Road safety

A group of road safety campaigners want to advise people about what factors affect the distance it takes a car to stop. You are going to use your physics knowledge and skills to help them. You will need to use your Working Scientifically, maths, and literacy skills.

Project overview

There are four parts to this project.

Part 1

You are going to read an article about road safety. You will be given some questions to answer. In pairs or groups, you can then discuss ideas about the science involved. You might want to think about what you have learned about forces. You can work together to think about how to investigate the distance it takes a car to stop. You could also do some research.

Part 2

You are going to plan an investigation. There are some questions to help you. Your answers will be assessed.

You will then carry out your investigation.

Part 3

You will answer some questions about your investigation. Your answers will be assessed.

Part 4

You will summarise what you have done in a Big Write. You will write a newspaper article using what you learned in your investigation.

Part 1

Read the article. Then answer the questions on the next page to show you have understood.

The Activate Herald

Wednesday 4th October, 2013 45p

STOP!

By Michael Michelson

ACTIVATE town council are worried about the increase in road traffic accidents in the winter. Accidents happen when cars cannot stop safely in an emergency. The council have monitored the traffic accidents during the year and noticed that there is a big increase in winter.

Town councillor David Davidson explained the problem.

'Modern cars have lots of safety features to stop you getting injured. They have air bags. The air bags inflate when the car stops suddenly.

This stops the driver or passenger hitting their head on the steering wheel or dashboard.

Cars also have crumple zones at the front so that the car takes longer to stop if it hits something. This means that the passengers are less likely to be hurt.

We are concerned that drivers are not thinking about what happens when the road conditions change. Lots of accidents happen when it is raining. The friction between the road and the car tyres affects the distance that it takes the car to stop. When the road conditions change, the friction changes too.'

Councillor Davidson also explained that there are lots of different factors that affect the distance that it takes a car to stop.

Questions

1 Fill in the gaps in this paragraph.

The force between the car and the road is called _____. This force will slow down the car. Cars have _____ and _____ to make it less likely that people are injured in an accident. The _____ _____ affects the stopping distance.

(4 marks)

2 Suggest **one** reason why road conditions could affect the stopping distance of a car.

_____ (1 mark)

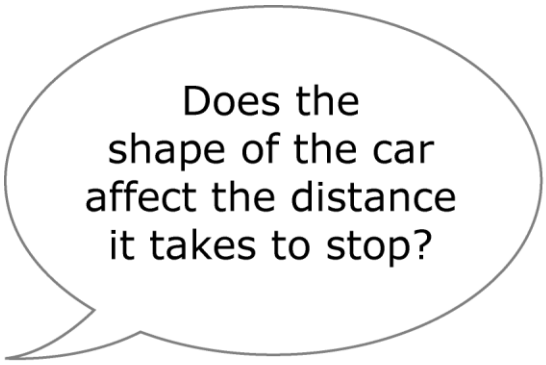
3 Suggest **one** other factor that could affect the stopping distance of a car.

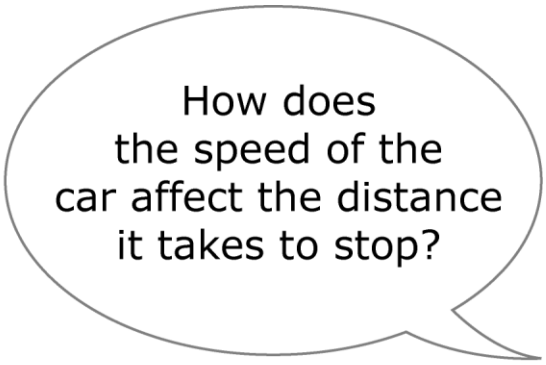
_____ (1 mark)

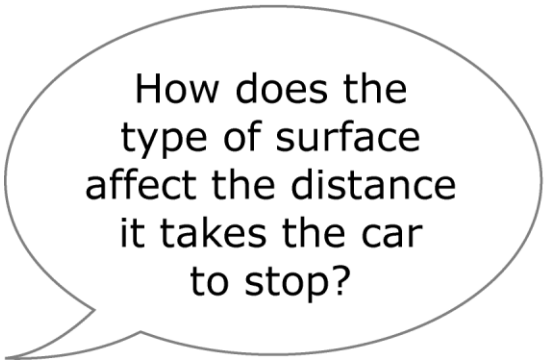
Group discussion

In your groups, discuss the science behind the article. You can use Topic 9.3 in your book to help you.

Here are some ideas for questions that you could investigate:







Discuss which question you would like to investigate. You need to think how you would collect data to answer the question.

Decide who will write some notes about your discussion. Use the sheet on the next page to help you organise your ideas.

(This is not the plan. You will plan this investigation in the next part, part 2.)

Research

You could also do some research to help you to decide on the best type of question or the best way to do the investigation.

Questions and notes	Tick when done
What makes a good question? Which question do we want to investigate?	
How could we collect data? What equipment do we need? What could we do to collect data?	
How can we do the investigation safely?	
What will our investigation tell us about the issues in the article?	

Part 2

In this part you are going to answer some questions to help you plan your investigation.

Questions

1 Write down the question that your group has decided to investigate.

_____ (1 mark)

2 Make a prediction about what you think will happen in your investigation.

_____

_____ (2 marks)

3 In your investigation you will need to change a variable.

a Name the independent variable in this investigation.

_____ (1 mark)

b Name the dependent variable in this investigation.

_____ (1 mark)

4 Describe how you plan to carry out your investigation.

This is a QWC question. You will get marks for:

- organising information clearly
- spelling and grammar
- using good English
- using scientific key words. (6 marks)

Equipment

Safety (risk assessment)

Method

Control variables

5 You will need to record your results in a table.

Draw a table that you can use for your investigation. (2 marks)

6 Answer this question if you did some research.

a Think about your research. Name two sources that you used.

1 _____

2 _____ (2 marks)

b Which one of the sources helped you most with your plan? Circle 1 or 2.

1 2

Explain your answer.

_____

_____ (1 mark)

Part 3

You have now completed your investigation.

In this part you will be **working independently** to:

- answer some questions about your investigation
- answer some questions about a similar investigation.

Questions

1 Name the variables in your investigation.

The independent variable was _____

The dependent variable was _____

One control variables was _____

_____ (3 marks)

2 Look at your results.

a Did you repeat any results? Circle your answer.

Yes No

b Explain why you did or did not repeat your results.

_____

_____

_____ (3 marks)

3 a What was the range of the independent variable? Give the units.

From _____ to _____ units _____ (2 marks)

b Draw a graph of your results. You should use graph paper. (3 marks)

c Look at your graph. Does it show a trend? Circle your answer.

Yes No Not sure

Describe what your results show.

_____

_____

_____ (3 marks)

d Write down your prediction from part 2.

My prediction _____

Do your results support your prediction? Circle your answer.

Yes No Not sure

Explain your answer. You should use examples from your results.

_____

_____

_____ (3 marks)

4 A tyre company has conducted some tests with model cars on different surfaces to see how well their tyres work. Here are their results.

	Stopping distance of model car (cm)		
Surface	**Measurement 1**	**Measurement 2**	**Mean**
sandpaper	45.0	48.0	46.5
ice	80.0	75.0	77.5
wet table	74.0	49.0	61.5

a Write a conclusion based on these results.

_____ (1 mark)

b Suggest an explanation for your conclusion.

_____ (1 mark)

5 Explain how these results link to the article about road safety.

_____

_____ (1 mark)

Part 4

The task

You are going to write a newspaper article. Your newspaper article will be for the Activate Herald. It will tell the story of what you have done.

There are three steps in this task.

1 **Planning:** You should always do some planning before you start a Big Write. Choose all of the information you want to put in your article. You can use the planning grid on the next page.

2 **Big Write:** Now you are ready to write your article. Make sure you look at your plan as you write. You should check what you have written afterwards. You could also ask someone else to read it for you.

3 **Optional group work:** Work in groups to look at some newspaper articles about science. Make a list of the things you think are important for a good article.

Brief from the Editor

Hi,

Thanks for agreeing to write this article for the paper. Please include:

- *a summary of the key points from the original article about concerns over road safety*
- *a description of what you did*
- *any important results you have that will help people understand.*

Remember, people will want to know who was involved and if it affects them. Make sure you explain all the science clearly. Most people reading the article will not be scientists.

Yours sincerely,

Angela Ashby (Editor)

Planning grid for newspaper article

Key points from original article
Who was involved in the investigation?
Summary of method
Important data
Summary of conclusions
Ideas for a headline for the article