

Grade Grabber 11

40 Mark Paper

Question 1



Photograph by Martin Hansen

The time taken, T seconds, to boil one litre of water (at room temperature) is inversely proportional to the power, P watts, of the kettle.

When a kettle rated with $P = 2$ kilowatts, the time take, $T = 72$ seconds

Find the time it will take to boil one litre of water (at room temperature) when a kettle rated with $P = 0.8$ kilowatts is used.

[4 marks]

Question 2

By using the theorem of Pythagoras, or otherwise, find the distance between the points $(3, 1)$ and $(23, 16)$

[3 marks]

Question 3

Writing answers in standard form and correct to three significant figures, calculate;

(i) $4.683 \times 10^6 + 8.908 \times 10^5$

[1 mark]

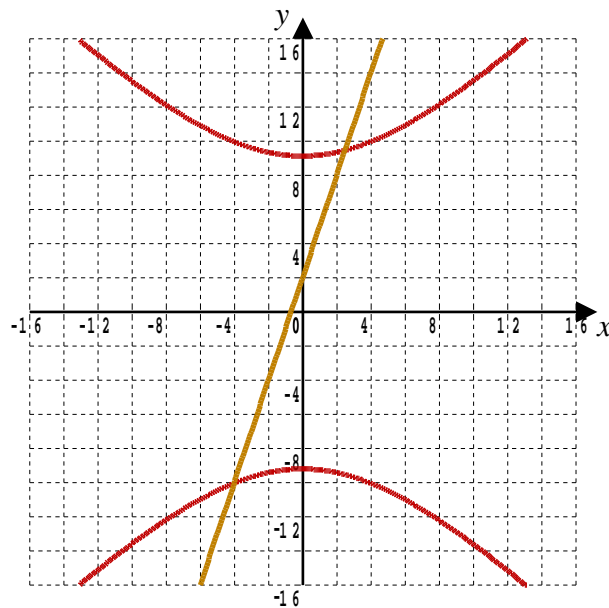
(ii) $5.2281 \times 10^{-4} \times 3.735 \times 10^{-2}$

[1 mark]

(iii) π^{20}

[1 mark]

Question 4



The graph shows a hyperbola (in red) and a straight line (in gold)

The hyperbola has equation $y^2 - x^2 = 84$ and the line has equation $y = 3x + 2$

Use algebra to determine the two points at where the hyperbola and line intersect.

[5 marks]

Question 5

Expand the brackets and simplify; $(3 - \sqrt{6})(\sqrt{2} + \sqrt{3})$

Show clear algebraic working.

[3 marks]

Question 6

(i) Show that $\frac{x^3 - 4}{x^2} = x - 4x^{-2}$

[1 mark]

(ii) Hence, or otherwise, use calculus to find the turning point on the curve;

$$y = \frac{x^3 - 4}{x^2}$$

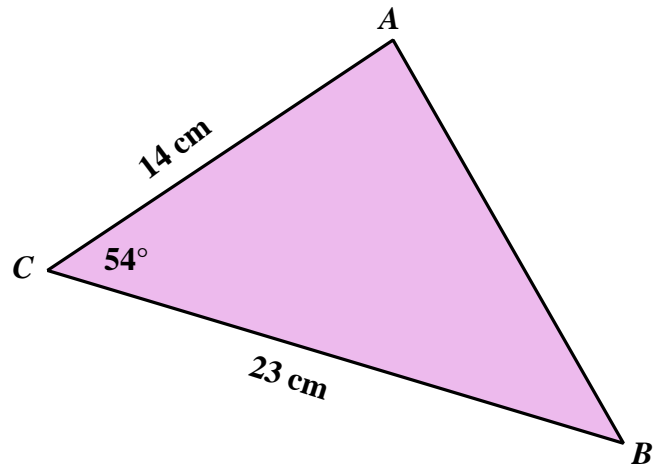
[4 marks]

(iii) State, with a reason, if the turning point is a minimum or a maximum

[2 marks]

Question 7

Calculate the length of AB



[3 marks]

Question 8

Solve the following equation giving exact answers,

$$\frac{x}{x - 2} + \frac{4}{x + 3} = 7$$

[5 marks]

Question 9

- (i) Write the recurring decimal $0.272\ 727\ 272\ 727\dots$
as a fraction in the form

$$\frac{p}{q}$$

where p and q are integers with no factor in common.

[3 marks]

- (ii) Write the recurring decimal $0.abababababab\dots$
as a fraction in the form

$$\frac{p}{q}$$

where p is expressed in terms of a and b
and q is an integer.

[4 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from mhh@shrewsbury.org.uk