



MODULE 5, LESSON 1

Visual Charts

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7 May 2019



Module 5

Charts and Graphs

PODS

The following pods will be needed for the four lessons in Module 5:

1. Categorical Data | MATHS-16-001
2. Discrete Data | MATHS-16-002
3. Continuous Data | MATHS-16-004
4. Time Series Data | MATHS-16-006
5. Bivariate Data | MATHS-25-006
6. Using Correlation | MATHS-25-007
7. Graphs Through the Origin | **MATHS-22-002**
8. $y = mx + c$ | MATHS-22-003
9. Gradient | MATHS-22-004
10. Quadratic Graphs | MATHS-28-001
11. Cubic Graphs | MATHS-28-004
12. Reciprocal Graphs | MATHS-28-002

Lesson 1

Visual Charts

PODS

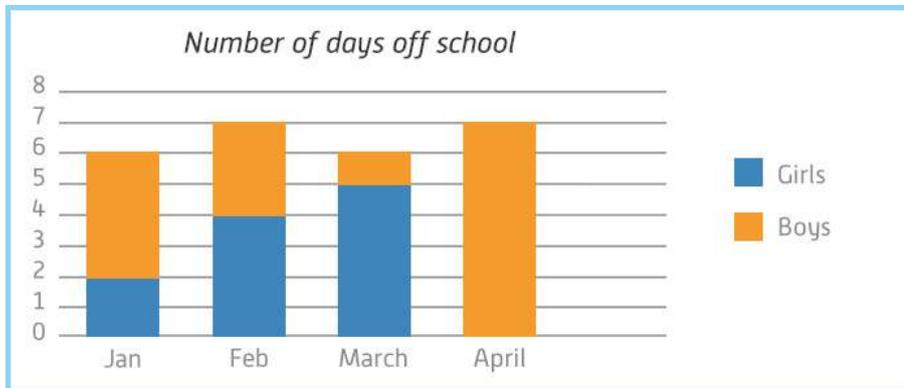
1. Categorical Data | MATHS-16-001
2. Discrete Data | MATHS-16-002
3. Continuous Data | MATHS-16-004
4. Time Series Data | MATHS-16-006





Quiz

Watch the pods and answer the questions below.



- How many students had days off school in Year 1 between January and April inclusive?
 - 30
 - 11
 - 26
 - You cannot tell

.....
- Which gender had most days off?
 - Girls
 - Boys
 - Same
 - Cannot tell

.....
- Which of the following statements is not true:
 - There is a month where no girls were recorded absent
 - Most months show more boys off than girls
 - In total there are fewer girls absent from school
 - The range of monthly absences is equal to 1.

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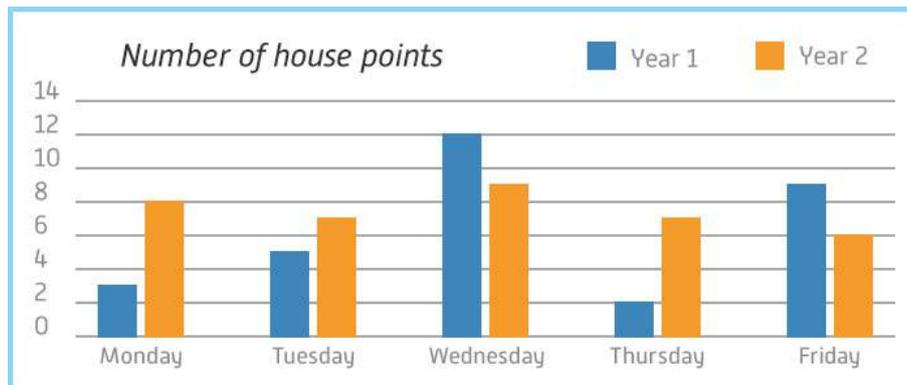
Children	Frequency	Angle
1	7	
2	15	
3	4	
4	3	
5	1	
Totals		

8. The frequency table shows the number of children living in the households of the students in Class 1. Uzma says 'to calculate the angles for a pie chart, you simply divide each frequency by x and then multiply by 360'. What should the value of x be?
- 360
 - 30
 - 15
 - It changes depending on which section you are calculating.

.....

.....

Use the multiple bar chart to answer questions 9 and 10.



9. On how many days did Year 1 collect more house points than Year 2?
- 1
 - 2
 - 3
 - 0

.....





10. How many house points were collected in total?

a) 68

c) 60

b) 65

d) 66

.....





Practise

Practise visual charts.

Do not use a calculator.



- The table below shows the favourite science of Year 11 students. Complete the missing values in the table.

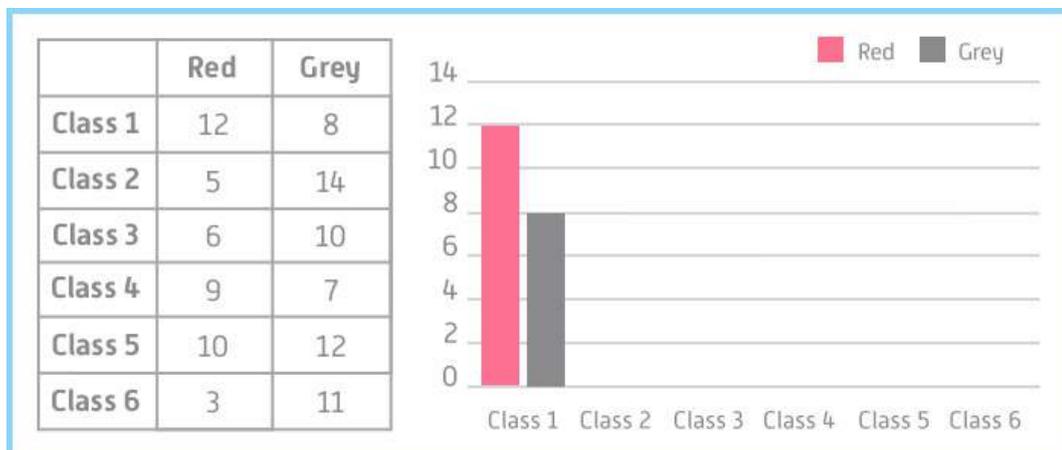
	Physics	Biology	Chemistry	Total
Boys	10			41
Girls		6		
Total	14	20	40	

- Use the table in question 1 to calculate the proportion of students who claim that physics is their favourite science.

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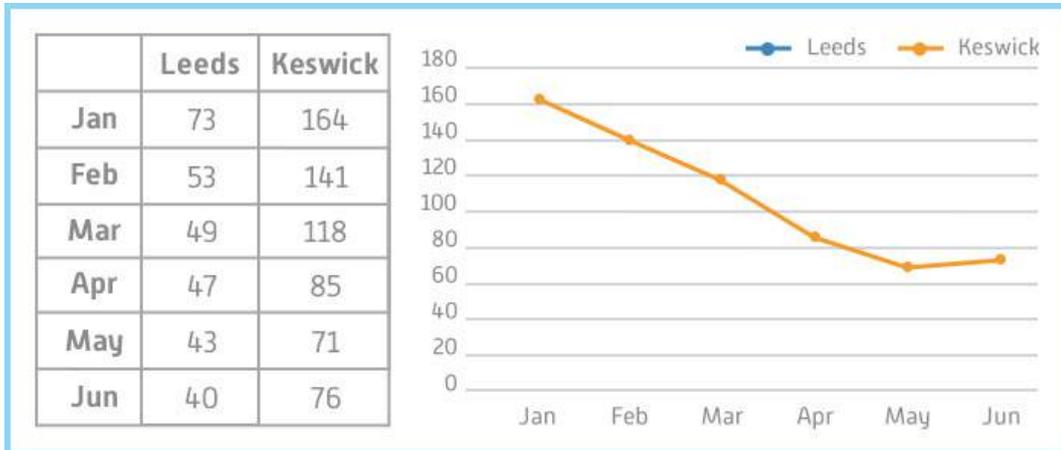
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- The table below shows the number of red and grey squirrels spotted by different classes on a school trip to Kielder. Use this information to complete the multiple bar chart below.

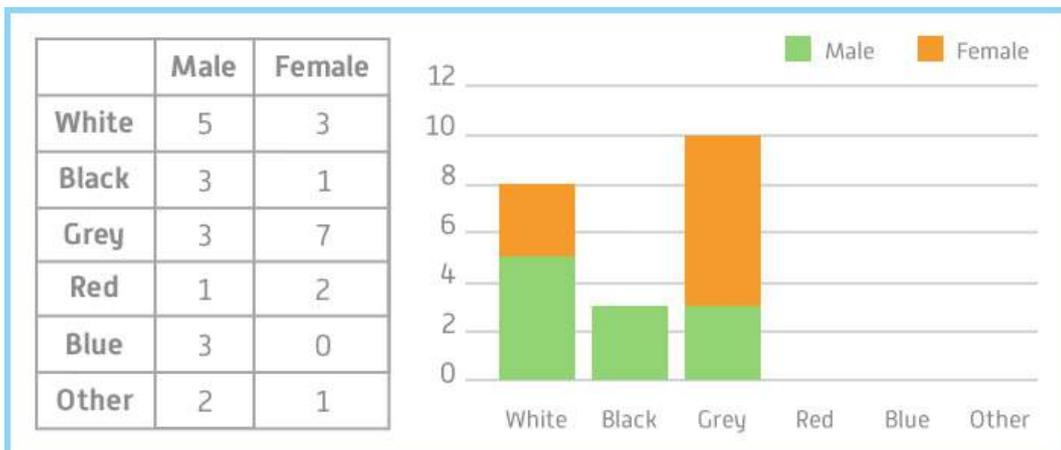




4. The table below shows the average rainfall (mm) in Leeds and Keswick for the first 6 months of the year. Use this data to plot a line graph for the amount of rainfall in Leeds on the graph below.



5. The table below shows the colour of the front door of 40 people working in a paint shop. Use this information to complete the composite bar chart below.





Practise

Practise visual charts.

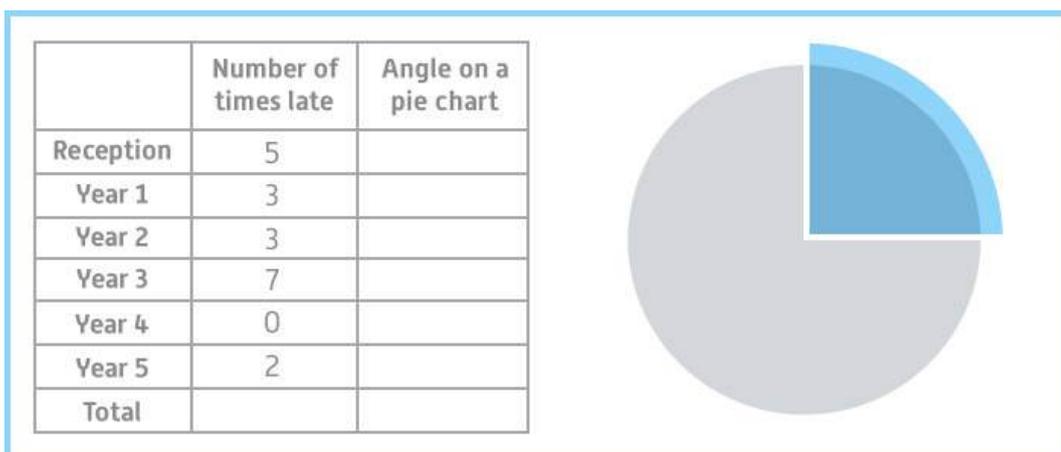
You may use a calculator.



- The table shows the number of times students from different classes were late for school last month. Complete the table by calculating the angle that each section would represent on a pie chart.

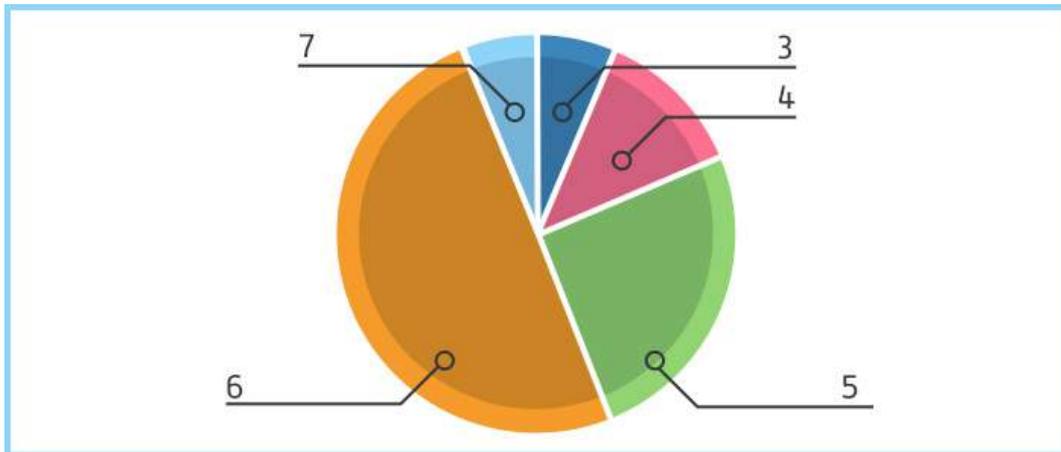
	Number of times late	Angle on a pie chart
Reception	5	
Year 1	3	
Year 2	3	
Year 3	7	
Year 4	0	
Year 5	2	
Total		

- Use the information in question 1 to complete the following pie chart, labelling all sections clearly.





3. The pie chart below shows the number of shoes sold last year by a shoe shop, sorted into different sizes.



Given that there were 12,000 size 5 pairs of shoes sold, calculate the total number of pairs of shoes sold by the shop last year.

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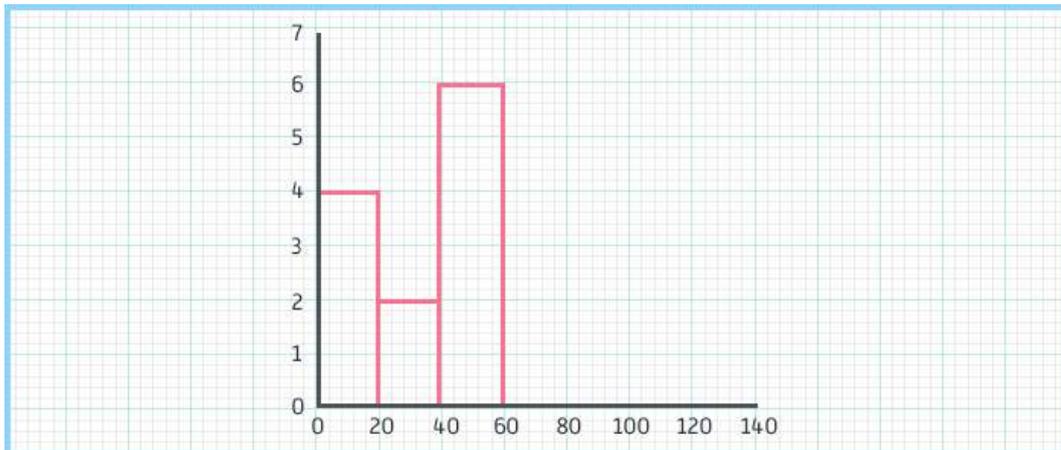
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4. The lengths, x , of 23 worms were recorded in mm as follows;
51, 15, 40, 90, 21, 81, 60, 105, 72, 95, 60, 54, 119, 64, 100, 45, 20, 12, 8, 50, 80, 80, 62,
Complete the following frequency table for this data.

Grouped x	Frequency, F
$0 < x \leq 20$	
$20 < x \leq 40$	
$40 < x \leq 60$	
$60 < x \leq 80$	
$80 < x \leq 100$	
$100 < x \leq 120$	
Total	



5. Use the information in question 4 to complete the following bar chart, labelling all axes clearly.





MODULE 5, LESSON 2

Scatter Graphs

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Lesson 2

Scatter Graphs

PODS

- 5. Bivariate Data | MATHS-25-006
- 6. Using Correlation | MATHS-25-007

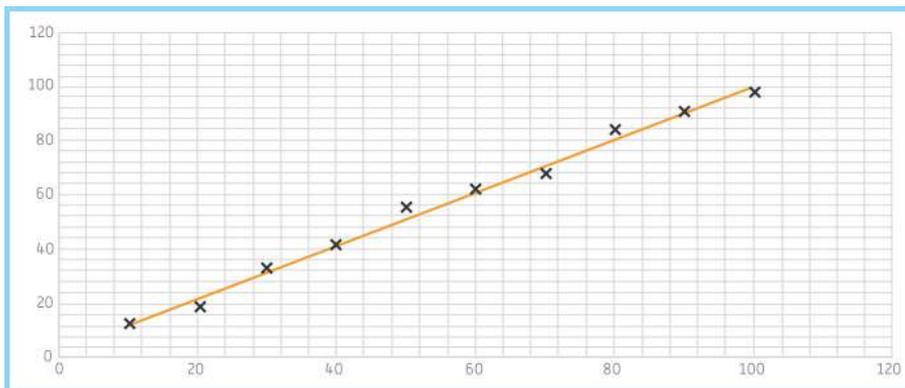
Quiz

Watch the pods and answer the questions below.

Do not use a calculator.



1. What type of correlation is shown on the scatter diagram below?

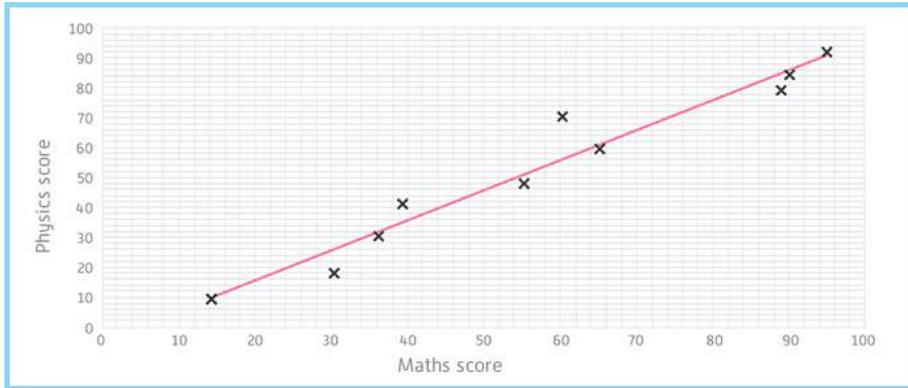


- a) Weak positive correlation
 - b) Weak negative correlation
 - c) Strong positive correlation
 - d) Strong negative correlation
-



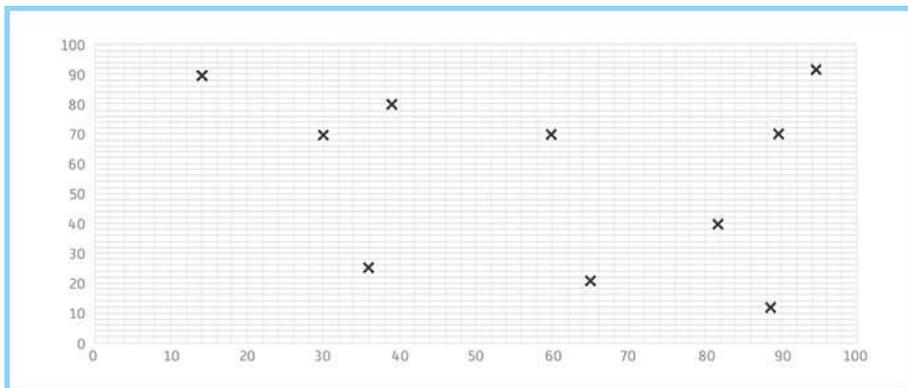


2. The scatter diagram shows the scores of 10 students in a maths and a physics test. Which of the following statements does not apply to this graph?



- a) The higher the maths score, the lower the physics score.
 b) The higher the physics score, the higher the maths score.
 c) There is a strong positive correlation
 d) Students generally had similar scores in both tests.

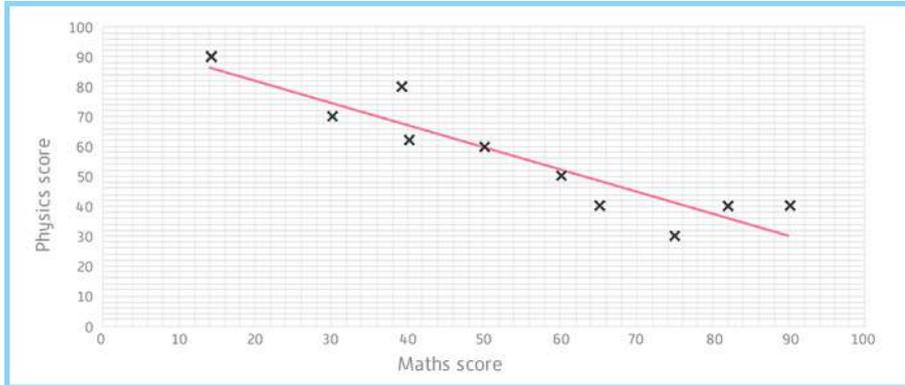
3. What type of correlation is shown on the scatter diagram below?



- a) Positive correlation
 b) Negative correlation
 c) No correlation
 d) Strong negative correlation

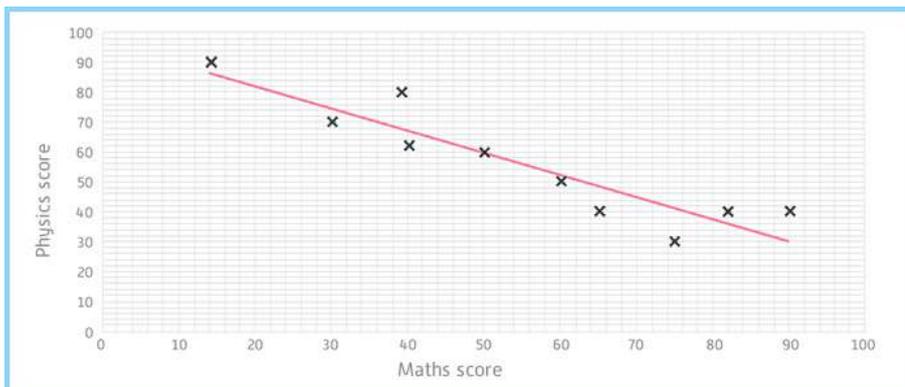


6. Use the scatter graph below to estimate the physics score of a student who scored 20 in maths.



- a) 20
b) 80
c) Outside of data range.
d) 82

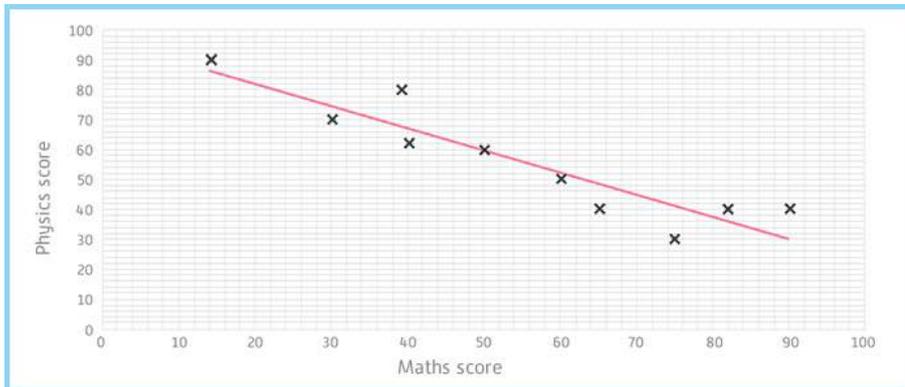
7. Use the scatter graph below to estimate the maths score of a student who scored 10 in physics.



- a) 105
b) 10
c) Outside of data range
d) 90

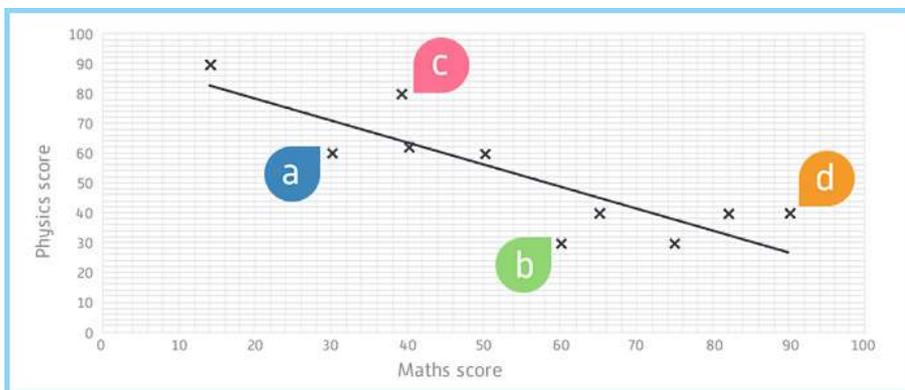


8. How many of the students scored less than 50 in the physics test?



- a) 4
b) 5
c) 3
d) 2

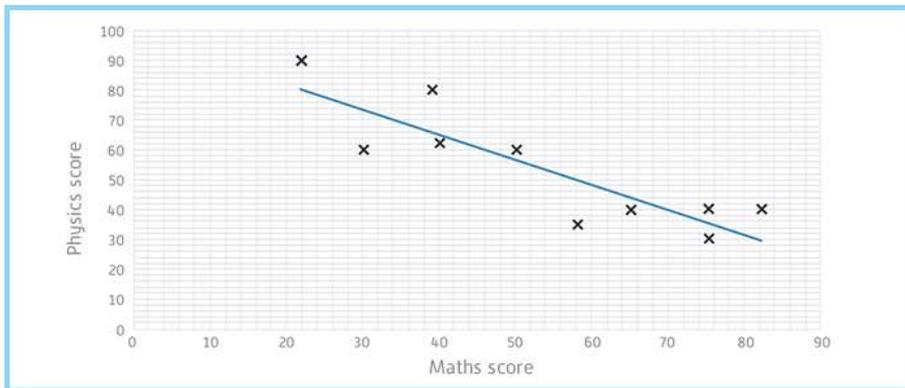
9. Which student scored twice as high on the physics test as on the maths test?



- a) A
b) B
c) C
d) D



10. In the scatter diagram below, why would you need to be very careful if you were using this scatter diagram to estimate the maths score of a student who scored 15 in physics?



- a) The line of best fit does not exactly pass through this point
- b) 15 lies outside of the range of the data
- c) The graph shows no correlation
- d) You would need to read off the values very carefully as the graph is small.
-





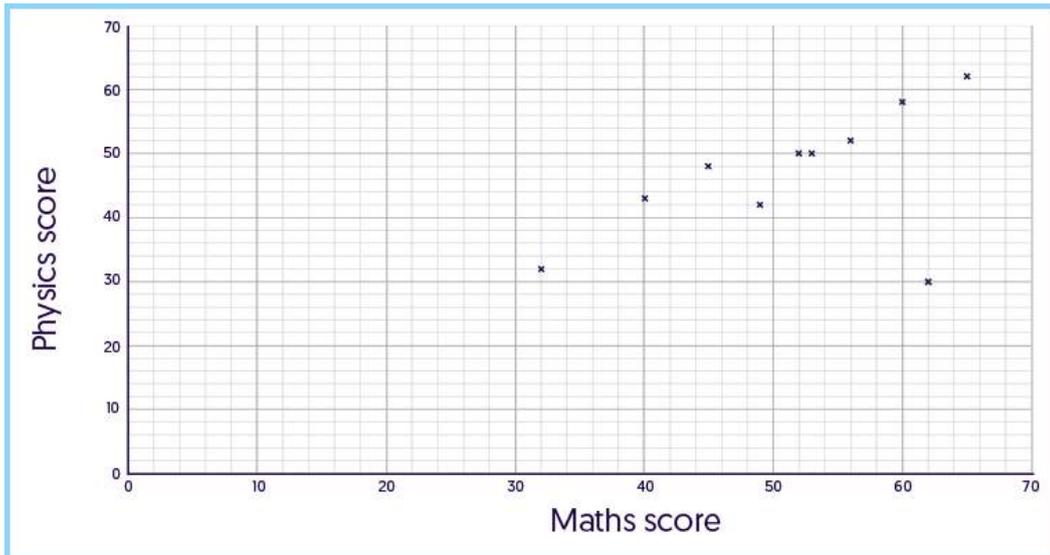
Practise

Practise what you have revised.

You may use a calculator.



1. The scatter graph shows the scores of students in a maths and physics test.



- a) One of these results is an outlier. Circle this value and write down both test scores of this student.

.....

- b) Draw a line of best fit on this diagram

- c) Describe the relationship between the maths and physics scores of these students.

.....

- d) What type of correlation is shown on the scatter diagram?

.....





e) Use this graph to estimate the maths score for a student who scores 54 in physics.

.....

f) Estimate the physics score of a student who scores 25 in maths.

.....

g) Which of the estimates in parts e) and f) is more reliable? Give a reason for your answer.

.....
.....

h) What is the range of maths scores?

.....

i) Which of the subjects has the more consistent scores? Give a reason for your answer.

.....
.....

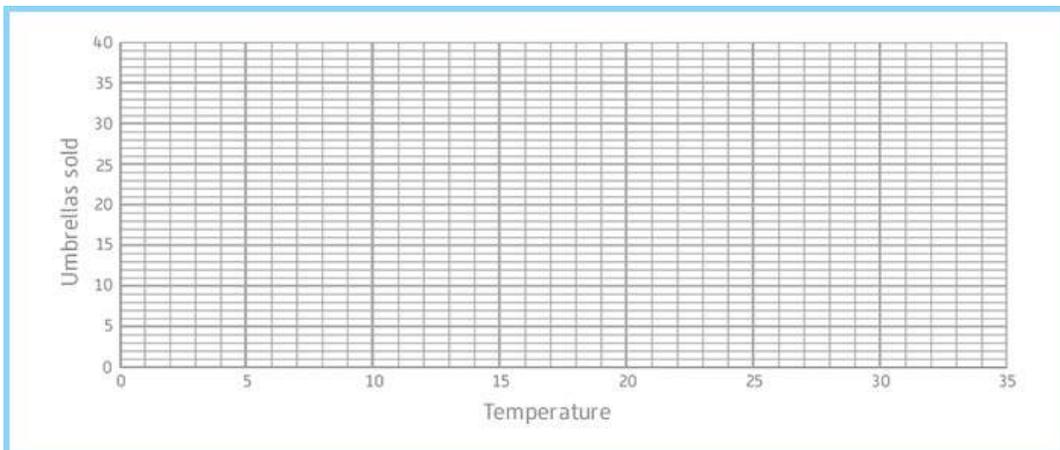




2. The table shows the average temperature recorded and the number of umbrellas sold by a seaside shop over various days.

Temperature	9	10	12	15	20	22	24	28	30	6
Umbrella sales	30	20	26	15	8	4	4	2	30	20

- a) Display this data in a scatter diagram.



- b) Draw a line of best fit on your scatter diagram.
c) Describe the relationship between the variables.

.....

- d) What type of correlation does the data show?

.....

- e) One value is not in line with the other data. What is the name given to this type of value?

.....





f) Clearly indicate the value discussed in (e) on your scatter diagram.

g) Give a reason as to why the value indicated may be a true data value and not an error.

.....

.....

h) The weather forecast claims that it is going to be 18 degrees tomorrow. How many umbrellas do you predict that the shop will sell?

.....

i) One day the shopkeeper forgot to measure the temperature, though knows that they have sold 32 umbrellas. Estimate the temperature on this day and comment, with reasons, on the reliability of your estimate.

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MODULE 5, LESSON 3

Linear Graphs

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Lesson 3

Linear Graphs

PODS

7. Graphs Through the Origin | MATHS-22-002
8. $y = mx + c$ | MATHS-22-003
9. Gradient | MATHS-22-004

Quiz

Watch the pods and answer the questions.

1. The x axis has the equation...

a) $y = x$

c) $x = 0$

b) $y = 0$

d) $y = mx$

.....

2. A linear graph showing direct proportion is **not** represented by the equation...

a) $y = x$

c) $y = mx$

b) $y = mx + 1$

d) $y = mx + 0$

.....

3. Which of the following coordinates does **not** lie on the line $y = 3x$?

a) $[0, 0]$

c) $[100, 300]$

b) $[-2, -6]$

d) $[2, 5]$

.....





4. Which of these graph types will **not** always pass through the origin?
- | | |
|---|----------------------------|
| a) Length of journey / Time taken for the journey | c) Linear graphs |
| b) Direct proportion graphs | d) Money conversion graphs |
-

5. The linear graph equation is
- | | |
|-----------------|-----------------|
| a) $x = my + c$ | c) $y = x$ |
| b) $y = cx + m$ | d) $y = mx + c$ |
-

6. Which of the following points does not lie on the line $y = 2x - 1$?
- | | |
|-----------|-------------|
| a) [2, 5] | c) [-1, -3] |
| b) [3, 5] | d) [0, -1] |
-

7. The gradient of a distance time graph represents...
- | | |
|-----------------------|-----------------|
| a) Distance travelled | c) Acceleration |
| b) Deceleration | d) Velocity |
-

8. The gradient of the line $y = 3x - 4$ is
- | | |
|-------|-------|
| a) 3 | c) 4 |
| b) -4 | d) -3 |
-





9. Which of the following lines is not parallel to the others?

a) $y = 3x - 2$

c) $3y = x - 2$

b) $2y = 6x - 4$

d) $y - 3x + 2 = 0$

.....

10. The gradient of the line passing through the points $(4, -2)$ and $(1, -6)$ is calculated by

a) $[-2 - -6] / [4 - 1] = 4/3$

c) $[4 - 1] / [-2 - -6] = -3/4$

b) $[-2 - 6] / [4 - 1] = -8/3$

d) $[-2 - -6] / [1 - 4] = -4/3$

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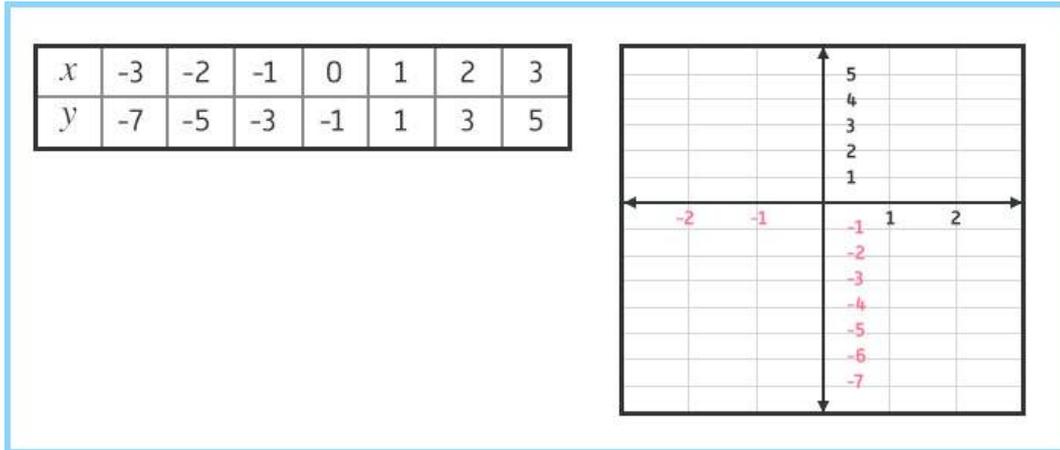
Practise

Practise linear graphs.

You may use a calculator.



1. Plot the graph on the axes below, using the given table of values



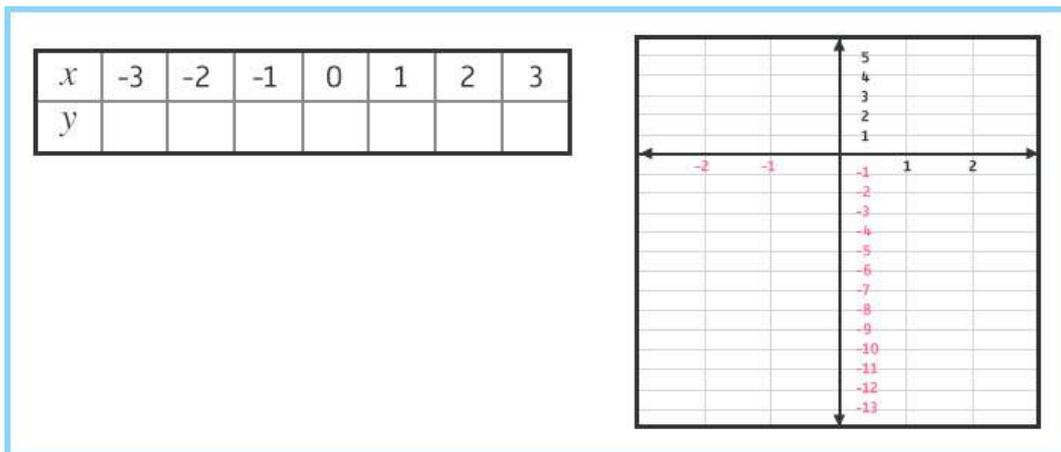
2. a) Complete the table of values for the linear graph $y = 3x - 4$

x	-3	-2	-1	0	1	2	3
y							

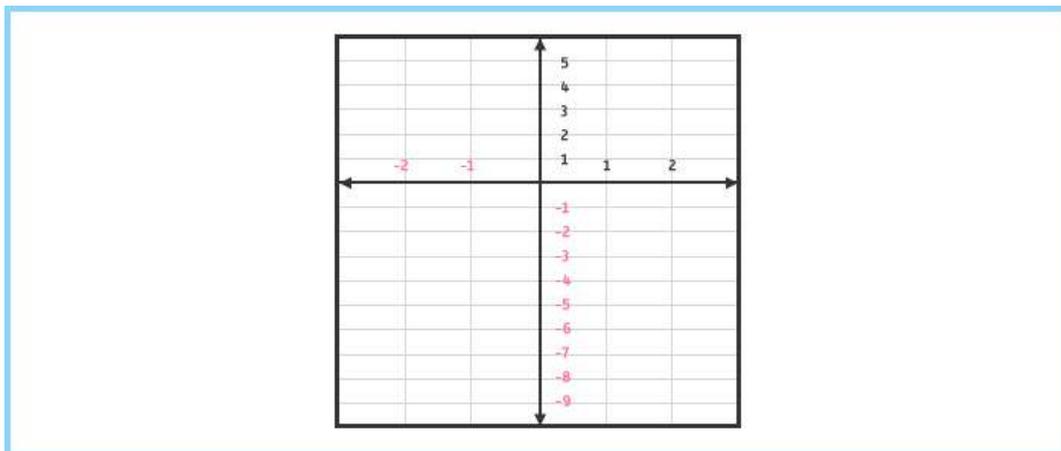




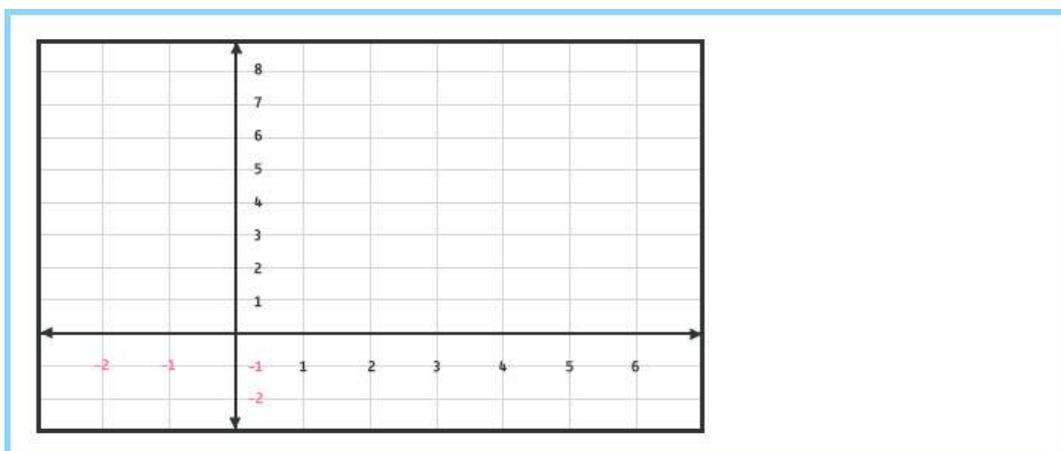
b) Plot the graph $y = 3x - 4$



3. Plot the graph of $y = 3 - 2x$

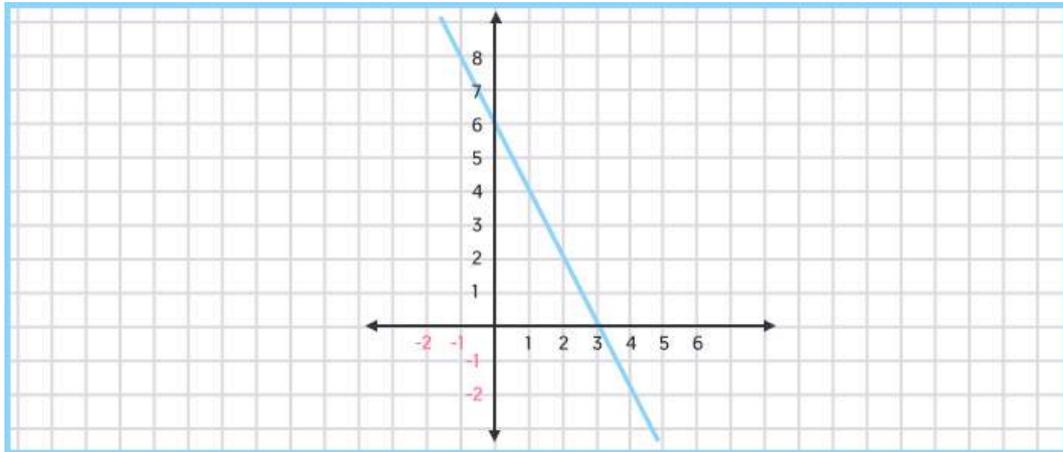


4. On the axes below, plot the graph of $x + y = 6$





5. Calculate the gradient of the line shown on the axis below:



6. A line passes through the points $[-2, -7]$ and $[1, -4]$. Calculate the gradient of the line and hence the equation of the line.

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7. Rearrange the following equation in order to find the gradient and y intercept of

$$3y + 2x = 7$$

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8. A line has an equation $y = 2x + 3$. A second line is parallel to this and passes through $(1, 0)$. Find the equation of the second line.

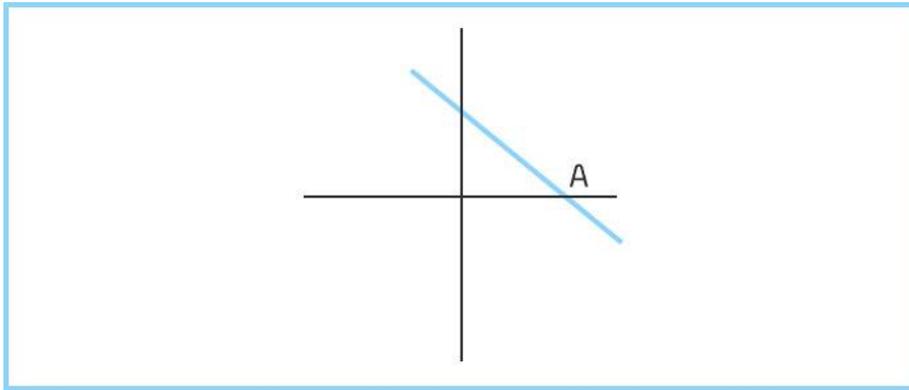
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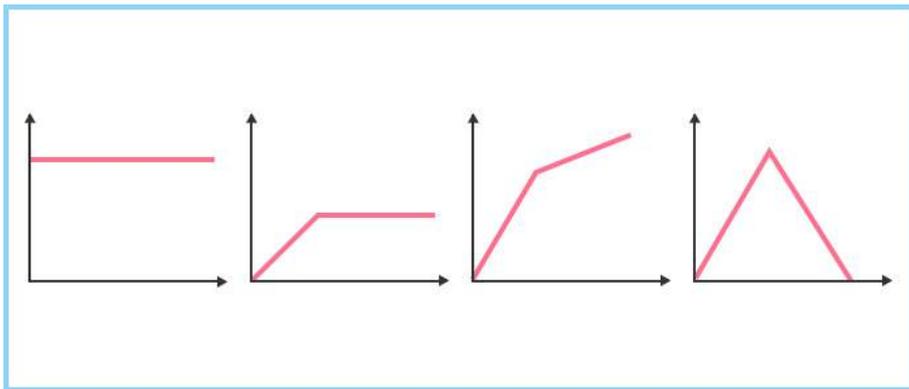




9. The graph shows the line with equation $y = 4 - 3x$. What are the coordinates of Point A where the graph meets the x axis?



10. Match each of the following distance time graphs to the descriptions below:



- a) Travels at a constant speed in one direction and then turns and travels at same speed in opposite direction.
 b) Travels at a constant speed of 10m/s and then slows to a speed of 5m/s.
 c) Stationary vehicle.
 d) Travels at a constant speed of 20mph before stopping suddenly.

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MODULE 5, LESSON 4

Quadratic, Cubic and Reciprocal Graphs

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Lesson 4

Quadratic, Cubic and Reciprocal Graphs

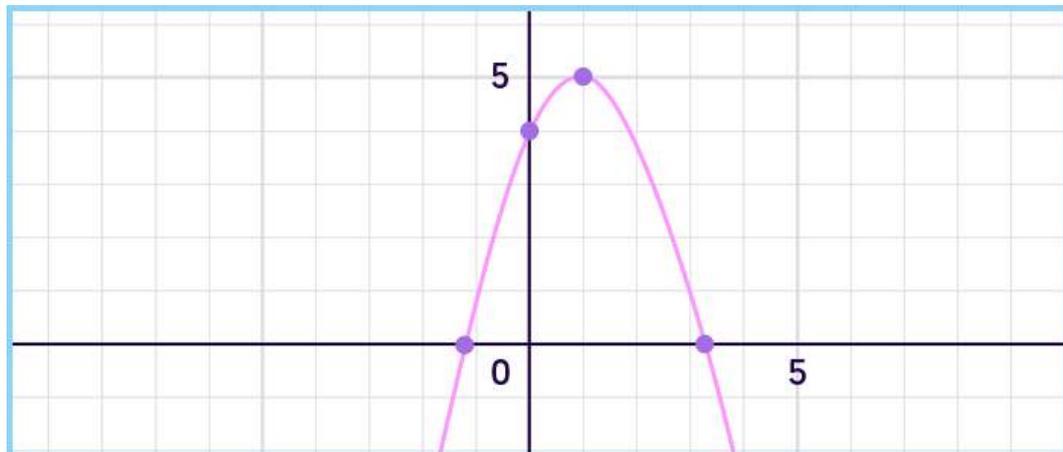
PODS

10. Quadratic Graphs | MATHS-28-001
11. Cubic Graphs | MATHS-28-004
12. Reciprocal Graphs | MATHS-28-002

Quiz

Watch the pods and answer the questions below.

1. Which of the following could be the equation of the graph?

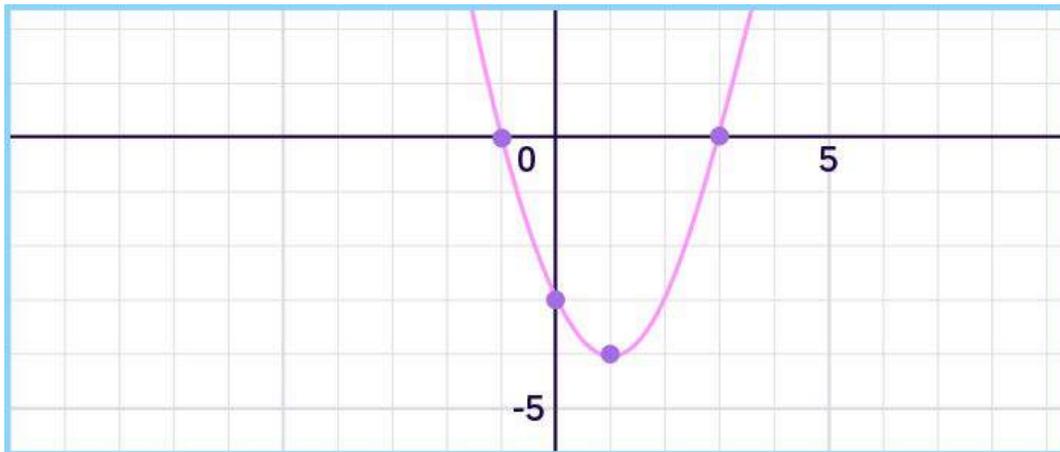


- | | |
|-----------------------|-----------------------|
| a) $y = x^2 + 2x + 4$ | c) $y = 4 - x^2 + 2x$ |
| b) $y = -x^2$ | d) $y = 2x + 4$ |
-





2. Which of the following could be the equation of the graph?



a) $y = x^2$

b) $y = x^2 - 2x - 3$

c) $y = 3 - x^2 - 2x$

d) $y = 2x - 4$

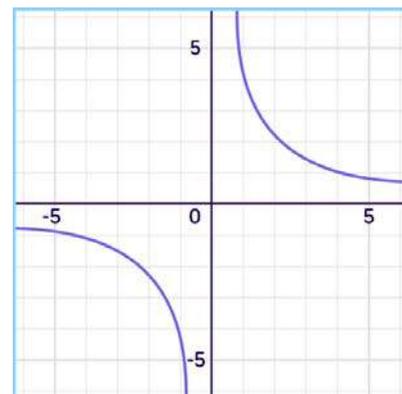
3. What word best describes the graph?

a) Linear

b) Quadratic

c) Cubic

d) Reciprocal



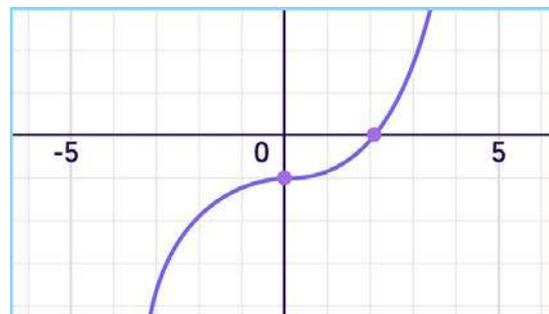
4. What kind of graph is drawn here?

a) Linear

b) Quadratic

c) Cubic

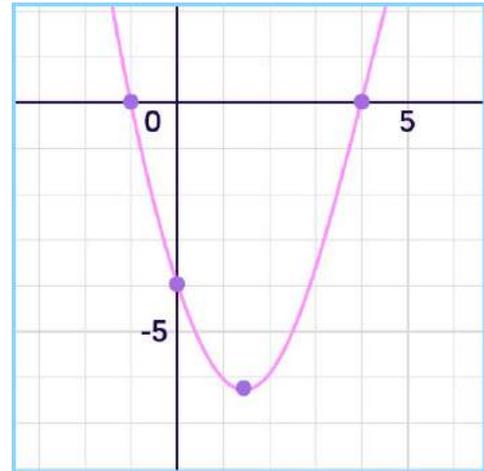
d) Reciprocal





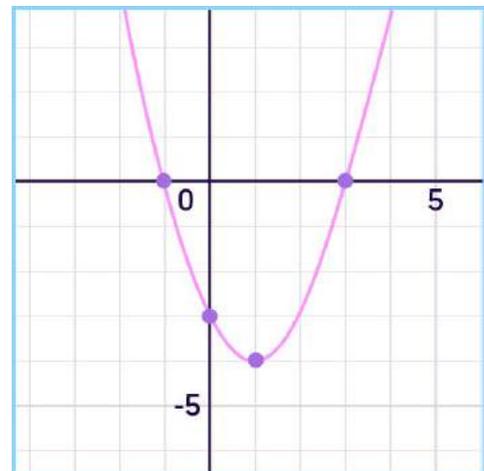
5. Which of the following equations could belong to the graph?

- a) $(x-1)(x+4) = y$
- b) $(x+1)(x+4) = y$
- c) $(x-1)(x-4) = y$
- d) $(x+1)(x-4) = y$



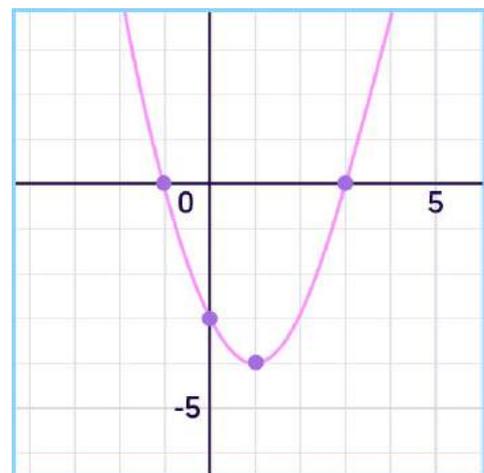
6. What are the coordinates of the minimum point of the curve?

- a) $[-4, 1]$
- b) $[1, -4]$
- c) $[3, 0]$
- d) $[-1, 0]$



7. What is the equation of the line of symmetry for the graph?

- a) $y = -4$
- b) $y = 1$
- c) $x = 1$
- d) $x = 0$





Practise

Practise quadratic, cubic and reciprocal graphs.

Do not use a calculator.



1. Complete the table of values which would help to plot the curve $y = x^2 - 3x$

x	-2	-1	0	1	2
y					

2. Complete the table of values which would help to plot the curve $y = x^3 - 4$

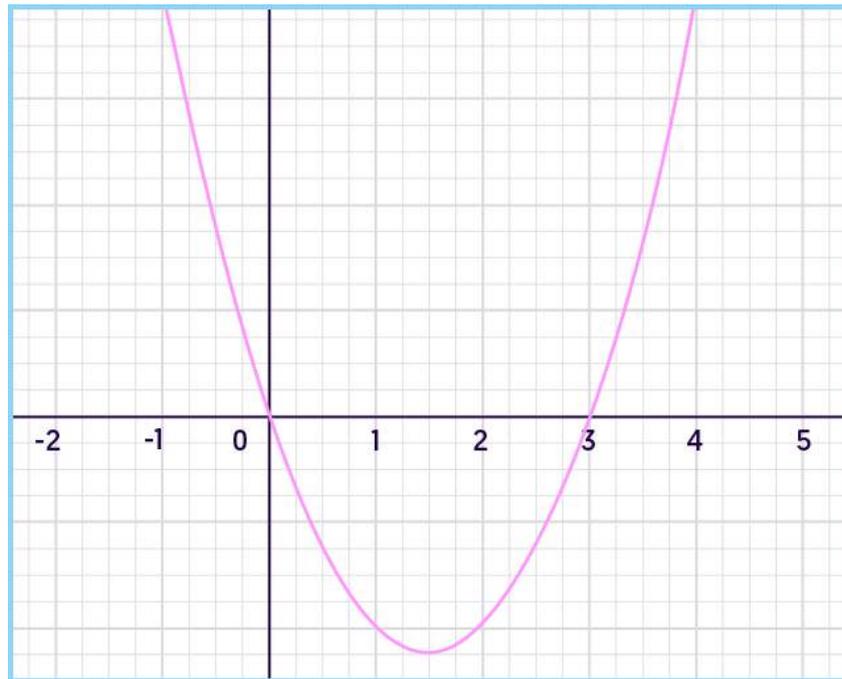
x	-2	-1	0	1	2
y					

3. Complete the table of values which would help to plot the curve $y = 4/x$

x	-2	-1	0	1	2
y					



4. The graph of $y = x^2 - 3x$ is drawn.

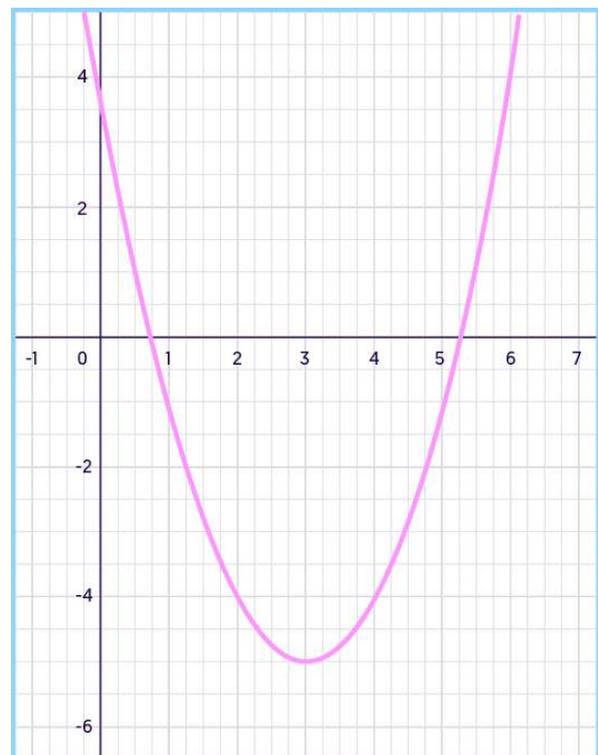


Use the graph to find the solutions to $0 = x^2 - 3x$

.....

5. Write down the coordinates of the turning point of the graph $y = x^2 - 6x + 4$ drawn here.

.....





Practise

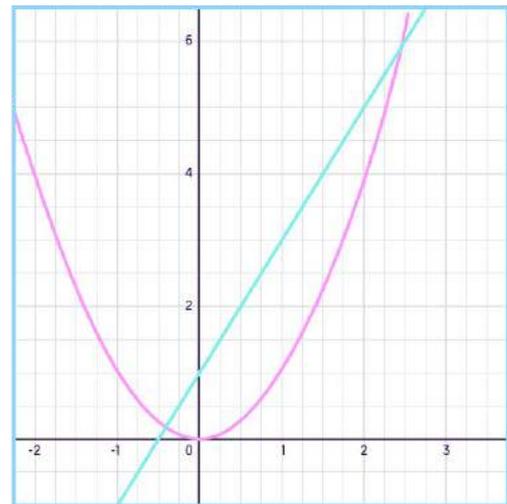
Practise quadratic, cubic and reciprocal graphs.

You may use a calculator.



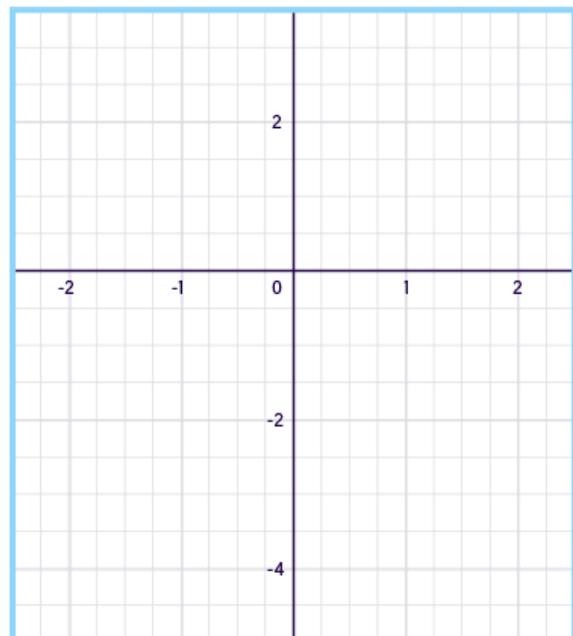
1. The graph shows $y = x^2$ and $y = 2x + 1$. Use the graph to find the solutions to the equation $x^2 = 2x + 1$

.....



2. Complete the table of values for the graph $y = x^2 - 3$, and sketch it using the axes below.

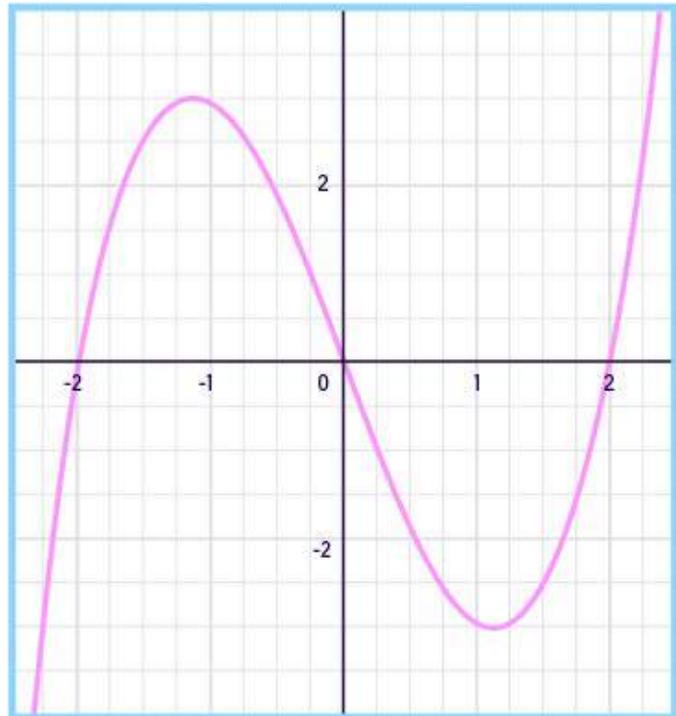
x	-2	-1	0	1	2
y					



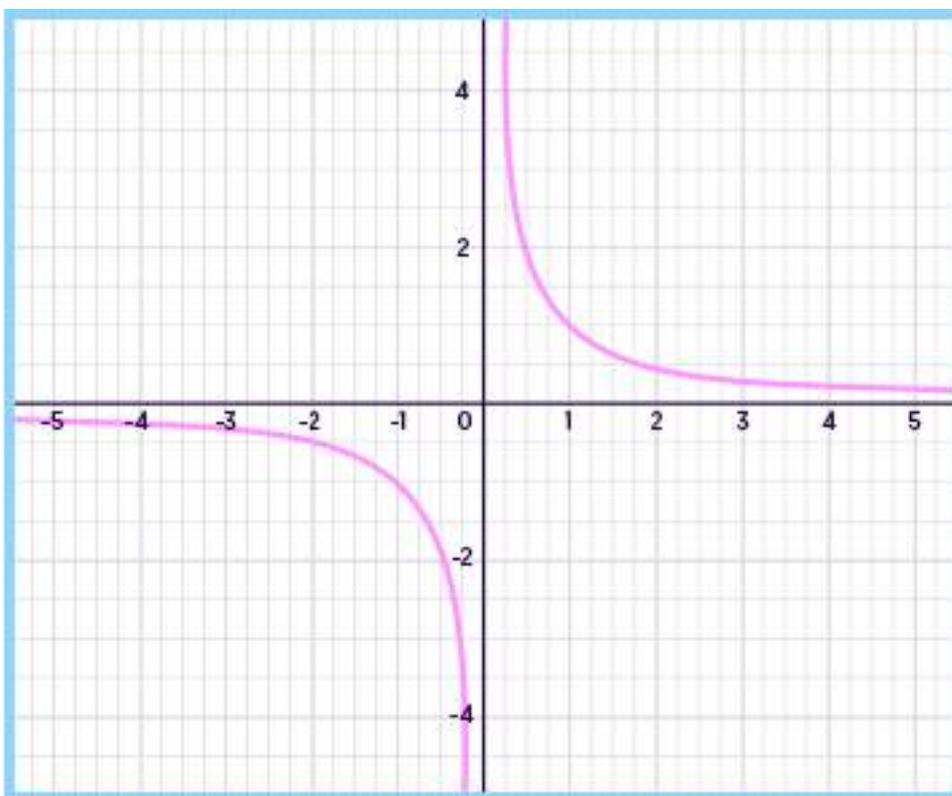


3. Write out the roots to the equation $y = x^3 - 4x$ which is drawn below.

.....

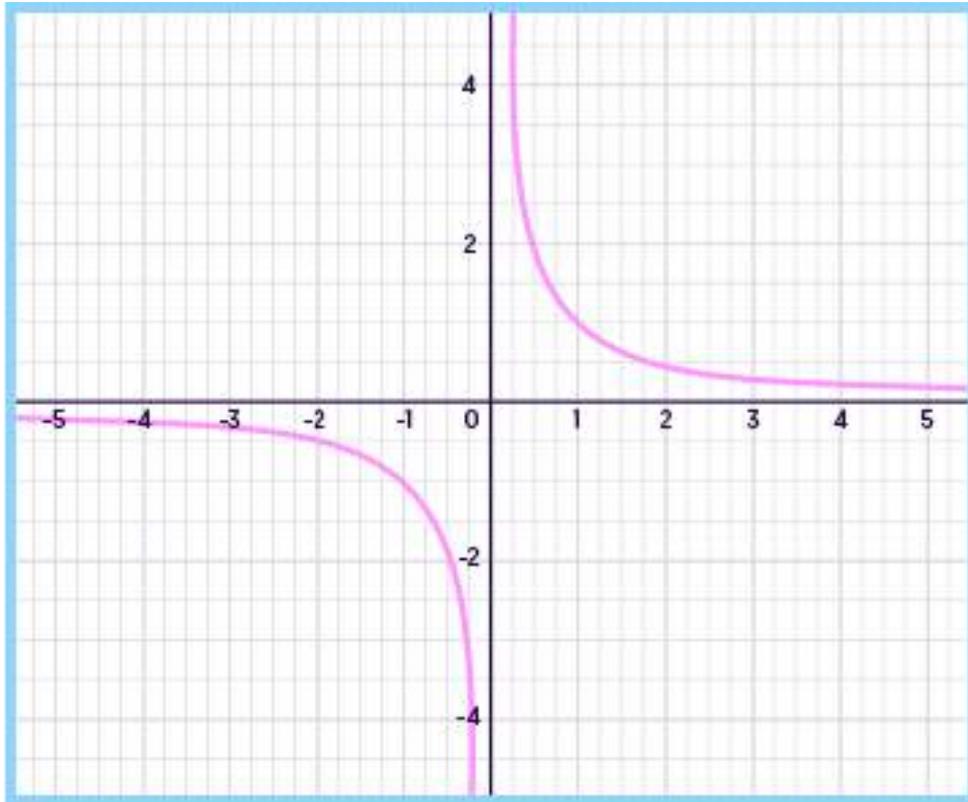


4. The graph of $y = 1/x$ is drawn below. On the same axes, sketch the graph $y = 3/x$





5. The graph of $y = 1/x$ is drawn below. What are the equations of the asymptotes for the graph $y = 1/x$?



.....

.....

.....





MODULE 5, APPLY

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7 May 2019



Apply

Apply what you have revised about visual and linear graphs.

Do not use a calculator.



Remember

When drawing a pie chart, calculate angles by dividing the frequency for each section by the total of the frequencies and then multiplying by 360. Check that your angles add up to 360 before drawing it.

When describing correlation, use “positive” or “negative” and when describing the relationship, state how the data behaves, with reference to how a variable increases or decreases as the other increases.

Your line of best fit helps you to make predictions – leave your estimation lines on your graph.

A linear graph has the general equation $y = mx + c$ where m is the gradient and c is the y intercept. You must have only “ y ” on the left-hand side to read off these values.

1. Match up the following words with the definitions below:

- a) Making estimates within a data set
- b) As one value increases so does the other
- c) As one value increases, the other decreases
- d) Making estimates outside of a data set
- e) A value which is far from being in line with the other values in the data set.

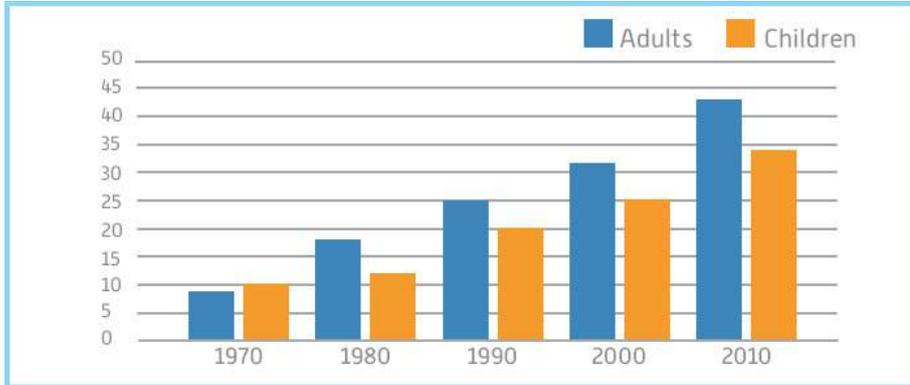
- i) Outlier
- ii) Positive correlation
- iii) Extrapolation
- iv) Negative correlation
- v) Interpolation

.....





2. The graph below shows the number of grams of sugar consumed on average per day by adults and children sampled in different years.



a) Which year shows the biggest difference between the consumption of sugar between adults and children?

.....

b) Bobby says: 'This graph shows that adults always have consumed more sugar than children'. Is Bobby correct? Give a reason for your answer.

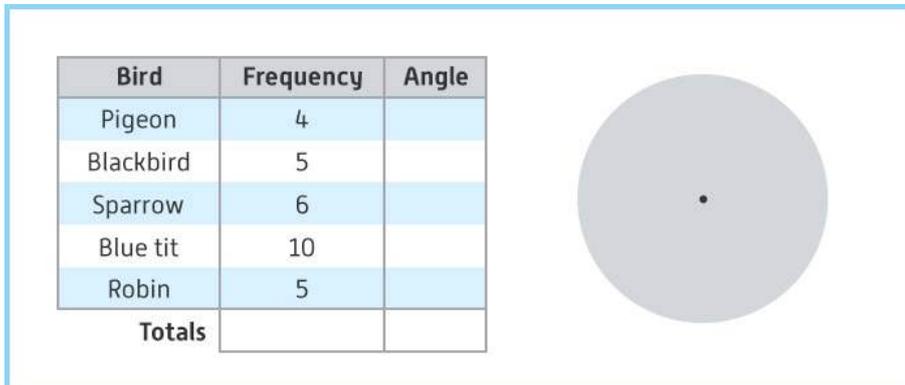
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c) Describe how sugar consumption has changed over time.

.....
.....
.....

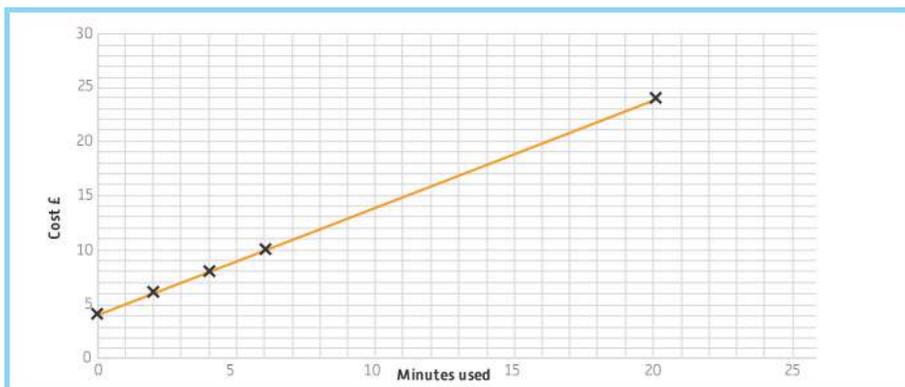


3. The table shows the number of birds spotted at a feeding table.
- a) Show this data in a pie chart.



- b) Which bird was the mode?
-

4. The graph below shows the charges for an international phone call on Tariff 1.



- a) What does the intercept show?
-

A second tariff, Tariff 2, is given by the equation $y = 3x$

- b) Plot a graph of the second tariff.

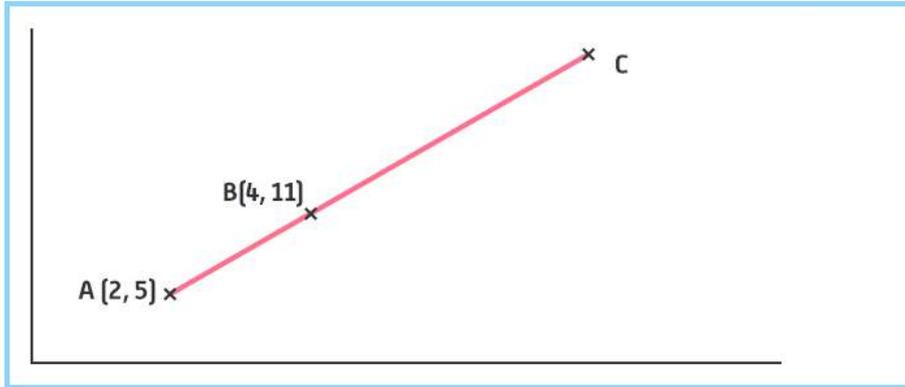
- c) What does the point of intersection of the two graphs of the graphs show?
-
-

- d) Which tariff is cheaper? Give a reason for your answer.
-
-





5. The graph below shows the line $y = 3x - 1$. The length AB and BC are in the ratio 1:2 respectively.



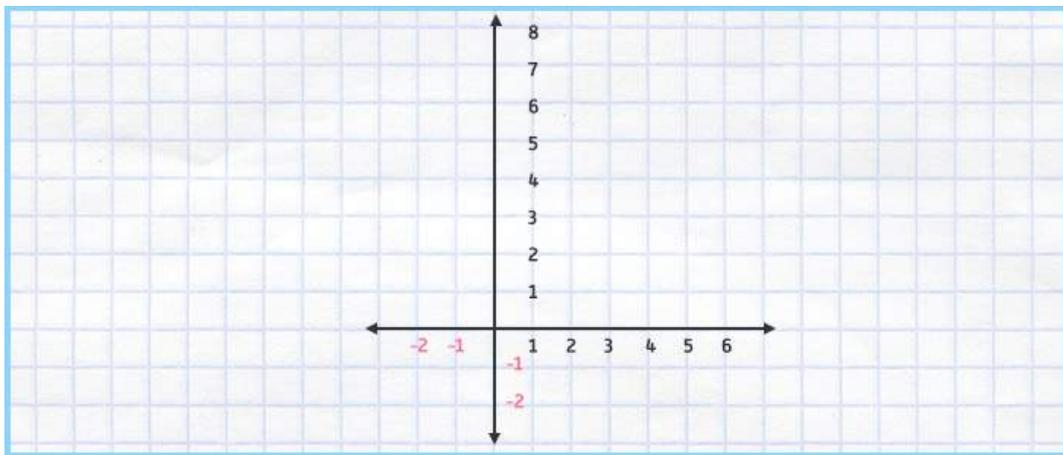
Calculate the coordinates of point C.

.....

.....

6. Plot the graphs $y = 3x$ and $y = 2x - 1$ on the axes below. Use these graphs to solve the equation:

$$3x = 2x - 1$$



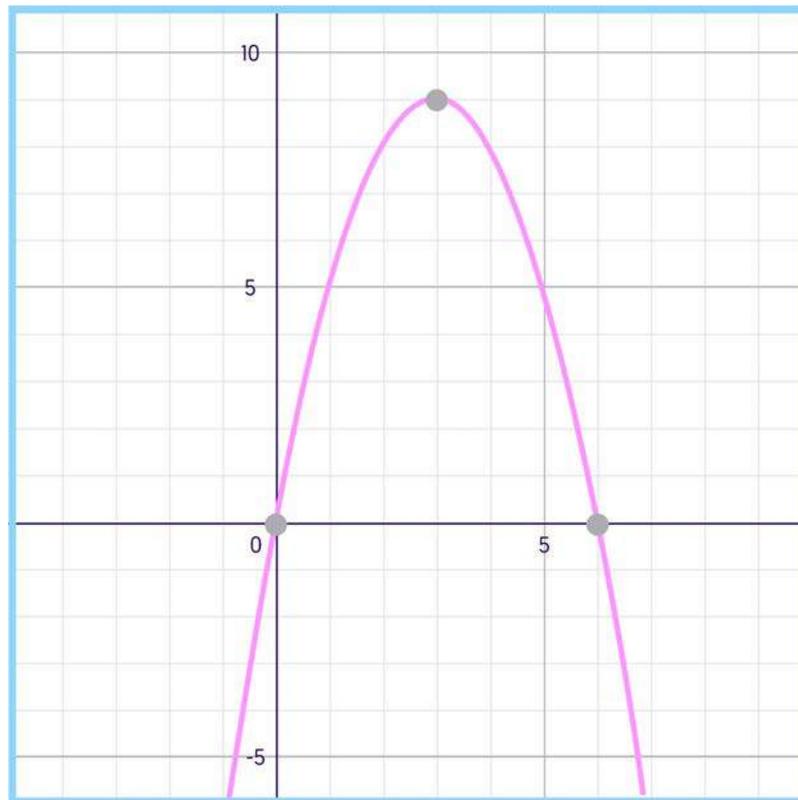
.....

.....





7. The graph of $y = 6x - x^2$ is drawn below:



- a) Write down the roots of the equation $y = 6x - x^2$

.....

- b) Write out the coordinates of the turning point of the curve $y = 6x - x^2$

.....

- c) What is the equation of the line of symmetry of the curve $y = 6x - x^2$?

.....

- d) Use the graph to find the solutions to the equation $5 = 6x - x^2$

.....





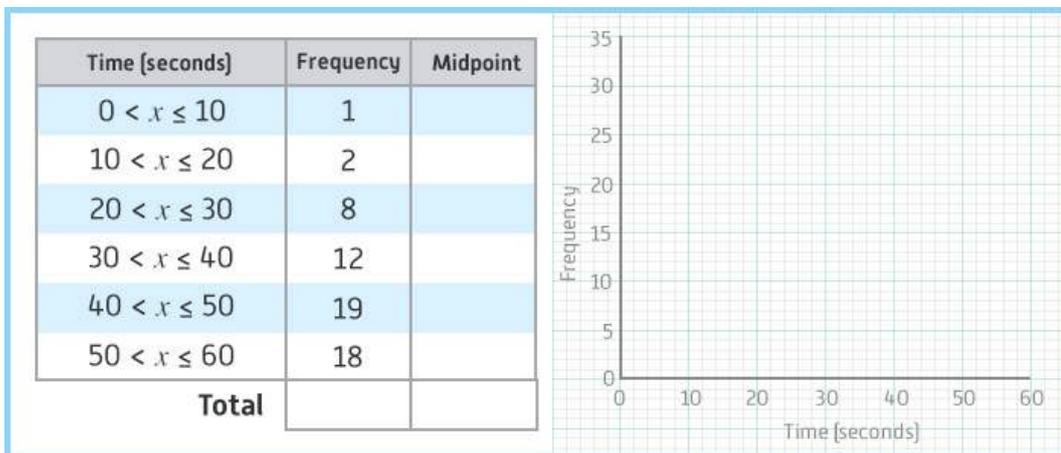
8. A line has equation $y = 2x + 4$. The points A and B are the intercepts between the line and the x and y axis respectively. O is the origin.

Calculate the area AOB.

.....

.....

9. The table shows that time that 60 children took to solve a puzzle. All children solved the puzzle in under 1 minute. Complete the frequency table and represent this information on a frequency polygon.



10. The table below shows the time taken for a group of children to read some instructions.

Time (seconds)	Frequency	
$0 < x \leq 10$	2	
$10 < x \leq 20$	4	
$20 < x \leq 30$	8	
$30 < x \leq 40$	14	
$40 < x \leq 50$	25	
$50 < x \leq 60$	10	
Total		

a) Find the modal class

.....

.....





b) Find the class which contains the median

.....

.....





Apply

Apply what you have revised about visual and linear graphs.

You may use a calculator.



Remember

When drawing a pie chart, calculate angles by dividing the frequency for each section by the total of the frequencies and then multiplying by 360. Check that your angles add up to 360 before drawing it.

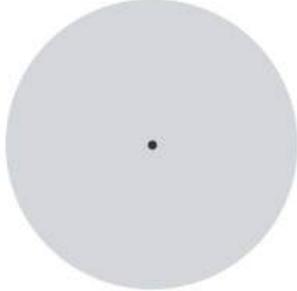
When describing correlation, use “positive” or “negative” and when describing the relationship, state how the data behaves, with reference to how a variable increases or decreases as the other increases.

Your line of best fit helps you to make predictions – leave your estimation lines on your graph.

A linear graph has the general equation $y = mx + c$ where m is the gradient and c is the y intercept. You must have only “ y ” on the left-hand side to read off these values.

- The table shows the number of birds spotted at a feeding table.
Show this data in a pie chart.

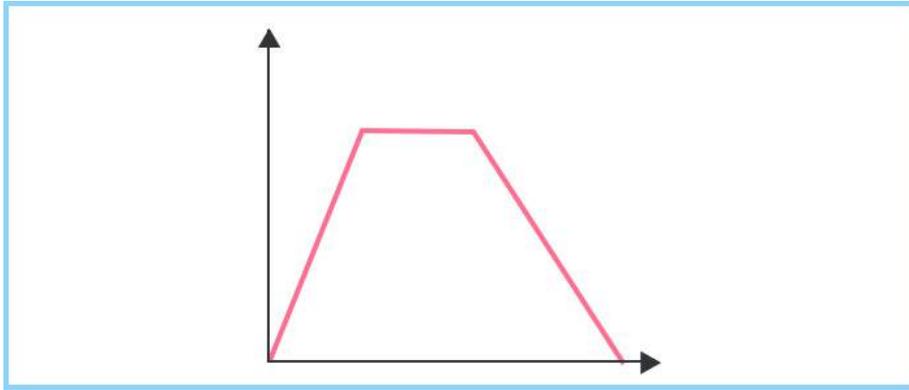
Bird	Frequency	Angle
Pigeon	15	
Blackbird	9	
Sparrow	7	
Blue tit	12	
Robin	5	
Totals		






2. A car travels for 5 seconds at a constant velocity. It suddenly stops after 40m and stays still for a further 5 seconds. It then returns to its starting position at half of the initial velocity.

The journey is shown on the distance time graph below.



- a) Calculate the velocity in the first 5 seconds of the journey.

.....

.....

- b) Which part of the graph identifies when the car is stationary?

.....

- c) What is the total distance travelled?

.....

- d) How long does the return part of the journey take?

.....

- e) What is the average speed for this journey, including the time when the car was stationary?

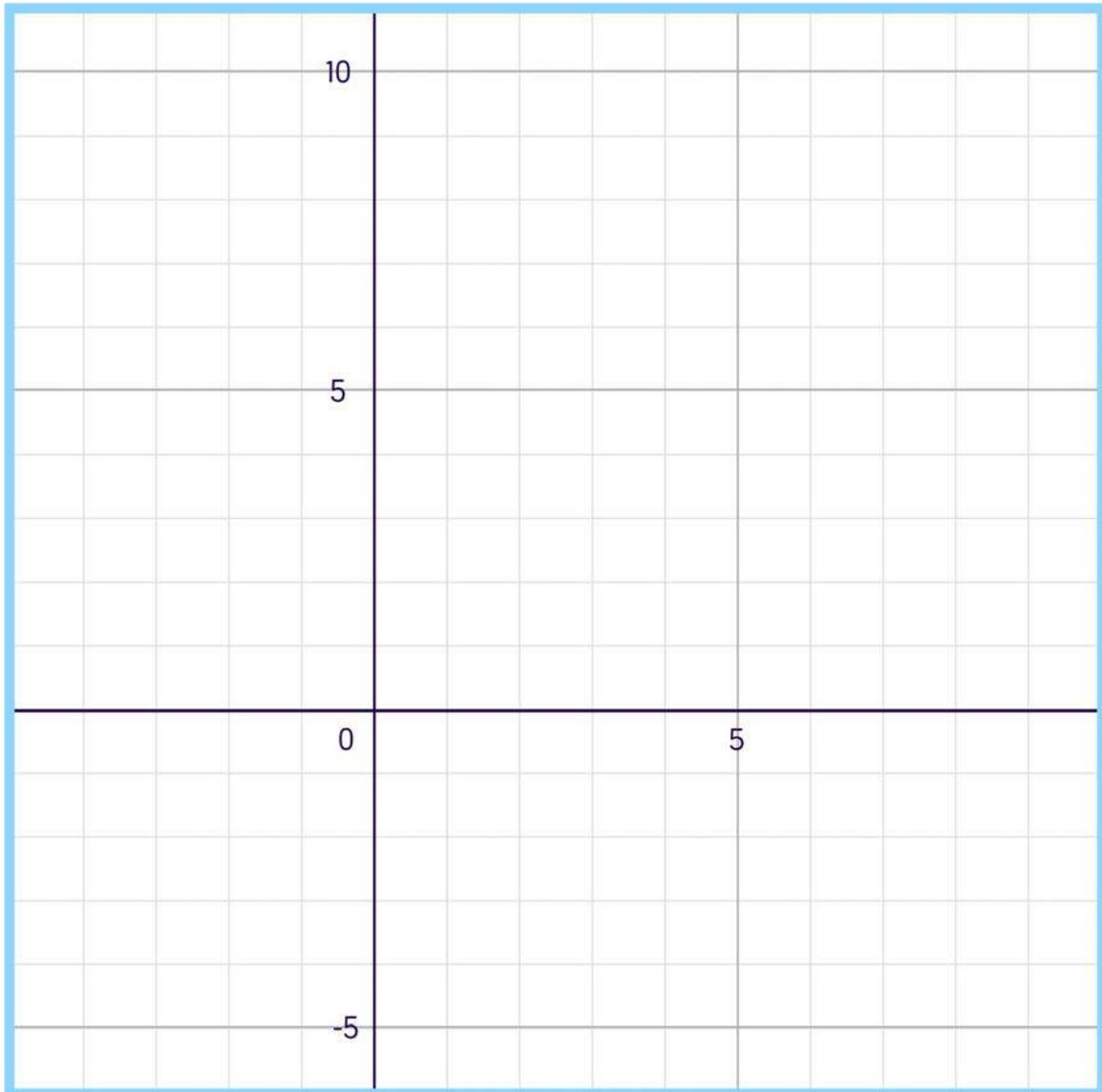
.....





3. a) Plot the graph of $y = x^2 - 5x$ in the interval $-1 < x < 5$

x	-1	0	1	2	3	4	5
y							

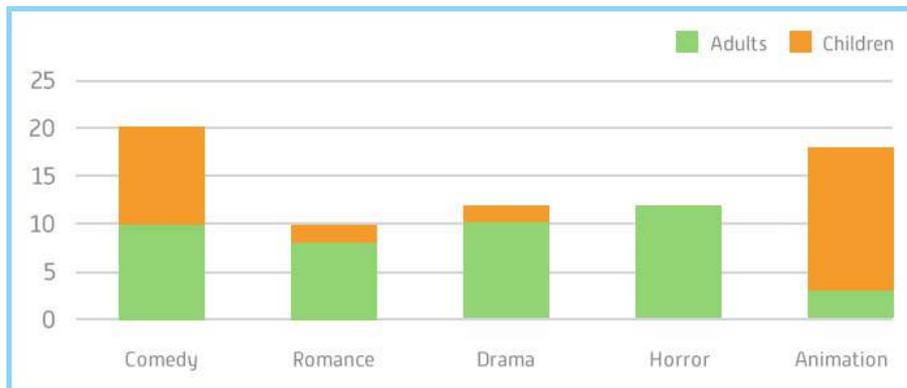


- b) Use your graph to write down the solutions to the equation $x^2 - 5x = -3$
-





4. People in a cinema were asked what their preferred genre of film was. The results are in the table below.



- a) How many people were asked in total?

.....

- b) What was the favourite genre of film with the adults?

.....

- c) What proportion of the people asked were children?

.....

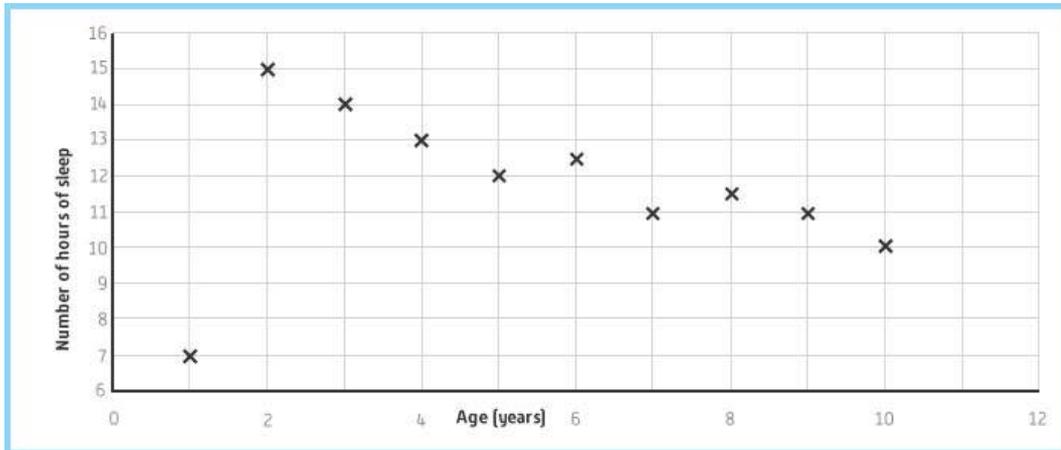
- d) What percentage of the children asked liked animation best?

.....





5. The following scatter graph shows the number of hours of sleep that different aged children had over the course of a 24 hour period.



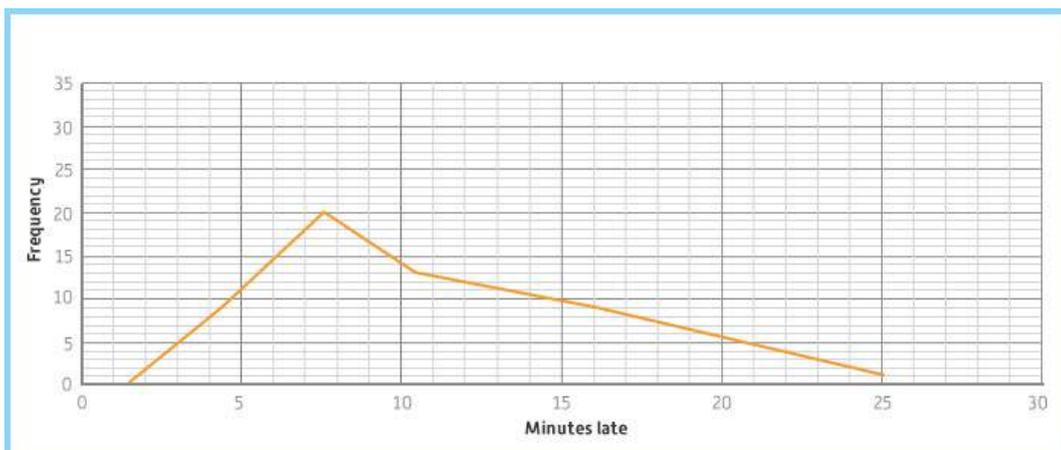
- a) Draw a line of best fit through this data.
- b) Identify an outlier.
- c) Use your graph to predict how much sleep an 11-year-old will need, and comment on the reliability of your result.

.....

.....

.....

6. 50 people are invited to a party which starts at 8 p.m. The number of minutes late they arrive is recorded on the frequency polygon below.





a) Complete the frequency table:

Minutes late	Frequency
$0 < x \leq 3$	
$3 < x \leq 6$	
$6 < x \leq 9$	
$9 < x \leq 12$	
$12 < x \leq 20$	
$20 < x \leq 30$	
Total	

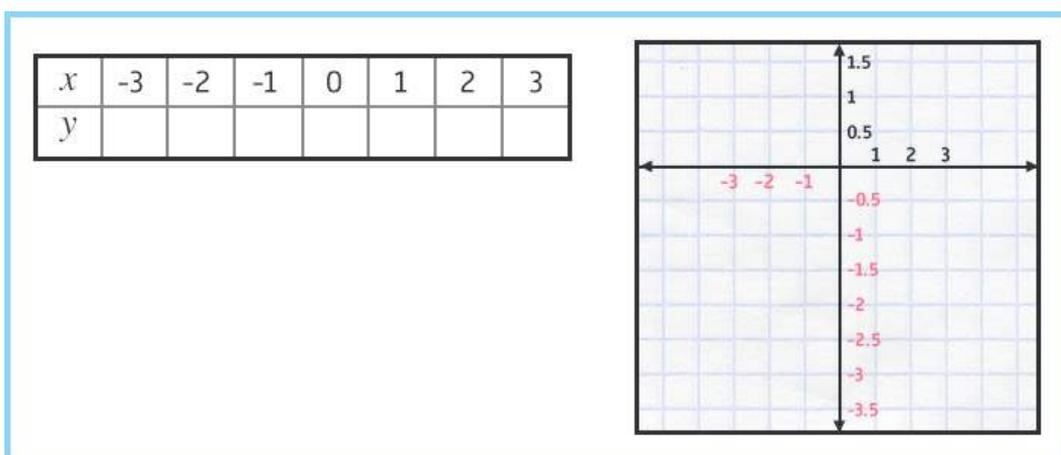
b) Shivani says that at least half of these partygoers were 9 or fewer minutes late. Is she correct?

.....

c) What percentage of the partygoers were more than 12 minutes late?

.....

7. Complete the table of values for the graph $y = 0.2x - 1.75$ and plot this graph on the axes below.





8. The two-way table below shows the after-school sport opted for by 74 pupils.

	Cricket	Tennis	Swimming	Total
Boys	10	14		41
Girls		6		
Total	14		40	

- a) Complete the table
 b) What proportion of the students are girls?

.....

- c) What is the ratio of the sports cricket to tennis to swimming chosen in its simplest form?

.....

- d) What percentage of those that chose swimming are boys?

.....

- e) Mr Thomas claims a higher proportion of the tennis players than the cricketers are girls. Is he correct? You must explain your answer.

.....

.....

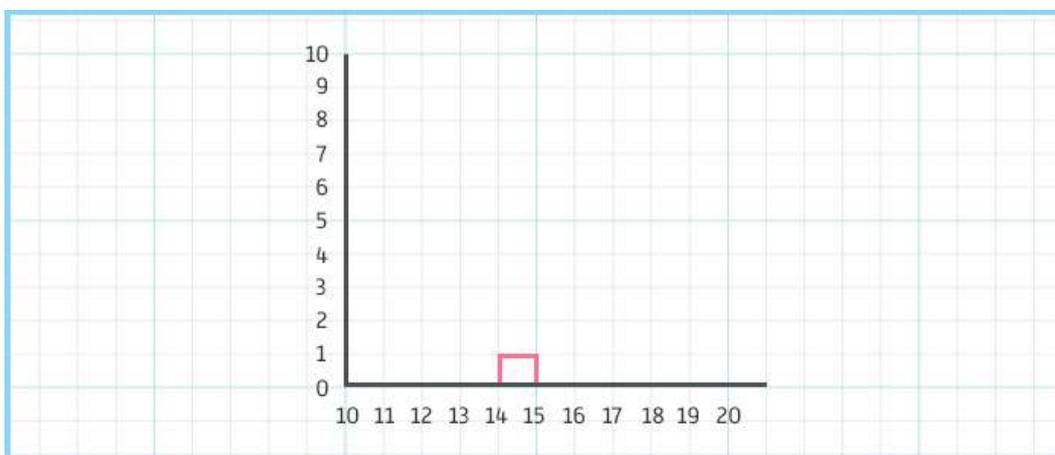




9. The following is a table of times taken to run 100m from 30 students:

Time (seconds)	Frequency
$14 < x \leq 15$	1
$15 < x \leq 16$	2
$16 < x \leq 17$	4
$17 < x \leq 18$	8
$18 < x \leq 19$	10
$19 < x \leq 20$	6
Total	30

- a) Display this data on a bar chart.



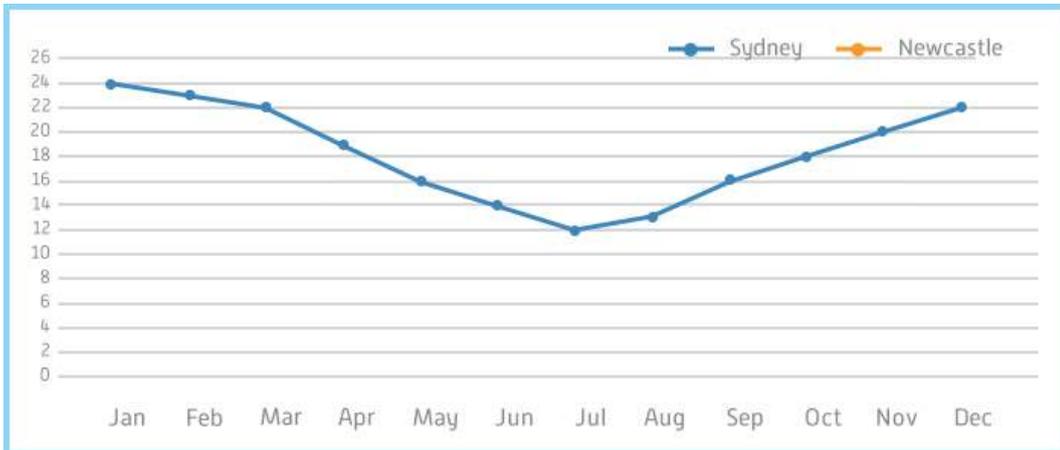
- b) What is the modal class of time taken to run 100m?
-



10. The chart shows the average temperatures by month for two cities, Sydney and Newcastle.

	Sydney	Newcastle		Sydney	Newcastle
January	24	3	July	12	13
February	23	4	August	13	14
March	22	5	September	16	12
April	19	6	October	18	9
May	16	9	November	20	6
June	14	12	December	22	5

a) Draw the line graph for Newcastle.



b) In which month is there the largest difference in temperatures between the two cities? Can you give a reason for this?

.....

.....

c) What percentage of months are warmer in Newcastle than they are in Sydney?

.....

.....



Answer Keys

Please refer to workbook for question content

Module 5

Charts and Graphs

Lesson 1

Money Problems

Quiz

1. c) 26
2. b) Boys
3. b) Most months show more boys off than girls
4. a) $(10 / 36) \times 360$
5. c) Lizard
6. b) 75%
7. a) 15
8. b) 30
9. b) 2
10. a) 68





Practise (Non-Calculator)



1.

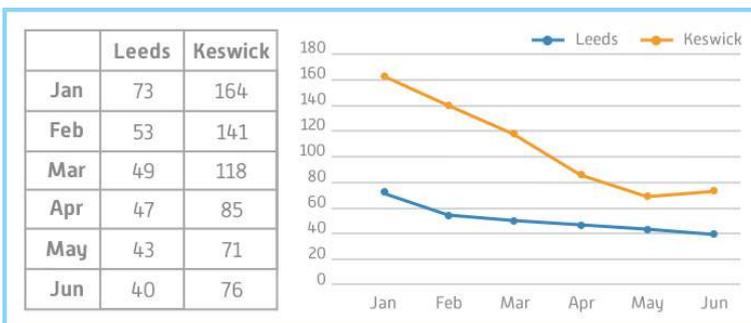
	Physics	Biology	Chemistry	Total
Boys	10	14	17	41
Girls	4	6	23	33
Total	14	20	40	74

2. $14/74 = 7/37$

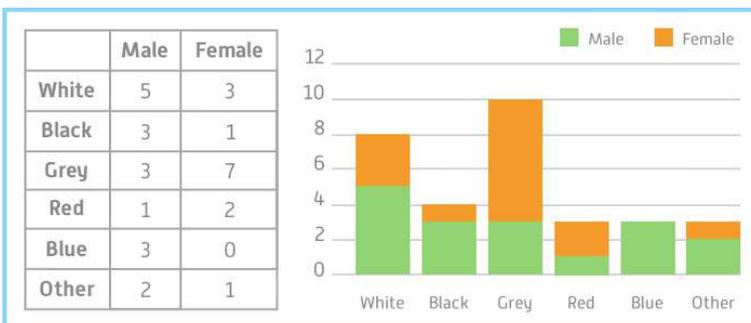
3.



4.



5.





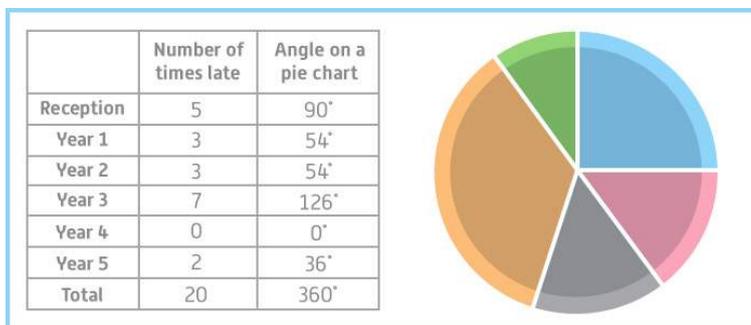
Practise (Calculator)



1.

	Number of times late	Angle on a pie chart
Reception	5	90°
Year 1	3	54°
Year 2	3	54°
Year 3	7	126°
Year 4	0	0°
Year 5	2	36°
Total	20	360°

2.

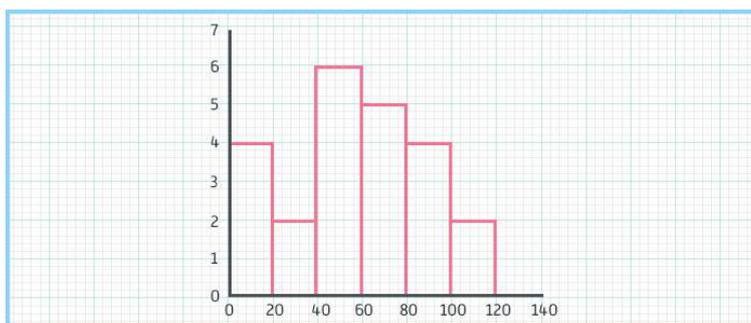


3. 12000 = $\frac{1}{4}$ of the shoes sold
 12000 \times 4 = 48000 pairs of shoes sold in total.

4.

Grouped x	Frequency, F
0 < x \leq 20	4
20 < x \leq 40	2
40 < x \leq 60	6
60 < x \leq 80	5
80 < x \leq 100	4
100 < x \leq 120	2
Total	23

5.





Lesson 2

Scatter Graphs

Quiz

1. c) Strong positive correlation
2. a) The higher the maths score, the lower the physics score
3. c) No correlation
4. b) B
5. b) Weak negative correlation
6. d) 82
7. c) Outside of data range
8. a) 4
9. a) A
10. b) 15 lies outside of the range of the data



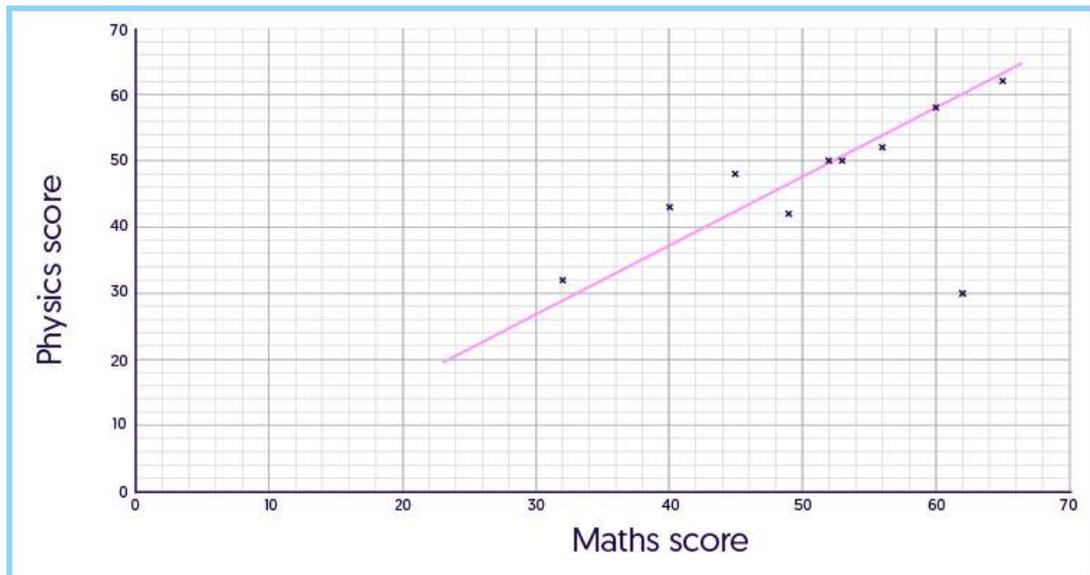


Practise (Calculator)



1. a) Maths 62 and Physics 30

b) Line drawn with shape of the data, ignoring the outlier.



c) Students who scored higher in Maths also scored higher in Physics.

d) Strong positive correlation.

e) Estimate lines drawn on graph from 54 and along to line of best fit and then down to maths score 56 [53-58]

f) Estimate lines drawn on graph from 25 and up to line of best fit and then across to physics score 22 [20-25]

g) Part e: estimating the maths score is more reliable as this data point is within the data set. Part f: the estimate for physics is outside of the data set and extrapolated.

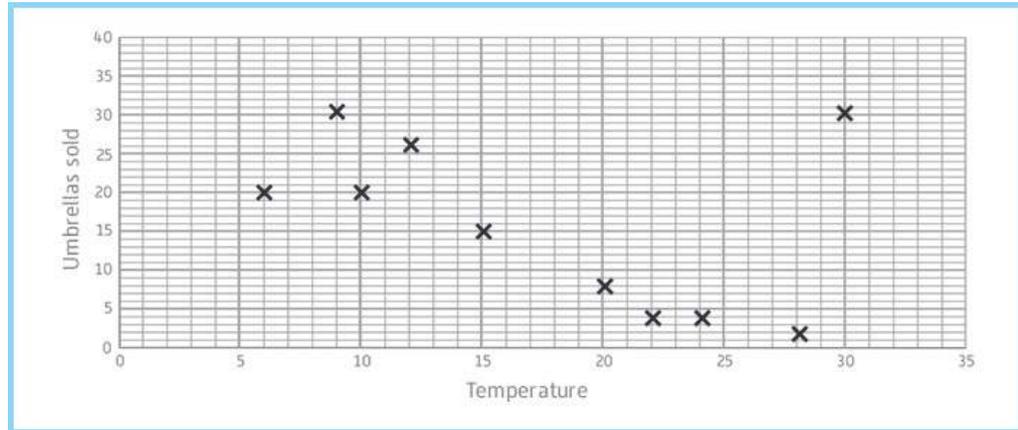
h) $65 - 32 = 33$

i) Range of physics scores = $62 - 30 = 32$

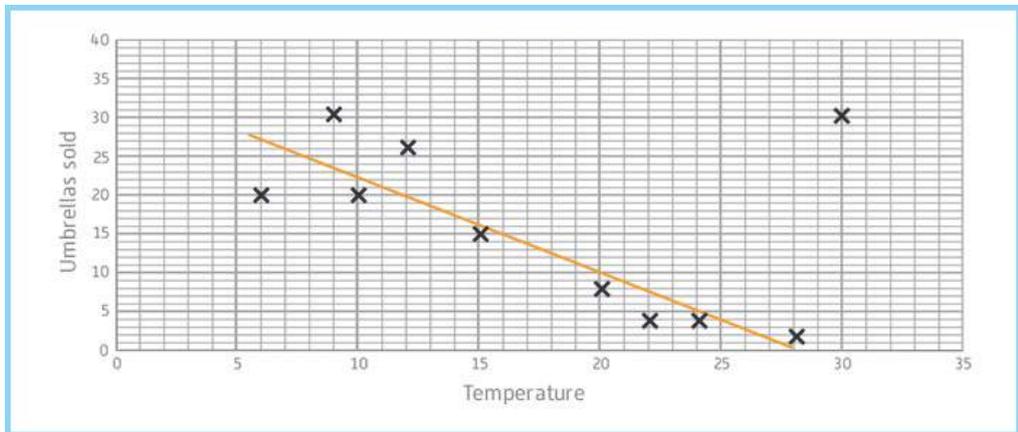


The physics scores are slightly more consistent as the range of scores is lower. If we ignore the outlier 30, then the range would be $62 - 32 = 30$, showing more consistency.

2. a)



b)

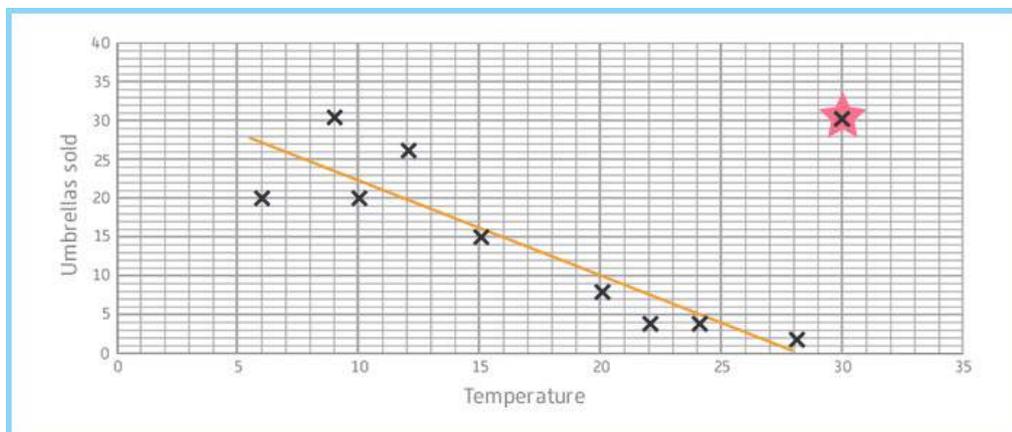


c) As the temperature rises, the number of umbrellas sold by the shop generally falls.

d) Negative correlation

e) Outlier

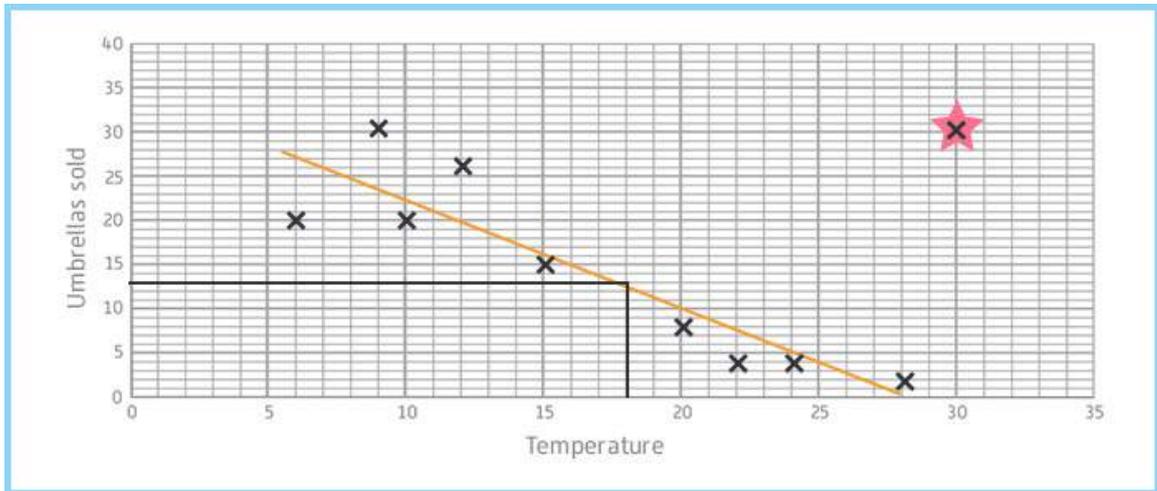
f)



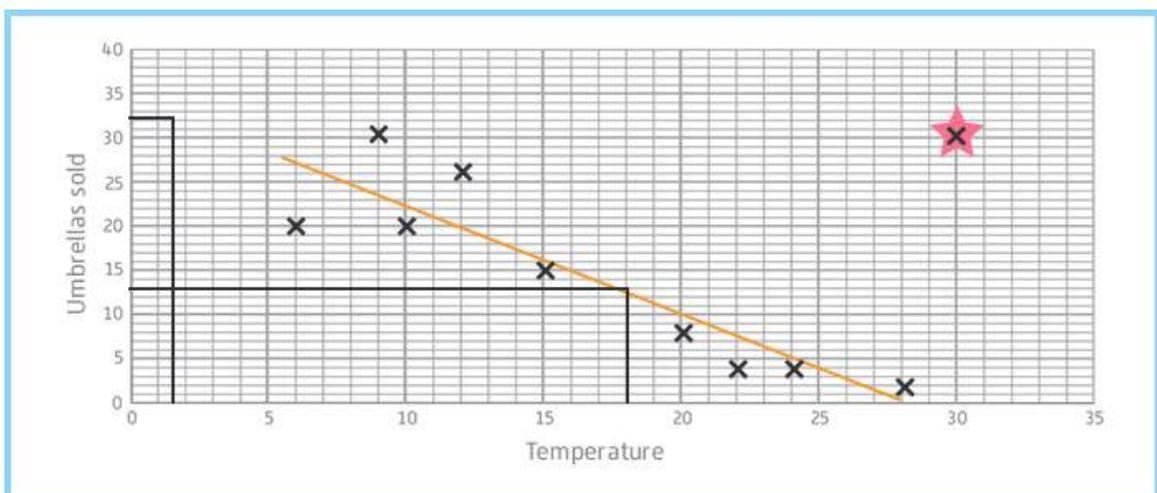


g) On a day where the temperature reaches 30 degrees there could have been a storm

h) 11-13 umbrellas.



i) Using graph, the estimate would be 1.5 degrees. This is not reliable as it is outside of the range of data and is achieved by extrapolation. The only other data value similar to this was an outlier from a very hot day. It is therefore possible that this was also a hot day.





Lesson 3

Linear Graphs

Quiz

1. b) $y = 0$
2. b) $y = mx + 1$
3. d) $[2, 5]$
4. c) Linear graphs
5. d) $y = mx + c$
6. a) $[2, 5]$
7. d) Velocity
8. a) 3
9. c) $3y = x - 2$
10. a) $[-2 - -6] / [4 - 1] = 4/3$



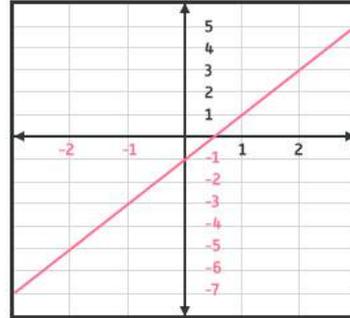


Practise (Calculator)



1.

x	-3	-2	-1	0	1	2	3
y	-7	-5	-3	-1	1	3	5

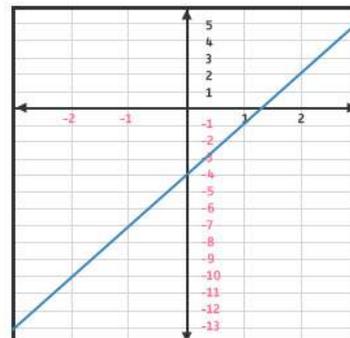


2. a)

x	-3	-2	-1	0	1	2	3
y	-13	-10	-7	-4	-1	2	5

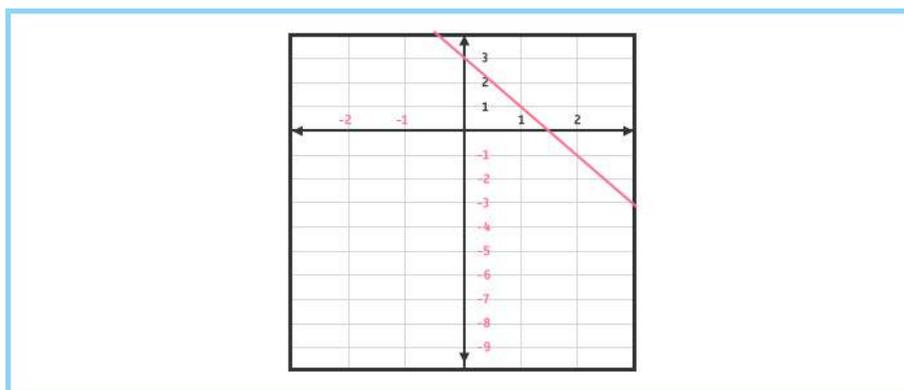
b)

x	-3	-2	-1	0	1	2	3
y	-13	-10	-7	-4	-1	2	5





3.



4.



5. Identify 2 coordinate pairs:

$(0, 6)$ and $(3, 0)$

Change in y / change in $x = -6/3 = -2$

6. Change in y / change in $x = [-4 - -7] / [1 - -2] = 3 / 3 = 1$

$$y = mx + c$$

Substitute in $m = 1$ and $[x, y] = [1, -4]$ to find $c = -5$

$$y = x - 5$$

7. $y = -\frac{2}{3}x + \frac{7}{3}$ therefore $m(\text{gradient}) = -\frac{2}{3}$ and c (y intercept) = $\frac{7}{3}$



8. Gradient = 2

$$y = mx + c$$

Substitute $m = 2$ and $[x, y] = [1, 0]$

$$0 = 2 \times 1 + c, \text{ therefore } c = -2$$

$$y = 2x - 2$$

9. Point A has y coordinate 0.

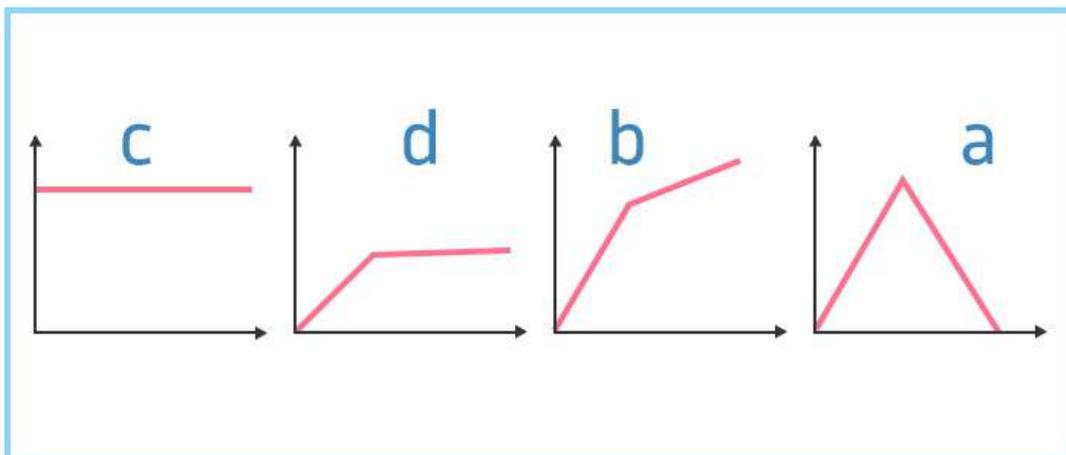
$$0 = -3x + 4$$

$$4 = 3x$$

$$4/3 = x$$

Coordinate = $[4/3, 0]$

- 10.





Lesson 4

Quadratic, Cubic and Reciprocal Graphs

Quiz

1. c) $y = 4 - x^2 + 2x$
2. b) $y = x^2 - 2x - 3$
3. c) Reciprocal
4. c) Cubic
5. d) $(x+1)(x-4) = y$
6. b) $[1, -4]$
7. c) $x = 1$
8. a) $[-2, 4]$
9. c) 0
10. b) -6





Practise (Non-Calculator)



1.

x	-2	-1	0	1	2
y	10	4	0	-2	-2

2.

x	-2	-1	0	1	2
y	-12	-5	-4	-3	4

3.

x	-2	-1	0	1	2
y	-2	-4	x	4	2

4. The solutions are found where the graph crosses the line $y = 0$; the x axis.
The graph crosses where $x=0$ and $x=3$. These are the solutions to $0 = x^2 - 3x$, and are sometimes called the roots.
5. The turning point where the graph is at a minimum at the coordinates $(3, -5)$



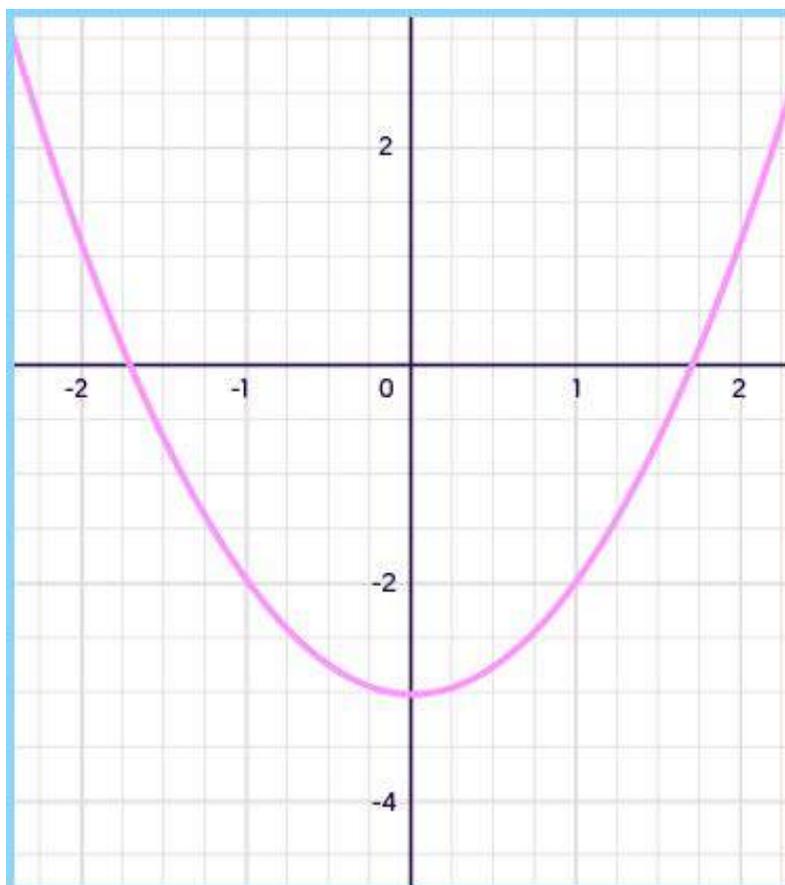
Practise (Calculator)



1. The solutions to the equation $x^2 = 2x + 1$ are the points where the curve and the line meet;
 [-0.4, 0.2] and [2.4, 5.8]
 Allow ± 0.2 to all values.

2.

x	-2	-1	0	1	2
y	1	-2	-3	-2	1

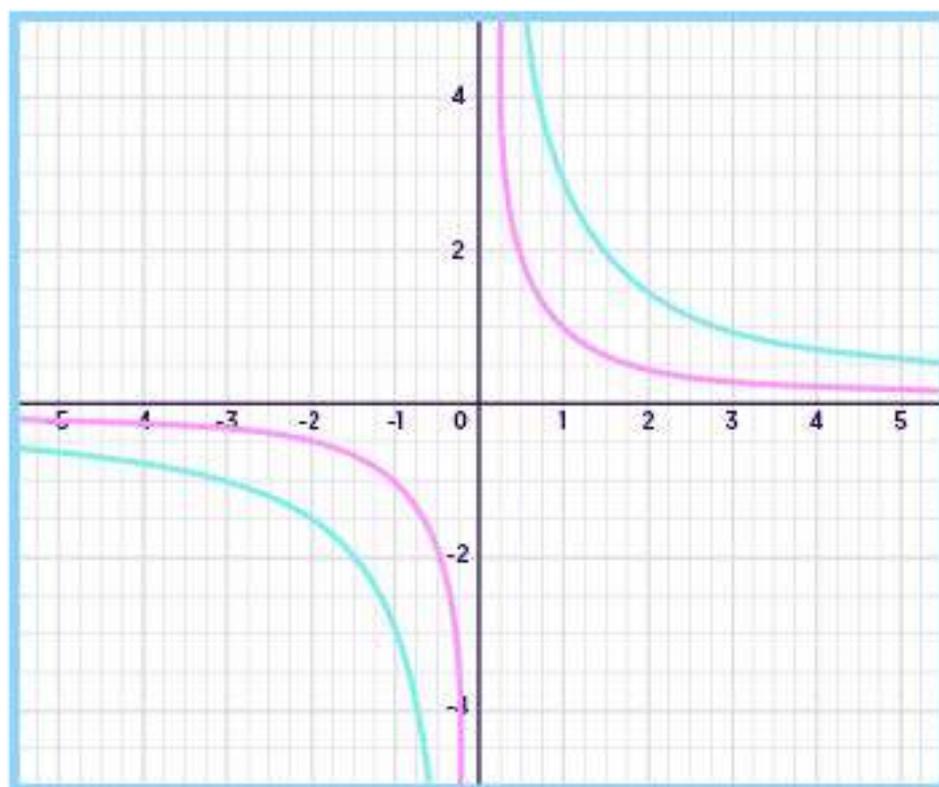


3. The roots of the equation are found where the graph intersects the x axis;
 $x = -2$, $x=0$ and $x=2$





4.



5. The asymptotes are the equations which represent all of the points that the graph cannot take.

The asymptotes for the graph $y = 1/x$ are $y = 0$ and $x = 0$, otherwise known as the x axis and the y axis.



Apply (Non-Calculator)

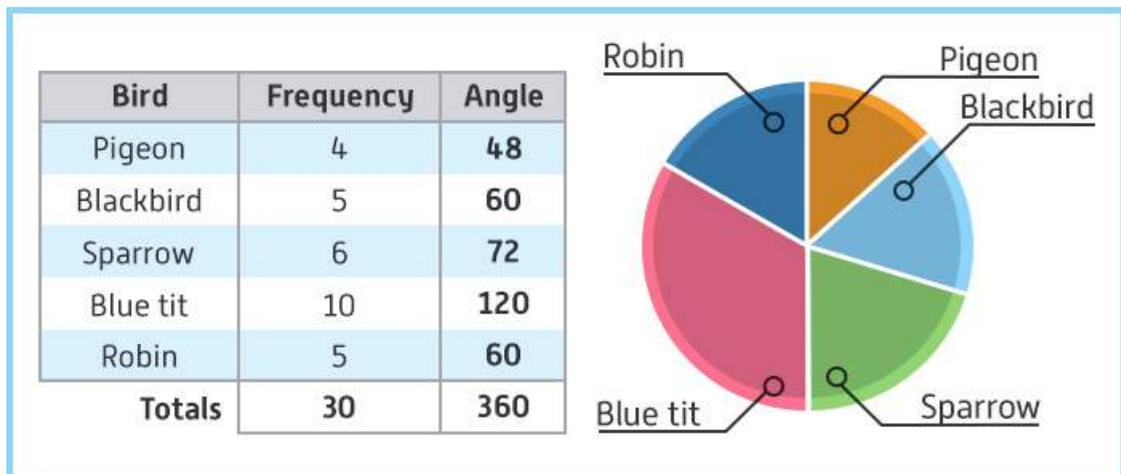


1.
 - a) v)
 - b) ii)
 - c) iv)
 - d) iii)
 - e) i)

2.
 - a) 2010 shows the largest difference of 9g/day.
 - b) No, in 1970 Children consumed 10g and adults 9g per day.
 - c) Upward trend of consumption at each entry point. Adults usually consuming more on average than children.

3.

a)



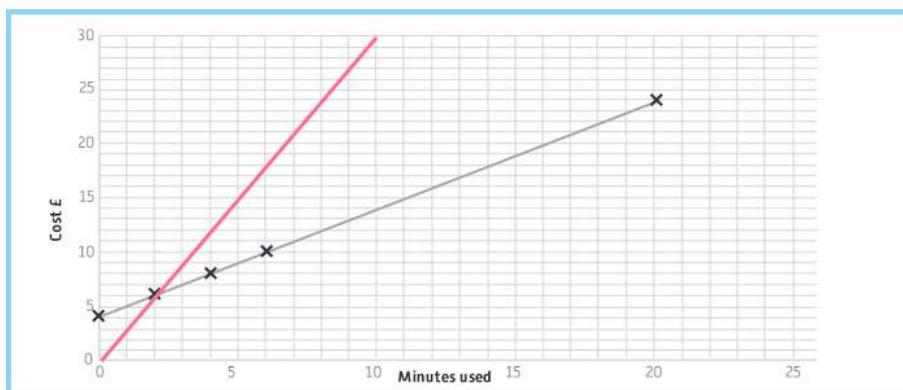
- b) The mode is the most frequently occurring – Blue tit.





4. a) The standard charge of £4 before you use any minutes.

b)



c) Intercept = $(2, 6)$

When time = 2 minutes, both tariffs charge £6

d) If you use less than 2 minutes, tariff 2 is cheaper. If you use more than 2 minutes, tariff 1 is cheaper.

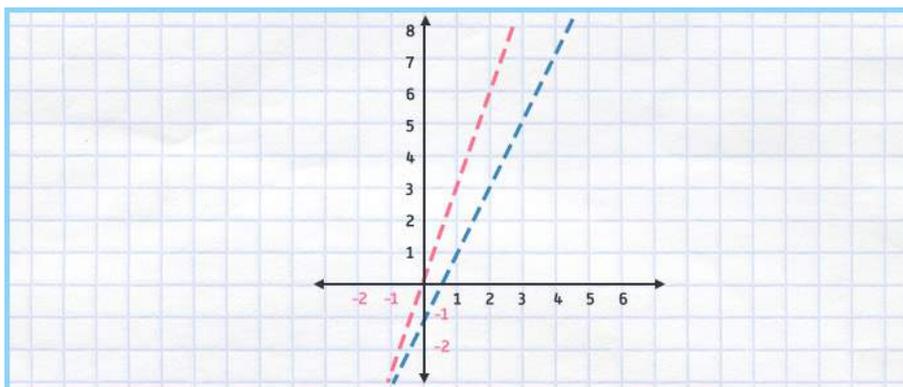
5. Ratio of lines = 1:2

Using parallel line geometry, if AB = '2 along, 6 up' then BC = '4 along, 12 up'

C therefore = $(8, 23)$

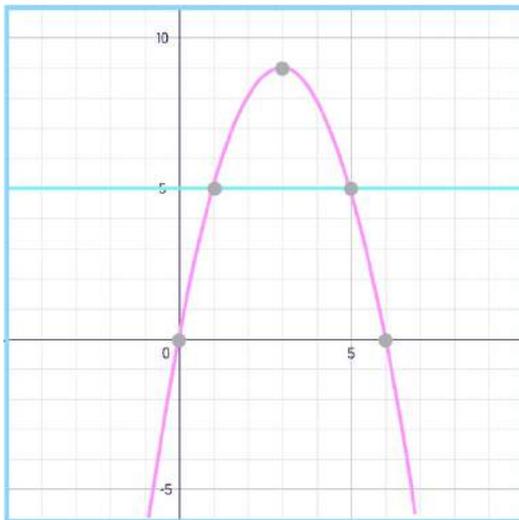
6. Intercept $(-1, -3)$

$x = -1$



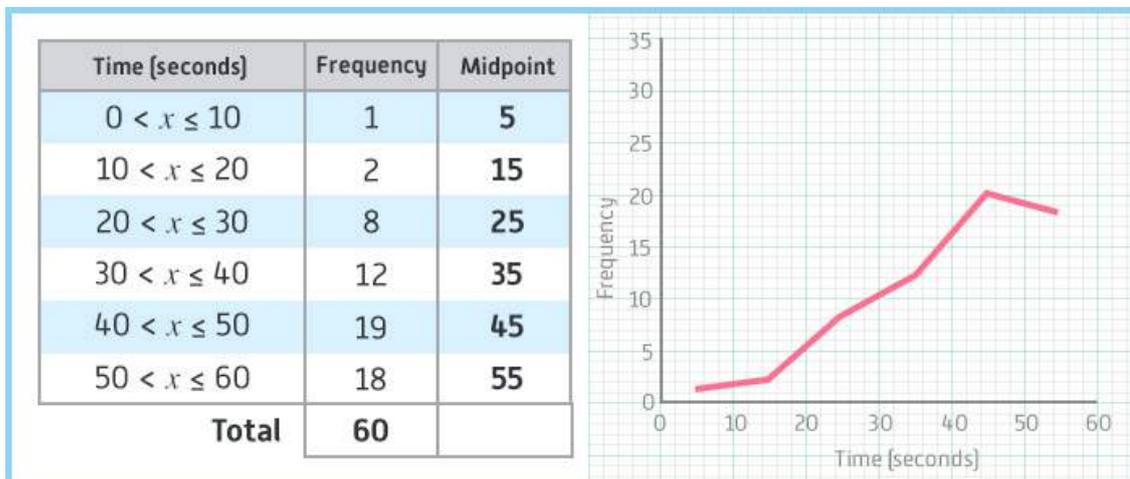


7. a) $x = 0$ and $x = 6$
 b) $(3, 9)$
 c) $x = 3$
 d) Solutions are the x values at the intersection of the graphs $y = 6x - x^2$ and $y = 5$; $x = 1$ and $x = 5$



8. y intercept from equation = $(0, 4)$
 x intercept occurs when $y = 0$, therefore $0 = 2x + 4$ leading to $x = -2$.
 Area bound by $(-2, 0)$, $(0, 0)$ and $(0, 4)$ is a right-angled triangle.
 Area = $0.5 \times 2 \times 4 = 4$ square units

9.





10. a) Modal class = highest frequency class
 $40 < x \leq 50$ as this is the group with the highest frequency
 b) Calculate the cumulative frequencies:

Time (seconds)	Frequency	
$0 < x \leq 10$	2	2
$10 < x \leq 20$	4	6
$20 < x \leq 30$	8	14
$30 < x \leq 40$	14	28
$40 < x \leq 50$	25	53
$50 < x \leq 60$	10	63
Total		

The class which contains the median is that which contains the $(63 + 1)/2$ th value which is the 32nd value. This is the $40 < x \leq 50$ interval.

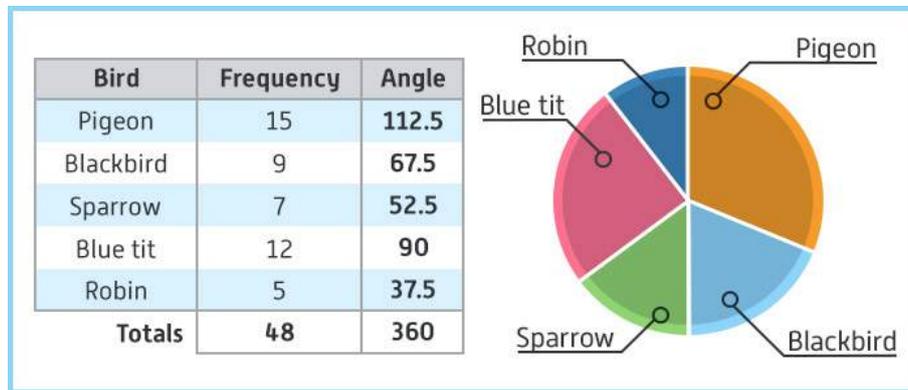
Class which contains the median = $40 < x \leq 50$



Apply (Calculator)



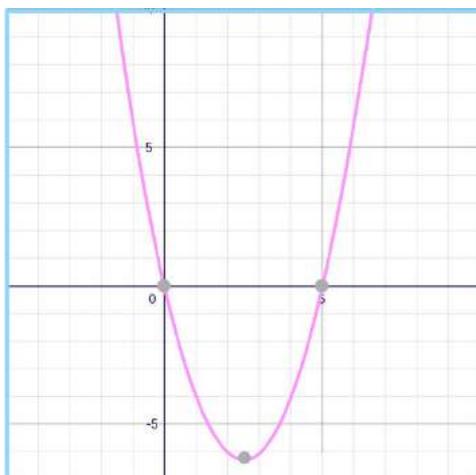
1.



2. a) $40 / 5 = 8\text{m/s}$
 b) The horizontal line segment
 c) 80m
 d) 10 seconds
 e) $80 / 20 = 4\text{ m/s}$

3. a)

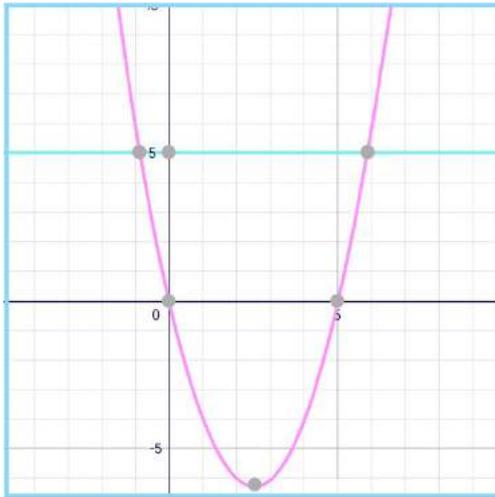
x	-1	0	1	2	3	4	5
y	6	0	-4	-6	6	-4	0





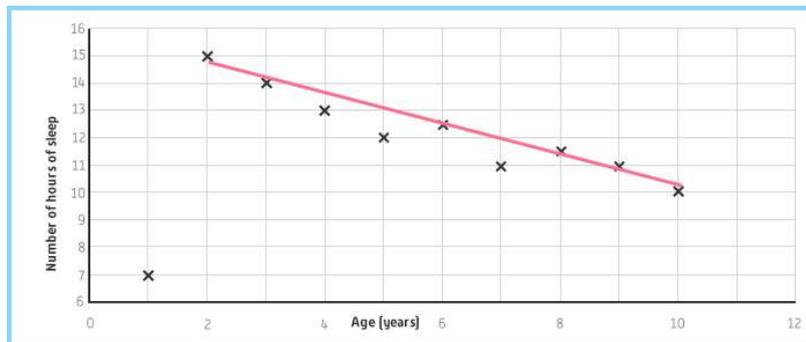
b) Solutions are found where the graph $y=x^2 - 5x$ intercepts the graph $y = -3$,
 $x = 0.7$ and $x = 4.3$ [Allow 0.2 either way or FT from graph]

Mark awarded from reading from drawn graph with intercepts clearly labelled.

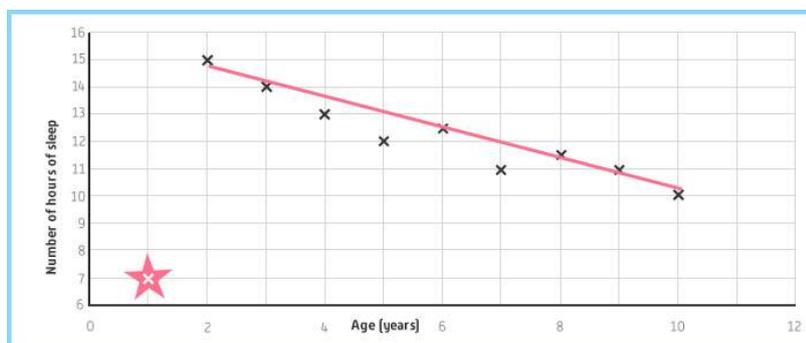


4. a) 72
 b) Horror
 c) $29/72$
 d) $15/29 = 51.7\%$

5. a)

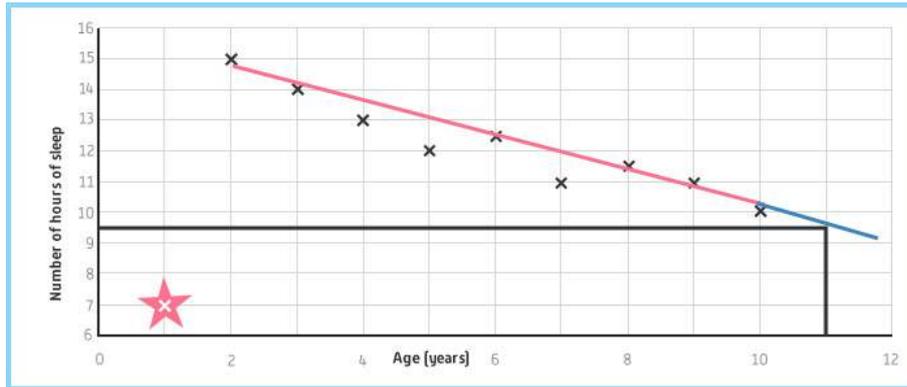


- b)





c)



Using line of best fit, 9.5 hours sleep. Extrapolation – this is outside of our data set and so it is unreliable.

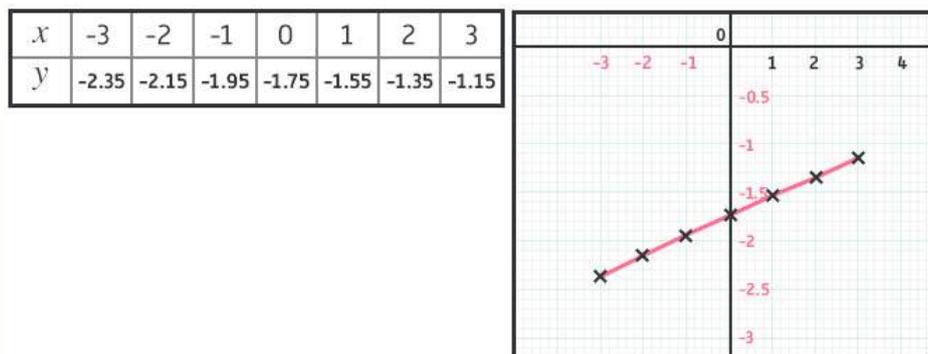
6.

a)

Minutes late	Frequency
$0 < x \leq 3$	0
$3 < x \leq 6$	7
$6 < x \leq 9$	20
$9 < x \leq 12$	13
$12 < x \leq 20$	9
$20 < x \leq 30$	1
Total	50

- b) $7 + 20 = 27$ partygoers under 9 minutes late
 $27 / 50 = 54\% > 50\%$ so yes, Shivani is correct
- c) $10 / 50 = 20\%$

7.





8.

a)

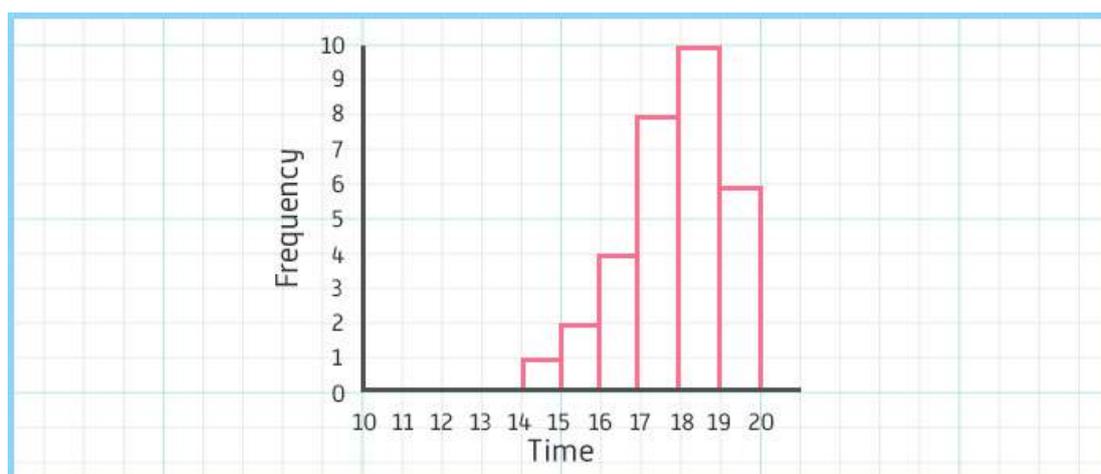
	Cricket	Tennis	Swimming	Total
Boys	10	14	17	41
Girls	4	6	23	33
Total	14	20	40	74

b) $33/74$ c) $14:20:40 = 7:10:20$ d) $17/40 = 42.5\%$ e) Tennis: $6/20 = 0.3$ Cricket: $4/14 = 0.29$

Yes, Mr Thomas is correct.

9.

a)

b) $18 < x \leq 19$ seconds



10.

a)



b) January – difference = 21 degrees.

Reason – Middle of winter vs middle of summer in different hemispheres.

c) $2/12 = 16.7\%$

