Kirkcaldy High School

BGE Science

Sports Science

Speed and Reaction Time

Name:_____

Class:_____

Teacher:_____

Expectations and Outcomes Learner Evaluation

Topic: Speed and Reaction Time

Experience and Outcomes	Date Completed (dd/mm/yy)	Evaluation How happy are you with it? (☺ ? ☹)
I can state the definition of speed		
I can calculate speed using the relationship between speed, distance and time.		
I can explain how to measure the speed of an object		
I can calculate an average.		
I can explain what independent, dependant and constant variables are.		
I can draw a scatter graph with a best fit line.		
I can plot a bar chart.		
I can plan an investigation to measure my own speed.		
I can calculate my own speed at different activities.		
I can calculate distance using the relationship between speed, distance and time.		
I can calculate time using the relationship between speed, distance and time.		
I can measure my reaction time		
I can explain how reaction time can affect performance.		
I can state different factors which affect reaction time.		
I can plan and carry out an investigation to see if distraction affects the success of competing a task.		

Calculating Speed

Starter

1. In which sports is it important to **have** speed (to be fast)?

_____

_____

2. In which sports do you need to measure speed?

_____

_____

Learning Intentions

- To learn the definition of speed.
- To use the relationship between speed, distance and time.

Success Criteria

☐ I can state the definition of speed.

☐ I use the relationship between speed, distance and time.

Tick me at the end if *you can* …

What is Speed?

Speed is a measure of the distance covered by an object in a given time.

If an object is travelling at 10 metres per second (10 m/s), this means that it travels a distance of _____ metres every _____ second.

Measuring Average Speed

It is the qualifying session for the British Grand Prix. Your job is to calculate the average speed of the cars around the track.

Each car completes one lap around the track.

What information would you need to calculate the speed of the formula one car round the track?

_____

_____

Units of Speed

Speed is commonly measured in:

- _____
- _____
- _____

What would the missing unit be?

	Unit of distance	Unit of time	Unit of speed
a	metre (m)	second (s)	
b	kilometre (km)		kilometres per hour (km/h)
c	metre (m)	minute (min)	
d		second (s)	centimetres per second (cm/s)
e	centimetre (cm)		centimetres per minute (cm/min)

In Science we usually use the units **metres per second (m/s).**

Speed Calculations

$$speed = \frac{distance}{time} \qquad v = \frac{d}{t}$$

Speed (v) is measured in metres per second (m/s).
Distance (d) is measured in metres (m).
Time (t) is measured in seconds (s).

Question 1:
A runner travels 100 metres in 20 seconds. Calculate their average speed.

Step 1: Write out the equation (relationship)

Step 2: Substitute in what you know

Step 3: Write the answer with units

Question 2:
A pupil runs 200 metres in 25 seconds. Calculate the speed of the pupil.

Step 1: Write out the equation (relationship)

Step 2: Substitute in what you know

Step 3: Write the answer with units

Question 3:
A car travels a distance of 20 metres in a time of 5 seconds. Calculate the average speed of the car.

Question 4:
A ball travels a distance of 18 m in a time of 4 s. Calculate the average speed of the ball.

Activity:
Answer the problems on the Speed Problem Sheet.
Remember to show all your working.

Activity:
Write your own speed calculation question for someone else to answer.

# Measuring Average Speed

Starter

Describe how you would measure the speed of the bowling ball.

    a. What measurements would you take? _____

    b. What equipment would you need?   _____

    c. What calculation would you do?   _____

Learning Intentions

- To explain how to measure the speed of an object.
- To use the relationship between speed, distance and time.
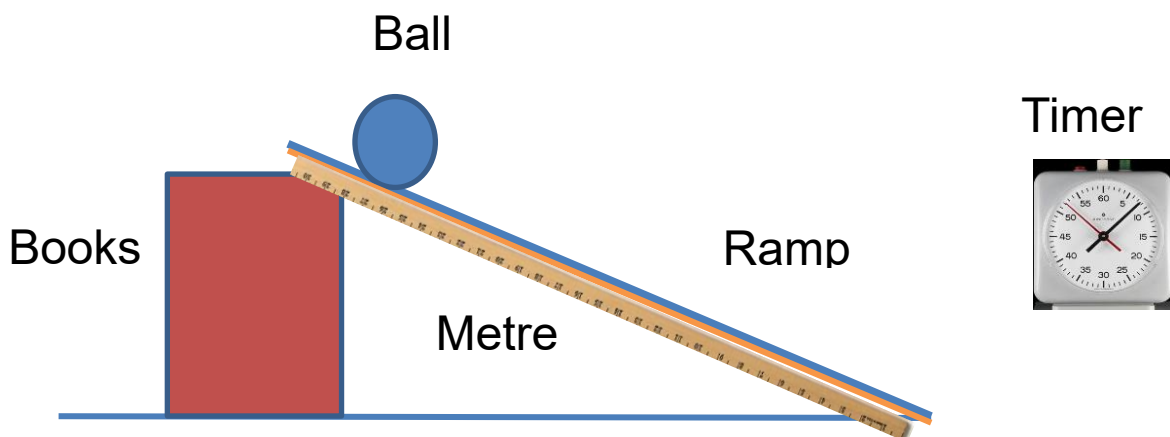- To calculate an average.

Success Criteria

Tick me at the end if *you can* …
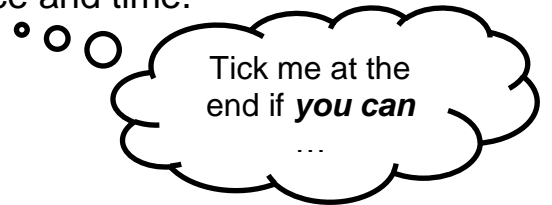
☐ I can explain how to measure the speed of an object.

☐ I use the relationship between speed, distance and time.

☐ I can calculate an average.

- -

Experiment

Aim: To compare the speed of the golf ball and tennis ball travelling down a ramp.

Method:

Ball

Timer

Books

Ramp

Metre

Results:

Distance travelled = _____ m

	Time Down Ramp (s)					
	1st	2nd	3rd	4th	5th	Average
Golf ball						
Tennis ball						

Calculating Speed:

Golf ball   **Tennis ball**

Conclusion:

_____

_____

_____

_____

Evaluation:

_____

_____

_____

Measuring Average Speed 2

Starter

1. Calculate the **average** of the following sets of numbers:

    a. 5, 12, 7   Answer: _____

    b. 6, 9, 15, 9, 11   Answer: _____

    c. 200, 100, 500, 200   Answer: _____

Learning Intentions

- To use the relationship between speed, distance and time.
- To explain what independent, dependant and constant variables are.
- To draw a scatter graph with a best fit line.

Success Criteria

Tick me at the end if *you can* …

☐ I can use the relationship between speed, distance and time.

☐ I can explain what independent, dependant and constant variables are.

☐ I can draw a scatter graph with a best fit line.

➖ ➖ ➖ ➖ ➖ ➖ ➖ ➖ ➖ ➖ ➖ ➖ ➖

Variables

Investigations usually involve variables:

- The _____ variable is changed or controlled to test the effects on the dependent variable.

- The _____ variable is the variable being tested and measured in a scientific experiment.

- The _____ variables are the variables that have to stay the same each time the experiment is conducted to ensure that the experiment is a "fair test".

Experiment

Aim: To investigate how changing the height of the ramp affects the speed of the ball.

Method:
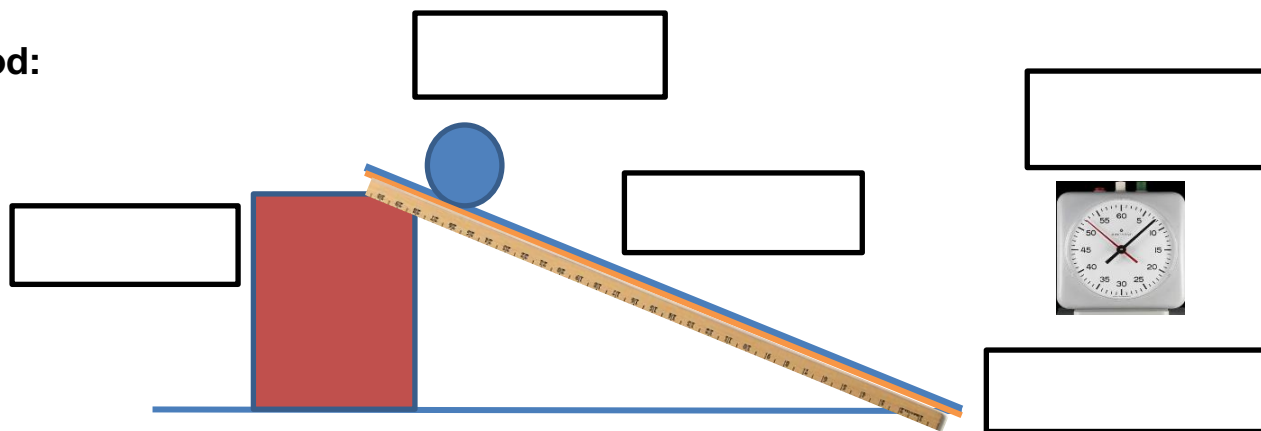
The independent variable you control is _____

The dependent variable you then measure is _____

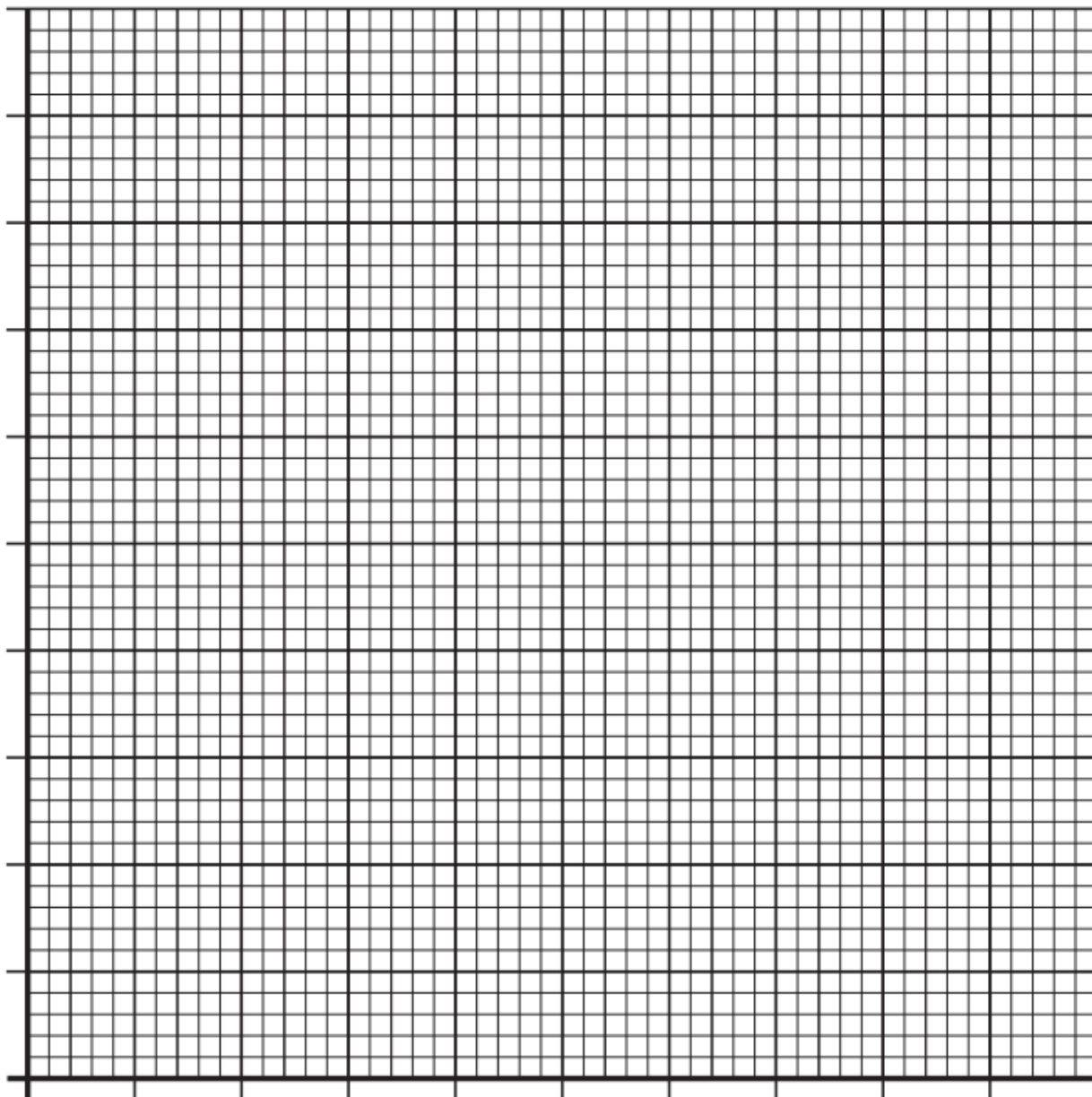The control variables you keep the same are _____

_____

Results:

Height (cm)	Time (s)				Distance (m)	Speed (m/s)
	1	2	3	Average		

Calculate speed using the relationship: $speed = \dfrac{distance}{time}$ ____

Graph:
Plot a scatter graph with best fit line. Speed (y-axis) v Height of Ramp (x-axis)

Conclusion:

_____

_____

Evaluation:

_____

Measuring Average Speed 3

Starter

1. Eve Muirhead's curling stone travelled 36 metres in 12 seconds. Calculate the average speed of the stone.

2. Lizzy Yarnold won gold for Britain in the 2018 winter Olympics. She travelled 1376 m in 51.46 s in her final Skelton run. Calculate her average speed down the run.

Learning Intentions

- To plot a bar chart.
- To use the relationship between speed, distance and time.

Success Criteria

☐ I can plot a bar chart.

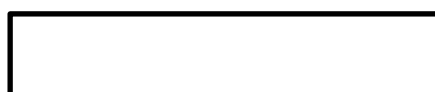☐ I can use the relationship between speed, distance and time.

Tick me at the end if *you can* …

Experiment

Aim: To investigate which wind up toy is the fastest.

Method:

Results:

Type of Toy	Time (s)	Distance (cm)	Speed (cm/s)

Calculate speed using the relationship: $speed = \dfrac{distance}{time}$

Note: Today we will be working in centimetres and seconds

Graph: On next page

Conclusion:
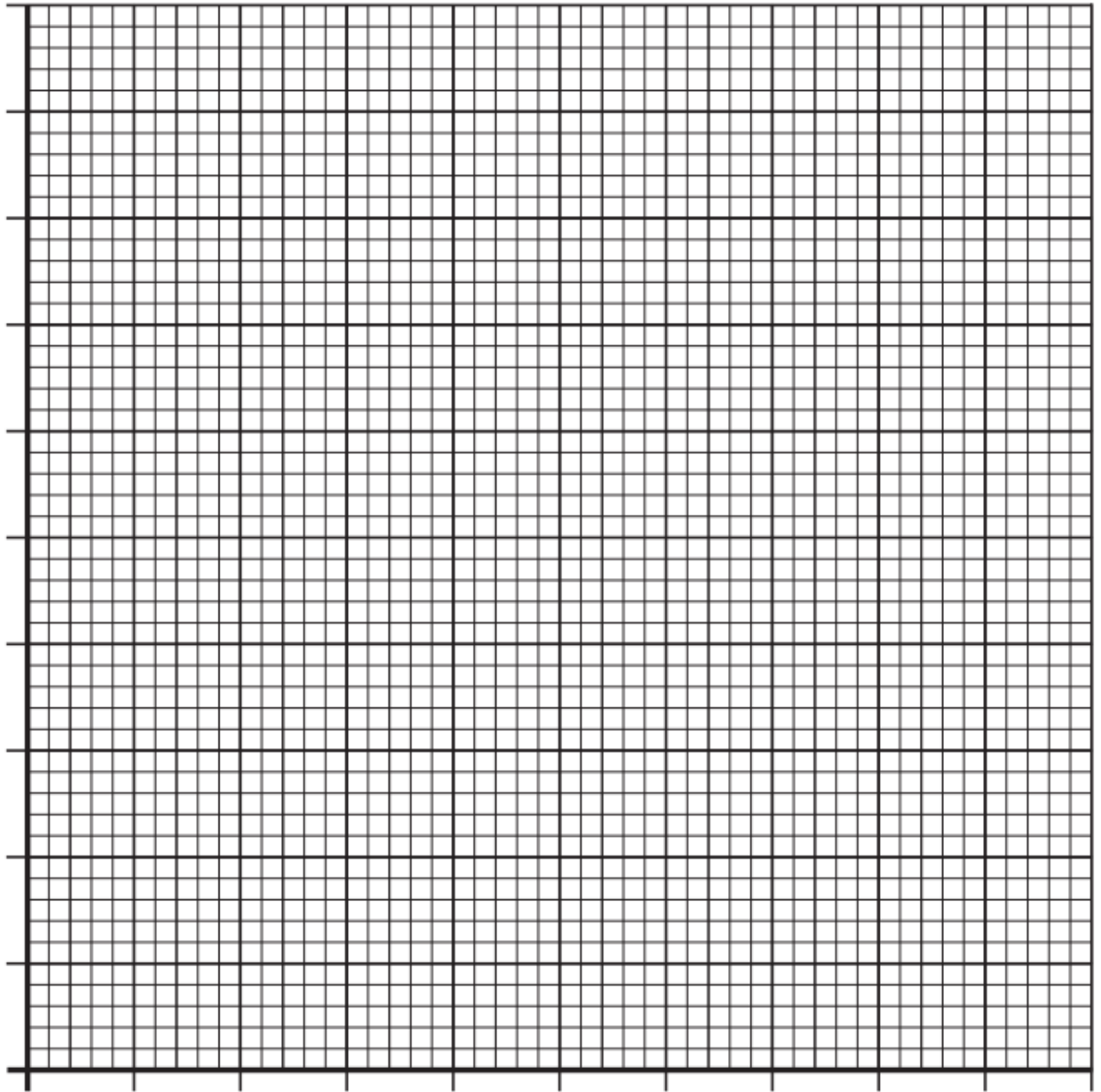
_____

_____

_____

Evaluation:

_____

_____

_____

Extension

From the calculated results of the class predict which toy will win the final race.

Was your prediction correct?

Graph:
Draw a **bar chart** of the speed of the different toys.

Measuring Your Average Speed

Starter

1. What 2 measurement do you need to calculate speed?

_____

2. Explain how you would calculate the speed of a person running 20 metres

_____

_____

Learning Intentions

- To plan an investigation to measure your own speed.
- To calculate your own speed at different activities.

Tick me at the end if *you can* …

Success Criteria

☐ I can plan an investigation to measure my own speed.

☐ I can calculate my own speed performing different activities.

Experiment

Aim: To measure your own speed at different activities.

Method:

_____

_____

_____

_____

_____

_____

_____

Results: Think about what your results table would look like. What information do you need to record? What will the **headings** be? What will the **units** be?
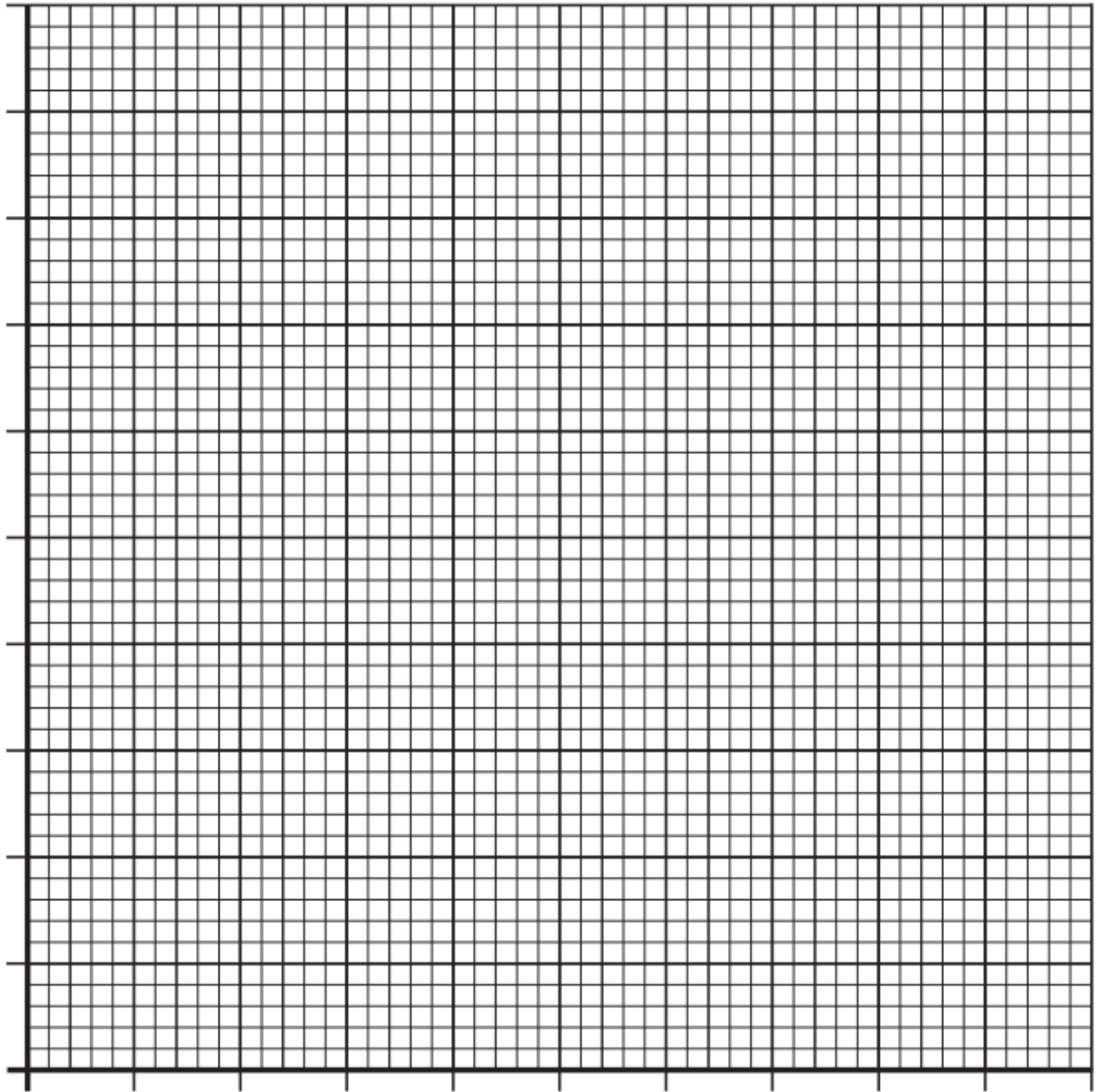

Graph: On next page

Conclusion:

_____

_____

_____

Evaluation:

_____

_____

_____

Graph:
Draw a **bar chart** using your results.

Speed, Distance and Time

Starter

1. How could this pupil improve their answer?

_____

2. Write out your own solution to the question.

Learning Intentions

- To use the relationship between speed, distance and time to calculate distance and time.

Success Criteria

☐ I can use the relationship between speed, distance and time to calculate the distance and time.

Tick me at the end if **you can** …
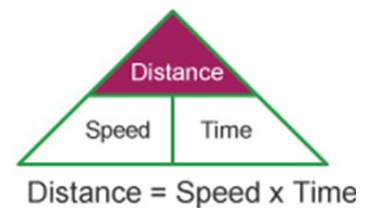
– – – – – – – – – – – – – – – – –

Speed, Distance and Time

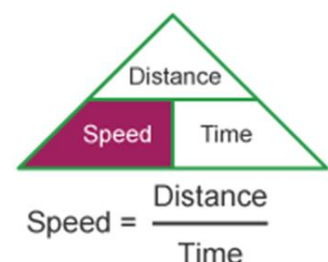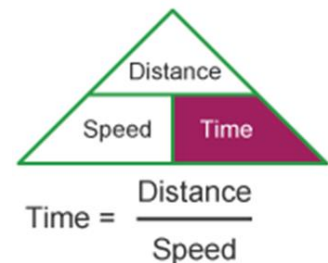We can also use the relationship $speed = \dfrac{distance}{time}$ to find distance and time.

We can **rearrange** or **change the subject** of the formula.

How can we calculate distance?

How can we calculate time?

Distance = Speed x Time

$$Time = \frac{Distance}{Speed}$$

$$Speed = \frac{Distance}{Time}$$

Question 1:
To get to school, a pupil walks a distance of 900 metres at an average speed of 3 m/s. Calculate how long it takes the pupil to walk to school.

Question 2:
Calculate how far a car travels in 300 seconds when it is travelling at a top speed of 30 m/s.

Activity:
Answer the problems on the Speed, Distance and Time Problem Sheet. Remember to show all your working.

Activity:
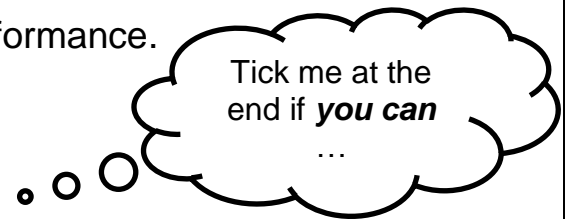Write your own calculation question for someone else to answer.

Reaction Time

Starter

1. Why, in sport, is it important to measure speed accurately?

    _____

    _____

2. In the experiment shown, how could we measure the speed of the ball more accurately?

    _____

    _____

Learning Intentions

- To measure my reaction time.
- To explain how reaction time can affect performance.
- To calculate an average.

Success Criteria

Tick me at the end if *you can* …

☐ I can measure my reaction time.

☐ I can explain how reaction time can affect performance.

☐ I can calculate and average.

- -

Human Reaction Time

It is difficult to measure short times accurately with an ordinary stopwatch because human reaction time affects the measurements.

To overcome this problem _____ _____ are used.

Experiment

Aim:

To investigate who has the quickest reaction time in the class.

Method:

Person 1 holds the ruler just under the 30cm mark and lets it hang vertically.

Person 2 places their thumb and index finger either side of the 0cm mark ready to catch it when it falls - their fingers must not touch the ruler.

Without warning the person 1 lets go and person 2 tries to catch the ruler as soon as possible.

Person 1

Person 2
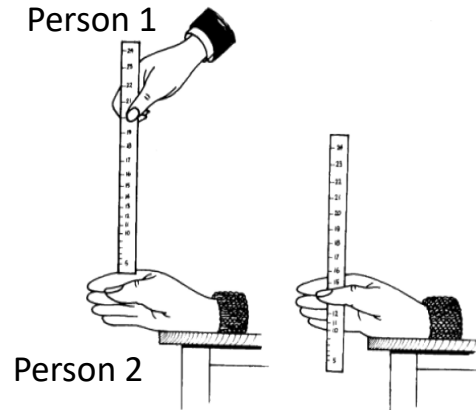
Results:

Attempt Number	Length caught at (cm)	
1		
2		
3		
4		
5		
Average Length		

Reaction time: _____ ms   Rating: _____

Conclusion:

_____

_____

Evaluation:

_____

_____

Conclusion (with distraction):

_____

_____

Reaction Time and Distraction

Starter

1. List 3 sports where the crowd must remain silent while the athletes are competing.

_____

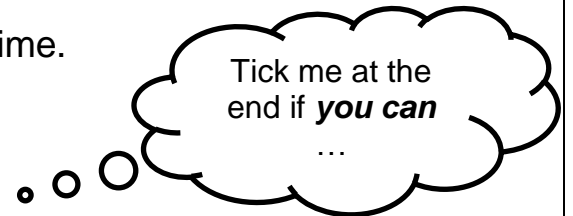2. List 3 sports where the crowd are encouraged to make noise.

_____

3. Explain why the crowd act differently while watching these sports.

_____

_____

Learning Intentions

- To state different factors which affect reaction time.

Tick me at the end if *you can* …

Success Criteria

☐ I can state different factors which affect reaction time.

Class Questions

1. Do people's reaction times improve with practice? Explain why.

_____

2. Do you think there a difference in reaction time between people of different ages? Explain why.

_____

3. What will happen to your reactions if you are tired?

_____

_____

4. Reaction rate can be affected by:

_____

_____

_____

_____

Measure your reaction time with the BBC sheep game.

Distraction and Performance

Starter

    1. Rearrange the following in the correct order:

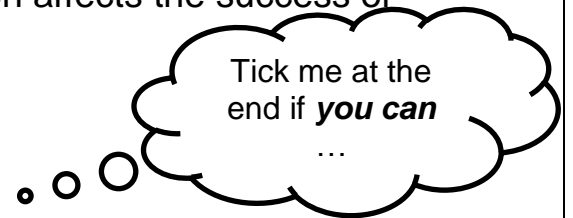   1. Method   _____

        2. Results   _____

        3. Evaluation   _____

        4. Aim   _____

        5. Conclusion   _____

        6. Hypothesis   _____

Learning Intentions

- To carry out an investigation to see if distraction affects the success of competing a task.

Success Criteria

> Tick me at the end if *you can* …

☐ I can plan and carry out an investigation to see if distraction affects the success of competing a task.

▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬

Experiment

Aim: To find out the effect of _____ on _____ at completing a task (e.g. memory).

Hypothesis: I think that **distraction** _____have an effect on success completing a memory task.

Method:

The independent variable you control is _____

_____

The dependent variable you then measure is _____

_____

The control variables you keep the same are _____

_____

_____

Results:

	Number of correct responses
No Distraction	
Distraction	

Class averages:

No distraction = _____

Distraction = _____

Conclusion:

_____

_____

Evaluation:

_____

_____

_____

_____

Extension:

Try the experiment again with a different variable such as words, letters or pictures!

	Number of correct responses
No Distraction	
Distraction	

Word Search

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

metres per second	reaction time	distraction	time
performance	variables	distance	
seconds	average	speed	
metres			

Calculating Averages Numeracy Task

Here's how you can find the average, or mean, of a set of numbers.

Step 1: Find the sum of the numbers.
Step 2: Divide the sum by the number of addends.

Find the average of these numbers: 12, 9, 9, 8, 12
Step 1: 12 + 9 + 9 + 8 + 12 = 50
Step 2: 50 ÷ 5 = 10
The average of the numbers is 10.

1. James has a spinner that has sections labelled 1 to 5. He spins the spinner 10 times. Here are his scores.

    1   4   4   2   3   4   5   1   4   1

    His average score is _____

2. Simone records the number of minutes she spends on her mobile phone over 7 days.

    8   5   1   3   6   24   19   10

    Her average time is _____

3. Here are the ages of 9 children at a birthday party.

    10   12   13   10   11   14   15   10   12

    The average age is _____

4. A football team played six games. Here are the number of goals they scored in each game:

    6   0   3   2   2   5

    The average goal per game is _____

5. Miss Jones gives her class a test. The test is out of 40 marks.

    31   29   20   35   32   38   32

    The average mark is _____

Rounding Numeracy Task

Question 1

   a. Round 3925 to the nearest thousand.   _____

   b. Round 3925 to the nearest hundred.   _____

   c. Round 3925 to the nearest ten.   _____

   d. Round 17.89 to the nearest whole number.   _____

   e. Round the number 7.819 to one decimal place. _____

   f. Round the number 7.819 to two decimal places. _____

Question 2

   a. At a football match between City and Rovers, there were 4486 fans. In the match report, 4486 was rounded to the nearest thousand.
Round 4486 to the nearest thousand.   _____

   b. At the football match 2156 hot drinks were sold. The caters round this number to the nearest hundred.
Round 2156 to the nearest hundred.   _____

   c. During the match, Rovers had 47.47% possession of the ball during the game.
Round 47.47 to the nearest whole number.   _____

   d. There were 833 passes during the football match.
Round 833 to the nearest ten.   _____

Question 3

   a. Write the number 14351 in words.

     _____

   b. Write the number 14351 to the nearest hundred.

     _____

   c. Write the number 1906 in words.

     _____

   d. Write the number twenty thousand, three hundred and twenty nine in figures.

     _____

   e. Write the number 1906 to the nearest ten.

     _____

Question 4

Holly works out the answer to 135.66 + 193.88 on a calculator. Her answer is shown on the calculator.

   a. Holly's answer is   _____

   b. Round her answer to the nearest 10.   _____

   c. Round her answer to the nearest 100.   _____

   d. Round her answer to the nearest integer.   _____

   e. Round her answer to one decimal place.   _____

Question 5

   a. Write 5725 to the nearest 100.   _____

   b. Write 83.07718 correct to two decimal places. _____

   c. Write 6.35 correct to 1 decimal place.   _____

   d. Write 129.34952 correct to 1 decimal place. _____

   e. Write 65.047 correct to 1 decimal place.   _____

Question 6

   a. Write 3856 to the nearest 100.   _____

   b. Write 11.36589 correct to two decimal places. _____

   c. Write 19.31 correct to 1 decimal place.   _____

   d. Write 7.7845168 correct to 1 decimal place. _____

   e. Write 58.359 correct to 1 decimal place.   _____

Additional Graph Paper