

**GCSE QUESTIONS****Q1. NON-CALCULATOR**The function  $f$  is given by

$$f(x) = 2x^3 - 4$$

(a) Show that  $f^{-1}(50) = 3$ 

(2)

The functions  $g$  and  $h$  are given by

$$g(x) = x + 2$$

$$h(x) = x^2$$

(b) Find the values of  $x$  for which

$$hg(x) = 3x^2 + x - 1$$

(4)

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**(Total for question = 6 marks)****Q2. NON-CALCULATOR**For all values of  $x$ 

$$f(x) = (x + 1)^2$$

$$g(x) = 2(x - 1)$$

(a) Show that  $gf(x) = 2x(x + 2)$ 

(2)

(b) Find  $g^{-1}(7)$

.....

(2)

(Total for question = 4 marks)

**Q3. NON-CALCULATOR**

The functions  $f$  and  $g$  are such that

$$f(x) = 3x - 1$$

$$g(x) = x^2 + 4$$

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

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

(2)

Given that  $fg(x) = 2gf(x)$ ,

(b) show that  $15x^2 - 12x - 1 = 0$

(5)

(Total for question = 7 marks)

**Q4. CALCULATOR ALLOWED**

$f$  and  $g$  are functions such that

$$f(x) = \frac{2}{x^2} \quad \text{and} \quad g(x) = 4x^3$$

(a) Find  $f(-5)$

.....  
(1)

(b) Find  $fg(1)$

.....  
(2)  
(Total for question = 3 marks)

**Q5. CALCULATOR ALLOWED**

$f$  and  $g$  are functions such that

$$f(x) = 3x^2 \quad \text{and} \quad g(x) = \frac{1}{x-2}$$

Find  $gf(4)$ .

Give your answer as a fraction.

.....  
(Total for question = 2 marks)

**Q6. CALCULATOR ALLOWED**

The functions  $f$  and  $g$  are such that

$$f(x) = 3(x - 4) \quad \text{and} \quad g(x) = \frac{x}{5} + 1$$

(a) Find the value of  $f(10)$

.....  
(1)

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

$$g^{-1}(x) = \dots\dots\dots (2)$$

(c) Show that  $ff(x) = 9x - 48$

(2)  
(Total for question = 5 marks)

**Q7. CALCULATOR ALLOWED**

The function  $f$  is such that

$$f(x) = 4x - 1$$

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

$$f^{-1}(x) = \dots\dots\dots (2)$$

The function  $g$  is such that

$$g(x) = kx^2 \text{ where } k \text{ is a constant.}$$

Given that  $fg(2) = 12$

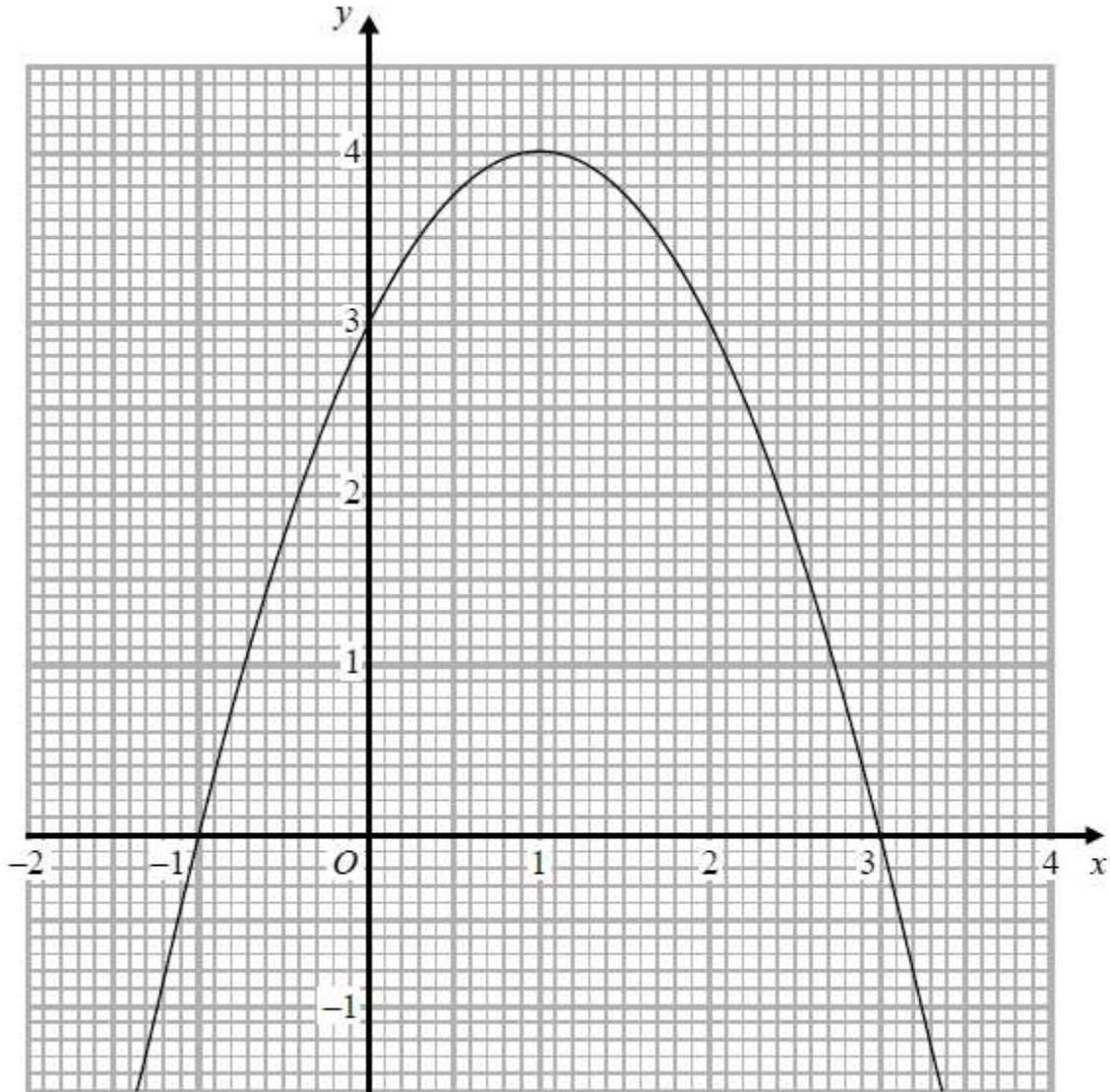
(b) work out the value of  $k$

$$k = \dots\dots\dots (2)$$

(Total for question = 4 marks)

**Q8. CALCULATOR ALLOWED**

The graph of  $y = f(x)$  is drawn on the grid.



(a) Write down the coordinates of the turning point of the graph.

(....., .....)  
(1)

(b) Write down the roots of  $f(x) = 2$

.....  
(1)

(c) Write down the value of  $f(0.5)$

.....  
(1)

(Total for question = 3 marks)

**Q9. CALCULATOR ALLOWED**

For all values of  $x$

$$f(x) = 2x - 3 \quad \text{and} \quad g(x) = x^2 + 2$$

(a) Find  $g(-4)$

.....  
(1)

(b) Show that  $gf(x) = 4x^2 - 12x + 11$

(2)

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

.....  
(4)  
(Total for question = 7 marks)

**Q10. CALCULATOR ALLOWED**

$$f(x) = \frac{1}{x+2} + \frac{1}{x-3}$$

(a) Work out  $f(5)$ . Give your answer as a fraction.

.....  
(2)

(b) Write down a value of  $x$  for which  $f(x)$  is not defined.

.....  
(1)

Given that  $f(x) = 4$

(c) find the possible values of  $x$ .

Give your answer in the form  $\frac{p \pm \sqrt{q}}{r}$  where  $p$ ,  $q$  and  $r$  are positive integers.

.....  
(5)  
(Total for question = 8 marks)

**Q11. CALCULATOR ALLOWED**

$f(x) = x^3$   
 $g(x) = 4x - 1$

(a) Find  $fg(2)$

.....  
(2)

$h(x) = fg(x)$

(b) Find an expression for  $h^{-1}(x)$

$h^{-1}(x) =$  .....  
(3)  
(Total for question = 5 marks)

**Q12. CALCULATOR ALLOWED**

$$f(x) = 4\sin x^\circ$$

(a) Find  $f(23)$

Give your answer correct to 3 significant figures.

.....  
(1)

$$g(x) = 2x - 3$$

(b) Find  $fg(34)$ . Give your answer correct to 3 significant figures.

.....  
(2)

$$h(x) = (x + 4)^2$$

Ivan needs to solve the equation  $h(x) = 25$

He writes

$$(x + 4)^2 = 25$$

$$x + 4 = 5$$

$$x = 1$$

This is not fully correct.

(c) Explain why.

.....  
.....

(1)  
(Total for question = 4 marks)

**Q13. CALCULATOR ALLOWED**

The functions  $f$  and  $g$  are such that

$$f(x) = 5x + 3$$

$$g(x) = ax + b$$

where  $a$  and  $b$  are constants.

$$g(3) = 20 \quad \text{and} \quad f^{-1}(33) = g(1)$$

Find the value of  $a$  and the value of  $b$ .



**Q14. CALCULATOR ALLOWED**

$$f(x) = 3x^2 - 2x - 8$$

Express  $f(x + 2)$  in the form  $ax^2 + bx$

$a = \dots\dots\dots$

$b = \dots\dots\dots$

(Total for question = 5 marks)

$\dots\dots\dots$

(Total for question is 3 marks)