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DEPARTMENT: AERONAUTICAL & ASTRONAUTICAL ENGINEERING

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COURSE TITLE: GENERAL MATHEMATICS II

COURSE CODE: MAT102

ANSWER TO ASSIGNMENT

(i) To show that A(6, -5), B(-2, 1), C(0, 3) forms an isosceles triangle

$x_1 = 6, x_2 = -2, x_3 = 0$

$y_1 = -5, y_2 = 1, y_3 = 3$

Using, $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$\overline{AB} = \sqrt{(-2-6)^2 + (1+5)^2} = \sqrt{(-8)^2 + (6)^2}$

$= \sqrt{64+36} = 10$ units

$\overline{AC} = \sqrt{(0-6)^2 + (3-(-5))^2} = \sqrt{100} = 10$

$\therefore \overline{AC} = \overline{AB}$

$\overline{BC} = \sqrt{(0+2)^2 + (3-1)^2} = \sqrt{8} = 2\sqrt{2}$

since $\overline{AB} = \overline{AC}$, the points form an isosceles triangle

b) Given $P=(5,-3)$, $Q(-4,9)$, $R(14,-15)$

(i) P divides QR

$$P = \left(\frac{kx_2 + x_1}{k+1}, \frac{ky_2 + y_1}{k+1} \right)$$

$$P(5,-3) = \left(\frac{kx_2 + x_1}{k+1}, \frac{ky_2 + y_1}{k+1} \right)$$

$\therefore x_1 = -4$, $x_2 = 14$, $y_1 = 9$, $y_2 = -15$

$$\frac{kx_2 + x_1}{k+1} = \frac{5}{1} \quad \text{and} \quad \frac{ky_2 + y_1}{k+1} = \frac{-3}{1}$$

Subs.

$$\frac{14k + (-4)}{k+1} = \frac{5}{1} \qquad \frac{-15k + 9}{k+1} = \frac{-3}{1}$$

$$5k + 5 = 14k - 4 \qquad -3k - 3 = -15k + 9$$

$$5k - 14k = -4 - 5 \qquad -3k + 15k = 9 + 3$$

$$\therefore k = 1 \qquad \therefore k = 1$$

$\therefore$ P divides QR in the ratio 1:1

(a) R divides PQ

Note the ratio $= k : 1$

the value of $R = \left(\frac{kx_2 + x_1}{k+1}, \frac{ky_2 + y_1}{k+1} \right)$

$R(14, -15) = \left(\frac{kx_2 + x_1}{k+1}, \frac{ky_2 + y_1}{k+1} \right)$

but $x_1 = 5, x_2 = -4, y_1 = -3$ and $y_2 = 9$.

$R(14, -15) = \left(\frac{kx - 4 + 5}{k+1}, \frac{ky + (-3)}{k+1} \right)$

$\therefore \frac{-4k + 5}{k+1} = \frac{14}{1}$ and $\frac{9k - 3}{k+1} = \frac{-15}{1}$

$\therefore -4k - 14k = 14 - 5$ and $+15k + 9k = -3 + 15$

$\frac{-18k}{-18} = \frac{9}{-18}$ and $\frac{-24k}{-24} = \frac{12}{-24}$

$k = -1/2$ and $k = -1/2$

$\therefore$ R divides PQ in the ratio $1/2 : 1$