

# Independent learning at Brannel

## Year 8 - Booklet 2 (English, Maths, Science)

Name:

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Tutor Group:

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## **100-Day Plan**

Use this booklet to help you work independently to practice the subject specific content and skills you have learnt at school.

Regular practice and retrieval is very important to help you remember key facts and skills. Revising material you have already learnt in small chunks will help with your revision for assessments. It will also help you to achieve your lesson goals and ensure you are working towards being the best you can be.

The subjects you will be working through in this booklet are:  
English, Maths, and Science.

Each week you will be set 3 independent learning tasks. You need to complete them in your own time. In school you will go through the answers and think about what you feel you have learnt from the activity.

This booklet and your independent learning exercise book should be kept in your zip wallet and brought to school every day.

Alongside this booklet there is a menu of enrichment activities that you can choose to complete if you wish. They are all activities either related to work you are doing in school or the world around us. If you complete these your teachers will give you merits towards the house cup.

## Subject Goals

Use your subject goals to help you challenge yourself. You should aim for your bronze goal as a minimum, and then challenge yourself to work towards your silver, gold or platinum.

<b>Subject</b>	<b>Bronze</b>	<b>Silver</b>	<b>Gold</b>	<b>Platinum</b>
English				
Maths				
Science				

## Academic Coaching Record: (English)

Use the coaching record to help you reflect on how you worked towards the tasks. Which 'therapy' activities really helped, which ones did you not find useful?

This will help you know which revision techniques work best for you when it comes to assessment revision.

<b>Work Title</b>	<b>What went well and why it was successful</b>	<b>What I will do differently next time:</b>
Juxtaposition		
Sibilance		
Colloquial Language & Dialect		
Caesura & Enjambment		
Dialogue		
Flashback		

## Academic Coaching Record: (Maths)

Use the coaching record to help you reflect on how you worked towards the tasks. Which 'therapy' activities really helped, which ones did you not find useful?

This will help you know which revision techniques work best for you when it comes to assessment revision.

<b>Work Title</b>	<b>What went well and why it was successful</b>	<b>What I will do differently next time:</b>
Area and perimeter of squares and rectangles		
Area of triangles, parallelograms and trapezium		
Area of compound shapes		
HCF and factors of algebraic terms		
Expanding brackets		
Factorising expressions into single brackets		

## Academic Coaching Record: (Science)

Use the coaching record to help you reflect on how you worked towards the tasks. Which 'therapy' activities really helped, which ones did you not find useful?

This will help you know which revision techniques work best for you when it comes to assessment revision.

<b>Work Title</b>	<b>What went well and why it was successful</b>	<b>What I will do differently next time:</b>
Photosynthesis		
Respiration		
Ecosystems		
Waves		
Energy Resouces		
Energy Transfer		

Complete subject  
checklists and extra  
information

## Subject Information

Subject	Topics covered during 100 days	Assessment date	Resources that may be helpful
<b>English</b>	<ul style="list-style-type: none"> <li>• Letter Writing &amp; Persuasive Language Techniques</li> <li>• Culture &amp; Identity Poetry</li> <li>• Cornish Dialect and Folktales</li> </ul>		BBC Bitesize Oak Academy
<b>Maths</b>	<ul style="list-style-type: none"> <li>• Area and perimeter of squares and rectangles</li> <li>• Area of triangles, parallelograms and trapezium</li> <li>• Area of compound shapes</li> <li>• HCF and factors of algebraic terms</li> <li>• Expanding brackets</li> <li>• Factorising expressions into single brackets</li> </ul>		Corbett Maths MathsGenie MathsMAdeEasy BBC Bitesize
<b>Science</b>	Photosynthesis Respiration Ecosystems Energy transfers Energy Resources Waves		BBC Bitesize Oak Academy

## Science checklists – Photosynthesis and respiration

Bioenergetics	R	A	G
Recall the equation for photosynthesis.			
Describe factors that increase the rate of photosynthesis.			
Describe photosynthesis as an endothermic reaction.			
Describe how to test a leaf for starch.			
Explain the results of the testing a leaf for starch experiment.			
Name the layers in a leaf.			
Discuss how the adaptations of the leaf link to function.			

Bioenergetics	R	A	G
Name the parts of the gas exchange system.			
Describe the gas exchange system, including key organs.			
Describe the process of breathing.			
Recall the equation for aerobic respiration.			
Describe aerobic respiration in animals.			
Recall the equation for anaerobic respiration.			
Describe aerobic respiration as an exothermic reaction.			
Describe anaerobic respiration in animals.			
Compare anaerobic respiration in animals, plants and			

### Media links

BBC Bitesize Photosynthesis Revision website:

[What is photosynthesis? - Respiration and gas exchange - KS3 Biology - BBC Bitesize - BBC Bitesize](#)

BBC Bitesize Respiration Revision website:

[Respiration and gas exchange - KS3 Biology - BBC Bitesize - BBC Bitesize](#)

## Science checklists – Ecology

Ecosystems	R	A	G
Identify producers, primary, secondary and tertiary consumers in a food chain.			
Compare food chains and food webs.			
Describe resources that animals and plants compete for.			
Describe how and plants are adapted to their environment.			
Describe how polar bears are adapted to survive in their ecosystem.			
Define global warming.			

### Media links

BBC Bitesize Ecology Revision website:

[Ecosystems and habitats - KS3 Biology - BBC Bitesize](#)

[Food chains and webs - Ecosystems and habitats - KS3 Biology – BBC Bitesize - BBC Bitesize](#)

[Changes to food webs - Ecosystems and habitats - KS3 Biology - BBC Bitesize - BBC Bitesize](#)

[Adaptations of plants - Ecosystems and habitats - KS3 Biology - BBC Bitesize - BBC Bitesize](#)

Video:

[Ecological sampling - Ecosystems and habitats - KS3 Biology - BBC Bitesize - BBC Bitesize](#)

## Science checklists – Waves

Waves	Covered in lesson	R	A	G	1	2	3
Label a transverse wave.							
Label a longitudinal wave.							
Explain why the speed of sound in a solid, liquid and gas is different.							
Describe how a sound is made.							
Describe how changing vibration affects pitch and loudness of sounds.							
Compare sounds on an oscilloscope.							
Describe the key words: frequency and amplitude.							

### Media links

BBC Bitesize Waves Revision website:

[Features of waves links to energy transfer guide for KS3 physics students - BBC Bitesize](#)

[Introduction to sound waves guide for KS3 physics students - BBC Bitesize](#)

Sound videos:

[Speed of sound and echoes for KS3 Physics - BBC Bitesize](#)

[How to play a record with a £5 note guide for KS3 physics students - BBC Bitesize](#)

## Science checklists – Energy

Energy Resources	Covered in lesson	R	A	G
Be able to name 5 forms of energy store and 4 forms of energy transfer.				
Be able to identify examples of devices that involve each type of energy.				
Be able to explain the Law of Conservation of Energy				
Be able to identify electricity generation as either renewable or <u>non renewable</u>				
Be able to describe advantages and disadvantages of a range of renewables				

Energy Transfer	Covered in lesson	R	A	G
State the difference between heat and temperature.				
Label the direction of heat flow from hotter to cooler areas.				
Name some everyday thermal conductors and insulators.				
Use the particle model to describe conduction.				
Name some everyday examples of convection.				
Describe convection in terms of changes in density.				
Use the particle model to explain convection.				
Know that hotter objects emit more infrared waves than they absorb.				
Know that cooler objects emit fewer infrared waves than they absorb.				
Know that emission and absorption of infrared waves causes changes in temperature.				
Describe what a thermogram is.				
Describe some ways of insulating homes.				
Explain how these reduce conduction, convection or radiation.				
Write a method to compare the energy content of food.				

### Media links

BBC Bitesize Energy Revision website:

[Generating electricity guide for KS3 physics students - BBC Bitesize](#)

[16. BBC Bitesize KS3 Revision Energy Resources BBC18LS16 - YouTube](#)



# Independent Learning Tasks

ENGLISH

## Independent Learning – English: Juxtaposition

Diagnosis (D):

Juxtaposition	R	A	G
Understand the meaning of juxtaposition			
Explain the effects of juxtaposition			



### What is Juxtaposition?

Juxtaposition occurs when an author places two things side by side as a way of highlighting their differences. Ideas, images, characters, and actions are all things that can be juxtaposed with one another. For example, it's a common plot device in fairy tales such as Cinderella to juxtapose the good-natured main character with a cruel step-sibling. The differences between the characters, as well as their close relation to one another, serve to highlight the main character's good qualities.



### Juxtaposition and Foils

A foil is one specific form of juxtaposition having to do with contrasts between characters. When a writer creates two characters that possess opposite characteristics, it's often with the intention of highlighting something specific about one or both of the characters by juxtaposing their qualities. Such characters are foils of one another. The tortoise and the hare, from the famous folk tale, are examples of foils.



## Therapy (T):

Choose a task from the menu below to help you remember the definitions and examples of juxtaposition and strengthen your knowledge.

Create revision flash cards with definitions and examples.	Create a vibrant poster which includes pictures and examples.
Write a short poem or rap which features examples of juxtaposition.	Create a short tutorial video where you teach the definitions of juxtaposition.

## Testing (T):

### Grade 1-3

Fill in the blank with a word that juxtaposes the underlined term.

- A part of life is \_\_\_\_\_.
- Even happy people are sometimes \_\_\_\_\_.
- The \_\_\_\_\_ will eventually come out after the rain.
- At \_\_\_\_\_ you can expect darkness. In the day, you can expect \_\_\_\_\_.

### Grade 4-6

Create a sentence for the juxtaposed words below:

- young/old
- warm/cold
- Past/future
- Light/darkness
- Muddy/clean
- Wealthy/poor

### Grade 7-9

Write a short story or poem which features an example of juxtaposition. Choose one of the juxtaposed pairings below:

- Light/darkness
- Young/old
- Past/future.

## Independent Learning – English: Sibilance

Diagnosis (D):

Sibilance	R	A	G
Identify the meaning of sibilance.			
Consider the effect of sibilance.			



### What is Sibilance?

Sibilance is a type of literary device and figure of speech wherein a hissing sound is created in a group of words through the repetition of 's' sounds. For example, 'Sarah's silly sister swallowed her sweet.'

Sibilance can also include more than just 's' sounds. Many people believe that sibilance includes any letter groups that create a hissing sound, including repeated 'sh', 'th', 'f', 'z', and 'v' sounds.



### Why Do People Use Sibilance?

We know what sibilance is, but why do people use it? Like all of the other literary devices listed above, sibilance can be used to create a song-like rhythm within writing. It can also be used to emphasise certain words within a text, or highlight key ideas.

Here are some of the main reasons why people choose to use sibilance in their writing:

- It can be used to make certain phrases or words more memorable for the reader.
- It can be used to create a musical effect within the writing as it generates a specific rhythm.
- It forces the reader to engage with the text. Sibilance can often slow down the process of reading, which, in turn, makes the reader pay more attention to the text.
- Lastly, sibilance can be used to create a mood within the text. Sibilance tends to produce a soft, whispering sound which, depending on the intention of the writer, can be used to create either a gentle or menacing mood etc.

## Therapy (T):

Choose a task from the menu below to help you remember the definitions and examples of sibilance and strengthen your knowledge.

Create revision flash cards with definitions and examples.	Create a vibrant poster which includes pictures and examples.
Write a poem which features examples of sibilance.	Create a short tutorial video on the use and effect of sibilance.

## Testing (T):

### Grade 1-3

Highlight or underline the sounds from the words in the sentences below which create the sibilance.

- a) Shots whizzed and whistled close to the soldiers.
- b) The sunshine shone on the slopes of Sunny Valley.
- c) The fire sizzled and spat sparks.
- d) She sells seashells on the seashore.

### Grade 4-6

Why does the writer use sibilance in the examples below? Explain the effect.

- a) Shots whizzed and whistled close to the soldiers.
- b) The sunshine shone on the slopes of Sunny Valley.
- c) The fire sizzled and spat sparks.
- d) She sells seashells on the seashore.

### Grade 7-9

Write a short story where you use sibilance to create a mood. Either use sibilance to create a gentle, soothing mood or use sibilance to create a menacing mood.

**FLASH mark where you have used sibilance – WM**

## Independent Learning – English: Colloquial Language & Dialect

Diagnosis (D):

Colloquial Language & Dialect	R	A	G
Identify the meaning of colloquial language.			
Identify the meaning of Dialect.			



### **What is Colloquial Language?**

Colloquialisms are the linguistic style to describe casual communication. Colloquialism is the most commonly used functional way of speech. It is employed in day-to-day conversation and many informal contexts.



### **Colloquial Language used in Literature:**

Colloquial language and expressions could be things like informal words, phrases, and slang words. They are used by writers to create a sense of community and society. Often, the way an author speaks will translate into their writing.

Writers will use colloquial language intentionally to give their writing a sense of realism and to give it more authenticity.



### **What is Dialect?**

Dialects are speech and language patterns used by a group of people in a geographical location.

Dialects reflect subtle or slight differences in pronunciation, vocabulary, and speech rate.

For examples, common Cornish dialects are:

‘Awright Aree!’ – ‘Are you OK?’

‘Werzetoo en?’ – ‘Where is he/she?’

‘Knowem doo e?’ – ‘Are you acquainted with this person?’

## Therapy (T):

Choose a task from the menu below to help you remember the definitions and examples of colloquial language & dialect and strengthen your knowledge.

Write a list of dialects from a region of your choice.	Create a vibrant poster which includes pictures and examples.
Write a short narrative between two characters, using colloquial language and dialect.	Create a short tutorial video about colloquial language and dialect.

## Testing (T):

### Extract from Checking out Me History by John Agard

Dem tell me  
Dem tell me  
Wha dem want to tell me

Bandage up me eye with me own history  
Blind me to me own identity

Dem tell me bout 1066 and all dat  
dem tell me bout Dick Whittington and he cat  
But Toussaint L'Ouverture  
no dem never tell me bout dat

#### Grade 1-3

- Identify the dialect in the poem extract from Checking Out Me History.
- List all the colloquial/slang expressions for:
  - Money
  - Food
  - Being mad

#### Grade 4-6

John Agard uses Caribbean dialect in his poem.

- Write a paragraph in a Cornish dialect.
- Rewrite the following sentences using colloquial or slang expressions.
  - That party was great!
  - Your outfit is very trendy.
  - Craig was showing his car off at the party.

#### Grade 7-9

John Agard uses Caribbean dialect in his poem.

How might this link with **identity**?

What message is he sending to his readers?

Explain your answer in a What/How/Why structure.

ER – effect on the reader WM - Dialect

## Independent Learning – English: Caesura & Enjambment

Diagnosis (D):

Caesura & Enjambment	R	A	G
Identify what caesura is and the effects.			
Identify what enjambment is and the effects.			



### What is Caesura?

Caesura is a rhythmical pause in a poetic line or a sentence. It often occurs in the middle of a line, or sometimes at the beginning and the end. At times, it occurs with punctuation; at other times it does not.



### What is enjambment?

Enjambment is the continuation of a sentence or clause across a line break. Enjambment has the effect of encouraging the reader to continue reading from one line to the next, since most of the time a line of poetry that's enjambed won't make complete sense until the reader finishes the clause or sentence on the following line or lines.

### Examples of **Caesura** and **enjambment**:



'Enter, stranger, but take heed  
Of what awaits the sin of greed,'

'I'll speak to it, though Hell itself should gape  
And bid me hold my peace. I pray you all,  
If you have hitherto concealed this sight,'

## Therapy (T):

Choose a task from the menu below to help you remember the definitions and examples of caesura & enjambment and strengthen your knowledge.

Create a list of rhetorical questions as examples.	Create a vibrant poster which includes pictures and examples.
Find a poem with caesura and enjambment/ try creating your own poem with these techniques.	Create a short tutorial video on caesura & enjambment.

## Testing (T):

### Ozymandias

I met a traveller from an antique land,  
Who said—"Two vast and trunkless legs of stone  
Stand in the desert. . . . Near them, on the sand,  
Half sunk a shattered visage lies, whose frown,  
And wrinkled lip, and sneer of cold command,  
Tell that its sculptor well those passions read  
Which yet survive, stamped on these lifeless things,  
The hand that mocked them, and the heart that fed;  
And on the pedestal, these words appear:  
My name is Ozymandias, King of Kings;  
Look on my Works, ye Mighty, and despair!  
Nothing beside remains. Round the decay  
Of that colossal Wreck, boundless and bare  
The lone and level sands stretch far away."

#### Grade 1-3

Identify caesura and enjambment in this poem.

Caesura

Enjambment

#### Grade 4-6

What is the effect of the caesura and enjambment in this poem? How does it contribute to the telling of the story?

E

WM (caesura and enjambment)

ER

#### Grade 7-9

Write your own poem about power and/or leadership, using caesura and enjambment. Don't forget to FLASH mark where you have used it.

Challenge: What were your intentions for using these techniques in your poem? What did you want the overall effect to be?

## Independent Learning – English: Dialogue

Diagnosis (D):

Dialogue	R	A	G
Identify dialogue in a text.			
Analyse the intentions of dialogue & characterisation.			



### What is Dialogue

Dialogue is typically a conversation between two or more people in a narrative work. As a literary technique, dialogue serves several purposes. It can advance the plot, reveal a character's thoughts or feelings, or show how characters react in the moment.



### Basic Dialogue Rules

1. Each speaker gets a new paragraph.
2. Each paragraph is indented.
3. Punctuation for what's said goes inside the quotation marks.
4. Long speeches with several paragraphs don't have end quotations.
5. Use single quotes if the person speaking is quoting someone else.
6. Skip the small talk and focus on important information only.



### What is a dialogue tag?

Here are some common examples of dialogue tags:

- He said
- She whispered
- They bellowed
- He hollered
- They sniped.

### **Example:**

"You really shouldn't have done that," he whispered.

## Therapy (T):

Choose a task from the menu below to help you remember the definitions and examples of dialogue and strengthen your knowledge.

Create revision flash cards with definitions and examples of dialogue.	Create a vibrant poster which includes pictures and examples.
Write a narrative between two friends, using interesting dialogue.	Create a short tutorial video on dialogue and characterisation.

## Testing (T):

### Grade 1-3

Copy out the dialogue below and replace the word 'said' for a more suited synonym.

- *"I cannot believe you ate my chocolate bar," said Thomas.*
- *"It has been in the cupboard for ages," said Harry. "I didn't think you would miss it."*
- *"That's not the point. You don't take what isn't yours!" said Thomas.*
- *"Oh, stop being such a baby!" said Harry.*
- *"Now you're just being unkind," said Thomas.*
- *"OK, I'm sorry," Harry said. "I'll tell you what – I'll pop to the shop now and get you two more chocolate bars."*

### An extract from *Me Before You* by Jo Jo Moyes

'I don't believe it,' I said. I had started to laugh – a joyous unexpected thing. 'Oh my God! Where did you get these?'

'I had them made. You'll be happy to know I instructed the woman via my brand-new voice recognition software.'

'Tights?' Dad and Patrick said in unison.

'Only the best pair of tights ever.'

My mother peered at them. 'You know, Louisa, I'm pretty sure you had a pair just like that when you were very little.'

Will and I exchanged a look. I couldn't stop beaming.

'I want to put them on now,' I said.

'Goodness, she'll look like Max Wall in a beehive,' my father said, shaking his head.

'Ah Bernard, it's her birthday. Sure, she can wear what she wants.'

### Grade 4-6

Read the dialogue from *Me Before You*.  
*What do you notice about the dialogue tags?*

*What is effective in this dialogue? Why?*  
*What does this briefly tell us about Lou's character?*

### Grade 7-9

Write a narrative between two characters, using interesting dialogue and dialogue tags.

Once complete, label your dialogue features and write a commentary on your work, explaining your choice of dialogue tags and intentions for the characters.

## Independent Learning – English: Flashback

Diagnosis (D):

Flashback	R	A	G
Identify flashback in writing.			
Analyse the intentions of flashback in writing.			

### What is a flashback?

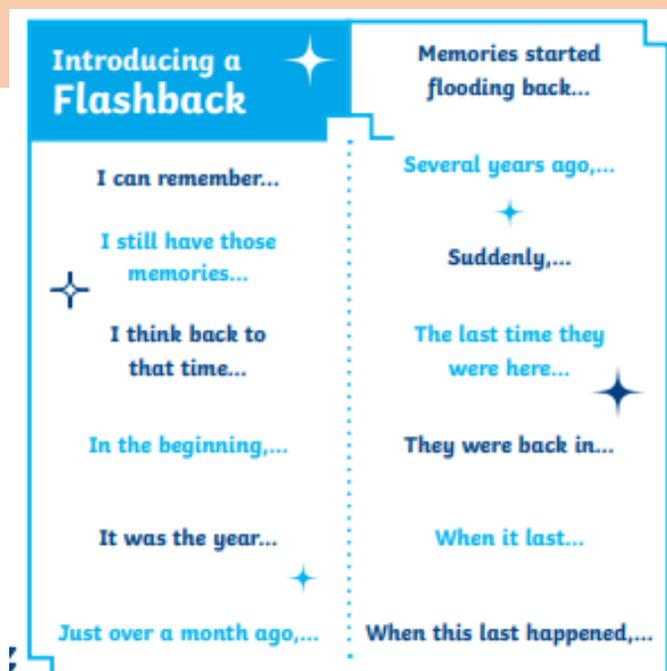


Flashbacks are a plot device that writers use to insert past events in order to provide context to the current events of a narrative. By using flashbacks, writers allow their readers to gain insight into a character's motivations and provide a background to a current predicament.

### Writing a Flashback in Prose Fiction



1. Determine why you need a flashback.
2. Place the flashback at a point where it won't disrupt the flow of the story.
3. Choose a consistent tense for the flashback (past, present)
4. Select an event for your flashback to focus on.
5. Define the timeframe of your flashback.
6. Use textual cues to clarify where the flashback begins and ends (e.g., he had been....had begun to...)
7. Set your flashback apart with different formatting if you wish (e.g., *in italics*)



## Therapy (T):

Choose a task from the menu below to help you remember the definitions and examples of flashback and strengthen your knowledge.

Create revision flash cards with definitions and examples.	Create a vibrant poster which includes pictures and examples.
Write a childhood memory in the form of a flashback.	Create a short tutorial video on flashbacks.

## Testing (T):

### Grade 1-3

Identify the flashback in this example.

- How did you know it was a flashback?
- What did you learn from the flashback?
- How did it interest you as a reader?

*The backfiring of the bus sent the older man spiraling back to his youth. He could hear the guns firing and his comrades shouting. Adrenaline rushed through him, taking his breath. Leaning against the sign for the bus stop, he covered his ears trying to staunch the flow of memories.*

### Grade 4-6

Flashbacks help to answer a reader's question.

Read the start of this story.

- What questions do you have that you want to be answered?
- If you were writing a flashback next, what would it contain?

Masimba rolled over and pushed himself upright. His head throbbed and he placed a hand on the wound. It flaked as he touched it. Something wasn't right; this wasn't what a fresh wound should feel like. Disorientated, he tried to take in his surroundings. He had seen this place before but he couldn't quite put a finger on where.

### Grade 7-9



'I sat with merry contentment, looking out to the green space before me.'

Using this sentence starter, write a flashback triggered by:

- Smell
- An object
- A sound or music
- A particular food



# MATHS

# Independent Learning – Maths: No. 1 – Area & Perimeter of squares & rectangles

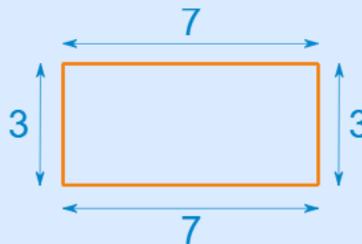
B	S	G	P

## Diagnosis (D):

F/H?	Place Value and Ordering Decimals	R	A	G
F/H	Calculate the perimeter of squares and rectangles			
F/H	Calculate the area of squares and rectangles			

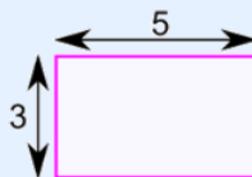
## Therapy (T):

Example: the perimeter of this rectangle is  $7+3+7+3 = 20$



	<p><u>Square</u></p> <p>Perimeter = <math>4 \times a</math></p> <p>a = length of side</p>
	<p><u>Rectangle</u></p> <p>Perimeter = <math>2 \times (a + b)</math></p>

Example: What is the area of this rectangle?



The formula is:

$$\text{Area} = w \times h$$

w = width  
h = height

The width is 5, and the height is 3, so we know  $w = 5$  and  $h = 3$ :

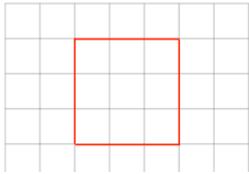
$$\text{Area} = 5 \times 3 = 15$$

**Testing (T):**

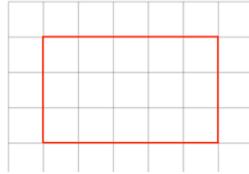
Grade 1 – 3:

1) Calculate the area and perimeter of these shapes drawn on cm squared paper

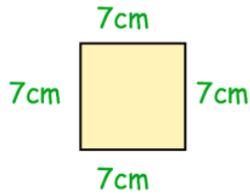
(a)



(b)



2) Calculate the area and perimeter of the square

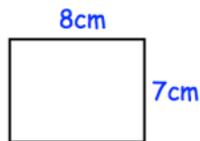


3) Calculate the area and perimeter of these rectangles

(a)



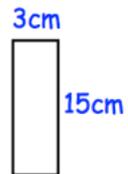
(b)



(c)



(d)



Grade 4 – 6:

1) Calculate the area and perimeter of these squares

(a)



(b)

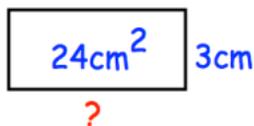


(c)

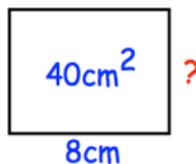


2) Calculate the missing length of these rectangles

(a)



(b)



(c)

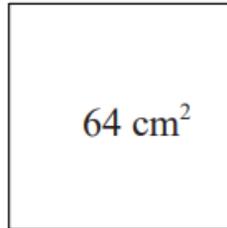


3) Jasmine says the perimeter of this shape is 12cm. Explain her mistake.



Grade 7 – 9:

- 1) A square has an area of  $64 \text{ cm}^2$ .

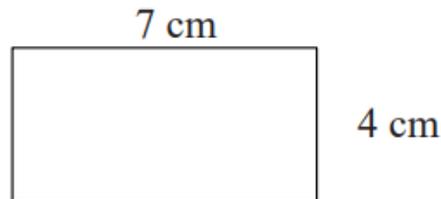


Find the perimeter of the square.

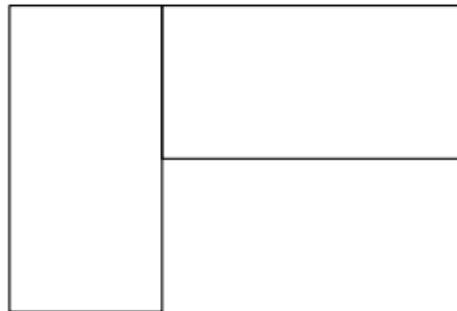
- 2) The length of a rectangle is three times the width of the rectangle.  
The area of the rectangle is  $48 \text{ cm}^2$ .

Draw the rectangle on a centimetre grid.

- 3) Here is a rectangle.



The six-sided shape below is made from two of these rectangles.



Work out the perimeter of this six-sided shape.

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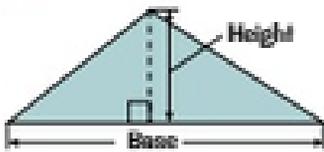
## 2. Area of Triangles, Parallelograms and Trapeziums

### Diagnosis:

Area of Triangles, Parallelograms and Trapeziums	R	A	G
To be able to calculate area of a triangle			
To be able to calculate area of a parallelogram			
To be able to calculate area of a trapezium			
To be able to find missing lengths in a shape by rearranging the equation			

### Therapy:

**Learn** these formulas:



**Area of triangle** =  $\frac{1}{2} \times \text{base} \times \text{vertical height}$

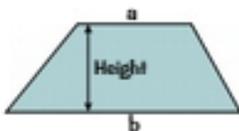
$$A = \frac{1}{2} \times b \times h$$



**Area of parallelogram** = base  $\times$  vertical height

$$A = b \times h$$

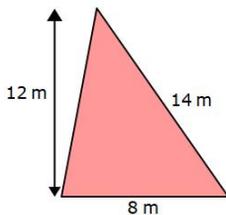
Note that in each case the **height** must be the **vertical height**, not the sloping height.



**Area of trapezium** = average of parallel sides  $\times$  distance between them (vertical height)

$$A = \frac{1}{2}(a + b) \times h$$

Example 3: Calculate the area of the triangle.



For the area calculation we use the perpendicular height (it must be straight up, not diagonal).

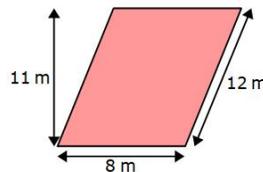
The height of this triangle is 12 metres.

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$\text{Area} = \frac{1}{2} \times 8 \times 12$$

$$\text{Area} = 4 \times 12$$

$$\text{Area} = 48\text{m}^2$$



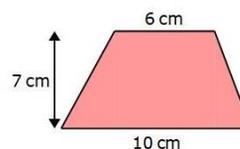
For the area calculation we use the perpendicular height (it must be straight up, not diagonal).

The height of this parallelogram is 11 metres.

$$\text{Area} = \text{base} \times \text{height}$$

$$\text{Area} = 8 \times 11$$

$$\text{Area} = 88\text{m}^2$$



For the trapezium above:

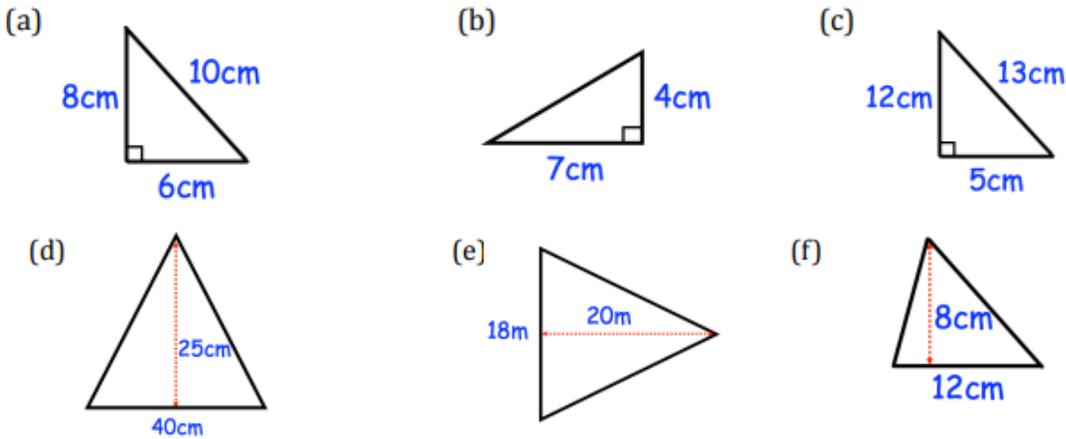
$$\text{Area} = \frac{1}{2}(6 + 10) \times 7$$

$$\text{Area} = \frac{1}{2}(16) \times 7$$

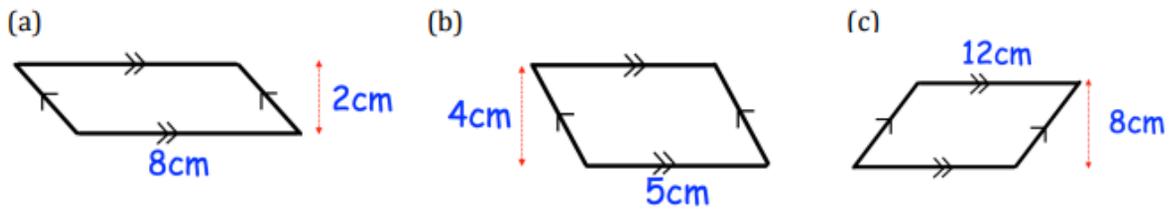
$$\text{Area} = 8 \times 7$$

$$\text{Area} = 56\text{cm}^2$$

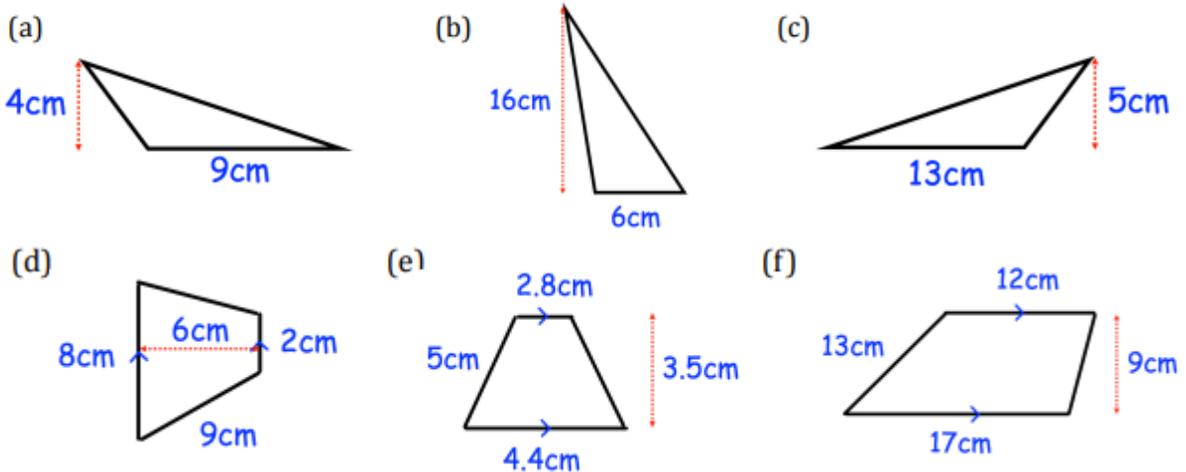
**Test:**  
**Grade 1-3**



Question 2: Work out the area of each of the parallelograms below. Include suitable units.

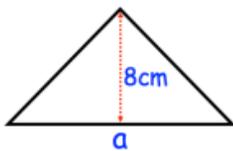


**Grade 4-6**



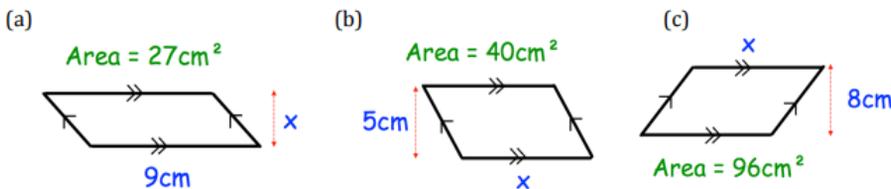
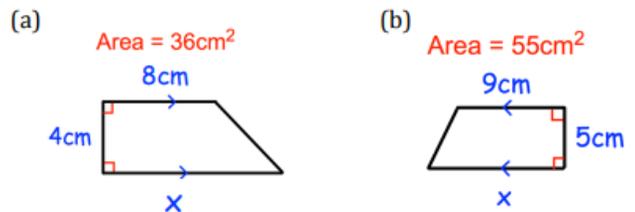
**Grade 7-9**

The area of the triangle is  $56\text{cm}^2$ , find  $a$ .



The areas of each of the parallelograms has been given. Calculate the length of the missing sides.

Question 4: Find  $x$  for each trapezium.



### 3. Area of Compound Shapes

#### Diagnosis:

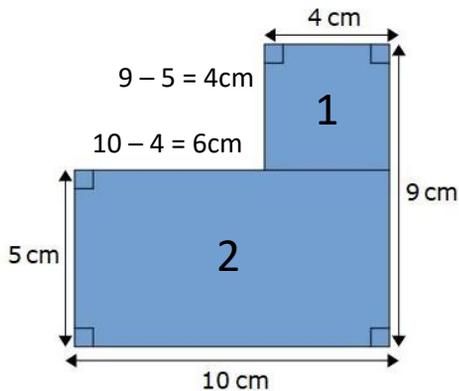
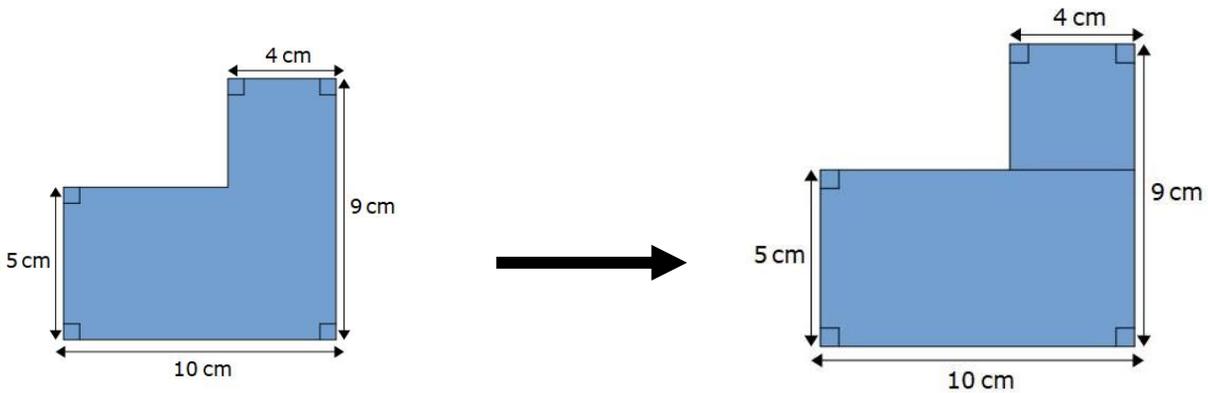
Area of Compound shapes	R	A	G
To be able to work out the area of squares and rectangles			
To be able to work out the area of triangles, parallelograms and trapezium			
To be able to find the area of compound shapes made of rectangles			
To be able to find the area of any compound shape			

#### Therapy:

To work out the area of this shape we can split it into two rectangles.

There are two ways of splitting the shape into two rectangles. We can split the shape like this:

Here is a compound shape:



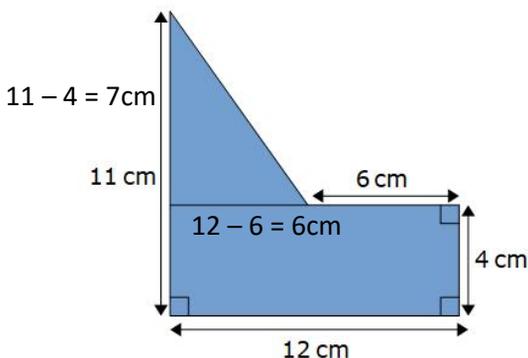
We now have all the information we need to calculate the areas.

The area of the large rectangle is  $5 \times 10 = 50 \text{ cm}^2$

The area of the square is  $4 \times 4 = 16 \text{ cm}^2$

The area of the whole shape is  $16 + 50 = 66 \text{ cm}^2$

To find the area of the compound shape we need to split it into a rectangle and a triangle.



The area of the rectangle =  $12 \times 4 = 48 \text{ cm}^2$

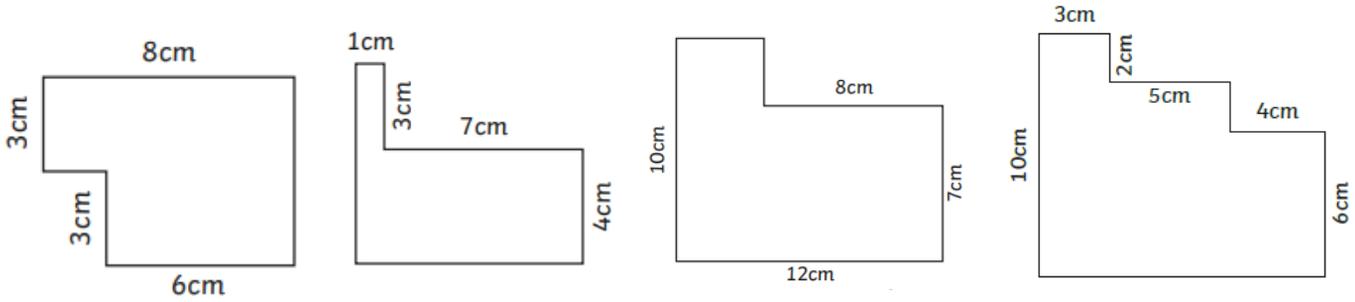
The area of the triangle =  $\frac{1}{2} \times 6 \times 7$

$\frac{1}{2} \times 6 \times 7 = 3 \times 7 = 21 \text{ cm}^2$

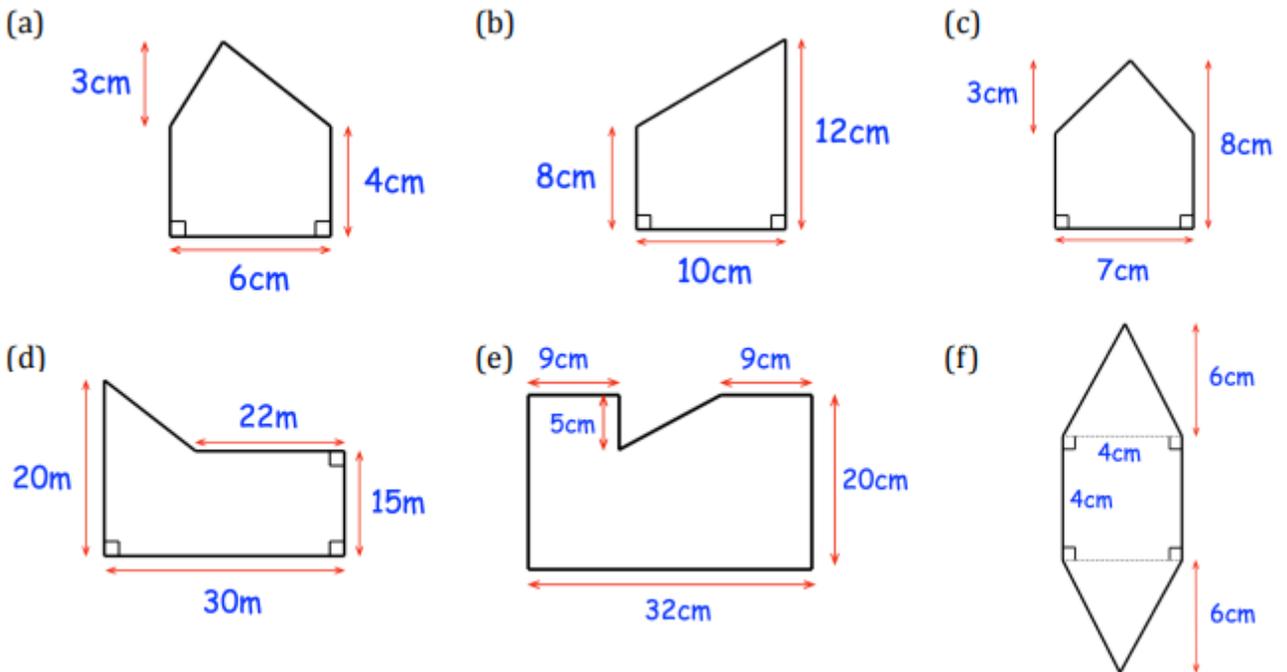
The total area =  $48 + 21 = 69 \text{ cm}^2$

Test:

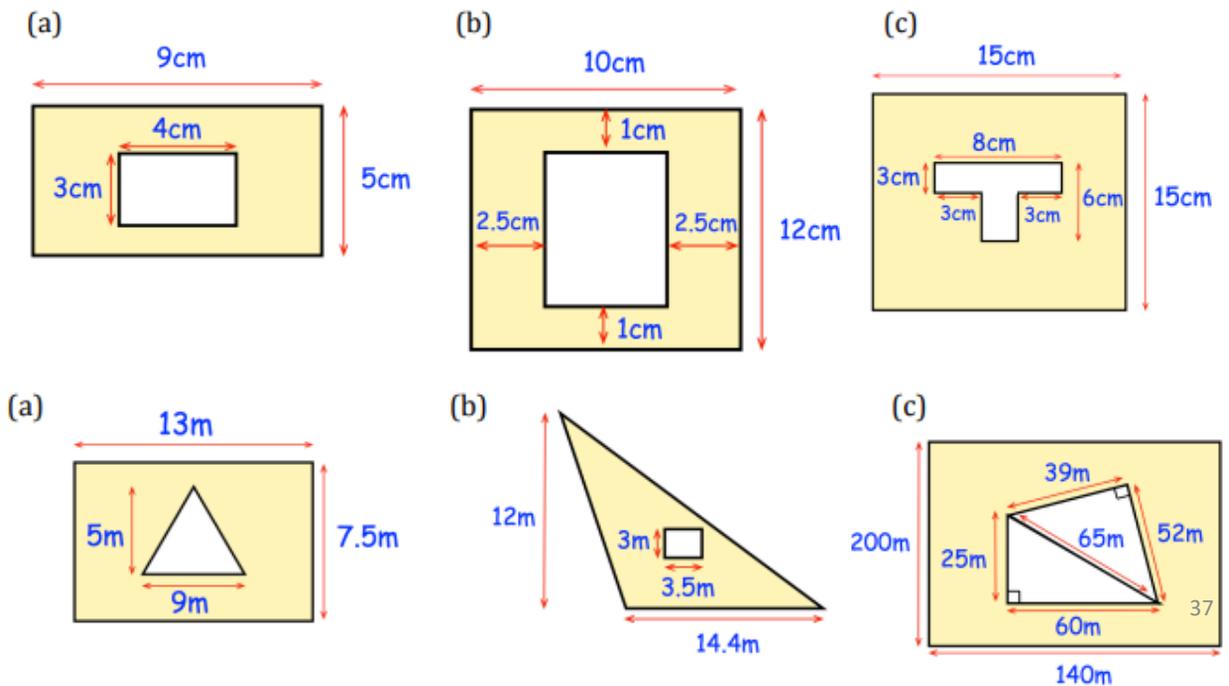
## Grade 1-3



## Grade 4-6



## Grade 7-9: Work out the area of the shaded region



# Independent Learning – Maths: No. 4 – HCF and factors of algebraic terms

B	S	G	P

## Diagnosis (D):

HCF and factors of algebraic terms	R	A	G
Find the Highest Common Factor of two numbers			
Find factors of algebraic terms			

## Therapy (T):

### Find the HCF of two or more numbers

The highest common factor (HCF) is the greatest factor that will divide into two or more numbers.

#### By listing:

1. List the factors of each number.
2. Compare the lists to find the greatest number common to both

---

### Find factors of an algebraic term

$$15c^2$$
$$1 \times 15 \times c \times c$$
$$3 \times 5 \times c \times c$$

We can see that when we list all the factors, there are a number of options.

We can say that **1**, **3**, **5** and **15** are all factors of  **$15c^2$** .

We can also say that **c** and  **$c^2$**  are factors of  **$15c^2$**  too.

↑

This is because we can say write the  $c \times c$  as  $c^2$

Testing:

Grade 1 – 3:

Write all the factors of the following terms.

a)  $12a$

b)  $15ab$

c)  $6cd$

d)  $4ef$

e)  $20uv$

f)  $7yz$

g)  $9efg$

h)  $11ef$

i)  $14abc$

j)  $8bc$

Grade 4 – 6:

Write all the factors of the following terms.

a)  $4a^2$

b)  $12b^2$

c)  $16cd^2$

d)  $10a^2b$

e)  $9gh^3$

f)  $18f^2g^2$

Grade 7 – 9:

Fill in the gaps.

a)  $3y \times \boxed{\phantom{000}} = 6y^2$

f)  $\boxed{\phantom{000}} \times 7g^2h = 7g^2h$

b)  $2c \times \boxed{\phantom{000}} = 10cd$

g)  $3x^3y \times \boxed{\phantom{000}} = 12x^5y^2$

c)  $\boxed{\phantom{000}} \times 4ab = 16a^2b^2$

h)  $\boxed{\phantom{000}} \times 4xyz = 12x^4yz^3$

d)  $10w \times \boxed{\phantom{000}} = 30wxy$

i)  $12u^2v^2 \times \boxed{\phantom{000}} = 12u^2v$

e)  $5a^2b \times \boxed{\phantom{000}} = 10a^5b^2$

j)  $g \times \boxed{\phantom{000}} = 2efg$

## 5. Expanding Brackets

### Diagnosis:

Expanding Brackets	R	A	G
To expand a single bracket with an integer outside the bracket			
To expand a single bracket with a variable outside the bracket			
To be able to expand and simplify more than one bracket			

### Therapy:

#### Expanding brackets

To expand a bracket means to multiply each term in the bracket by the expression outside the bracket. For example, in the expression  $3(m + 7)$ , multiply both  $m$  and  $7$  by  $3$ , so:

$$3(m + 7) = 3 \times m + 3 \times 7 = 3m + 21.$$

Expanding brackets involves using the skills of simplifying algebra. Remember that  $2 \times a = 2a$  and  $a \times a = a^2$ .

*Check your understanding:* Expand  $3f(5 - 6f)$ .

$$3f(5 - 6f) = 3f \times 5 - 3f \times 6f = 15f - 18f^2$$

#### Expanding and simplifying

Expressions with brackets can often be mixed in with other terms. For example,  $3(h + 2) - 4$ . In these cases first expand the bracket and then collect any like terms.

##### Example 1

Expand and simplify  $3(h + 2) - 4$ .

$$3(h + 2) - 4 = 3 \times h + 3 \times 2 - 4 = 3h + 6 - 4 = 3h + 2$$

##### Example 2

Expand and simplify  $6g + 2g(3g + 7)$ .

**BIDMAS or BODMAS** is the order of operations: Brackets, Indices or Powers, Divide or Multiply, Add or Subtract.

Following BIDMAS, multiplying out the bracket must happen before completing the addition, so multiply out the bracket first.

This gives:

$$6g + 2g(3g + 7) = 6g + 2g \times 3g + 2g \times 7 = 6g + 6g^2 + 14g$$

Collecting the like terms gives  $6g^2 + 20g$ .

*Check your understanding:*  $3(3n + 4) + 4(9n + 8)$

**Test:**

**Grade 1-3:**

- |                 |                 |                 |                       |
|-----------------|-----------------|-----------------|-----------------------|
| (a) $5(y + 3)$  | (b) $4(a + 2)$  | (c) $8(w + 10)$ | (d) $3(x - 7)$        |
| (e) $9(s - 1)$  | (f) $2(8 - t)$  | (g) $7(4 + h)$  | (h) $10(a + 2b + 3c)$ |
| (i) $4(3y + 2)$ | (j) $5(2p - 1)$ | (k) $3(7a + 2)$ | (l) $9(2x - 5)$       |

**Grade 4-6:**

- |                 |                  |                  |                 |
|-----------------|------------------|------------------|-----------------|
| (a) $a(c + 2)$  | (b) $c(d - 3)$   | (c) $a(b + c)$   | (d) $w(8 - y)$  |
| (e) $c(5 + a)$  | (f) $w(a - 9)$   | (g) $y(s + t)$   | (h) $2a(c - 3)$ |
| (i) $5x(y + 8)$ | (j) $3a(2c + 9)$ | (k) $6g(2c - 1)$ | (l) $9k(2 + d)$ |

**Grade 7-8:**

- |                             |                            |                             |
|-----------------------------|----------------------------|-----------------------------|
| (a) $5(y + 3) + 2(y + 7)$   | (b) $6(2w + 5) + 9(w + 2)$ | (c) $3(y - 2) + 4(2y + 5)$  |
| (d) $7(2g + 3) - 5(g + 2)$  | (e) $6(x - 2) - 4(x - 8)$  | (f) $2(3y - 8) - 5(2y - 1)$ |
| (g) $8(5 + 2m) + 3(5 - 3m)$ | (h) $4(w + 7) - 2(2w + 1)$ | (i) $9(1 + 2y) + 3(3 - y)$  |

**Grade 9:**

- |                              |                             |                            |
|------------------------------|-----------------------------|----------------------------|
| (a) $w(w + 5) + w(w + 7)$    | (b) $2g(4g + 3) + g(g - 7)$ | (c) $n(n - 4) - n(5 - n)$  |
| (d) $2e(4e + 3) - 3e(e - 5)$ | (e) $a(3 + c) + c(a + 2)$   | (f) $m(a + 7) - a(4 - 3m)$ |

# Independent Learning – Maths: No. 6 – Factorising Expressions

B	S	G	P

## Diagnosis (D):

Factors and Multiples	R	A	G
To understand and describe what factorising is			
To identify the highest common factors of algebraic terms			
To factorise two-term expressions			

### What is factorising?

Factorising is the reverse process of expanding brackets. To factorise an expression fully, means to put it in brackets by taking out the highest common factors.

The simplest way of factorising is:

- Find the highest common factor of each of the terms in the expression.
- Write the highest common factor (HCF) in front of any brackets
- Fill in each term in the brackets by multiplying out.

### How to factorise:

To factorise fully:

$$3x + 6$$

**1** Find the highest common factor (HCF) of the numbers 3 (the coefficient of  $x$ ) and 6 (the constant).

Factors of 3:

1, 3

Factors of 6:

1, 6

2, 3

#### Top tip:

Writing the factor pairs makes it easier to list all the factors

The highest common factor (HCF) of  $3x$  and 6 is 3

**2** Write the highest common factor (HCF) at the front of the single bracket.

$$3( + )$$

**3** Fill in each term in the bracket by multiplying out.

What do I need to multiply 3 by to give me  $3x$ ?

$$3 \times x = 3x$$

What do I need to multiply 3 by to give me 6?

$$3 \times 2 = 6$$

$$3(x + 2)$$

**Testing (T):**

Grade 1 – 3:

(a)  $4x + 6$

(b)  $15x + 20$

(c)  $9y - 12$

(d)  $5x + 15$

(e)  $6x - 3$

(f)  $4x + 8$

(g)  $5y - 25$

(h)  $8w + 24$

(i)  $10y + 15$

(j)  $14w + 21$

(k)  $20y - 30$

(l)  $27x + 18$

(m)  $6 - 4x$

(n)  $9 + 12y$

(o)  $45 + 60x$

(p)  $16y - 32$

Grade 4 – 6:

(a)  $x^2 + 7x$

(b)  $x^2 - 3x$

(c)  $y^2 + y$

(d)  $w^2 + 9w$

(e)  $x^2 - 7x$

(f)  $4w^2 + 10w$

(g)  $6x^2 - 8x$

(h)  $9y^2 - 6y$

(i)  $10c + c^2$

(j)  $5g - g^2$

(k)  $14x^2 + 35x$

(l)  $40x^2 - 50x$

(m)  $12x^2 + 18x$

(n)  $24x^2 - 18x$

(o)  $45y^2 + 60y$

(p)  $7w^2 + 2w$

Grade 7 – 9:

(a)  $x^2 + xy$

(b)  $a^2 - ab$

(c)  $xy + xz$

(d)  $ab + ac - ad$

(e)  $6c^2 - 4cd$

(f)  $10x^2 + 15xy$

(g)  $12ab + 18bc$

(h)  $8xy + 4y^2$

(i)  $8cdf + 10cde$

(j)  $7w^2 + 6w + wy$

(k)  $8ab^2 - 10ab$

(l)  $4xy^2 + 6xy + 2x^2y$

(m)  $6mn - 7m^2n$

(n)  $11g^2h + 22h^2$



# SCIENCE

# Independent Learning – Science: No. 1– Photosynthesis

B	S	G	P

## Diagnosis (D):

Bioenergetics	R	A	G
Recall the equation for photosynthesis.			
Describe factors that increase the rate of photosynthesis.			
Describe photosynthesis as an endothermic reaction.			
Describe how to test a leaf for starch.			
Explain the results of the testing a leaf for starch experiment.			
Name the layers in a leaf.			
Discuss how the adaptations of the leaf link to function.			

### Photosynthesis

A chemical reaction that produces **glucose** and oxygen from carbon dioxide and water.  
 $\text{carbon dioxide} + \text{water} \rightarrow \text{oxygen} + \text{glucose}$

### What is the glucose used for?

Storage as **starch**, respiration and making **proteins** for growth.

### Endothermic

A chemical reaction that takes in energy from its **surroundings**. E.g. Photosynthesis.

### Factors that affect the rate of photosynthesis

Temperature, light **intensity** and carbon dioxide levels.

### Where does photosynthesis occur?

Any part of the plant that contains **chloroplasts** e.g. leaves

### How are leaves adapted for photosynthesis?

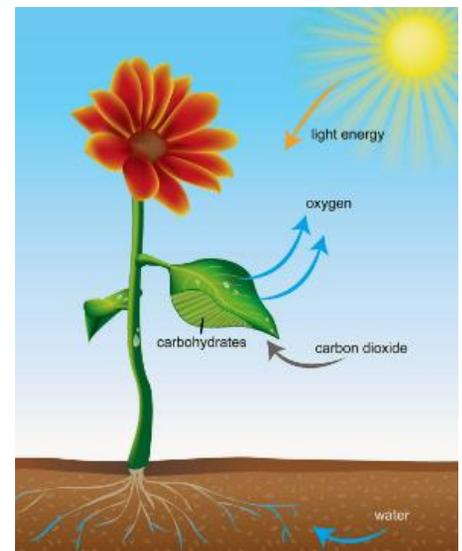
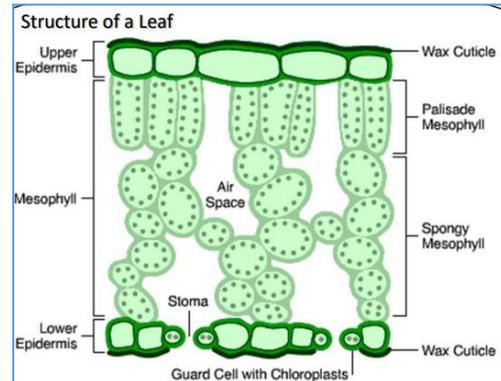
- Large surface area- to absorb lots of light
  - Thin- to allow gases to **diffuse**.
  - Lots of chloroplasts- where photosynthesis occurs.
  - Veins- to transport substances.

### What are stomata?

Small **openings** found on the bottom of leaves.

### What are the function of stomata?

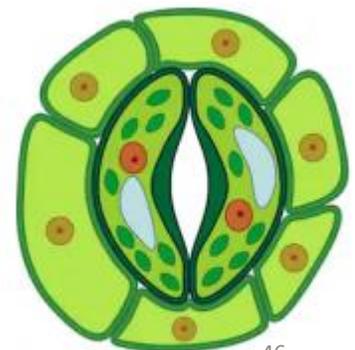
To allow carbon dioxide to **diffuse** into leaves. To allow oxygen and water to diffuse out of leaves.



## 1) Testing



To do this you should first take the leaf you are about to test and, using forceps, place it in a beaker of boiling water to kill it. Then place the leaf into a boiling tube of boiling ethanol to remove all the chlorophyll. Wash the leaf with water to remove the ethanol and soften the leaf, and spread it out on a white tile. Add a few drops of **iodine** solution onto the leaf. If starch is present, the iodine will turn from yellow-brown to blue-black.

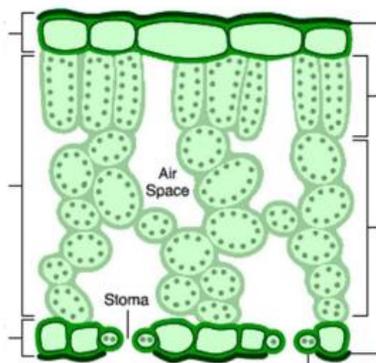


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## Stomata

## Therapy (T):

1. Learn the definitions for the keywords and practice remembering them doing 'look, cover, write, check' until you can get it right from memory.
2. Write out a step by step guide to describe how you test a leaf for starch
3. Use the knowledge organiser to learn the structure of a leaf. When you are confident label the diagram below:



4. Make some flash cards to help you remember the functions of the different parts of a leaf

---

## Testing (T)

Test that you have understood the science you have learnt by trying the questions below.

**Do these questions without looking at the knowledge organiser.** If you can't remember the answers, you need to go back and do some more of the 'therapy' work.

The grades for each question are there to help you achieve your goal. This is just a guide however; you should try all questions.

Grade 1-3: **Complete the Word equation for Photosynthesis:**

\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_

This process takes place in the \_\_\_\_\_ of plant cells. \_\_\_\_\_ intensity, \_\_\_\_\_ concentration and \_\_\_\_\_ all affect how fast a plant will photosynthesise.

Grade 4-6:

Q1. Describe the role of the following structures: Upper epidermis, palisade mesophyll and the stomata

Q2. Describe why photosynthesis is an endothermic reaction

Q3. Describe how light effects the rate of photosynthesis

Grade 7-9:

Q1. Write the balanced symbol equation for photosynthesis

Q2. Explain how glucose is stored and used in a plant

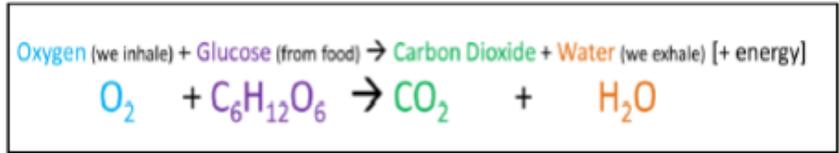
B	S	G	P

Diagnosis (D):

Bioenergetics	R	A	G
Name the parts of the gas exchange system.			
Describe the gas exchange system, including key organs.			
Describe the process of breathing.			
Recall the equation for aerobic respiration.			
Describe aerobic respiration in animals.			
Recall the equation for anaerobic respiration.			
Describe aerobic respiration as an exothermic reaction.			
Describe anaerobic respiration in animals.			
Compare anaerobic respiration in animals, plants and			

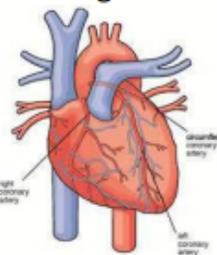
## Aerobic Respiration

In the mitochondria **aerobic respiration** occurs. This is a reaction that uses **oxygen** to break down glucose into **carbon dioxide** and **water** (which we exhale). This releases energy.



We use this energy constantly to

- keep our bodies warm
- build larger molecules from smaller ones (e.g. building amino acids up into proteins)

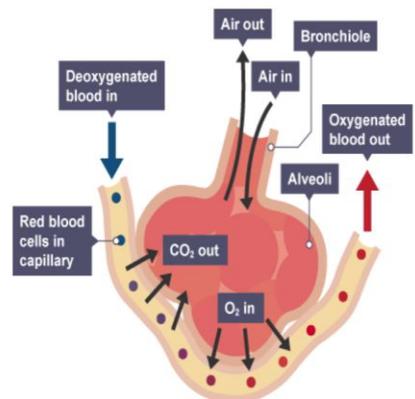


This means that:

- We have to breath more quickly and more deeply to supply our cells with more oxygen.
- Our heart beats quicker to pump blood to the working muscles. Remember, that our blood carries the oxygen and glucose (the reactants for respiration)
- These changes result in a faster rate of respiration and more energy release.

**Gas exchange in the lungs** happens in the **alveoli**. Some of the features of alveoli include:

- **Thin walls**
- **Large surface area**
- **Moist surface**
- **Rich blood supply**



## Anaerobic Respiration

During strenuous exercise or a rapid burst of activity the body may not be able to supply the cells with enough oxygen. The cells continue to do respiration but will switch to doing **Anaerobic Respiration**.



If lactic acid builds up in our muscles this causes cramp.

## Therapy (T):

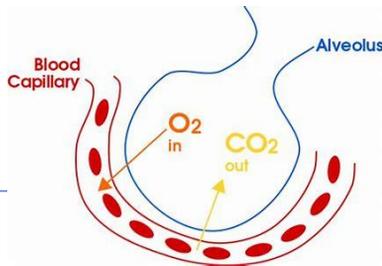
1. Learn the definitions for the following keywords and practice remembering them doing 'look, cover, write, check' until you can get it right from memory.

### Aerobic respiration, anaerobic respiration, gas exchange

2. Complete the following table:

	Aerobic respiration	Anaerobic respiration
Definition		
Word equation		
Symbol equation		

3. Make some flash cards to help you remember the adaptation of the alveoli. Include a diagram like the one below:



## Testing (T)

Test that you have understood the science you have learnt by trying the questions below.

**Do these questions without looking at the knowledge organiser.** If you can't remember the answers, you need to go back and do some more of the 'therapy' work.

The grades for each question are there to help you achieve your goal. This is just a guide however; you should try all questions.

### Grade 1-3: Complete the Word/symbol equation for Respiration:

\_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ In the \_\_\_\_\_ aerobic respiration occurs. This is a reaction that uses \_\_\_\_\_ to break down glucose into \_\_\_\_\_ and \_\_\_\_\_ (which we exhale). This releases \_\_\_\_\_.

### Grade 4-6:

Q1. Describe the changes that take place in our body during aerobic respiration

Q2. Describe the changes that take place in our body during anaerobic respiration

Q3. Describe the role of mitochondria in respiration

### Grade 7-9:

Q1. Explain the process of gas exchange

Q2. Explain the term 'oxygen debt'

Q3. Explain why we breathe more quickly and deeply after exercise

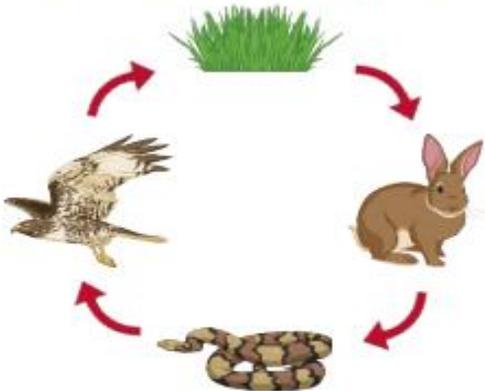
## Independent Learning – Science Ecosystems

### Diagnosis (D):

Ecosystems	R	A	G
Identify producers, primary, secondary and tertiary consumers in a food chain.			
Compare food chains and food webs.			
Describe resources that animals and plants compete for.			
Describe how and plants are adapted to their environment.			
Describe how polar bears are adapted to survive in their ecosystem.			
Define global warming.			

### Food Chains

The source of all energy in a food chain is the sun's radiation. It is made useful by plants and algae which produce organic compounds through photosynthesis.



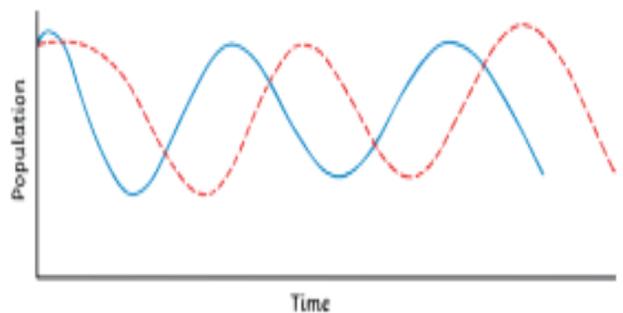
The living organisms use the energy to produce biomass and grow.

When a living organism is consumed, some of the biomass and energy is transferred. Some of the energy is lost.

Remember: the arrow in a food chain indicates the direction of the flow of energy.

Remember: the arrow in a food chain indicates the direction of the flow of energy.

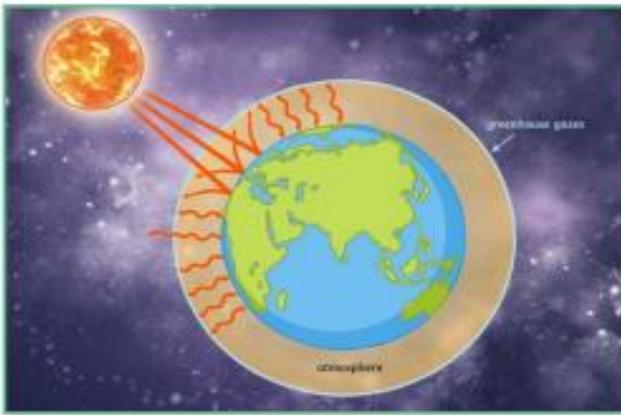
Populations of predators and prey increase and decrease in cycles. The size of the predator population depends on the size of the prey population and vice versa. Overall, there is a stable community.



----- = Predator

———— = Prey

## Global Warming



The **greenhouse effect** is the natural process where some of the Sun's radiation is trapped within the insulating layer of the atmosphere. This maintains a temperature suitable to support life on Earth.

Most of the radiation from the Sun is absorbed by the Earth when it reaches the surface. The rest of the infrared radiation is reflected from the surface and absorbed by the greenhouse gases and clouds in the atmosphere. This is then re-emitted in all directions.

However, due to many contributing factors, the global temperature is gradually increasing. Several gases, called greenhouse gases, trap the heat around the Earth; the most concerning is carbon dioxide. Human activities contribute to the excess amount of carbon dioxide in the atmosphere and so are a cause of global warming.

Global warming leads to the melting of ice caps, rising sea levels, flooding, changes to climate, changes in migration patterns, changes in species distribution and reduction in biodiversity.

## Adaptations

Adaptations are specific features of an organism which enable them to survive in the conditions of their habitat.

Adaptations can be structural, behavioural or functional:

### Adaptations of a Polar Bear

- Their fur is hollow and transparent in order to reflect visible light and camouflage them. This is why their fur looks white in the snow.
- Small bumps on their footpads, called papillae, help them grip to icy surfaces.
- Long, thick, curved claws help them to kill and eat their prey.
- Large paws distribute their weight evenly. This is very important when walking on ice!
- Their skin beneath their fur is black, helping them absorb heat and keep warm.
- Thick layers of fur and body fat also help to keep them warm.
- They have developed into strong swimmers, able to navigate between icebergs and other hazards in the hunt for prey.

## Therapy (T):

1. Look at the diagram and information on food chains and try and remember as much as you can.
2. On a separate piece of paper (without looking!) try and draw a mind map about food chains. Check your answers and keep practising until you can get it right from memory.
3. Repeat the process with global warming and adaptations.

Make some flash cards to help you remember the different things you will need to know. When you have made them keep testing yourself until you can get them all right.

E.g.

(front) What can global warming lead to?	(back) <b>Ice caps melting</b>
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## Testing (T)

Test that you have understood the science you have learnt by trying the questions below. **Do these questions without looking at the knowledge organiser.** If you can't remember the answers, you need to go back and do some more of the 'therapy' work.

The grades for each question are there to help you achieve your goal. This is just a guide however; you should try all questions.

Grade 1-3:

- Q1. Draw a simple food chain of at least three organisms.
- Q2. On the food chain label a 'producer', 'prey' and 'predator'
- Q3. Explain using simple vocabulary to explain what is meant by 'producer', 'prey' and 'predator'.

Grade 4-6:

- Q1. Describe what is meant by predator-prey cycles.
- Q2. Briefly explain what is meant by global warming and the greenhouse effect.
- Q3. State the adaptations of a polar bear.

Grade 7-9:

- Q1. Explain with example(s) what is meant by predator-prey cycles.
- Q2. Explain using scientific languages what is meant by global warming and the greenhouse effect, and its effect(s) on the environment.
- Q3. Describe the adaptations of a cactus or a camel (use the internet to help).

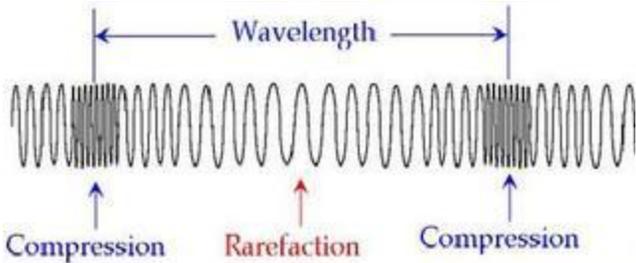


# Y8 Independent Learning – Waves

## Diagnosis (D):

Waves	Covered in lesson	R	A	G	1	2	3
Label a transverse wave.							
Label a longitudinal wave.							
Explain why the speed of sound in a solid, liquid and gas is different.							
Describe how a sound is made.							
Describe how changing vibration affects pitch and loudness of sounds.							
Compare sounds on an oscilloscope.							
Describe the key words: frequency and amplitude.							

### Longitudinal waves – sound.

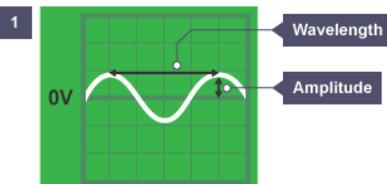


When an object or substance vibrates it can produce sound waves in air. These are called longitudinal waves. The object makes air particles push together or pull apart. Sound can also travel through a solid or liquid. It cannot pass through empty space as there are no particles.

- the **amplitude** is the maximum height of the wave from its resting position – the greater the amplitude, the louder the sound
- the **wavelength** is the distance between the crests (tops) of two waves next to each other (or any other two identical points on waves next to each other)
- the **frequency** is the number of waves per second – the higher the frequency, the closer together the waves are and the higher the **pitch**

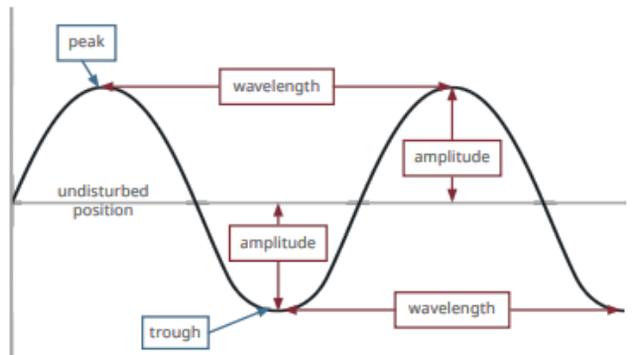
### Oscilloscope traces

The graphs shown by an oscilloscope are called **oscilloscope traces**. The diagrams show some typical oscilloscope traces for sound:

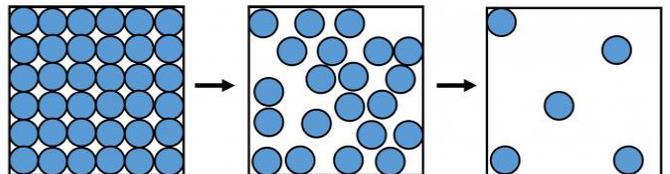


The amplitude shows the size of vibration. The bigger the amplitude, the bigger the vibration, the louder the sound. The shorter the wavelength the faster the object is vibrating. If the sound has a shorter wavelength it has a higher frequency so is a higher pitch.

### Transverse waves – light and water



Sound waves travel fastest in solids because there is no space between the particles. The vibration is passed on very quickly when one particle collides with its neighbour.



Frequency is measured in Hertz (Hz). This is the number of waves (oscillations) per second. Higher frequency sounds have a higher pitch. Lower frequency sounds have a lower pitch.

Humans can hear sounds that have a frequency between 20Hz and 20 000Hz.

## Therapy:

1. Look at a section of the knowledge organiser, cover it over, then on a separate piece of paper, write down everything you can remember. Go back and check what you remembered: with a different coloured pen:
  - a) if you made any mistakes, correct them,
  - b) if you missed anything, add it.
2. Make a mindmap of waves– add in some diagrams so you can explain the difference between transverse and longitudinal waves.
3. Make some flash cards with definitions to learn.

E.g.	<h1>Frequency</h1>	<ul style="list-style-type: none"><li>• The number of waves/vibrations per second.</li><li>• Measured in Hertz (Hz)</li><li>• High frequency = high pitch</li><li>• Low frequency = low pitch</li></ul>
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## Testing:

Test that you have understood the science you have learnt by trying the questions below. **Do these questions without looking at the knowledge organiser.** If you can't remember the answers, you need to go back and do some more of the 'therapy' work.

The grades for each question are there to help you achieve your goal. This is just a guide however; you should try all questions.

### Grade 1-3:

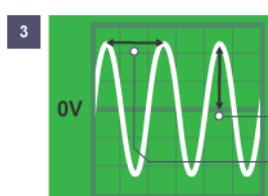
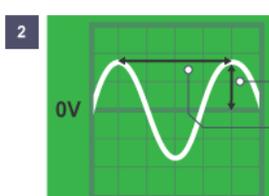
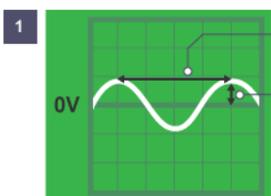
1. What word do we have for the height of a wave?
2. What word do we have for the distance between wave peaks?
3. What word describes the number of vibrations per second?

### Grade 4-6:

1. State the range of human hearing.
2. Draw and label a longitudinal wave in a spring.
3. Explain why sound waves travel slowest in gases.

### Grade 7-9:

1. Which wave below is the quietest?
2. Which waves have the same frequency?
3. Which wave has the highest pitch?



# Independent Learning – Science - Energy

B	S	G	P

## Diagnosis (D):

Energy Resources	Covered in lesson	R	A	G
Be able to name 5 forms of energy store and 4 forms of energy transfer.				
Be able to identify examples of devices that involve each type of energy.				
Be able to explain the Law of Conservation of Energy				
Be able to identify electricity generation as either renewable or non renewable				
Be able to describe advantages and disadvantages of a range of renewables				

## Therapy (T):

1. Look at the picture of the energy stores and try and remember as much as you can.
2. On a separate piece of paper (without looking!) try and re-draw the diagram. Check your answers and keep practising until you can get it right from memory.
3. Now add as much information from the description as you can

Now you are happy that you can remember all of the energy stores, move on to the next task.

Make some flash cards to help you remember the different energy stores When you have made them keep testing yourself until you can get them all right.

E.g.

(front) <b>Gravitational Energy</b>	(back) <b>This is the energy we get as a result of gravitational force on an object's height.</b>
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## Testing (T)

Test that you have understood the science you have learnt by trying the questions below. **Do these questions without looking at the knowledge organiser.** If you can't remember the answers, you need to go back and do some more of the 'therapy' work.

The grades for each question are there to help you achieve your goal. This is just a guide however; you should try all questions.

Grade 1-3:

- Q1. What energy does a racing car have when it is going at its top speed?
- Q2. What is the energy store in a candle?
- Q3. What is the energy stored in our food?

Grade 4-6:

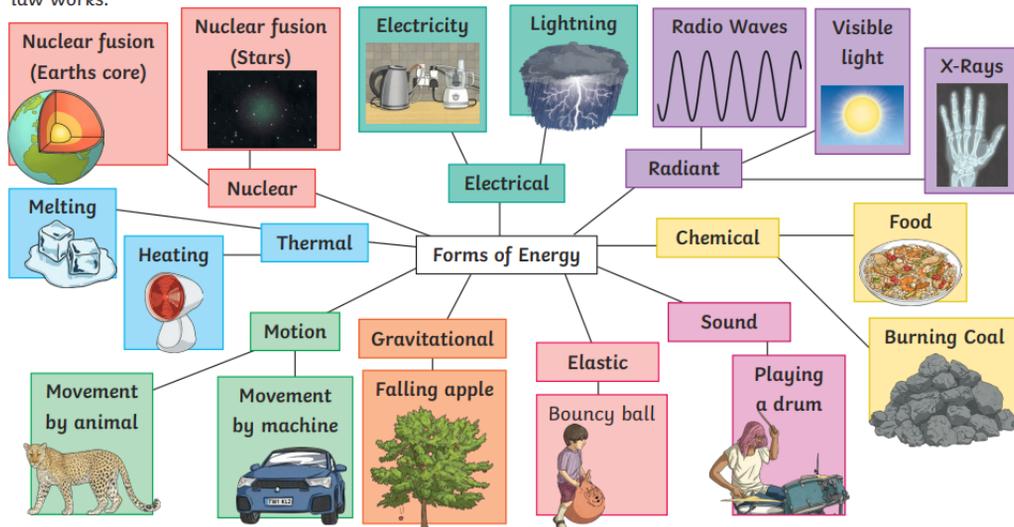
- Q1. How do plants transfer energy?
- Q2. What is the energy stored in an object that is raised from the ground?
- Q3. How can we reduce our energy use? Write down as many ways as you can.

Grade 7-9:

- Q1. Describe how non-renewable energy resources are formed
- Q2. Explain what a renewable energy resource is?
- Q3. What does conservation of energy mean?

# Types of Energy

Energy is all around us. Einstein's first Law of Conservation of Energy, states that 'Energy can neither be created nor destroyed; energy can only be transferred or changed from one form to another.' Take a look at how this law works:



There are nine different types of energy:

- Heat energy** - This type of energy is created by the vibrations of atoms and molecules inside different substances. The faster they move, the more energy they have and the more heat they give off.
- Radiant energy** - This type of energy is also known as **light or electromagnetic** energy. Radiant energy is a type of kinetic energy because it moves in waves.
- Chemical energy** - Chemical energy is found in atoms and molecules - it is the energy that holds these particles together. Chemical energy is stored energy that can be found in food, coal and natural gas.
- Nuclear energy** - Nuclear energy is stored in the nucleus of atoms. To release this energy either: nuclei are joined together (the process called fusion) or, the nucleus is split apart (called fission). Nuclear power plants use fission. They generate energy by splitting the atoms of plutonium or Uranium.
- Electrical energy** - Electrical energy is the movement of electrons (tiny particles that are one of the building blocks of atoms). Electricity is electrons moving through a wire.
- Motion energy** - This can also be called **kinetic energy**. It is the energy released through movement. Chemical potential and elastic potential are examples of stored energy. Someone going for a run is an example of motion energy.
- Sound energy** - Sound moves in waves and is generated when a force makes an object vibrate. Like banging on a drum. There is less energy in sound in comparison to some other kinds of energy.
- Elastic energy** - This is a type of potential energy. The energy is stored in an elastic object, such as a spring or elastic band. They store elastic energy when a force, like a pull or a squeeze, causes them to be stretched or squashed.
- Gravitational energy** - This is the energy we get as a result of gravitational force on an object's height.

## Independent Learning – Science - Energy

B	S	G	P

Diagnosis (D):

Energy Transfer	Covered in lesson	R	A	G
State the difference between heat and temperature.				
Label the direction of heat flow from hotter to cooler areas.				
Name some everyday thermal conductors and insulators.				
Use the particle model to describe conduction.				
Name some everyday examples of convection.				
Describe convection in terms of changes in density.				
Use the particle model to explain convection.				
Know that hotter objects emit more infrared waves than they absorb.				
Know that cooler objects emit fewer infrared waves than they absorb.				
Know that emission and absorption of infrared waves causes changes in temperature.				
Describe what a thermogram is.				
Describe some ways of insulating homes.				
Explain how these reduce conduction, convection or radiation.				
Write a method to compare the energy content of food.				

Therapy (T):

1. Look at the information on the next page try and remember as much as you can.
2. On a separate piece of paper (without looking!) try and re-draw the diagram. Check your answers and keep practising until you can get it right from memory.
3. Now add as much information from the description as you can

Now you are happy that you can remember all of the energy stores, move on to the next task.

Make some flash cards to help you remember the different energy stores When you have made them keep testing yourself until you can get them all right.

(front) <b>Heating</b>	(back) If the surroundings are cooler than an object, energy will be transferred from the object to the surroundings.
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Testing (T)

Answer the questions on the last page of this section

# Radiation

What is temperature?

Temperature is a measurement of the **average** energy of the particles in a substance.

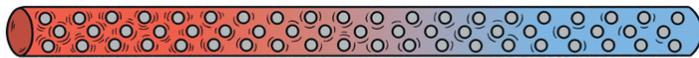
## Heating

If the surroundings are cooler than an object, energy will be transferred from the object to the surroundings.

## Conduction

When you heat a solid, energy is transferred from the fuel to the particles in the solid. This causes the particles to vibrate more.

In conduction, particles transfer energy by colliding with each other when they vibrate.



As the particles near to the heat source vibrate more, they bump into those next to them and transfer energy.

## Thermal Processes

There are different processes that cause energy to be transferred by heating.

**Conduction** and **convection** transfer energy because of the movement of particles.

**Radiation** transfers energy as waves.

## Convection

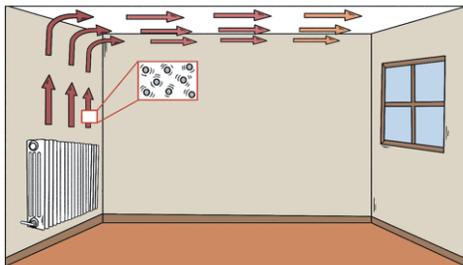
Even though fluids are not good conductors, they can still transfer energy by heating.

If you heat a liquid or a gas, energy is transferred from the fuel to the particles in the liquid or gas. This causes the particles to move faster and vibrate more.

This increased movement causes the particles to move further apart.

They take up more space, so are less dense.

This means the hotter fluid rises.



All objects emit (give out) **radiation**.

How much they emit depends on the properties of their surface.

The type of radiation they emit depends on their temperature.



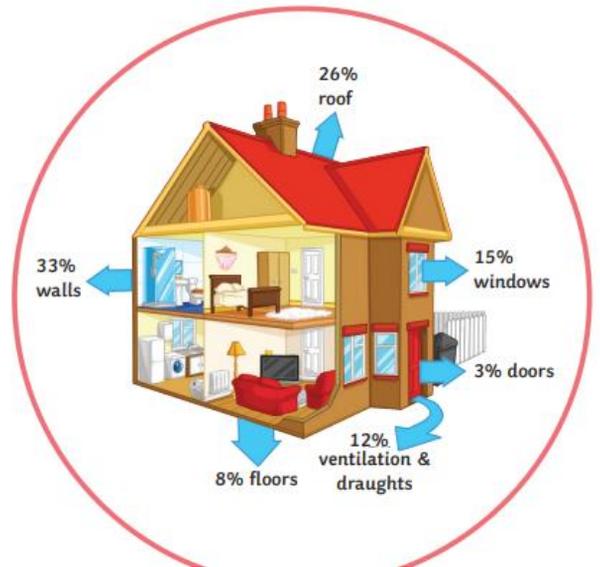
Piccadilly Circus Tube Station in Thermal Infrared by © David Skinner via Flickr licensed under CC BY



Very hot objects give out light as well as infrared radiation.

**Insulation** – reduces the amount of heat lost. In your home, you can prevent heat loss in a number of ways:

- thick walls;
- thermal insulation, such as:
- loft insulation (reducing convection);
- cavity walls (reduces conduction and convection);
- double glazing (reduces conduction).



## Conduction, Convection or Radiation?

The transfer of energy from the hot-water bottle to the bed.



**conduction**

The transfer of energy through the water in the kettle.



**convection**

The transfer of energy from the flame to the food in the oven.



**convection**

The transfer of energy from the soup to the metal spoon.



**conduction**

The transfer of energy from the cup to the person's hands.



**conduction**

The transfer of energy from the heater to the person's hands.



**radiation**

The transfer of energy from the bonfire to the spectators.

**radiation**



The transfer of energy from the heating element to the bread.

**radiation**



# Energy Transfer and Dissipation

Some people are standing around a bonfire.



Describe the energy transfers in this system that cause the people and the surroundings to warm up.

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Determine which person will feel the warmest.

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Explain why, referring to the energy transfers involved.

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