1 QUESTION ON EVERY TOPIC
GCSE HIGHER

Video Solutions

SCAN ME

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1 (a) Expand and simplify $7(x - 3) - 2(x - 10)$

.....

(2)

(b) Factorise fully $8x^2y - 10xy^3$

.....

(2)

(Total for Question 1 is 4 marks)

2 Write 92 as a product of its prime factors.

.....

(Total for Question 2 is 2 marks)

3 Chloe buys a phone for £120.

She sells it for £138.

Work out Chloe's percentage profit.

..... %

(Total for Question 3 is 2 marks)

4 (a) Work out $4\frac{1}{2} \div 1\frac{3}{4}$

Give your answer as a mixed number in its simplest form.

.....

(3)

(b) Work out $3\frac{2}{3} - 1\frac{2}{5}$

Give your answer as a mixed number in its simplest form.

.....

(3)

(Total for Question 4 is 6 marks)

5 Make b the subject of the formula $r = 9b - p$

.....

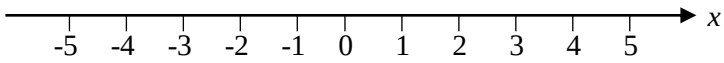
(Total for Question 5 is 2 marks)

6 (a) Solve $3x + 10 \leq 5 - 2x$

.....

(3)

(b) Represent your answer to part (a) on the number line below.



(2)

(c) $-9 \leq 2p - 5 < -3$

p is an integer
Write down all the possible values for p

.....

(3)

(Total for Question 6 is 8 marks)

7 (a) Find the reciprocal of 1.25
Give your answer as a decimal.

.....

(1)

(b) A number, n, is rounded to 1 decimal place.
The result is 6.4

Complete the error interval for n.

..... $\leq n <$ .....

(2)

(Total for Question 7 is 3 marks)

8 The table shows information about the time, t minutes, that 60 students spent revising.

Time (t minutes)	Frequency
$10 < t \leq 20$	28
$20 < t \leq 30$	13
$30 < t \leq 40$	13
$40 < t \leq 50$	6

(a) Write down the modal class.

.....

(1)

(b) Write down the interval containing the median.

.....

(1)

(c) Work out an estimate for the mean time spent revising.

..... minutes

(3)

(Total for Question 8 is 5 marks)

9 Use your calculator to work out $\dfrac{1.8^3}{\sqrt{17}-2}$

(a) Write down all the figures on your calculator display.

.....

(2)

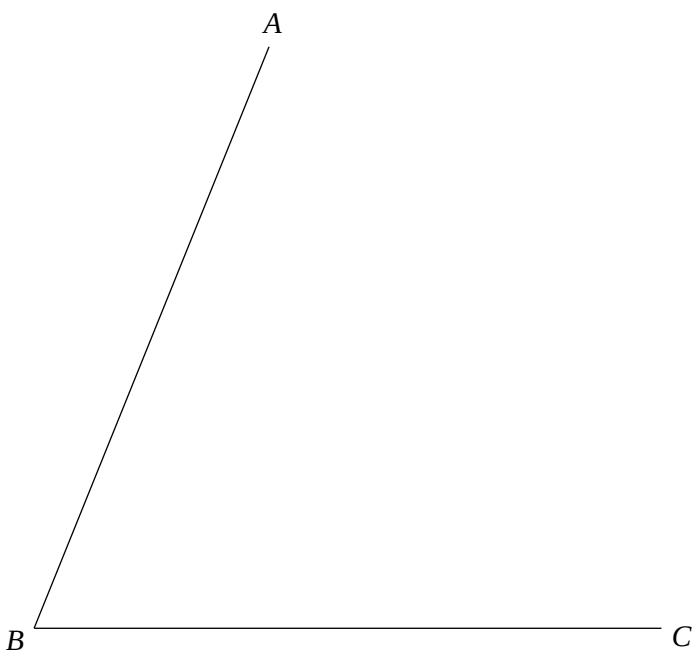
(b) Write your answer to part (a) correct to 3 significant figures.

.....

(1)

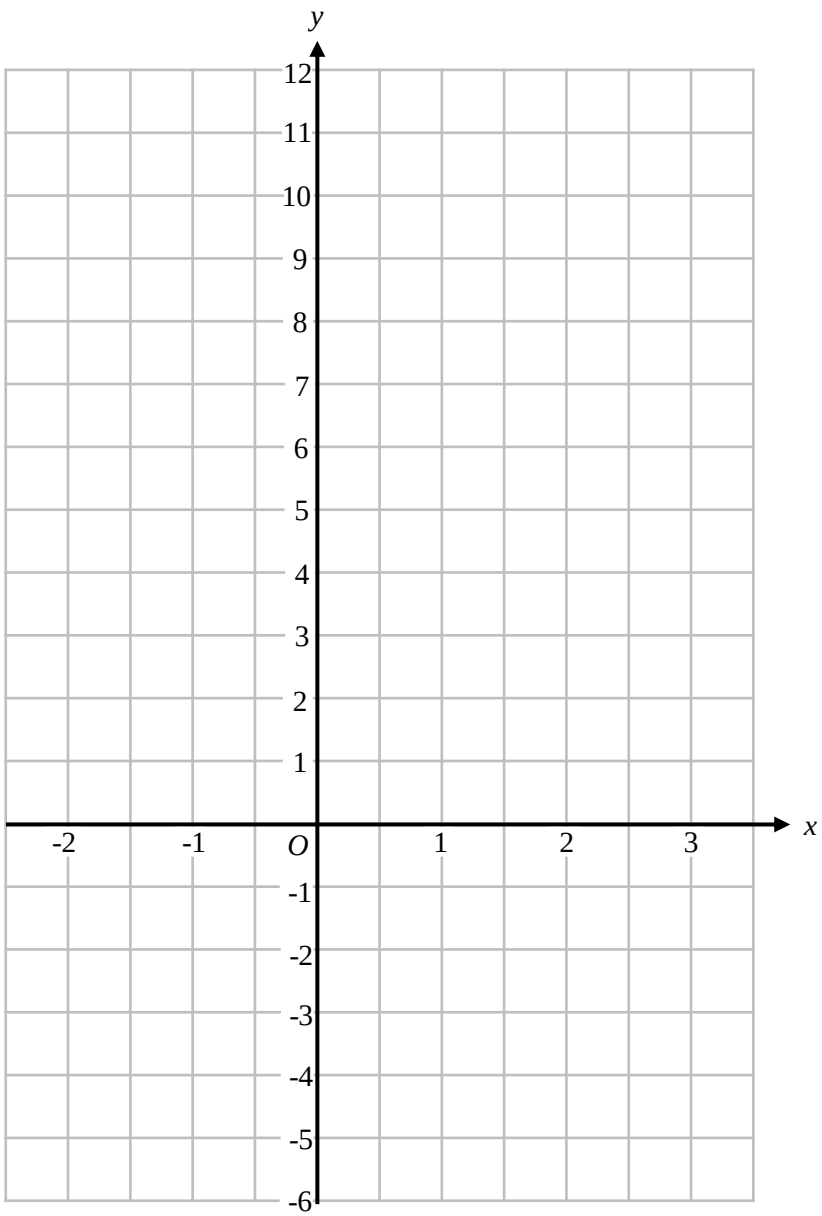
(Total for Question 9 is 3 marks)

10 Use a ruler and compasses to construct the line *BP* that bisects the angle *ABC*.
You must show **all** construction lines.



(Total for Question 10 is 2 marks)

11 (a) On the grid below, draw the graph of $y = 3x + 2$ for values of x from -2 to 3



(3)

(b) Does the point with coordinates (25, 77) lie on the line $y = 3x + 2$?
You must show how you get your answer.

.....

.....

(1)

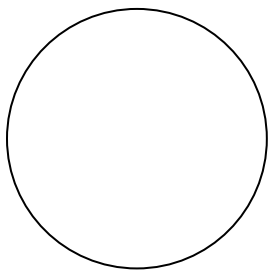
(Total for Question 11 is 4 marks)

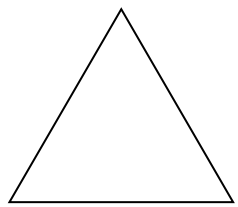
12 Work out an estimate for $\dfrac{699 \times 32}{0.21}$

.....

(Total for Question 12 is 3 marks)

13 Here is a circle and an equilateral triangle.





8 cm

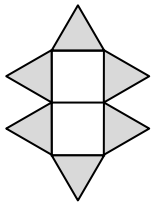
The circumference of the circle is 20% greater than the perimeter of the triangle.

Work out the area of the circle.
Give your answer to 3 significant figures.

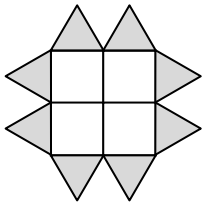
..... cm^2

(Total for Question 13 is 4 marks)

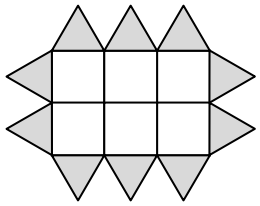
14 Here is a sequence of patterns made from square tiles ☐ and triangular tiles. △



pattern number 1



pattern number 2



pattern number 3

(a) Find an expression, in terms of n, for the number of triangular tiles in pattern n.

.....

(2)

Rich makes one of the patterns from the sequence.
He uses 88 total tiles.

(b) Work out how many **square** tiles Rich used.

..... square tiles

(3)

(Total for Question 14 is 5 marks)

15 The number of people visiting a cinema on Saturday was 20% more than it was on Friday.
The number of people who visited the cinema on Saturday was 9840

Work out the number of people who visited the cinema on Friday.

.....

(Total for Question 15 is 2 marks)

16 (a) Simplify $\frac{15x^6y^8}{3xy^2}$

.....

(2)

(b) Simplify $(2y^3)^5$

.....

(2)

(Total for Question 16 is 2 marks)

17 (a) Expand and simplify $(x - 5)(x - 8)$

.....

(2)

(b) Factorise $4x^2 - 9$

.....

(2)

(c) Solve $x^2 + 2x - 8 = 0$

.....

(3)

(Total for Question 17 is 7 marks)

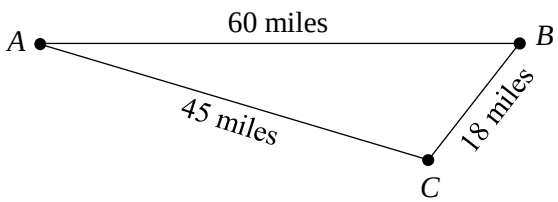
Solutions

18 A floor with an area of 10 m^2 can be tiled by 3 workers in 8 hours.
Work out how long it would take 4 workers to tile a floor that is 25 m^2
Assume that all workers can tile at the same rate.

..... hours

(Total for Question 18 is 3 marks)

19 A lorry and a car both travel from *A* to *B*.



The lorry takes the direct 60-mile route from *A* to *B* travelling at an average speed of 50 mph.
The car goes from *A* to *B* but passes through point *C* along the route.

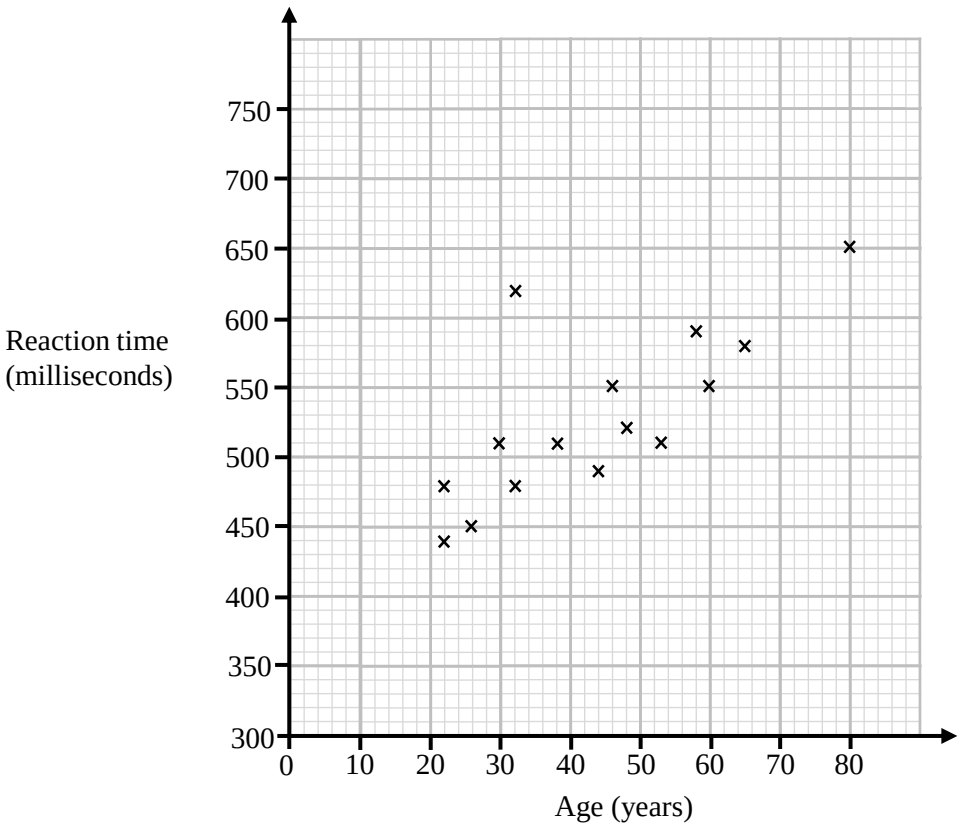
Between *A* and *C*, the car travels at an average speed of 60 mph.
Both vehicles depart *A* at the same time and arrive at *B* at the same time.

Work out the average speed of the car between *C* and *B*.

..... mph

(Total for Question 19 is 4 marks)

20 The scatter graph shows reaction times in milliseconds and the ages of 15 people.



(a) One of the points plotted on the scatter graph is considered an outlier.
Write down the coordinates of this point.

(..... , ...)

(1)

(b) For all the other points write down the type of correlation.

.....

(1)

A person aged 55 has their reaction time measured.

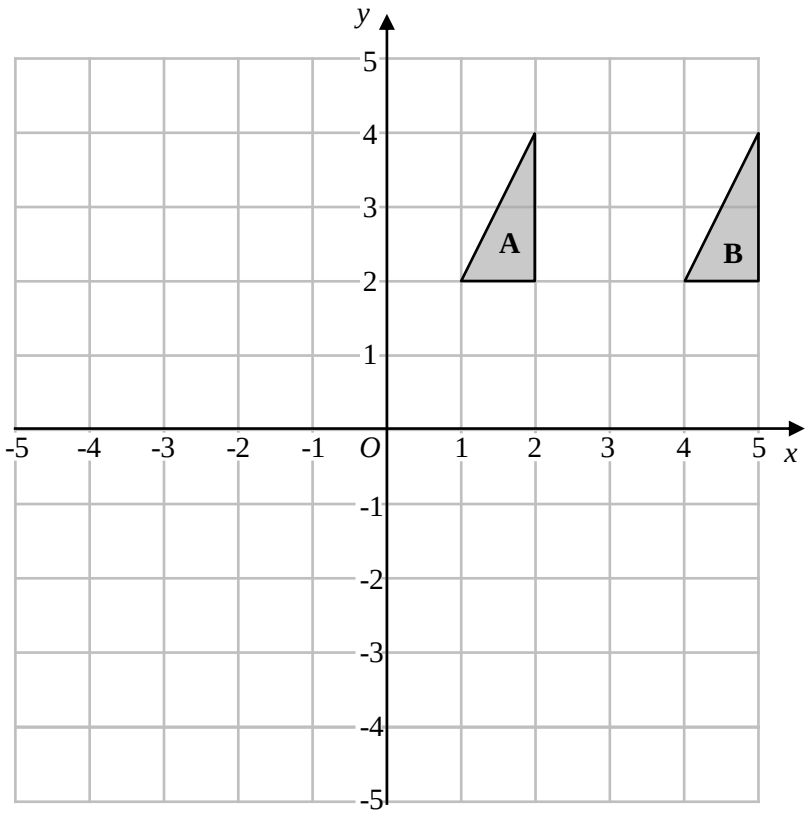
(c) Use the graph to estimate their reaction time.

..... milliseconds

(2)

(Total for Question 20 is 4 marks)

21



(a) Describe fully the single transformation that maps triangle **A** onto triangle **B**

.....

.....

(2)

(b) Rotate triangle **A,** 90° anticlockwise about the point (1,0)
Label the new triangle **C**.

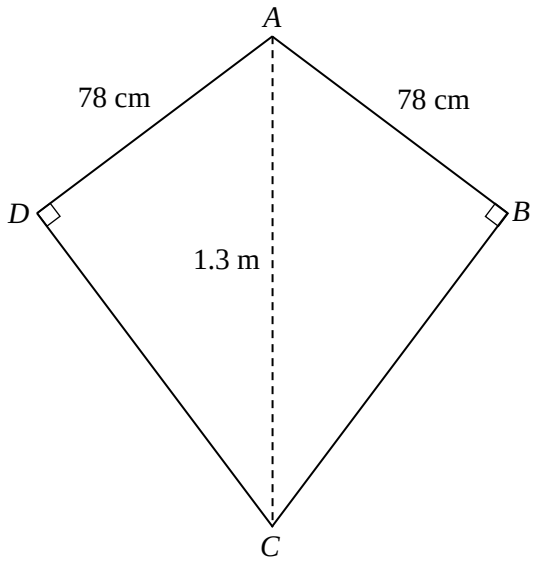
(2)

(c) Reflect triangle **A** in the line $y = 2$
Label the new triangle **D**.

(2)

(Total for Question 21 is 6 marks)

22 *ABCD* is a kite.



AB = *AD* = 78 cm
AC = 1.3 m
Angle *ADC* = Angle *ABC* = 90°

Work out the perimeter of the kite.
Give your answer in centimetres.

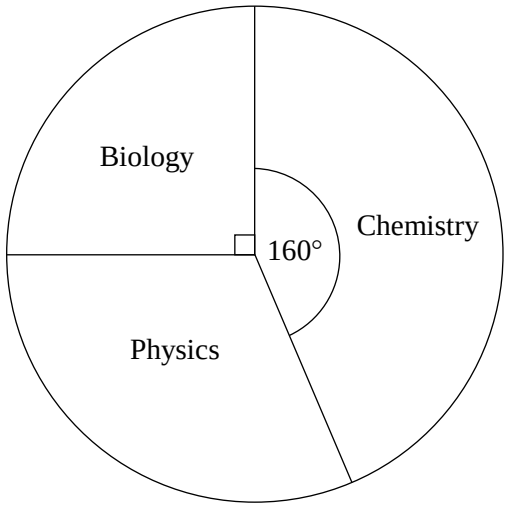
..... cm

(Total for Question 22 is 4 marks)

Solutions

23 Craig is revising for his science exams.

The pie chart below shows how much time he spends revising each of the subjects.



Craig spends 30 minutes longer revising Chemistry than he spends revising Physics.

Work out how many minutes Craig spends revising for Biology.

..... minutes

(Total for Question 23 is 3 marks)

Solutions

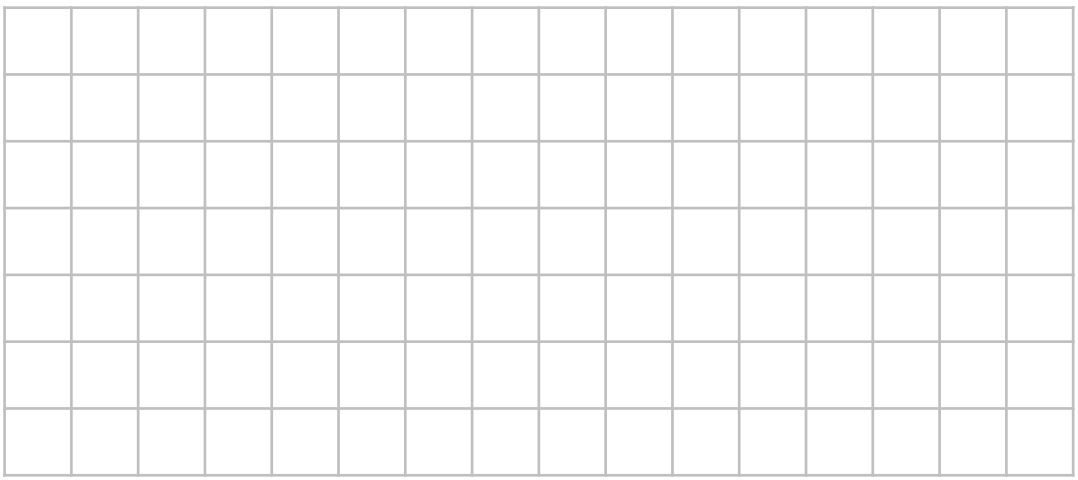
24 Here are two column vectors $\mathbf{a} = \begin{pmatrix} -6 \\ 5 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}$

(a) Work out $2\mathbf{a} - \mathbf{b}$ as a column vector.

$\begin{pmatrix} \ldots\ldots \\ \ldots\ldots \end{pmatrix}$

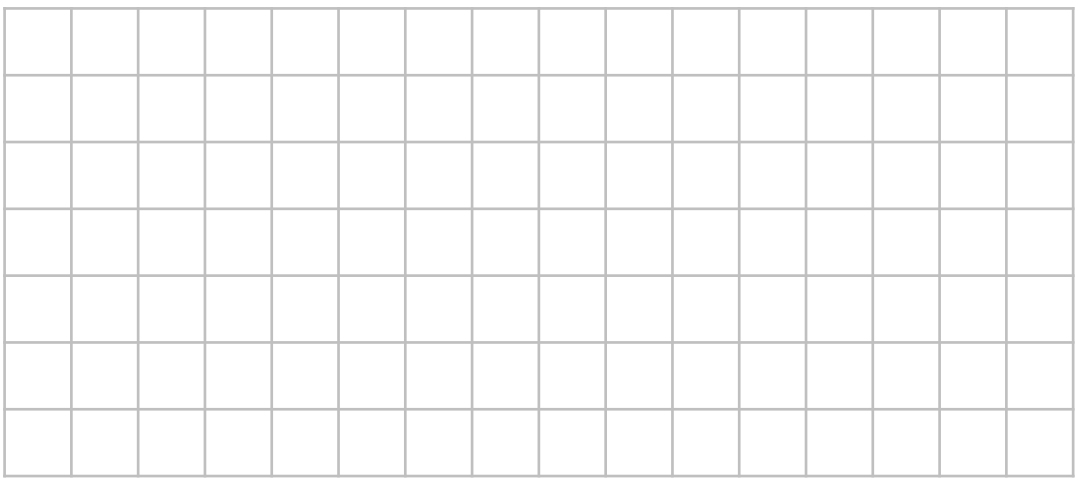
(2)

(b) On the grid below draw and label the vector $-\mathbf{a}$



(1)

(c) On the grid below draw a vector that is perpendicular to $\mathbf{b}$.



(1)

(Total for Question 24 is 4 marks)

25 Some of the ingredients needed to make 12 pancakes are shown below.

For 12 pancakes	
Flour	300 g
Milk	400 ml
Eggs	2

Raul has the following ingredients.

1500g of flour
1800 ml of milk
11 eggs

Work out the maximum number of pancakes that Raul can make.

.....

(Total for Question 25 is 3 marks)

26 Write these numbers in order of size
Start with the smallest number.

8.6×10^4 0.086 86×10^2 8600×10^{-4}

.....

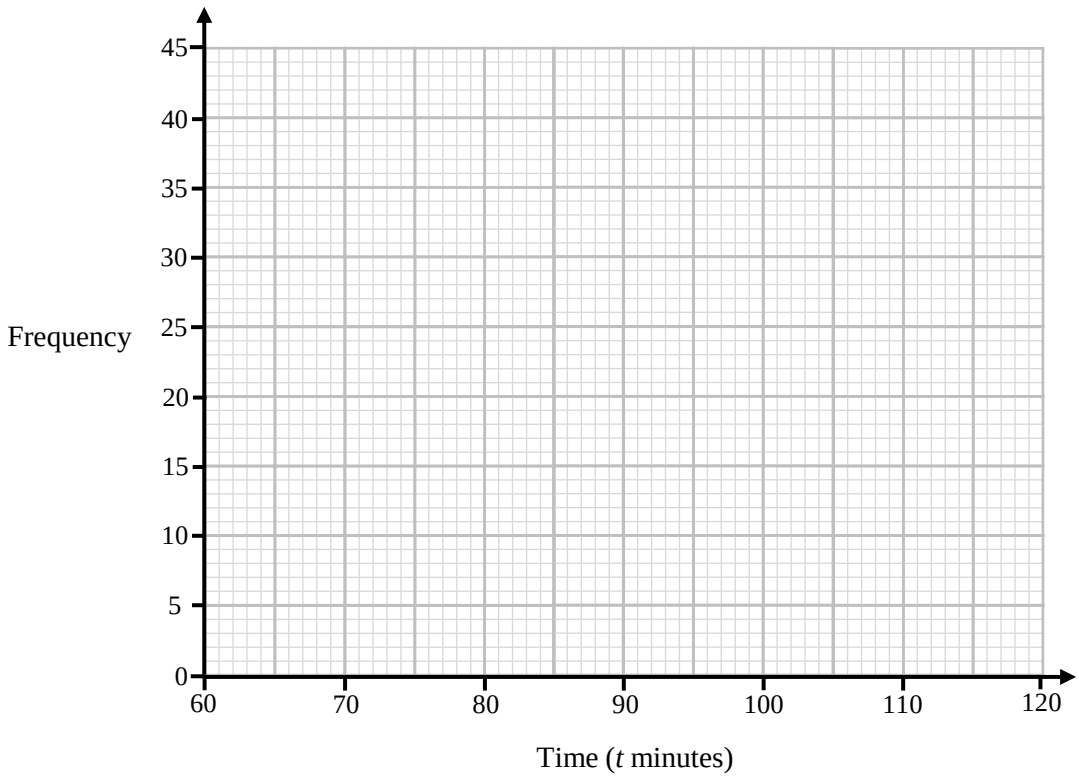
(Total for Question 26 is 2 marks)

Solutions

27 The table shows information about the time, t minutes, that 100 people took to complete a race.

Time (t minutes)	Frequency
$60 < t \leq 70$	3
$70 < t \leq 80$	12
$80 < t \leq 90$	15
$90 < t \leq 100$	44
$100 < t \leq 110$	26

On the grid, draw a frequency polygon for the information in the table.

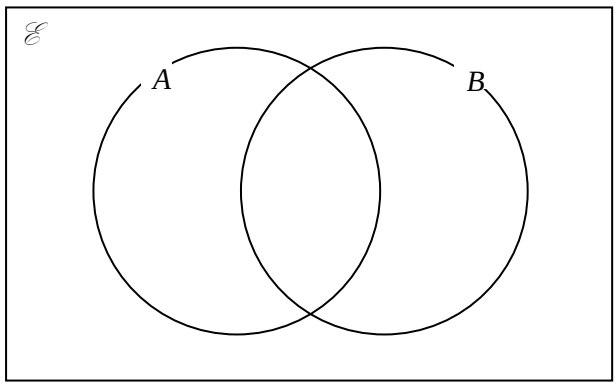


(Total for Question 27 is 2 marks)

Solutions

28 $\mathscr{E}$ = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
A = {multiples of 3}
B = {factors of 12}

(a) Complete the Venn diagram for this information.



(3)

A number is chosen at random from the universal set, $\mathscr{E}$

(b) Find the probability that this number is in the set A ∪ B

.....

(2)

(Total for Question 28 is 5 marks)

29 (a) Work out $(8 \times 10^{10}) \times (3 \times 10^{3})$
Give your answer in standard form.

.....

(2)

(b) Work out $\dfrac{1 \times 10^{3} + 2 \times 10^{2}}{4.8 \times 10^{-2}}$

Give your answer in standard form.

.....

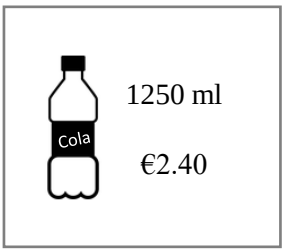
(3)

(Total for Question 29 is 5 marks)

30 Nadia buys her favourite Cola in the United Kingdom.
Whilst on holiday in Spain she sees the same Cola drink for sale.

United Kingdom

Spain



£1 = €1.17

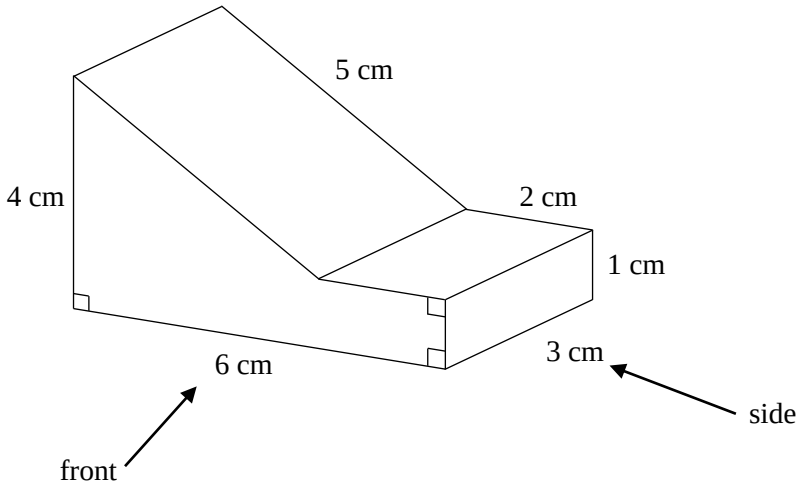
Which of the two bottles represents better value for money?
Show clearly how you got your answer.

.....

(Total for Question 30 is 4 marks)

Solutions

31 The diagram shows a prism with a cross section in the shape of a pentagon.



(a) On the centimetre grids below, draw the front elevation, side elevation and the plan of the prism.

Front elevation

Side elevation

Plan

Solutions

31 (b) Work out the volume of the prism.

..... cm^3

(Total for Question 31 is 4 marks)

32 Solve the simultaneous equations

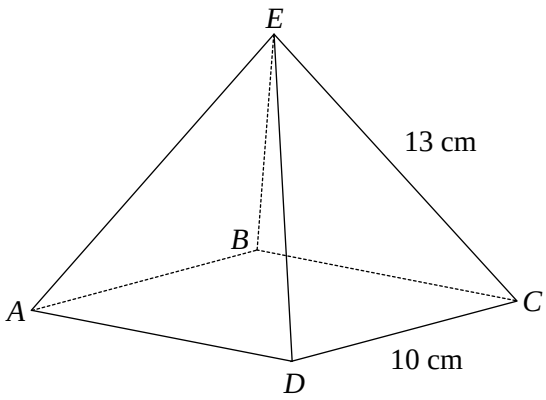
$$5x + 3y = 5$$
$$4x - 2y = -7$$

x = ...

y = ...

(Total for Question 32 is 3 marks)

33 *ABCDE* is a square-based pyramid.



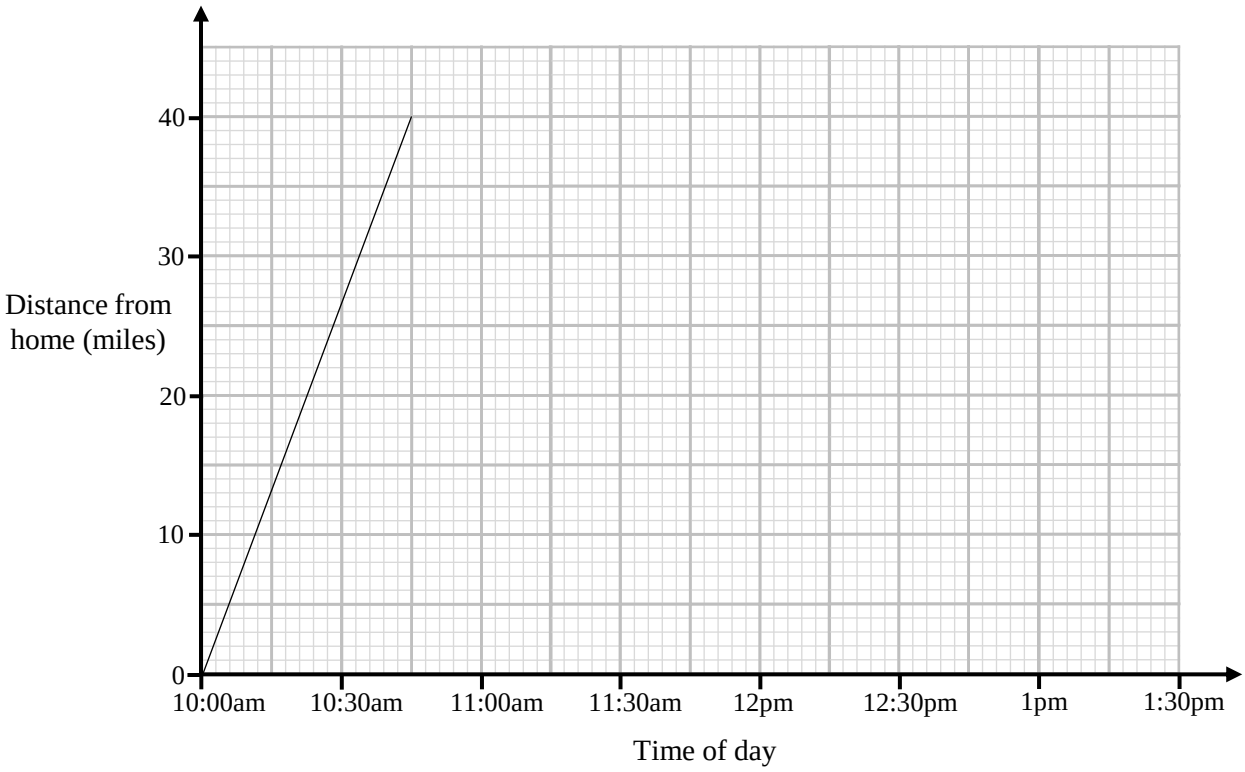
$AB = BC = CD = DA = 10$ cm
$EA = EB = EC = ED = 13$ cm

Calculate the surface area of the squared-based pyramid.

..... cm^2

(Total for Question 33 is 4 marks)

34 Sovra drove from her home to the dentist.
The distance time graph below shows Sovra's journey to the dentist.



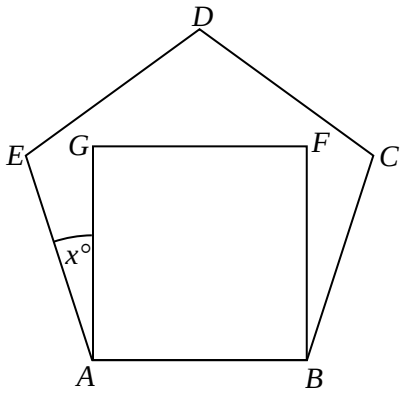
Sovra stayed at the dentist for 45 minutes.
She then drove home at a constant speed of 32 mph.

Complete the distance time graph.

(Total for Question 34 is 3 marks)

Solutions

35 *ABCDE* is a regular pentagon and *ABFG* is a square.



Work out the value of x

$x =$ .....

(Total for Question 35 is 3 marks)

36 Tia has £5000 to invest for 3 years. She compares the deals of two banks.

Bank A
2.5% compound interest

Bank B
First Year 4% compound interest
All Other Years 1% compound interest

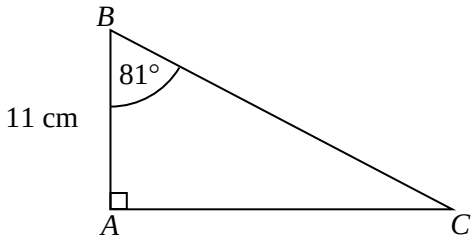
How much **more** money will Tia make going with bank A compared to bank B.

£.....

(Total for Question 36 is 4 marks)

Solutions

37



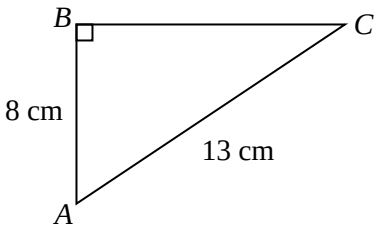
Triangle *ABC* is a right-angled triangle.
Angle *ABC* = 81°
AB = 11 cm

Work out the length of *AC*.
Give your answer to 1 decimal place.

..... cm

(Total for Question 37 is 2 marks)

38



Triangle *ABC* is a right-angled triangle.
AB = 8 cm
AC = 13 cm

Work out the size of angle *CAB*.
Give your answer to 1 decimal place.

°

.....

(Total for Question 38 is 2 marks)

Solutions

39 There are only red cubes, yellow cubes, blue cubes and green cubes in a box.
The table shows the probabilities of taking at random a red or yellow cube from the box.

Colour	red	yellow	blue	green
Probability	0.8	0.1		

The number of blue cubes in the box is the same as the number of green cubes.

(a) Complete the table.

(2)

Kim claims that there are a total of 75 cubes in the box.

(b) Explain why Kim must be incorrect.

.....

.....

.....

(1)

(Total for Question 39 is 5 marks)

40 The interior angle of a regular polygon is 168°

(a) Work out the exterior angle for the regular polygon

.....°

(1)

(b) Work out how many sides the regular polygon has.

.....

(2)

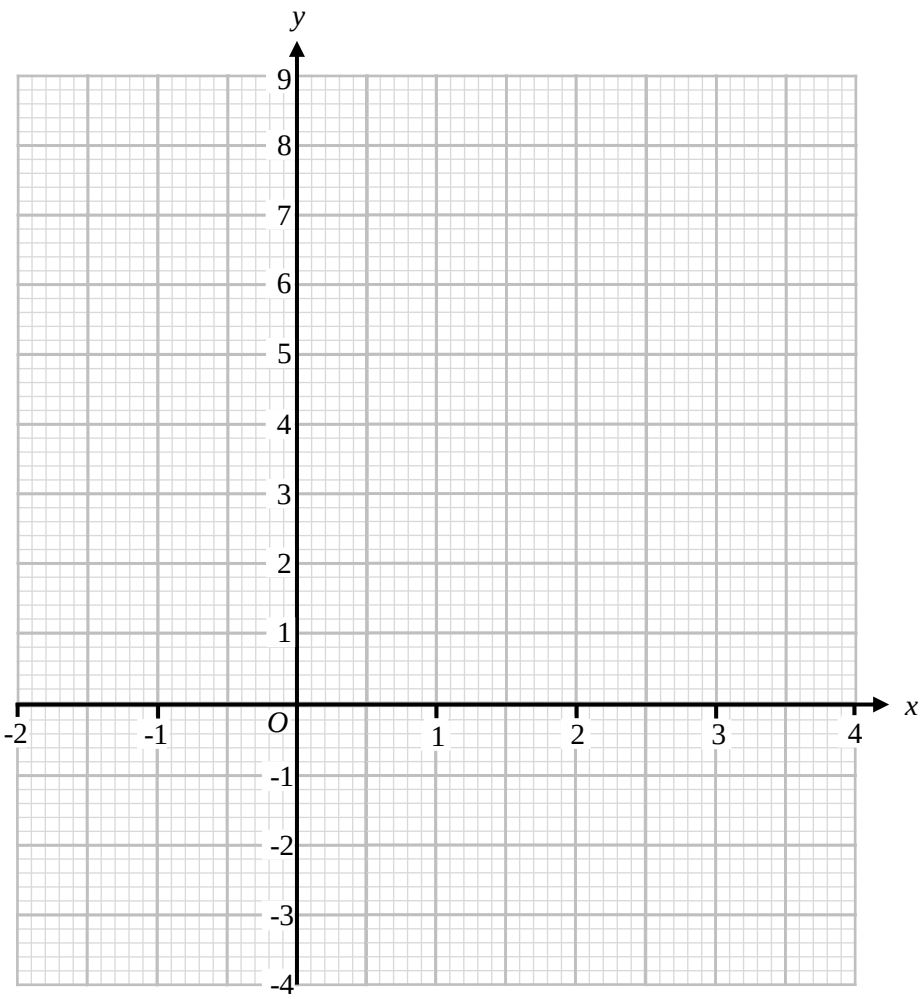
(Total for Question 40 is 3 marks)

41 (a) Complete the table of values for $y = x^2 - 3x - 1$

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

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$ for values of x from -2 to 4



(2)

(c) Use the graph to estimate the solutions to $x^2 - 3x - 1 = 2$

.....

(2)

(Total for Question 41 is 6 marks)

42 *ABCD* is a map of a rectangular field.

1 cm represents 50 metres.

A tower needs to be placed in the field so that it is

Closer to point *C* that to point *D*.
Within 350 metres of point *B*.

Shade the region of possible positions for the tower.

(Total for Question 42 is 3 marks)

43 (a) Find the highest common factor (HCF) of 75 and 210

.....

(2)

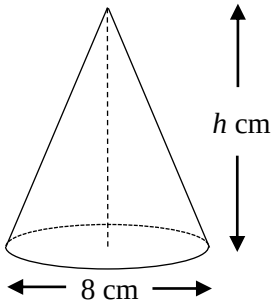
(b) Find the lowest common multiple (LCM) of 75 and 210

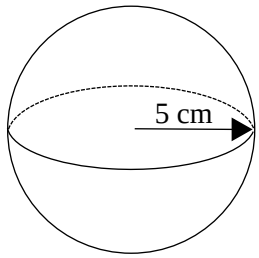
.....

(2)

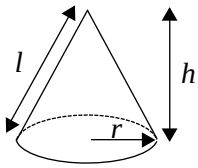
(Total for Question 43 is 4 marks)

44 Below are a solid cone and a solid sphere.

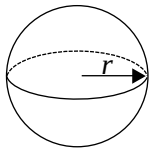




Volume of a cone = $\frac{1}{3}\pi r^2 h$



Volume of a Sphere = $\frac{4}{3}\pi r^3$



Volume of the cone = 30% of the volume of the sphere.

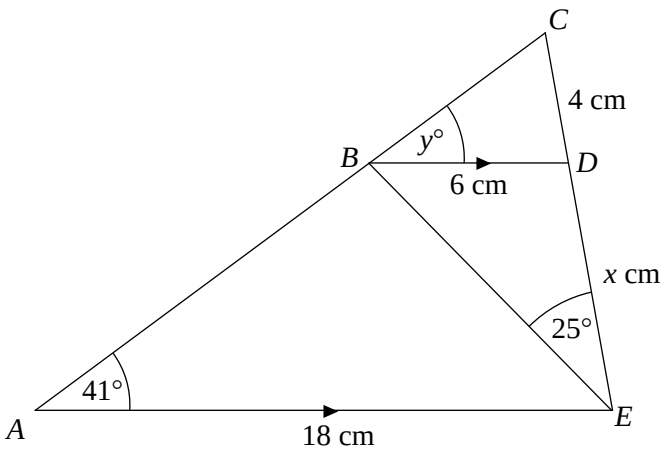
Work out h, the height of the cone.
Give your answer to 1 decimal place.

..... cm

(Total for Question 44 is 5 marks)

Solutions

45 *ACE* is a triangle.



Not drawn accurately.

Line *BD* is parallel to line *AE*.
CD = 4cm
BD = 6 cm
AE = 18 cm
DE = *x* cm
Angle *EAB* = 41°
Angle *DEB* = 25°
Angle *DBC* = *y*°

(a) Work out the value of *x*

x = ...

(3)

(b) Write down the value of *y*.

y = ...

(1)

(c) Give a reason for your answer to part (b).

.....

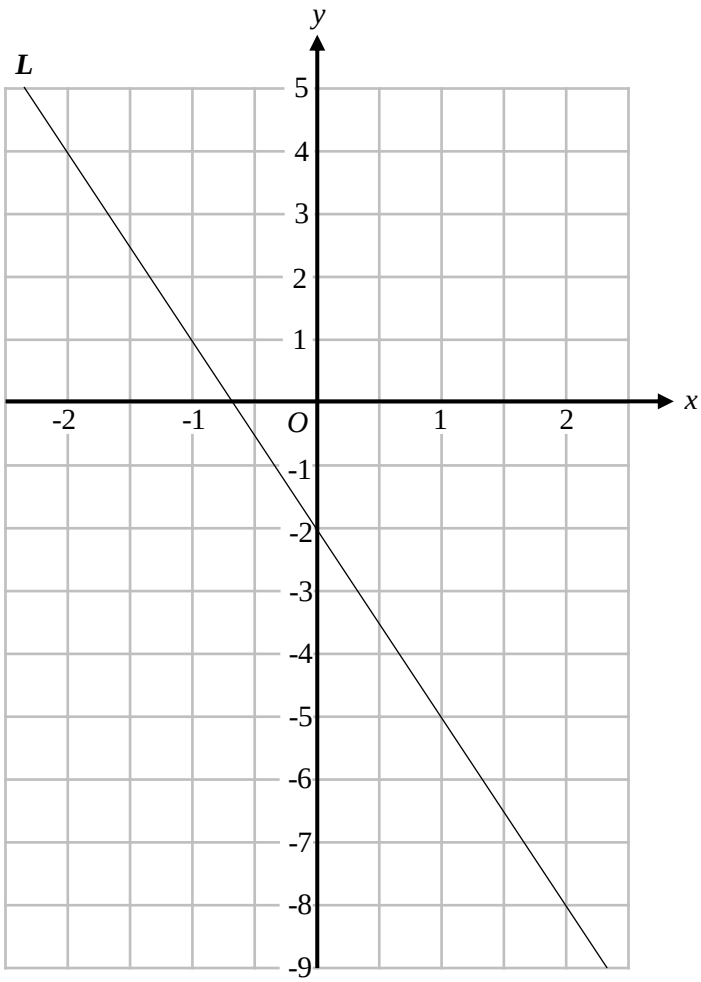
.....

(1)

(Total for Question 45 is 5 marks)

Solutions

46 The line **L** is shown on the grid.

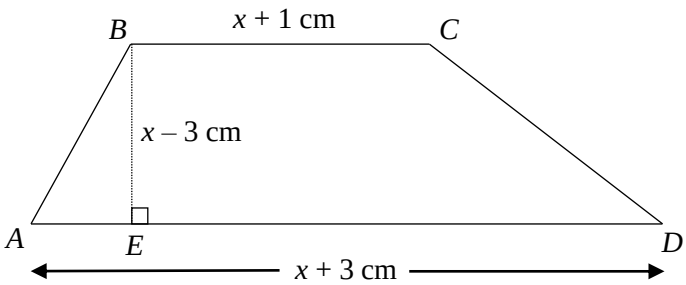


Find an equation for **L**.

.....

(Total for Question 46 is 3 marks)

47 *ABCD* is a trapezium.



AD is parallel to *BC*.
BC = $x + 1$ cm
AD = $x + 3$ cm
BE = $x – 3$ cm

The area of the trapezium is equal to 24 cm^2

(a) Show that $x^2 – x – 30 = 0$

(4)

(b) Work out the value of x.

$x =$ .....

(2)

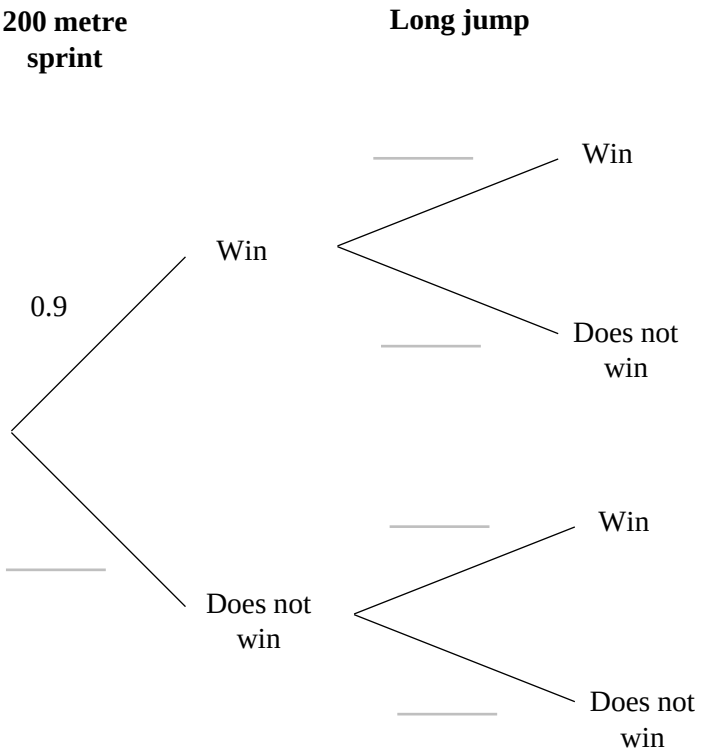
(Total for Question 47 is 6 marks)

48 Katarina competes in both the 200 metre sprint and the long jump at her school sports day.

The probability that she will win the 200 metre sprint is 0.9

The probability that she will win the long jump is 0.8

(a) Complete the probability tree diagram.



(2)

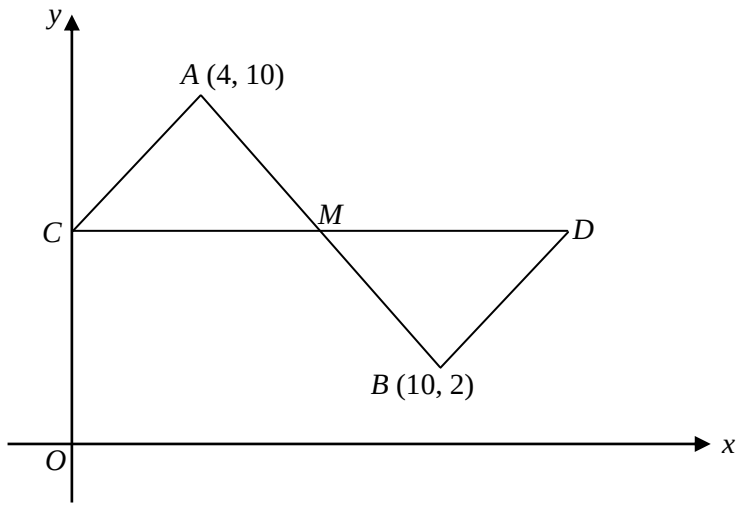
(b) Work out the probability that Katarina wins exactly one of the events.

.....

(3)

(Total for Question 48 is 5 marks)

49



$A = (4, 10)$
$B = (10, 2)$
Line segment CM is parallel to the x-axis and point C is on the y-axis.

Point M is the midpoint of both line segments AB and CD.

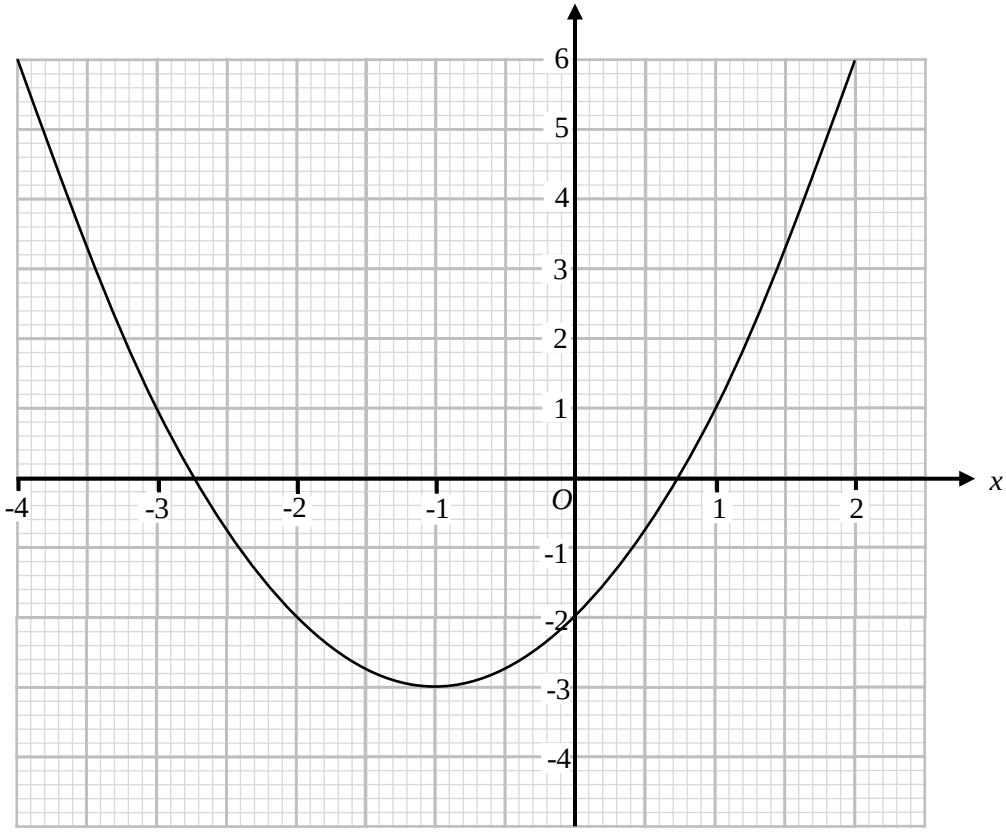
(a) Work out the coordinates of the point D.

(..... , ...)
(3)

(b) Prove that triangle AMC is congruent to triangle DMB.

(3)
(Total for Question 49 is 5 marks)

50 The graph of $y = x^2 + 2x - 2$ is drawn on the grid.



(a) Write down the coordinates of the turning point of the graph.

(..... , ...)

(1)

(b) Write down the equation of the line of symmetry for the graph.

.....

(1)

(c) Write down an estimate for the roots of the equation $x^2 + 2x - 2 = 0$

.....

(2)

(Total for Question 50 is 4 marks)

51 (a) y is directly proportional to x.

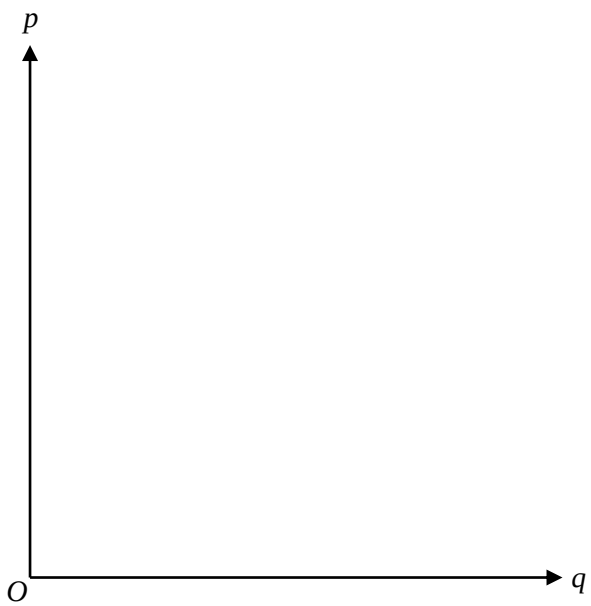
Complete the table.

y	1	80		
x	4		10	0.5

(3)

(b) Using the axes below, sketch a graph to represent the statement

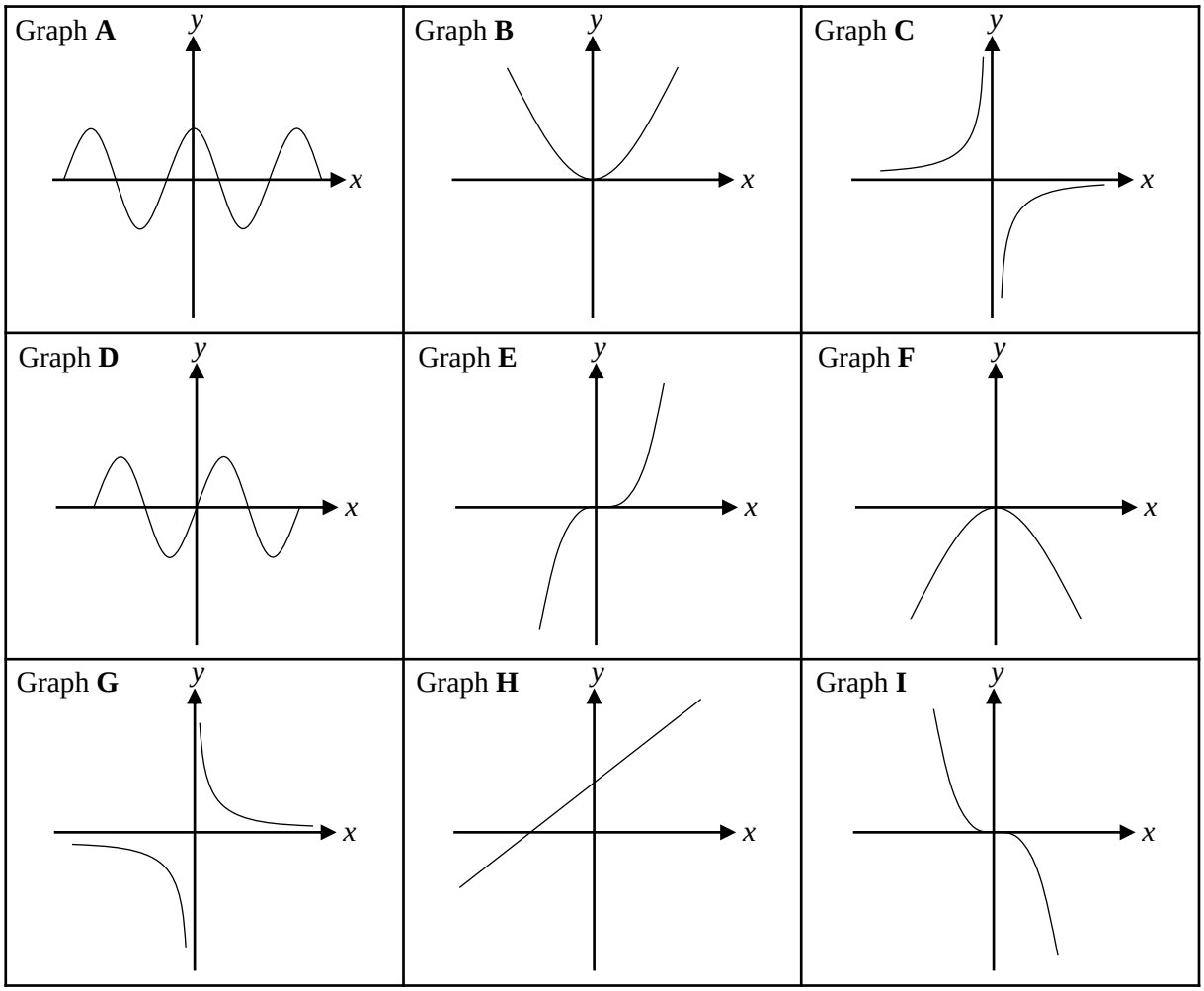
p is inversely proportional to q



(1)

(Total for Question 51 is 4 marks)

52 Here are nine graphs.



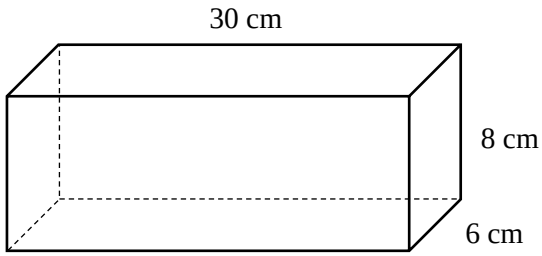
Each of the equations in the table is the equation of one of the graphs

Complete the table.

Equation	Letter of Graph
$y = -x^2$	
$y = x^3$	
$y = \sin(x)$	
$y = \frac{1}{x}$	

(Total for Question 52 is 4 marks)

53 The diagram shows a solid cuboid made from only gold and silver.



Volume of gold in the cuboid : volume of silver in the cuboid = 3 : 5

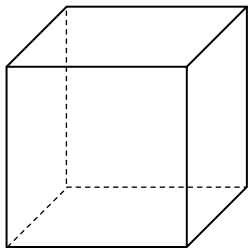
The density of gold is 19.3 g/cm^3
The density of silver is 10.5 g/cm^3

Work out the mass of the cuboid in kilograms.
Give your answer to 3 significant figures.

..... kg

(Total for Question 53 is 4 marks)

54 The diagram shows a solid cube placed on a horizontal floor.



$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

The force exerted by the cube on the floor is equal to 320 newtons.
The pressure between the floor and the cube is equal to 500 N/m^2

Work out the length of one of the sides of the cube.
Give your answer in metres.

..... m

(Total for Question 54 is 3 marks)

55 $\boldsymbol{L_1}$ and $\boldsymbol{L_2}$ are straight lines.

$\boldsymbol{L_1}$ has equation $2y - 8x = 10$
$\boldsymbol{L_2}$ joins the points with coordinates (3, 10) and (8, 30)

Show that lines $\boldsymbol{L_1}$ and $\boldsymbol{L_2}$ are parallel.

(Total for Question 55 is 3 marks)

56 The first three terms of a Fibonacci sequence are shown below

$3a$ $2b$ $3a + 2b$

The fourth term of the sequence is equal to 51
The fifth term of the sequence is equal to 84

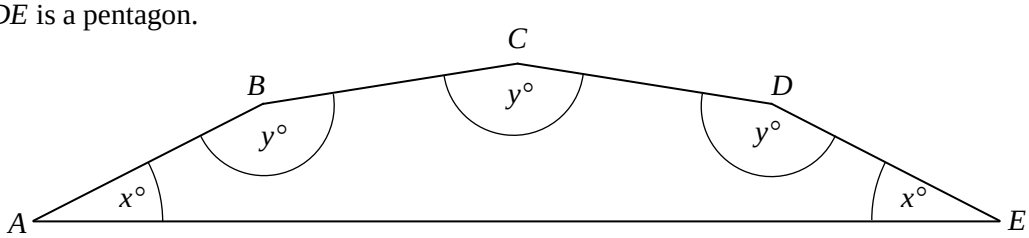
Work out the values of a and b.

$a =$ .....

$b =$ .....

(Total for Question 56 is 4 marks)

57 $ABCDE$ is a pentagon.



Angle ABC = Angle BCD = Angle CDE = $y°$
Angle DEA = Angle EAB = $x°$

$x : y = 1 : 6$

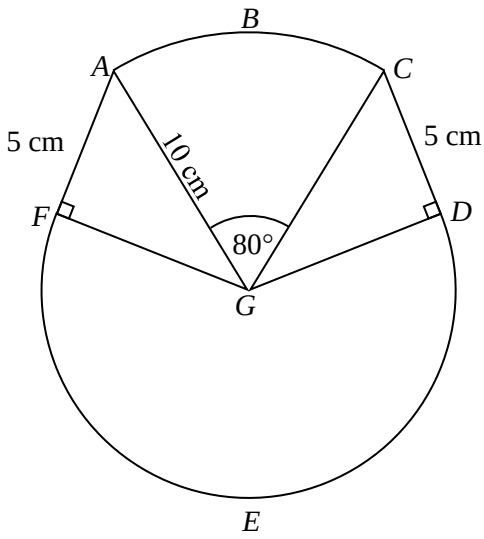
Work out the values of x and y.

$x =$ .....

$y =$ .....

(Total for Question 57 is 4 marks)

58



ABCG and *DEFG* are sectors with centre *G*.
AG = 10 cm
AF = *CD* = 5 cm
Angle *AGC* = 80°
Angle *GFA* = Angle *CDG* = 90°
Calculate the length of the arc *DEF*.
Give your answer to 1 decimal place.

.....cm

(Total for Question 58 is 5 marks)

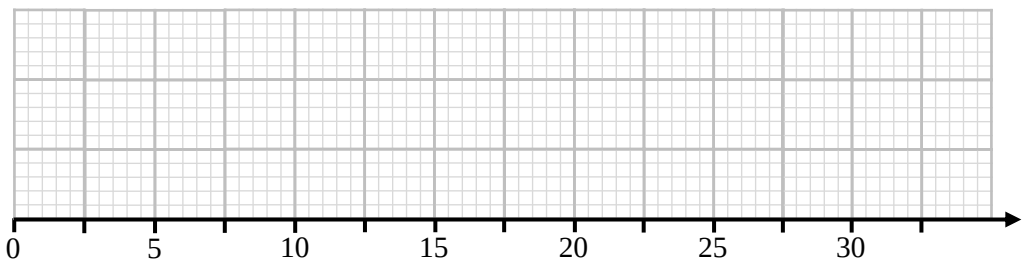
Solutions

59 The stem and leaf diagram below shows information about the average battery life, in hours, of 23 mobile phones from company A.

0	9										
1	0	2	2	2	3	4	5	6	6	7	9
2	0	0	1	5	6	7	7	8	9		
3	1	1									

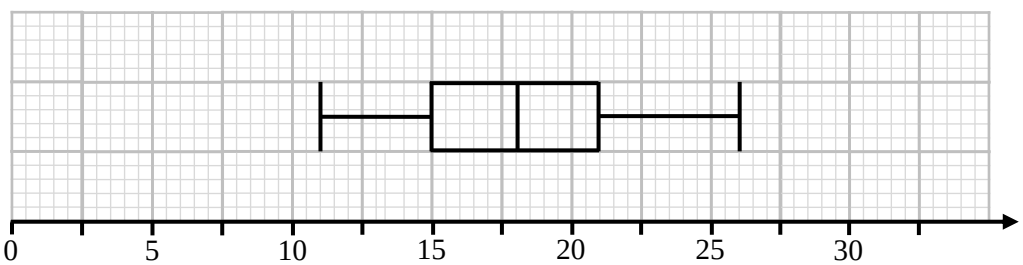
Key: 3 | 1 represents 31 hours

(a) On the grid, draw a box plot for this information.



(3)

The box plot below shows information about the average battery life of phones from company B.



(b) Compare the distribution of battery lives from company A and company B.

.....

.....

.....

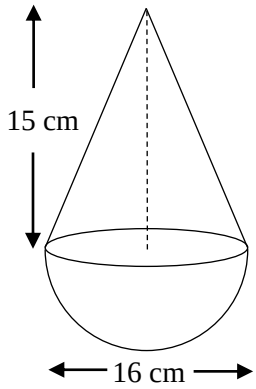
.....

.....

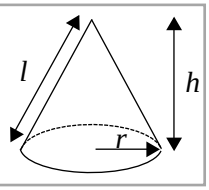
(2)

(Total for Question 59 is 5 marks)

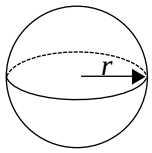
60 The diagram shows a solid shape.
The shape is a cone on top of a hemisphere.



Curved surface area of a cone $= \pi rl$



Surface area of a sphere $= 4\pi r^2$



The diameter of the hemisphere is 16 cm.
The height of the cone is 15 cm.

Work out the surface area of the solid shape.
Give your answer to 3 significant figures.

..... cm^2

(Total for Question 60 is 4 marks)

61 Expand and simplify $(x + 9)(x + 2)(x - 3)$

.....

(Total for Question 61 is 3 marks)

62 (a) Write down the value of $16^{\frac{1}{2}}$

.....

(1)

(b) Write down the value of $\left(\frac{25}{4}\right)^0$

.....

(1)

(c) $4^n = 8$

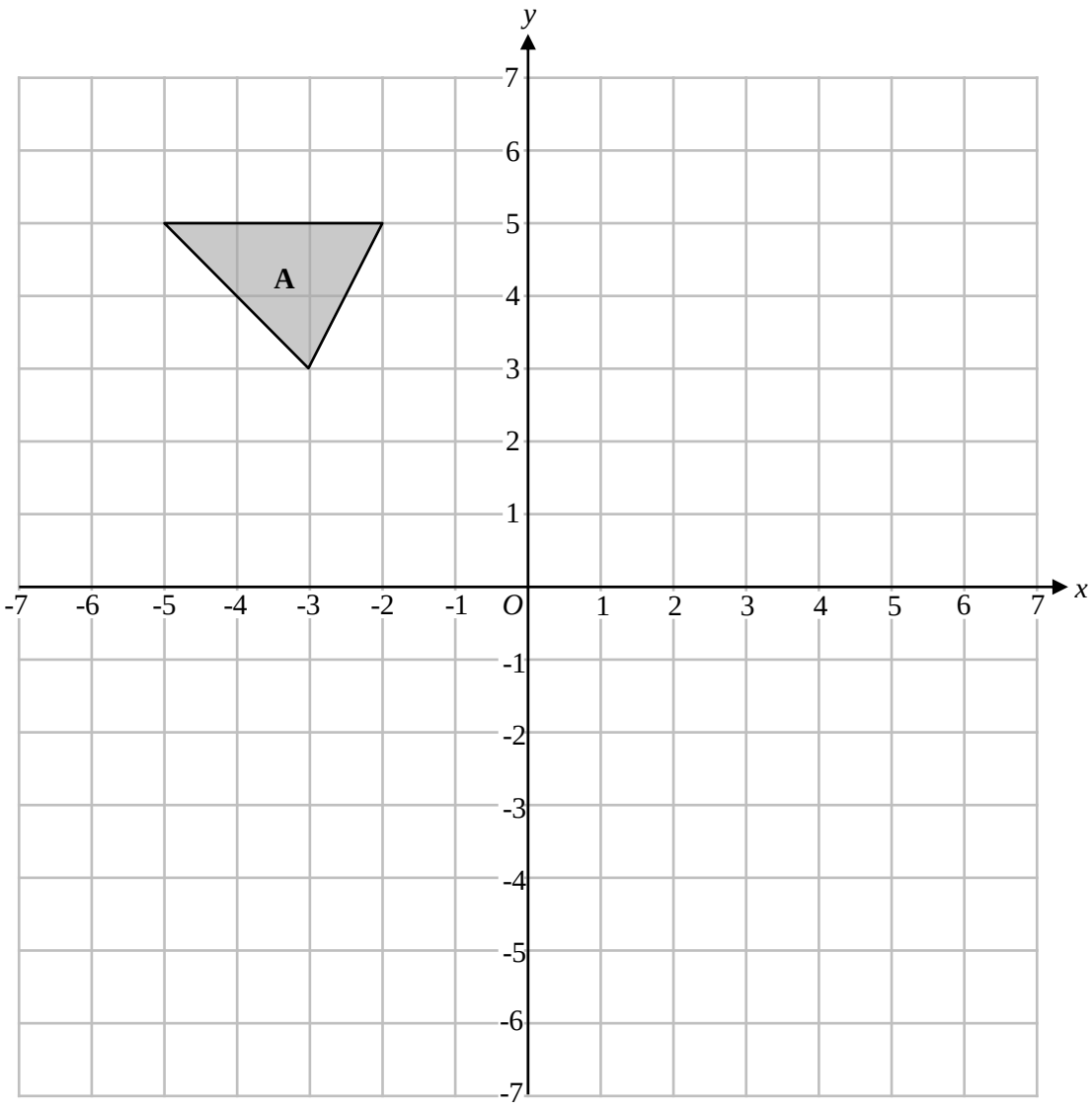
Work out the value of 100^{-n}

.....

(3)

(Total for Question 62 is 5 marks)

63



Enlarge shape A by scale factor -2 with centre of enlargement (–2, 1).
Label your image B.

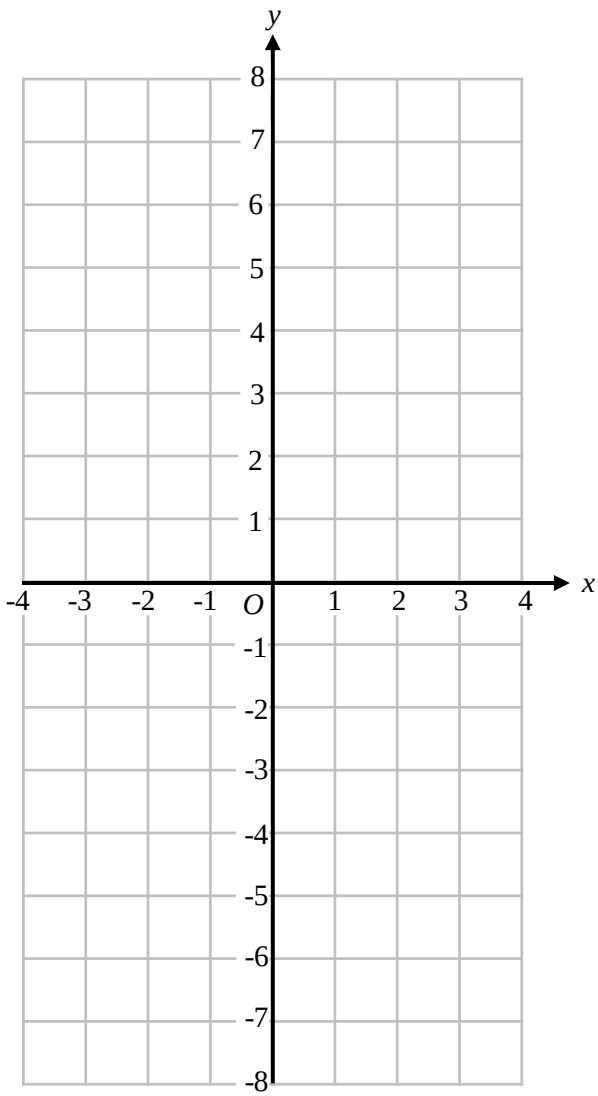
(Total for Question 63 is 2 marks)

Solutions

64 On the grid show, by shading, the region that satisfies all these inequalities.

$y \geq 0$ $x \geq -1$ $y \leq x + 3$ $2x + y \leq 6$

Label the region **R**.



(Total for Question 64 is 4 marks)

Solutions

65 Kenny wants to find out an estimate for the number of fish in a lake.

One day he catches 350 fish from the lake.
He puts a mark on each fish and returns them to the lake.

The next day he catches 175 fish from the lake.
He finds that 70 of these fish have been marked.

(a) Work out an estimate for the total number of fish in the lake.

.....

(3)

Kenny returns all the marked fish to the lake.
The following day he catches another 175 fish.
This time he estimates that there are fewer than 700 fish in the lake.

(b) Work out the lowest possible number of marked fish that Kenny could have caught.

.....

(3)

(Total for Question 65 is 6 marks)

66 Write the following in order of size.
Start with the smallest.

2.03^6 7.95^2 $\sqrt{6500}$ $\sqrt[3]{124000}$

.....

(Total for Question 66 is 2 marks)

67 The table below shows the number of players that play in each position in a football squad.

Position	Goalkeeper	Defender	Midfielder	Striker
Number of players	3	8	10	5

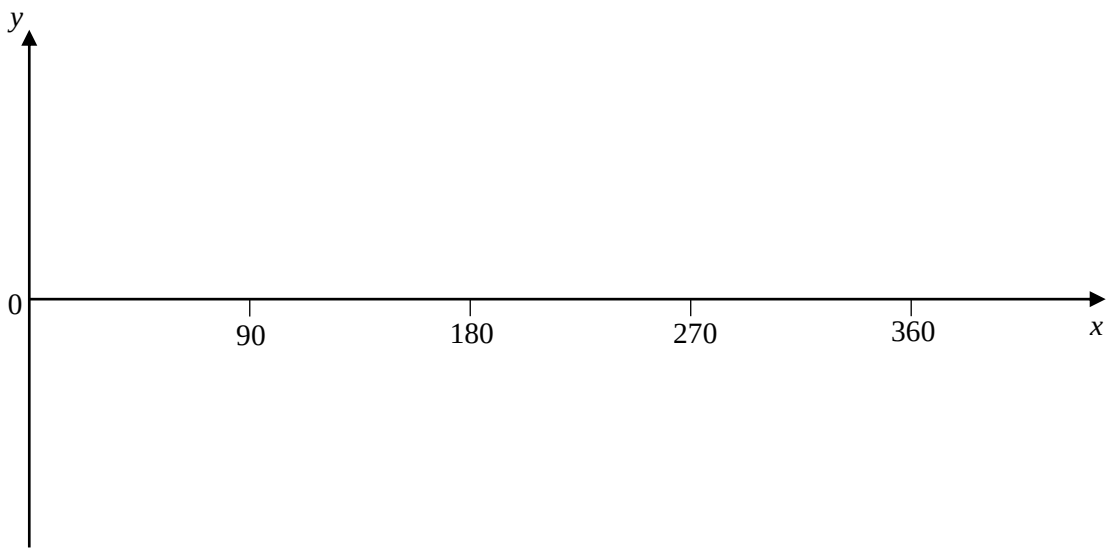
Each player plays in only one position.
The manager is going to select one player from each position to win an award.

Work out the number of different ways there are to choose one goalkeeper, one defender, one midfielder and one striker.

.....

(Total for Question 67 is 2 marks)

68 Sketch the graph of $y = \cos x°$ for $0 \leq x \leq 360$



(Total for Question 68 is 2 marks)

Solutions

69 The grouped frequency table gives information about the money spent, in £, by 60 visitors to a supermarket.

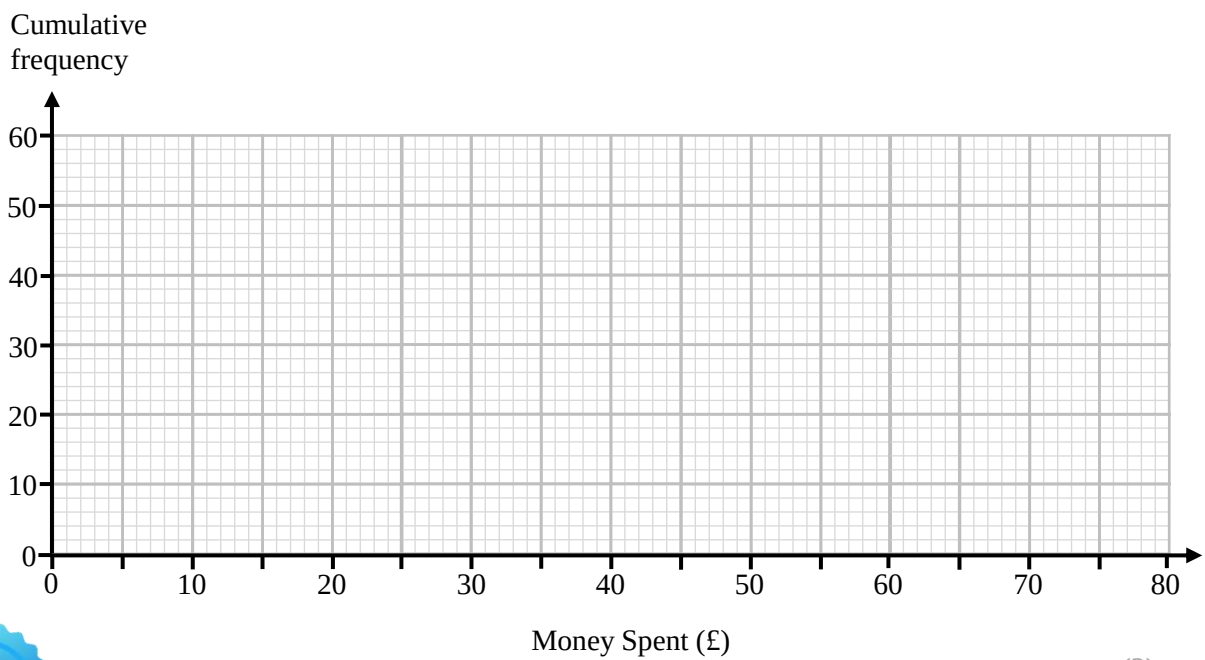
Money Spent (£)	Frequency
$0 < m \leq 20$	6
$20 < m \leq 40$	16
$40 < m \leq 60$	29
$60 < m \leq 80$	9

(a) Complete the cumulative frequency table.

Money Spent (£)	Cumulative Frequency
$0 < m \leq 20$	
$0 < m \leq 40$	
$0 < m \leq 60$	
$0 < m \leq 80$	

(1)

(b) On the grid, draw the cumulative frequency graph for this information.



(2)

Solutions

69 (c) Use your graph to find an estimate for the median amount of money spent in the supermarket by the 60 visitors.

£.....

(1)

One of the 60 visitors is selected at random to win a prize.

(d) Use your graph to find an estimate for the probability that the visitor selected spent more than £35.

.....

(2)

(Total for Question 69 is 6 marks)

70 The first two terms of a geometric sequence are shown below

$2\sqrt{5}$ $10\sqrt{10}$

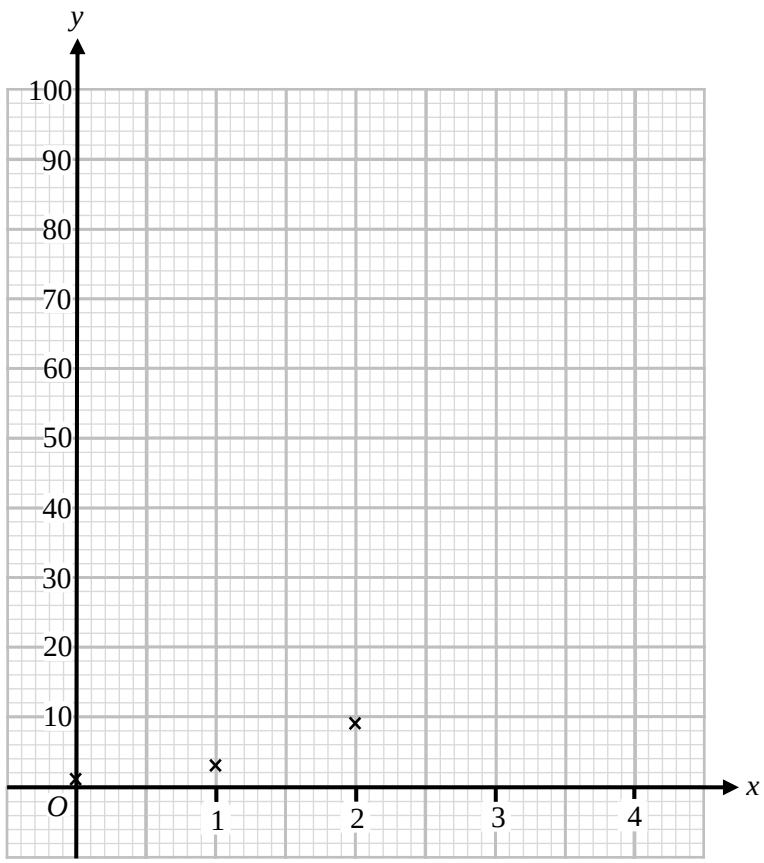
Work out the difference between the third term and the first term of the sequence.
Give your answer in the form $k\sqrt{5}$, where k is an integer.

.....

(Total for Question 70 is 3 marks)

71 Nina is drawing the graph of $y = a^x$ where a is an integer.

She correctly plots the points for $x = 0$, $x = 1$ and $x = 2$



(a) Write down the value of a

$a =$ .....

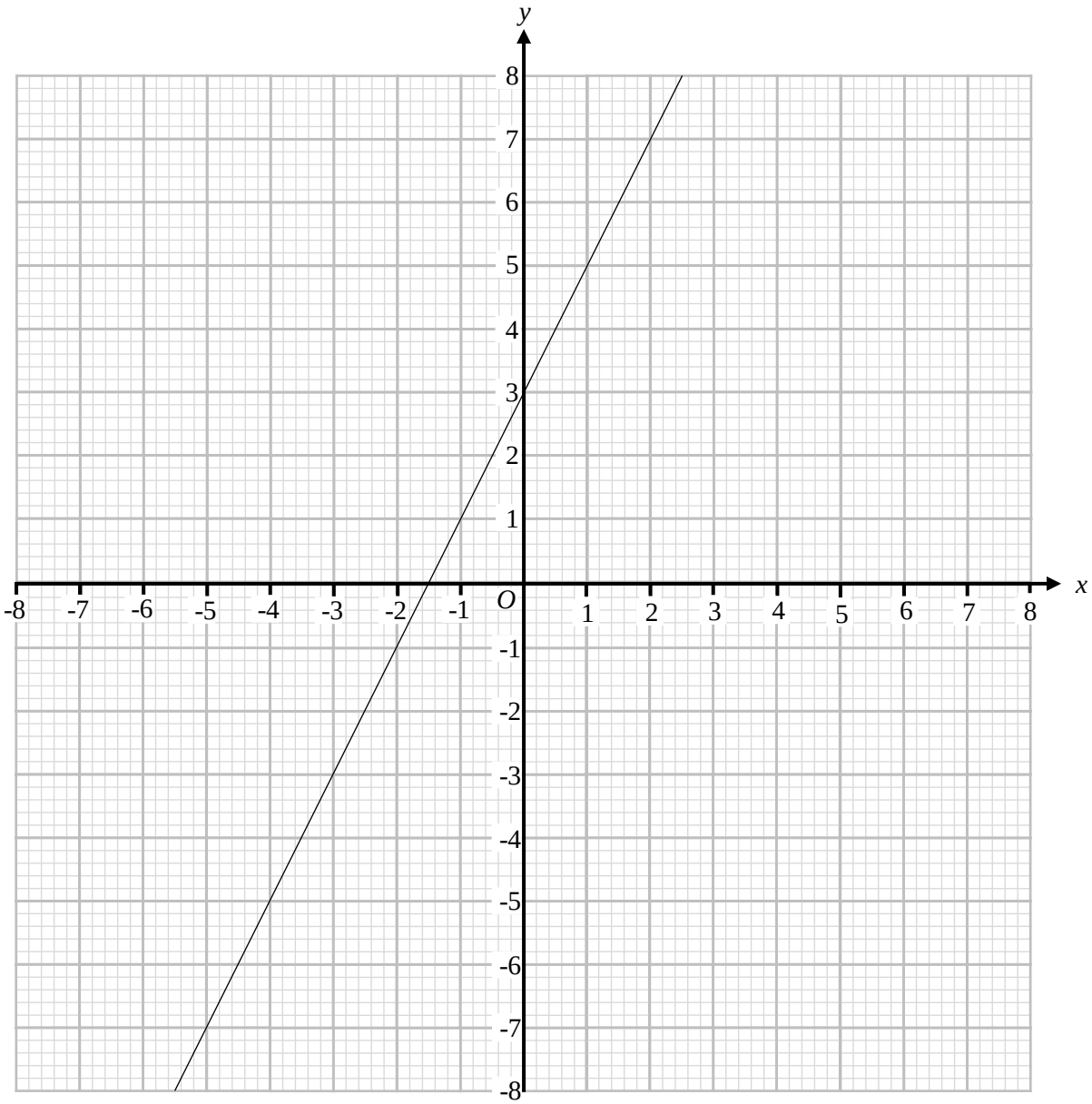
(1)

(b) Complete the graph for x values from 0 to 4

(2)

(Total for Question 71 is 3 marks)

72 The graph of $y = 2x + 3$ is shown below.



(a) Draw the graph of $x^2 + y^2 = 36$ onto the grid above.

(2)

(b) Use your graph to find estimates to the solutions of the simultaneous equations

$x^2 + y^2 = 36$
$y = 2x + 3$

.....

(Total for Question 72 is 3 marks)

Solutions

73 Solve $6x^2 = 3x + 4$

Give your answers correct to 3 significant figures.

.....

(Total for Question 73 is 4 marks)

74 Here are the first five terms of a quadratic sequence.

8 19 34 53 76

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 74 is 3 marks)

75 $f(x) = x^2 - 3$ $g(x) = 2x + 1$ $h(x) = \dfrac{x+3}{4-x}$

(a) Work out the value of f(-5)

.....

(1)

(b) Find $h^{-1}(x)$

$h^{-1}(x) =$ .....

(3)

(c) Solve $gf(x) = f(x) + g(x)$

.....

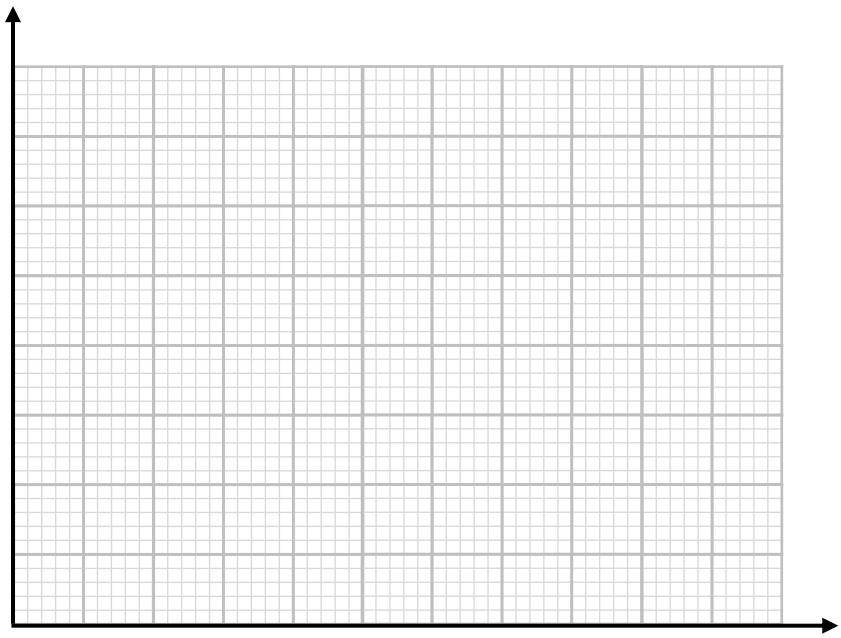
(5)

(Total for Question 75 is 9 marks)

76 The table gives information about the time, in minutes, 100 people took to complete a puzzle.

Time (t, minutes)	Frequency
$0 < t \leq 10$	23
$10 < t \leq 30$	34
$30 < t \leq 35$	38
$35 < t \leq 50$	15

On the grid, draw a histogram for this information.



(Total for Question 76 is 3 marks)

77 Express $0.13\dot{6}$ as a fraction in its simplest form.
You must show all your working.

.....

(Total for Question 77 is 3 marks)

78 (a) Write $x^2 - 8x + 19$ in the form $(x - a)^2 + b$

.....

(2)

(b) Write down the coordinates of the turning point on the curve with equation $y = x^2 - 8x + 19$

(..... , ...)

(1)

(Total for Question 78 is 3 marks)

79 A bag contains 25 counters that are only red, blue or green.

A counter is taken at random from the bag and its colour is noted.
The counter is not replaced and then a second counter is taken at random from the bag.

The probability that the first counter is red is equal to $\frac{3}{5}$

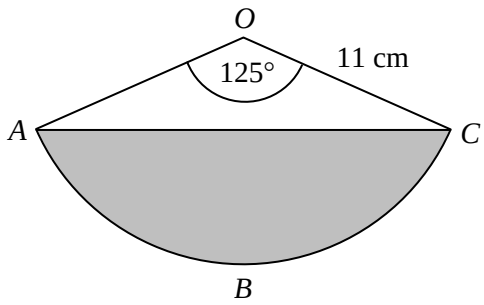
The probability that the first counter is blue and the second counter is red is equal to $\frac{1}{10}$

Work out the probability that both counters selected are green.

.....

(Total for Question 79 is 4 marks)

80 *ABCO* is sector with centre *O*.
OA = 11 cm
Angle *COA* = 125°
Calculate the area of the shaded region.
Give your answer to 1 decimal place.



..... cm^2

(Total for Question 80 is 4 marks)

81 Work out the value of $(\sin 60° + \sin 90°)(\cos 0° - \cos 30°)$

.....

(Total for Question 81 is 3 marks)

82 x is directly proportional to y
y is inversely proportional to z^2

Given that $x = 1$ and $y = 4$ when $z = 3$
find the value of x when $z = \sqrt{6}$

$x =$ .....

(Total for Question 82 is 4 marks)

83 The straight line $\mathbf{L_1}$ has the equation $6y = 25 - 9x$
The line $\mathbf{L_1}$ passes through the point A with coordinates (k, k).

(a) Work out the value of k.

$k =$ .....

(2)

The point B has coordinates (7.5, 8)
The straight line $\mathbf{L_2}$ is perpendicular to line $\mathbf{L_1}$ and passes through point B.

(b) Work out the equation of the line $\mathbf{L_2}$

.....

(3)

(Total for Question 83 is 5 marks)

84 (a) Show that the equation $x^3 - 2x - 6 = 0$ has a solution between $x = 2$ and $x = 3$

(2)

(b) Show that the equation $x^3 - 2x - 6 = 0$ can be rearranged to give $x = \sqrt[3]{2x + 6}$

(2)

(c) Starting with $x_0 = 2$, use the iteration formula $x_{n+1} = \sqrt[3]{2x_n + 6}$ three times to find an estimate for the solution of $x^3 - 2x - 6 = 0$

.....

(3)

(d) By substituting your answer to part (c) into $x^3 - 2x - 6$ comment on the accuracy of your estimate for the solution to $x^3 - 2x - 6 = 0$

.....

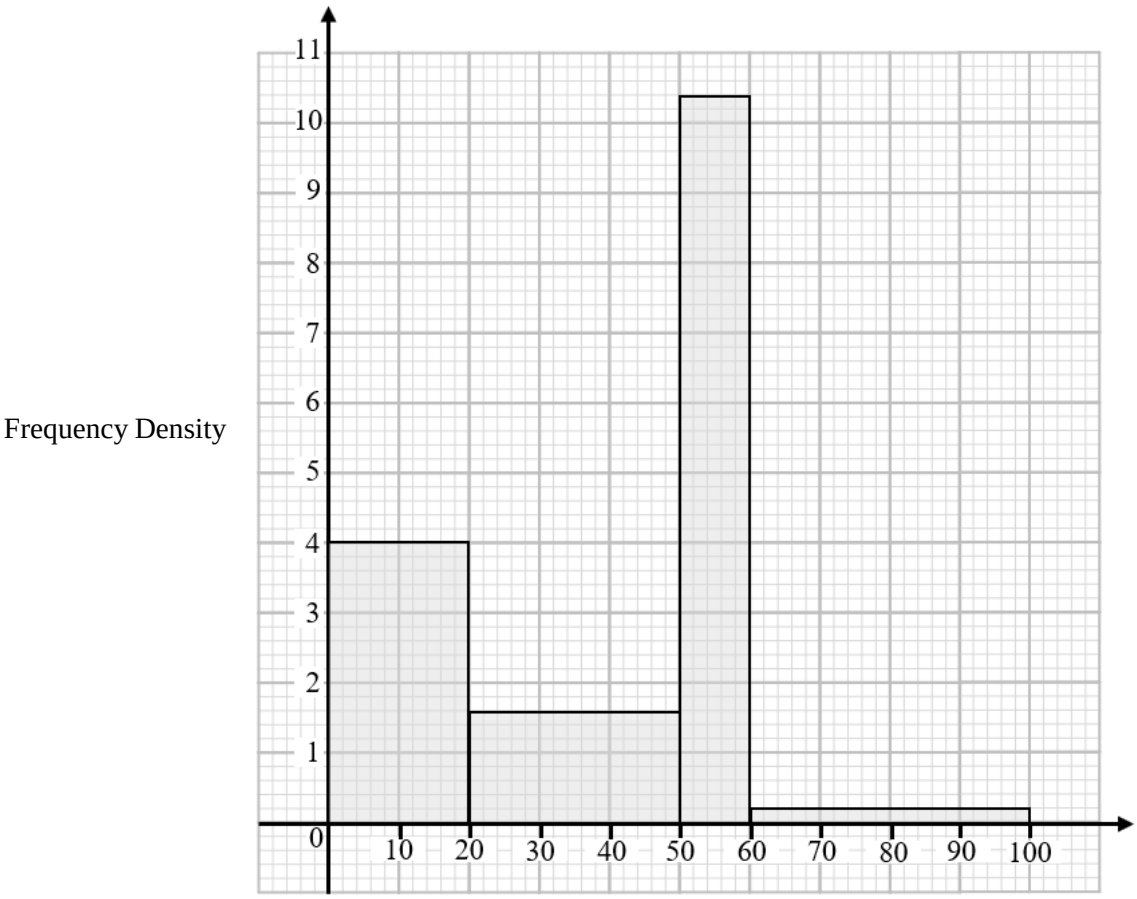
.....

.....

(2)

(Total for Question 84 is 9 marks)

85 The histogram shows information about the time, in minutes, students at a school spent revising for their mock exams.



(a) Work out how many of the students revised for more than 1 hour.

.....

(1)

(b) Work out an estimate for the interquartile range of the times spent revising.

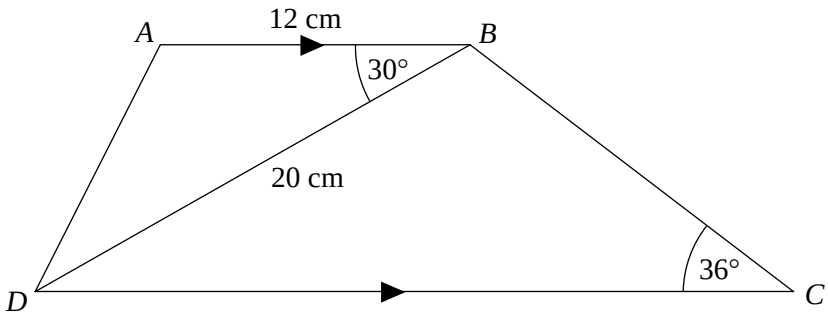
..... minutes

(3)

(Total for Question 85 is 4 marks)

Solutions

86 *ABCD* is a trapezium with *AB* parallel to *DC*.



(a) Work out the length of *AD*.
Give your answer to 1 decimal place.

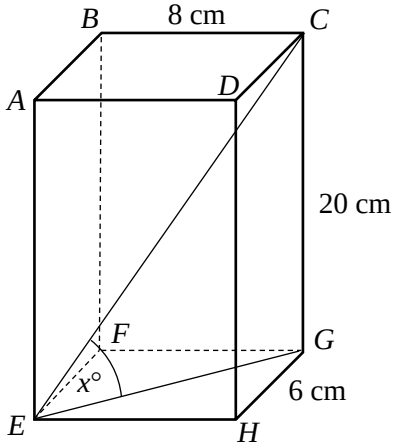
..... cm
(3)

(b) Work out the length of *BC*.
Give your answer to 1 decimal place.

..... cm
(3)

(Total for Question 86 is 6 marks)

87 *ABCDEFGH* is a cuboid.



$BC = 8$ cm
$CG = 20$ cm
$GH = 6$ cm
Angle $GEC = x°$

Work out the value of x.
Give your answer to 3 significant figures.

$x =$ .....

(Total for Question 87 is 4 marks)

88 $a = \frac{v^2}{r}$

$v = 3.5$ correct to 1 decimal place.
$r = 0.08$ correct to 1 significant figure.

Work out the upper bound and the lower bound for the value of a.
Give your answers to 6 significant figures.
You must show all your working.

upper bound = ...

lower bound = ...

(Total for Question 88 is 4 marks)

Solutions

89 a and b are consecutive integers.
Prove algebraically that $a^3 + ab + b^3$ is an odd number.

(Total for Question 89 is 5 marks)

90 Solve $3x^2 - 2x - 5 < 0$

(Total for Question 90 is 3 marks)

Solutions

91 The table below shows information about three solid shapes A, B and C that are similar.

	Shape A	**Shape B**	**Shape C**
Height (cm)		18	63
Surface Area (cm^2)	320	720	
Volume (cm^3)	1152		

Complete the table

(Total for Question 91 is 5 marks)

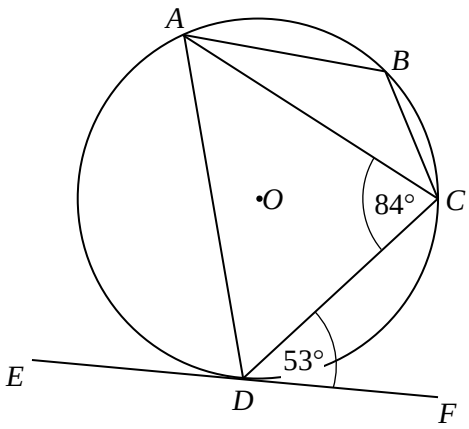
92 A triangle has side lengths 9 cm, 10 cm and 11 cm.
The interior angles of the triangle are $A°$, $B°$ and $C°$ where $A° < B° < C°$

Show that $\cos(A°) = \frac{7}{11}$

(Total for Question 92 is 4 marks)

Solutions

93 *A*, *B*, *C* and *D* are points on the circumference of a circle with centre *O*.
EF is the tangent to the circle at point *D*.



Angle *ACD* = 84°
Angle *CDF* = 53°

Work out the size of angle *ABC*.
Give reasons for each stage of your working.

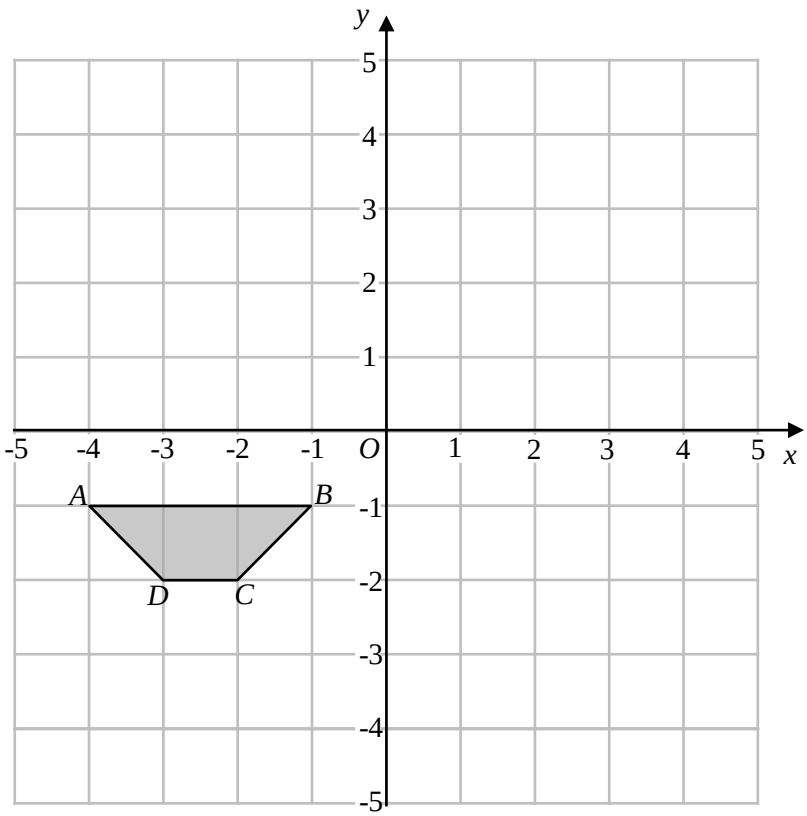
°

.....

(Total for Question 93 is 4 marks)

Solutions

94



$A = (-4, -1)$
$B = (-1, -1)$
$C = (-2, -2)$
$D = (-3, -2)$

Trapezium $ABCD$ is transformed.

(a) Describe a single transformation where points C and D are invariant, and points A and B are not.

.....

.....

.....

(2)

(b) Describe a single transformation where point B is invariant, and points A, C and D are not.

.....

.....

.....

(2)

(Total for Question 94 is 4 marks)

95 Solve $\frac{x}{x+5} - \frac{2}{x-1} = -1$

.....

(Total for Question 95 is 5 marks)

Solutions

96 Ship A and Ship B are both travelling to the same port.

Ship A travels directly to the port on a bearing of 070°
Ship B travels directly to the port on a bearing of 020°

The distance from Ship B to the port is 35 km.
The distance between Ship A and Ship B is 30 km.

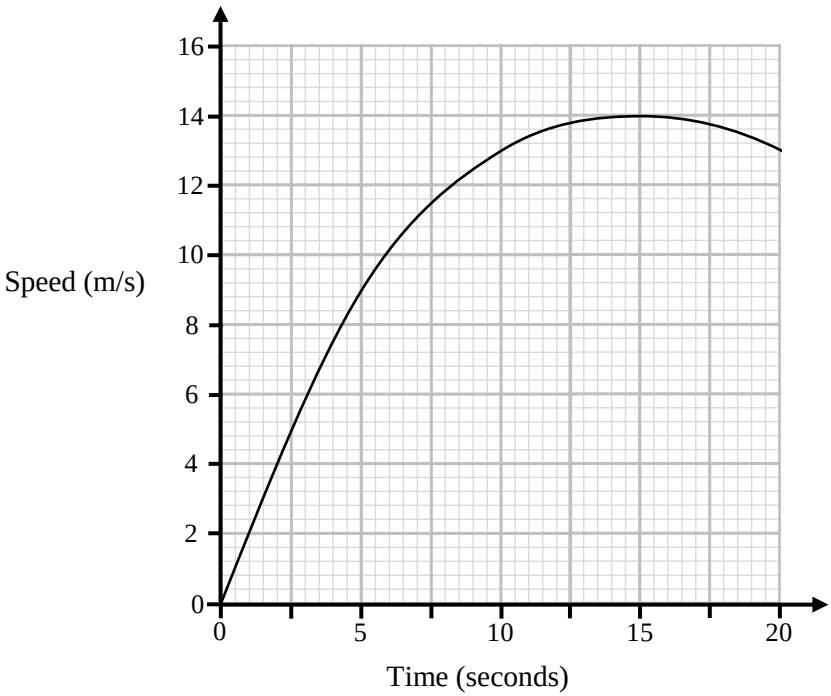
Find the bearing of Ship B from Ship A.
Give your answer to 1 decimal place.

.....°

(Total for Question 96 is 5 marks)

97 A go-kart moves from rest.

The graph gives information about the speed, v metres per second, of the go-kart t seconds after it starts to move.



(a) Work out an estimate for the acceleration of the go-kart at $t = 10$

..... m/s^2

(3)

(b) Work out an estimate for the distance the go-kart travels in the first 15 seconds of its journey.
Use 3 strips of equal width.

..... m

(3)

(Total for Question 97 is 6 marks)

98 Show that $\dfrac{6-\sqrt{500}}{\sqrt{5}+1}$ can be written in the form $a\sqrt{5}-b$, where a and b are integers.

(Total for Question 98 is 4 marks)

99 Find the coordinates of the turning point on the curve with equation $y = 2x^2 + 12x - 7$
You must show all your working

(..... , ...)

(Total for Question 99 is 4 marks)

100 Write $\dfrac{9x^2 - 100}{3x^2 + 13x + 10} \div \dfrac{6x^2 - 20x}{5x^2 - 5} + 2x^{-1}$ in the form $\dfrac{ax + b}{cx}$ where a, b and c are integers.

.....

(Total for Question 100 is 5 marks)

Solutions

101 **C** is a graph with equation $x^2 - y^2 = 48$

L is a straight line with equation $x - 3y = 4$

Using algebra, find the coordinates of the points of intersection of **C** and **L**.
You must show all your working.

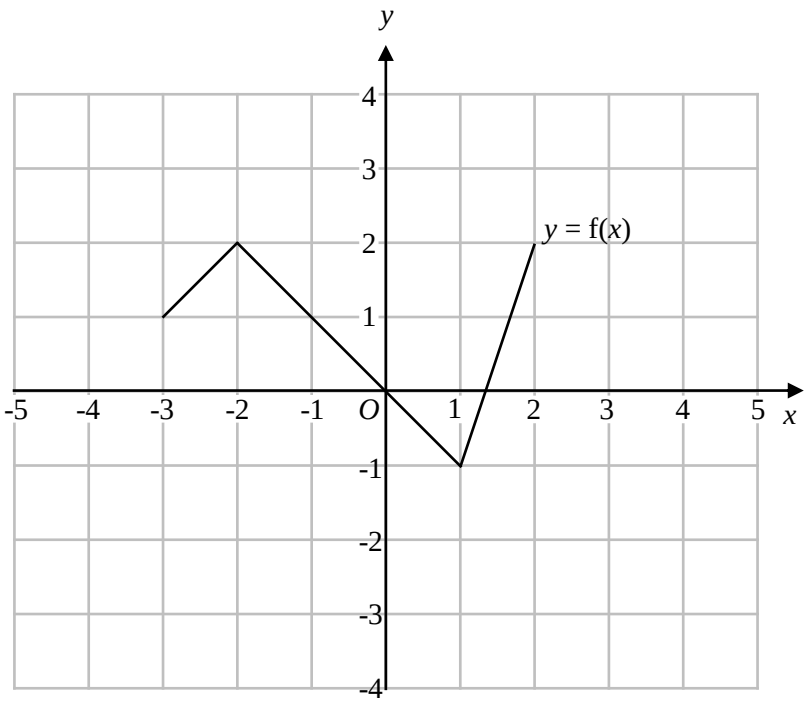
(..... , ...)

(..... , ...)

(Total for Question 101 is 5 marks)

Solutions

102 The graph of $y = f(x)$ is shown on the grid.



(a) On the grid, draw the graph with equation $y = -f(x)$

(2)

A curve **M** with the equation $y = 7 - 2x^2$ is transformed by the vector $\begin{pmatrix} -3 \\ 8 \end{pmatrix}$ to give the curve **N.**

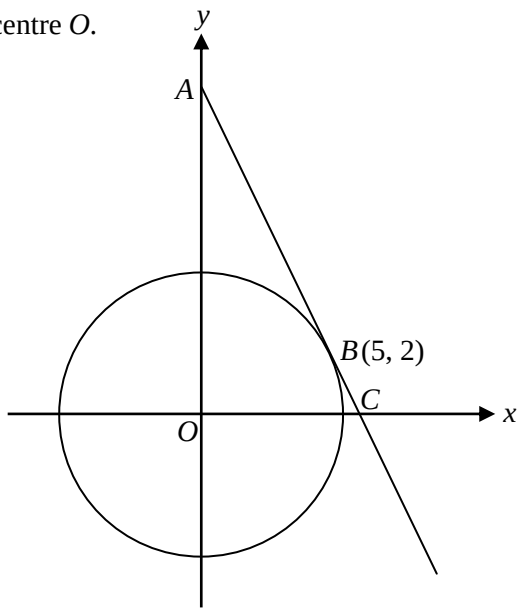
(b) Find the equation of the curve **N.**
Give your answer in the form $y = ax^2 + bx + c$ where a, b and c are integers.

.....

(4)

(Total for Question 102 is 6 marks)

103 The diagram shows a circle, centre O.



The tangent to the circle at point B (5, 2) intersects the y-axis at point A and the x-axis at point C.

(a) Work out the equation of the line AC.
Give your answer in the form $ax + by = c$ where a, b and c are integers.

.....

(5)

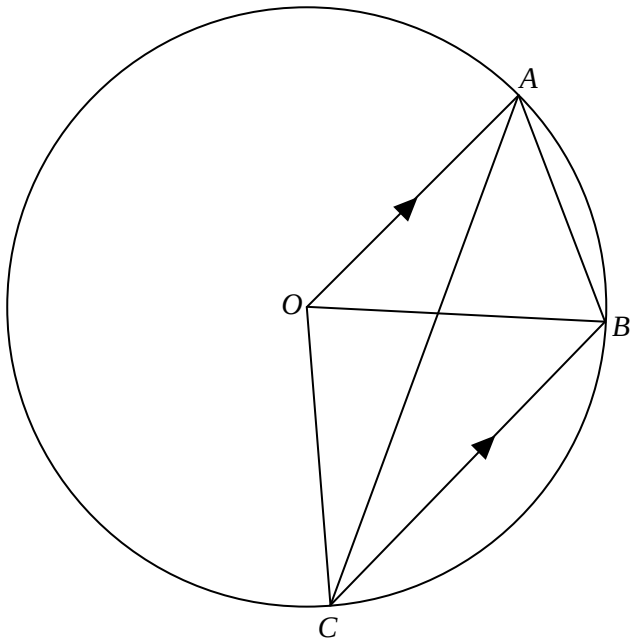
(b) Work out the area of triangle AOC.

..... units^2

(3)

(Total for Question 103 is 8 marks)

104 *A*, *B* and *C* are points on the circumference of a circle, centre *O*.



OA is parallel to *CB*.

Prove that Angle *BCO* + Angle *CAB* = 90°

(Total for Question 104 is 4 marks)

105 A super car is travelling at a constant speed of 200 mph.
The driver applies the brakes to slow the vehicle down.

The speed of the car n seconds after the brakes are applied is S_n

The speed of the car $(n + 1)$ seconds after the brakes are applied, S_{n+1}, is given by

$$S_{n+1} = 0.8(S_n - K) \text{ where } K \text{ is a constant.}$$

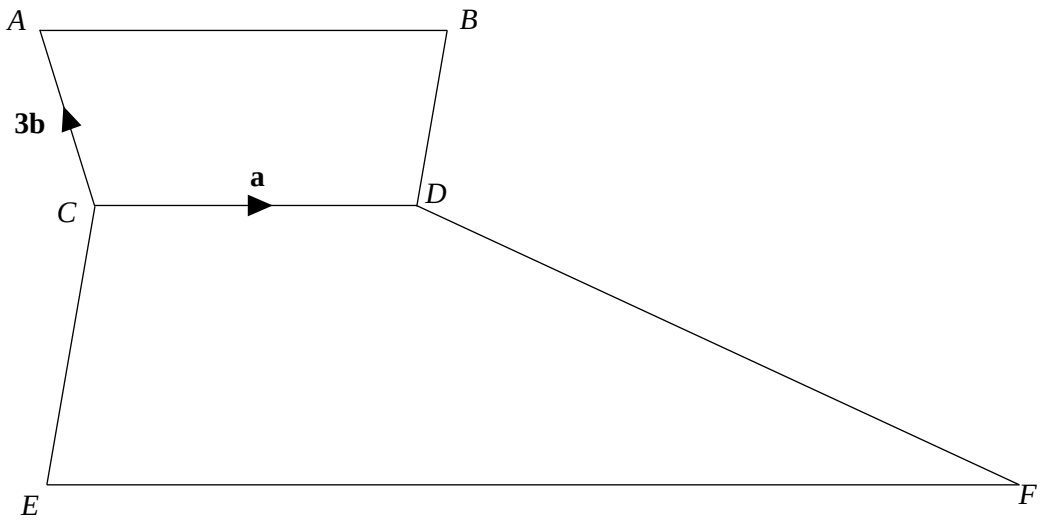
The cars speed falls by 54% in the first two seconds after the brakes are applied.

Work out the speed of the car three 3 seconds the brakes were applied.

..... mph

(Total for Question 105 is 5 marks)

106 *ABDC* and *CDFE* are trapeziums where *AB*, *CD* and *EF* are parallel lines.



$\overrightarrow{CD} = \mathbf{a}$
$\overrightarrow{CA} = \mathbf{3b}$

(a) Write down the vector $\overrightarrow{AD}$ in terms of **a** and **b**.

.....

(1)

AB : *CD* : *EF* = 4 : 3 : 17
BD is parallel to *CE*
ADF is a straight line.
AD : *DF* = 1 : *k*

(b) Work out the value of *k*.

k = ...

(5)

(Total for Question 106 is 6 marks)