Reverse Mean Higher GCSE Questions

1) Pete has seven Shetland ponies. They have a mean height of 116cm.
   Pete buys an eighth pony. The height of this pony is 128cm.
   Find the mean height of all eight ponies.

2) The mean height of seven pupils is 123cm. One pupil of height 147cm leaves the group.
   Find the mean height of the remaining six pupils

3) There are 12 students in Phil's Maths group. The mean mark in a test is 76%. In Paul's group there are only eight students. Their mean mark is 84%.
   Find the overall mean for the 20 children.

4) Don delivers pint bottles of milk to two streets. For the first street of 10 houses, the mean number of bottles of milk he delivers is 3.1.
   For the second street of six houses, the mean number of bottles he delivers is 2.5.
   Find the mean number of bottles of milk he delivers per household for the two streets altogether.

5) Nigel has scored a mean of 18 runs in the last five cricket matches. His mean score must be 20 or more for him to be chosen for the school team.
   Find the number of runs that he must make in the next match if he is to be chosen for the school team.

6) Annabel recorded her test results in the back of her exercise book.

Maths	English	Physics	Chemistry	Biology
88%	85%	77%	79%	

   Annabel knows the mean of her five tests was 81%.
   What did she get in Biology?

7) There are 25 students in a class, 10 girls and 15 boys.
   On one particular night, the mean time spend on homework by the boys was 1.6 hours and the mean time spent on homework by the girls was 2.1 hours.
   Work out the mean time spent on homework by all the students in the class.
   Give your answer in hours and minutes.

Bearings
Video 26 on Corbettmaths

Question 5: Give these directions of travel as three figure bearings

(a) North (b) South-east (c) West (d) North-east

(e) East (f) South-west (g) South (h) North-west

Question 6: A dolphin is on a bearing of 100° from the island.
The same dolphin is on a bearing of 015° from the lighthouse.
On a sketch of the diagram below, mark the location of the dolphin.

Question 7: A hot-air balloon is on a bearing of 140° from the radar A.
The same hot-air balloon is on a bearing of 065° from the radar B.
On a sketch of the diagram below, mark the location of the hot-air balloon.

Bearings
Video 26 on Corbettmaths

Question 8: A UFO is on a bearing of 015° from the radar A.
The same UFO is on a bearing of 315° from the radar B.
On a sketch of the diagram below, mark the location of the UFO.

Question 9:

(a) The bearing of A from B is 025°, find the bearing of B from A.
(b) The bearing of A from B is 061°, find the bearing of B from A.
(c) The bearing of A from B is 098°, find the bearing of B from A.
(d) The bearing of A from B is 102°, find the bearing of B from A.
(e) The bearing of A from B is 193°, find the bearing of B from A.
(f) The bearing of A from B is 222°, find the bearing of B from A.
(g) The bearing of A from B is 315°, find the bearing of B from A.

Question 10: Make a copy of the diagram below into your book.

(a) Find the bearing of B from A.
(b) Find the bearing of A from B.

Use the scale 1cm represents 20miles.

(c) From your diagram, work out the real distance between A and B.

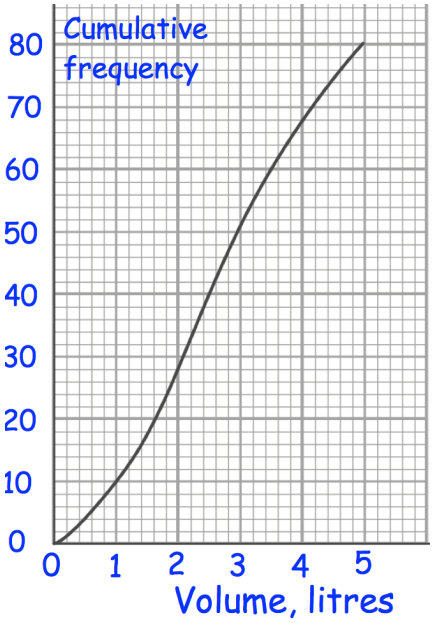
C is 140 miles from B on a bearing of 110°.

(d) On your diagram, mark C with a cross.

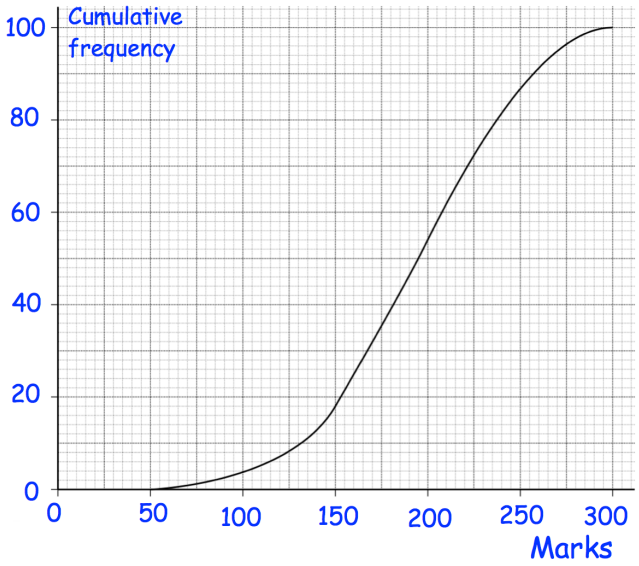
Cumulative Frequency Graphs

Videos 153 and 154 on www.corbettmaths.com

(c)



(d)



Question 7: The graph shows information about the time taken to solve a puzzle.

(a) How many people took less than 30 seconds?

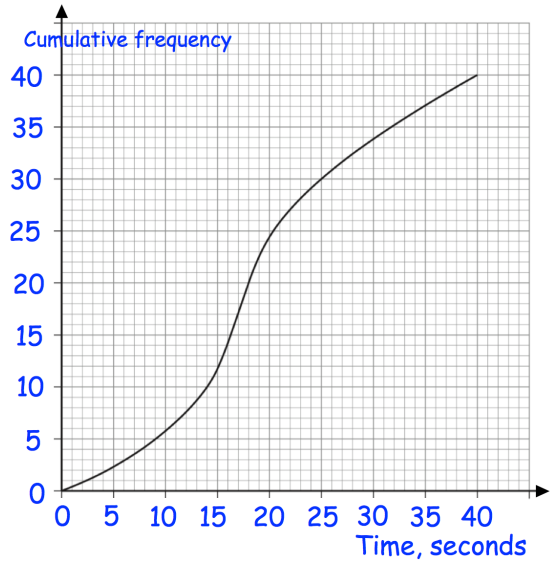
(b) How many people took less than 10 seconds?

(c) How many people took longer than 25 seconds?

(d) How many people took longer than 35 seconds?

(e) The fastest 10 people completed the puzzle in under how many seconds?

(f) The slowest 2 people completed the puzzle in longer than how many seconds?



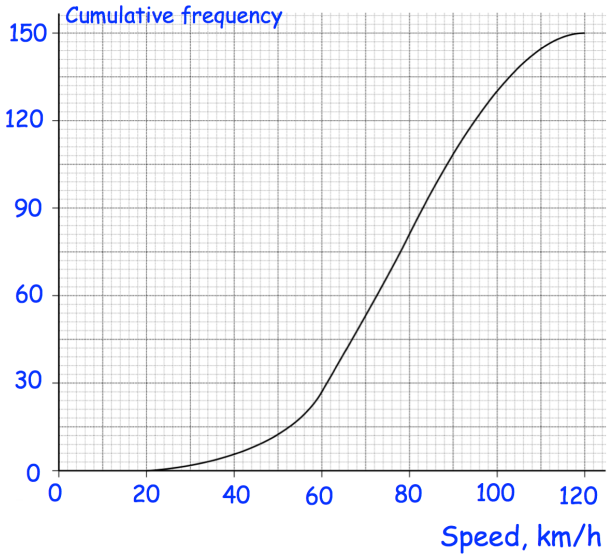
Question 8: The graph shows information about the speed of cars on a road.

(a) How many cars travelled under 50km/h?

(b) How many cars travelled over 110km/h?

(c) 42 cars were exceeding the speed limit. What is the speed limit?

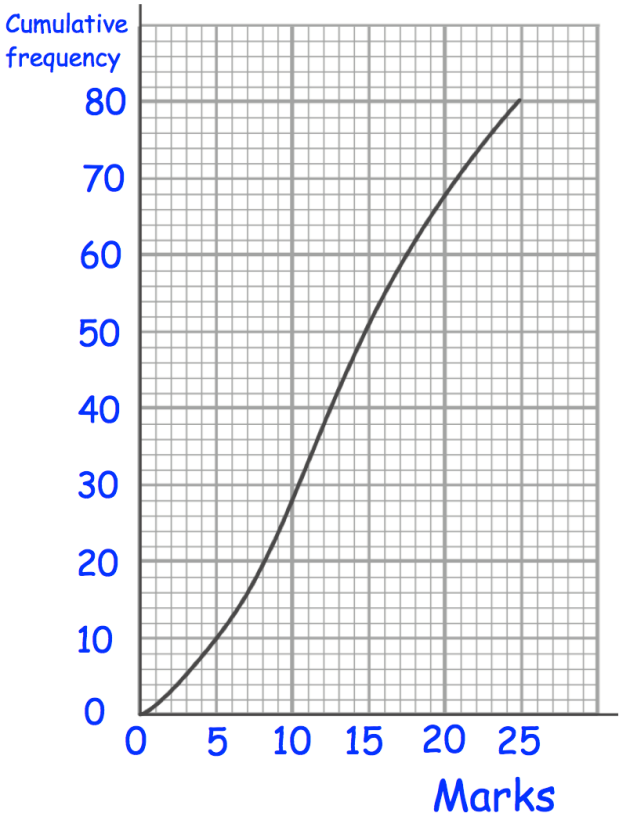
(d) Mr Rodgers says 18% of the cars were travelling too slowly on this road. Below what speed does he feel is too slow?



Cumulative Frequency Graphs

Videos 153 and 154 on www.corbettmaths.com

Apply



Question 1: Some students complete a quiz.
The cumulative frequency graph shows their results

(a) How many students completed the quiz?

(b) Complete the frequency table below.

(c) What percentage of the students scored above 20 marks?

Marks	Frequency
$0 < m \leq 5$	
$5 < m \leq 10$	
$10 < m \leq 15$	
$15 < m \leq 20$	
$20 < m \leq 25$	

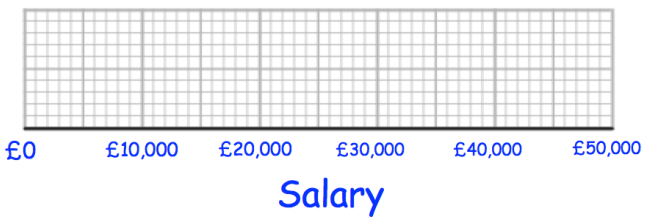
Question 2: The cumulative frequency graph below shows the salaries of 80 teachers.
The lowest salary is £4,000 and the highest salary is £39,000.

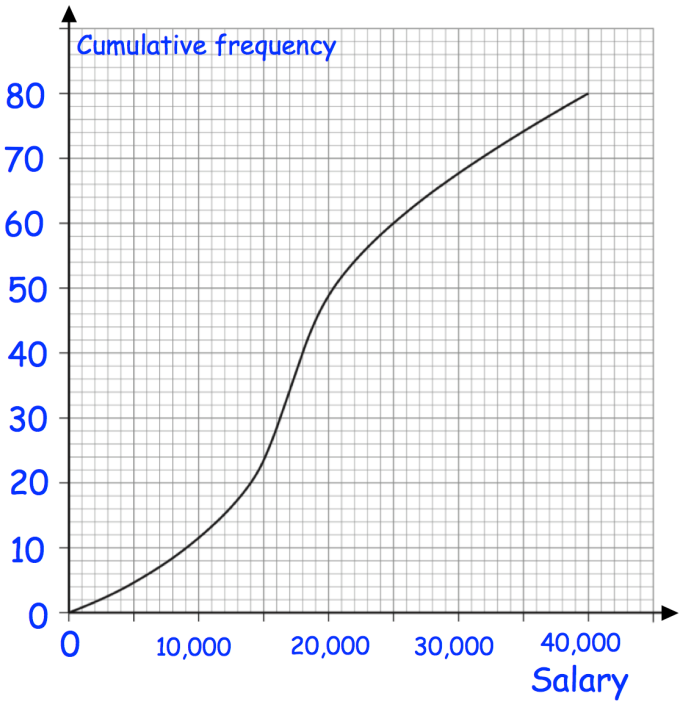
A teacher is picked at random to answer a survey.

(a) Find the probability that the teacher selected is paid less that £15,000.

(b) Find the probability that the teacher selected is paid over £25,000.

(c) Draw a box plot to represent the salaries.





Cumulative Frequency Graphs

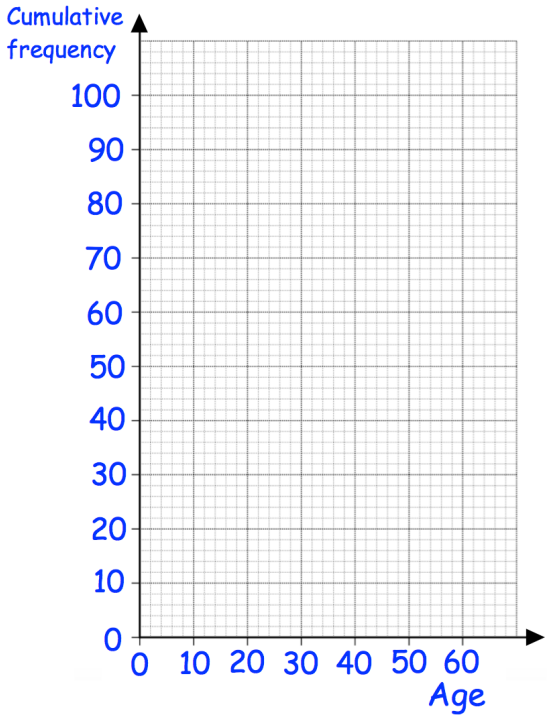
Videos 153 and 154 on www.corbettmaths.com

Question 3: The table shows information about the members of Abbeyville Cricket Club

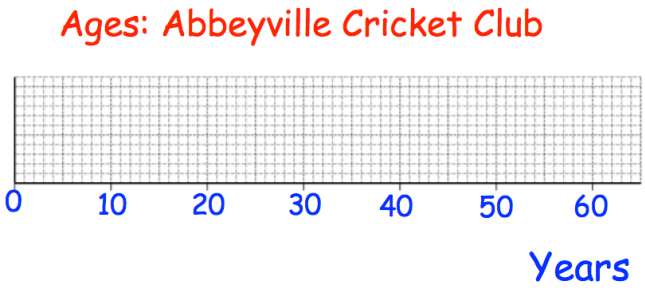
Age	Frequency
$0 < A \leq 10$	2
$10 < A \leq 20$	5
$20 < A \leq 30$	19
$30 < A \leq 40$	38
$40 < A \leq 50$	25
$50 < A \leq 60$	11

The youngest member is 9 and the oldest member is 58.

(a) Draw a cumulative frequency graph to represent this information.



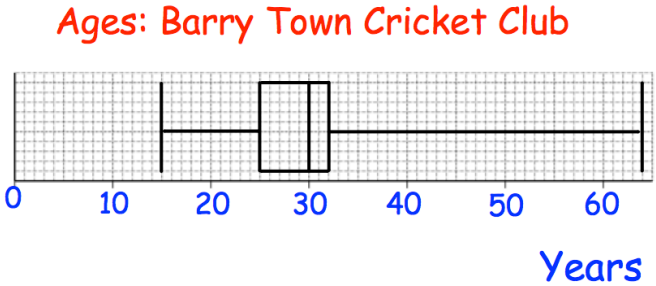
(b) Draw a box plot to represent this information



(c) Work out the interquartile of the ages of the members of Abbeyville Cricket Club.

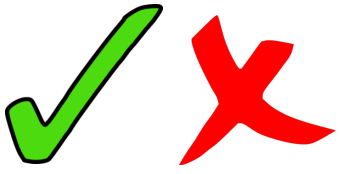
The box plot below shows information about Barry Town Cricket Club

(d) Write down the median age of the members of Barry Town Cricket Club



(e) Compare the distributions of the ages of the members of Abbeyville Cricket Club to the ages of the members of Barry Town Cricket Club.

Answers



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Capture Recapture

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Examples

Click here

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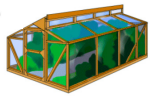
Workout

Question 1: Hannah wants to estimate the number of eels in a lake.
She catches and rings 50 eels.
She returns the 50 eels to the lake.
The next day Hannah catches 400 eels.
Of these 400 eels, 10 are ringed.

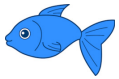
Work out an estimate for the total number of eels in the lake.

Question 2: Tom wants to estimate the number of woodlice in a greenhouse.
He catches and marks 32 woodlice.
The woodlice are then returned to the greenhouse.
The next day Tom catches 20 woodlice.
8 of these are marked.



Work out an estimate for the total number of woodlice in the greenhouse.

Question 3: A scientist wants to estimate the total number of fish in a pond.
On Thursday, she catches 180 fish.
These fish are marked and returned to the pond.
On Friday, the scientist catches 305 fish.
45 of these fish are marked.



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

(b) What assumptions have you made?

Question 4: Darren wants to estimate how many grasshoppers live in a field.
He catches and marks 24 grasshoppers.
He then releases the grasshoppers.
The next day, Darren returns to the same field and captures 51 grasshoppers.
7 of these have been marked.

Work out an estimate for the total number of grasshoppers in the field.

Capture Recapture
Video 391 on www.corbettmaths.com

Question 5: Heather has a large jar of jelly beans.

Heather wants to find an estimate for the total number of jelly beans in the jar.
She takes out all the jelly beans and marks 200 of them.
Heather mixes the jelly beans and puts them back into the jar.

Heather then takes 140 jelly beans from the jar.
3 of the jelly beans are marked.
Heather then puts all the jelly beans back into the jar.

(a) Work out an estimate for the number of jelly beans in the jar.

(b) What assumptions have you made?

Apply

Question 1: Charlotte wants to work out an estimate of the number of fish living in a pond.
She captures X fish and tags them.
Charlotte returns the fish to the pond.
The next day Charlotte catches 50 fish.
Of these 50 fish, 32 are tagged.

Charlotte's estimate of the number of fish in the pond is 125.

Work out how many fish Charlotte tagged, X.

Question 2: Ronan wants to estimate the number of honey bees in a beehive.

On Wednesday, Ronan catches 660 honey bees from the beehive.
He marks the honey bees and then releases them.

On Thursday, Ronan catches 400 honey bees and notes how many were marked.

Ronan then calculates his estimate as 22,000 honey bees in the beehive.

How many of the 400 honey bees caught on Thursday were marked?

Capture Recapture

Video 391 on www.corbettmaths.com

Question 3: Rhys has a large tub of yellow counters.
Alex has a large tub of blue counters.

40 yellow counters are taken from Rhys' tub and placed into Alex's tub.
40 blue counters are taken from Alex's tub and placed into Rhys' tub.

Rhys randomly selects 100 counters from his tub.
8 of the 100 counters are blue.

Alex randomly selects 50 counters from his tub.
48 of the 50 counters are blue.

All the counters are then placed into one tub.

Work out an estimate for the ratio of yellow to blue counters in the tub.

Question 4: A scientist wants to estimate the number of lions living in a region.

On Thursday, he locates and tags some lions.
On Friday he returns and locates 10 less lions than he had on Thursday.
He notices that 4 of the lions are tagged.

The scientist works out an estimate for the total number of lions living in the region.

He notices that the number of lions that he had caught on Thursday, was a fifth of the total number of lions.

How many lions live in the region?

Answers

Click here

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Changing the Subject: Advanced

Video 8 on www.corbettmaths.com

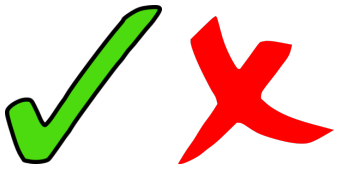
Question 3: Make c the subject of the following

(a) $w = \frac{ac}{a - c}$ (b) $w = 6 + \frac{a}{c + 2}$

Apply

Question 1: The cosine rule is $a^2 = b^2 + c^2 - 2bc \cos A$.
Make cos A the subject.

Answers



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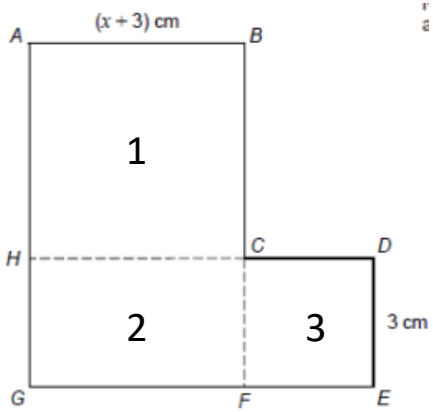
Forming and Solving Equations

Hard example

ABCH is a square. HCFG is a rectangle. CDEF is a square.



Show that the total area of the L-shape in cm² is $x^2 + 9x + 27$

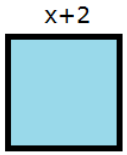
Remember when you multiply two expressions like this together it forms double brackets

Area of square 1: (x + 3) x (x + 3)
= (x + 3)(x + 3)
= $x^2 + 6x + 9$

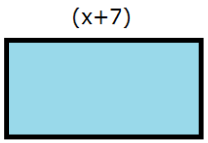
Area of rectangle 2: 3 x (x + 3)
= 3x + 9

Area of square 3: 3 x 3 = 9

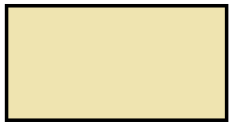
Total area = $x^2 + 6x + 9 + 3x + 9 + 9$
= $x^2 + 9x + 27$



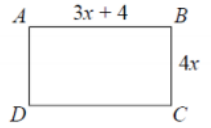
The area of this shape is 36cm². Find the value of x.

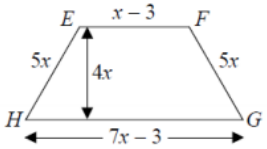


The area of this shape is 22cm². Find the value of x.

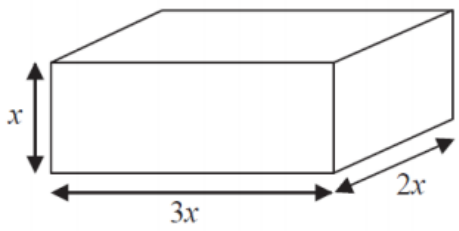


The area of this shape is 42cm².
Form an equation for the area of this shape
Solve this equation and obtain a suitable value for x

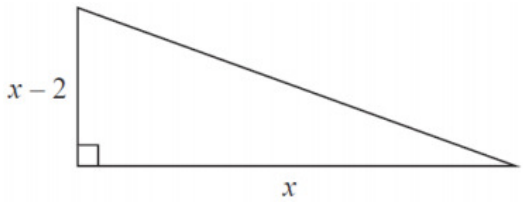




ABCD is a rectangle. EFGH is a trapezium.
All measurements are in centimetres.
The perimeters of these two shapes are the same.
Work out the area of the rectange.



All measurements are in centimetres.
X is an integer.
The total volume of the cuboid is less that 900cm³
Show that x ≤ 5



The area of the triangle is 2.5 cm².
Find the perimeter of the triangle. Give your answer correct to 3 significant figures.

Mixed exam questions

Q1. June 2015 unit 1

Here is a shape.

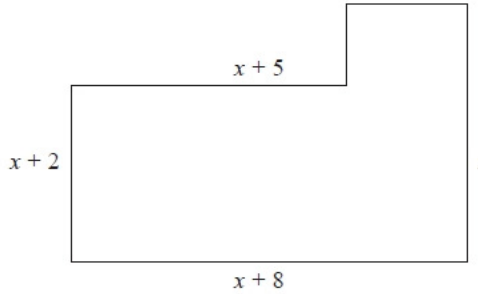


Diagram **NOT** accurately drawn

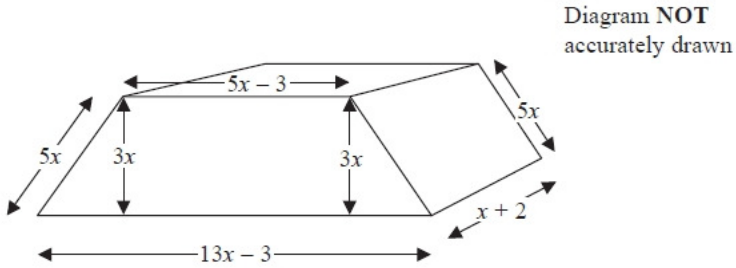
All the measurements are in centimetres. All the corners are right angles.
The area of the shape is A cm².
Find a formula for A in terms of x.
Give your answer in its simplest form.

A = ...

(Total for question = 4 marks)

Q2. June 2014 unit 1

***** This shape is a solid prism. The cross section of the prism is a trapezium.

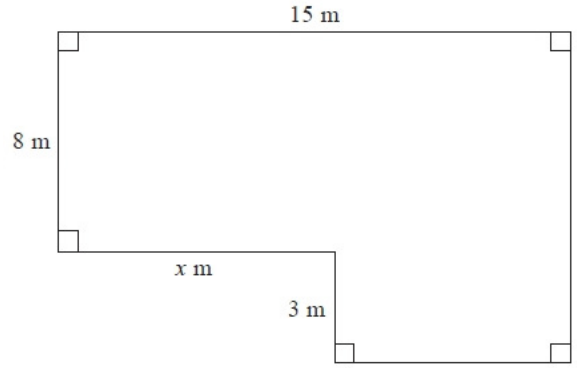


Show that the total surface area of the prism is $82x^2 + 32x - 12$

(Total for Question is 4 marks)

Q3. **November 2014 paper 1**

The diagram shows the plan of a floor.



The area of the floor is 138 m^2.
Work out the value of x.

.....

(Total for Question is 4 marks)

Examiner's Report Key notes

- Be careful when subtracting expressions. E.g. (x + 8) − (x + 5) is actually x + 8 – x – 5.
- Remember to set out your working out carefully. Make it clear to the examiner what you are trying to calculate. On this type of question it may halp to number each section of the shape.

Answers

$(x + 2)(x + 2) = 36$ $x^2 + 4x + 4 = 36$ $x^2 + 4x - 32 = 0$ $(x + 8)(x – 4) = 0$ $X = -8$ or 4 so $x = 4$	$(x + 7)(x - 2) = 22$ $x^2 + 5x - 14 = 22$ $x^2 + 5x - 36 = 0$ $(x + 9)(x – 4) = 0$ $X = -9$ or 4 so $x = 4$
$(2x – 9)(x – 2) = 42$ $2x^2 - 13x + 18 = 42$ $2x^2 - 13x - 24 = 0$ $(2x + 3)(x – 8) = 0$ so $x = 8$	
Perimeter of the rectangle: $3x + 4 + 3x + 4 + 4x + 4x = 14x + 8$ Perimeter of the trapezium: $7x – 3 + 5x + 5x + x – 3 = 18x – 6$ The perimeters are equal, so $14x + 8 = 18x – 6$ $8 = 4x – 6$ $14 = 4x$ so $x = 3.5$ Area of the rectangle = $(3x + 4) \times 4x$ $= (10.5 + 4) \times 14 = 14.5 \times 14 = 187cm^2$	
Volume = $x \times 3x \times 2x = 6x^3$ $6x^3 < 900$ $x^3 < 150$ the nearest cube number is 120, which is 5 cubed so $x \leq 5$	
$x^2 - 2x = 2.5$ $x^2 - 2x - 2.5 = 0$ Using the quadratic formula, $x = 2.87$ To find the perimeter, we need to use Pythagoras first. $X – 2 = 2.87 – 2 = 0.87$ $c^2 = 0.87^2 + 2.87^2$ $c^2 = 8.9938$ $c = 3.00$ Perimeter = $0.87 + 2.87 + 3 = 6.74$cm	

Exam questions

Q1.

Answer	Mark	Notes
$x^2+10x+22$	4	M1 for $(x+8) – (x+5)$ (=3) or $(x+4) – (x+2)$ (=2) M1 for area of one rectangle eg $(x+2)(x+5)$ $(= x^2+7x+10)$ M1 for complete method to find area e.g. $(x+2)(x+5) + 3(x+4)$ $(= x^2+7x+10 + 3x+12)$ A1 cao

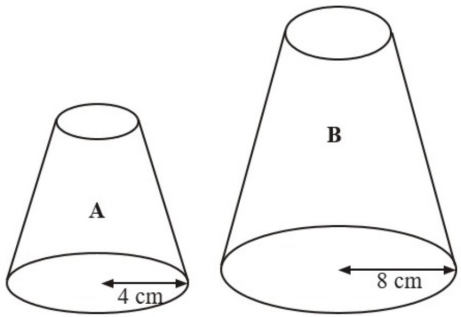
Q2.

Working	Answer	Mark	Notes
Front or Back: $\frac{1}{2} \times 3x(13x – 3 + 5x – 3)$ $= 27x^2 – 9x$ or $\frac{1}{2}(4x)(3x) + 3x(5x – 3)$ **Top**: $(5x – 3)(x + 2)$ $= 5x^2 + 7x – 6$ **Bottom**: $(13x–3)(x + 2)$ $= 13x^2 + 23x – 6$ **Each Side**: $5x(x + 2)$ $= 5x^2 + 10x$ **Total SA** = $2(27x^2 – 9x) +$ $2(5x^2 + 10x) + (5x^2 + 7x – 6)$ $+ (13x^2 + 23x – 6)$ $= (54 + 10 + 5 + 13)\,x^2$ $+ (–18 + 20 + 7 + 23)\,x$ $+ (– 6 – 6)$	$82x^2 + 32x – 12$	4	M1 finds the area of at least 2 faces (condone omission of brackets) M1 writes a correct algebraic expression for the area of at least 3 different faces M1 correct expressions for all 6 faces and adds C1 (dep on M3) for correct algebraic expression as a correct summary

Q3.

Answer	Mark	Notes
9	4	M1 for method to find area of one rectangle, eg 15×8 (=120) or 15×11 (=165) M1 (dep) for subtracting from/by given area, eg (138 – "120") (=18) or "165" – 138 (=27) M1 for final step from complete method shown, eg 15 – "18" ÷ 3 or "27" ÷ 3 A1 cao **OR** M1 for a correct expression for the area of one rectangle, eg $(8 + 3) \times (15 – x)$ or $8 \times x$ M1 (dep) for a correct equation eg $(8 + 3) \times (15 – x) + 8 \times x = 138$ M1 for correct method to isolate x, eg $3x = 27$ A1 cao

1.



Two solid shapes, A and B, are mathematically similar.
The base of shape A is a circle with radius 4 cm.
The base of shape B is a circle with radius 8 cm.
The surface area of shape A is 80 cm^2

(a) Work out the surface area of shape B.

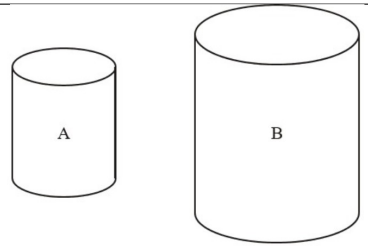
(2 marks)

The volume of shape B is 600cm^3.

(b) Work out the volume of shape A.

(2 marks)

2.

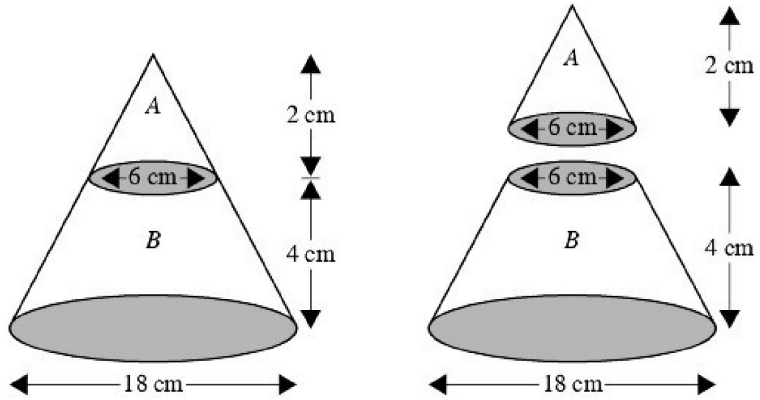


The two cylinders, A and B, are mathematically similar.
The height of cylinder B is twice the height of cylinder A.
The total surface area of cylinder A is 180 cm^2.

Calculate the total surface area of cylinder B.

(3 marks)

3.



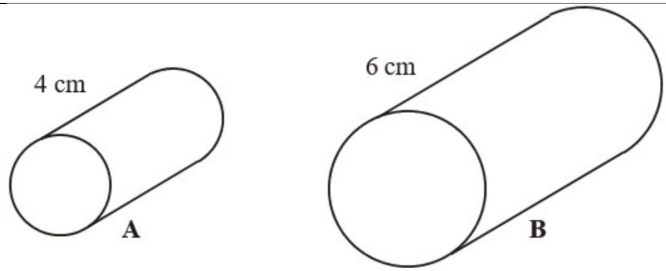
The diagram represents a large cone of height 6 cm and base diameter 18 cm.

The large cone is made by placing a small cone A of height 2 cm and base diameter 6 cm on top of a frustum B.

Calculate the volume of the frustum B.
Give your answer in terms of π.

(4 marks)

4.



Cylinder A and cylinder B are mathematically similar.

The length of cylinder A is 4 cm and the length of cylinder B is 6 cm.

The volume of cylinder A is 80 cm^3.

Calculate the volume of cylinder B.

(3 marks)

5. X and Y are two geometrically similar solid shapes.

The total surface area of shape X is 450 cm^2.

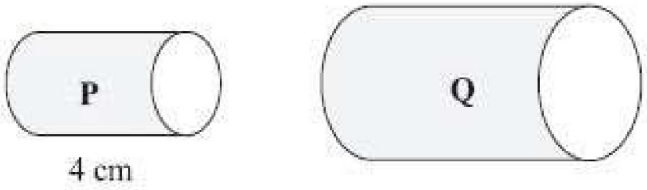
The total surface area of shape Y is 800 cm^2.

The volume of shape X is 1350 cm^3

Calculate the volume of shape Y.

(3 marks)

6.



Two cylinders, P and Q, are mathematically similar.

The total surface area of cylinder P is 90π cm^2.
The total surface area of cylinder Q is 810π cm^2.
The length of cylinder P is 4 cm.

(a) Work out the length of cylinder Q.

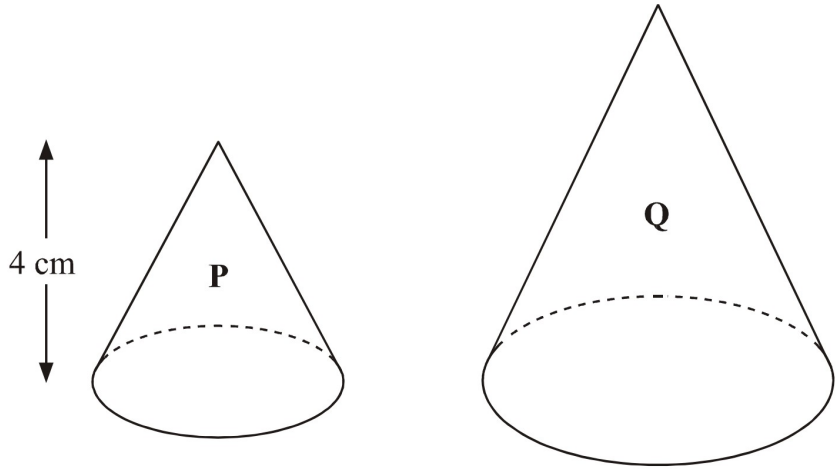
(3 marks)

The volume of cylinder P is 100π cm^3.

(b) Work out the volume of cylinder Q.
Give your answer as a multiple of π.

(2 marks)

7.



Two cones, P and Q, are mathematically similar.

The total surface area of cone P is 24 cm^2.
The total surface area of cone Q is 96 cm^2.

The height of cone P is 4 cm.

(a) Work out the height of cone Q.

(3 marks)

The volume of cone P is $12cm^3$

(b) Work out the volume of cone Q.

(2 marks)

Corbett maths

Functions
Videos 369, 370 on Corbettmaths

Question 16: Given $g(x) = \dfrac{3x+1}{2}$

(a) Find $g^{-1}(x)$

(b) Calculate the value of $g^{-1}(11)$

Question 17: Given $f(x) = \dfrac{4x}{9} - 8$

(a) Find $f^{-1}(x)$

(b) Calculate the value of $f^{-1}(-10)$

Apply

Question 1: Given $f(x) = 5x + 7$ and $g(x) = 3x - 18$

Find the value of a such that $f(a) = g(a)$

Question 2: Given $f(x) = x^2 + 9$ and $g(x) = x + 21$

Find the values of a such that $f(a) = g(a)$

Question 3: Given $f(x) = \dfrac{x+1}{3}$ and $g(x) = \dfrac{2}{x+2}$

Find the values of a such that $f(a) = g(a)$

Question 4: Given $f(x) = x^2 + 4x - 1$

Express the following in the form $ax^2 + bx + c$

(a) $f(x+2)$ (b) $f(x-1)$ (c) $f(2x)$

(d) $f(3x)$ (e) $f(2x-1)$ (f) $f(4x+3)$

Corbett maths

Functions
Videos 369, 370 on Corbettmaths

Question 5: The function f is such that $f(x) = kx + 7$

The function g is such that $g(x) = 3x - 2$

Given that $gf(1) = 34$

Work out the value of k

Question 6: The function g is such that $f(x) = \dfrac{kx+2}{4}$

The function h is such that $g(x) = 2x + 5$

Given that $fg(4) = -9.25$

Work out the value of k

Question 7: For all values of x

$$f(x) = x^2 + 5$$
$$g(x) = x - 4$$

Solve $fg(x) = gf(x)$

Question 8: $f(x) = x^2 + 3x + 8$

Show that $f(x+1) - f(x) = 2x + 4$

Answers

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1) Equations and Indices: Easier

1) Simplify

a) $(a^5)^3$

b) $(2a)^4$

c) $(-2a^2)^4$

d) $(3a^2b^3)^3$

e) $\sqrt[3]{64t^{27}v^{15}}$

(5 Marks)

2) Express (where possible) each of the following as 2^k for some value of k

a) 8

b) 1

c) $\frac{1}{2}$

d) $\sqrt{2}$

e) $\sqrt{8}$

f) $\frac{1}{\sqrt{2}}$

g) $\left(\sqrt{8}\right)^3$

(7 Marks)

1) Equations and Indices: Medium

3) Solve the equation

$$3^{x+1} = \frac{27^x}{9}$$

(5 Marks)

4) Solve the equation

$$25^{x-1} = 5\sqrt{5}$$

(5 Marks)

5) Solve the equation

$$\frac{16^x}{2^{x-1}} = 2^{\frac{1}{2}}$$

(5 Marks)

1) Equations and Indices: Harder

6) Solve the equation

$$\frac{8^{x+1}}{2^x} = 16$$

(5 Marks)

7) Solve the equation

$$27^y = 3^{1+y}$$

(5 Marks)

8) Solve the equation

$$\left(\frac{1}{4}\right)^n = 8^{n+1}$$

(5 Marks)

Sketching Quadratics
Video 265 on Corbettmaths

Question 5: Sketch the following graphs.

(a) $y = x^2 + 6x + 8$ (b) $y = x^2 - x - 6$ (c) $y = x^2 + 6x + 9$

(d) $y = x^2 - 13x + 42$ (e) $y = x^2 + 5x - 36$ (f) $y = x^2 - 2x + 1$

(g) $y = x^2 + 5x + 11$ (h) $y = x^2 - 4x + 7$

Question 6: Sketch the following graphs.

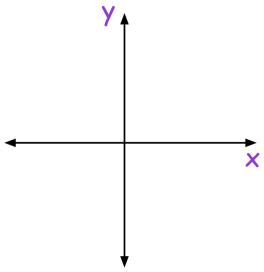
(a) $y = (x - 7)(x + 10)$ (b) $y = (x + 3)(x + 8)$ (c) $y = (x - 2)^2$

Question 7: Sketch the following graphs.

(a) $y = x^2 - 49$ (b) $y = x^2 - 1$ (c) $y = x^2 - 196$

Question 8: Michael wants to sketch the graph of $y = -x^2 + 5x + 14$

(a) Find the value of y when $x = 0$
(b) Use your answer to (a) to plot where the graph crosses the y–axis.
(c) Solve the equation $-x^2 + 5x + 14 = 0$
(d) Use your answers to (c) to help you plot where the graph crosses the x–axis.
(e) Sketch the graph of $y = -x^2 + 5x + 14$



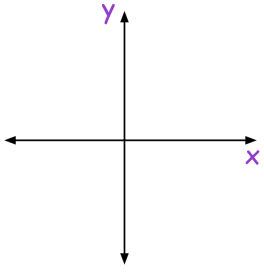
Question 9: Sketch the following graphs.

(a) $y = -x^2 - 5x - 4$ (b) $y = -x^2 + 9x - 18$ (c) $y = 84 - 5x - x^2$

(d) $y = (3 - x)(x + 8)$ (e) $y = -x^2 - 8x - 16$ (f) $y = 144 - x^2$

Question 10: Robyn wants to sketch the graph of $y = 2x^2 + 9x + 4$

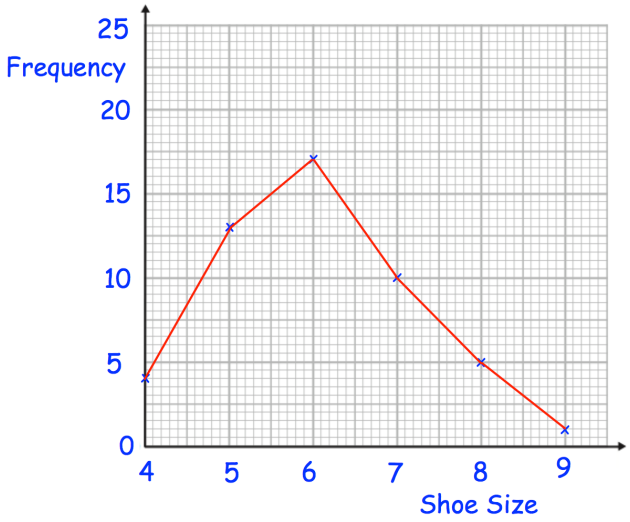
(a) Find the value of y when $x = 0$
(b) Use your answer to (a) to plot where the graph crosses the y–axis.
(c) Solve the equation $2x^2 + 9x + 4 = 0$
(d) Use your answers to (c) to help you plot where the graph crosses the x–axis.
(e) Sketch the graph of $y = 2x^2 + 9x + 4$



Frequency Polygons

Videos 155 and 156 on www.corbettmaths.com

Question 2: Henry surveyed 50 people.
This frequency polygon shows their shoe sizes.



(a) What is the modal shoe size?

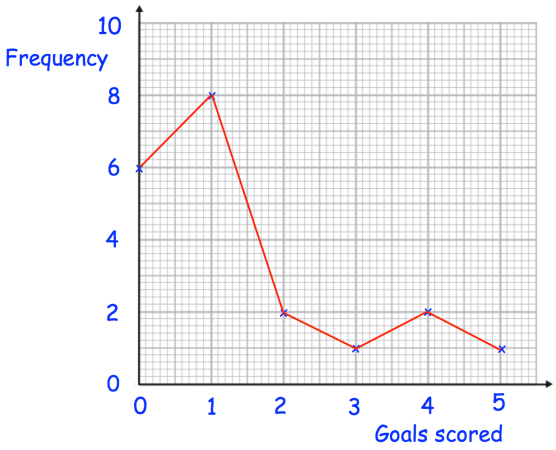
(b) What is the range of the shoe sizes?

(c) What fraction of the people surveyed have size 5 shoes?

(d) What percentage of the people surveyed have size 7 shoes?

(e) Henry picks somebody at random to win a prize.
Write down the probability that the winner has size 6 shoes.

Question 3: Roy is a striker for Rovers.
The frequency polygon shows the number of goals scored in each game over 20 games he has played.



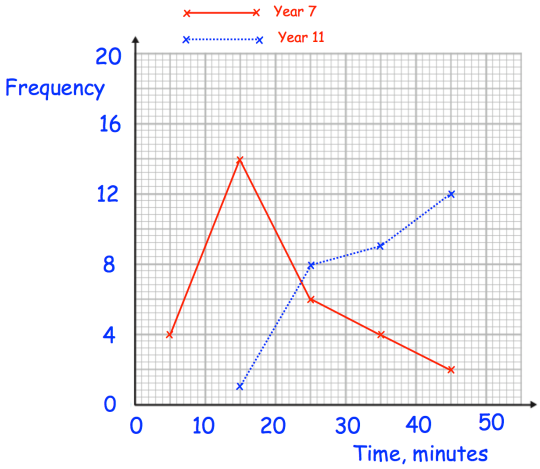
(a) Work out the median number of goals scored per game.

(b) Work out the mean number of goals scored per game.

(c) A journalist asks him for the "average" number of goals scored per game.
Which average should he use?

Question 4: The frequency polygons show the amount of time that 30 students in year 7 and 30 students in year 11 spent on their last maths homework.

Compare the time spent on homework by the year 7s and the year 11s.



Frequency Polygons

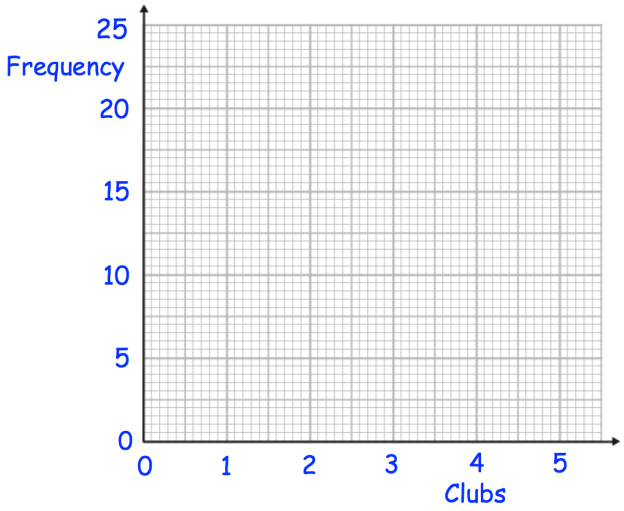
Videos 155 and 156 on www.corbettmaths.com

Question 5: 50 boys and 50 girls attend a primary school.
The table below shows how many clubs they attend.

(a) On the same grid, draw a frequency polygon for the boys and a frequency polygon for the girls.

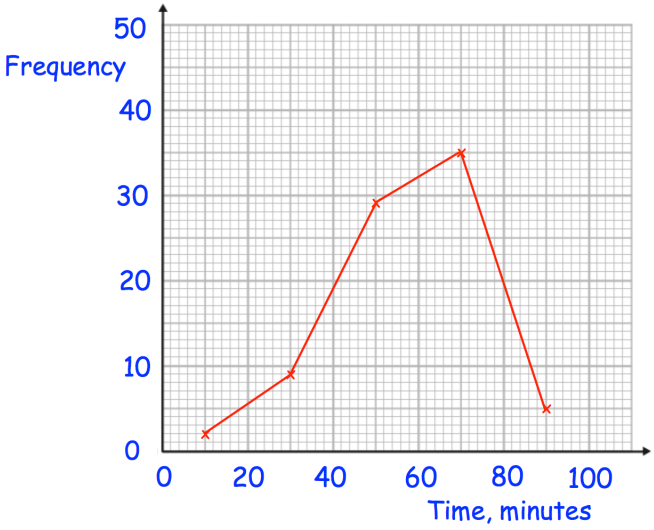
(b) Compare the distributions.

Clubs	Boys	Girls
0	5	2
1	20	18
2	14	22
3	9	7
4	2	1

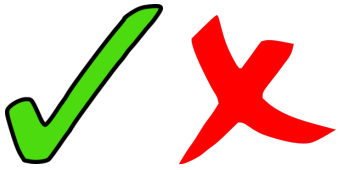


Question 6: The frequency polygon shows information about the amount of time people spend in the gym.

Calculate an estimate of the mean time spent in the gym.



Answers



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Error Intervals

Video 377 on www.corbettmaths.com

Examples

Click here

Scan here

Workout

Question 1: The mass of a coin is 8 grams to the nearest gram.
Complete the error interval for the mass of the coin

..... g ≤ mass < ..... g

Question 2: The distance between two cities is 900km to the nearest 100km.
Complete the error interval for the distance

..... km ≤ distance < ..... km

Question 3: Frank rounds a number, y, to the nearest ten.
His result is 20
Write down the error interval for y

Question 4: Lily rounds a number, y, to the nearest whole number.
Her result is 5
Write down the error interval for y

Question 5: Freya rounds a number, y, to one decimal place.
Her result is 6.4
Write down the error interval for y

Question 6: Oscar rounds a number, y, to the nearest integer.
His result is 100
Write down the error interval for y

Question 7: A number, n, is rounded to 1 decimal place.
The result is 1.3
Using inequalities, write down the error interval for n.

Question 8: A number, n, is rounded to 2 decimal places.
The result is 6.27
Using inequalities, write down the error interval for n.

Question 9: Elliott weighs 56.2kg.
This mass, m, is to the nearest 100g.
Write the error interval due to rounding.

Error Intervals

Video 377 on www.corbettmaths.com

Question 10: A number, x, is 21 when rounded to 2 significant figures.
Write down the error interval.

Question 11: A number, y, is 15000 when rounded to 2 significant figures.
Write down the error interval.

Question 12: A number, y, is 680000 when rounded to 3 significant figures.
Write down the error interval.

Question 13: The length of a line, l, was given as 2.8cm, truncated to 1 decimal place.
Complete the error interval for l

..... $cm \leq l <$ ..... cm

Question 14: A number, y, is 0.37 when truncated to 2 decimal places.
Complete the error interval for y

..... $\leq y <$ .....

Question 15: A number, n, is truncated to 1 decimal place.
The result is 18.1
Using inequalities, write down the error interval for n.

Question 16: A number, n, is truncated to 3 decimal places.
The result is 4.066
Using inequalities, write down the error interval for n.

Apply

Question 1: The length of each side of a regular hexagon is 4.7cm to 1 decimal place.
Write the error interval for the perimeter, P

Question 2: Grace and George complete a crossword.
It takes Grace 9 minutes to complete the crossword to the nearest minute.
It takes George 11 minutes to complete the crossword to the nearest minute.

Show that the total time for both people to complete the crossword could be 20 minutes 50 seconds.

Question 3: A man jogs 200 metres to the nearest 10 metres.
It takes him 30 seconds to the nearest 10 seconds.

Work out the error interval for his speed, s.

Error Intervals

Video 377 on www.corbettmaths.com

Question 4: A number, x, is 1.92 when truncated to 2 decimal places.
Matthew has been asked to write down the error interval.
This is his answer.

$$1.915 \leq x < 1.925$$

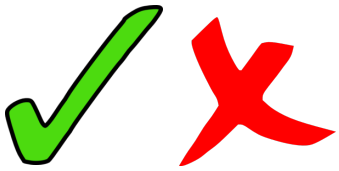
Explain why Matthew is wrong.

Question 5: A number, n, is rounded to 3 significant figures.
The result is 7500
Norris has been asked to write down the error interval for n.
This is his answer.

$$7450 < x < 7550$$

Explain why Norris is wrong.

Answers



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Edexcel GCSE
Mathematics (Linear) – 1MA0

STANDARD FORM

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Items included with question papers
Nil

Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

Information

The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
Check your answers if you have time at the end.

1. (a) Write the number 0.00037 in standard form.

(1)

.....

(b) Write 8.25 × 103 as an ordinary number.

(1)

.....

(c) Work out $(2.1 \times 10^{8}) \times (6 \times 10^{-5})$.
Write your answer in standard form.

(2)

.....

(4 marks)

2. (a) Write 6.43×10^{5} as an ordinary number.

.....

(1)

(b) Work out the value of $2 \times 10^{7} \times 8 \times 10^{-12}$
Give your answer in standard form.

.....

(2)

(3 marks)

3. (a) Write down the value of 10^0

.....

(1)

(b) Write 6.7×10^{-5} as an ordinary number.

.....

(1)

(c) Work out the value of $(3 \times 10^7) \times (9 \times 10^6)$
Give your answer in standard form.

.....

(2)

(4 marks)

---

4. (a) Write 8.2×10^5 as an ordinary number.

.....

(1)

(b) Write 0.000 376 in standard form.

.....

(1)

(c) Work out the value of $(2.3 \times 10^{12}) \div (4.6 \times 10^3)$
Give your answer in standard form.

.....

(2)

(4 marks)

---

5. A floppy disk can store 1 440 000 bytes of data.

(a) Write the number 1 440 000 in standard form.

……

(1)

A hard disk can store 2.4×10^9 bytes of data.

(b) Calculate the number of floppy disks needed to store the 2.4×10^9 bytes of data.

……

(3)

(4 marks)

---

6. (a) (i) Write 40 000 000 in standard form.

.....

(ii) Write 3×10^{-5} as an ordinary number.

.....

(2)

(b) Work out the value of

$$3 \times 10^{-5} \times 40\,000\,000$$

Give your answer in standard form.

.....

(2)

(4 marks)

---

7. (a) Write the number 40 000 000 in standard form.

.....

(1)

(b) Write 1.4×10^{-5} as an ordinary number.

.....

(1)

(c) Work out

$(5 \times 10^4) \times (6 \times 10^9)$

Give your answer in standard form.

.....

(2)

(4 marks)

---

8. (a) Write 6.4×10^4 as an ordinary number.

.....

(1)

(b) Write 0.0039 in standard form.

.....

(1)

(c) Write 0.25×10^7 in standard form.

.....

(1)

(d) Work out $(3.2 \times 10^5) \times (4.5 \times 10^4)$ in standard form.

.....

(2)

(5 marks)

---

9. (a) (i) Write 7900 in standard form.

.....

(ii) Write 0. 00035 in standard form.

.....

(2)

(b) Work out $\frac{4 \times 10^3}{8 \times 10^{-5}}$

Give your answer in standard form.

.....

(2)

(4 marks)

---

10. (a) Write 30 000 000 in standard form.

.....

(1)

(b) Write 2×10^{-3} as an ordinary number.

.....

(1)

(2 marks)

---

11. (a) Write 5.7×10^{-4} as an ordinary number.

.....

(1)

(b) Work out the value of $(7 \times 10^4) \times (3 \times 10^5)$

Give your answer in standard form.

.....

(2)

(3 marks)

---

12. Write the following numbers in order of size.
Start with the smallest number.

0.038×10^{2} 3800×10^{-4} 380 0.38×10^{-1}

.....

(2 marks)

13. The time taken for light to reach Earth from the edge of the known universe is 14 000 000 000 years.

Light travels at the speed of 9.46×10^{12} km/year.

Work out the distance, in kilometres, from the edge of the known universe to Earth.
Give your answer in standard form.

..... km

(3 marks)

14. The surface area of Earth is 510 072 000 km^2.
The surface area of Jupiter is 6.21795 × 1010 km^2.

The surface area of Jupiter is greater than the surface area of Earth.
How many times greater?
Give your answer in standard form.

.....

(3 marks)

15. $p^2 = \dfrac{x - y}{xy}$

$x = 8.5 \times 10^{9}$
$y = 4 \times 10^{8}$

Find the value of p.
Give your answer in standard form correct to 2 significant figures.

.....

(4 marks)

16. $y^2 = \dfrac{ab}{a + b}$

$a = 3 \times 10^{8}$
$b = 2 \times 10^{7}$

Find y.
Give your answer in standard form correct to 2 significant figures.

$y =$ .....

(4 marks)

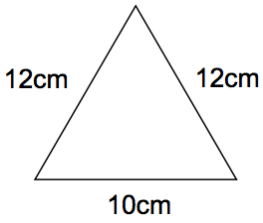
Trigonometry

Video 329, 330, 331 on www.corbettmaths.com

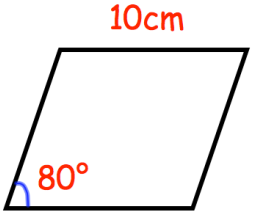
Question 6: A helicopter leaves A and flies 40 miles due east. Then the helicopter flies 10 miles due south and arrives at B. Work out the bearing of B from A.

Question 7: A boat leaves a port and sails 55km due west and then 30km due north and arrives at an oil rig. What is the bearing of the oil rig from the port?

Question 8: Shown is an isosceles triangle. Calculate its area.

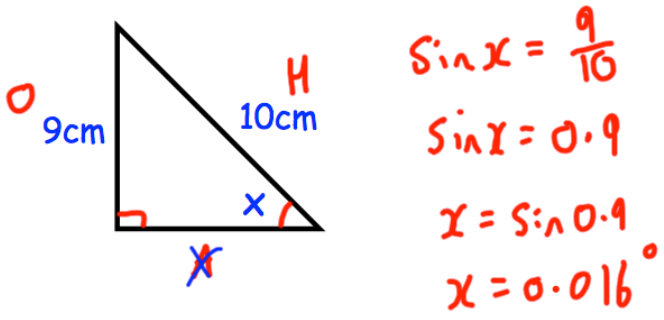


Question 9: Shown is a rhombus of side length 10cm.
Calculate its area.

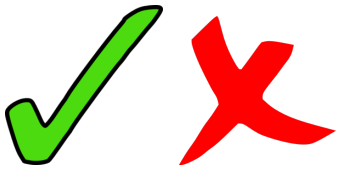


Question 10: Can you spot any mistakes in the question below?

Find the size of the angle x.



Answers



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Box Plots

Videos 149 and 150 on www.corbettmaths.com

Question 4: Draw a box plot for each set of data

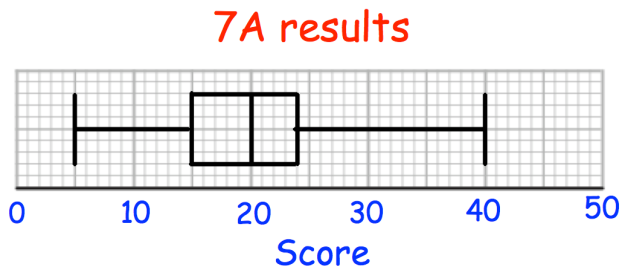
(a) 8, 10, 13, 14, 14, 15, 15, 16, 18, 19, 21, 22, 24, 29, 35

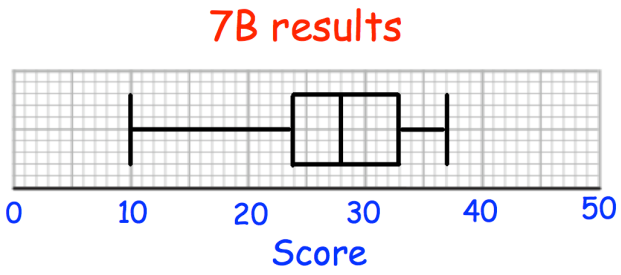
(b) 40, 80, 90, 90, 100, 120, 130

(c) 5.9, 7.3, 7.8, 8, 8.4, 8.7, 8.9, 8.9, 8.9, 9, 9, 9.1, 9.1, 9.3, 9.5, 9.6, 9.9, 10.5, 10.9

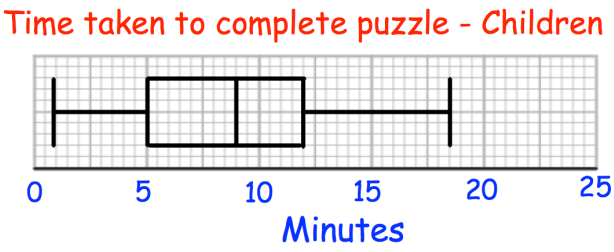
Question 5: Compare the distributions of each pair of box plots below.

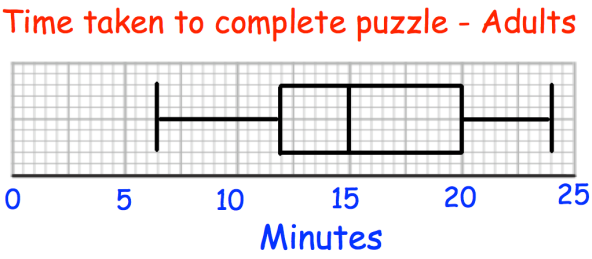
(a)



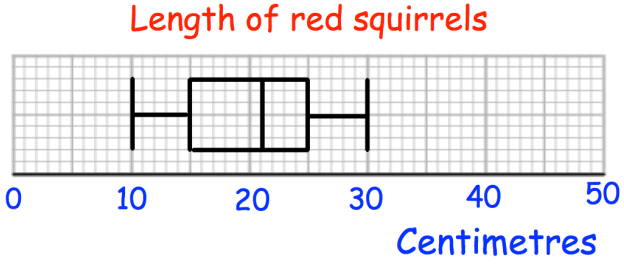


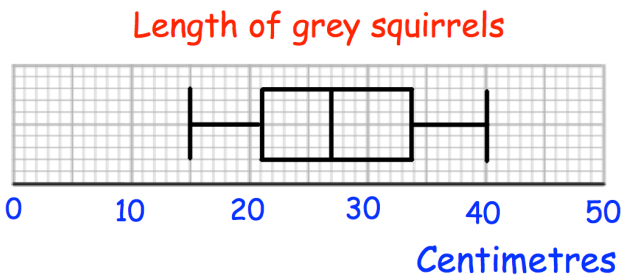
(b)



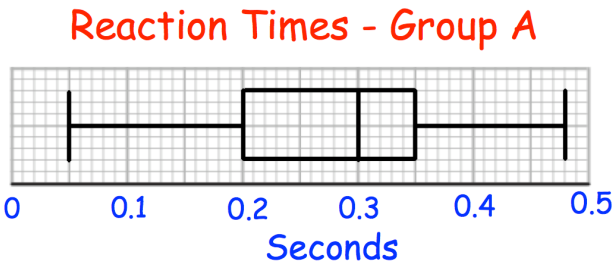


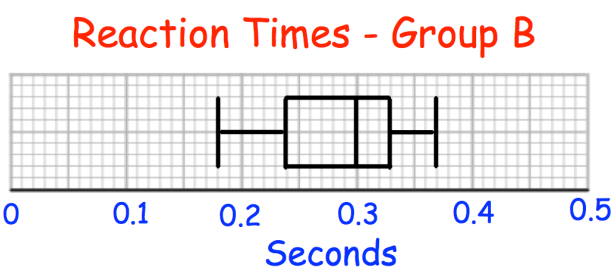
(c)





(d)





Box Plots

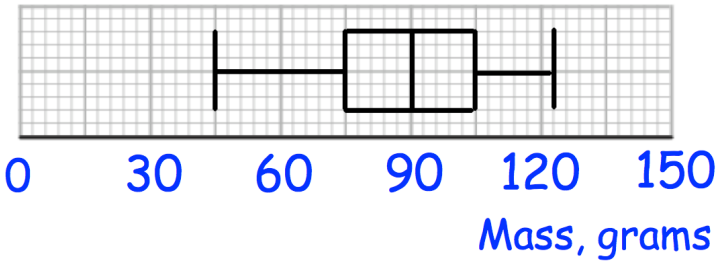
Videos 149 and 150 on www.corbettmaths.com

Question 3: Mr Jones is an estate agent on the Isle of Man.
He has created this table to show information about the prices of houses he has sold.

Explain how you know he has made a mistake.

Median	£375,000
Range	£235,000
Interquartile Range	£590,000

Question 4: The box plot show information about the masses of apples in a crate.



Jack is going to select apples at random from the crate.
After selecting each apple, he records its mass and returns it to the crate before picking another.
Work out the probability that:

(a) Jack picks two apples, both under 75g

(b) Jack picks two apples, both over 90g

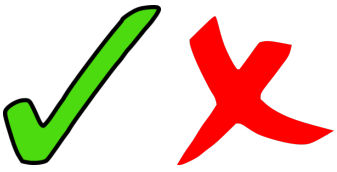
(c) Jack picks two apples, both over 105g

(d) Jack picks two apples, one under 90g and one over 105g

(e) Jack picks three apples, all over 105g

(f) Jack picks three apples, two over 105g and one under 75g.

Answers



Click here

Scan here

Product Rule for Counting

Video 383 on www.corbettmaths.com

Question 6: Oliver picks a 4-digit **even** number that is greater than 3000.
The second digit is a multiple of 4.

How many different numbers could Oliver pick?

Question 7: Sophia is creating a 6-digit code to lock her iPad.

She only uses digits greater than 2.
She only uses each digit once.

How many possible codes can Sophia create?

Question 8: In a class, there are 10 boys and 9 girls.
The teacher has been asked to pick one boy and one girl to win a prize.

How many possible pairs of students can the teacher pick?

Question 9: Jason picks a 5-digit number that is less that 80000.
The first digit is odd.
The fourth and fifth digits are equal.

How many different numbers can Jason pick?

Question 10: A headteacher wants to survey two Year 7 students.
There are 100 students in Year 7.

How many possible pairs of students can the headteacher pick?

Question 11: How many even numbers greater than 40000 can be created using these digits?

2	9	1	6	8

Apply

Question 1: On a school trip, students are given a packed lunch.
The students can choose one piece of fruit and one snack.
There are 8 different pieces of fruit and some different snacks.

Altogether there are 104 different ways to choose one piece of fruit and one snack

How many different snacks are there?

Product Rule for Counting

Video 383 on www.corbettmaths.com

Question 2: At a summer camp, children pick a morning, an afternoon and an evening activity.
There are 4 morning and 7 evening activities to pick from.

Altogether there are 224 different ways to choose their activities.

How many afternoon activities are there?

Question 3: In a gym there are

12 exercise classes on a Monday
13 exercise classes on a Wednesday
7 exercise classes on a Friday

Katie is going to attend either

a class on Monday and a class on Friday
or a class on Wednesday and a class on Friday
or a class on Monday, Wednesday and Friday

Work out how many different ways there are to pick which exercises classes Katie is going to attend.

Question 4: A group of 10 people enter a room.
Each person shakes hands, once, with all the other people in the room.

How many handshakes are there in total?

Question 5: A pizza parlour sells 9 different toppings.

Michael orders a pizza with 2 different toppings.

(a) How many different pizzas can he choose from?

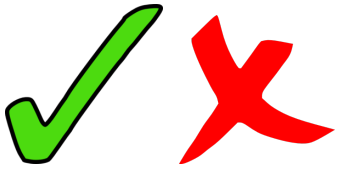
Beth orders a pizza with 3 different toppings.

(b) How many different pizzas can she choose from?

John orders a pizza with 4 different toppings.

(c) How many different pizzas can he choose from?

Answers

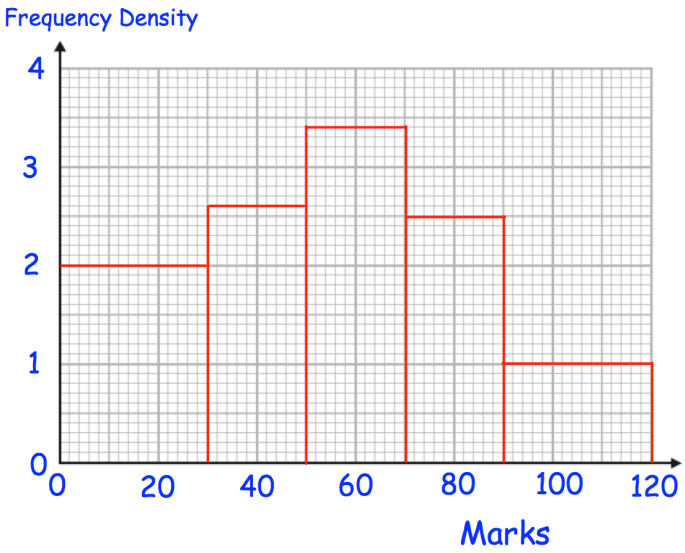


Click here

Histograms

Videos 158 and 159 on www.corbettmaths.com

Question 3: 260 people sit a driving theory test.
Their results are shown in this histogram.



10% of the people scored less than x marks.

(a) Find x.

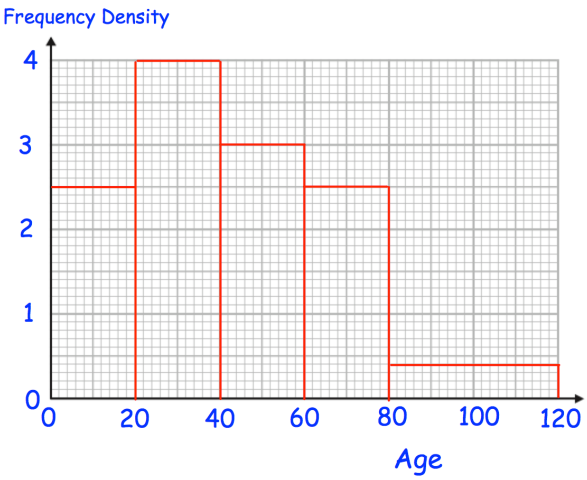
5% of people scored more than y marks.

(b) Find y

70% of people scored less than z marks.

(c) Find z

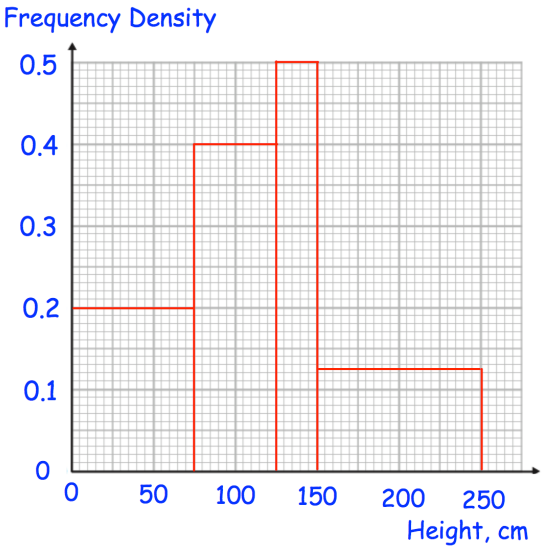
Question 4: The ages of the residents of a village are represented in this histogram



(a) How many people live in the village?

(b) Calculate an estimate of the mean age

Question 5: The heights of some sunflowers are represented in the histogram.



(a) Find an estimate of the median

(b) Find an estimate of the lower quartile

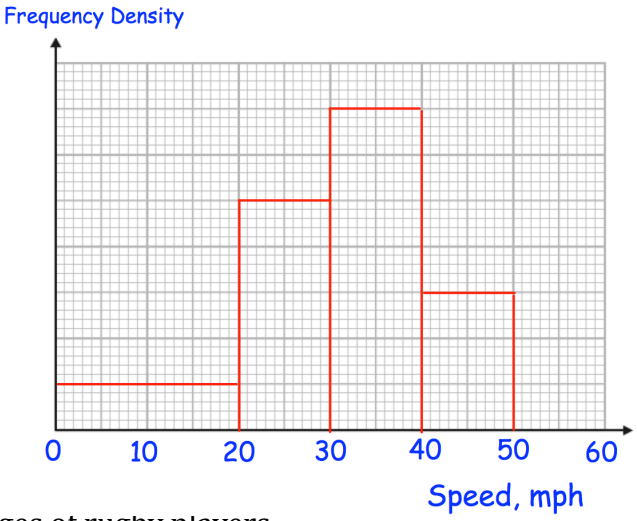
(c) Find an estimate of the upper quartile

(d) Find an estimate of the interquartile range

Histograms

Videos 158 and 159 on www.corbettmaths.com

Question 6: The histogram shows the speed, in miles per hour, of cars on a road over 1 hour. 24 cars travelled faster than 40mph.



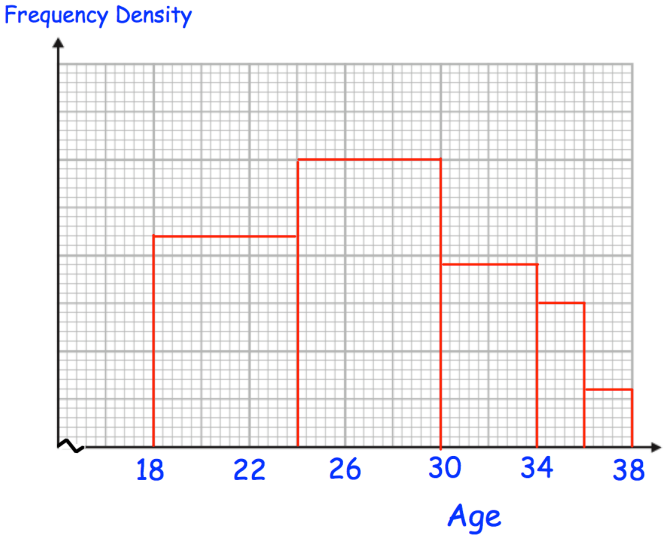
(a) How many cars travelled slower than 20mph?

(b) How many cars travelled between 20mph and 40mph?

(c) Estimate how many cars travelled between 15mph and 35mph.

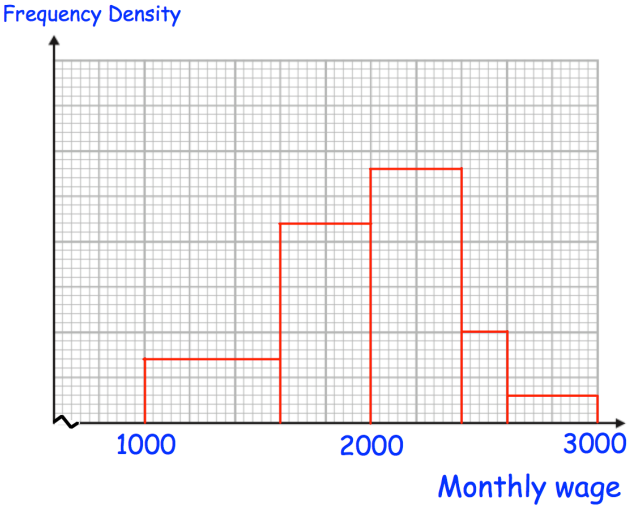
Question 7: The histogram below shows the ages of rugby players. There are 768 players that are under 26 years old.

Work out an estimate of how many players are over 32.



Question 8: The histogram below shows the monthly salaries of employees. There are 216 people who have a monthly salary of between £1800 and £2100.

Work out an estimate of how many employees have a salary of between £2300 and £2900

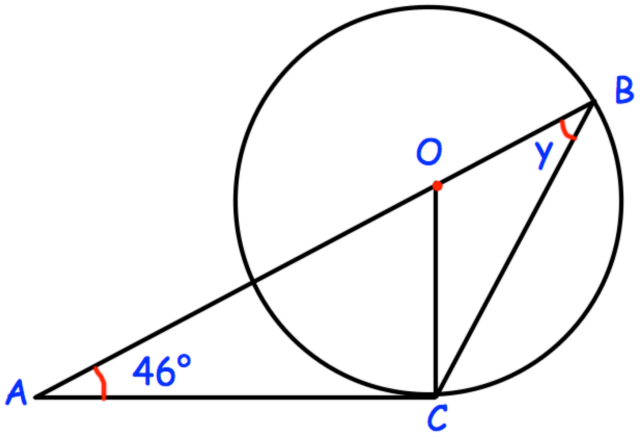


Answers

Click here

Scan here

14.

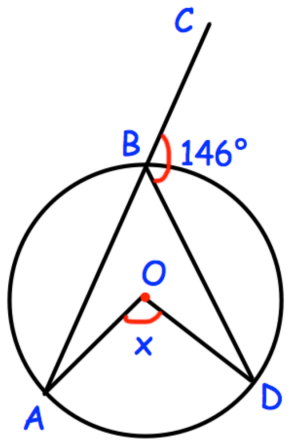


AOB is a straight line.
B and C are points on the circumference of a circle, centre O.
AC is a tangent to the circle.

Work out the size of the angle y.

.....°
(4)

15.

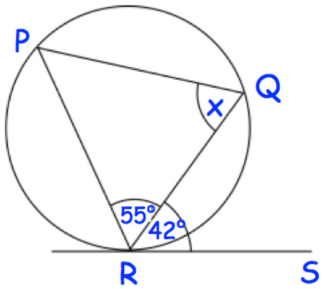


Shown is a circle with centre O.
ABC is a straight line.
Angle CBD is 146°

Find the size of angle AOD.

.....°
(3)

16. RS is a tangent to the circle at R.



Calculate the value of x.

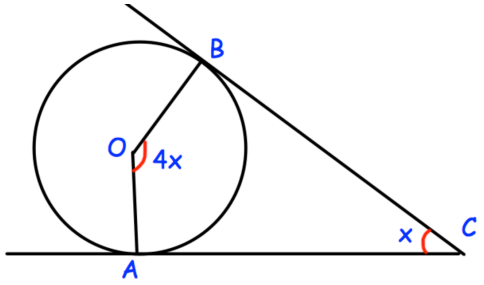
Give reasons for your answer.

.....°

(3)

---

17. AC and BC are tangents to the circle with centre O.

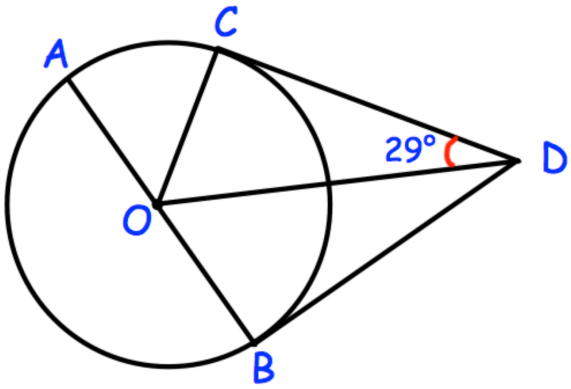


Find the size of x.

.....°

(3)

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



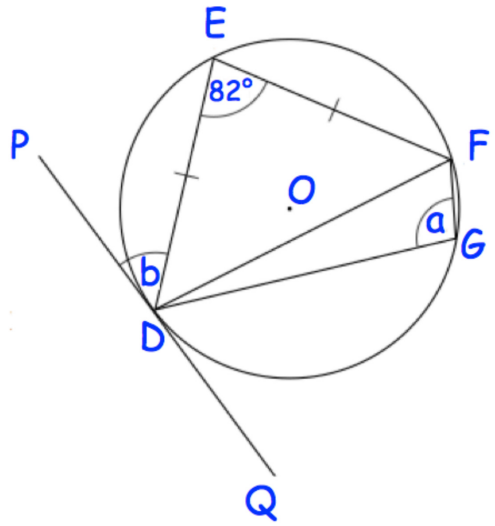
AOB is a diameter of the circle.
CD and BD are tangents to the circle.
Angle CDO = 29°

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

.....°

(4)

19. DEFG is a cyclic quadrilateral.
PDQ is a tangent at D.
O is the centre of the circle.
DEF is an isosceles triangle.



(a) Work out the value of a.

.....°
(2)

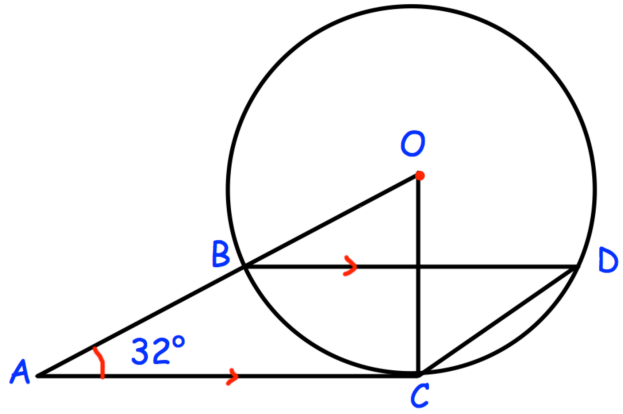
(b) Work out the value of b.

.....°
(3)

(c) Write down the name of the circle theorem used in part (b)

.....
(1)

20.



Shown is a circle, centre O.
B, C and D are points on the circumference.

ABO is a straight line.
AC is a tangent to the circle.

(a) Work out angle AOC.

.....°
(2)

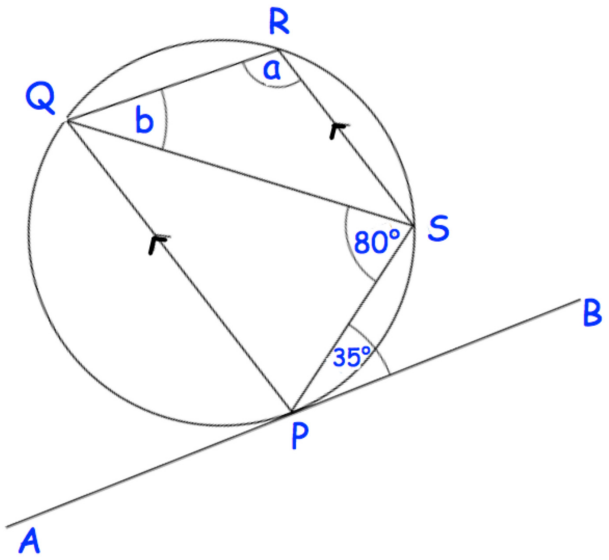
(b) Work out angle BDC.

.....°
(3)

(c) Work out angle ACD.

.....°
(1)

21. PQRS is a cyclic quadrilateral.
APB is a tangent to the circle at P.
PQ is parallel to SR.
Angle SPB = 35° and angle PSQ = 80°



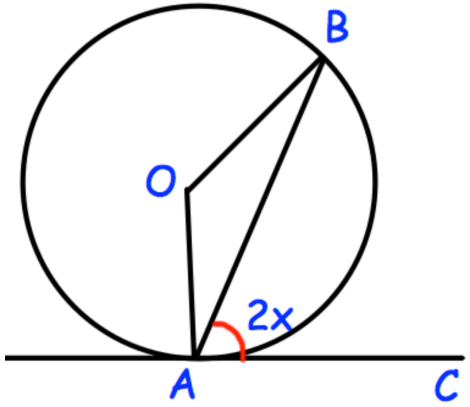
(a) Work out the size of angle QRS.

.....°
(4)

(b) Work out the size of angle RQS.

.....°
(2)

22.

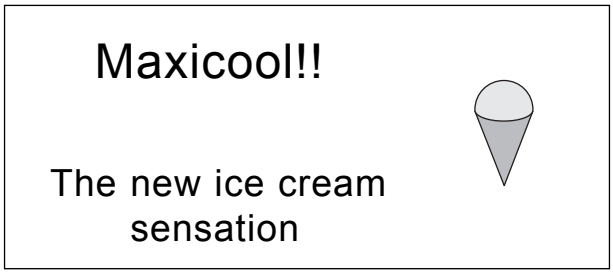


A and B are points on the circumference of a circle, centre O.
CA is a tangent to the circle.
Angle CAB = 2x

Prove that angle AOB = 4x
Give reasons for each stage of your working.

(4)

1. **[4 marks]**



A Maxicool consists of a cone full of ice cream with a hemisphere of ice cream on top.
The radius of the hemisphere is 3 cm.
The radius of the base of the cone is 3 cm.
The height of the cone is 10 cm.

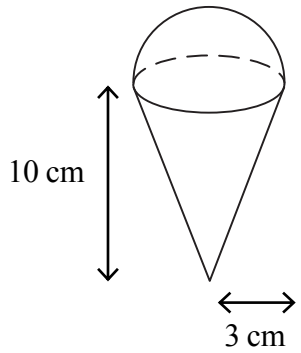


Diagram **NOT** accurately drawn

Calculate the total volume of ice cream in a Maxicool.
Give your answer correct to 3 significant figures.

Questions compiled by:
@Maths4Everyone

..... cm^2

2. **[5 marks]**

A solid is made from a cylinder and a hemisphere.
The cylinder has radius 1.5 cm and height 4 cm.
The hemisphere has radius 1.5 cm.

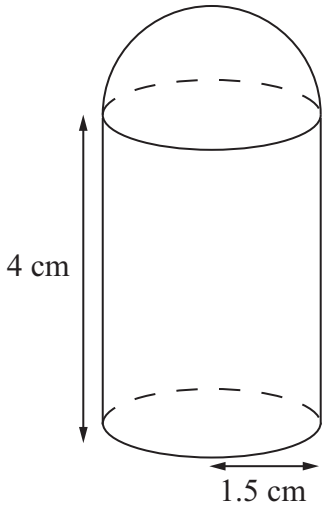


Diagram **NOT** accurately drawn

Work out the total volume of the solid.
Give your answer correct to 3 significant figures.

..... cm^3

3. **[4 marks]**

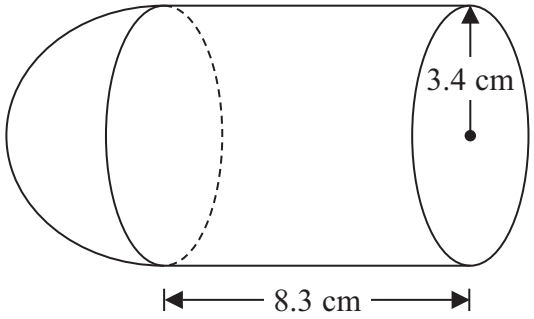


Diagram **NOT** accurately drawn

The diagram shows a shape made from a solid cylinder and a solid hemisphere.
The cylinder has a radius of 3.4 cm and a length of 8.3 cm.
The hemisphere has a radius of 3.4 cm.

Calculate the total surface area of the solid shape.
Give your answer correct to 3 significant figures.

..... cm^2

4. **[3 marks]**

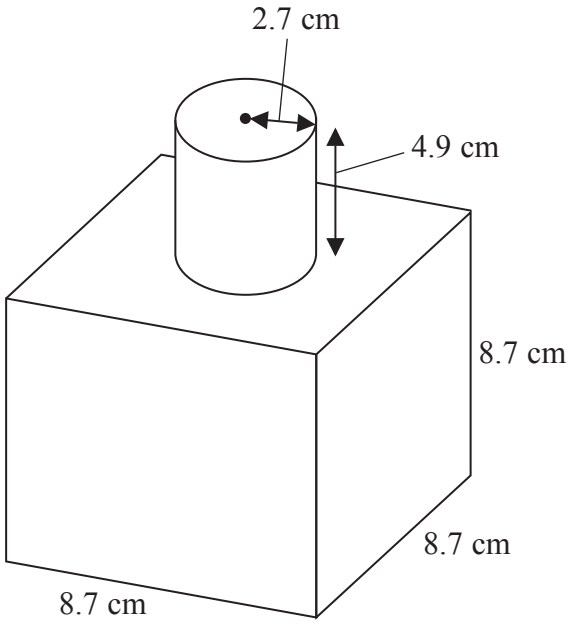


Diagram **NOT** accurately drawn

The diagram shows a shape made from a solid cube and a solid cylinder.
The cube has sides of length 8.7 cm.
The cylinder has a radius of 2.7 cm and a height of 4.9 cm.

Calculate the total surface area of the solid shape.
Give your answer correct to 3 significant figures.

..... cm^2

5. **[3 marks]**

The diagram shows a sphere and a cone.

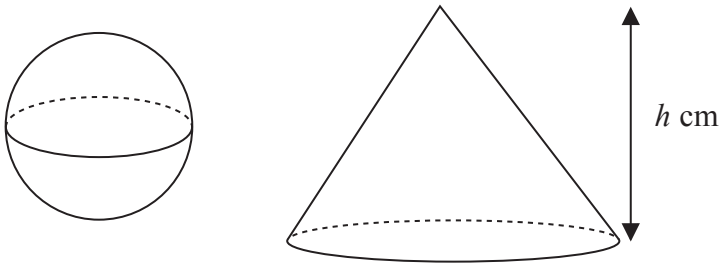


Diagram **NOT** accurately drawn

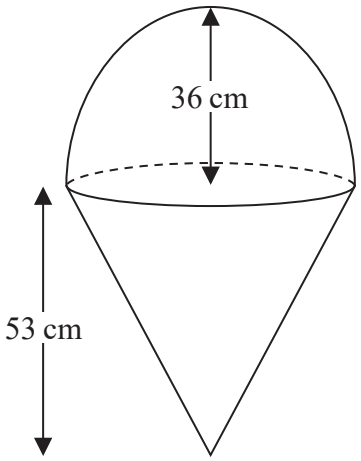
The cone has height h cm.
The radius of the base of the cone is 3 times the radius of the sphere.

Given that the volume of the sphere is equal to the volume of the cone, find an expression for the radius of the sphere in terms of h.
Give your expression in its simplest form.

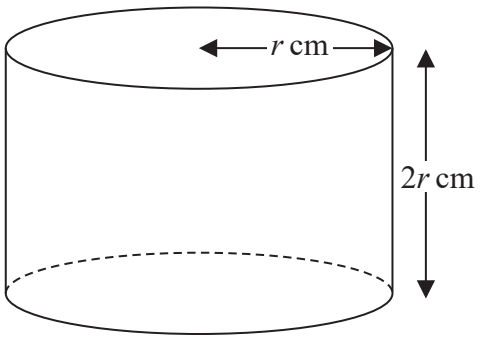
6. **[6 marks]**

The diagram shows two solid shapes, shape **A** and shape **B**.
Shape **A** is made of a hemisphere and a cone.
Shape **B** is a cylinder.

Diagram **NOT** accurately drawn



A



B

For shape **A**

radius of the hemisphere is 36 cm
radius of the base of the cone is 36 cm
height of the cone is 53 cm

For shape **B**

radius of the cylinder is r cm
height of the cylinder is $2r$ cm

The volume of shape **A** = the volume of shape **B**

Calculate the height of shape **B**.

7. **[4 marks]**

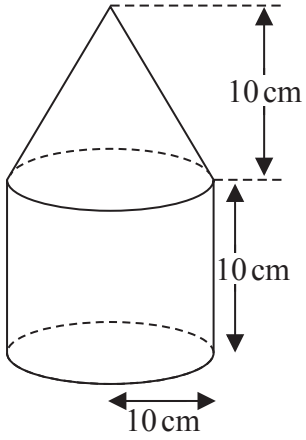


Diagram **NOT** accurately drawn

The diagram shows a solid shape made from a cone on top of a cylinder.

The cone has a radius of 10 cm and a height of 10 cm.
The cylinder has a radius of 10 cm and a height of 10 cm.
The centre of the base of the cone coincides with the centre of the top face of the cylinder.

The total surface area of the solid is A cm^2

Show that $A = (300 + 100\sqrt{2})\pi$

8. **[3 marks]**

The diagram shows a cylinder and a sphere.

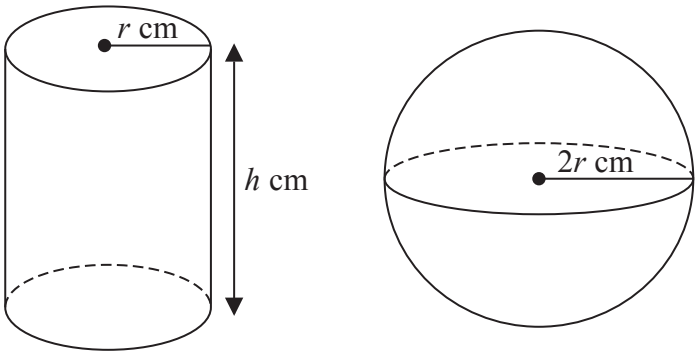


Diagram **NOT** accurately drawn

The cylinder has radius r cm and height h cm.
The sphere has radius $2r$ cm.

The volume of the cylinder is equal to the volume of the sphere.
Find an expression for h in terms of r.
Give your answer in its simplest form.

.....

9. **[5 marks]**

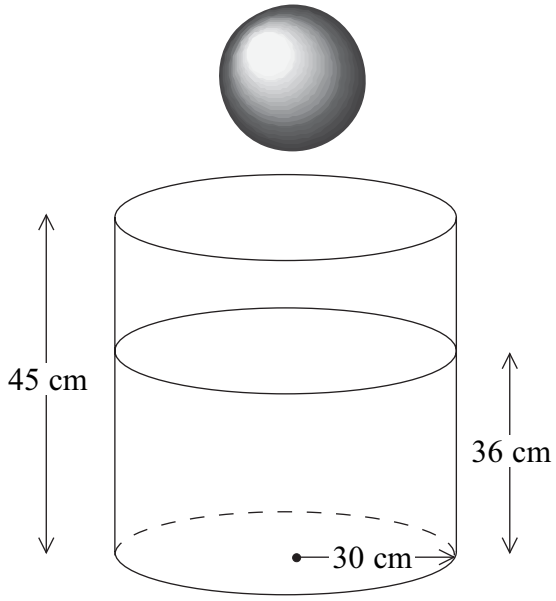


Diagram **NOT** accurately drawn

A cylindrical tank has a radius of 30 cm and a height of 45 cm.
The tank contains water to a depth of 36 cm.

A metal sphere is dropped into the water and is completely covered.
The water level rises by 5 cm.

Calculate the radius of the sphere.

..... cm

10. **[5 marks]**

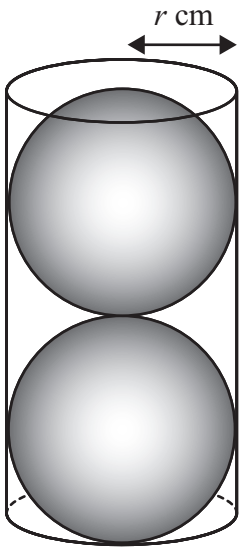


Diagram **NOT** accurately drawn

Two solid spheres, each of radius r cm, fit exactly inside a hollow cylinder.
The radius of the cylinder is r cm.
The height of the cylinder is equal to $4r$ cm.

The volume of the space inside the cylinder, not occupied by the spheres, is $\frac{125}{6}\pi$ cm^3

Calculate the value of r.

Show your working clearly.

$r =$ .....

11. **[5 marks]**

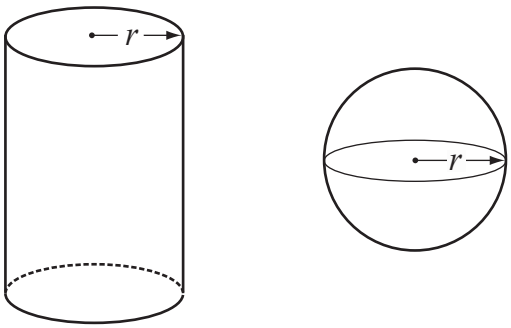


Diagram **NOT** accurately drawn

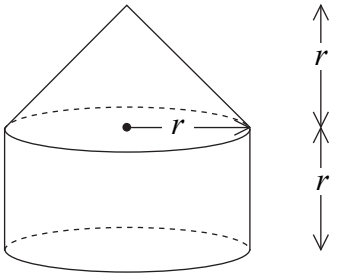
The diagram shows a solid cylinder and a solid sphere.
The cylinder has radius r.
The sphere has radius r.

Given that $\dfrac{\textbf{Total surface area of cylinder}}{\text{Surface area of sphere}} = 2$

find the value of $\dfrac{\text{Volume of cylinder}}{\text{Volume of sphere}}$

.....

12. **[5 marks]**



The diagram shows a solid made from a cone and a cylinder.
The cylinder has radius r and height r.
The cone has base radius r and height r.

(a) Show that the total volume of the solid is equal to the volume of a sphere of radius r.

(2)

The curved surface area of a cylinder with base radius r and height h is $2\pi rh$.
The curved surface area of a cone with base radius r and slant height l is πrl.

(b) Show that the **total** surface area of the above solid is greater than the surface area of a sphere of radius r.

(3)

1 The number of rabbits in a field t days from now is P_t where

$P_0 = 220$
$P_{t+1} = 1.15(P_t - 20)$

Work out the number of rabbits in the garden 3 days from now.

(3 marks)

---

2 The number of people living in a town t years from now is P_t where

$P_0 = 55000$

$P_{t+1} = 1.03(P - 800)$

Work out the number of people in the town 3 years from now.

(3 marks)

---

3 Using $x_{n+1} = 3 + \frac{9}{x_n{}^2}$

With $x_0 = 3$

Find the values of x_1, x_2 and x_3.

(3 marks)

---

4 Using $x_{n+1} = \frac{5}{x_n{}^2 + 3}$

With $x_0 = 1$

Find the values of x_1, x_2 and x_3.

(3 marks)

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5 Starting with $x_0 = 3$ use the iteration formula $x_{n+1} = \frac{7}{x_n{}^2} + 2$ three times to find an estimate for the solution to $x^3 - 2x^2 = 7$

(3 marks)

---

6 Starting with $x_0 = 0$ use the iteration formula $x_{n+1} = \frac{2}{x_n{}^2 + 3}$ three times to find an estimate for the solution to $x^3 + 3x = 2$

(3 marks)

---

7 Using $x_{n+1} = \frac{5}{x_n{}^2} + 2$

With $x_0 = 2.5$

(a) Find the values of x_1, x_2 and x_3

(3)

(b) Explain the relationship between the values of x_1, x_2 and x_3 and the equation

$x^3 - 2x^2 - 5 = 0$

(2)

(5 marks)

---

8 (a) Show that the equation $2x^3 - x^2 - 3 = 0$ has a solution between $x = 1$ and $x = 2$.

(2)

(b) Show that the equation $2x^3 - x^2 - 3 = 0$ can be rearranged to give: $x = \sqrt{\frac{3}{2x-1}}$

(1)

(c) Starting with $x_{y^2} = 1$, use the iteration formula $x = \sqrt{\frac{3}{2x-1}}$ twice to find an estimate for the solution to $2x^3 - x^2 - 3 = 0$

(3)

(6 marks)

9 Using $x_{n+1} = 1 + \frac{1}{x_n{}^2}$

With $x_0 = 2$

(a) Find the values of x_1, x_2 and x_3

(3)

(b) Explain the relationship between the values of x_1, x_2 and x_3 and the equation $x^3 - x^2 - 1 = 0$

(2)

(5 marks)

---

10 (a) Show that the equation $x^3 + 4x = 1$ has a solution between $x = 0$ and $x = 1$.

(2)

(b) Show that the equation $x^3 + 4x = 1$ can be rearranged to give: $x = \frac{1}{4} - \frac{x^3}{4}$

(1)

(c) Starting with $x = 0$, use the iteration formula $x_{n+1} = \frac{1}{4} - \frac{x_n{}^3}{4}$ twice to find an estimate for the solution to $x^3 + 4x = 1$

…….....

(3)

(6 marks)

C1 COORDINATE GEOMETRY *Worksheet A*

1 Find the gradient of the line segment joining each pair of points.

a (3, 1) and (5, 5) **b** (4, 7) and (10, 9) **c** (6, 1) and (2, 5) **d** (–2, 2) and (2, 8)

e (1, 3) and (7, –1) **f** (4, 5) and (–5, –7) **g** (–2, 0) and (0, –8) **h** (8, 6) and (–7, –2)

2 Write down the gradient and y-intercept of each line.

a $y = 4x - 1$ **b** $y = \frac{1}{3}x + 3$ **c** $y = 6 - x$ **d** $y = -2x - \frac{3}{5}$

3 Find the gradient and y-intercept of each line.

a $x + y + 3 = 0$ **b** $x - 2y - 6 = 0$ **c** $3x + 3y - 2 = 0$ **d** $4x - 5y + 1 = 0$

4 Write down, in the form $y - y_1 = m(x - x_1)$, the equation of the straight line with the given gradient which passes through the given point.

a gradient 2, point (4, 1) **b** gradient 5, point (2, –5)

c gradient –3, point (–1, 1) **d** gradient $\frac{1}{2}$, point (1, 6)

e gradient –2, point $(\frac{3}{4}, -\frac{1}{4})$ **f** gradient $-\frac{1}{5}$, point (–3, –7)

5 Find, in the form $y = mx + c$, the equation of the straight line with the given gradient which passes through the given point.

a gradient 3, point (1, 2) **b** gradient –1, point (5, 3)

c gradient 4, point (–2, –3) **d** gradient –2, point (–4, 1)

e gradient $\frac{1}{3}$, point (–3, 1) **f** gradient $-\frac{5}{6}$, point (9, –2)

6 Find, in each case, the equation of the straight line with gradient m which passes through the point P. Give your answers in the form $ax + by + c = 0$, where a, b and c are integers.

a $m = 1$, P (2, –4) **b** $m = \frac{1}{2}$, P (6, 1) **c** $m = -4$, P (–1, 8)

d $m = \frac{2}{5}$, P (–3, 5) **e** $m = -3$, $P\left(\frac{3}{2}, -\frac{1}{8}\right)$ **f** $m = -\frac{3}{4}$, $P\left(\frac{2}{3}, -7\right)$

7 Find, in the form $y = mx + c$, the equation of the straight line passing through each pair of points.

a (0, 1) and (4, 13) **b** (2, 9) and (7, –1) **c** (–4, 3) and (2, 7)

d $(-\frac{1}{2}, -2)$ and (2, 8) **e** (3, –2) and (18, –5) **f** (–3.2, 4) and (–2, 0.4)

8 Find, in the form $ax + by + c = 0$, where a, b and c are integers, the equation of the straight line which passes through each pair of points.

a (3, 0) and (5, 2) **b** (–1, 8) and (5, –4) **c** (–5, 3) and (7, 5)

d (–4, –1) and (8, –17) **e** (2, –1.5) and (7, 0) **f** $(-\frac{3}{5}, \frac{1}{10})$ and (3, 1)

9 The straight line l passes through the points A (–6, 8) and B (3, 2).

a Find an equation of the line l.

b Show that the point C (9, –2) lies on l.

10 The point M (k, $2k$) lies on the line with equation $x - 3y + 15 = 0$.

Find the value of the constant k.

C1 COORDINATE GEOMETRY *Worksheet C*

1 The straight line l has gradient -3 and passes through the point with coordinates $(3, -5)$.

a Find an equation of the line l.

The straight line m passes through the points with coordinates $(-1, -2)$ and $(4, 1)$.

b Find the equation of m in the form $ax + by + c = 0$, where a, b and c are integers.

The lines l and m intersect at the point P.

c Find the coordinates of P.

2 Given that the straight line passing through the points $A\ (2, -3)$ and $B\ (7, k)$ has gradient $\frac{3}{2}$,

a find the value of k,

b show that the perpendicular bisector of AB has the equation $8x + 12y - 45 = 0$.

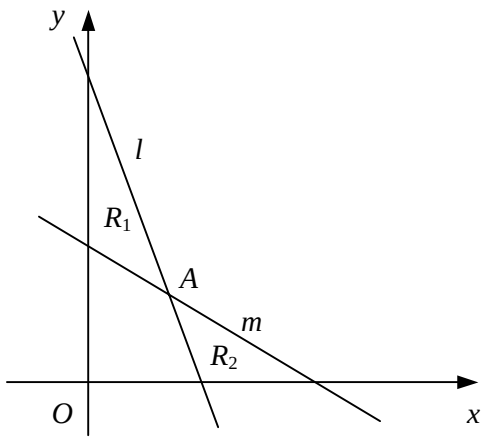
3 The vertices of a triangle are the points $A\ (5, 4)$, $B\ (-5, 8)$ and $C\ (1, 11)$.

a Find the equation of the straight line passing through A and B, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

b Find the coordinates of the point M, the mid-point of AC.

c Show that OM is perpendicular to AB, where O is the origin.

4



The line l with equation $3x + y - 9 = 0$ intersects the line m with equation $2x + 3y - 12 = 0$ at the point A as shown in the diagram above.

a Find, as exact fractions, the coordinates of the point A.

The region R_1 is bounded by l, m and the y-axis.

The region R_2 is bounded by l, m and the x-axis.

b Show that the ratio of the area of R_1 to the area of R_2 is $25 : 18$

5 The straight line l has the equation $2x + 5y + 10 = 0$.

The straight line m has the equation $6x - 5y - 30 = 0$.

a Sketch the lines l and m on the same set of axes showing the coordinates of any points at which each line crosses the coordinate axes.

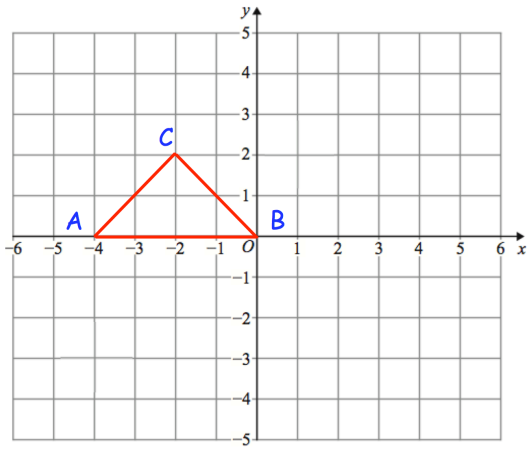
The points where line m crosses the coordinate axes are denoted by A and B.

b Show that l passes through the mid-point of AB.

Invariant Points

Video 392 on www.corbettmaths.com

Apply



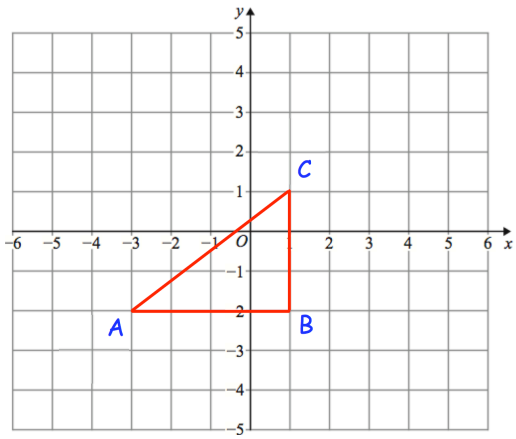
Question 1: ABC is a triangle.

Describe fully a **single** transformation of ABC so that:

(a) None of the vertices are invariant.

(b) Exactly one vertex is invariant.

(c) Exactly two vertices are invariant.



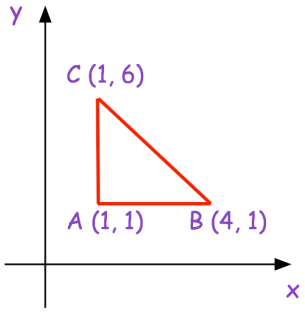
Question 2: Here is triangle ABC

Olivia says "if ABC is reflected in the line $x = -3$ there is one invariant point."

Amelia says "if ABC is reflected in the line $y = -2$ there are two invariant points."

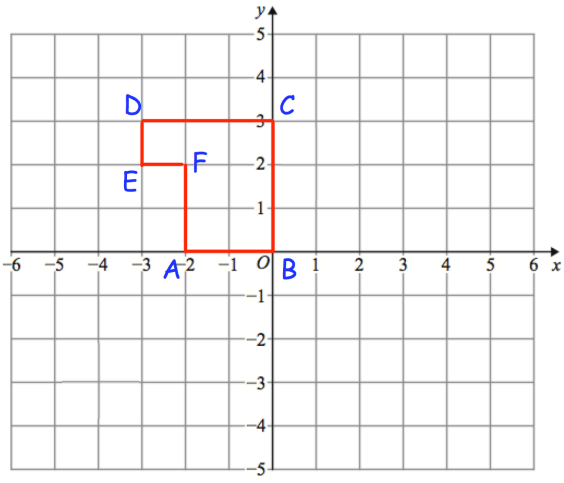
Isla says "if ABC is reflected in the line $x = 1$ there are two vertices that are invariant."

Which student is incorrect? Explain your answer.



Question 3: Here is a sketch of triangle ABC.

Describe fully a **single** transformation of ABC so that all the points on AC are invariant and the point B is not invariant.



Question 4: Here is shape ABCDEF

Describe fully **single** transformations so that from the six vertices:

(a) only vertices B and C are invariant.

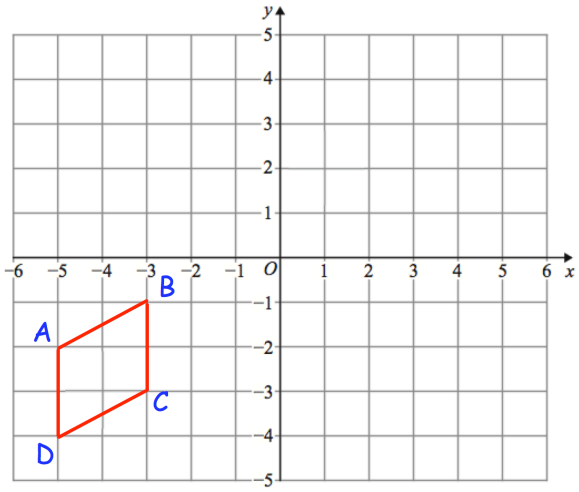
(b) only vertex F is invariant.

(c) only vertices B, D and F are invariant.

Invariant Points

Video 392 on www.corbettmaths.com

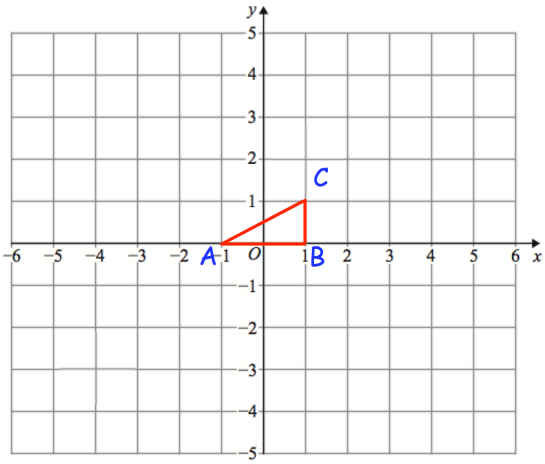
Question 5: Here is quadrilateral ABCD



ABCD is reflected in the line $x = -1$
followed by a reflection in the line $y = -x$
followed by a rotation of 180° about $(-1, -1)$

Which of the vertices are invariant?

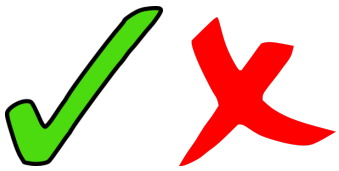
Question 6: Shown is triangle ABC



ABC is rotated 180° about $(-1, 2)$ and then translated by the vector $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$

Write down the coordinate of the invariant point.

Answers



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