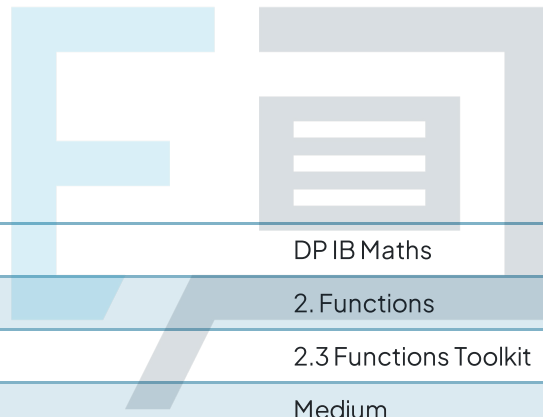




# 2.3 Functions Toolkit

## Question Paper



Course	DP IB Maths
Section	2. Functions
Topic	2.3 Functions Toolkit
Difficulty	Medium

# Exam Papers Practice

To be used by all students preparing for DP IB Maths AA SL  
Students of other boards may also find this useful

### Question 1a

The functions  $f$  and  $g$  are defined such that  $f(x) = 4x - 10$  and  $g(x) = \frac{x + 8}{2}$ .

Show that  $(g \circ f)(x) = 2x - 1$

[2 marks]

### Question 1b

Given that  $(g \circ f)(a) = 27$ , find the value of  $a$ .

[2 marks]

### Question 1c

Show that  $(f \circ g)(x) = 2x + 6$ .

[2 marks]



# Exam Papers Practice

### Question 1d

Given that  $(f \circ g)(b) = 44$ , find the value of  $b$ .

[2 marks]

### Question 2a

The functions  $f(x)$  and  $g(x)$  are defined as follows

$$f(x) = x^2 \quad x \in \mathbb{R}$$

$$g(x) = 4x - 3 \quad x \in \mathbb{R}$$

Write down the range of  $f(x)$ .

[1 mark]

### Question 2b

Find

(i)  $(f \circ g)(x)$

(ii)  
 $(g \circ f)(x)$

[4 marks]



# Exam Papers Practice

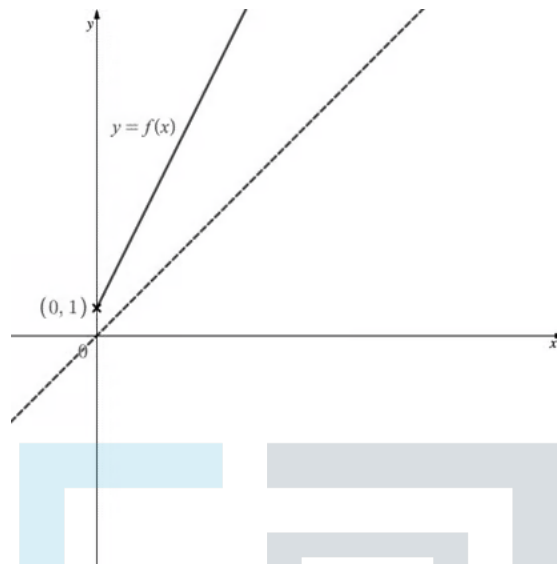
### Question 2c

Solve the equation  $f(x) = g(x)$ .

[2 marks]

### Question 3a

The graph of  $y = f(x)$  is shown below.



- (i) Use the graph to write down the domain and range of  $f(x)$ .
- (ii) Given that the point  $(1, 1)$  lies on the dotted line, write down the equation of the line.

[3 marks]

# Exam Papers Practice

### Question 3b

On the diagram above sketch the graph of  $y = f^{-1}(x)$ .

[2 marks]

### Question 4a

The functions  $f(x)$  and  $g(x)$  are defined as follows

$$f(x) = \frac{1}{2}(4x - 3) \quad x \in \mathbb{R}$$

$$g(x) = 0.5x + 0.75 \quad x \in \mathbb{R}$$

Find

- (i)  
 $fg(x)$
- (ii)  
 $gf(x)$

[3 marks]



### Question 4b

Write down  $f^{-1}(x)$  and state its domain and range.

Exam Papers Practice [3 marks]

### Question 5a

A function is defined by  $f(x) = 54x - 13$ ,  $-2 < x < 20$ .

Find the value of  $f\left(\frac{5}{2}\right)$ .

[1 mark]

**Question 5b**

Write down the range of  $f(x)$ .

[2 marks]

**Question 5c**

Find the value of  $f^{-1}(122)$ .

[2 marks]

**Question 5d**

Write down the range of the inverse function.

[1 mark]

# Exam Papers Practice

**Question 6a**

Consider the function  $f(x) = -6x - 3$ . The domain of  $f(x)$  is  $-5 \leq x \leq 3$ .

Find

(i)  
 $f(2)$

(ii)  
 $x$  when  $f(x) = 15$ .

[2 marks]

**Question 6b**

Find the range of  $f(x)$ .

[3 marks]

**Question 6c**

Write down the domain of the inverse function.

[1 mark]

**Question 7a**

The functions  $f$  and  $g$  are defined for  $x \in \mathbb{R}$  by  $f(x) = 3x^2 + 10x + 7$  and  $g(x) = x + d$ , where  $d \in \mathbb{R}$ .

Find the range of  $f$ .

[2 marks]

Exam Papers Practice

**Question 7b**

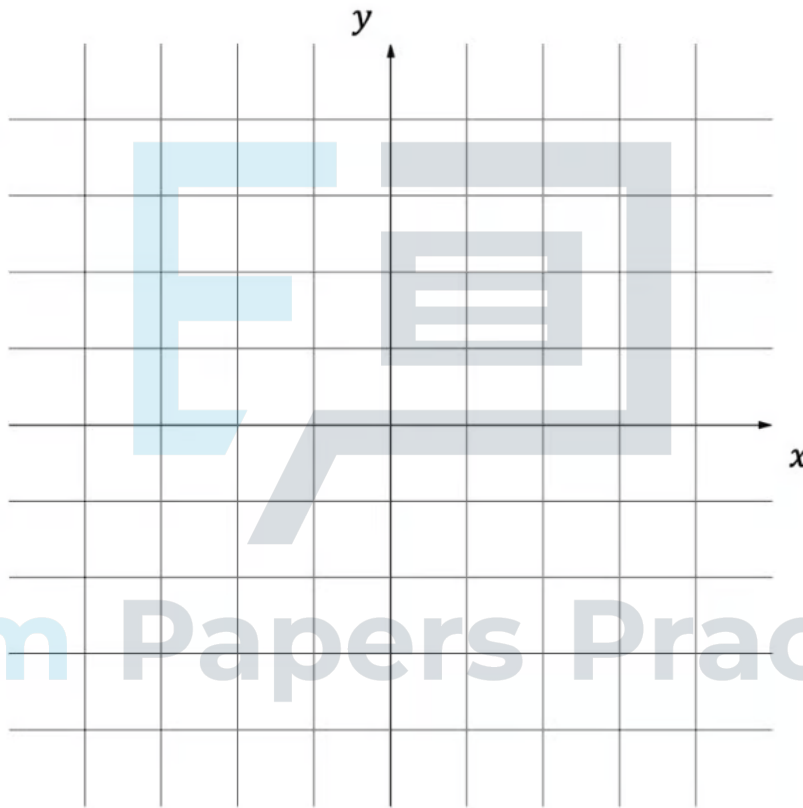
Given that  $(g \circ f)(x)$  is always positive for all  $x$ , determine the set of possible values for  $d$ .

[4 marks]

**Question 8a**

Consider the function  $g(x) = \sqrt{4-x}$ .

Sketch the graph of the function  $g(x)$ , labelling the  $x$  and  $y$  intercepts.



[3 marks]



### Question 8b

Find

(i)  
 $g(-5)$

(ii)  
 $x$  when  $g(x) = \frac{1}{2}$ .

[2 marks]

### Question 8c

Find

(i)  
the maximum possible domain of the function  $g(x)$

(ii)  
the range of the function  $g(x)$  that corresponds to the domain found in part (c) (i).

[2 marks]

# Exam Papers Practice