7K1 Using forces

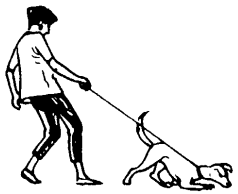
Extra Help

Name _____ Class _____

- All the people in the pictures are using **forces**. The words in the box describe the forces they are using. Use these words to fill in the spaces and complete the sentences. You can use a word more than once.

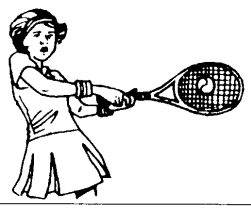
kicks	twists	pushes	pulls	hits	squeezes

The man p _ _ _ _ _ _ the wheelchair. This makes it move.

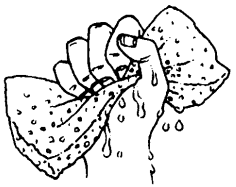


The girl p _ _ _ _ _ on the dog's lead. This slows the dog down.

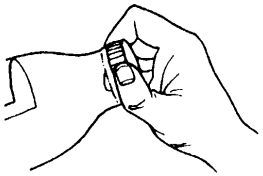
The boy k _ _ _ _ _ the ball. The ball moves towards the goal.



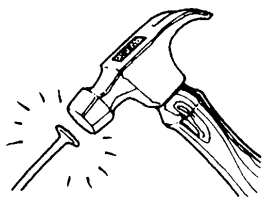
The girl h _ _ _ _ the ball. The ball changes direction and travels back to the other player.



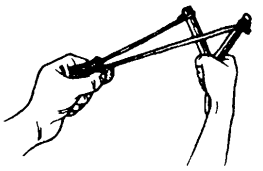
The boy s _ _ _ _ _ _ _ _ _ the sponge. This changes the size and shape of the sponge.



The girl t _ _ _ _ _ _ the top. The top turns and the bottle opens.



The hammer h _ _ _ _ the nail. The nail moves into the wood.



The boy p _ _ _ _ _ back on the rubber band. This stretches the rubber band.

7K1

Presenting and interpreting data

Sc1 Skill Sheet 21

Name _____ **Class** _____

This is a table of results for a finger-strength investigation done by a group of 11 and 12 year old pupils.

Name	*Boy or Girl*	*Thumb length (cm)*	*Finger–thumb squeeze (N)*
James	B	6.5	80
Jane	G	4.5	75
Roheen	G	4.8	110
Peter	B	5.8	115
John	B	5.8	95
Katy	G	5.6	110
Claire	G	5.9	65
Mark	B	5.2	130
Laura	G	5.4	95
Lee	B	4.9	100
Hannah	G	5.4	135
Wasif	B	4.8	125
Tracy	G	4.9	70
Tammy	G	5.5	80
Sam	B	5.5	115
Ross	B	6.3	100
Cassie	G	5.7	55
Winston	B	5.3	75
Stephanie	G	5.9	120
Farzana	G	5.6	80
Ryan	B	5.4	85

1 What are the three variables for the class shown in the table?

_____

2 What relationship do you predict that there would be between thumb length and the finger–thumb squeeze force?

_____

3 Do you predict that the finger–thumb squeeze force would be affected by whether a pupil is a boy or a girl? If you do, how do you think it would be affected?

_____

4 Now plot the results from the table above on a suitable scatter-graph.
Does the graph support your predictions made in questions **2** and **3**?
Explain your reasoning.

_____

_____

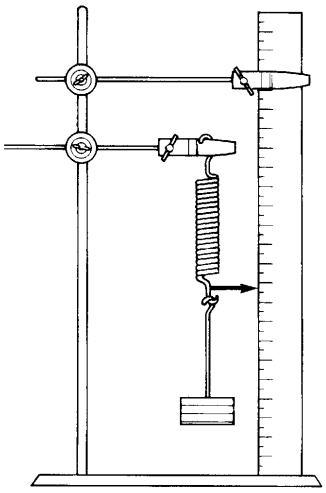
_____

7K3 Stretching springs

Help Sheet

Think about:

- After making your spring you can test it. The diagram will give you some ideas:



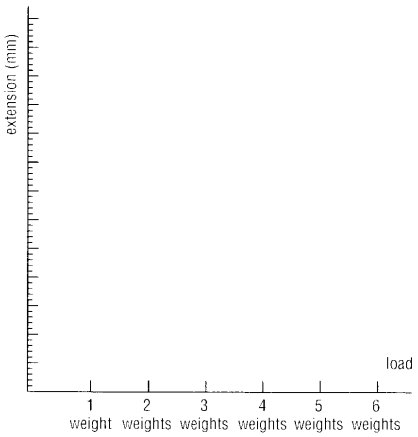
You could:

- Fix a pointer at the bottom of the spring, with a ruler next to it:
- It is easier if you have several ***equal*** weights.
- Begin by reading the start position of the pointer on the scale. Write it down.
  Add one weight to your spring. Use the pointer to measure how much longer the spring has got.
  This is called the **extension**.
- You can record your results in a table like this:

Load (equal weights)	*Extension of spring (mm)*
1 weight	
2 weights	
3 weights	
4 weights	
5 weights	
6 weights	

⚠ eye protection

- Each time you add another weight, measure the extension of the spring. Make sure you always measure from the original start position of the pointer.
- Continue adding weights until your spring loses its shape.
- Then plot a graph of your results (on graph paper), starting like this:



- What do you notice about your graph?
  Write down what you think it means.
- If you have time, repeat your investigation with
  - copper wire which is thicker or thinner,
  - iron wire or nichrome wire of the same thickness as the copper wire.

  In each case, try to predict what you will find.
- Write a report of what you did and what you found out.

7K3

Stretching springs – results

Extra Help

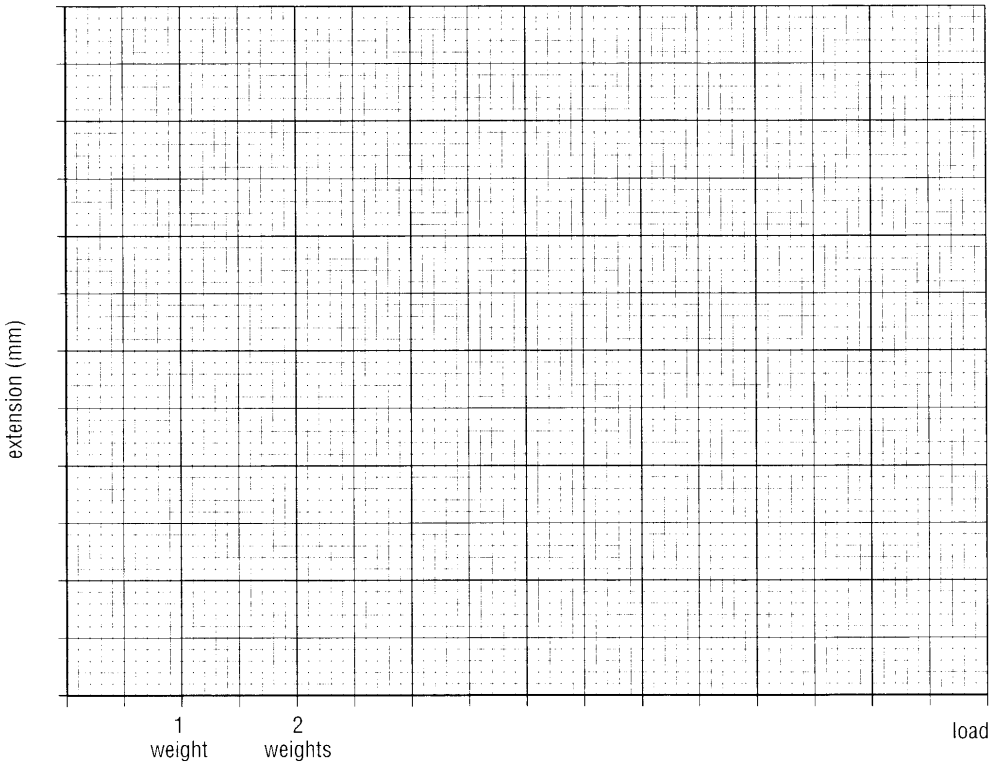
Name _____ **Class** _____

- Record your results in the table:

Load (equal weights)	*Extension of spring (mm)*
1 weight	
2 weights	
3 weights	
4 weights	
5 weights	
6 weights	

- Plot a graph of your results below.
  Don't forget to number the axes and give your graph a title.

A graph to show _____



7K3 Lines of best fit

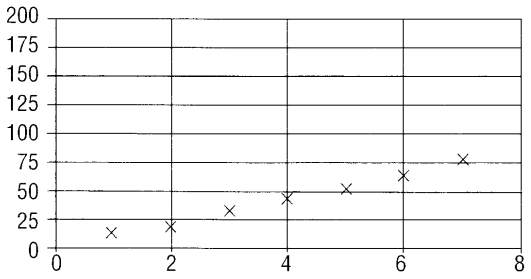
Sc1 Skill Sheet 22

Name _____ **Class** _____

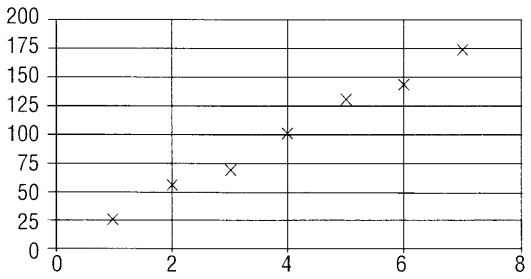
Rachel used a spreadsheet to plot the graphs for 3 different springs.

1 Complete each graph using a line of 'best fit'.

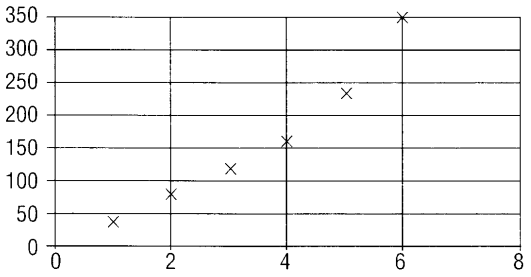
Thick steel spring	
Weight (N)	*Extension (mm)*
1	12
2	21
3	30
4	47
5	52
6	66
7	77



Thin steel spring	
Weight (N)	*Extension (mm)*
1	25
2	55
3	70
4	100
5	128
6	146
7	174



Copper spring	
Weight (N)	*Extension (mm)*
1	38
2	82
3	120
4	161
5	232
6	350
(7)	(600)



2 Which of these 3 springs stretches most easily? _____

3 What pattern do you notice between the extension and weight added to each of the springs? _____

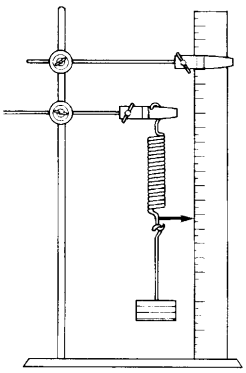
4 Is there something unusual about the copper spring? _____

5 What weight would be needed to produce an extension of 100 mm for the copper spring? _____

7K3 Stretching springs

HOMEWORK SHEET
Looking for patterns

Leanne hung a steel spring from a clamp and stand.
Then she added slotted masses, one at a time.
She used a ruler to measure the length of the spring each time.
Then she began to work out how much the spring was stretching (its extension).



⚠ eye protection

Leanne's results:

Force (in newtons)	*Length (in cm)*	*Extension (in cm)*
0	11	0
2	15	4
4	19	8
6	23	12
8	27	
10	33	
12	47	

Use the information in the table above to:

1 Work out the last 3 extensions.

2 Draw the axes for a graph with force along the bottom, and extension up the side (remember to make your scale even and to label the axes).

3 Plot the extension for each force on your graph. Draw the line of best fit.

4 Describe how the spring stretches at first.

5 Describe what happens towards the end of the experiment.

Mark scheme
You will receive 3 marks for correctly answering question 1.
You will receive 2 marks for correctly answering each of questions 2, 3 and 4.
You will receive 1 mark for correctly answering question 5.

Maximum = 10 marks

7K4

Friction

Extra Help

Name _____ **Class** _____

- The sentences on the diagram need completing.
  Finish them off by choosing the correct endings from the box below.

• **so that the tyre does not skid on the road.**
• **because it would slow the wheel down.**
• **so your hands can grip the handle-bars.**
• **so your bottom does not slip off the seat.**
• **because it would be hard to steer the bike.**
• **so that your feet do not slip off the pedals.**

Friction is not wanted here

_____

_____

Friction is wanted here

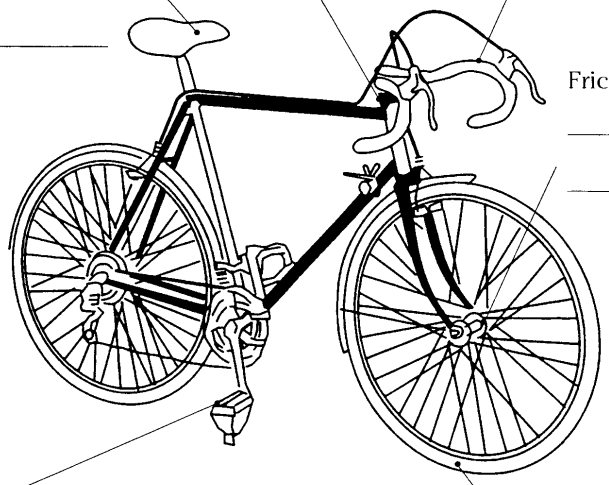
_____

_____

Friction is wanted here

_____

_____



Friction is not wanted here

_____

_____

Friction is wanted here

_____

_____

Friction is wanted here

_____

_____

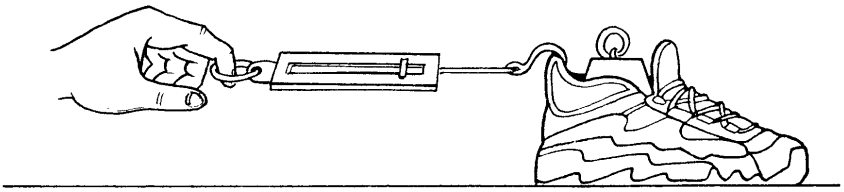
7K4

Presenting results, finding anomalies

Sc1 Skill Sheet 24

Name _____ **Class** _____

A group of pupils did an investigation on the friction of shoes:



Their results are shown in the table:

Shoe sole	*Load in shoe (N)*	*Average friction resistance over 30cm (N)*
plastic	5	2
plastic	10	3
rubber	5	6
rubber	10	8
leather	5	3
leather	10	5
trainer	5	8
trainer	10	7

1 Show the data in the table on a suitable graph.
(*Hint:* which is better in this case, a line-graph or a bar-graph?)

2 Look carefully at your graph:
Write down the anomalous result.
('Anomalous' results do not follow the pattern suggested by the other results.)

_____

3 How could the pupils have made their results more reliable?

_____

_____

4 Which type of shoe sole seems to provide least surface friction?

_____

7K5 Investigating movement

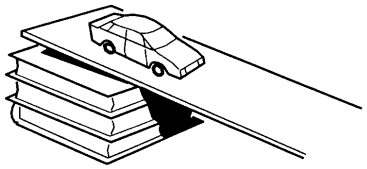
Extension Sheet

1 If you have 2 cars, how can you find out which car has the most friction?

---

2 Investigate how the **time taken** by the car depends on the **weight** of the car.

- How can you change the weight of the car?
- How can you measure the (total) weight of the car?
- Write down your hypothesis before you try it.



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3 Measure the distance between the light gates.
Then calculate the **speed** of your car (at each height of the ramp) by using the formula shown here:

$$\textit{average speed} = \frac{\textit{distance travelled}}{\textit{time taken}}$$

---

4 Suppose you are going to plot a graph of **average speed** of the car against the **height** of the ramp.

a) First, predict the shape of the graph and make a sketch of it.

b) Then use your results (from part **3**) to plot the graph on graph paper.

c) Did you predict the shape of the graph correctly?

---

5 If a computer is available, use a spread-sheet to:

a) do the calculations in part **3**,

b) plot the graph in part **4**b.

7K5

Reliability of results

Sc1 Skill Sheet 25

Name _____ **Class** _____

A A group did an investigation to find out which car rolled best.

Look at the results below and work out the order.

Car	*Distance car rolled (cm)*
blue	50
green	75
red	60
black	80

Order

1. _____ Best
2. _____
3. _____
4. _____ Worst

B The group repeated their tests.
Work out the average and find the order now.

Car	*Distance car rolled (cm)*		*Average*
	1st try	*2nd try*	
blue	50	80	
green	75	75	
red	60	50	
black	80	60	

Order

1. _____ Best
2. _____
3. _____
4. _____ Worst

continued

Reliability of results (continued)

C They did their tests a third time.
Again, work out the averages and find the order.

Car	*Distance car rolled (cm)*			*Average*
	1st try	*2nd try*	*3rd try*	
blue	50	80	car crashed	
green	75	75	75	
red	60	50	55	
black	80	60	75	

Has the order changed? _____

Which car has the most reliable results? _____

Explain why. _____

_____

Which car has the least reliable results? _____

Give two reasons to justify your answer.

1. _____

2. _____

How could you make the results for the car in the last question more reliable?

_____

_____

_____

7K5

Investigating movement

LITERACY SHEET Core

Name _____ **Class** _____

Use the writing frame below to help you plan an investigation to find out how the time taken by a car depends on the height of the runway.
The words in the smaller boxes on the right may help you. You do not have to use them.

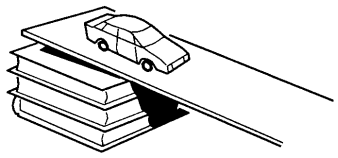
Aim

I am going to see how

Prediction

I think that	**because** **then** **and** **but**

Apparatus



Method

First I will	**next** **then** **finally** **and** **so**

Fair test

I am going to	**keep** **same** **change**

Results

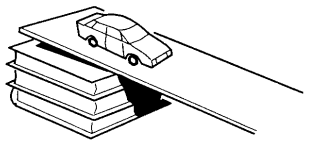
I will record	**time** **distance** **height**

7K5 Investigating movement

HOMEWORK SHEET
Handling data

James and Megan often go roller skating in the park.
There are 2 ramps to use. They are the same length, but one is higher and steeper.
James prefers the higher slope, and Megan prefers the less steep one.
James says that if they both let go at the top of each slope at the same time, he will get to the bottom first.
Megan disagrees. Who do you think is right?

At school they ask their teacher if they can do an experiment to test James's prediction.
They roll a model car one metre down a ramp:
They use light gate sensors to measure the times taken for different heights of the slope.
They tried 7 different heights, and they repeated the time measurement 3 times at each height.



Here are their results. Complete the last column of the table:

Height of car at the start (cm)	*1st trial Time (seconds)*	*2nd trial Time (seconds)*	*3rd trial Time (seconds)*	*Average time (seconds)*
10	1.64	1.62	1.63	
15	1.35	1.37	1.36	
20	1.13	1.12	1.14	
25	0.937	0.938	0.939	
30	0.838	0.834	0.833	
35	0.751	0.750	0.755	
40	0.671	0.672	0.671	

1 Draw a graph of **average time** against **height**. What is the shape of the graph?
2 Does the time to travel down the slope increase or decrease as the ramp is made higher?
3 Was James right?

4 Why does the car move down the ramp?
5 What is the name given to the energy that the car has at the top?
6 Where did this energy come from?
7 What is the name given to the energy it has at the bottom?
8 Where is the energy when the car has stopped?
9 What is the resultant force on the car when it has stopped moving?

10 Can you explain why the time taken to travel should change with the height? Try to use some scientific words in your answer.
11 Which things would James and Megan have tried to keep the same in their experiment?
12 Write a paragraph to evaluate this experiment. How could it be improved?

Mark scheme
You will receive 1 mark each for questions 1–9; 2 marks for question 10; 3 marks each for questions 11 and 12.