Sample Paper 4: Paper 2

Question 6 (25 marks)

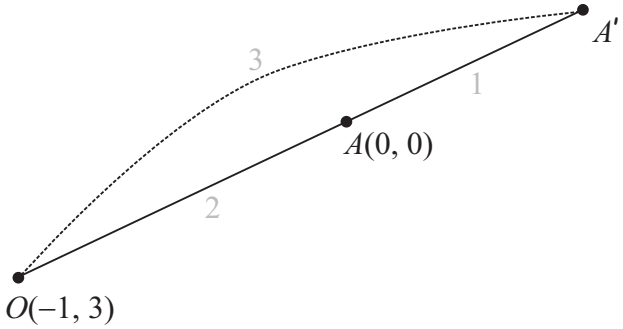
Question 6 (a)

$A(0, 0),\ B(1, 4),\ C(4, 1)$

$$A = \tfrac{1}{2}\left|x_1y_2 - x_2y_1\right|$$
$$= \tfrac{1}{2}\left|(1)(1) - (4)(4)\right|$$
$$= \tfrac{1}{2}\left|-15\right|$$
$$= \tfrac{15}{2}$$

Question 6 (b)

$$k = \frac{\left|\text{Image Length}\right|}{\left|\text{Object Length}\right|} = \frac{\left|OA'\right|}{\left|OA\right|} = \frac{3}{2}$$



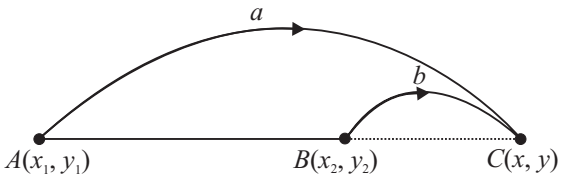
$a = 3,\ b = 1$

$O(-1, 3) = (x_1,\ y_1);\ A(0, 0) = (x_2,\ y_2)$

$$A' = \left(\frac{3(0) - 1(-1)}{3 - 1}, \frac{3(0) - 1(3)}{3 - 1}\right) = \left(\frac{1}{2}, -\frac{3}{2}\right)$$

External Division

$$x = \frac{ax_2 - bx_1}{a - b},\ y = \frac{ay_2 - by_1}{a - b}$$



$a = 3,\ b = 1$

$O(-1, 3) = (x_1,\ y_1);\ B(1, 4) = (x_2,\ y_2)$

$$B' = \left(\frac{3(1) - 1(-1)}{3 - 1}, \frac{3(4) - 1(3)}{3 - 1}\right) = \left(2, \frac{9}{2}\right)$$

$a = 3,\ b = 1$

$O(-1, 3) = (x_1,\ y_1);\ C(4, 1) = (x_2,\ y_2)$

$$C' = \left(\frac{3(4) - 1(-1)}{3 - 1}, \frac{3(1) - 1(3)}{3 - 1}\right) = \left(\frac{13}{2}, 0\right)$$

Question 6 (c)

$$A' = \left(\frac{1}{2}, -\frac{3}{2}\right) \to \left(-6, -\frac{3}{2}\right)$$

$$B' = \left(2, \frac{9}{2}\right) \to \left(-\frac{9}{2}, \frac{9}{2}\right)$$

$$C' = \left(\frac{13}{2}, 0\right) \to (0, 0)$$

$$A = \tfrac{1}{2}\left|(-6)\left(\frac{9}{2}\right) - \left(-\frac{3}{2}\right)\left(-\frac{9}{2}\right)\right| = \tfrac{1}{2}\left|-27 - \frac{27}{4}\right| = \tfrac{1}{2}\left|-\frac{135}{4}\right| = \frac{135}{8}$$

$$\frac{\text{Area } A'B'C'}{\text{Area } ABC} = \frac{\left(\frac{135}{8}\right)}{\left(\frac{15}{2}\right)} = \frac{9}{4} = \left(\frac{3}{2}\right)^2 = k^2$$