Mock Grade 8/9

Maths Booklet 3

Paper 2H
Calculator

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1 The functions f and g are such that

$$f(x) = 3x + 10 \qquad g(x) = ax + b$$ where a and b are constants.

$g(2) = 4$ and $f^{-1}(40) = g(3)$

Find the value of a and the value of b.

$a =$ .....

$b =$ .....

(Total for Question 1 is 5 marks)

2 S is a geometric sequence.

(a) Given that $\frac{3+2\sqrt{x}}{3}$, 1 and $-3+2\sqrt{x}$ are the first three terms of S, find the value of x.

You must show all your working.

.....

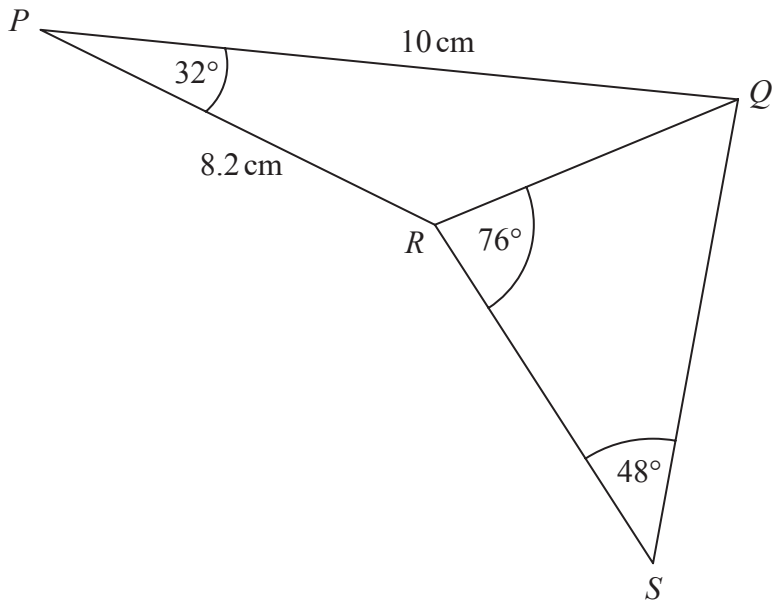
(3)

(b) Show that the 4th term of S is $21-12\sqrt{3}$

(2)

(Total for Question 2 is 5 marks)

3 *PQR* and *QRS* are triangles.



Calculate the length of *QS*.
Give your answer correct to 3 significant figures.
You must show all your working.

..... cm

(Total for Question 3 is 4 marks)

4 The functions g and h are such that

$$g(x) = \sqrt[3]{3x - 4} \qquad h(x) = \frac{1}{x}$$

(a) Find g(23)

.....

(1)

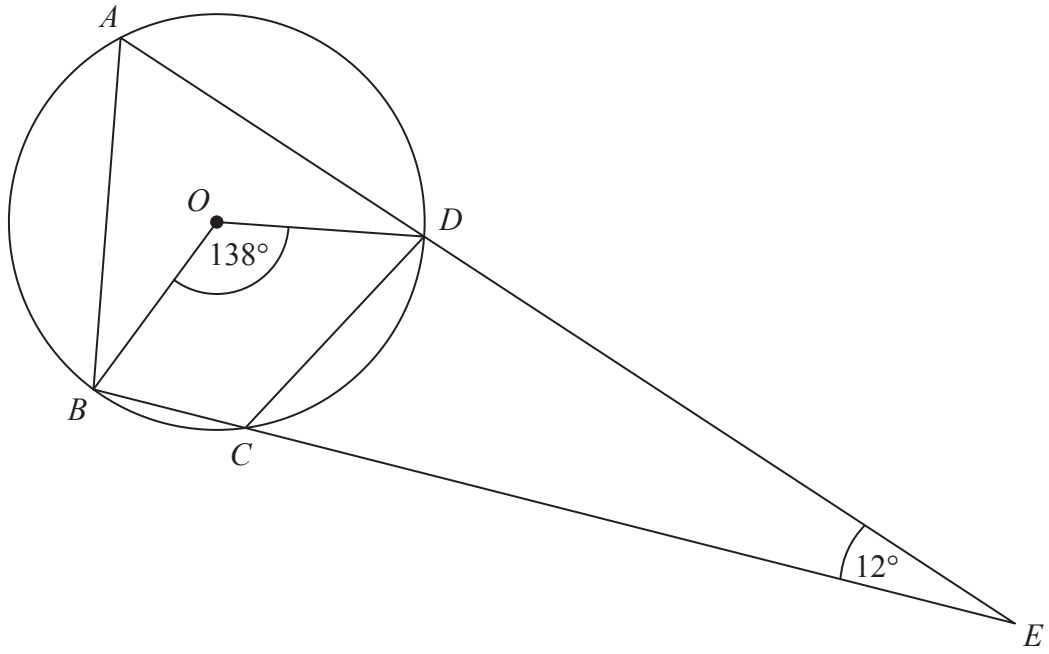
(b) Find $hg^{-1}(x)$
Give your answer in terms of x in its simplest form.

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

(3)

(Total for Question 4 is 4 marks)

5 *A*, *B*, *C* and *D* are points on the circumference of a circle, centre *O*.
ADE and *BCE* are straight lines.

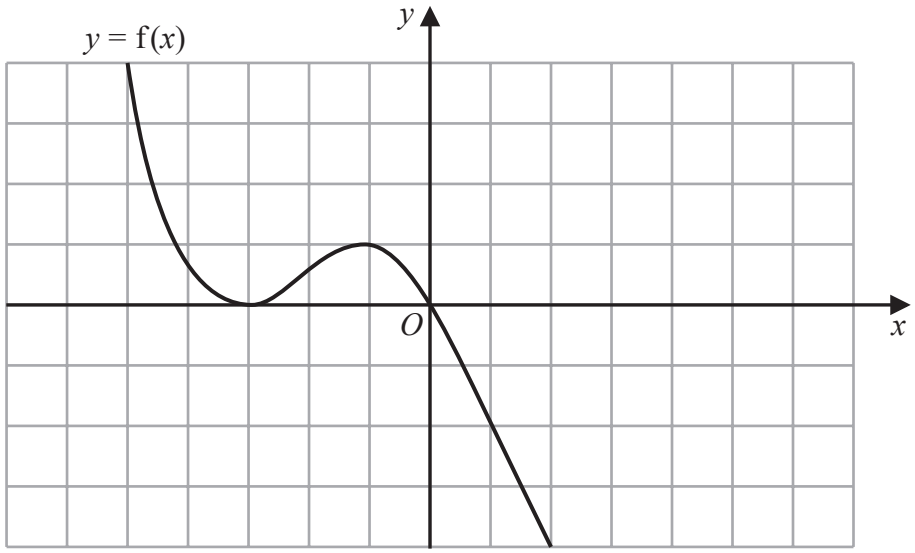


Work out the size of angle *CDE*.
Give a reason for each stage of your working.

.....°

(Total for Question 5 is 4 marks)

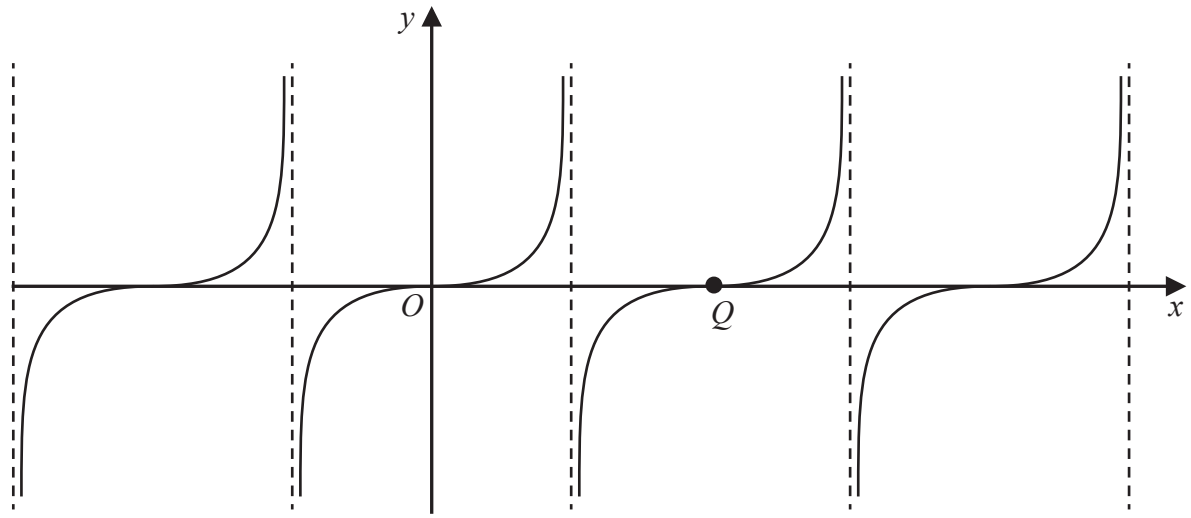
6 The graph of $y = f(x)$ is shown on the grid below.



(a) On the grid above, sketch the graph of $y = -f(-x)$

(1)

Here is a sketch of the graph of $y = \tan x°$



The graph of $y = \tan x°$ is translated to give the graph of $y = g(x)$

Following the translation the point Q, shown on the graph above, moves to point R.

Point R has coordinates $(-90, 2)$

(b) Find an expression for $g(x)$ in terms of x.

.....

(2)

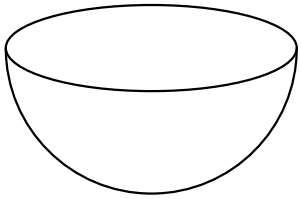
(Total for Question 6 is 3 marks)

7 Find algebraically the set of values of x for which

$$4x^2 - 81 > 0 \quad \textbf{and} \quad 6x^2 - 25x - 44 > 0$$

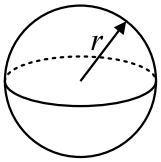
(Total for Question 7 is 5 marks)

8 The diagram shows a hemisphere with volume of 500 cm^3.



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

Surface are of sphere = $4\pi r^2$



Work out the surface area of the hemisphere.
Give your answer correct to 3 significant figures.

..... cm^3

(Total for Question 8 is 4 marks)

9 $d = \frac{30}{c^2}$

c = 4.31 correct to 3 significant figures.

By considering bounds, work out the value of d to a suitable degree of accuracy.
Give a reason for your answer.

(Total for Question 9 is 4 marks)