

Lesson 12

GCSE Mathematics Functions I

12.1 Test

Marks Available: 86

Question 1

The function f is given by, $f(x) = x^2 - x$, $x \in \mathbb{R}$

Calculate;

(i) $f(7)$

(ii) $f(3)$

(iii) $f(10)$

(iv) $f(0)$

(v) $f(1)$

(vi) $f(4)$

(vii) $f(-4)$

(viii) $f(100)$

(ix) $f\left(\frac{1}{2}\right)$

(x) $f\left(-\frac{1}{2}\right)$

[6 marks]

Question 2

Sometimes the domain of a function is restricted.

Consider the function $g(x) = \frac{12}{x - 3}$, $x \in \mathbb{R}$, $x \neq 3$

(i) Which real number is not allowed into this function ?

[1 mark]

(ii) Why is this function's domain necessarily restricted in this way ?

[2 marks]

Question 3

This question involves the functions;

$$f(x) = 4x - 1 \quad x \in \mathbb{R}$$

$$g(x) = \frac{12}{x - 3} \quad x \in \mathbb{R}, \quad x \neq 3$$

Determine the value of,

(i) $f(8)$

(ii) $g(5)$

(iii) $ff(5)$

(iv) $fg(9)$

(v) $gf(2)$

[5 marks]

Question 4

If $H(x) = 3x^2 + 1$, $x \in R$, find expressions that do not involve brackets for,

(i) $H(6)$

(ii) $H(10x)$

(iii) $H(x + 4)$ **HINT : FOIL**

[1, 2, 3 marks]

Question 5

If $w(x) = 7x + 5$, find x such that $w(x) = 33$ $(x \in \mathbb{R})$

[3 marks]**Question 6**

If $n(x) = \frac{3x + 2}{5}$, find x such that $n(x) = 7$ $(x \in \mathbb{R})$

[3 marks]**Question 7**

Let u and v be the functions,

$$u(x) = 4x + 7 \quad x \in \mathbb{R}$$

$$v(x) = 5x + 6 \quad x \in \mathbb{R}$$

Evaluate each of the following,

(i) $u \circ v(1)$

(ii) $u \circ v(-1)$

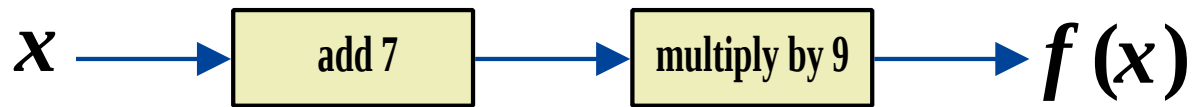
(iii) $u \circ v(5z)$

(iv) $u \circ v(3z + 2)$

[1, 1, 2, 2 marks]

Question 8

Consider the following flow diagram;



(a) Write down (i) $f(x)$

(ii) $f^{-1}(x)$

[1, 2 marks]

(b) Determine the value of,

(i) $f(-3)$

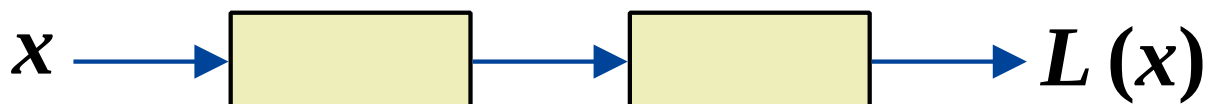
(ii) $f^{-1}(45)$

[1, 1 marks]

Question 9

(a) Fill in the flow diagram for the function,

$$L(x) = 11(x - 4), \quad x \in \mathbb{R}$$



[1 mark]

(b) Write down $L^{-1}(x)$

[2 marks]

(c) Determine the value of,

(i) $L(24)$

(ii) $L^{-1}(44)$

[1, 1 marks]

Question 10

Consider the function $k(x) = \frac{x}{13} - 7$, $x \in \mathbb{R}$

Find an expression for the inverse function $k^{-1}(x)$

HINT : Draw a flow diagram.

[4 marks]

The GCSE examination often includes an awkward functions question.
Here is an example of a grade 8 question.

Question 11

For the function $f(x) = 5x + 1$, $x \in \mathbb{R}$, determine x such that $f(x) = f^{-1}(x)$

[5 marks]

Question 12

If $p(x) = \frac{5x - 7}{3 - x}$, $x \in \mathbb{R}$, $x \neq 3$, find x such that $p(x) = 11$

[4 marks]

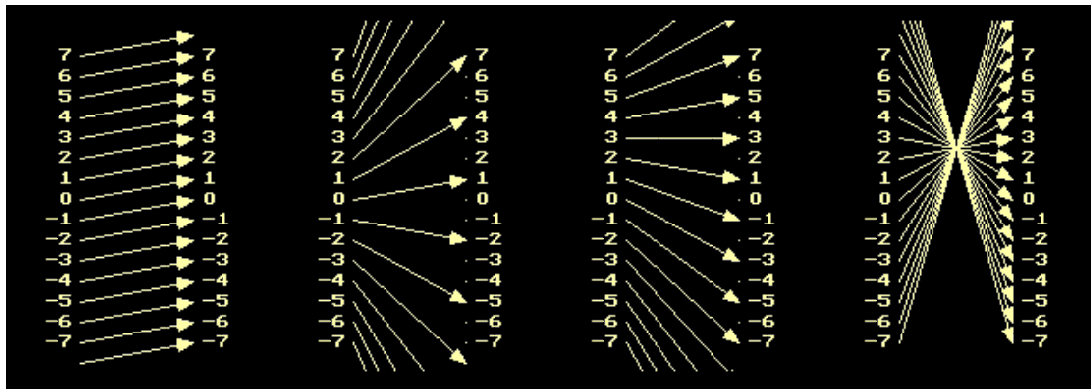
Question 13

You are not expected to have seen integer “arrow diagrams” like these before.

(i) Which one of the four diagrams is a mapping of the function,

$$w(x) = 5 - x, \quad x \in \mathbb{Z} ?$$

(ii) For each of the other three diagrams, suggest the functions being mapped.



[4 marks]

Question 14

Let f and g be the functions, $f(x) = 3x + 5, x \in \mathbb{R}$

$$g(x) = x^2 + 5, x \in \mathbb{R}$$

Find; (i) $fg(4)$

[2 marks]

(ii) $gff(-1)$

[2 marks]

(iii) $gf(x)$ and write the answer without using brackets.

[4 marks]

Question 15

Let v and w be the functions, $v(x) = 10 - x, x \in \mathbb{R}$

$$w(x) = \sqrt{x}, x \in \mathbb{R}, x \geq 0$$

(a) Find, (i) $vw(36)$

[2 marks]

(ii) $wv(-1)$

[2 marks]

(iii) $wv(x)$

[3 marks]

(b) If $vw(x) = 0$, what must be the value of x ?

[3 marks]

Question 16

Consider the function $f(x) = 8 - \frac{12}{7x}$, $x \in \mathbb{R}$, $x \neq 0$

Find an expression for the inverse function $f^{-1}(x)$

[4 marks]

Question 17

Consider the function $f(x) = \frac{13 - x}{5 + 2x}$, $x \in \mathbb{R}$, $x \neq -\frac{2}{5}$

Find an expression for the inverse function $f^{-1}(x)$

[5 marks]

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