

## 1MA1 Higher themed papers: Functions

|                                                                                                                                                                     |                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| Write your name here                                                                                                                                                |                                |
| Surname                                                                                                                                                             | Other names                    |
| Centre Number                                                                                                                                                       | Candidate Number               |
| <input type="text"/>                                                                                                                                                | <input type="text"/>           |
| Pearson Edexcel<br>Level 1/Level 2 GCSE (9–1)                                                                                                                       |                                |
| <b>Mathematics</b><br><b>Functions</b>                                                                                                                              |                                |
|                                                                                                                                                                     | Paper Reference<br><b>1MA1</b> |
| <b>You must have:</b> Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used. | Total Marks                    |

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- If your calculator does not have a  $\pi$  button, take the value of  $\pi$  to be 3.142 unless the question instructs otherwise.

### Information

- The total mark for this paper is **48**. There are **9** questions.
- Questions have been arranged in an ascending order of mean difficulty, as found by all students in the June 2017–November 2019 examinations.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

**1MA1 Higher themed papers: Functions**

**1** 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 1 is 3 marks)**

---

**1MA1 Higher themed papers: Functions**



2

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

$$f(x) = 3x - 1 \quad \text{and} \quad g(x) = x^2 + 4$$

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

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

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

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

(5)

**(Total for Question 2 is 7 marks)**

**1MA1 Higher themed papers: Functions**

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

- (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 following equation  $h(x) = 25$

He writes

$$\begin{aligned}(x + 4)^2 &= 25 \\ x + 4 &= 5 \\ x &= 1\end{aligned}$$

This is not fully correct.

- (c) Explain why.

.....  
.....  
**(1)**

**(Total for Question 3 is 4 marks)**

---

**1MA1 Higher themed papers: Functions**



**4** 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

$$g(x) = x + 2 \text{ and } h(x) = x^2$$

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

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

.....  
**(4)**

**(Total for Question 4 is 6 marks)**

---

**1MA1 Higher themed papers: Functions**



**5** For all values of  $x$

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

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

**(2)**

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

.....  
**(2)**

**(Total for Question 5 is 4 marks)**

---

**1MA1 Higher themed papers: Functions**

**6** For all values of  $x$

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

(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 6 is 7 marks)**

---

**1MA1 Higher themed papers: Functions**

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

(a) Find  $fg(2)$

.....  
**(2)**

$h(x) = fg(x)$

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

$h^{-1}(x) = \dots\dots\dots$   
**(3)**

**(Total for Question 7 is 5 marks)**

---



**1MA1 Higher themed papers: Functions**

**8**  $f(x) = \frac{1-x}{1+x}$

(a) Show that  $ff(x) = x$

**(3)**

(b) Hence, write down  $f^{-1}(x)$

.....  
**(1)**

**(Total for Question 8 is 4 marks)**

---

**1MA1 Higher themed papers: Functions**

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

- (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 9 is 8 marks)**

---

---

**TOTAL MARKS FOR PAPER: 48**