Co-ordinate Geometry : Merit / Excellence Practice #4

1. If A = (4, $^-2$) and B = (k, k), find k so that a line going through A and B is parallel to the line $3x + 2y = 12$.

2. X = (8, 1), Y = ($^-4$, $^-2$), Z = ($^-6$, 6). Show XYZ is a right angle triangle.

3. Find the point collinear with M = (3, 4) and N = (7, 5) which is on the line $x + 2y = 9$.

4. The line $y = \frac{1}{2}x + 3$ is the perpendicular bisector of points A = (4, 10) and B. Find B.

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Answers – Co-ordinate Geometry : Merit / Excellence Practice #4

1. If A = $(4, {}^-2)$ and B = (k, k), find k so that a line going through A and B is parallel to the line $3x + 2y = 12$.

   $3x + 2y = 12$ rearranges to $y = \frac{-3}{2}x + c$, so $m_{AB} = m_{line} = \frac{-3}{2}$

   So $m_{AB} = \frac{k - -2}{k - 4} = \frac{-3}{2}$

   Rearranging ${}^-3(k - 4) = 2(k + 2)$, which solves to give $\boldsymbol{k = 1.6}$

2. X = (8, 1), Y = $({}^-4, {}^-2)$, Z = $({}^-6, 6)$. Show XYZ is a right angle triangle.

   $m_{XY} = \frac{1 - -2}{8 - -4} = \frac{3}{12} = \frac{1}{4}$

   $m_{ZY} = \frac{6 - -2}{-6 - -4} = \frac{8}{-2} = {}^-4$

   $m_{XY} \times m_{ZY} = \frac{1}{4} \times {}^-4 = {}^-1$

   As the gradients of XY and ZX multiply to give ${}^-1$, they are perpendicular.

   If the sides are perpendicular, the triangle has a right angle.

3. Find the point collinear with M = (3, 4) and N = (7, 5) which is on the line $x + 2y = 9$.

   $m_{MN} = \frac{5 - 4}{7 - 3} = \frac{1}{4}$

   Equation of MN is found by: $y - 5 = 0.25(x - 7)$ $\qquad y - y_1 = m(x - x_1)$

   Which gives $y = 0.25x + 3.25$

   Point wanted is the intersection of MN and $x + 2y = 9$

   $\mathbf{(1\tfrac{2}{3}, 3\tfrac{2}{3})}$ $\qquad$ *simultaneous equation*

4. The line $y = \frac{1}{2}x + 3$ is the perpendicular bisector of points A = (4, 10) and B. Find B

   If $y = \frac{1}{2}x + 3$, then slope of line AB $= \frac{-1}{\frac{1}{2}} = {}^-2$

   Equation of AB is found by: $y - 10 = {}^-2(x - 4)$ $\qquad y - y_1 = m(x - x_1)$

   LineAB is: $y = {}^-2x + 18$

   Intersection of AB and bisector line is (6, 6) $\qquad$ *simultaneous equation*

   midAB = (6, 6) = $\left(\frac{4 + x}{2}, \frac{10 + y}{2}\right)$ which gives x and y for B

   B = (8, 2)

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