

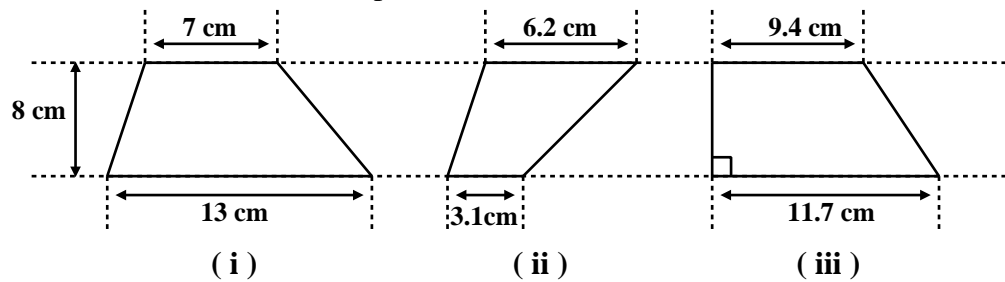
Grade Grabber 3

40 Mark Paper

Question 1

The area of a trapezium may be found by remembering that it is “*half the sum of the parallel sides times the (perpendicular) distance in between*”.

Below are sketched three trapezia,



Calculate the area of each trapezium.

[3 marks]

Question 2

A yacht with a displacement hull has a theoretical maximum speed given by;

$$Speed_{max} = 1.34 \times \sqrt{\text{Waterline length}}$$

where the speed is in knots and the waterline length is in feet.



The yacht, Farida, pictured, has a waterline length of 28 feet.
What is its maximum speed ?

[1 mark]

Question 3

The area of the floor of a room is 25 m^2

(i) Assuming the floor is square, what is the length of a each side of the floor in metres ?

[1 mark]

(ii) What is the length of each side in centimetres ?

[1 mark]

(iii) Use your part (ii) answer to determine the area of the floor in cm^2

[1 mark]

(iv) If the room were rectangular rather than square, but still of area 25 m^2 , would your part (iii) answer be different ?

[1 mark]

Question 4

Differentiate :

$$y = 5x^4 + x^2 + 1$$

[2 marks]

Question 5

Joyce thinks of a number, adds on 5, and squares the result.

As a result, in her mind, right now, is the number 1.

(i) By calling Joyce's original number, x , write down an equation that captures the above information.

[1 mark]

(ii) Solve your equation to determine the two possible values of Joyce's original number.

[2 marks]

Question 6

From a point, P , a *Shrewsbury School Rover* walks on a bearing of 020° for a distance of 400 metres to a second point, Q .
He then walks due South until he is at a third point, R .
 R is due East of P

- (i) Sketch a diagram to show the relative positions of P , Q and R and mark a right angle on your diagram.

[2 marks]

- (ii) Determine the distance from R to P .
Give your answer correct to one decimal place.

[2 marks]

Question 7

Rationalise the denominator and simplify your answer;

$$\frac{\sqrt{3}}{3 - \sqrt{3}}$$

[3 marks]

Question 8

In a “build a Lego Tower” competition the height, h , of 100 towers were;

Height, h (in cm)	$120 < h \leq 130$	$130 < h \leq 140$	$140 < h \leq 150$	$150 < h \leq 160$
Number of Towers	12	33	38	17

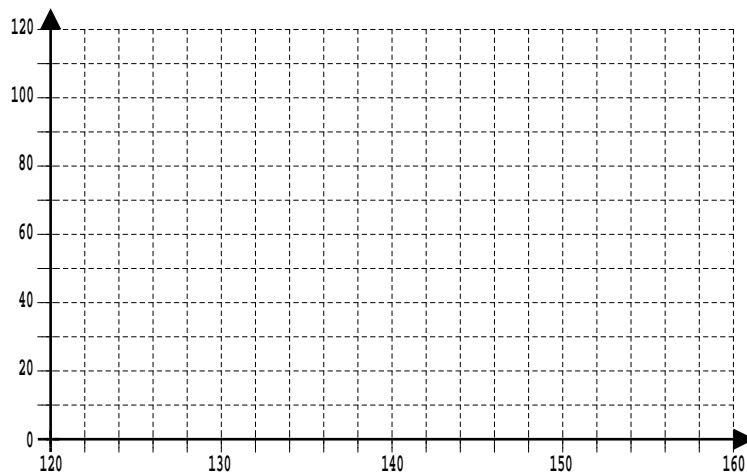
(i) Estimate the mean height of the towers.

[3 marks]

(ii) Explain why your answer to part (i) is an “estimate”.

[1 mark]

(iii) Draw a cumulative frequency graph on the grid below,



[2 marks]

(iv) Use your graph to find the median and the interquartile range.

[3 marks]

(v) If a tower is selected at random, what is the probability that it is *taller* than 145cm.

[1 mark]

Question 9

$$f(x) = \sqrt{x - 11}, \quad x \geq 11$$

(i) Evaluate $f(60)$ [1 mark]

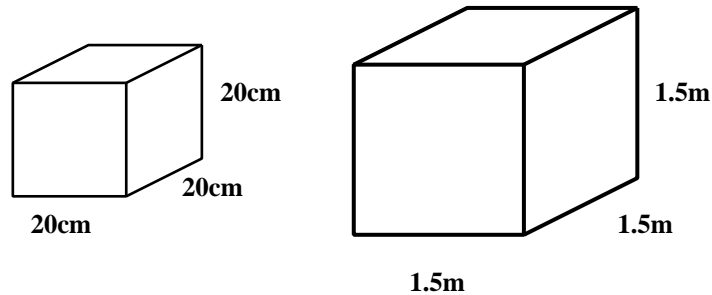
(ii) Explain the need for the condition on the domain that $x \geq 11$ [2 marks]

(iii) Determine the inverse of the function $f(x)$
That is, find $f^{-1}(x)$

(iv) Determine $f^{-1}(3)$ [2 marks]

Question 10

(i) Find the volume of the two cubes drawn below.
Give your first answer in cm^3 and your second in m^3 .



(ii) Explain why 400 cm^3 is a very different amount of volume to 4 m^3 , even although it is true that $100 \text{ cm} = 1 \text{ m}$ [2 marks]

(iii) Which cube has the greater volume ? [1 mark]

[1 mark]