Co-ordinate Geometry : Merit / Excellence Practice #1

1. Find the perpendicular bisector of the line segment $\overline{PQ}$ if P = (3, 5) and Q = ($^{-}1$, 3).

2. Show if A = (1, 4), B = (2, 1) and C = (5, $^{-}8$) are collinear.

3. A = (1, 1), B = (1, 9), C = (k, 5). Find k so that the triangle ABC is equilateral.

4. Find the centre of the circle that includes the points X = (12, 2), Y = (13, 1) and Z = (9, 3).

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1. Find the perpendicular bisector of the line segment $\overline{PQ}$ if P = (3, 5) and Q = (⁻1, 3).

midpoint = $\left(\frac{3+-1}{2}, \frac{5+3}{2}\right)$ = (1, 4)

$m_{PQ} = \frac{5-3}{3--1} = \frac{2}{4} = 0.5$, so bisector's slope is $\frac{-1}{0.5}$ = ⁻2 $\qquad m^{\perp} = \frac{-1}{m}$

y – 4 = ⁻2(x – 1) $\qquad y - y_1 = m(x - x_1)$

y = ⁻2x + 6

2. Show if A = (1, 4), B = (2, 1) and C = (5, ⁻8) are collinear.

$m_{AB} = \frac{1-4}{2-1} = \frac{-3}{1}$ = ⁻3

$m_{AC} = \frac{-8-4}{5-1} = \frac{-12}{4}$ = ⁻3

Slopes are the same, so the points are collinear.

(Alternatively, but more slowly, show they all lie on the line y = ⁻3x + 7)

3. A = (1, 1), B = (1, 9), C = (k, 5). Find k, so that the triangle ABC is equilateral.

length AB = 8, so length AC = 8 to make the triangle equilateral.

$8 = \sqrt{(k-1)^2 + (5-1)^2}$

$64 = (k-1)^2 + 16$

$48 = (k-1)^2$

$\pm\sqrt{48} = k - 1$

k = 7.928 or ⁻5.928

4. Find the centre of the circle that includes the points X (12, 2), Y (13, 1) and Z (9, 3).

Midpoints XY = (12.5, 1.5) and YZ (11, 2)

$m_{XY} = \frac{2-1}{12-13} = \frac{1}{-1}$ = ⁻1 $\qquad m_{YZ} = \frac{1-3}{13-9} = \frac{-2}{4}$ = ⁻0.5

So matching perpendicular slopes are $\frac{-1}{-1}$ = 1 and $\frac{-1}{-0.5}$ = 2

Perpendicular bisector of XY is $y - 1.5 = 1(x - 12.5) \Rightarrow y = x - 11$

Perpendicular bisector of YZ is $y - 2 = 2(x - 11) \Rightarrow y = 2x - 20$

Rewrite as $x - y = 11$ and $2x - y = 20$

Those two lines intersect (calculator) at centre of the circle = **(9, ⁻2)**