

SCIENCE ENQUIRY GAMES

List of Games

- 1 Planning
Planning Posers
- 2 Fair Testing
Fair Test Scramble
- 3 Identifying Equipment
What's in the Box
- 4 Repeat Readings
Bull's Eye
- 5 Using Tables
Table Talk
- 6 Drawing Conclusions
Thumbs Up, Thumbs Down
- 7 Vocabulary
Splat
- 8 Evaluating
Bloopers
- 9 Enquiry Overview
Sort It

Planning

Planning Posers



Kinds of Investigation

Glossary



Kind of investigation	Description	Example of this kind of investigation
Doing a fair test	In a fair test, you change one factor to find out what happens to something else. You only change one factor and keep all the other factors the same.	What happens to the distance a toy car goes when you put the ramp at different heights?
Carrying out a survey	In a survey, you record things you observe or measure. You often do a survey when you want to find things out about people, or plants and animals in their environment.	Do people with longer legs jump higher? Which plants do bees visit most often?
Classifying	You classify things when you sort them into groups. Sometimes we sort things into different groups because they have different features, like materials or animals. Sometimes we sort things into groups because they behave in different ways - the things either do something or they don't do something.	How can we group these different leaves? Are these materials attracted to the magnet or not?
Observing or measuring something over time	Sometimes you find things out by watching one thing over a period of time - you could watch it for a few minutes or a few weeks. Sometimes we just make observations and sometimes we can measure what is happening using equipment.	How will the caterpillar change over the next six weeks?

Presenting Evidence 1

Tables



Tables can be used in many ways. They can have two or more columns. They can have words or numbers in them. Here are 3 examples of tables. These can be helpful when you are doing **fair tests, surveys, observing over time and classifying**.

Do we all have the same pulse rate?	
NAME	PULSE RATE
John	65
Caroline	73
Ahmed	66
Rebecca	64
Joshua	72

How loud are sounds?	
SOUND	HOW LOUD
whisper	quiet
clap	medium
alarm	very loud
yell	loud
radio	variable

How can we identify leaves?			
LEAF	PRICKLY	LENGTH (CM)	SHINY?
Ivy	NO	4	YES
Oak	NO	8	NO
Hazel	NO	5	NO
Holly	YES	7	YES
Horse Chestnut	NO	16	NO

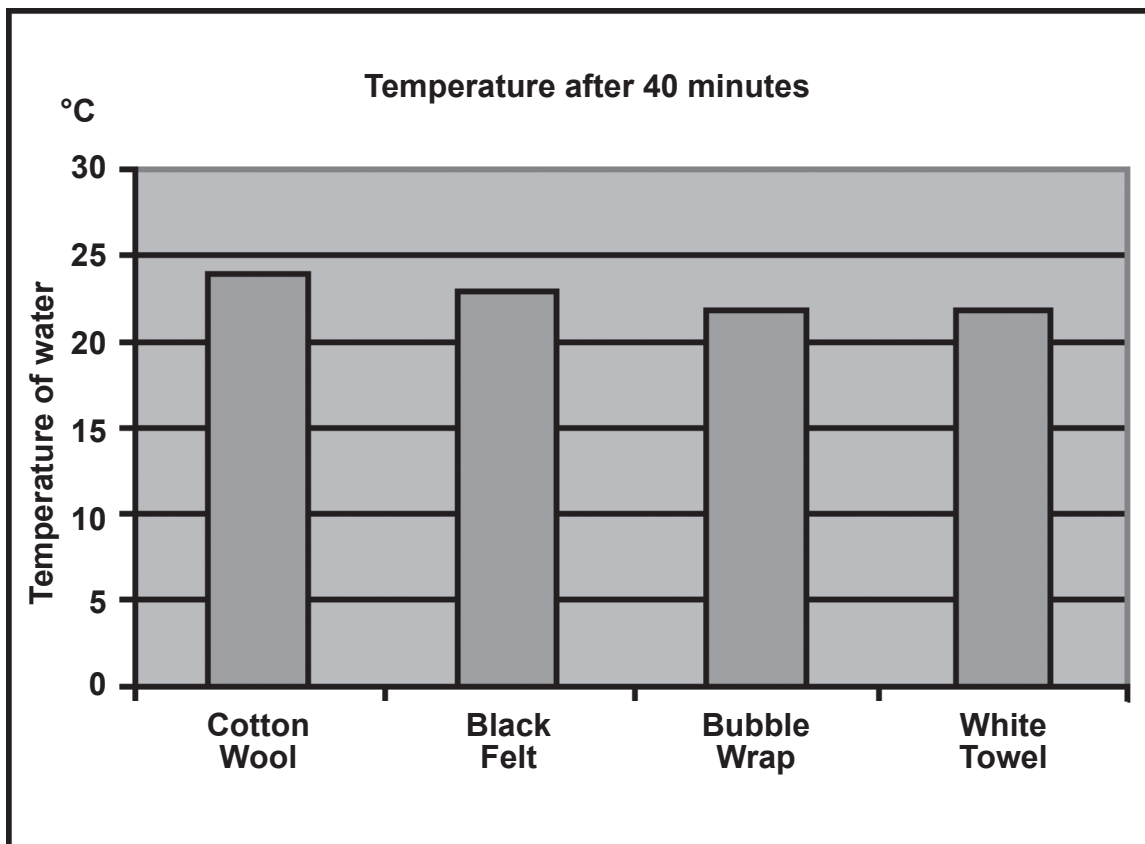
Presenting Evidence 2

Bar Charts



Bar charts usually have words across the bottom (horizontal axis) and numbers up the side (vertical axis). These can be helpful when you are doing **fair tests or surveys**.

Which is the best material for making a tea cosy?



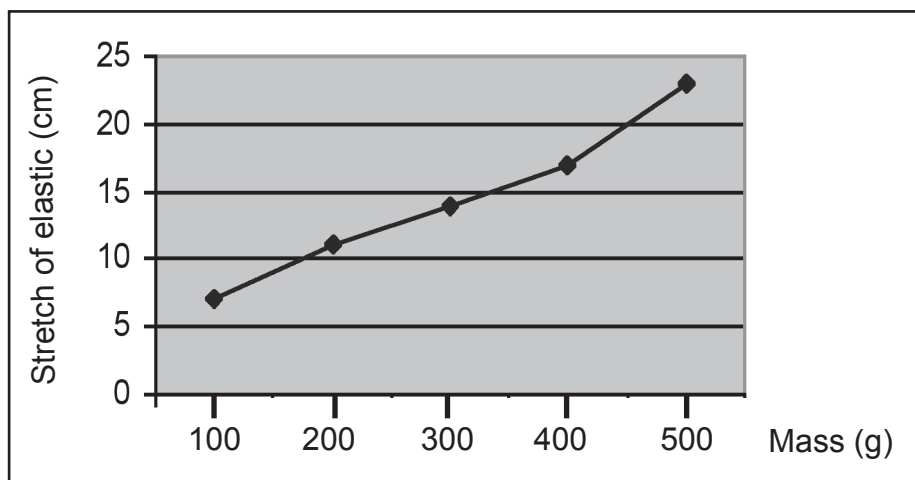
Presenting Evidence 3

Line Graphs

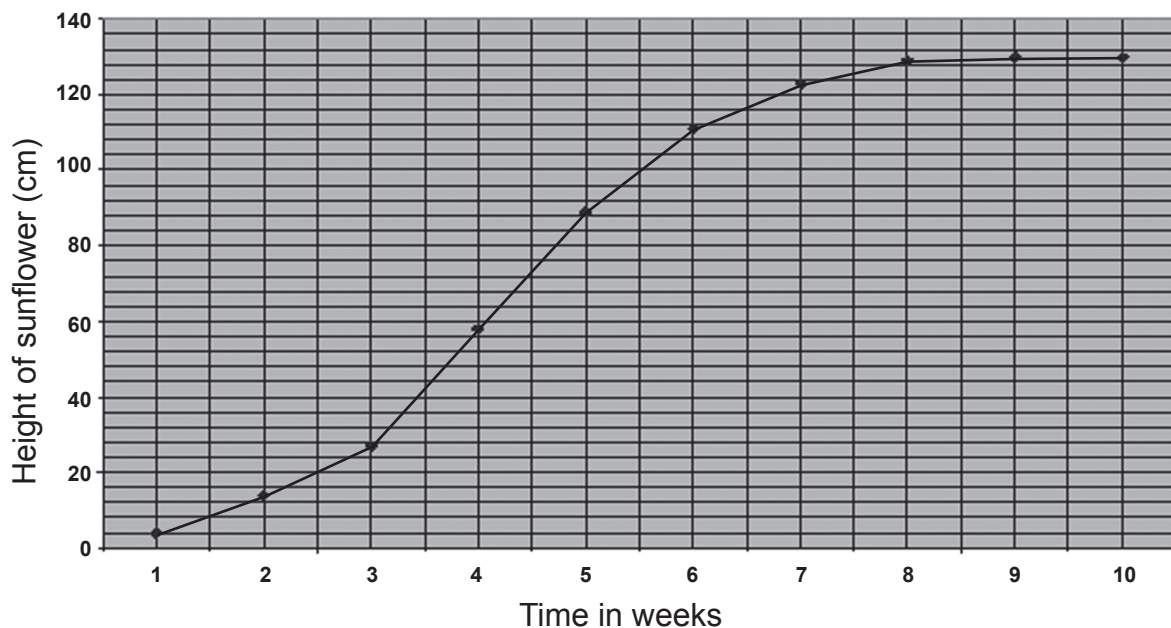


Line graphs have numbers on the bottom (horizontal axis) and up the side (vertical axis). These can be helpful when you are doing **fair tests** and **when you are measuring something over time**. Here are two line graphs.

Stretching elastic



Growing Sunflowers

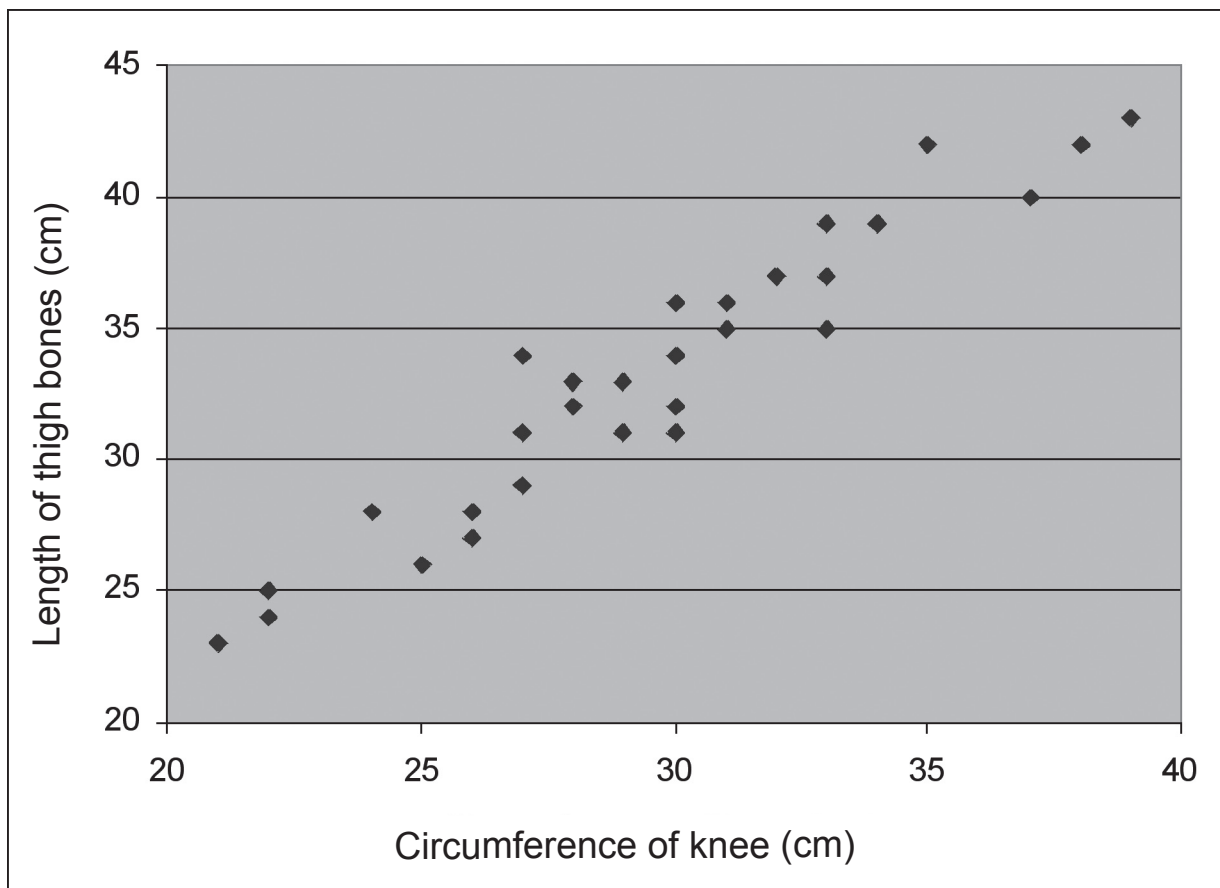


Presenting Evidence 4

Scatter Graphs



In a scatter graph, each dot represents one person or thing. You plot the dots to see whether there is a connection between two sets of data. These can be helpful when you are doing **surveys**.



Poser Questions



Can be cut up and used individually

Which paper towel soaks up the most water?

How can we group these materials?

What will happen to the temperature of the hot water if we let it cool down and take its temperature every 5 minutes?

When I change the size of the spinner's wings, what happens to the time it takes to fall?

What colour hair do people in our class have?

If we make the elastic band different lengths what will happen to the pitch of the note when we pluck it?

Which materials are attracted to the magnet?

How does the mould grow on this orange if we leave it for three weeks?

Do people with longer arms have longer fingers?

Which is the best soil for letting water drain through?

Which of these solids dissolve in a beaker of water and which do not dissolve?

How does the shape of the moon change if we look at it every other night over the next month?

How many different types of plants can we find in the long grass, the short grass and in the woods?

Investigation labels



Enlarge to A3 and cut up to put in the corners of the classroom.
Use as A4 on children's tables.

Classifying

Fair Test

Survey

Over Time

Planning Posers

Matching Activity

Methods of investigation

fair test

survey

classifying

observe or
measure
over time

Methods of recording

table

bar chart

line graph

scatter graph

Fair Testing

Fair Test Scramble



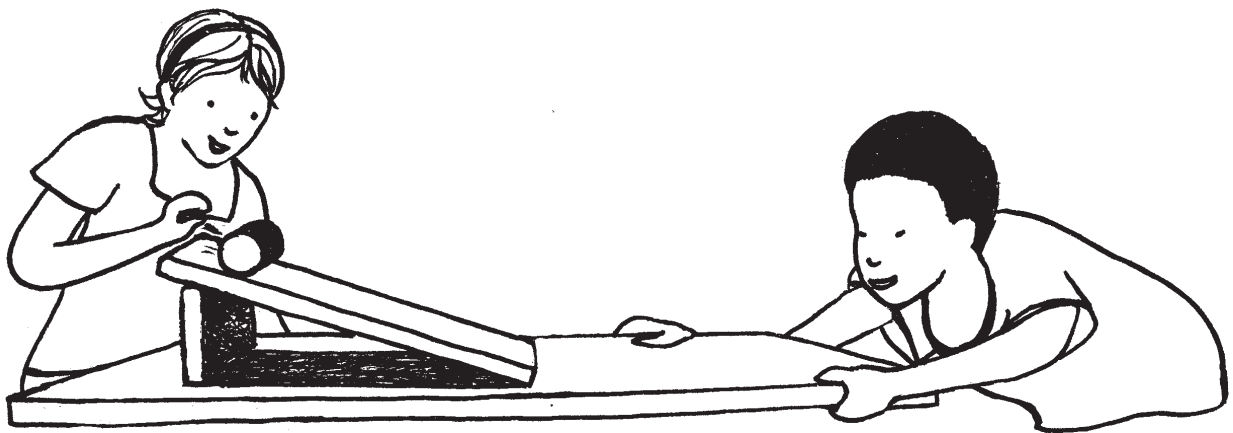
Investigation Pictures 1

What affects the time sugar takes to dissolve in water?



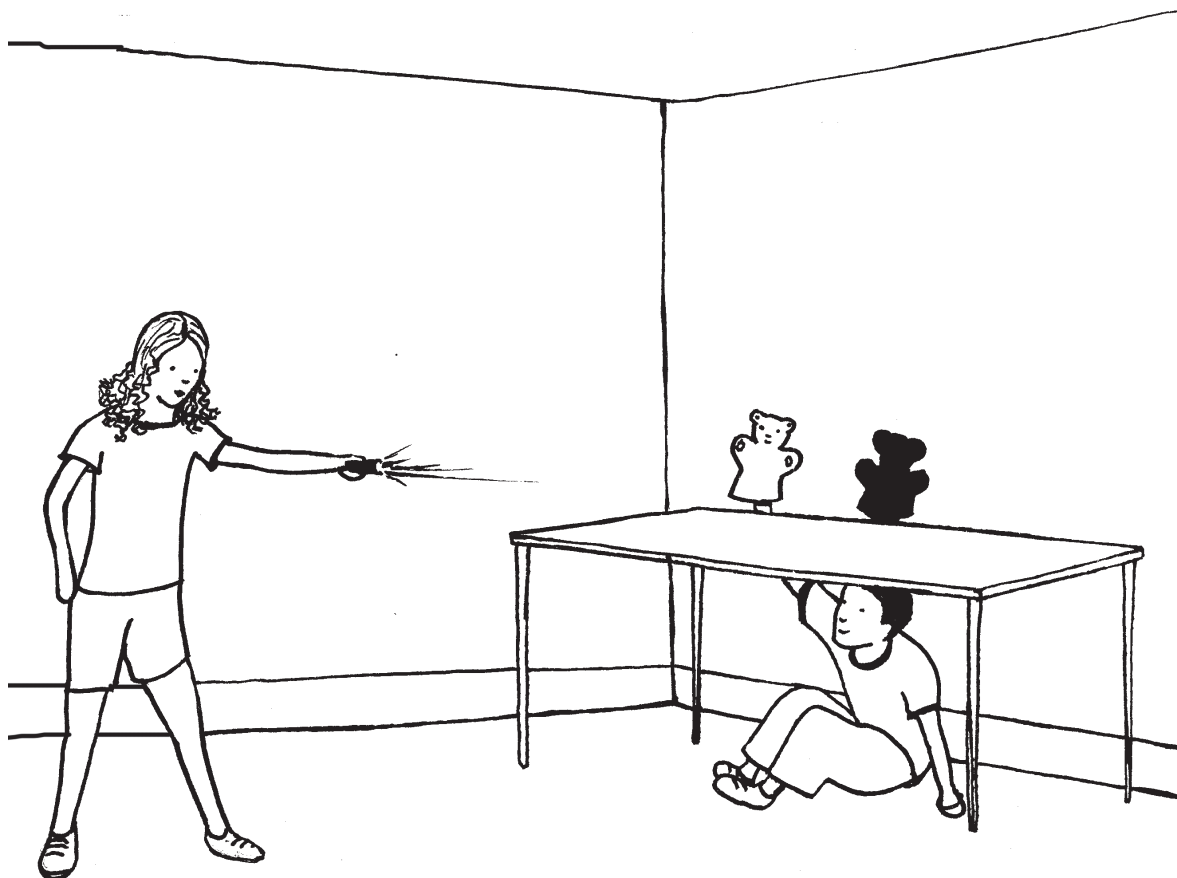
Investigation Pictures 2

What makes a difference to
the distance a can travels
after it has been rolled
down a ramp?



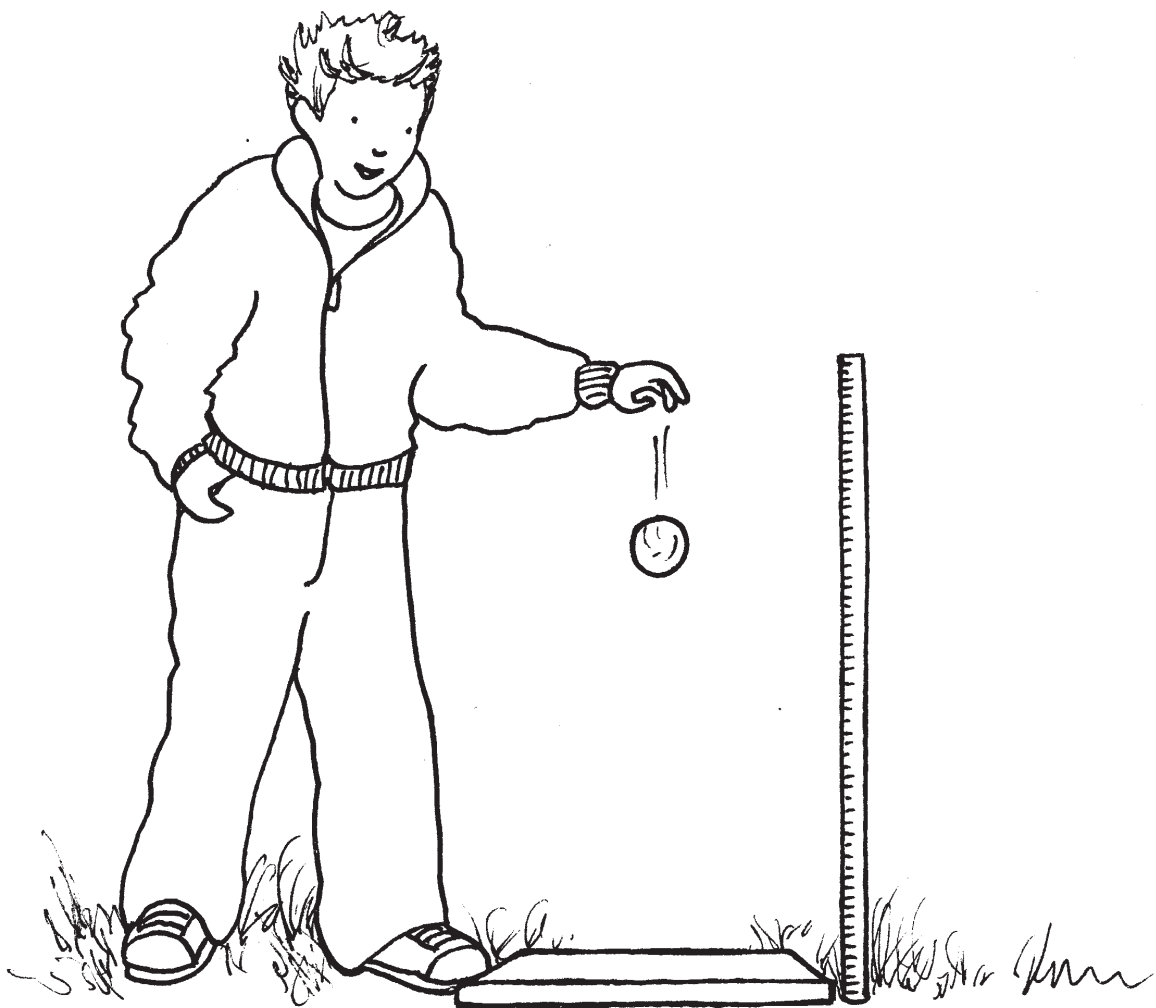
Investigation Pictures 3

What affects the height of a shadow when a light shines on a puppet?



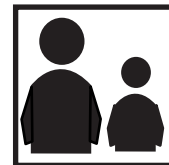
Investigation Pictures 4

How can we make a ball bounce to different heights on its first bounce?



Fair Test Scramble

Factor Cards



You need to cut out the cards

Distance can travelled

Point where can was released

Surface of floor

Height of ramp

Height of bounce

Size of can

Type of surface

Length of shadow

Height of drop

Temperature of water

Mass of sugar

Time sugar takes to dissolve

Type of ball

Volume of water

Height of puppet

Type of sugar

Distance from light

Number of stirs

Fair Test Scramble

Questions



How does the temperature of the water affect the time it takes the sugar to dissolve?

How does the height of the ramp affect the distance the can travels?

How does the height of drop make a difference to how high the ball bounces?

Does the distance between the puppet and the light make a difference to the length of the shadow?

How does the size of the can affect the distance the can travels?

What happens to the height of the bounce when the ball gets dropped on different surfaces?

What happens to the length of the shadow when you change the height of the puppet?

How does the type of sugar affect the time it takes the sugar to dissolve?

What happens to the time the sugar takes to dissolve when you change the volume of water?

Fair Test Scramble

Labels



Enlarge to A3 and cut up to put around classroom.

Change

Measure

Keep the same

Keeping Coffee Warm

Ahmed, Alison and Alex were trying to find out which material would be the best to stop the teacher's coffee going cold. They had four different materials, cotton, foil, bubble wrap and felt. They wrapped each one round some hot water in plastic cups.



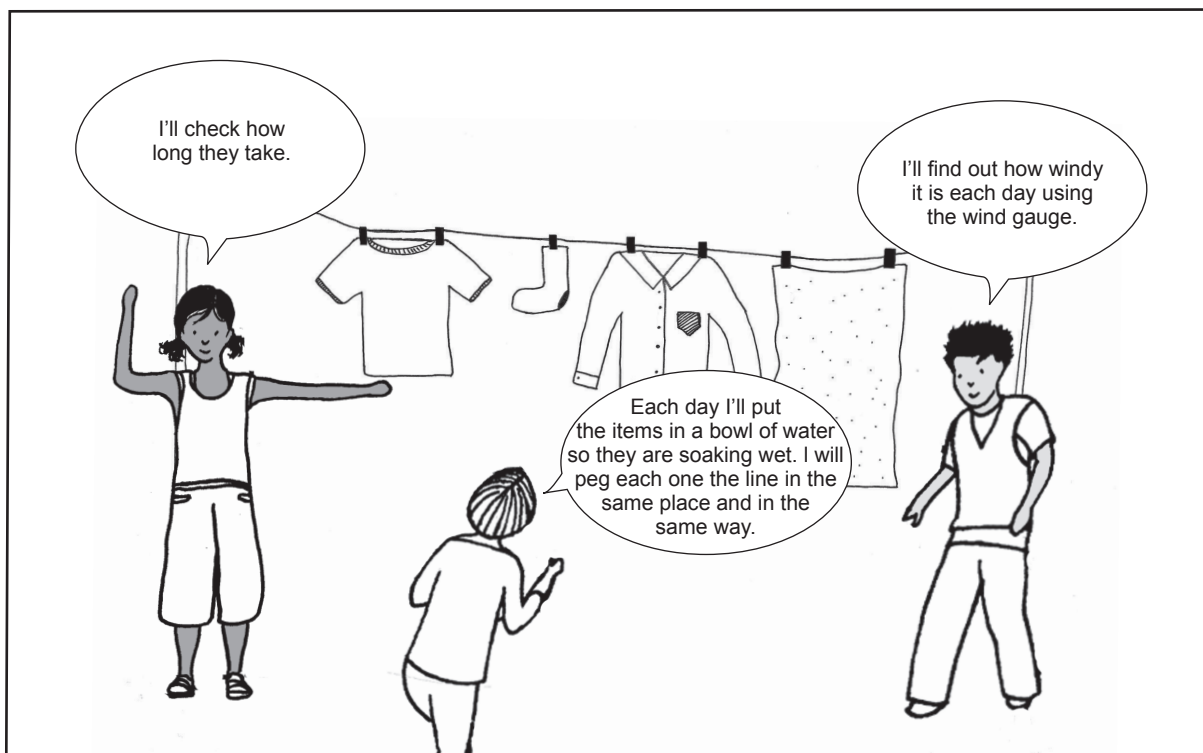
Which factor were they changing?

Which factor were they measuring to get their results?

Which factors were they keeping the same?

Drying Clothes

Samir, Sandi and Sal were trying to find out if clothes dry better when it is windy. They had chosen four different items to dry, a t-shirt, a towel, a shirt and a sock. They planned to put them on a washing line in the playground on four different days.



Which factor is changing?

Which factor were they measuring to get their results?

Which factors were they keeping the same?

Identifying Equipment

What's in the Box?



Equipment List 1



Standard thermometer (0° - 100° C)	Crocodile lead
Timer (clockwork type)	Forcemeter (0 - 10 N)
Tape measure (0 - 100 cm)	Horseshoe magnet
30cm ruler	Bar magnet
Plastic measuring cylinder (250ml)	Sieve
Magnifying glass	Filter paper
Electric bulb (lamp)	Plastic funnel
Battery (cell)	Safety goggles
Battery holder	Electric bulb holder

Equipment List 2



Standard thermometer (0° - 100° C)	Standard thermometer (0° - 40° C)
Stopwatch measuring whole seconds	Stopwatch measuring hundredths of seconds
Tape measure (0 - 100cm)	Tape measure (0 - 10metres)
Measuring cylinder (0 - 100ml)	Measuring cylinder (0 - 250ml)
Measuring cylinder (0 - 1litre)	Stethoscope
Pooter/Bug hunter	Syringe
Forcemeter (0 - 2.5N)	Forcemeter (0 - 10N)
Forcemeter (0 - 50N)	Datalogger - light probe
Calipers	Masses (weights)
Balance	Bathroom scales
Graph paper	Tuning Fork

Repeat Readings

Bull's Eye



Bull's Eye Statements



Here are some reasons why we might repeat readings.

To use scientific equipment

So we can get more evidence

Because the first reading might
not be right

To make the test fair

To check results

So we will get a better idea of the
likely result

Because readings are always a bit
different so we need to do them
more than once

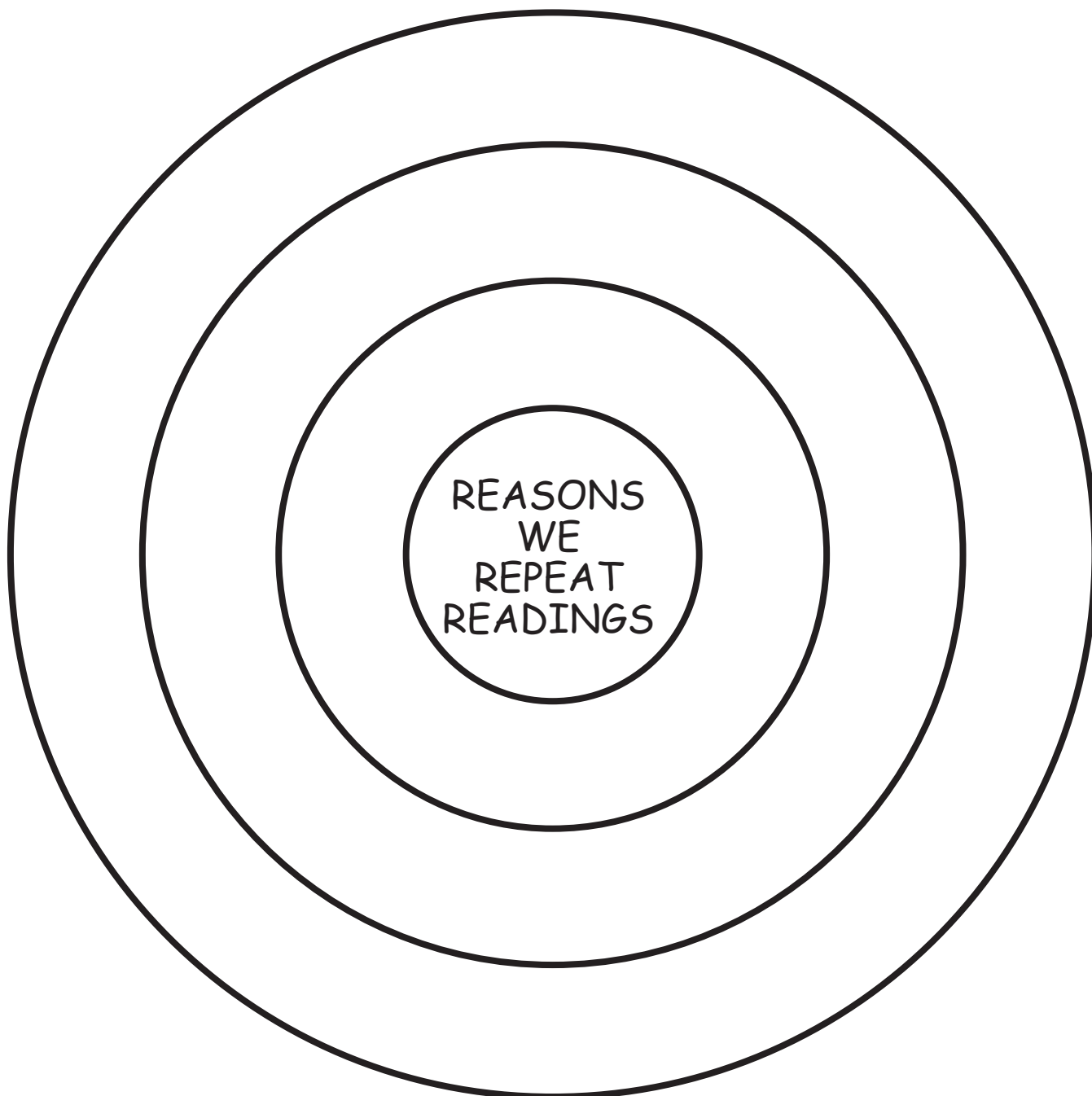
Because things change a little bit
so we need to take an average

So we can change the equipment



REASONS WE REPEAT READINGS

Bull's Eye



Breaking Threads

Some children are investigating the force needed to break different threads. They loop one end of each thread round the hook on a forcemeter and pull gently until the thread snaps. They record the number of Newtons (N) at the point when the thread breaks and repeat the procedure 4 times with each thread.



Here is the record of their results

Type of Thread	Force to break the thread (N)				
	1st go	2nd go	3rd go	4th go	Most Likely Result
Grey Plain Wool	6	7	6	6	6
Red Nylon	9	7	8	8	8
Blue Cotton	8	10	12	10	10
Yellow Fluffy Wool	5	5	5	6	5



Why do you think they did not get the same number of Newtons each time they tested the threads?



How did repeating the tests help them?



How did they decide which was the most likely result?

Dissolving Artificial Sweeteners

2

Some children are testing how long sweeteners take to dissolve in water at different temperatures. They take the temperature of the water, just before a sweetener is added, using a temperature sensor. They let the sweetener dissolve without stirring.



Here is the record of their results

Temp of water $^{\circ}\text{C}$	Time for sweetener to dissolve (seconds)				
	1st go	2nd go	3rd go	4th go	Most Likely Result
10 $^{\circ}$	22	20	23	22	22
21 $^{\circ}$	16	15	14	14	15
36 $^{\circ}$	13	10	12	12	12
58 $^{\circ}$	7	6	5	6	6



Why do you think they did not get the same temperature each time ?



How did repeating the tests help them?



How did they decide which was the most likely result?

Using Tables

Table Talk



Table Talk

Blank Table



Five species of animal live on planet Xena. You have a blank results table and a conclusion. You will get numbers to put on the table.

As soon as you have enough evidence to be sure that the conclusion that you have been given is right, call out

Results
support the
conclusion.

As soon as you have enough evidence to be sure that your conclusion is wrong, call out.....

Results
do not support
the conclusion.

Name	Number of legs	Number of antennae	Number of eyes	Number of wings
Squag				
Thrub				
Corby				
Drobbie				
Whoosh				

Conclusion Cards



Cut up and give one to each pair of children.

Easier

The Whoosh has more eyes than any other animal.

A Squag has fewer legs than a Corby.

There are more antennae on Whooshes than on Squags.

Thrubs have the same number of legs as one other animal.

Corbys have the least number of wings.

Squags have fewer wings
than a Whoosh.

Thrubs and Drobbles have the
same number of antennae.

Whooshes have more wings
than Drobbles.

Corbys have more legs
than Thrubs.

Drobbles have the same number of
eyes as one other animal.

Squags have as many eyes
as Drobbles.

Conclusion Cards

Harder



Drobbles and Whooshes have more wings between them than Thrubs and Squags.

The Thrub has more antennae than a Drobble but fewer antennae than a Corby.

Thrubs and Whooshes have more legs between them than Drobbles and Corbys.

The number of wings on a Drobble is less than the number of eyes on a Whoosh.

Whooshes have more antennae than a Drobble and fewer legs than a Thrub.

Conclusion Cards

Extension



The following sentences could be given out and used to promote discussion. None of them can be supported or refuted by the evidence for the reasons given.

The Corby is the fastest flier.

(evidence only about the number of wings not how fast)

Whooshes run slower than any other animal.

(evidence only about the number of legs not how fast)

Drobbles can not see as far as Squags.

(evidence only about the number of eyes not how far they can see)

Thrubs are better at sensing things than Squags.

(evidence only about the number of antennae not how good they are at sensing)

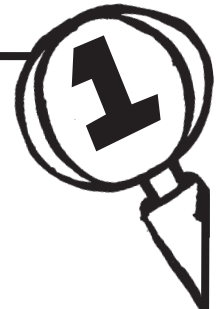
Incomplete Statements



Cut up, fold and place in container

The Squag has legs	The Thrub has eyes
The Squag has antennae	The Thrub has wings
The Squag has eyes	The Corby has legs
The Squag has wings	The Corby has antennae
The Thrub has legs	The Corby has eyes

The Drobbles has legs	The Whoosh has eyes
The Drobbles has antennae	The Whoosh has wings
The Drobbles has eyes	The Whoosh has antennae
The Drobbles has wings	The Whoosh has legs
The Corby has wings	The Throb has antennae



Properties of Materials

Some children are testing some different objects to see what they do. First they decide what material each object is made from. Then they test the material. They do four different tests. Here is their table.

Object	What material it is made from?	Test 1 Is it magnetic? Does it get pulled towards a magnet?	Test 2 Is it flexible? Does it bend?	Test 3 Is it transparent? Does it let light through?	Test 4 Is it a good electrical conductor? Does the bulb light when you put it in a circuit?
Spoon	Wood	No	No	No	No
Fork	Steel	Yes	No	No	Yes
Cooking foil	Aluminium	No	Yes	No	Yes
Key	Brass	No	No	No	Yes
Food wrap	Plastic	No	Yes	Yes	No
Towel	Cotton	No	Yes	No	No

Here are some conclusions that the children made. Do the results in the table support their conclusions? Tick ONE box on each row.

Conclusion	Results support conclusion	Results do not support conclusion
All metal things are attracted to magnets.		
Some plastic things let light through.		
All the metals we tested were good electrical conductors.		
None of the bendy things conducted electricity.		

Hardness of Rocks

Some children wanted to know how hard five different rocks were. They scratched each rock with four different objects. Sometimes the object scratched the rock. Sometimes the objects did not leave a mark on the rock.

Here is their table of results.

Rock	Was scratched by ...			
	plastic fork	matchstick	metal key	fingernail
Granite	X	X	X	X
Sandstone	✓	X	✓	X
Chalk	✓	✓	✓	X
Clay	✓	✓	✓	✓
Slate	X	X	✓	X

Here are some conclusions that the children made. Do the results in the table support their conclusions? Tick ONE box on each row.

Conclusion	Results support conclusion	Results do not support conclusion
The clay was soft. It was scratched by all our objects.		
The sandstone was harder than the chalk.		
The granite was not as hard as the slate.		
The order of hardness for our five rocks, going from hardest to softest, is granite, slate, sandstone, chalk, clay.		

Drawing Conclusions

Thumbs Up
Thumbs Down

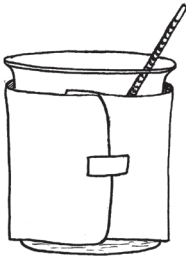
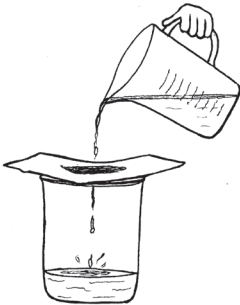


Thumbs Up Thumbs Down

Table of Results



Some children tested materials. They did three different tests on the same four materials.

Test 1 Insulation Test The children wrapped different fabrics round beakers of hot water and saw how warm they kept the water. 	Test 2 Waterproof Test The children poured the same amount of water on the fabrics and saw how much water dripped through. 	Test 3 Strength Test The children rubbed the fabrics with the same stone and saw how many times they had to rub each fabric before a hole appeared. 
---	---	---

Here is their table of results.

Type of fabric	Test 1 INSULATION TEST Temperature of water after 10 mins in degrees C	Test 2 WATERPROOF TEST How much water dripped through in 1 minute in ml	Test 3 STRENGTH TEST How many rubs before hole appears
Cotton	41	9	18
Wool	45	12	12
Denim	43	5	28
Nylon	39	6	4

Thumbs Up Thumbs Down

Statement Cards



Out of the four materials we tested, nylon was the worst insulator.

Wool is the best at keeping things warm. It is better than any other material.

Wool did best in the waterproof test.

Denim keeps you dry.

We did the rub test on four materials and the strongest was denim.

If you wear this type of wool in the rain you would get wetter than if you wear this type of cotton.

The cotton wasn't as strong as the wool in the rub test.

Denim will always be stronger than nylon.

If you want to choose a material to help you keep warm and dry the one to go for is denim. No other material is as good.

Thumbs Up Thumbs Down

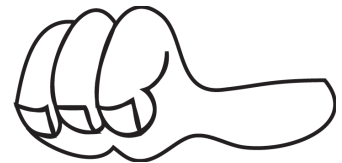
Labels



**Supported by
the evidence**



**Partially
supported by
the evidence**



**Not
supported by
the evidence**





Germinating Seeds

Some children wanted to find out what helped grass seeds to germinate. They got 4 dishes and put some damp kitchen paper in each one. They put 20 grass seeds in each dish. They left the dishes in different places and made sure the kitchen paper was always damp.

They counted the number of seeds that had germinated and kept a record on a table. This is what they found out.



Place	Temperature of place	Number of germinated seeds			
		Day 1	Day 4	Day 7	Day 10
fridge	cold	0	0	0	0
dark shed	cool	0	6	9	12
cupboard	warm	0	14	19	20

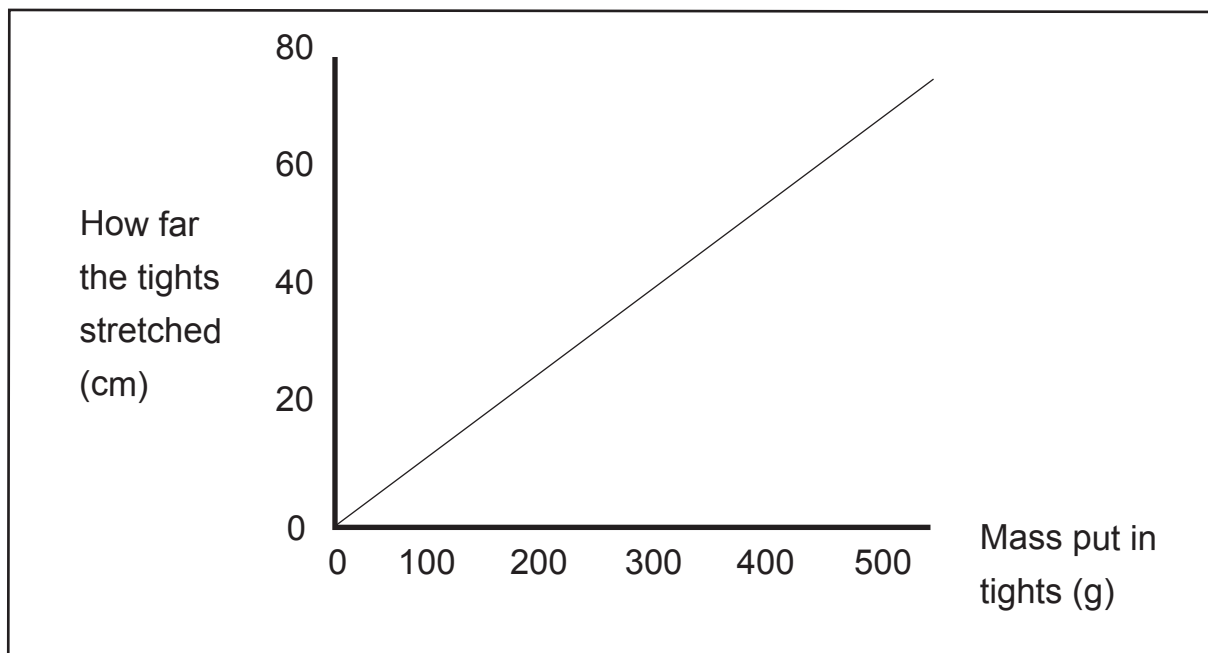
Look at the things that they said after their experiment. Do you think they are supported by the evidence, partially supported by the evidence or not supported by the evidence? Tick one box after each sentence.

Observations	Supported by the evidence	Partially supported by the evidence	Not supported by the evidence
The cupboard was the place where the seeds germinated quickest.			
It doesn't matter how long you leave seeds in a fridge, they will never germinate.			
It looks as if warm places are better for germinating seeds than cold places.			
All the seeds germinated in the warm cupboard.			
The dark shed was better for germinating seeds than the cupboard.			

Stretching Tights

Some children wanted to find out how much a thick pair of woollen tights would stretch when you put different masses (weights) in them.

They put their results on a graph.



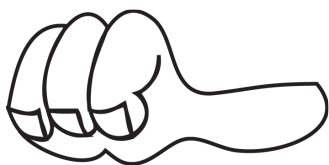
Look at the things they said after their experiment. Do you think they are supported by the evidence, partially supported by the evidence or not supported by the evidence? Tick one box after each sentence.

Observations	Supported by the evidence	Partially supported by the evidence	Not supported by the evidence
The more mass we put in the tights the more they stretched.			
If we add another mass of 100g the tights will stretch 15cm.			
Thin tights stretch more than thick tights.			

Supported by
evidence



Partially supported by
evidence



Not supported by
evidence



Vocabulary

Vocabulary Splat



Splat

Description Cards



A line that goes along the bottom or up the side of a line graph or bar chart.

You can record the results of your investigation in one of these. It has words and numbers written in rows and columns.

Rashid said 'I looked at the woodlouse. I saw it had lots of segments and a dark stripe down its back.' He was making ...

When you say what you found out in an investigation you will be making your ...

You can record the results of your investigation on one of these. It has words on one axis and numbers on the other.

Tools you use to help you carry out your investigation.

Talking about how you will carry out your investigation is making a ...

You can record the results of your investigation on one of these. It has numbers on both axes.

You use equipment to get these. They are written in numbers and units.

You are doing one of these when you collect information or evidence to help you answer a scientific question.

Changing one factor and keeping all others the same is a ...

Saying why you think something happened is suggesting an ...

Jenny said 'I think the hotter water will make the sugar dissolve faster'. She was making a ...

You get this when you get results from your investigation.

Things that you change, measure or keep the same when you are doing an investigation are ...

Splat

Word List



Words we use when we are investigating

Axis
Table
Observations
Conclusion
Bar chart
Equipment
Plan
Line Graph
Measurements
Investigation
Fair Test
Explanation
Prediction
Evidence
Factors

Splat Bingo Card 1

Axis	Table	Measurements
Investigations	Observations	Fair Test
Conclusion	Explanation	Bar Chart

Splat Bingo Card 2

Prediction	Equipment	Evidence
Plan	Factors	Line Graph
Axis	Measurements	Table

Splat Bingo Card 3

Investigations	Observations	Fair test
Plan	Evidence	Conclusion
Factors	Line graph	Axis

Splat Bingo Card 4

Measurements	Table	Investigation
Plan	Factors	Line Graph
Prediction	Equipment	Bar Chart

Splat Bingo Card 5

Equipment	Evidence	Plan
Fair test	Conclusion	Explanation
Factors	Prediction	Axis

Splat Bingo Card 6

Evidence	Plan	Measurements
Table	Fair test	Conclusion
Factors	Equipment	Observations

Conclusion

Bar Chart

Equipment

Axis

Table

Observation

Plan

Line Graph

Measurements

Investigation

Explanation

Prediction

Fair Test

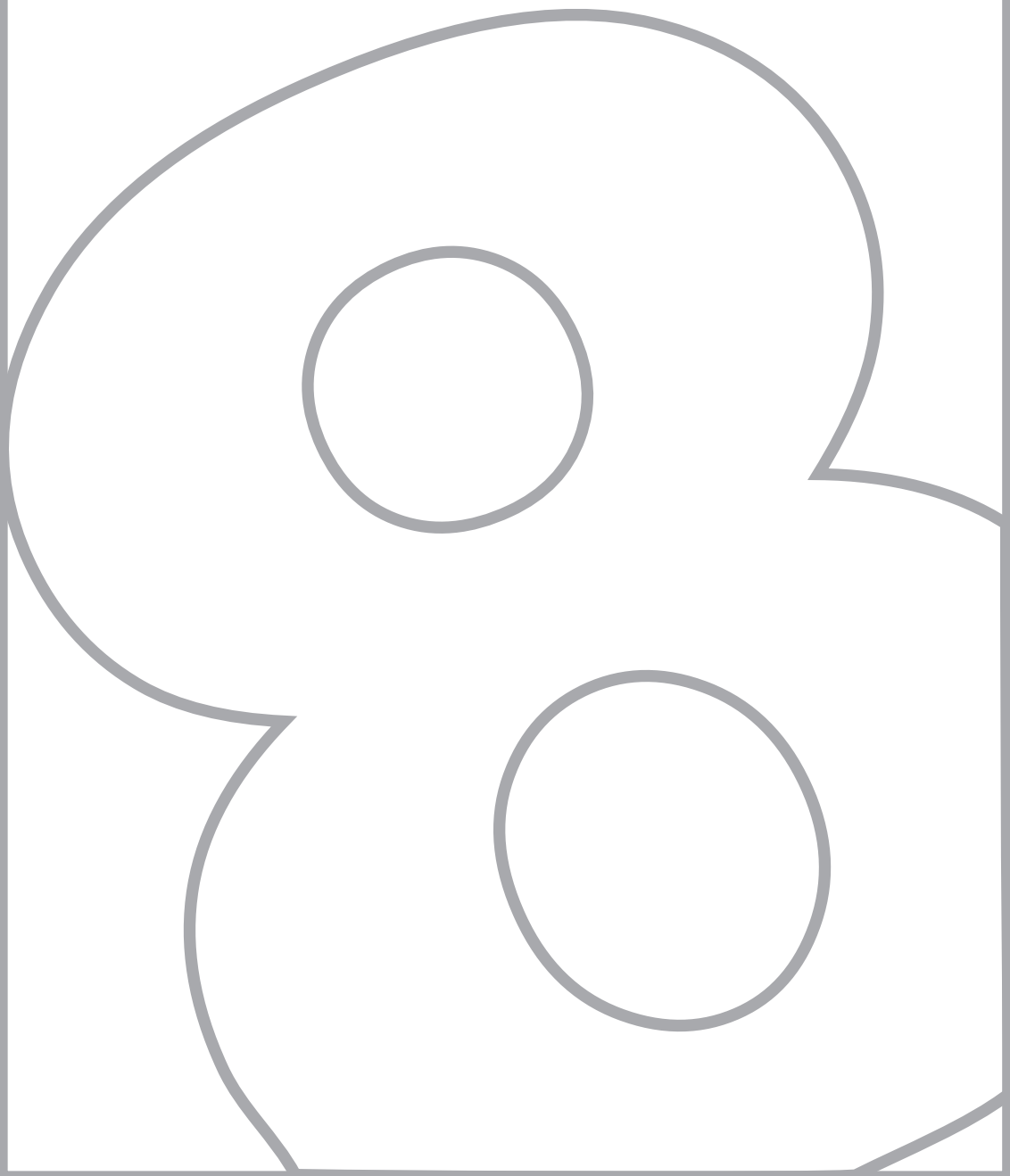
Evidence

Factors

Description	Word
A line that goes along the bottom or up the side of a line graph or bar chart.	Plan
You can record the results of your investigation in one of these. It has words and numbers written in rows and columns.	Explanation
Rashid said 'I looked at the woodlouse. I saw it had lots of segments and a dark stripe down its back.' He was making ...	Measurements
When you say what you found out in an investigation you will be making your ...	Axis
You can record the results of your investigation on one of these. It has words on one axis and numbers on the other.	Bar chart
Tools you use to help you carry out your investigation.	Table
Talking about how you will carry out your investigation is making a ...	Equipment
You can record the results of your investigation on one of these. It has numbers on both axes.	Observations
You use equipment to get these. They are written in numbers and units.	Fair Test
You are doing one of these when you collect information or evidence to help you answer a scientific question.	Line Graph
Changing one factor and keeping all others the same is a ...	Conclusion
Saying why you think something happened is suggesting an ...	Investigation
Jenny said 'I think the hotter water will make the sugar dissolve faster'. She was making a ...	Prediction
You get this when you get results from your investigation.	Evidence
Things that you change, measure or keep the same when you are doing an investigation are ...	Factors

Evaluating

Blooper



Growing Potatoes



We want to grow potatoes in our school garden. We did an investigation to find out what helps them to grow well. We wanted to use 60 potatoes for our test but only had 50, so we decided to cut 10 of the bigger potatoes in half. Now we had 60 potatoes for our test!

We dug three trenches to plant the potatoes:

- The first trench was 10 cms deep
- The next trench was 20 cms deep
- The last trench was 30 cms deep

We put potatoes in each trench:

- We put in 10 potatoes in the first trench
- We put in 20 potatoes in the next trench
- We put in 30 potatoes in the last trench

We thought that fertiliser might make a difference:

- We added a bit of fertiliser to the first trench
- We added a bit more to the next trench
- We added a lot to the last trench

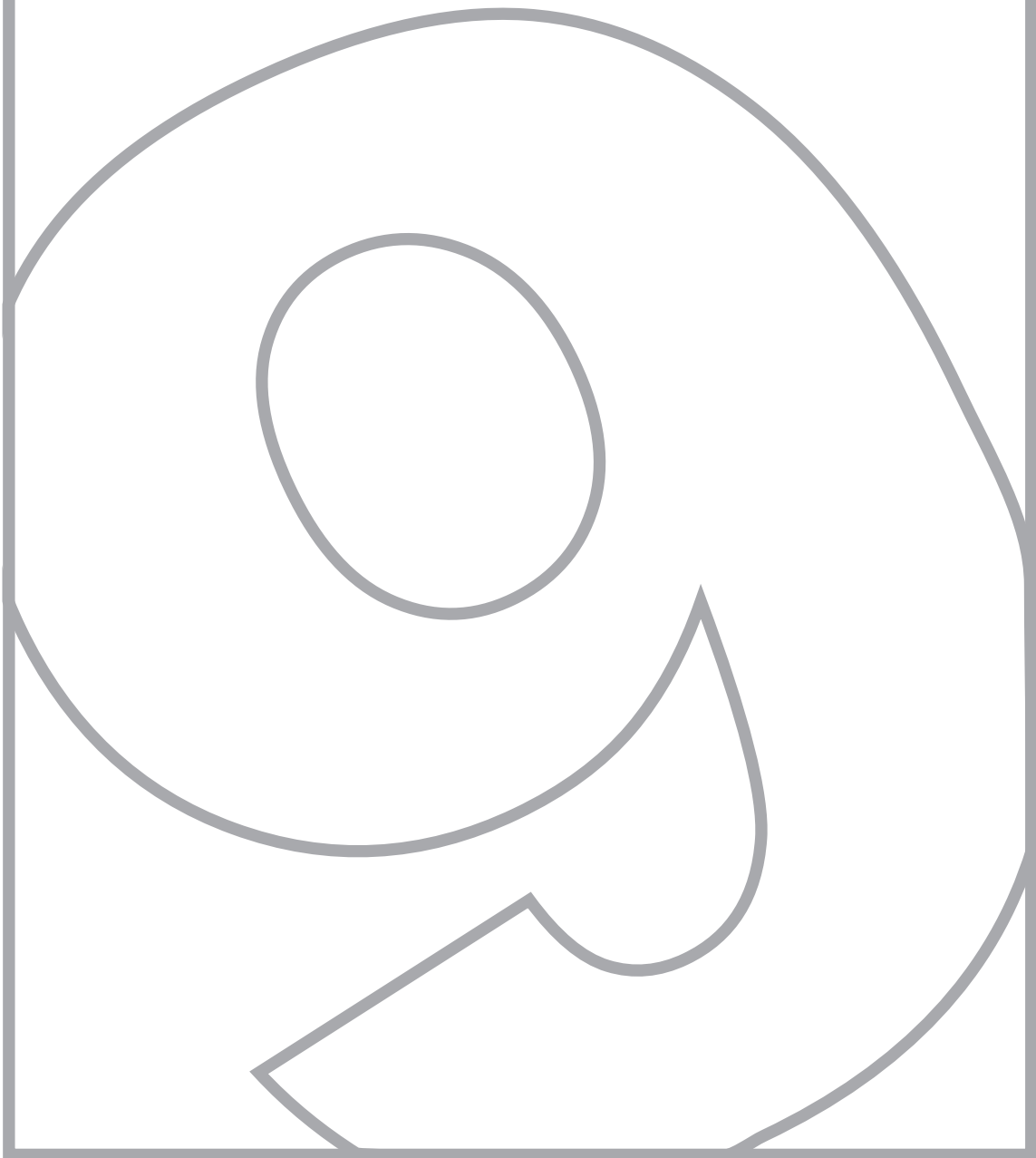
It took several weeks before the potatoes grew. We gave all the potatoes enough time to grow and then dug them out of the ground.

It was hard work digging up the potatoes in the 30 cms trench, and the potatoes were difficult to find as well, so we left some of them in the ground.

We weighed all the potatoes that we had and put the results in a table. We made sure that we had labelled each axis. The highest column showed the best way to grow potatoes.

Enquiry Overview

Sort It



Sort It

True False Statements



Discuss these statements and decide whether they are true, false or it depends.

When you have finished talk to other people and see what they think.

STATEMENTS	TRUE	FALSE	IT DEPENDS
When you investigate you always have to do a fair test.			
There is only one way of finding out the answer to scientific questions.			
If you are observing something you are carrying out a scientific enquiry.			
Planning makes sure you get the right answer.			
You will not find out the answer to a question unless you do a plan.			
Planning can help you to decide the best way to do something.			
It is usually best to explore your ideas first to find out what questions you want to answer.			
Some questions cannot be answered by doing practical activity.			
If you do not do a practical activity then it is not a scientific enquiry.			
You should always put your results on a graph.			
Tables and graphs help you to understand your results.			
It is only a scientific enquiry if you use measuring equipment.			
You have to repeat measurements for a test to be fair.			
In a fair test you only change one thing at a time.			
In a fair test you only keep one thing the same.			

Sort It Labels



Enlarge to A3

True

False

It depends