



CHAPTER 1: FUNCTIONS



Paper 1

Solution to Question 22

(a) Given $m(x) = \frac{ax+5}{x-3}$.

Let $y = m(x)$

$$y = \frac{ax+5}{x-3}$$

$$xy - 3y = ax + 5$$

$$xy - ax = 3y + 5$$

$$x(y - a) = 3y + 5$$

$$x = \frac{3y+5}{y-a}$$

$$m^{-1}(y) = \frac{3y+5}{y-a}$$

$$m^{-1}(x) = \frac{3x+5}{x-a}$$

Compare with $m^{-1}(x) = \frac{bx+5}{x-2}$.

Thus, $a = 2$ and $b = 3$.

(b) From (a), $m(x) = \frac{2x+5}{x-3}$ and $m^{-1}(x) = \frac{3x+5}{x-2}$.

Given $m(x) = m^{-1}(3)$

Hence, $\frac{2x+5}{x-3} = \frac{3(3)+5}{3-2}$

$$\frac{2x+5}{x-3} = 14$$

$$2x + 5 = 14x - 42$$

$$47 = 12x$$

$$x = \frac{47}{12}$$

Solution to Question 31

Given $f(x) = mx + n$, $g(x) = (x + 2)^2 - 5$ and $fg(x) = 3(x + 2)^2 - 20$.

$$\begin{aligned} \text{(a)} \quad g^2(2) &= gg(2) \\ &= g[(2 + 2)^2 - 5] \\ &= g(11) \\ &= (11 + 2)^2 - 5 \\ &= 169 - 5 \\ &= 164 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad fg(x) &= f[(x + 2)^2 - 5] \\ &= m[(x + 2)^2 - 5] + n \\ &= m(x + 2)^2 - 5m + n \end{aligned}$$

Compare with $fg(x) = 3(x + 2)^2 - 20$.

$$\begin{aligned} m = 3 \quad \text{and} \quad -5m + n &= -20 \\ -5(3) + n &= -20 \\ n &= -5 \end{aligned}$$

Thus, $m = 3$ and $n = -5$.

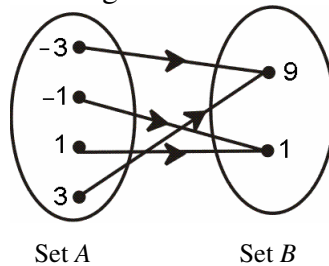
$$\begin{aligned} \text{(c)} \quad f(x) &= 3x - 5 \\ \text{Let } y &= 3x - 5 \\ x &= \frac{y + 5}{3} \\ f^{-1}(x) &= \frac{x + 5}{3} \end{aligned}$$

$$\begin{aligned} \text{Thus, } gf^{-1}(x) &= g\left(\frac{x + 5}{3}\right) \\ &= \left(\frac{x + 5}{3} + 2\right)^2 - 5 \\ &= \left(\frac{x + 11}{3}\right)^2 - 5 \end{aligned}$$

 Paper 1

1. In the diagram, set B shows the images of certain elements of set A .

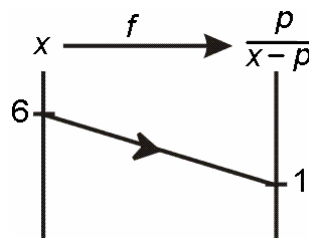
Clone
SPM
2006



- (a) State the type of relation between set A and set B .
(b) Using the function notation, write a relation between set A and set B .

2. The diagram shows the function $f: x \rightarrow \frac{p}{x-p}$, $x \neq p$, where p is a constant.

Clone
SPM
2006



Find the value of p .

3. A relation is represented by the set of ordered pairs, $\{(2, 1), (3, 2), (4, 1), (5, 3), (6, 4), (7, 4)\}$. State
(a) the type of the relation.
(b) the range of the relation.
(c) the objects of 4.
(d) the image of 2.
4. Given $f: x \rightarrow \frac{px-2}{x-4}$, $x \neq 4$ and $f(2) = 5$. Find the value of
(a) q . (b) p .
5. Given $f: x \rightarrow ax + b$, where a and b are constants, $f(2) = 1$ and $f^{-1}(7) = 4$. Find the values of a and b .
6. Given $f: x \rightarrow \frac{4}{x-3}$, $x \neq 3$. Find
(a) the value of h .
(b) the values of x for which f maps onto itself.
(c) $ff^{-1}(4)$.