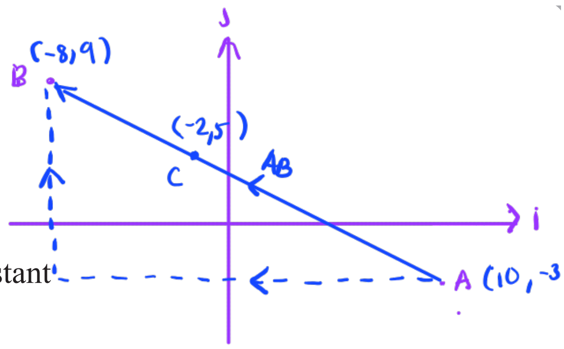

1. Relative to a fixed origin O

- point A has position vector $10\mathbf{i} - 3\mathbf{j}$
- point B has position vector $-8\mathbf{i} + 9\mathbf{j}$
- point C has position vector $-2\mathbf{i} + {}^{5}p\mathbf{j}$ where p is a constant

(a) Find $\overrightarrow{AB}$

(2)

(b) Find $|\overrightarrow{AB}|$ giving your answer as a fully simplified surd.

(2)

$\frac{12}{18} \cdot \frac{2}{3}$

Given that points A, B and C lie on a straight line,

(c) (i) find the value of p,

(ii) state the ratio of the area of triangle AOC to the area of triangle AOB.

(3)

a) $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$

$= -(10\underline{i} - 3\underline{j}) + (-8\underline{i} + 9\underline{j})$ (1)

$= -10\underline{i} - 8\underline{i} + 3\underline{j} + 9\underline{j}$

$= -18\underline{i} + 12\underline{j}$ (1)

b) $|\overrightarrow{AB}| = \sqrt{(-18)^2 + (12)^2}$

$= \sqrt{468}$ (1)

$= \sqrt{36} \times \sqrt{13}$

$= 6\sqrt{13}$ (1)

(c) (i) gradient BC = gradient BA (because all points are on the same line)

$m_{BC} = \frac{9-p}{(-8)-(-2)} = \frac{9-p}{-6}$ (1)

$m_{BA} = \frac{9-(-3)}{(-8)-10} = \frac{12}{-18}$

so, $\frac{9-p}{-6} = \frac{12}{-18}$

$3(9-p) = 12$

$27-3p = 12$

$3p = 15$

$p = 5$ (1)

(ii) since length AC : AB is 2 : 3,

ratio of triangle AOC is 2:3 to triangle AOB. (1)