GCSE MATHEMATICS · HIGHER

Targeting Grade 9

Paper 8 · Calculator · 50 minutes · 40 marks

Name ..... **Date** .....

Answer **all** questions. Show all your working: answers without working may not get full marks. Diagrams are **not** accurately drawn. You may use a calculator. If your calculator does not have a π button, take the value of π to be 3.142 unless the question says otherwise.

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1 P is directly proportional to x^2 and inversely proportional to y.

(a) x is increased by 10% and y is decreased by 20%

Work out the percentage change in P.

.....

(3)

(b) x is increased by 10%

Work out the percentage change in y needed so that the value of P does not change.

.....

(2)

(Total for Question 1 is 5 marks)

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2 Amir and Bea each invest the same amount of money.

Amir's account pays 3.2% per year compound interest.

Bea's account pays 4.5% per year simple interest.

At the end of how many whole years will Amir's investment first be worth more than Bea's investment?

You must show all your working.

years .....

(Total for Question 2 is 4 marks)

3 $x = 7.4$, truncated to 1 decimal place.

$y = 3.25$, correct to 2 decimal places.

$$z = \frac{x}{y - 2}$$

(a) Work out the upper bound for the value of z.

Give your answer correct to 3 decimal places.

.....

(3)

(b) By considering bounds, write down the value of z to a suitable degree of accuracy.

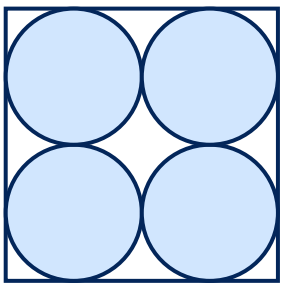
Give a reason for your answer.

.....

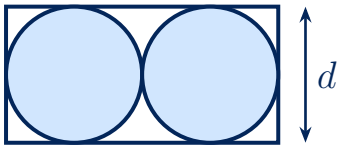
(2)

(Total for Question 3 is 5 marks)

4



View from above



View from the side

Four identical balls each have a diameter of d cm.

The balls fit exactly into a box in the shape of a cuboid, in a 2 by 2 arrangement.

Each ball touches the base and the lid of the box, two sides of the box and two of the other balls.

Work out the percentage of the volume of the box that is **not** filled by the balls.

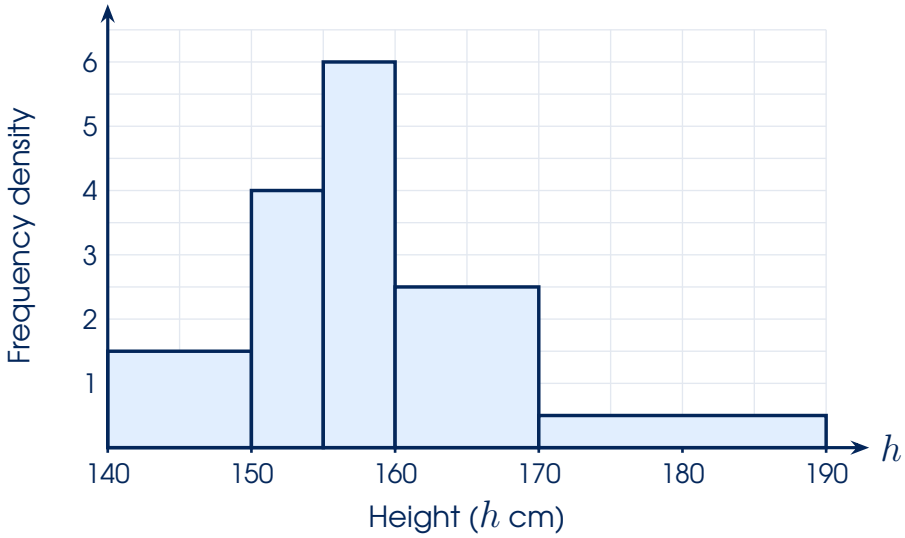
Give your answer correct to 1 decimal place.

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

% .....

(Total for Question 4 is 4 marks)

5 The histogram shows information about the heights, h cm, of 100 students.



(a) Work out an estimate for the median height.

cm .....

(3)

(b) Work out an estimate for the percentage of the students who are taller than 165 cm.

% .....

(2)

(Total for Question 5 is 5 marks)

6 ABC is a triangle.

$AB = 7$ cm, $BC = 8$ cm, $AC = 13$ cm

(a) Show that angle $ABC = 120°$

(2)

(b) Work out the shortest distance from B to the line AC.

Give your answer correct to 3 significant figures.

cm .....

(3)

(Total for Question 6 is 5 marks)

7 A ball is thrown upwards.

Its height, h metres, above the ground t seconds after it is thrown is given by

$$h = 20t - 4.9t^2$$

(a) Work out the length of time for which the ball is more than 15 m above the ground.

Give your answer correct to 2 decimal places.

seconds .....

(4)

(b) Work out the greatest height of the ball.

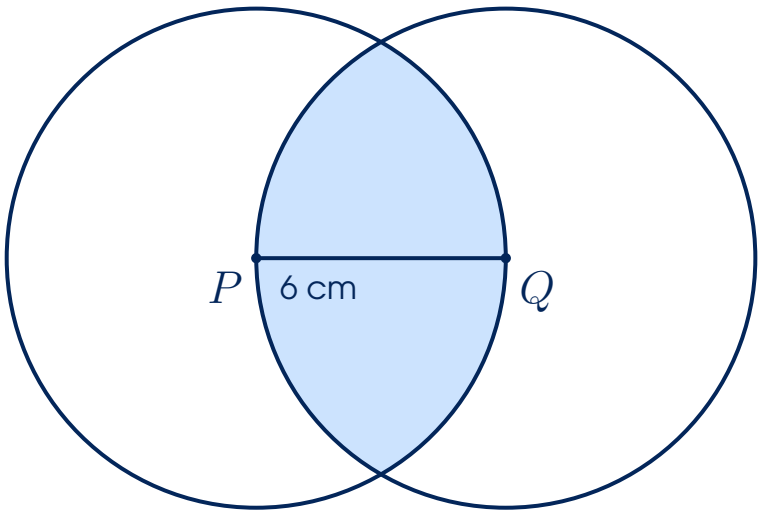
Give your answer correct to 3 significant figures.

m .....

(2)

(Total for Question 7 is 6 marks)

8



The diagram shows two circles.

Both circles have radius 6 cm.

The circle with centre P passes through Q, and the circle with centre Q passes through P.

Work out the area of the shaded region where the two circles overlap.

Give your answer correct to 3 significant figures.

cm^2 .....

(Total for Question 8 is 6 marks)

TOTAL FOR PAPER IS 40 MARKS