Name	Class

MATHS TEACHER HUB

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Functions

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.	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*.
•Diagrams are NOT accurately drawn, unless otherwise indicated.
•You must **show all your working out.**
•If the question is a **1H** question you are not allowed to use a calculator.
•If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information

•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.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

9 The functions f and g are such that

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

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

.....

(1)

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

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

(2)

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

(2)

Specimen 2 – Paper 2H

(Total for Question 9 is 5 marks)

10 $f(x) = 4\sin x°$

(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

$(x + 4)^2 = 25$
$x + 4 = 5$
$x = 1$

This is not fully correct.

(c) Explain why.

.....

.....

(1)

(Total for Question 10 is 4 marks)

10 The function f is such that

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

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

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

(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

$k =$ .....

(2)

(Total for Question 10 is 4 marks)

11 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)

June 2018 – Paper 2H **(Total for Question 11 is 3 marks)**

16 The functions f and g are given by

$$f(x) = \frac{12}{x+1} \quad \text{and} \quad g(x) = 5 - 3x$$

(a) Find $f(-3)$

.....

(1)

(b) Find $fg(1)$

.....

(2)

(c) Find $g^{-1}(4)$

.....

(2)

(Total for Question 16 is 5 marks)

18 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 18 is 6 marks)

18 $f(x) = 3x^2 - 2x - 8$

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

.....

(Total for Question 18 is 3 marks)

19 The functions f and g are such that

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

(a) Find $gf(-3)$

.....

(2)

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

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

(2)

(Total for Question 19 is 4 marks)

19 The functions g and h are such that

$$g(x) = \sqrt[3]{2x - 5} \qquad h(x) = \frac{1}{x}$$

(a) Find g(16)

.....

(1)

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

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

(3)

(Total for Question 19 is 4 marks)

19 f and g are functions such that

$$f(x) = \frac{12}{\sqrt{x}} \quad \text{and} \quad g(x) = 3(2x + 1)$$

(a) Find g(5)

.....

(1)

(b) Find gf(9)

.....

(2)

(c) Find $g^{-1}(6)$

.....

(2)

(Total for Question 19 is 5 marks)

19 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 19 is 4 marks)

20 For $x \geqslant 0$, the functions f and g are such that

$$f(x) = 3x + 4 \qquad g(x) = \frac{\sqrt{x} + 2}{5}$$

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

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

(2)

(b) Solve $gf(x) = 3$

$x =$ .....

(3)

(Total for Question 20 is 5 marks)

21 The functions f and g are such that

$$f(x) = 3x^2 + 1 \quad \text{for } x > 0 \qquad \text{and} \qquad g(x) = \frac{4}{x^2} \quad \text{for } x > 0$$

(a) Work out gf(1)

.....

(2)

The function h is such that $h = (fg)^{-1}$

(b) Find $h(x)$

.....

(4)

(Total for Question 21 is 6 marks)

21 The functions f and g are such that

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

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

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

(2)

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

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

(5)

(Total for Question 21 is 7 marks)

22 $f(x) = \sqrt[3]{x}$
$g(x) = 2x + 3$

$h(x) = fg(x)$

Find $h^{-1}(x)$

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

(Total for Question 22 is 3 marks)

22 The functions f and g are such that

$$f(x) = 5x + 3 \qquad g(x) = ax + b \qquad \text{where } a \text{ and } b \text{ are constants.}$$

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

Find the value of a and the value of b.

$a =$ .....

$b =$ .....

(Total for Question 22 is 5 marks)