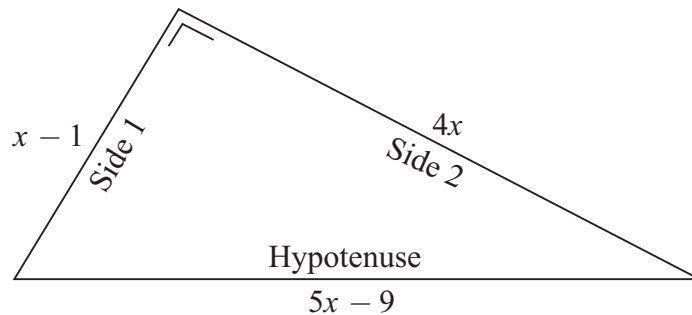


LC 2016 (SET A): PAPER 1

QUESTION 5 (25 MARKS)

Question 5 (a) (i)

$$\begin{aligned}(5x-9)^2 &= (x-1)^2 + (4x)^2 \\ 25x^2 - 90x + 81 &= x^2 - 2x + 1 + 16x^2 \\ 8x^2 - 88x + 80 &= 0 \\ x^2 - 11x + 10 &= 0 \\ (x-1)(x-10) &= 0 \\ x &= 1, 10 \\ \therefore x &= 10\end{aligned}$$



Question 5 (a) (ii)

$$\begin{aligned}x &= 10 \\ \text{Hypotenuse: } 5x - 9 &= 5(10) - 9 = 41 \\ \text{Side 1: } x - 1 &= (10) - 1 = 9 \\ \text{Side 2: } 4x &= 4(10) = 40 \\ (\text{Side 1})^2 + (\text{Side 2})^2 &= 9^2 + 40^2 = 1681 \\ (\text{Hypotenuse})^2 &= 41^2 = 1681 \\ \therefore (\text{Side 1})^2 + (\text{Side 2})^2 &= (\text{Hypotenuse})^2\end{aligned}$$

MARKING SCHEME NOTES

Question 5 (a) (i) [Scale 10D (0, 2, 5, 8, 10)]

- 2: • any use of Pythagoras
5: • fully correct substitution
8: • both roots correct

Question 5 (a) (ii) [Scale 5B (0, 2, 5)]

- 2: • 9 or 40 or 41
• using 1 or -10 from candidates work

Reject $x = 1$ as it will give one of the sides a length of zero.

Question 5 (b) (i)

An **injective** function from a set A to a set B is a function in which **every** value of x in A has a **different** value of y in B .

METHOD 1

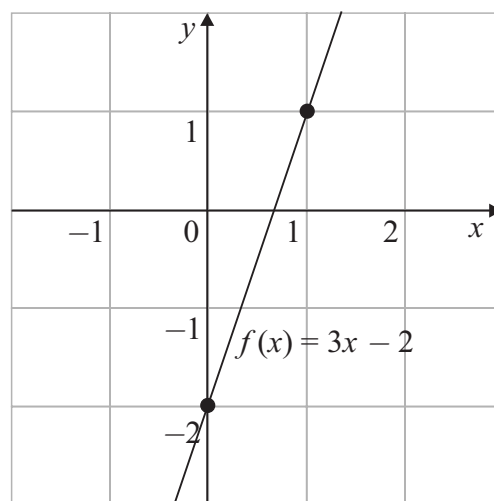
If $f(x)$ is an injective function from A to B , it follows that $f(x_1) = f(x_2) \Leftrightarrow x_1 = x_2$.

$$\begin{aligned}f(x_1) &= 3x_1 - 2 \\ f(x_2) &= 3x_2 - 2 \\ f(x_1) = f(x_2) &\Rightarrow 3x_1 - 2 = 3x_2 - 2 \\ 3x_1 &= 3x_2 \\ \therefore x_1 = x_2 &\Rightarrow f(x) \text{ is an injective function, } x \in \mathbb{R}.\end{aligned}$$

Question 5 (b) (ii)

$$\begin{aligned}y &= 3x - 2 \\ 3x &= y + 2 \\ x &= \frac{y+2}{3} \\ \therefore f^{-1}(x) &= \frac{x+2}{3}\end{aligned}$$

METHOD 2



A graph of the function is drawn. Horizontal lines in the codomain cut the graph **at most once**. Therefore, the function is injective.

MARKING SCHEME NOTES

Question 5 (b) (i) [Scale 5B (0, 2, 5)]

- 2: • $f^{-1}(x)$ written
• $f(x)$ drawn
• $f(a) = f(b)$

Question 5 (b) (ii) [Scale 5B (0, 2, 5)]

- 2: • any relevant transpose
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