

DECEMBER ASSESSMENTS
PURE MATHEMATICS
TIME: 2 HOURS

Attempt **all** questions

All working must be clearly shown

1. (a) The points A $(-7, -7)$, B $(8, -1)$, C $(4, 9)$, D are vertices of the parallelogram ABCD.
 - (i) Find the co-ordinates of D and prove that ABCD is a rectangle
 - (ii) Find the area of the rectangle?
 - (b) P, Q, R are the points $(1, 6)$, $(-5, 2)$, $(3, 4)$ respectively. Find the equations of the perpendicular bisectors of PQ and QR. Hence find the co-ordinates of the circumcentre of the triangle ABC (point of intersection of the perpendicular bisectors to PQ and QR).
 - (c) Find the orthocentre of the triangle whose vertices are the points $(1, 0)$, $(2, -7)$, $(-3\frac{1}{2}, -1\frac{1}{2})$ [The orthocentre is the point of intersection of the perpendiculars from the vertices on to the opposite sides]
 - (d) The three straight lines $y = x$, $2y = 7x$ and $x + 4y - 60 = 0$ form a triangle. Find the equations of the three medians, and calculate the co-ordinates of their point of intersection.
2. (a) Solve the simultaneous equations
 - (i)
$$\begin{aligned} 3x^2 + xy - y^2 &= 17 \\ 2x - y &= 1 \end{aligned}$$
 - (ii)
$$\begin{aligned} 2x^2 - 3xy - 2y^2 &= 12 \\ 2x - 3y &= 4 \end{aligned}$$
 - (iii)
$$\begin{aligned} x + y + Z &= 3 \\ 3x - y + 2Z &= 4 \\ x + y - Z &= 1 \end{aligned}$$
 - (b) Rationalise
 - (i)
$$\frac{\sqrt{6} + \sqrt{3}}{\sqrt{6} - \sqrt{3}}$$
 - (ii)
$$\frac{1 - \tan 60^\circ}{1 + \tan 60^\circ}$$
 - (c) Solve the following indicial equations
 - (i) $2^{2x+3} - 3^2 \cdot 2^x + 1 = 0$
 - (ii)
$$\begin{aligned} 2^{x+y} &= 8^{x-y} \\ 9^{x+2y} &= (27)^{2x+y-1} \end{aligned}$$