image mirror line angle of rotation center of rotation clockwise/anti-clockwise

Mr. Omar is teaching the class about **reflection and rotation**. Read and listen to the lesson. Then do the activities.

transformations: reflection and rotation

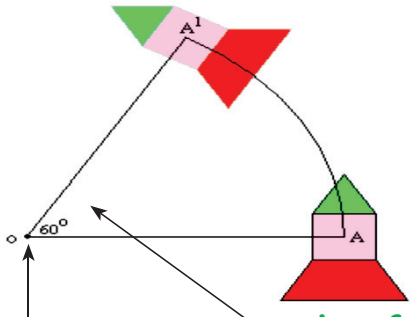
Reflection (Flip it over)



mirror line (Line of reflection)

mirror image

rotation (Turn it round)



centre of rotation

angle of rotation

Remember, reflection and rotation are transformations. We change the position, but not the shape.

Yes, reflection is when we flip the shape over and rotation is when we turn it round. What about reflection Mohammed?

Reflection is a **mirror image**! A mirror image is the same shape, but the other way round, like your image in a mirror.

That's right, Mohammed! Look at the board. When we map a reflection, we use a mirror line. **A mirror line** is a line that divides something in half, and one side is a mirror image of the other. The mirror line bisects the drawing. It divides it into two equal parts.

But rotation is different, isn't it, Sir?

Yes it is, Mohammed. When we rotate a shape, we turn it round. On the board, we are rotating it **anti-clockwise** – opposite to the way a clock moves! The point that it turns from is the **centre of rotation**. It is the centre of the circle! How many degrees the shape turns is the **angle of rotation**. On the board, the angle of rotation is 60°.

Task 1:

Help us choose the correct words to complete the following

1. When we draw a reflection, we get a(n) ..... .

   a) mirror image **b)** mirror line **c)** rotation **d)** angle of rotation.

2. When we rotate a shape, we turn it from the ..... of rotation.

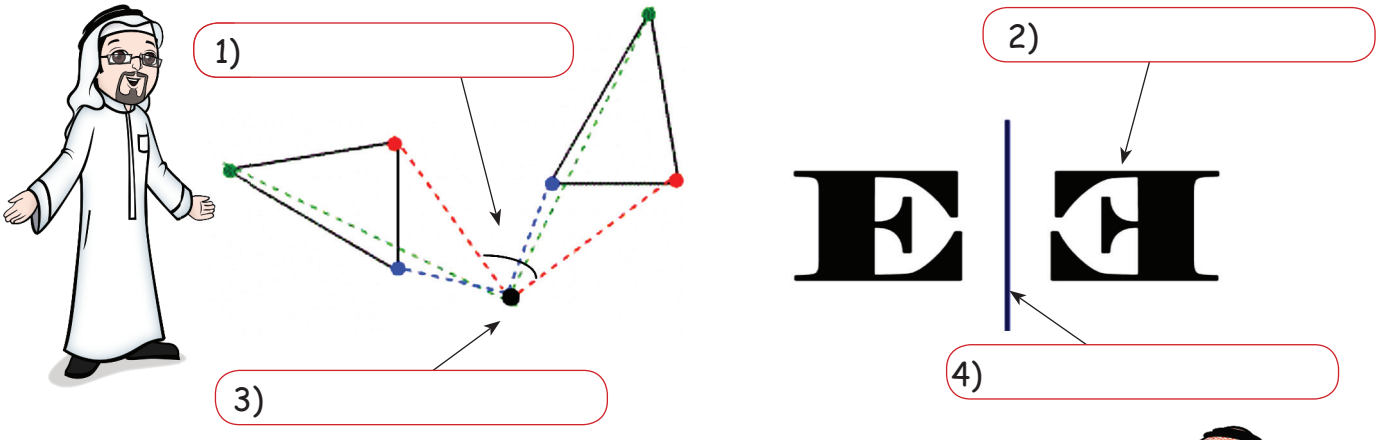
   a) mirror **b)** angle **c)** centre **d)** flip

3. How many degrees we rotate a shape is the ..... of rotation.

   a) centre **b)** angle **c)** line **d)** mirror

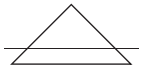
Task 2:

Label the diagram.



Task 3:

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

1. A mirror image is the same as a reflection. **TRUE** **FALSE**
2. This line is a mirror line →  **TRUE** **FALSE**
3. When we rotate a shape, we always turn it round by 60°. **TRUE** **FALSE**
4. We must always rotate shapes clockwise. **TRUE** **FALSE**

Number ..... is TRUE. All the others are FALSE.

Task 4:

Work in pairs. Ask and answer these questions.

What is a mirror line?

I know that! A mirror line is....

What's the difference between reflection and rotation?

Rotation is... but reflection is .....

What is clockwise and anti-clockwise?

Clockwise is... and anti-clockwise is...

Task 5: PUZZLE TIME!

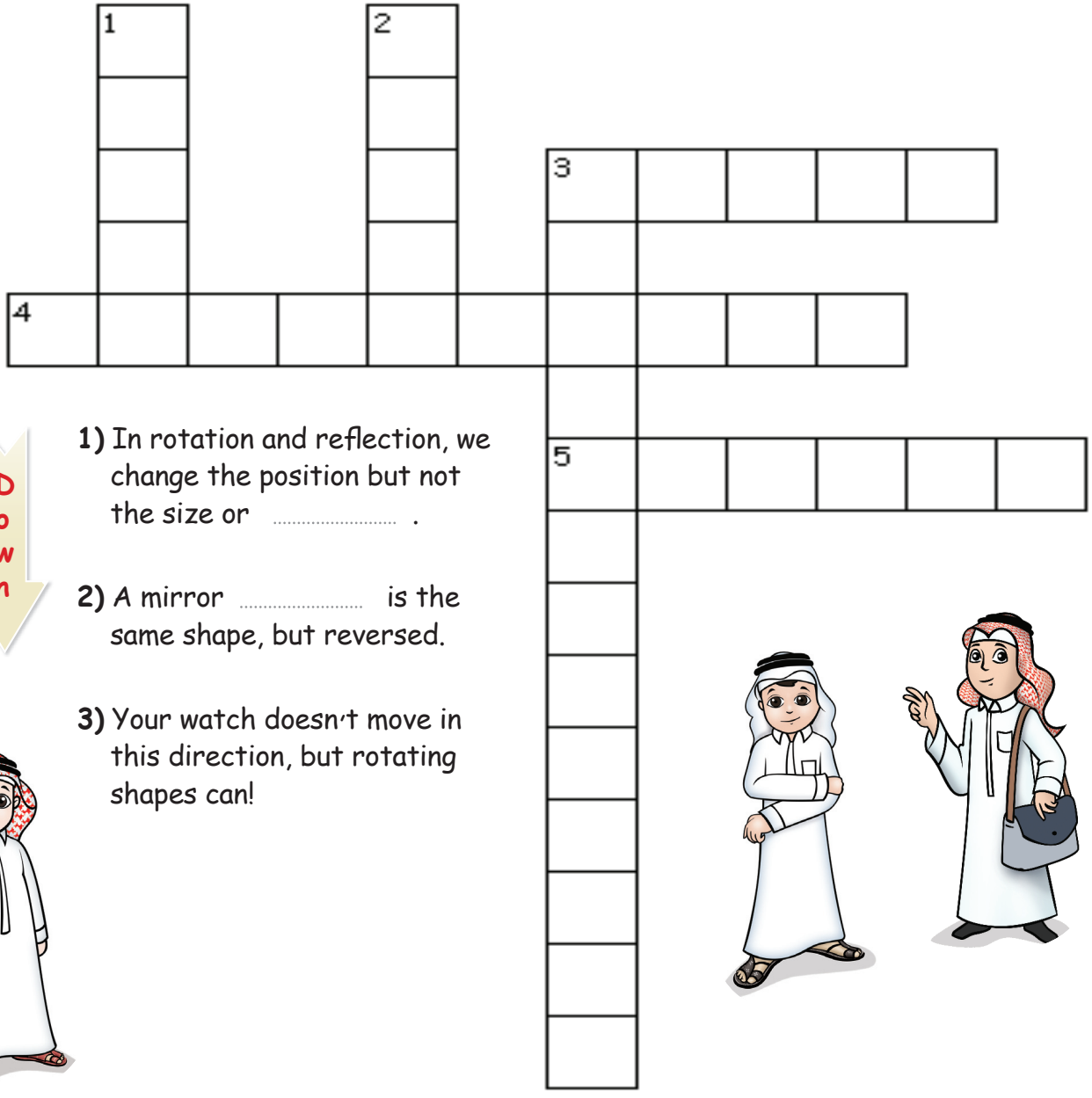
Complete this crossword about reflection and rotation.

Across

3) How much we rotate a shape is the ..... of rotation.

4) A mirror line is also called a line of ..... .

5) The point where we rotate a shape from is the ..... of rotation.

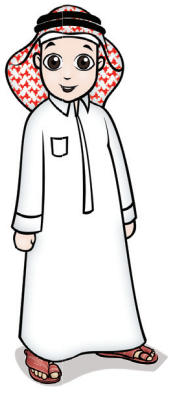


Down

1) In rotation and reflection, we change the position but not the size or ..... .

2) A mirror ..... is the same shape, but reversed.

3) Your watch doesn't move in this direction, but rotating shapes can!



TODAY'S MATHEMATICS KEYWORDS

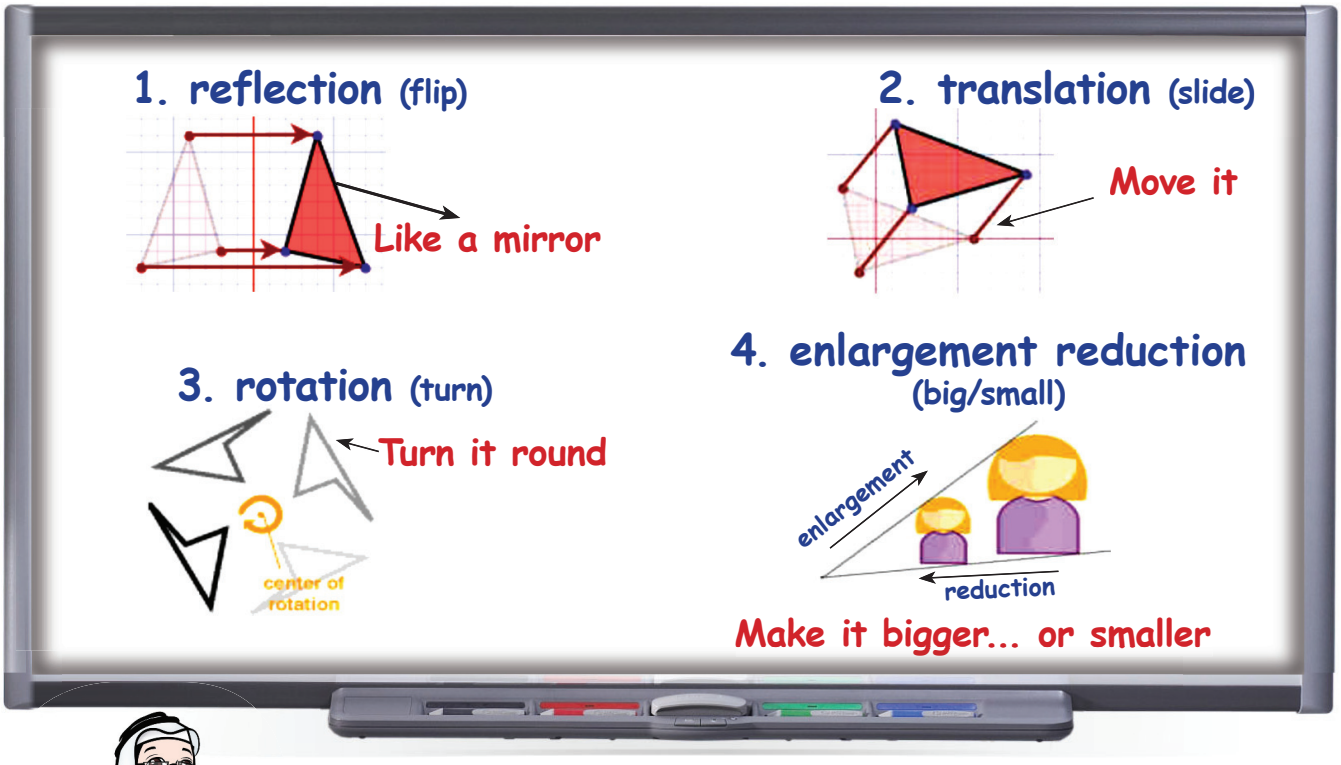
Complete the table. Match the keywords listed below with the meaning then drow a picture or give an example.

anticlockwise mirror image clockwise angle of rotation
center of rotation mirror line

KEYWORD	MEANING	PICTURE or EXAMPLE
	This is a reflection in a mirror.	
	The line of reflection is also known as this.	
	The point that a shape turns from.	
	The amount of degrees of turn anticlockwise.	
	In the same direction as a clock moves.	
	In the opposite direction of a clock.	

TRANSFORMATIONS

KEYWORDS: transformation reflection rotation enlargement reduction translation



Today, we're studying **transformations**. This is a change in the position or size of something.

I know about **reflection**. That's also called a mirror image.

Yes, a **reflection** is like seeing the shape in a mirror. It is the same shape, but we flip it over!

R | ℜ ← Flip it over

That's right Khalid! Like number 1 on the board. There are other kinds of transformations too! **Translation** is when you move a shape to a different place, like a car moving along a road.

Oh, I understand! What about rotation, Sir?

Rotation is when you turn something round a center, like in number 3.

Yes, Sir! And I can see from number 4, that **enlargement** is when we make something bigger, and **reduction** is when we make it smaller.

That's right! In all of these, reflection, rotation, translation, enlargement and reduction, we change the position and/or the size, but not the shape.

Task 1: LET'S MATCH!

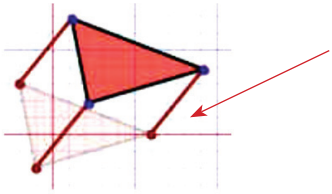
Let's check that! Draw lines to match the following definitions.

1 translation	a) Turning a shape round a central point.
2 rotation	b) Making something bigger
3 enlargement	c) Moving a shape along to a different place.
4 reduction	d) Flipping the shape over to make a mirror image.
5 refection	e) Making something smaller.

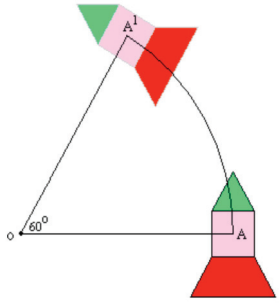
Task 2:

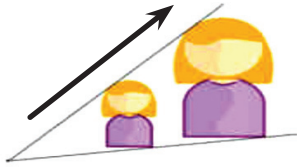
What kinds of transformations are these? Label the pictures:

1)

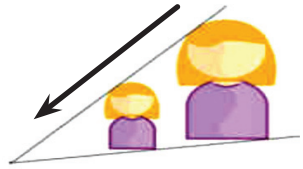


2)





3)



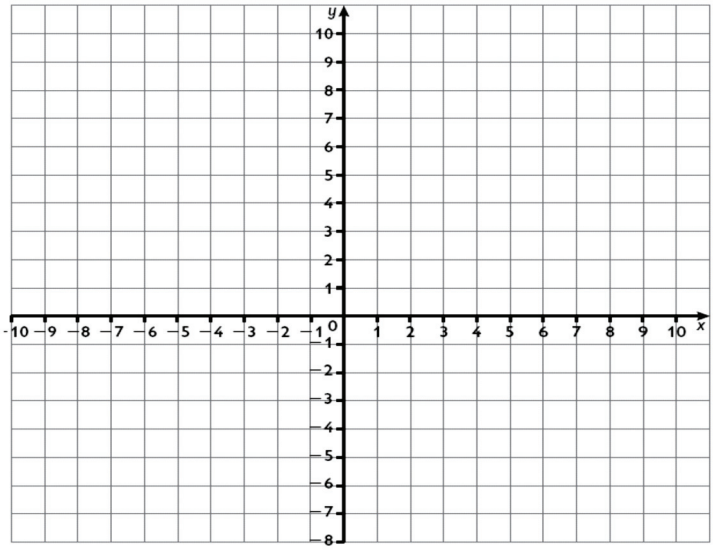
4)

Task 3:

Work in pairs.

STUDENT A

Write a letter or draw a shape here.



STUDENT B

Draw the reflection here!

Task 4: **Let's double check! Choose the correct words to complete the following sentences.**

1. A mirror image is a ..... .
   - **a)** reflection
   - **b)** rotation
   - **c)** reduction
   - **d)** enlargement
   - **e)** translation

2. When we make the size of something less, it is ..... .
   - **a)** reflection
   - **b)** rotation
   - **c)** reduction
   - **d)** enlargement
   - **e)** translation

3. When we turn something, it is ..... .
   - **a)** reflection
   - **b)** rotation
   - **c)** reduction
   - **d)** enlargement
   - **e)** translation

Task 5: **Work in pairs. Ask and answer these questions about TRANSFORMATION:**

What is transformation? What kinds of transformation are there?

Transformation is ...
The different kinds are ...

Rotation is... but translation is ...

What is the difference between rotation and translation?

What is the difference between enlargement and reduction?

That's easy! Enlargement is when.. we make.... but reduction is .....

Task 6: **Work in pairs. Ask and answer these questions about TRANSFORMATION:**

TONTINAALSR SI

A AGNECH NI

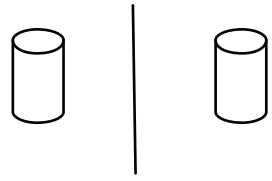
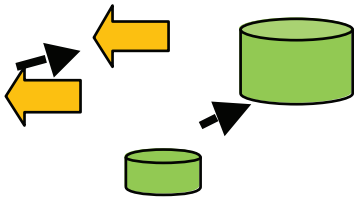
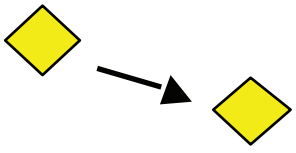
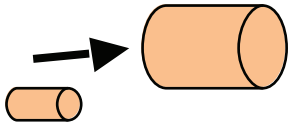
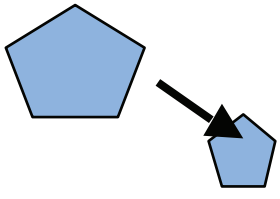
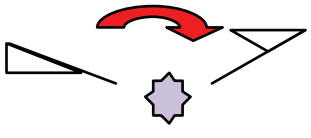
ZEIS NDA HPSEA.

This is TRUE/FALSE (because .....

TODAY'S MATHEMATICS KEYWORDS

Write the keyword to match the meaning and picture or example.

transformation reflection rotation enlargement
reduction translation

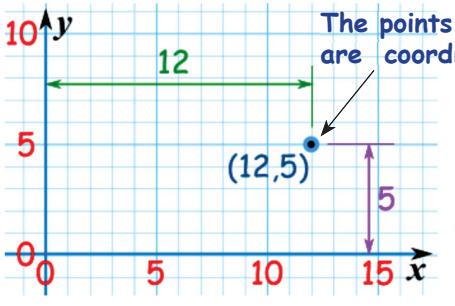
KEYWORD	MEANING	PICTURE or EXAMPLE
	A mirror image.	
	Changing the position or size of a shape.	
	Moving a shape to a new position.	
	Making something larger.	
	Making something smaller.	
	Turning a shape around a center.	

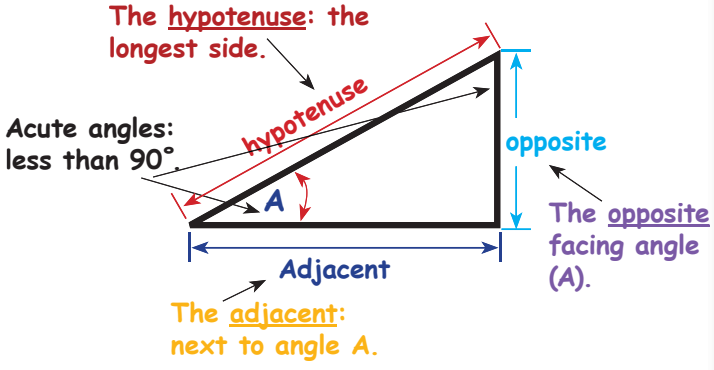
LET'S REVIEW!

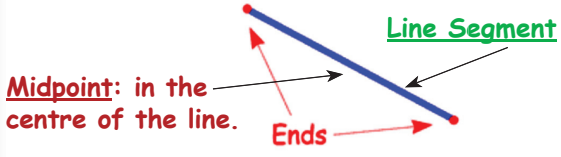
KEYWORDS:

opposite adjacent hypotenuse obtuse acute
distance point midpoint coordinates line segment
transformations reflection mirror image mirror line
translation rotation clockwise anti-clockwise
centre of rotation angle of rotation

Pythagoras and Trigonometry







Remember! In right triangles, the longest side is the **hypotenuse**. The **opposite** is the side facing angle A. The **adjacent** is the side next to angle A. Remember that the two smaller angles in a right triangle are **acute**; less than 90°. There are no **obtuse** angles, this means no angles are more than 90°. A **point** is an exact place. It shows position. It has no size. **Coordinates** are two numbers that show an exact position on a graph. **Distance** is the length between two points.

That's right, Khalid! I know that a **line segment** is a line that has two ends. The **midpoint** is the point in the middle. It divides a **line segment** in half.

LET'S REVIEW!

Task 1:

Choose the correct words to complete the following sentences.

1. In a right triangle, ... angles are acute.
   - **a)** one
   - **b)** two
   - **c)** three

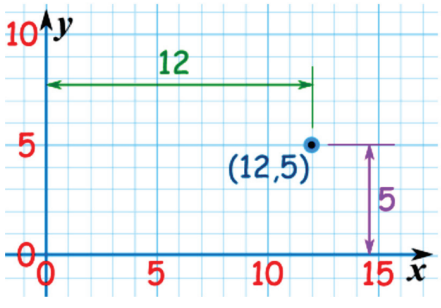
2. The hypotenuse is ..... the opposite side.
   - **a)** as long as
   - **b)** longer than
   - **c)** shorter than

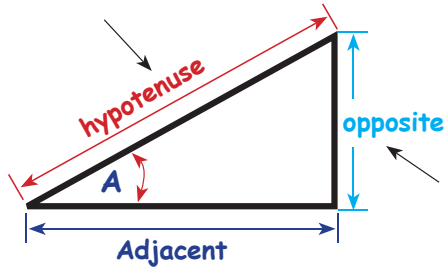
3. Coordinates ..... .
   - **a)** are angles
   - **b)** are lines
   - **c)** show a point

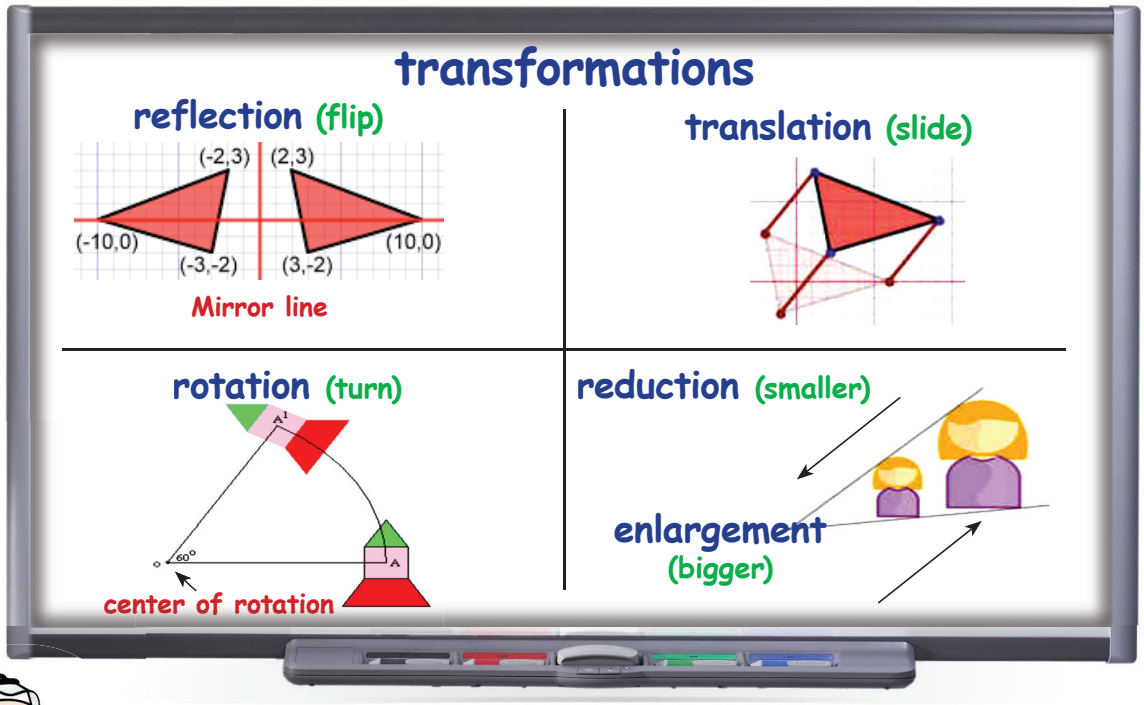
Task 2:

Let's check! Draw lines between the two columns to make correct sentences.

1. A midpoint is	**a)** any line with two end points.
2. The opposite side is	**b)** an exact point on a graph.
3. The hypotenuse is	**c)** in the middle of a line segment.
4. A line segment is	**d)** longer than all the other sides.
5. Coordinates tell us	**e)** the side facing angle A.







Now, let's revise **transformations**. This is a change in the position or size of something. **Reflection** is like seeing the shape in a mirror. A reflection is a **mirror image**. It is the same shape, but we flip it over! The line that divides the two sides is the **mirror line**. **Translation** is when we move a shape to a different place, like a car moving along a road.

Rotation is when we turn something round a center. It can turn **clockwise** (like a clock) or **anti-clockwise** (opposite to the way a clock moves). The point that it turns from, is the **centre of rotation**. It's the centre of the circle! How many degrees the shape turns is the **angle of rotation**.

Yes, Khalid, and **reduction** is when we make it smaller. When we make something bigger, it is **enlargement**. In all of these – reflection, rotation, translation, enlargement and reduction – we change the position and/or the size, but not the shape.

Task 1:

Choose the right words to make correct sentences:

1. ..... is when we make a shape bigger.

   a) Enlargement b) Reduction c) Reflection d) Translation

2. ..... makes a mirror image.

   a) Enlargement b) Reduction c) Reflection d) Translation

3. When we move a shape to a different place, it is ..... .

   a) enlargement b) reduction c) rotation d) translation

Task 2:

Now, let's ask and answer questions about Transformation.

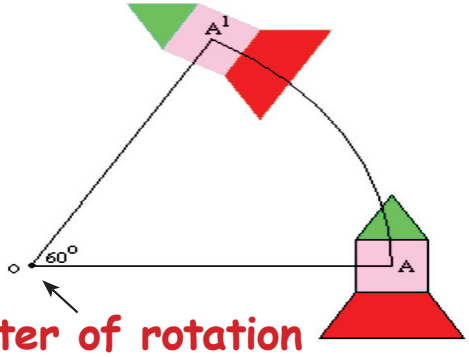
What are the different kinds of transformation?

There's reflection, rotation ....

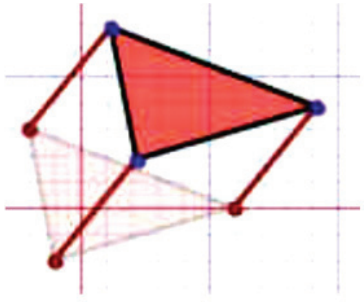
What's the difference between reflection and rotation?

Rotation is... and reflection is .....

rotation (turn)



center of rotation



Task 3: PUZZLE TIME!

Complete this crossword. Use the words in the box below to help you.

flat cube plan root solid squared reduction

Across

3) A ..... is a 3D shape with six sides all the same.

5) 3D shapes are ..... .

7) A..... is a top view drawing of a building.

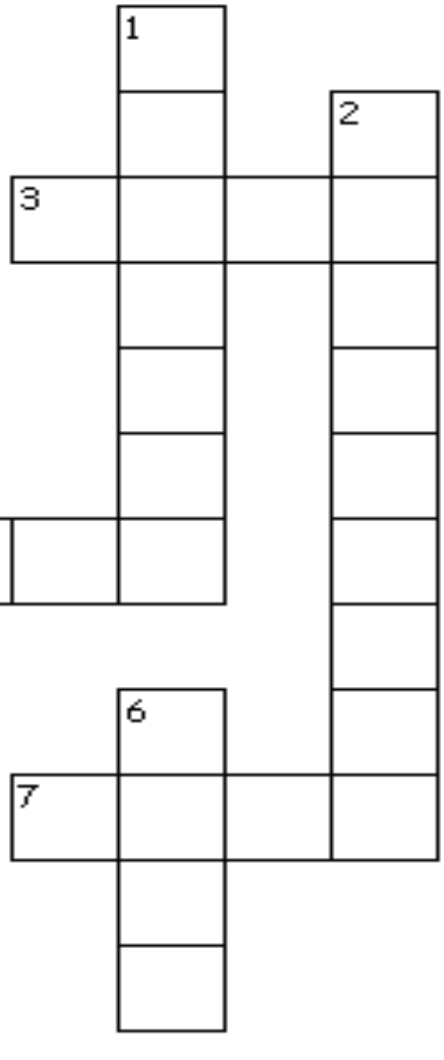
Down

1) Four times four is four ..... .

2) ..... is when we make something smaller.

4) The cube ..... of 27 is 3

6) 2D shapes are ..... .

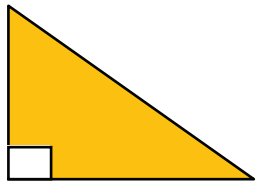


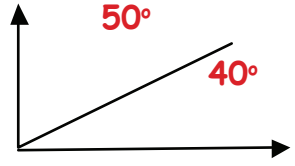
QUIZ

Task 1: Can you remember the keywords from this semester?

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.

adjacent side hypotenuse opposite side obtuse acute
right triangle sine cosine tangent complementary angles

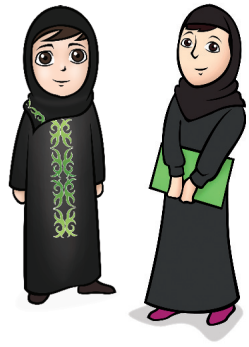
	KEYWORD	MEANING	PICTURE or EXAMPLE
1		The side between the right angle and the given angle A.	
2			
3	cosine		
4		The longest side in a right triangle.	
5	opposite side		

	KEYWORD	MEANING	PICTURE or EXAMPLE
6	obtuse angle		
7			
8			$? = \frac{\text{opposite}}{\text{adjacent}}$
9		The opposite side divided by the hypotenuse.	
10	acute angle		

Task 2: MATCHING

Help us draw lines to match the words with their correct meanings.

1 variable.	f) A line that goes up and down.
2 midpoint.	g) A line that goes from left to right through zero
3 algebraic expression	h) Two lines that stay the same distance apart.
4 coordinate	i) To form a right angle where two lines meet.
5 origin	j) A line that is parallel to the floor.
6 perpendicular	k) Gives us the exact position on a graph or grid
7 χ - axis	l) Has numbers, variables and signs
8 horizontal	m) Where the x-axis and y-axis cross
9 parallel	n) The point in the middle.
10 vertical	o) A letter that takes the place of a number.



Task 3: MULTIPLE CHOICE!

Choose the correct words to complete the following sentences

1. Transformations may change size but they do not change .....
   a) colour b) shape c) position

2. A ..... is multiplied to get a product.
   a) line b) constant c) factor

3. The ..... is found by dividing the opposite side by the adjacent side.
   a) tangent b) sine c) cosine

4. A ..... is moving an object across a flat surface or graph with no change of size.
   a) translation b) enlargement c) reduction

5. When the hypotenuse and opposite sides are known, then we can use the ..... ratio.
   a) sine b) cosine c) tangent

6. If one angle in a right triangle is 90^0, then the other two angles must be .....
   a) obtuse b) straight angles c) acute

7. A ..... has no size but only shows position.
   a) point b) line c) angle

8. The point equidistant from two end-points is the ..... .
   a) line segment b) midpoint c) centre of rotation

9. ..... shapes have only 2 dimensions.
   a) Round b) Cube c) Flat

10. A ..... is used in place of a number.
    a) variable b) expression c) equation

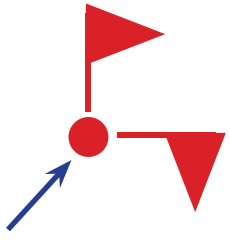
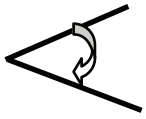
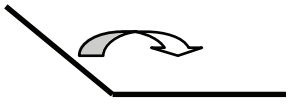
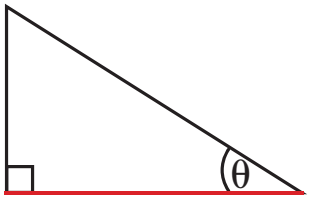
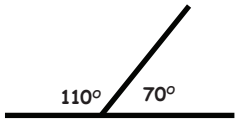
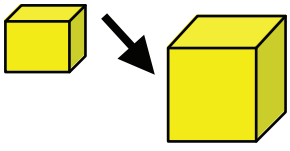
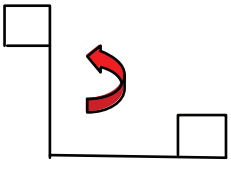
Task 4: FUN TIME!

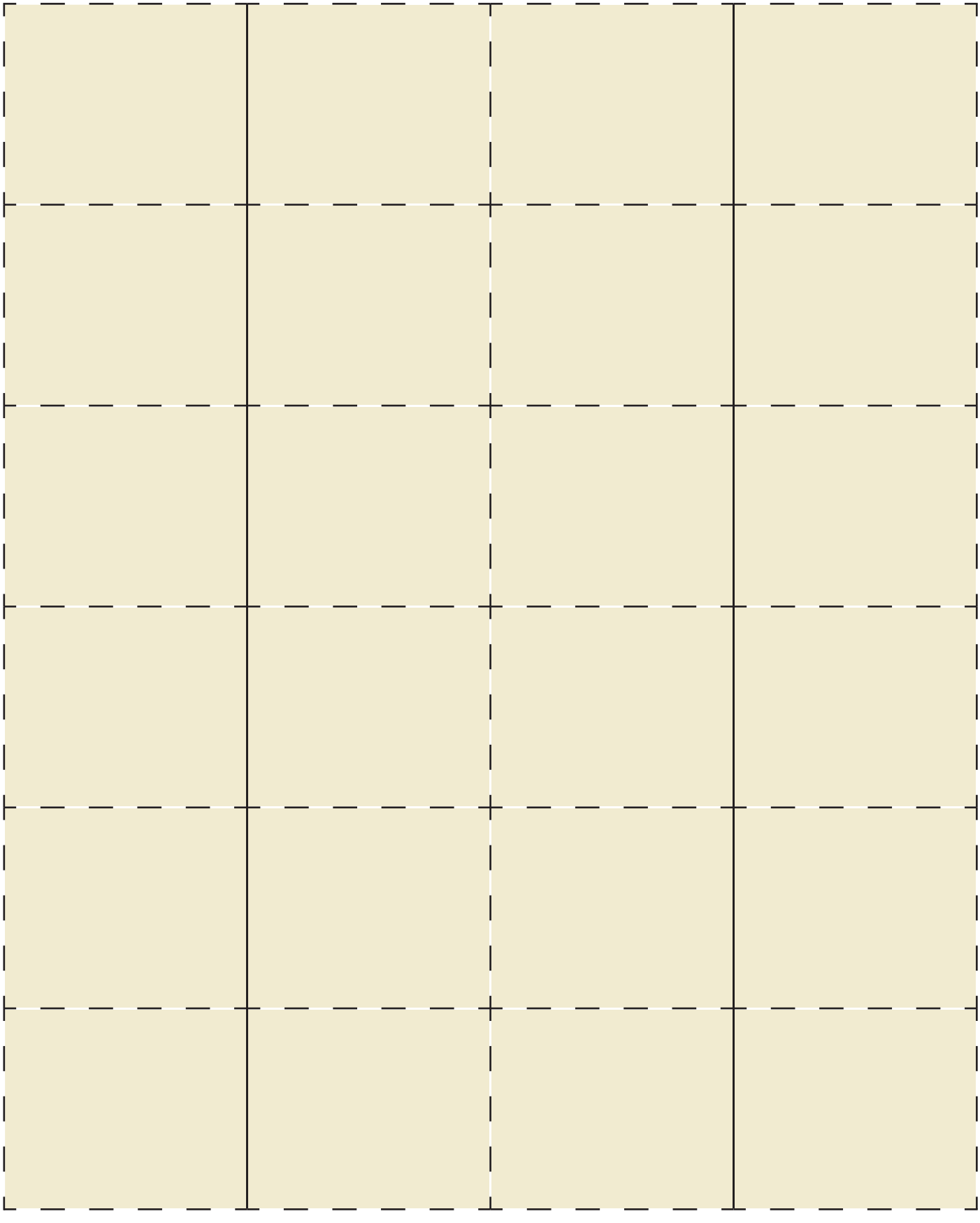
Let's us play Dominoes!

PLAY DOMINOES! Directions (dominoes game on next page)

1. Cut on the dashed lines. **Do not cut** on the solid 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.

negative integer	8^2	negative integer	8^2	exponent or power	oscending order		
$4-3$	greater than	negative integer	8^2	exponent or power	oscending order		

term	mirror Line	line of reflection	move a shape to a new position
translation	The longest side	hypotenuse	
center of rotation		acute angle	
obtuse angle	adjacent side		supplementary angles
	enlargement		rotation
	sine	$\frac{\text{Opp}}{\text{Hyp}}$	4χ



extended ratio

4:3:2

When you compare more than two quantities in a ratio

hypotenuse

constant

percent

%

Out of 100 **40%** = $\frac{40}{100}$

factor

$6 \times 4 = 24$

A number that is multiplied by another number.

base

simple interest

mirror image

The reflection of a shape.

GLOSSARY

GLOSSARY

A

acute angle
(pg. 41)

An angle that is less than 90^0

adjacent side
(pg. 41, 47)

The short side next to the given angle in a right triangle.

algebraic expression $4y + 2x - 3$
(pg. 31)

An expression with numbers, variables and operation signs (+,-,x) but without an equal sign (=).

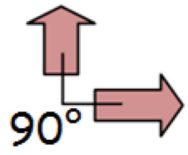
algebraic term
(pg. 31)

A number multiplied by one or more variables.

angle of rotation
(pg. 63)

The angle through which a shape is rotated to form the image.

anticlockwise
(pg. 63)



The direction of movement opposite to the way a clock moves.

B

base $10^3 = 10 \times 10 \times 10$
(pg. 10)

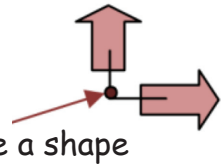
The number used as a factor.

binomial $4y + 3a$
(pg. 31)

An expression with two terms with a sign (+,-,x) between them.

C

center of rotation
(pg. 63)



The point that we rotate a shape around.

GLOSSARY

clockwise
(pg. 63)

To move in the same direction as a clock.

coefficient
(pg. 25)

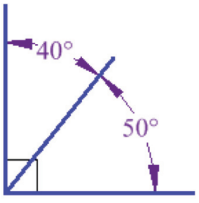
$5a$

The number used to multiply a variable.

common factor
(pg. 25, 31)

A number that is a factor of two or more numbers.
3 is a common factor of 6 and 12.

complementary angles
(pg. 53)



Two angles that add to 90°

constant
(pg. 25)

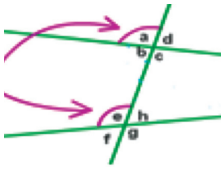
$4x + 3y + 5$

A number without a variable in an expression.

constant of proportionality
(pg. 15)

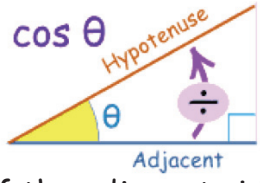
A constant ratio or unit rate in a proportion.

corresponding angles
(pg. 58)



Angles that are in the same position on two parallel lines in relation to a transversal.

cosine
(pg. 47)



The length of the adjacent side divided by the hypotenuse.

D

discount
(pg. 20)

100 QR - 30% = 70 QR

A reduction in price.

GLOSSARY

E

enlargement
(pg. 68)

To make something bigger.

equation
(pg. 25)
A math sentence that contains an equal (=) sign.

estimation/estimate
(pg. 10)
A number close to an exact value.
An estimate indicates about how much.

expand $3x(2x + 5) = 6x^2 + 15x$
(pg. 31)
To remove the brackets in an expression or equation.

exponent $4^3 = 4 \times 4 \times 4$
(pg. 10)
Tells us how many times to use the base as a factor.
In 4^3, the exponent is 3.

exponential equation
(pg. 10)
A non-linear equation.

expression $4a + 3b + 2$
(pg. 25)
Terms without an equal sign. It has numbers, variables and operation signs, but NO equal sign.

extended ratio $4:3:2$
(pg. 15)
When you compare more than two quantities in a ratio

exterior angle
(pg. 53, 58)

The angle outside of a shape.

extremes $3:4 = 6:8$
(pg. 15)
The outer terms in a proportion.

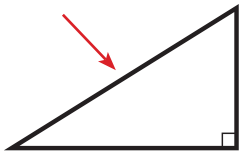
F

factor $6 \times 4 = 24$
(pg. 31)
A number that is multiplied by another number.

factorize $3x + 9y = 3(x + 3y)$
(pg. 31)
Finding the factors to be multiplied together to get an expression.

H

hypotenuse
(pg. 41, 47)

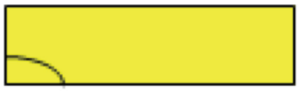


The side opposite the right angle in a right triangle.
It's the longest side in a right triangle.

I

index $3^2 = 3 \times 3$
(pg. 10)
Tells us how many times to use the base as a factor.
Same as exponent or power.

interior angle



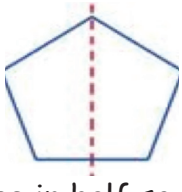
(pg. 53, 58)
An angle inside a shape.

M

means $4:5 = 8:10$
(pg. 15)
In a ratio these are the inner terms.

mirror image N И
(pg. 63)
The reflection of a shape.

mirror line



(pg. 63)
A mirror line divides an image in half so that one half is the reflection of the other half.

monomial
(pg. 31)
An expression with just one term.

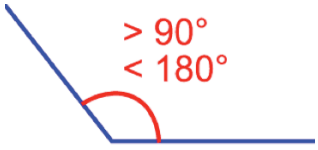
N

negative power 5^{-2}
(pg. 10)
This is repeated division. You can invert the number and change it to a positive power.

GLOSSARY

O

obtuse angle
(pg. 41)



An angle that is more than 900 but less than 1800

opposite side
(pg. 41, 47)

The side in a right triangle that is opposite the angle A.

P

percent
(pg. 20)

%

Out of 100 **40%** = $\frac{40}{100}$

percent of change
(pg. 20)

The difference in the cost price and the selling price as a percent.

percent of decrease
(pg. 20)

The percent of change when the new amount is less than the original.

percent of increase
(pg. 20)

The percent of change when the new amount is greater than the original.

power
(pg. 10)

$6^2 = 6 \times 6$

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

profit
(pg. 20)

The selling price minus the cost.

proportion
(pg. 15)

An equation that shows that two ratios are equal to each other.

Pythagorean Theorem
(pg. 41)

$a^2 + b^2 = c^2$

The rule for finding the lengths of sides in right triangles.

R

ratio
(pg. 15)

3:5

Shows the relative sizes of two or more values.

GLOSSARY

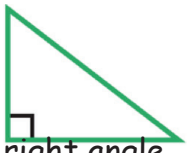
reduction
(pg. 68)

To make something smaller.

reflection
(pg. 68)

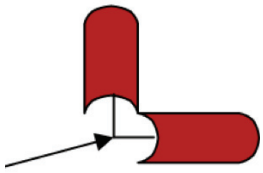
A mirror image. The same shape flipped over.

right triangle
(pg. 41)



A triangle with one right angle.

rotation
(pg. 68)



To turn an object around a center point.

S

scientific notation
(pg. 10)

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

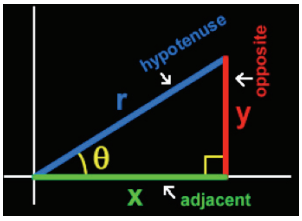
A way of writing very large or very small numbers.

simple interest
(pg. 20)

Loan **2,000 at 3%** interest for 2 years
= 60 x 2 = 120 QR
Interest paid on the original amount.

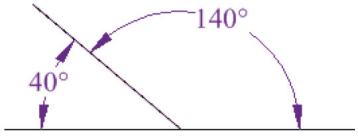
sine
(pg. 47)

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$



The length of the opposite side divided by the hypotenuse.

supplementary angles
(pg. 53)

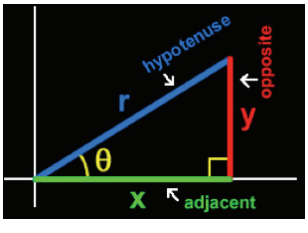


Two angles that add up to 180^0 degrees.

T

tangent
(pg. 47)

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$



The length of the opposite side divided by the adjacent side.

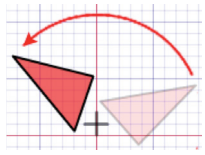
term

$4xy + 3x - 2$

(pg. 25)

A number, variable, or numbers and variables multiplied together in an expression.

transformation



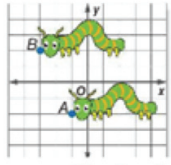
(pg. 68)

Moving a shape so that it is in a different position, but still has the same size, area, angles and line lengths..

translation

(pg. 68)

Moving a shape to a different place.

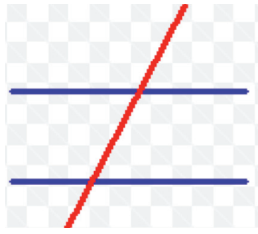


The caterpillar has been moved from point A to point B.

transversal

(pg. 58)

A line that intersects two or more other lines.



V

variable

$3 + a = 6$

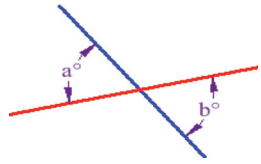
(pg. 25)

A letter that takes the place of an unknown number.

vertically opposite angles

(pg. 58)

Two angles that are opposite and equal to each other.



SCIENTIFIC ENGLISH

SCIENCE

GRADE 9

Grade 8 Review

Look at the keywords column in the table below (from Grade 8). Rewrite each word in the next column. Next to the word, write its meaning, and in the last box draw a picture or give an example. The first one is done for you!

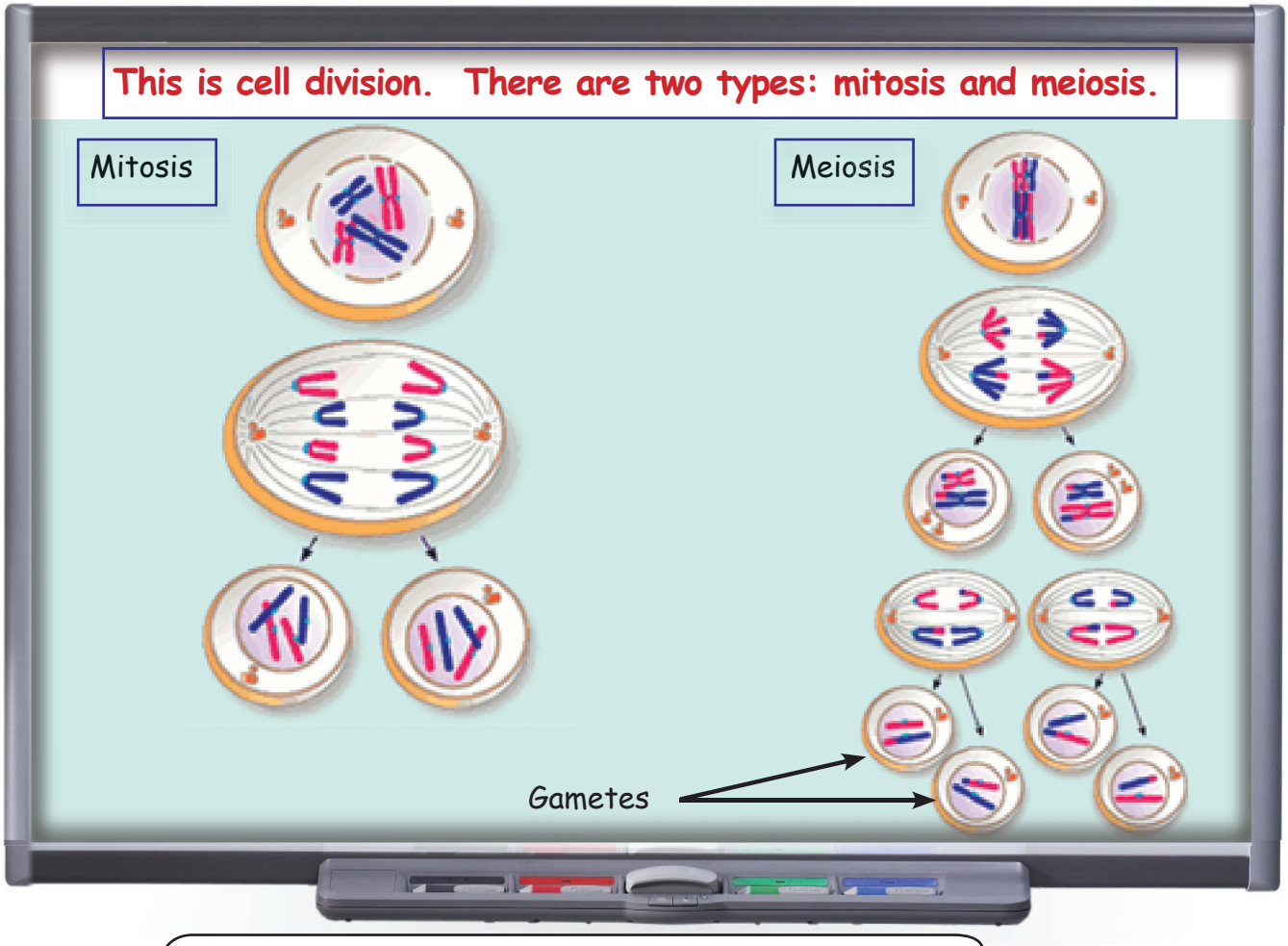
KEYWORD	MEANING	PICTURE or EXAMPLE
Lungs	Organs in our body we use for breathing.	
Haemoglobin		
Yeast		
Element		

KEYWORD	MEANING	PICTURE or EXAMPLE
Electroplating		
Alkali		
Gravity		
Thermometer		
Electromagnet		

CELL DIVISION

KEYWORDS: **cell division** **mitosis** **meiosis** **gametes** **chromosomes**

Today, we are studying **cell division**. Read and listen to the lesson, then do the activities that follow.



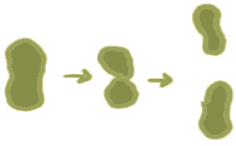
Good morning. Today, we're learning about **cell division**. This is when a cell divides to make new cells.

What does mitosis and meiosis mean?

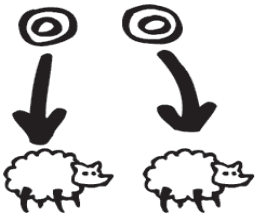
They are the two kinds of cell **division**. **Mitosis** (my-toe-sis) is when cells divide to make cells for **growth** and **repair**. **Mitosis** makes **identical** cells. That means, they are exactly the same as the parent. **Meiosis** (my-o-sis) is when cells divide to **reproduce**. Meiosis makes cells called **gametes**. Gametes are cells that can reproduce . They come together to make new cells. Meiosis makes cells that are not exactly the same.

Chromosomes are very small parts of the cell that contain the information. Chromosomes carry information about an animal or plant when cells divide.

What are chromosomes?



Divide: split into 2 parts.



Identical: exactly the same.

Task 1:

Match the two parts to complete the sentences. Draw lines.

1	Chromosomes	a)	is the division of cells for growth and repair.
2	Mitosis	b)	are cells that can come together and reproduce.
3	Meiosis	c)	is the division of cells for reproduction.
4	Gametes	d)	is when cells divide.
5	Cell division	e)	carry information about something when cells divide.

Task 2:

Help Sheikha answer the following questions with YES or NO: Explain your answer'

Are gametes produced in mitosis?

Yes, they are/~~No~~, they aren't.

Are meiosis and mitosis kinds of animal?

Yes, they are/~~No~~, they aren't

Are mitosis and meiosis kinds of cell division?

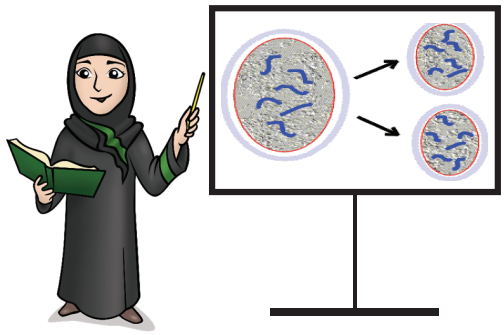
Yes, they are/~~No~~, they aren't.

Are there chromosomes in animal and plant cells?

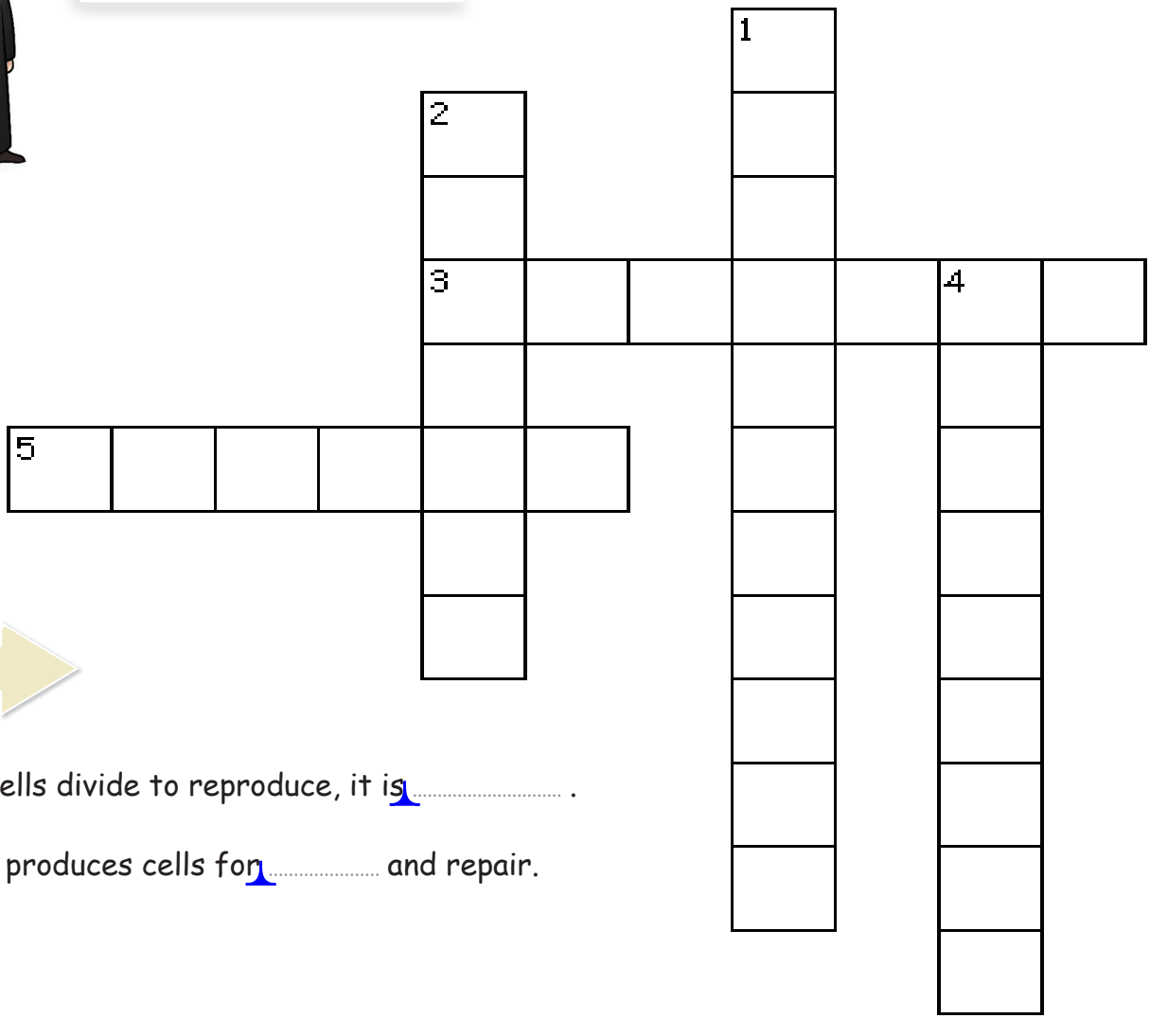
~~Yes~~, there are/~~No~~, there aren't.

Task 3:

Work in teams. Help Sheikha to complete the crossword about CELL DIVISION.



This isn't easy!
Can you help me, please!



Across

3) When cells divide to reproduce, it is ..... .

5) Mitosis produces cells for ..... and repair.

Down

1) Very small parts of the cell that carry information are called ..... .

2) These cells can come together and reproduce.

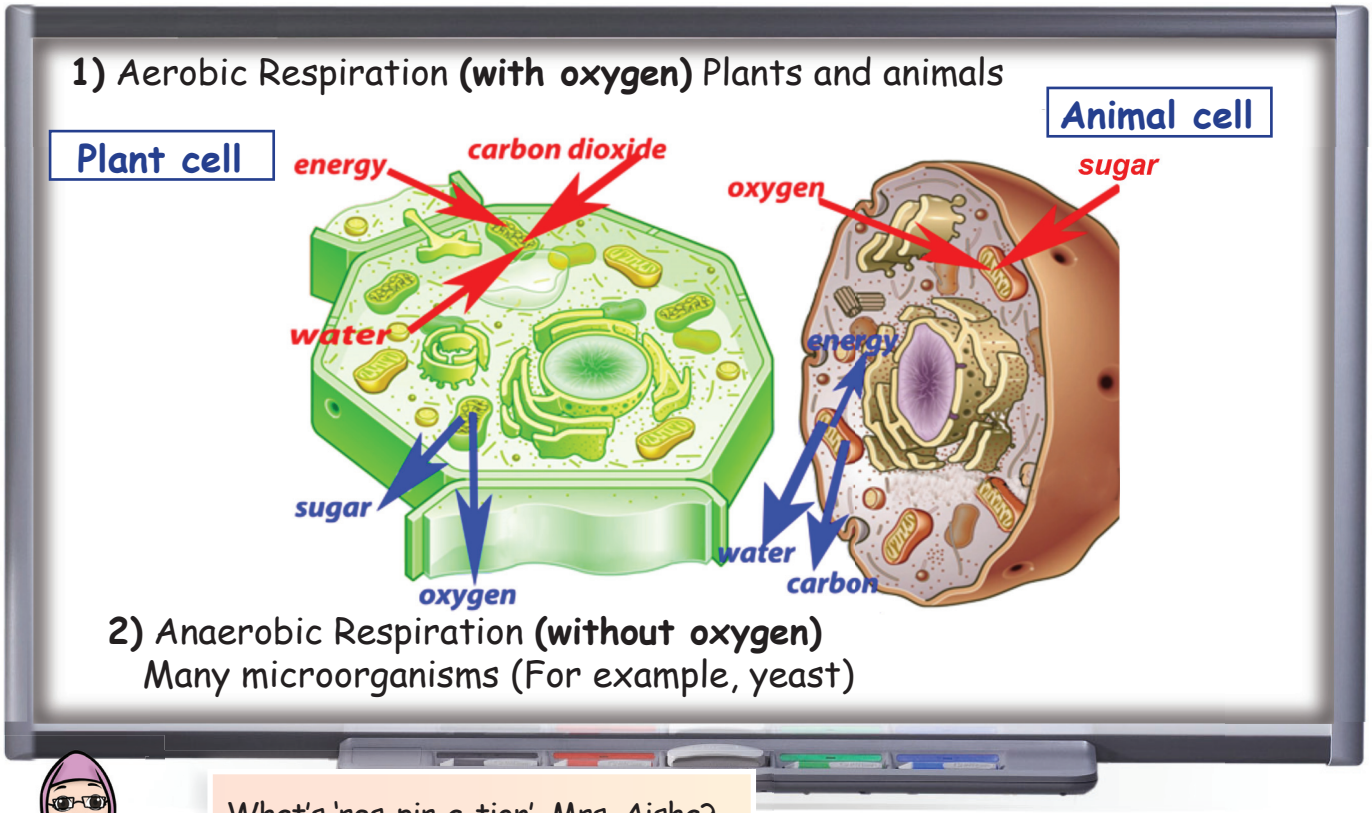
4) Mitosis makes cells that are ..... . This means they are exactly the same.

RESPIRATION

KEYWORDS: cell | respire/respiration | aerobic/anaerobic | breathe | rate of respiration | microorganism | respirometer

Mrs Aisha is teaching Maha and Sheikha about **respiration**.
Read and listen to the lesson, then do the activities that follow.

1) Aerobic Respiration **(with oxygen)** Plants and animals



2) Anaerobic Respiration **(without oxygen)**
Many microorganisms (For example, yeast)

What's 'res-pir-a-tion', Mrs. Aisha? Why do living things respire?

A **cell** is the smallest unit of life. All living things need energy. Cells **respire** to get energy from food. This is **respiration**. Respiration happens in all living cells. Animals take in air when they **breathe**. Air has oxygen, which helps respiration happen.

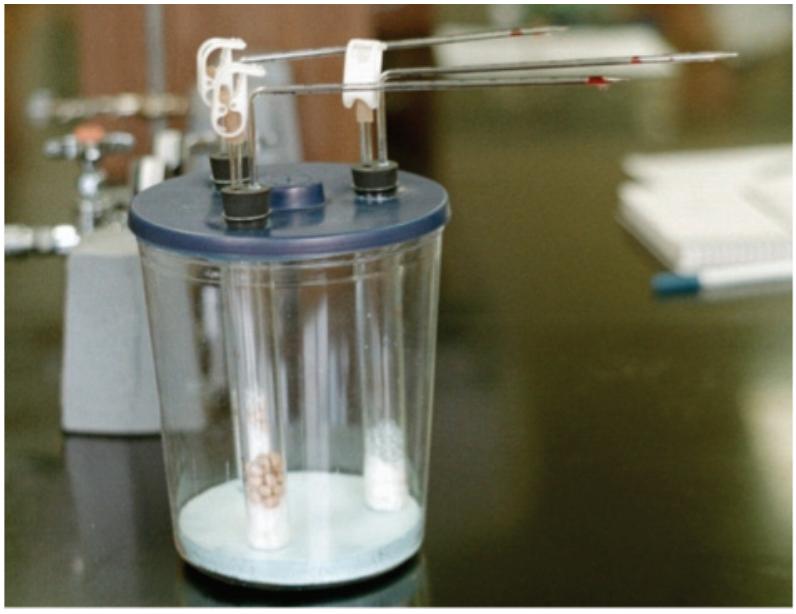
Yes! My book says that animals take in oxygen and give out carbon dioxide. And plants respire, too!

That's right, Sheikha. Respiration with oxygen is called **aerobic respiration** (air-o-bic). This happens in animals and plants

Is there another kind of respiration?

Yes. Some microorganisms respire without oxygen. (**Microorganisms** are tiny living things. We can't see them without a **microscope**). This is **anaerobic respiration** (an-air-o-bic). In living cells, we can measure how fast or slowly a cell respires.

This is the **rate of respiration**.



We measure the rate of respiration using a respirometer.

Task 1:

Work in pairs. Which one of the following sentences is FALSE? Explain why.

1. All living things respire. TRUE/FALSE
2. All living things need oxygen to respire. TRUE/FALSE
3. Plants need oxygen to respire. TRUE/FALSE

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

Task 2:

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

1. There are ..... kinds of respiration.
   a) two b) three c) four

2. ..... respiration happen(s) without oxygen.
   a) Aerobic b) Anaerobic c) Both aerobic and anaerobic

3. Animals take in oxygen by ..... .
   a) walking b) eating c) breathing

4. Respiration is how living things get ..... .
   a) light b) energy c) water

5. Some ..... do not need oxygen to respire.
   a) animals b) plants c) microorganisms

Task 3:

Match the words with their definitions. Number one has been done for you.

1. Rate
2. Anaerobic
3. Cell
4. Aerobic
5. Carbon dioxide

a) With oxygen
b) Gas
c) Without oxygen
d) Speed (fast or slow)
e) Living thing

Task 4:

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

What is a cell?

Anaerobic respiration is.... but anaerobic respiration...

What things don't need oxygen to respire?

That's easy! A cell is ...

What's the difference between aerobic respiration and anaerobic respiration?

Hmm? I think ...

Task 6: PUZZLE TIME!

That's excellent! Now work in teams. Help each other and complete this crossword:

Across

2) How fast or slow something respires is the ..... of respiration.

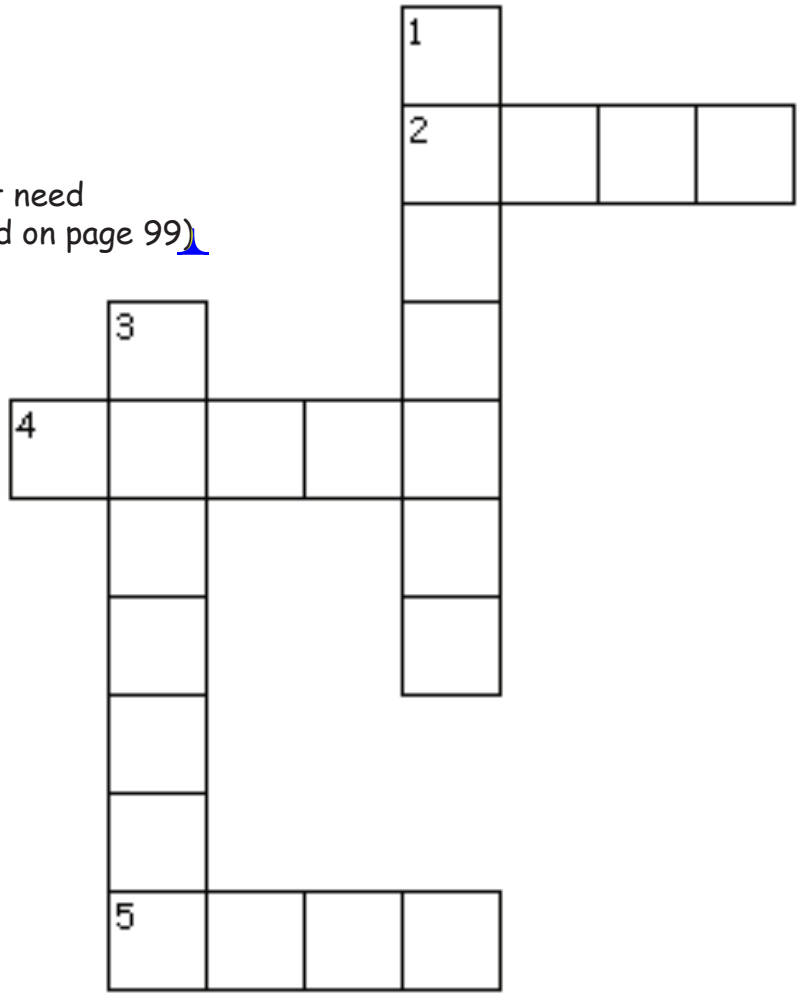
4) This is a microorganism that doesn´t need oxygen to respire. (Look on the board on page 99)

5) This is the smallest unit of life.

Down

1) Animals do this to get oxygen.

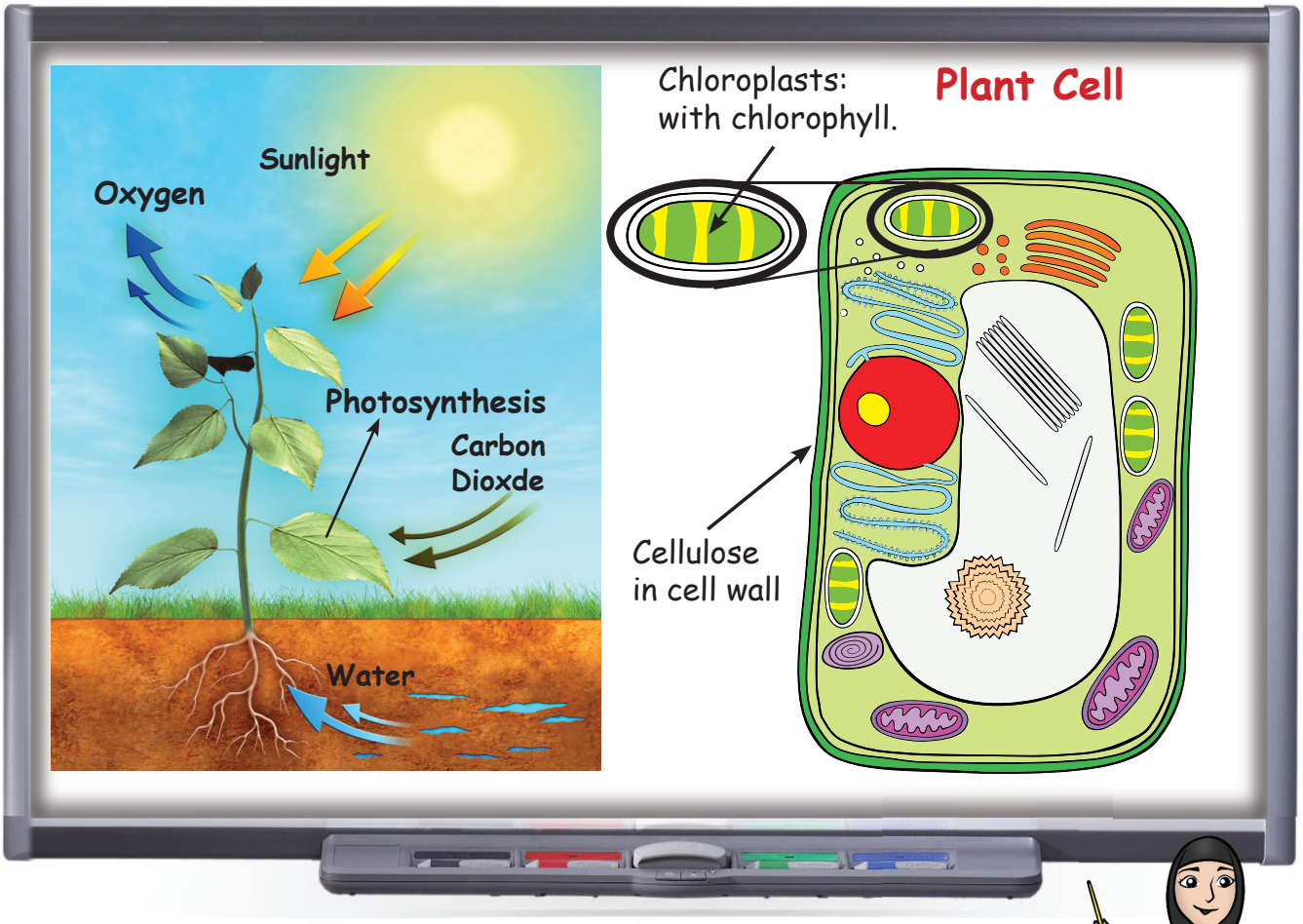
3) ..... respiration is with oxygen



PHOTOSYNTHESIS

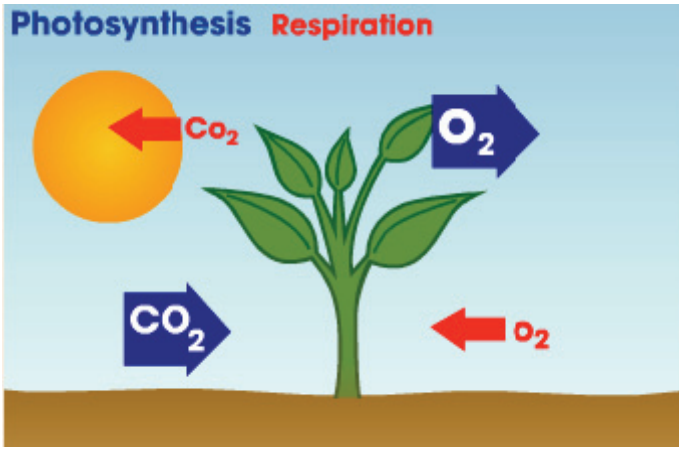
KEYWORDS: **photosynthesis** **chloroplasts** **chlorophyll** **starch** **glucose** **biomass**

Today, Maha and Sheikha are learning about **photosynthesis**.
Read and listen to the lesson, then do the activities that follow.



Photosynthesis is when plants use carbon dioxide, water and energy from sunlight to make **glucose.** This happens during the day. Glucose is stored as starch. Photosynthesis happens in **chloroplasts**. These contain a green substance called **chlorophyll**. Plants can only photosynthesize in the light.

Ah! So, leaves let carbon dioxide and oxygen go in and out.



Yes. Respiration takes place in the plant's cells, using oxygen to produce energy and giving off carbon dioxide as a waste product. So, in terms of the gas taken in and the gas given out, **respiration is the opposite of photosynthesis**. Look at the diagram below. The arrows represent the relative sizes.

Before I forget, who knows what **biomass** means?

I know! It is the mass of any kind of plant that we can convert into energy, like burning it.

Task 1:

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

1. Plants change glucose into starch and cellulose. TRUE/FALSE
2. In photosynthesis, oxygen is given out. TRUE/FALSE
3. Plants photosynthesize all the time. TRUE/FALSE

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

Task 2:

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

1 Chlorophyll	a) are where photosynthesis happens.
2 Chloroplasts	b) gives plants their green colour.
3 Starch	c) is energy that is converted from plants.
4 Biomass	d) is made during photosynthesis.
5 Glucose	e) is a kind of food made from glucose.

Task 3:

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

1 Plants need ..... for photosynthesis.

a) oxygen b) starch c) carbon dioxide

2 Chloroplasts have ..... in them.

a) stomata b) chlorophyll c) sunlight

3 Plants use ..... from sunlight in photosynthesis.

a) oxygen b) energy c) chlorophyll

Task 4:

Work in pairs. Ask and answer these questions about photosynthesis:

What do plants change glucose into?

What is photosynthesis?

What is biomass?

I know! They change glucose into ..... !

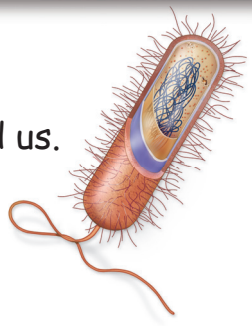
It's when a plant...

DISEASES AND MICROORGANISMS

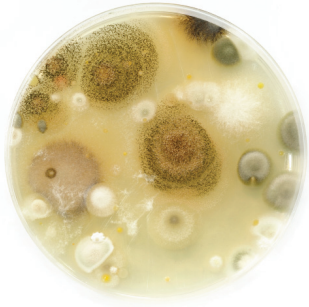
KEYWORDS: **infection/infectious** **microbes/microorganisms** **viruses** **bacteria** **fungi** **pathogens** **protozoa**

Today, Mrs Aisha is teaching the class about disease and **microorganisms**. Read and listen to the lesson, then do the activities that follow.

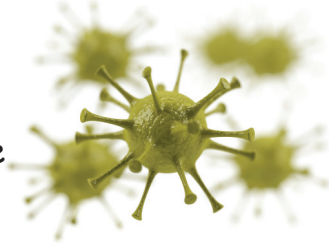
Bacteria
are all around us.



Fungi
can cause disease.



Viruses
often cause serious disease



Microbes that make diseases are pathogens. Infection is when disease goes from one living thing to another.

Today, we are studying disease and **microorganisms**. We also call microorganisms 'microbes'. Do you know what they are, Maha?

Yes, I do. **Microbes** are tiny living things that we can only see with a microscope, for example, **protozoa**. It is a single celled organism that can cause infections.

What about you, Huda?

Yes! Bacteria, viruses and fungi are all **microbes**. **Microbes** that cause diseases and make us ill are often called germs.

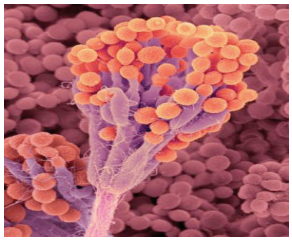
Mrs Aisha: That's right, Huda and Maha. The real name for microbes that make diseases is **pathogens**. When pathogens go into a living thing, it is an **infection**. A disease that can go from one living thing, to another is **infectious**.

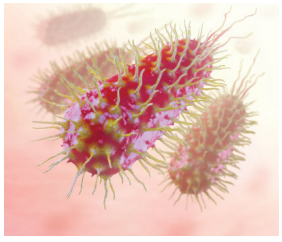
Maryam: Are all microbes bad, Mrs Aisha?

Mrs Aisha: No, they're not. Microbes are all around us all the time. Some are good and some are bad. Some viruses are very dangerous. **Viruses** are very tiny and they need to live in other cells. Viruses are much smaller than bacteria and fungi. **Viruses** can cause many diseases, such as flu and measles.

Maryam: What about bacteria and **fungi**?

Mrs Aisha: **Bacteria** are everywhere; in the air, earth and water. Some are useful – like the ones in our stomach, but some are harmful. **Fungi** are bigger than bacteria and viruses. Fungi can cause infectious diseases, but they can be useful too. Yeast is a fungus. We make bread with yeast.





Task 1:

Match the two parts of the sentences. Draw lines.

1 Fungi	a) These are microbes that spread disease; often called 'germs'.
2 Bacteria	b) Yeast is one of these.
3 Viruses	c) These are everywhere, even in your stomach!
4 Pathogens	d) These need to live in other cells.

Task 2:

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

1. Microbes that cause disease are called ..... .
   a) bacteria **b)** yeast **c)** pathogens
2. ..... are smaller than the other kinds of microbes.
   a) Bacteria **b)** Viruses **c)** Fungi
3. A disease that passes between living things is ..... .
   a) fungi **b)** useful **c)** infectious
4. Flu is a ..... .
   a) fungus **b)** bacteria **c)** virus
5. We can only see protozoa with ..... .
   a) glasses **b)** a camera **c)** a microscope

Task 3:

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

1. Both fungi and bacteria can be useful and harmful. **TRUE/FALSE**
2. Yeast is an example of a useful fungus. **TRUE/FALSE**
3. Pathogens help defend your body from infections. **TRUE/FALSE**

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

Task 4:

Work in pairs. Ask and answer the following questions about diseases and microorganisms.

What are pathogens?

What does 'protozoa' mean?

Which kinds of microbes live in cells?

I know that! Pathogens are...

Many diseases are infectious. What does 'infectious' mean?

Hmm? I think it's ....

Task 5:

Excellent! Now work in teams. Complete the crossword about today's lesson.

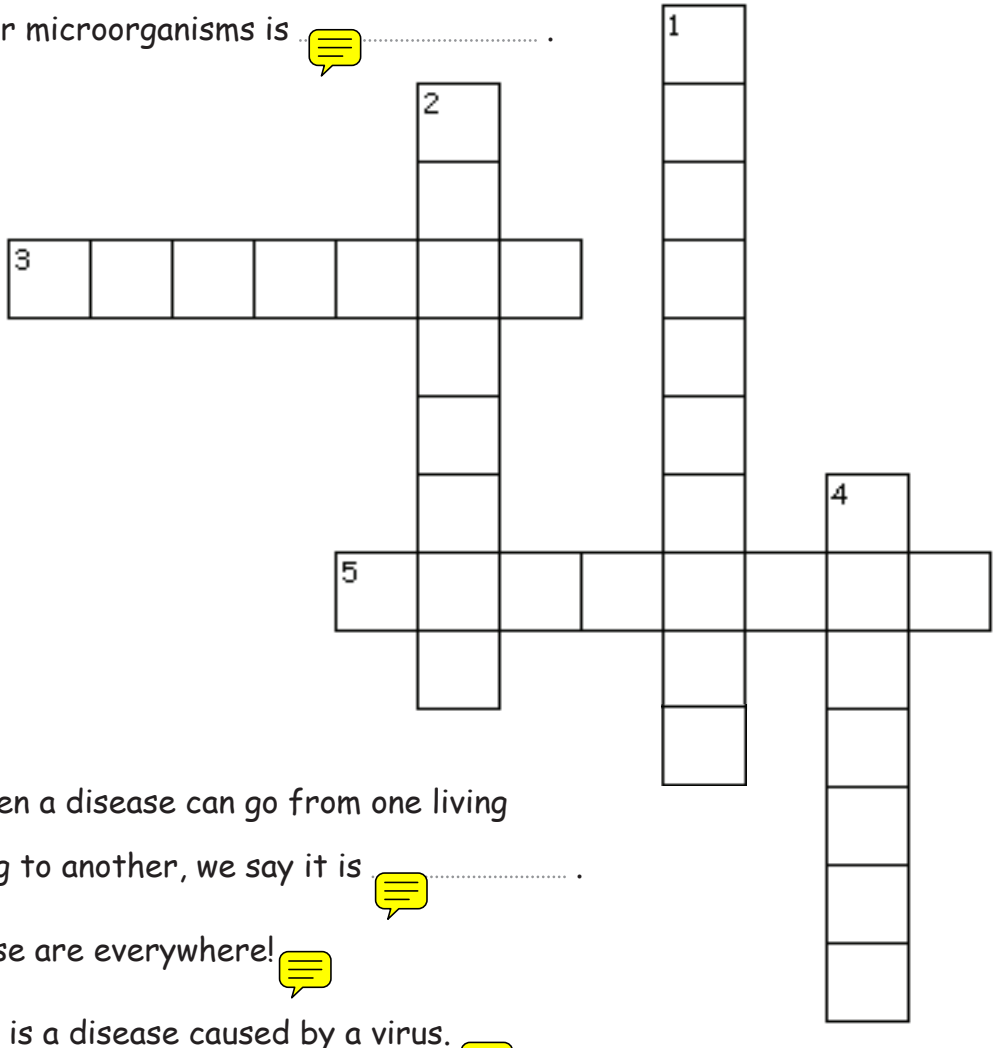
This is difficult!

Don't worry, Maha.
I'll help you! 3 across is...

Across

3) You have useful bacteria in this part of your body!

5) Another word for microorganisms is ..... .



Down

1) When a disease can go from one living thing to another, we say it is ..... .

2) These are everywhere!

4) This is a disease caused by a virus.

DISEASES AND INFECTION

KEYWORDS: **immunity** **vaccine/vaccination** **antibiotics** **penicillin** **antibodies**

Today, Maha and Sheikha are learning about **preventing infection and disease**. Read and listen to the lesson, then do the activities that follow.

Protecting Ourselves against Infection and Disease

Immunity: The natural way the body fights and stops disease and infection.

Vaccine: A process of exposing the body's immune system to a harmless version of the pathogen in order to stimulate white blood cells to produce antibodies.

Antibiotics: A medicine made from microorganisms (like fungus) that fights infection.

Penicillin: An important antibiotic that treats many infections (e.g. pneumonia)

Last week, we studied diseases, and today, we are learning how to fight them.

That's very important, Mrs Aisha, but what is 'im-mu-ni-ty'?

Immunity? I know! Immunity is how the body fights disease and infection. When you get a disease or infection, your body makes **antibodies** to fight it.

Mrs Aisha: Well done, Sheikha! When we protect ourselves, we stop diseases, infections and viruses from hurting us. Our body protects itself by immunity, but sometimes our body needs help.

Maha: Yes! That's why we have vaccines.

Mrs Aisha: Right, Maha. Look at the board. You can see someone getting an injection of a vaccine. This is a **vaccination**. I'm sure you have had some vaccinations. Vaccination involves exposing the body's immune system to a weakened or harmless version of the pathogen in order to stimulate white blood cells to produce antibodies.

Sheikha: But, what are antibiotics, Mrs Aisha?

Mrs Aisha: **Antibiotics** are medicines made from microorganisms, like fungus. They fight infection by killing germs in the body. We take antibiotics when we are ill.

Penicillin is a very important kind of antibiotic. We use penicillin to treat many diseases, like pneumonia (new-mo-nee-a).

Maha: Thank you, Mrs Aisha. I'm really glad we have vaccines and antibiotics.

Task 1:

Let's check that! Draw lines to match the words with the correct definitions.

1 Immunity	a) We often give this by injection. It's made from germs, but stops you getting ill in the future.
2 Vaccine	b) Your body's way of fighting infection. It makes chemicals to kill germs.
3 Penicillin	c) Medicine made from microorganisms. It fights infection. We take this when we are ill.
4 Antibiotic	d) This fights pneumonia and many other infections.

Task 2:

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

1. We take antibiotics ..... we are ill.
   a) when **b)** before **c)** after
2. Penicillin is a kind of ..... .
   a) illness **b)** antibiotic **c)** vaccine
3. ..... is the way your body protects itself.
   a) Immunity **b)** Vaccination **c)** Penicillin

Task 3:

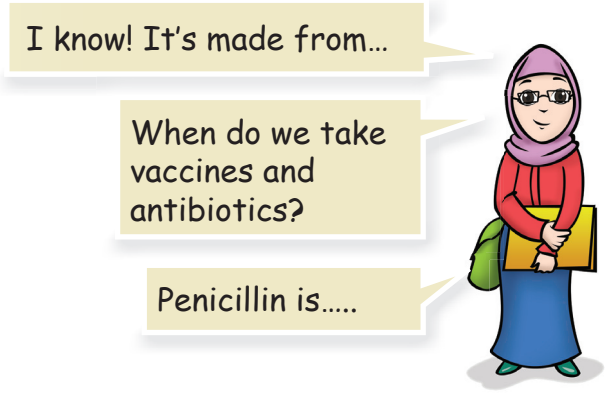
Work in pairs. ONE of these sentences is FALSE. Which one is it? Explain why.

1. Penicillin is a kind of antibiotic. **TRUE/FALSE**
2. If you have pneumonia, it is good to take penicillin. **TRUE/FALSE**
3. Immunity, antibiotics and vaccines are all kinds of medicine. **TRUE/FALSE**

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

Task 4:

Work in pairs. Ask and answer the following questions about how we fight infection and disease.



Task 5: PUZZLE TIME!

Work in teams and complete this crossword about fighting disease and infection.

Across

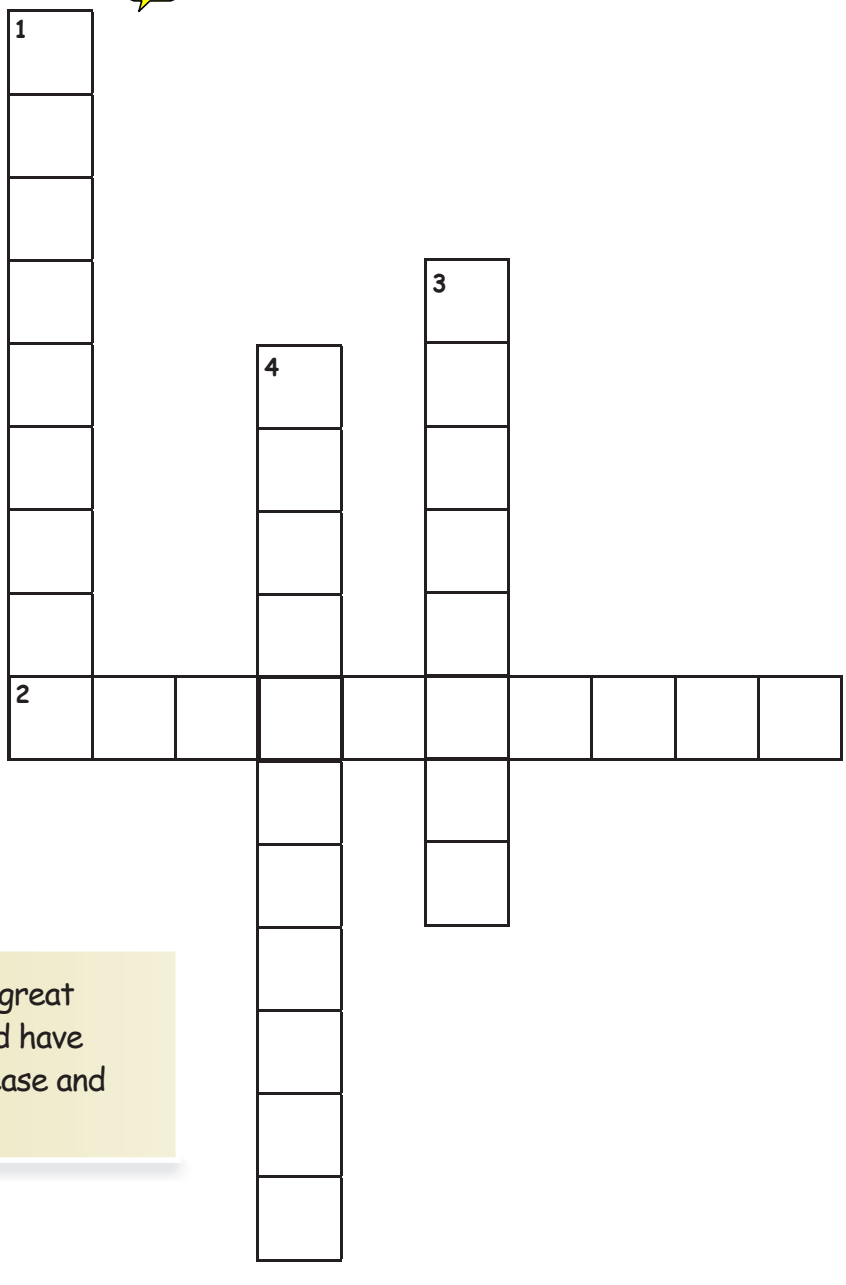
2) An ..... is made from microorganisms and it fights infection.

Down

1) This is a disease we treat with penicillin.

3) This is the natural way our body makes chemicals to fight illness.

4) The doctor or nurse gives us a ..... to stop us getting a disease in the future.

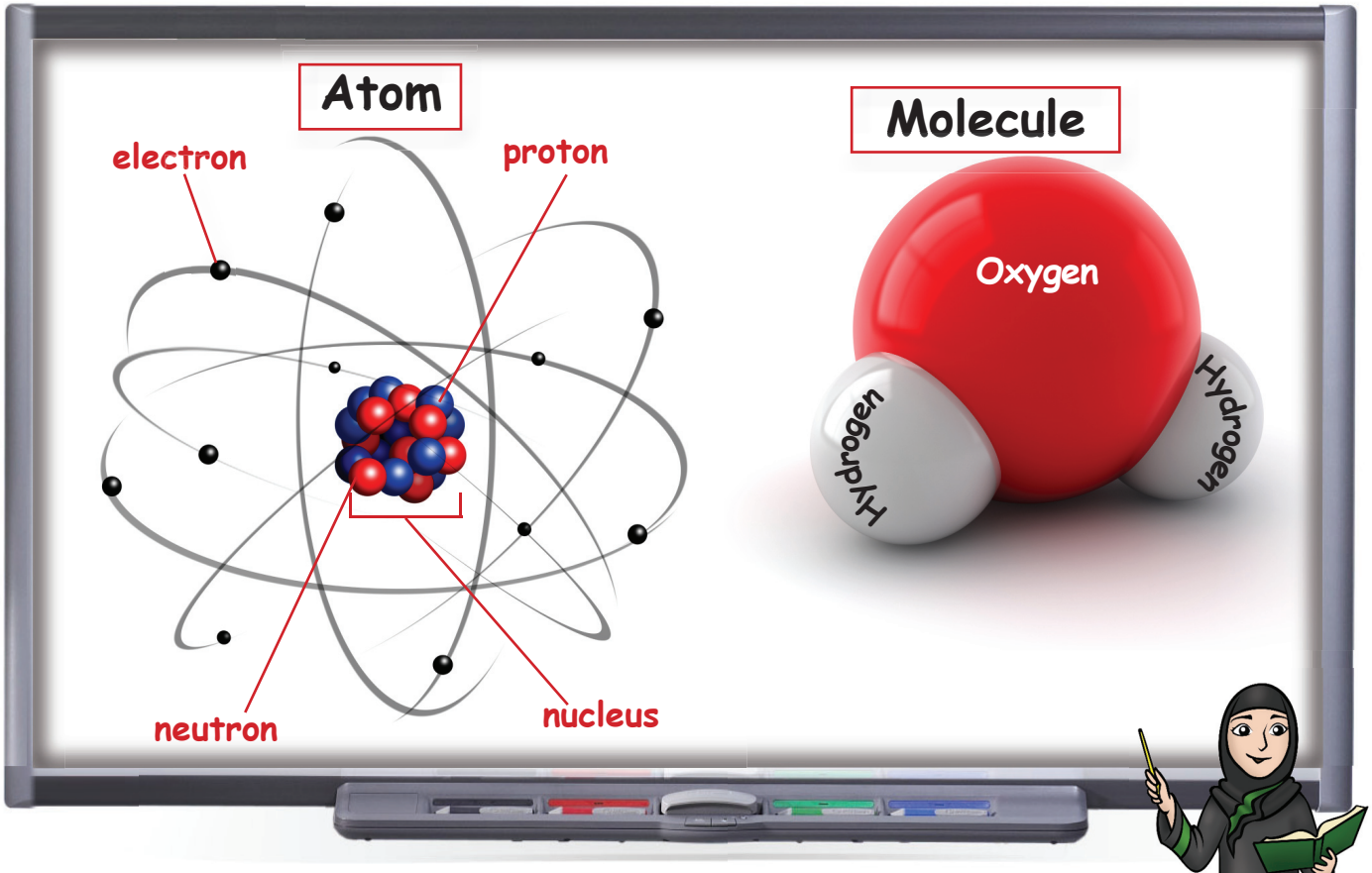


Excellent! Now, check out this great website to play some games and have fun learning about fighting disease and infection.

ATOMIC STRUCTURE

KEYWORDS: atom molecule nucleus proton neutron electron

Mrs Aisha is teaching the class about **atomic structure**.
Read and listen to the lesson, then do the activities that follow:



Miss, what's the difference between an atom and a molecule?

An atom is smaller than a molecule. Look at the board. An **atom** is the smallest part of any living or non living thing. Do you know the parts of an atom, Sheikha?

Yes, I do. The **nucleus** is in the centre of an atom. It is made of **protons** and **neutrons**. The tiny particles moving around the nucleus are **electrons**.

That's right. When atoms come together, they make molecules.

A **molecule** is two or more atoms joined together chemically. Look at the board. You can see that two hydrogen atoms and one oxygen atom come together to make a substance. That substance is H_2O. That's water!

Task 1:

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

1. Molecules are much bigger than atoms. **TRUE/FALSE**
2. The nucleus of an atom is made of protons and electrons. **TRUE/FALSE**
3. Water is made of hydrogen and oxygen. **TRUE/FALSE**

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

Task 2:

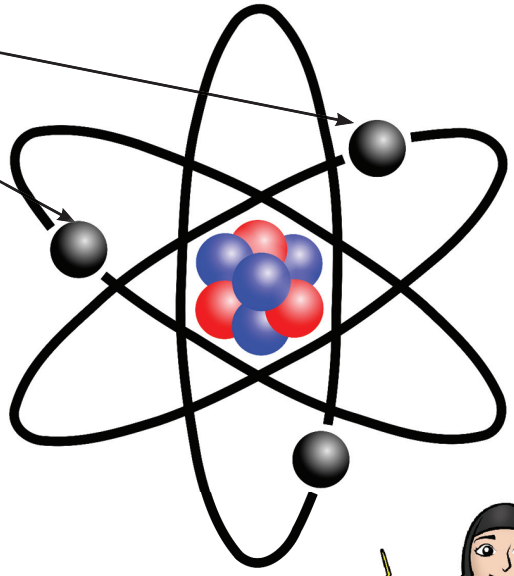
Choose the correct words to complete the following sentences. Is it a, b, or c?

1. Atoms join to form…
   a) protons **b)** a nucleus **c)** molecules
2. The tiny particles moving around the nucleus are…
   a) protons **b)** electrons **c)** molecules
3. The smallest part of anything is…
   a) an atom **b)** a molecule **c)** hydrogen
4. Atoms are made of..
   a) molecules **b)** protons, neutrons and electrons **c)** protons and neutrons.
5. A water molecule is made of …
   a) a hydrogen atom and two oxygen atoms **b)** an oxygen atom and two hydrogen atoms
   c) a hydrogen atom and an oxygen atom

Task 3:

What are they? Label this diagram. Draw the arrow (⟶) and write the words:

1. E..... s
2. N..... is made of
3. P..... s and
4. N..... s



Task 4:

Match the words with correct clues.

1	Electrons	a)	This is made of neutrons and protons.
2	Hydrogen	b)	These move around the centre of the atom.
3	Water	c)	Atoms combine to form these.
4	Molecules	d)	Two of these atoms combine with an oxygen atom to make something very useful!
5	Nucleus	e)	H_2O

Task 5:

Write questions for the following statements.

1. ..... ?

   It is made of two or more atoms.

2. ..... ?

   It's made of two hydrogen atoms and one oxygen atom.

3. ..... ?

   It is made of protons and neutrons.

Task 6:

Ask and answer the following questions about atomic structure:

What is an atom? What is it made of?

It is..... It's made of...

What is H_2O? How is it made?

It's... It's made when...

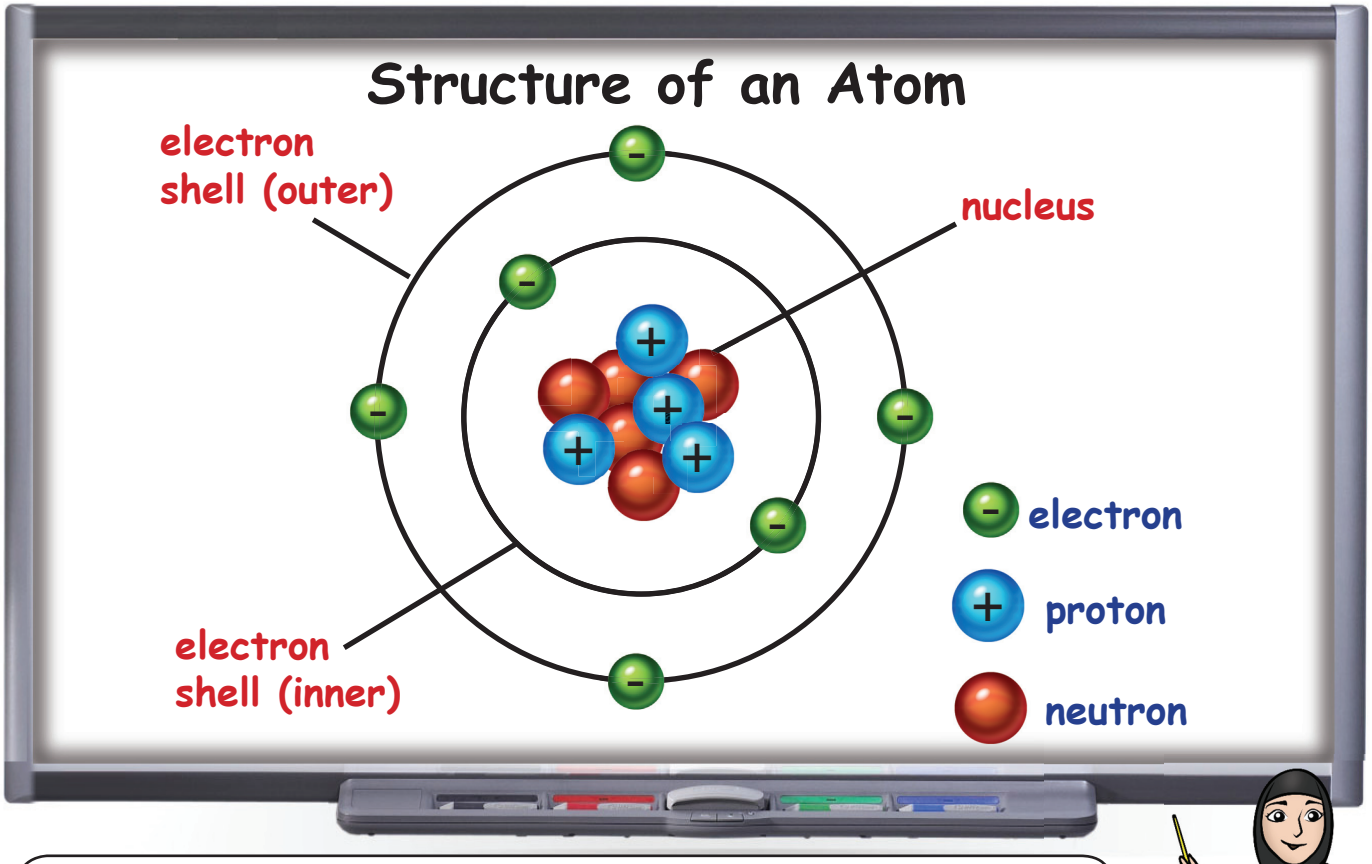
What's the difference between atoms and molecules?

Atoms are..... but molecules are.....

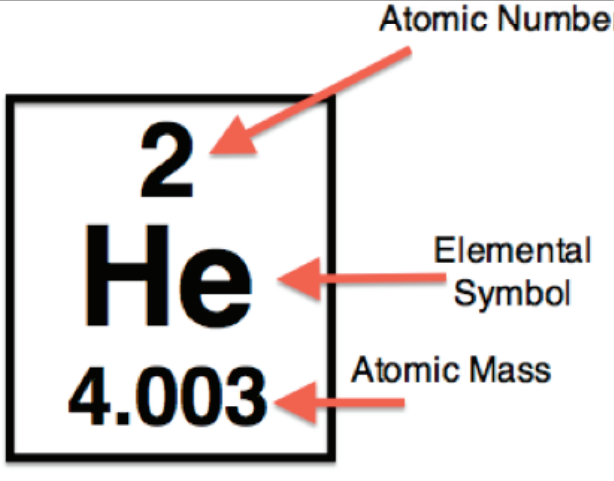
INSIDE AN ATOM

KEYWORDS: electron shell (outer/inner shell) positive/ negative charge atomic number

Today, Mrs Aisha is revising ATOMIC STRUCTURE with Maha and Sheikha.



OK, Maha, can you remember what is in the centre of an atom?
When you look at the periodic table, you see these two numbers – what do they mean?



I know, **Atomic number** means the number of protons only and **atomic mass** mean, the number of protons and neutrons. Can you tell me more?

Yes, I can Miss. The **nucleus** is in the centre. It's made of **protons** and **neutrons**. The tiny particles that fly around the nucleus are **electrons**. Electrons are much smaller than protons and neutrons.

That's right! Our book says the electrons make the electron shell. There is an inner shell closer to the nucleus and an outer shell further away from the nucleus. Can you explain about charges please, Mrs Aisha?

Sure! A charge is a kind of electrical force. The protons have a **positive (+)** charge and the electrons have a **negative (-) charge**. Neutrons don't have any charge at all.

Thank you very much, Mrs Aisha. It's clear now.

Task 1:

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

1. The outer shell is made of electrons. TRUE/FALSE
2. Electrons are bigger than protons and neutrons. TRUE/FALSE
3. The protons in the nucleus have a positive charge. TRUE/FALSE

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

Task 2:

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

1 The inner and outer shells of the atom	a) are much bigger than electrons.
2 Protons and neutrons	b) are made of electrons.
3 Protons	c) have no charge.
4 Neutrons	d) have a negative charge.
5 Electrons	e) have a positive charge.

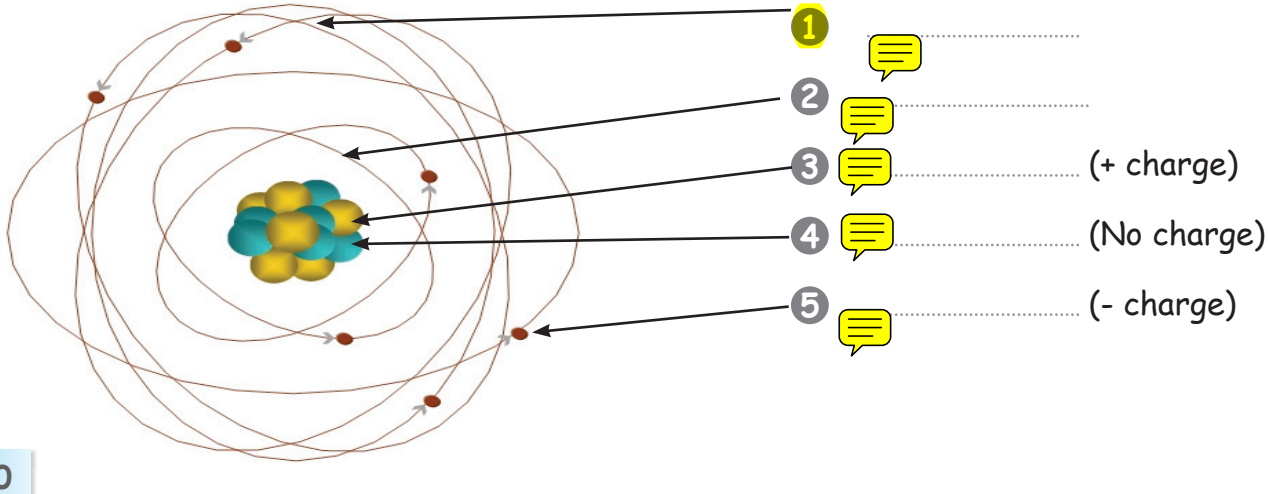
Task 3:

Work in pairs. Are these sentences TRUE or FALSE? If they are FALSE, explain why.

1. The nucleus is at the centre of the atom. **TRUE/FALSE**
2. Electrons fly around the nucleus. **TRUE/FALSE**
3. The outer shell is closer to the nucleus than the inner shell. **TRUE/FALSE**
4. An atom is made of protons, neutrons and electrons. **TRUE/FALSE**
5. Electrons are the largest particles in an atom. **TRUE/FALSE**

Task 4:

Label the diagram.



Task 5:

Work in pairs. Ask and answer the following questions about the structure of an atom.

Can you describe an atom? What is it made of?

What are the smallest parts of atom?

Where are the electrons?

At the centre.... Around the centre.....

They are the ....

The electrons are.....

Task 6: PUZZLE TIME!

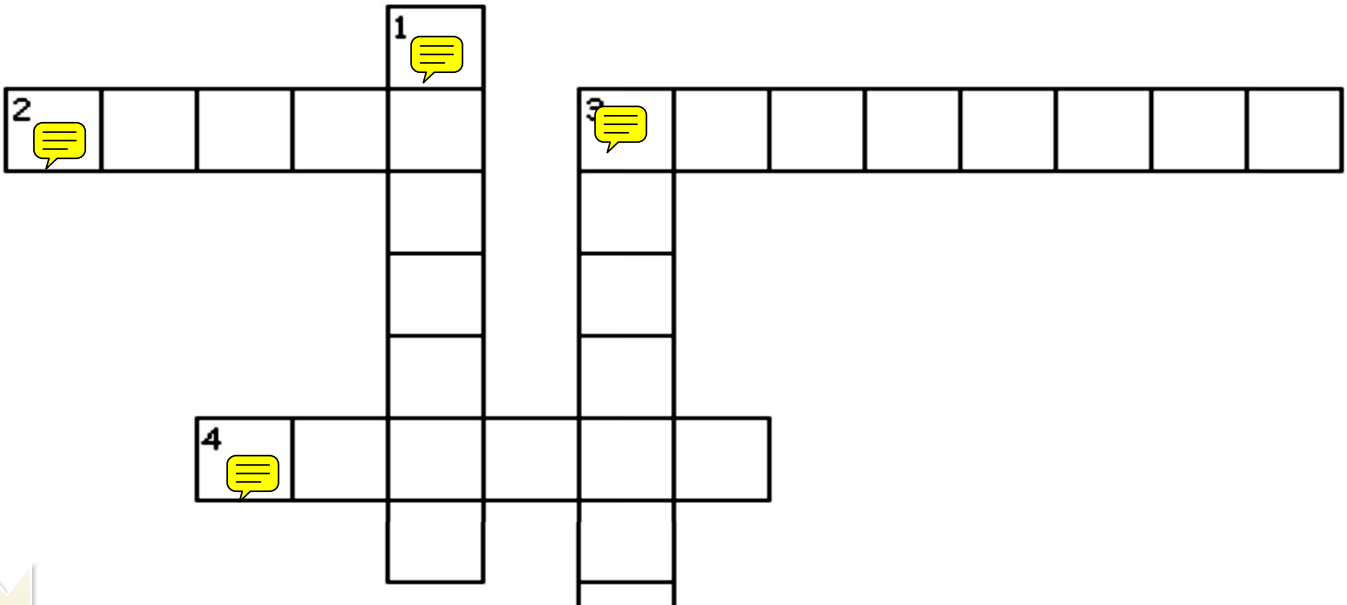
Work in teams to complete this crossword.

Across

2) The part of the atom furthest from the centre is the ..... shell.

3) Electons have a ..... charge.

4) The nucleus is in the ..... of the atom.



Down

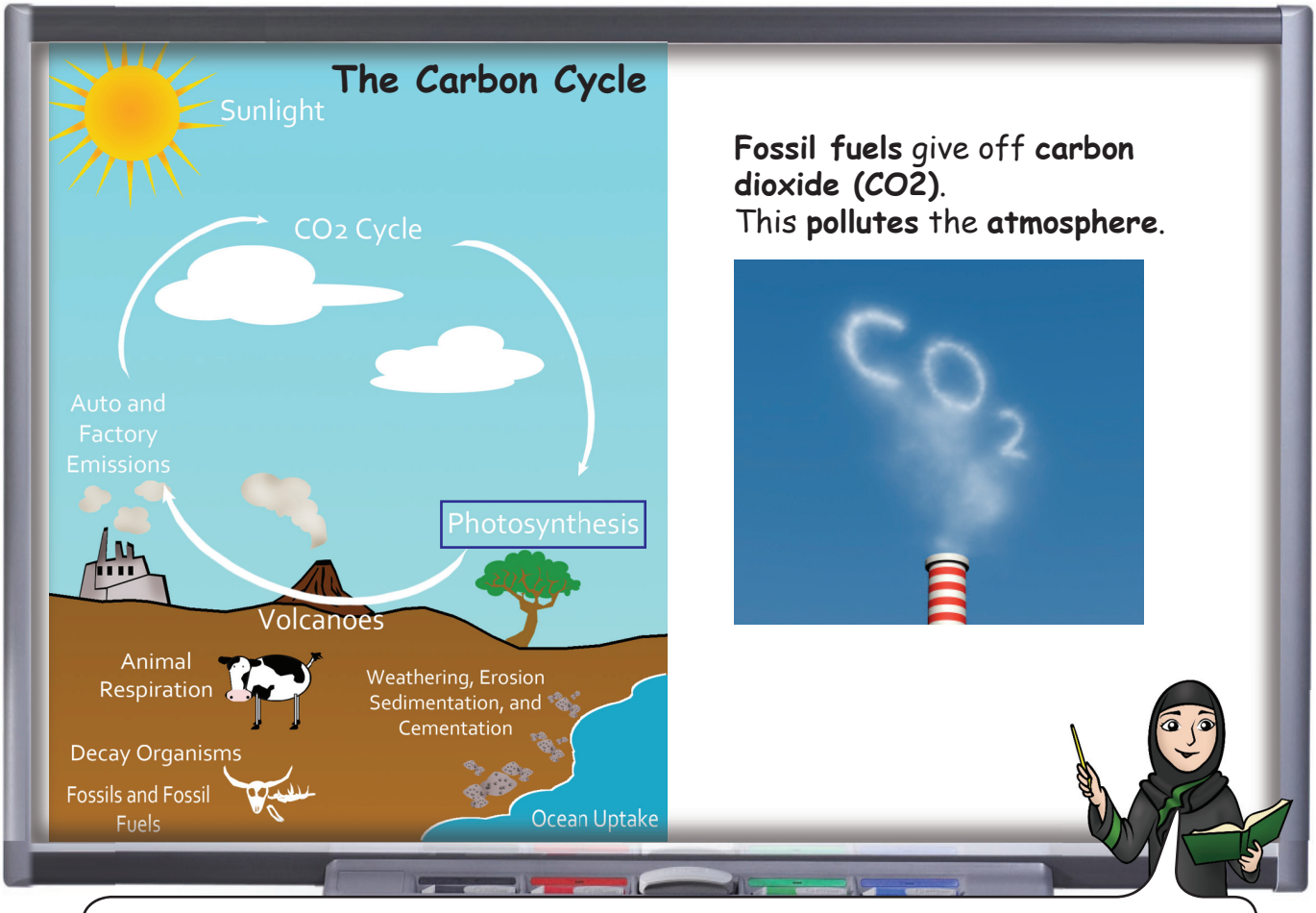
1) These are charged particles in the nucleus.

3) These particles have no charge.

POLLUTION 1

KEYWORDS: **pollution** **atmosphere** **fuel/fossil fuels** **carbon cycle**

Today, Mrs Aisha is teaching the class about **pollution**. Read and listen to the lesson, then do the activities that follow.



Today, we are studying a very important subject: **pollution**. This is when we produce harmful substances that damage the natural things around us, like the plants, animals and atmosphere. Can you tell us what the atmosphere is please, Maha?

Yes, Miss. The **atmosphere** is the mixture of gases around the earth. It's important because it's the air we breathe! Our atmosphere is made of nitrogen (78%) and oxygen (21%).

Oxygen is very important, because we need it to respire. There is some carbon dioxide in the atmosphere, too. If this gets too much, it's a big problem!

Mrs Aisha: You're right, Sheikha. There's very little carbon dioxide in the atmosphere, only 0.37%. This amount has stayed the same because of the **carbon cycle**. This is the way photosynthesis, respiration and burning keep the amount of carbon dioxide at the same level all the time.

Maha: So, what are fossil fuels? Why are they a problem?

Mrs Aisha: A **fuel** is a material we burn to get energy and power. **Fossil fuels** are natural fuels - oil, coal and natural gas – that come from inside the earth. They were made millions of years ago. When we burn fossil fuels, we put a lot of carbon dioxide and other harmful gases into the atmosphere. This pollutes our atmosphere and the earth.

Task 1:

Match the two parts to complete the sentences. Draw lines.

1 A fossil fuel is	a) the natural way the earth keeps the amount of CO_2 at the same level.
2 The carbon cycle is	b) something you can burn to get energy.
3 The atmosphere is	c) when we make harmful things that damage our world.
4 Pollution is	d) the gases around the earth.
5 Electrons	e) have a negative charge.

Task 2:

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

1 Respiration is part of the carbon cycle. TRUE/FALSE

2 The two main gases in the atmosphere are oxygen and CO_2. TRUE/FALSE

3 When we burn fossil fuels, we pollute the atmosphere. TRUE/FALSE

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

Task 3:

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

1. Natural ..... is a fossil fuel.

   a) air b) gas c) wood

2. The atmosphere has less than 1% of ..... .

   a) nitrogen b) oxygen c) carbon dioxide

3. Fossil fuels make ..... when we burn them. This pollutes the atmosphere.

   a) nitrogen b) oxygen c) carbon dioxide

4. We get fossil fuels from ..... .

   a) inside the earth b) the atmosphere c) pollution

Task 4:

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

What is the atmosphere? What is it made of?

It is..... It's made of....

What are fossil fuels? Why are they useful?

They are ... They are very useful because...

How do we cause pollution with fossil fuels?

When we burn...

Task 5: PUZZLE TIME!

Now, let's work in teams to complete this crossword.

Across

3) When we burn fossil fuels, they make gases that ..... the atmosphere and the Earth.

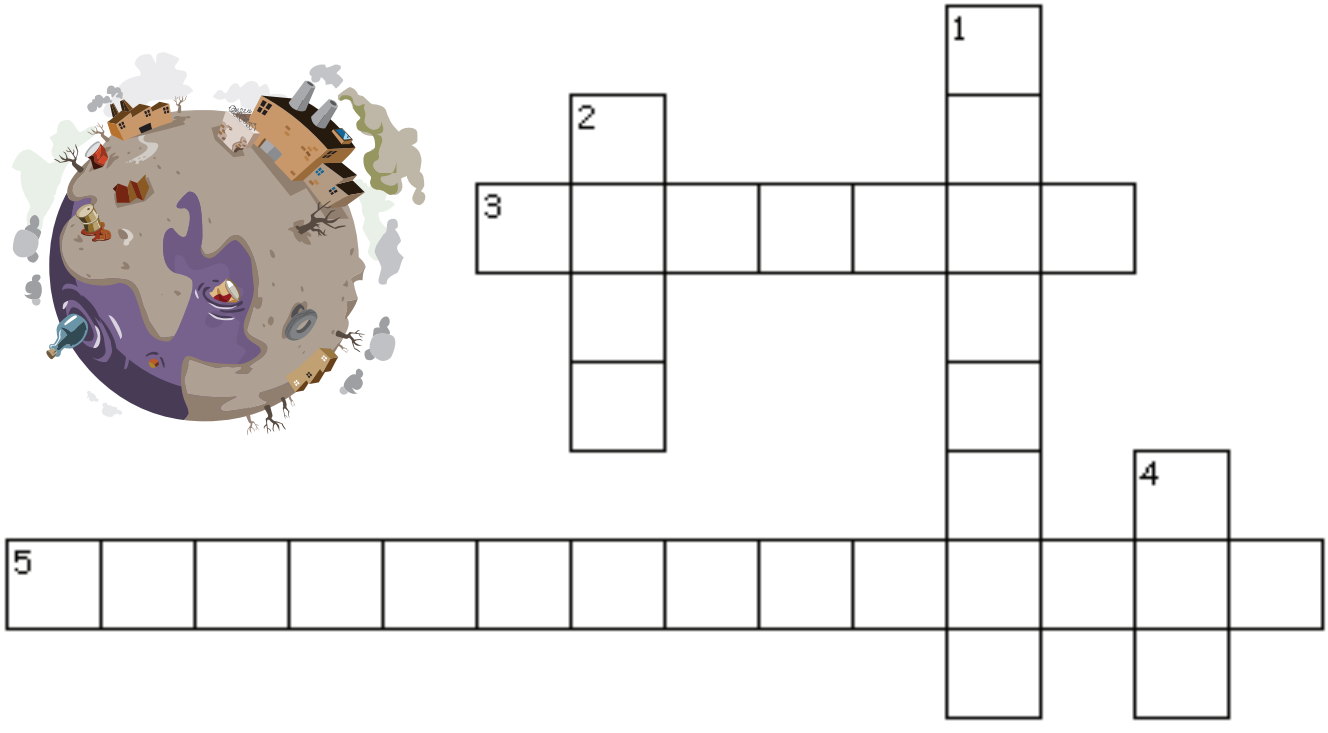
5) This is part of the carbon cycle.

Down

1) There's more of this in the atmosphere than any other gas.

2) This is a fossil fuel.

4) The atmosphere is important. It's the ..... we breathe!



POLLUTION 2

KEYWORDS: **eutrophication** **fuels** **pH** **acidic** **environment** **nitrate** **fertilizer**

Today, Mrs Aisha is teaching the class more about **pollution**. This time about water pollution. Read and listen to the lesson, then do the activities that follow

Water pollutants. Increasing human population has led to an increase in pollution. Some of this is due to:

- more **carbonaceous fuels being burnt like, coal, petrol and gas** for heat and power.
- more food being grown – so, we use more chemical fertilizers!
- land taken over for industry and housing. This destroys green or natural areas.

As a result there has been an increase in levels of water pollution.

- **Nitrate fertilisers** are very soluble in water and are easily washed off fields by the rain and then into rivers and reservoirs. They are then difficult to remove.
- **Pesticides** are used by farmers to kill weeds or insects and may be washed or blown into streams and rivers. Sulfur dioxide in the air can dissolve in water to form an **acidic** solution. This changes the **pH level** and affects the living **environment** for animals.

Ok, so about water? How is it exactly affected?

Ok, let's talk about .. Eutrophication

A major problem with the use of fertilisers occurs when they are washed off the land by rainwater into rivers and lakes.
This increases the amount of chemicals in the water which encourages algae growth.

This algae forms a layer over the water surface. This prevents sunlight reaching other water plants, which then die. **Bacteria** break down the dead plants and use up the oxygen in the water so, the lake may be left completely lifeless.

Task 1:

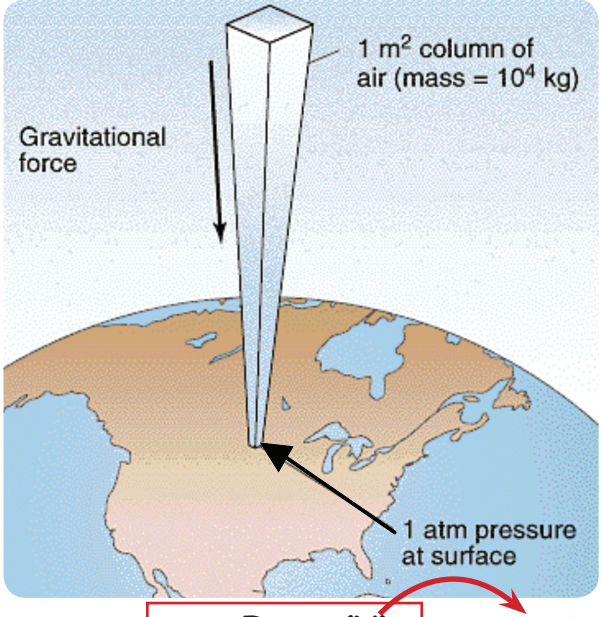
Draw lines. Match the two parts to make correct sentences.

1 pH level	a) is the place we are surrounded by.
2 Eutrophication	b) is when too much of a particular plant grows causing a major disturbance to the balanced ecosystem.
3 Environment	c) tells us how acidic or alkaline something is.
4 Nitrate fertilisers	d) are easily washed off and stay in the water causing an imbalance

PRESSURE

KEYWORDS: pressure pascal (Pa) force contact area air pressure barometer

Air Pressure



$$P = \frac{\text{Force (N)}}{\text{Area (m}^2\text{)}}$$

remember Newtons!

Which applies more pressure on the earth?

Discuss with your teacher!

Today, we are studying **pressure**. The standard unit of measure for pressure is called the **pascal** (Pa) and is calculated by dividing the **force** (N) with the **contact area** (m^2).

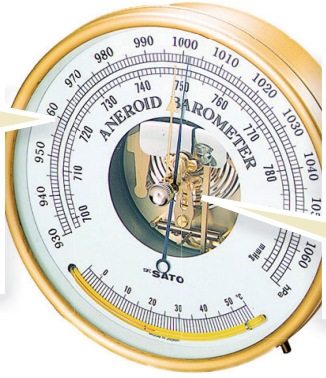
Air makes pressure, too. On earth, there is a force of approximately 1N of air pushing down on a $1m^2$ contact area.

Well done! That's correct. Air pressure can change according to height or altitude. We measure changes to air pressure using a **barometer**.

Does this mean as you get higher into the atmosphere, there is less air pushing down above you? And therefore, the air pressure is less?

This is an aneroid barometer.

It has a flexible metal box that has been tightly sealed, after some of the air was removed.



Small changes in surrounding air pressure cause the box to expand or contract and through a connected system of springs and levers a pointer moves around a dial to indicate the changing weather.

Task 1:

Match the words with the correct definitions.

1	A Pascal (Pa)	a)	measures changes in air pressure.
2	Pressure	b)	is a unit of measure for pressure.
3	A barometer	c)	is a concentration of force placed onto a contact area.

Task 2:

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

1. The concentration of a force on a specific area is .....
   a) pressure b) area c) weight

2. To calculate pressure, we use the following. Pressure is ..... .
   a) force x area b) $\frac{\text{force}}{\text{area}}$ c) $\frac{\text{area}}{\text{force}}$

3. As you get higher in altitude, the air pressure.....
   a) increases b) decreases c) stays the same

Task 3:

Read the clues, find the answers and then find the word in the word search.

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

Clues

1. Measured as newton (N)
2. Unit of pressure
3. Tool used for weather forecasting
4. P = Force/ ????
5. This changes when you fly in a plane.

Task 4:

Work in pairs. Ask and answer questions about pressure.

What is the formula for pressure? Let's design our own pressure calculation?

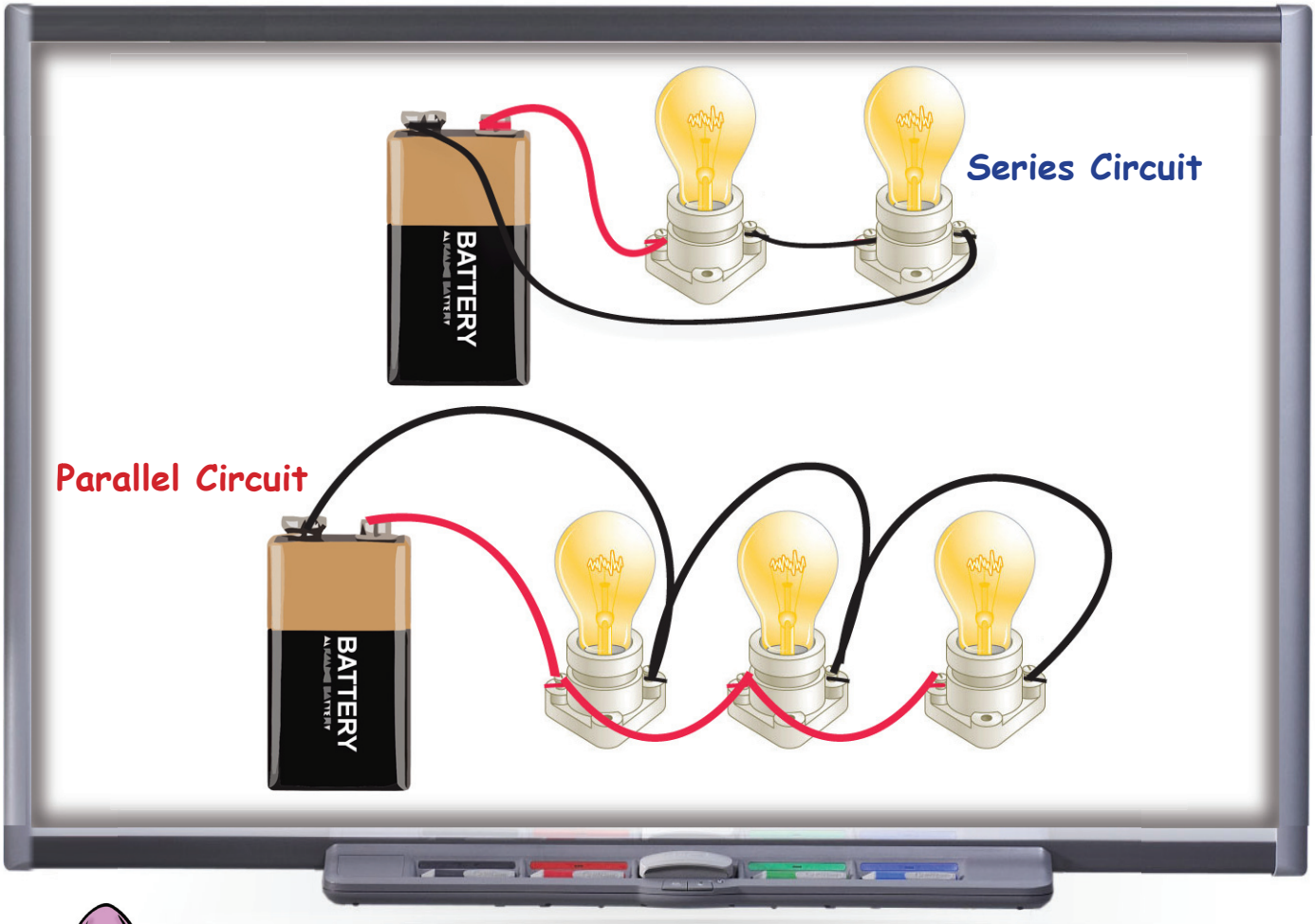
What scientific instrument is used to measure air pressure? How does it work?

Yes, I know that! It's..... Ok, together we can choose something to measure.

It's called a..... These are some of its features.....

ELECTRIC CIRCUITS

KEYWORDS: electric circuit | series | parallel | electric cell | battery



Miss, what is an **electric circuit** and what is an **electric cell**?

An **electric circuit** is a path that electricity flows through.
An **electric cell** changes chemical energy to electrical energy.
A group of cells is often called a battery.

Do you know the difference between a series circuit and a parallel circuit?

In a **parallel** circuit, the electricity can flow through many different paths. This is the best way to connect two or more lamps to a battery.

I can see on the board that in a **series** circuit, there is only one path for the electricity. The battery, the switch and the lights are all connected one after the other.

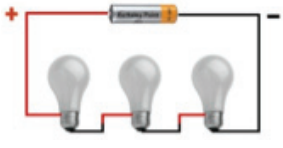
Task 1:

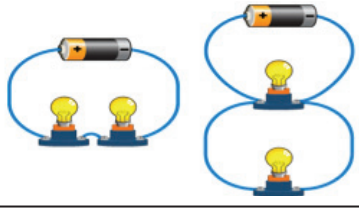
Write (T) for true sentences or (F) for the false ones.

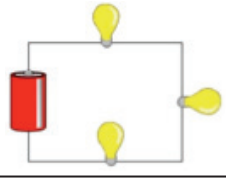
1. Electricity flows through a circuit. .....
2. A battery and an electric cell are the same .....
3. Electrical energy changes to chemical energy in a battery. .....
4. There are many paths for electricity in a series circuit. .....
5. There are many paths for electricity in a parallel circuit. .....

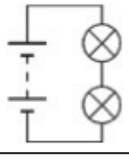
Task 2:

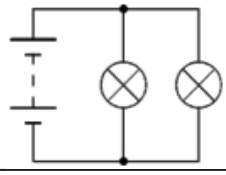
Write 'series' or 'parallel' in the boxes.











Task 3:

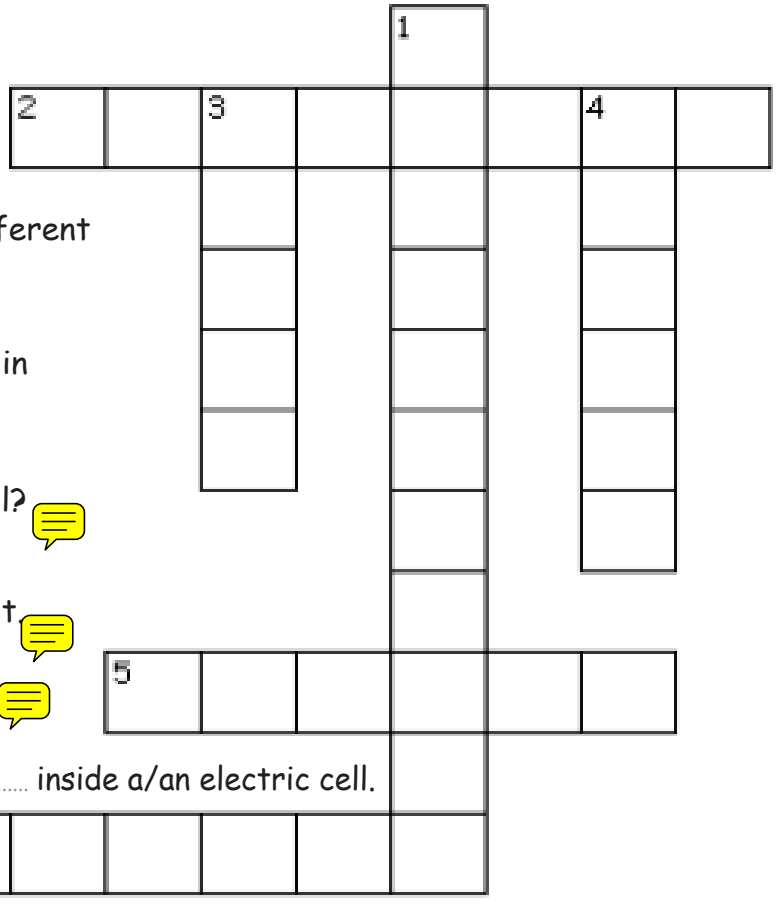
Use the words from the box below to complete the following sentences.

chemical	series (x2)	electrical	parallel

1. Electricity flows along one path in a ..... circuit.
2. Electricity changes paths in a ..... circuit.
3. ..... energy becomes ..... energy inside an electric cell.
4. In a ..... circuit, all the electrical parts of the circuit are connected one behind the other.

Task 4: PUZZLE TIME!

Fill in the puzzle.



Across

2) Electricity can flow through many different paths in a/an ..... circuit.

5) Electricity flows in only one direction in a ..... circuit.

6) What is another word for electric cell?

Down

1) ..... flows through an electric circuit.

3) What is another word for path?

4) There is a change of ..... inside a/an electric cell.

Task 5:

Ask a partner to say 'series ' or 'parallel ' for each sentence.

The light, switch and battery are connected one after the other.

The electricity can flow through many paths.

There is only one path of electricity.

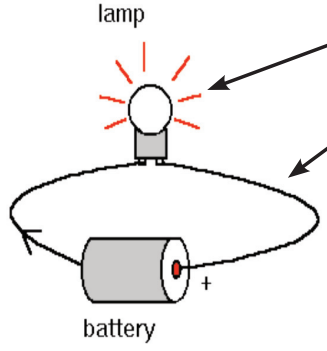
This is a good way to connect many lamps to one battery.

ELECTRICITY

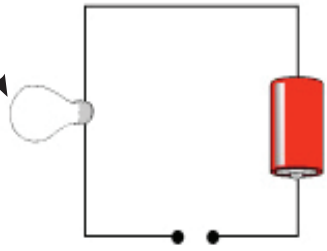
KEYWORDS: **electric** **open / closed circuit** **power** **amperes (amps)** **resist / resistance** **ohms**

Electric current: the flow of charge through a conductor.

Resistance is the force against the flow of electricity, This bulb and the wire have resistance.



Closed circuit (working!)



Open circuit (not working!)

Today, we are studying electricity. Can anybody tell me what an electric current is?

Yes. I can. An **electric current** is a flow of electric charge through a conductor. We measure the electric current in **amperes** (amps).

What about power, who knows about power?

Electric power is the rate that the electrical energy changes into other kinds of energy.

Mr Omar: That's excellent! Well done! If you look at the board, you will see that there are two circuits. A **circuit** is an unbroken way for electricity, made by a conductor. There is an open circuit and a closed circuit. The **closed circuit** is working, because electricity can flow. The **open circuit** isn't working, because there is a gap.

Khalid: Can you explain what resistance is please, Sir?

Mr Omar: Yes, Khalid. To **resist** something is to go against it. **Resistance** is a force against an electrical current, making it difficult for it to flow.Things have some resistance, like bulbs and wire. We measure resistance in **ohms**.

Task 1:

Match the words with their definitions. Draw lines.

1 Power	a) A force against the flow of electricity.
2 Circuit	b) A charge going through a conductor.
3 Electric current	c) A route or way for electricity to flow, through a conductor.
4 Resistance	d) How fast or slow the energy changes to another kind of energy.

Task 2:

Well done! Now help Khalid and Mohammed choose the correct words to complete the sentences.

1 We measure ..... in ohms.

a) power b) electric current c) resistance

2 We measure ..... in amperes.

a) electric current b) power c) resistance

3 Electricity can flow easily in a (n) .....

a) open circuit b) closed circuit c) resistor

Task 3:

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

What is an electric current?

What are amps and ohms?

What's the difference between an open circuit and a closed circuit?

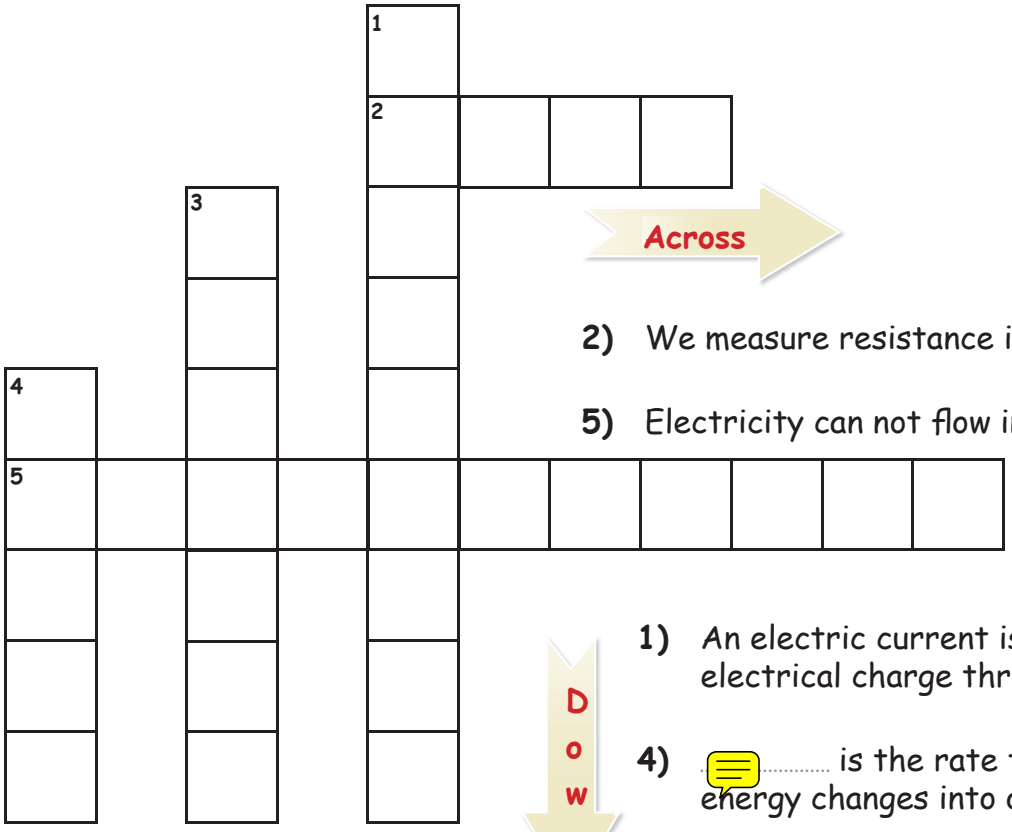
It's the ....

Amps measure..... and ohms measure...

An open circuit is.... but a closed circuit is .....

Task 4: PUZZLE TIME!

Excellent! Now help Khalid and Mohammed to complete the crossword!



Across

2) We measure resistance in .....

5) Electricity can not flow in this circuit!! (2 words)

Down

1) An electric current is the flow of electrical charge through a .....

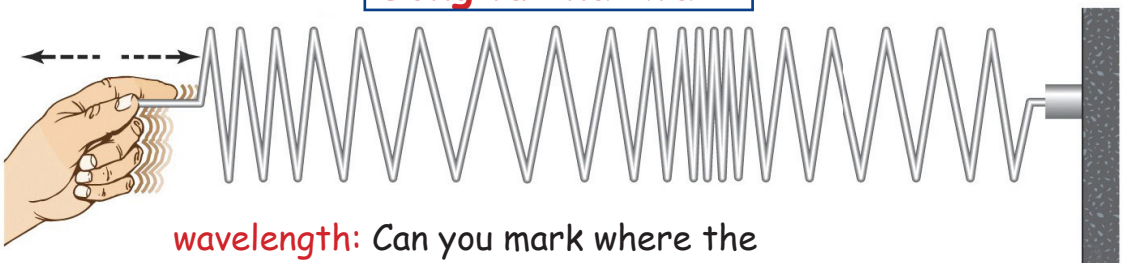
4) ..... is the rate that electrical energy changes into other energy.

3) We measure the electric current in .

WAVES

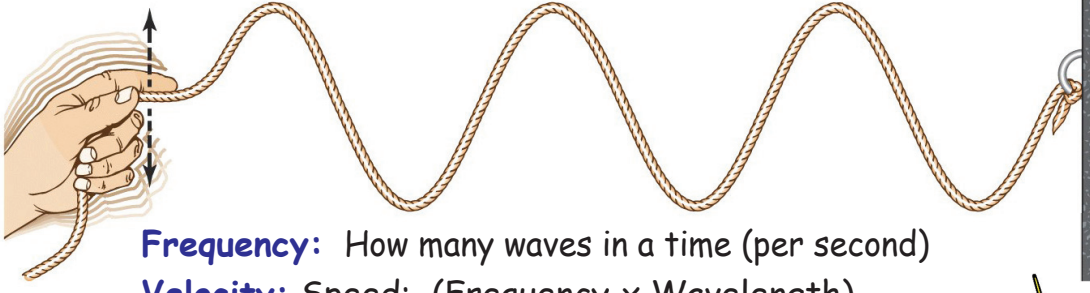
KEYWORDS: wave transverse longitudinal wavelength velocity frequency

Longitudinal wave



wavelength: Can you mark where the wave begins and ends?

Transverse wave

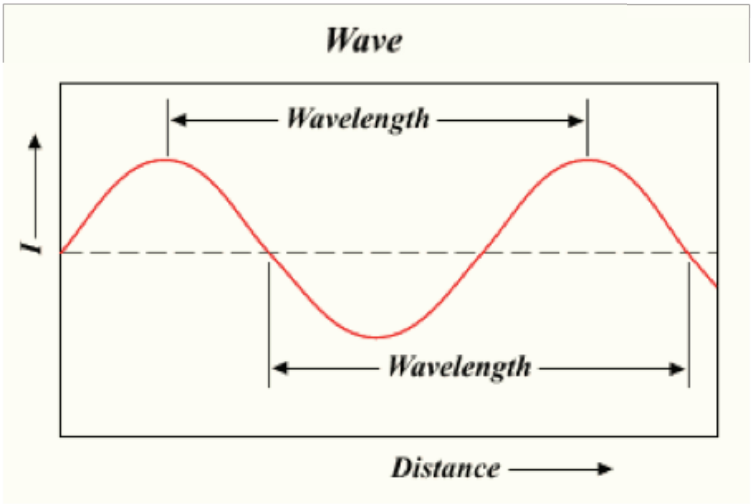


Frequency: How many waves in a time (per second)

Velocity: Speed: (Frequency x Wavelength)

Today, we are studying waves. A **wave** is the result of an action that moves energy. Do you know what a wavelength is, Maha?

A wavelength is how long a wave is. It's the distance from a point on a wave to the same point on the next wave.



And I know what frequency is! The **frequency** is how many waves go past a point in a second. The **velocity** is the speed. We calculate velocity by frequency times (x) wavelength.

What does frequency mean?

Well done! But there's another thing you should know.
Look at the whiteboard. There are two kinds of waves. A **transverse** wave moves up and down, like a wave in the sea, or side to side, like when you move a rope!

Oh yes! Like this!

That's right, Maha.

What's the other type of wave?

It's called a longitudinal wave. That's (long-i-tu-di-nal) a long word! A **longitudinal** wave is a wave that goes along, like the one on the board. A slinky shows the movement well. Sound waves are longitudinal.

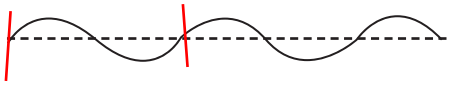
Task 1:

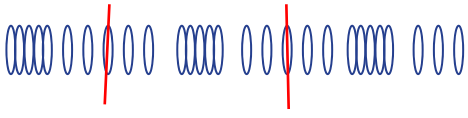
Match the words with their correct definitions. Underline the correct word.

1 A wave is	a) the number of waves per second.
2 Wavelength is	b) energy moving because of an action.
3 Velocity is	c) how fast or slow something moves.
4 Frequency is	d) how long a wave is.

Task 2:

Are these transverse or longitudinal waves. Underline the correct word..

1 Transverse/longitudinal wave 

2 Transverse/longitudinal wave 

3 Can you mark on both diagrams the length of one wavelength?

Task 3:

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

1 A wave with an up-and-down movement is a ..... wave.

a) longitudinal b) transverse c) fast

2 Sound waves are ..... .

a) longitudinal b) transverse c) up-and-down

3 When you move a rope from side-to-side, you make ..... waves.

a) longitudinal b) transverse c) slow

Task 4:

Write ONE WORD to complete each of the following sentences

1. We multiply frequency by wavelength, to get the ..... of a wave.
2. The number of waves per second is the ..... .
3. When there is an action that moves energy, it makes a ..... .

Task 5:

Work in pairs. Ask and answer questions about waves.

What movement makes a transverse wave?

Easy! It's...

What's the difference between a transverse wave and a longitudinal wave?

Yes, I know that! It's a... or...

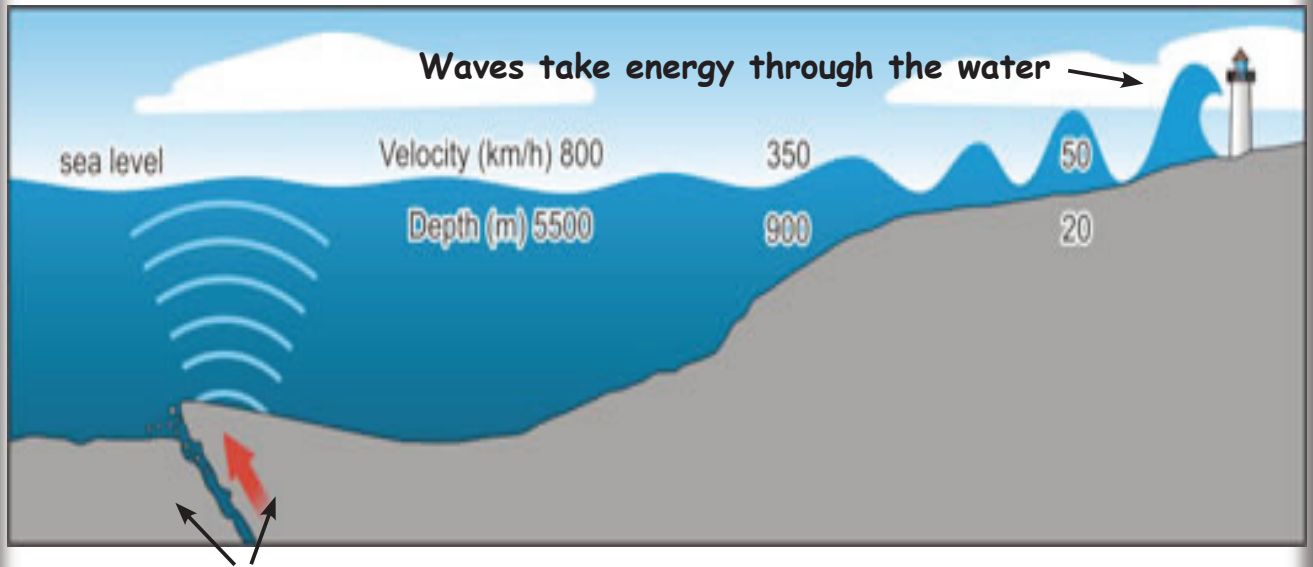
What is wavelength?

A transverse wave.... but a...

THE POWER OF WAVES

KEYWORDS: earthquake, Richter scale, tsunami, epicenter, focus, plate

Waves move on the surface of the sea to land.



Today, we are going to learn about waves that are very dangerous. We are going to look at how an earthquake can cause a tsunami.

Yes, Mrs Aisha! I saw about the tsunami on the news. It was tragic! But what is a tsunami?

I know! A tsunami is a very large sea wave caused by an earthquake.

That's right, Huda. Look at the board. The earth is made of many plates.

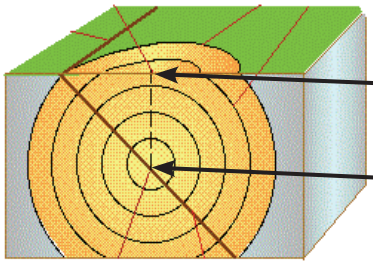
A **plate** is a very large sheet of rock on the surface of the earth and under the sea.

These plates push against each other and sometimes the plates move suddenly.

And that makes an earthquake, Mrs Aisha!

Yes, it does, Maha! An **earthquake** is when the plates move, making the earth vibrate. The point where the earthquake begins is the **focus**. The place on the earth's surface above the focus is the **epicenter**. We measure the force of earthquakes on something called the Richter scale.

But how does that make a tsunami, Mrs Aisha?



The earthquake sends waves through the water and makes a big wave on the surface of the sea. The tsunami wave can be over 20 meters high and it moves very fast. It is 800 kph in the beginning and 50 kph when it hits the land. It causes a lot of horrible damage.

Task 1:

Match the words with their correct definitions. Draw lines.

1 Focus	a) The place on the surface above the point where the earthquake begins.
2 Epicenter	b) A large sheet of rock on the surface of the earth.
3 Plate	c) Something we use to measure the force of earthquakes.
4 Richter scale	d) The point where the earthquake begins.

Task 2:

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

1 An earthquake happens when the ..... move(s).

a) plates b) tsunami c) epicenter

2 The focus is ..... the surface of the earth.

a) below b) on c) above

3 The epicenter is ..... the surface of the earth.

a) below b) on c) above

4 A(n) ..... can be very high.

a) epicenter b) earthquake c) tsunami

5 When a tsunami hits the land, it is often moving at around ..... kph.

a) 800 b) 80 c) 50

Task 3:

Complete the following questions. Write one word only.

Question	Answer
1 How do we ..... an earth quake?	We use the Richter scale.
2 Are plates made of .....?	Yes, they are.
3 How ..... is a tsunami?	Sometimes more than twenty meters.

Task 4: WORK IN PAIRS.

Ask and answer questions about earthquakes and tsunamis:

What makes an earthquake happen?

What's the difference between the epicenter and the focus?

How does an earthquake make a tsunami?

It's when.....

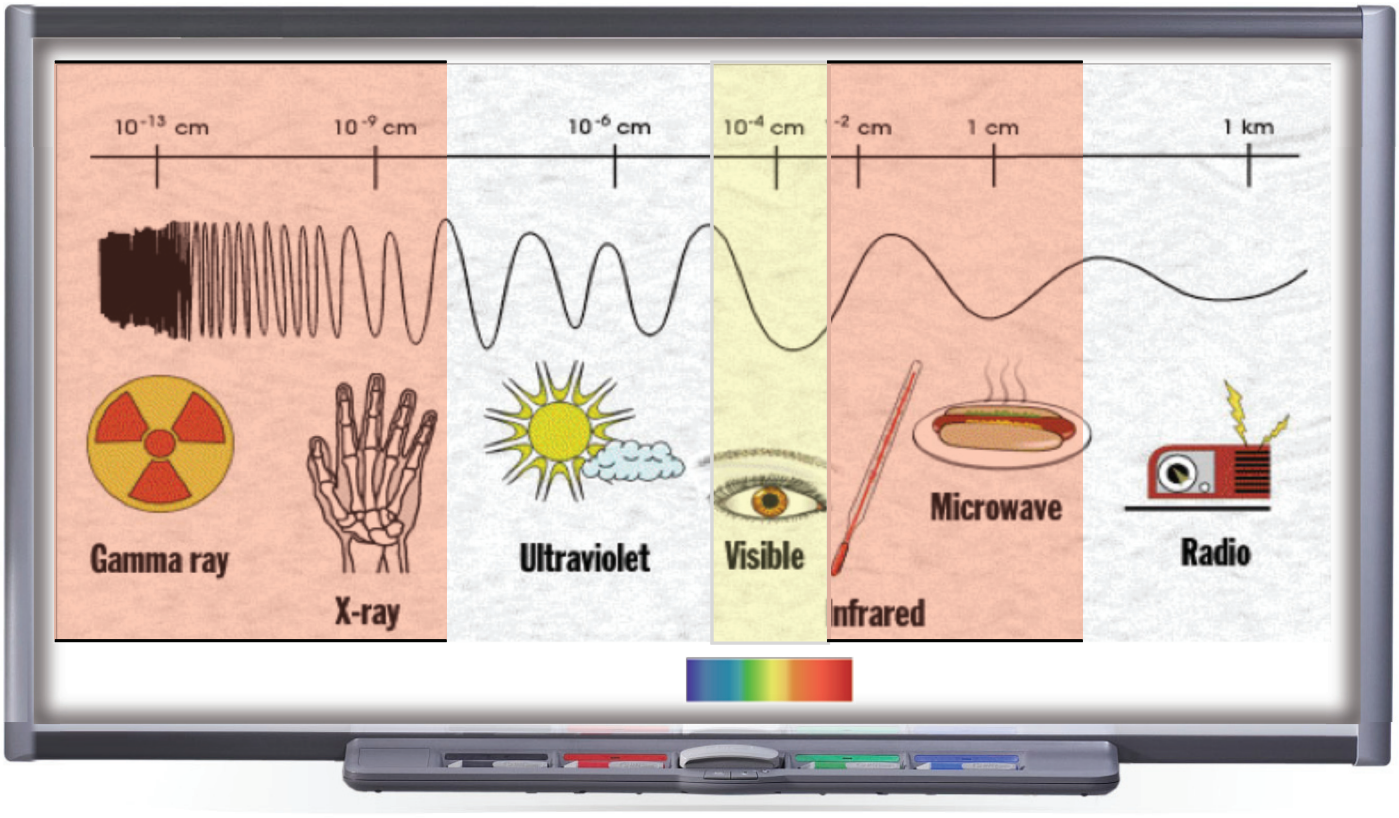
Easy! The focus is...

Well, when the plates move, ...

ELECTROMAGNETIC SPECTRUM

KEYWORDS: radiowaves, microwaves, infrared, visible light, ultraviolet, X-rays, gamma rays, radiation, speed of light, wavelength, frequency, electromagnetic radiation

Today, Mrs Aisha is teaching Maha and Sheikha about **the electromagnetic** spectrum. Read and listen to the lesson, then do the activities that follow.



Can anybody tell me what light is?

Yes. I can! White light is made up of different colours.

ELECTROMAGNETIC SPECTRUM

That's excellent! Visible light is just one part of the **electromagnetic spectrum**. These are various types of electromagnetic radiation with longer wavelengths of light than red light and with shorter wavelengths than violet light. All the different types of electromagnetic waves are **transverse waves** and travel at the same speed through space, approx 300,000 km/sec – the speed of light.

On the board you can see the electromagnetic spectrum and you can see the main types of waves. Remember what we can ONLY see the VISIBLE section, the colours from RED to VIOLET. If you look at the pink zone, these are waves that can effect us!

How Miss?

There are some hazards of electromagnetic radiation!

Over-exposure to certain types of electromagnetic radiation can be harmful. The higher the frequency of the radiation (closer the waves lines are together), the more damage it is likely to cause to the body.

- **microwaves** cause internal heating of body tissues
- **infrared radiation** is felt as heat and causes skin burns
- **X-rays** damage cells, causing mutations (which may lead to cancer) and cell death
- **gamma rays** also damage cells, causing mutations (which may lead to cancer) and cell death.
- **ultraviolet radiation - UV -** is found naturally in sunlight. We cannot see or feel ultraviolet radiation, but our skin responds to it by turning darker. This happens as our bodies attempt to reduce the amount of ultraviolet radiation reaching deeper skin tissues. Darker skins absorb more ultraviolet light, so less ultraviolet radiation reaches the deeper tissues. This is important, because ultraviolet radiation can cause normal cells to become cancerous.

Task 1:

Choose the correct words to answer the following questions.

1. Which of the following has the longest wavelength?
   - ○ Red light
   - ○ Yellow light
   - ○ Violet light

2. Which of the following has the highest frequency?
   - ○ Radio waves
   - ○ Microwaves
   - ○ Gamma rays

3. Which types of electromagnetic radiation are used for communicating over long distances?
   - ○ Radio waves
   - ○ infa-red
   - ○ X-rays

Task 2:

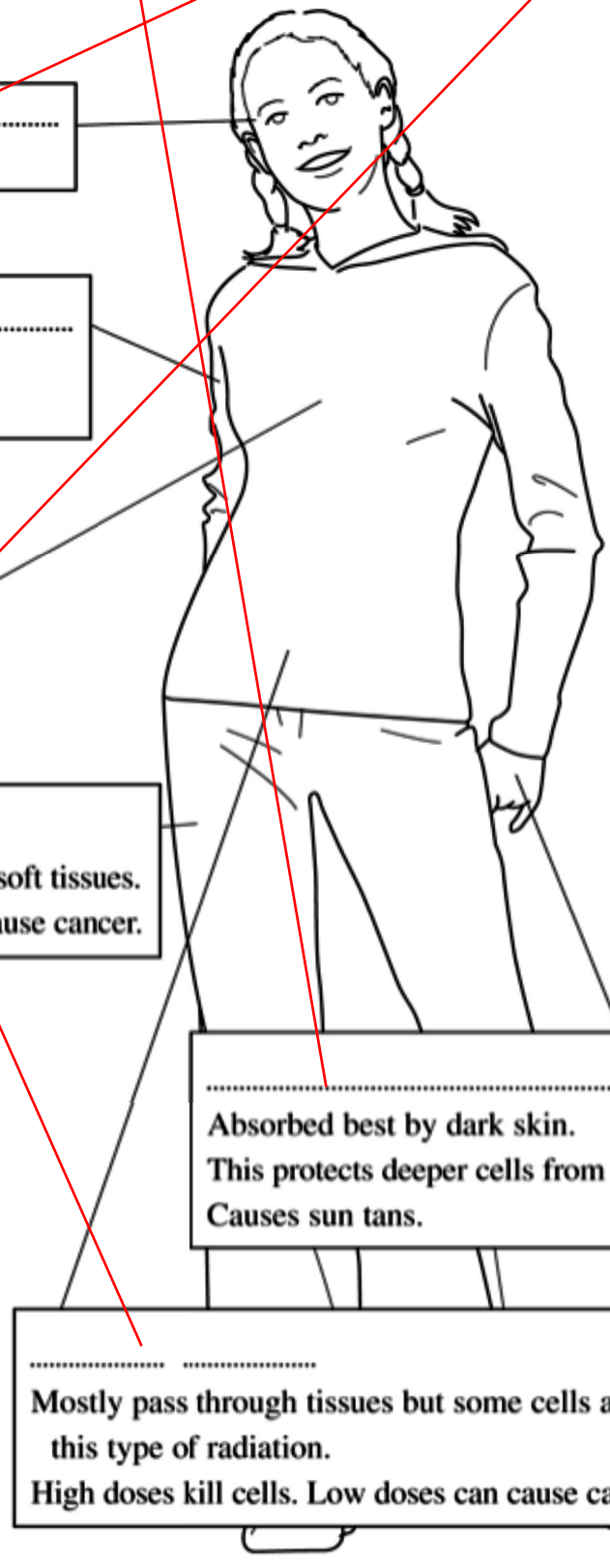
Match the uses of electromagnetic radiation with an appropriate image. Use arrows.

Electromagnetic radiation	Uses	image
1 radiowaves	broadcasting communications satellite transmissions	
2 microwaves	cooking communications satellite transmissions	
3 infrared	cooking thermal imaging short range communications optical fibres television remote controls	
4 visible light	vision photography illumination	
5 ultraviolet	security marking fluorescent lamps detecting forged bank notes disinfecting water	
6 X-rays	observing the internal structure of objects airport security scanners medical X-rays	

Task 3:

Use the words from the box below to fill in the blanks.

gamma rays infrared microwaves ultraviolet visible light X-rays



....
Sensed by eyes.

..... - .....
Sensed as heat and absorbed by skin.

.....
Absorbed by water molecules in cells.
The heat produced can damage or kill cells.

.....-.....
Absorbed by bones but passes through soft tissues.
High doses kill cells. Low doses can cause cancer.

.....
Absorbed best by dark skin.
This protects deeper cells from damage.
Causes sun tans.

....
Mostly pass through tissues but some cells absorb this type of radiation.
High doses kill cells. Low doses can cause cancer.

Corrections

Page NO.	Note	Amendment

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