Co-ordinate Geometry : Merit/Excellence Practice #5

1. Are the points E = (2, 3), F = (5, 1) and G = (15, $^{-}$5) collinear?

2. Find the perpendicular bisector of H = (3, 6) and I = (5, 9).

3. X = (2, 2), Y = (6, 4), Z = (4, 8). Find the equation of the line of mirror symmetry for triangle XYZ.

4. Find the points 10 away from (1, 6) that are on the line $y = 2x + 4$

Answers – Co-ordinate Geometry : Merit/Excellence Practice #5

1. Are the points E = (2, 3), F = (5, 1) and G = (15, ⁻5) collinear.

   $m_{EF} = \frac{3-1}{2-5} = \frac{2}{-3} = ⁻0.6666$ $\quad\quad$ $m_{EG} = \frac{3--5}{2-15} = \frac{8}{-13} = ⁻0.615$

   The slopes are not the same, so the points are not collinear.

   (Can also be answered by showing that the line EF is $y = \frac{-2x}{3} + \frac{13}{3}$

   and that G is not on that line.)

2. Find the perpendicular bisector of H = (3, 6) and I = (5, 9).

   Midpoint is $(\frac{3+5}{2}, \frac{6+9}{2})$ = (4, 7.5)

   $m = \frac{9-6}{5-3} = \frac{3}{2}$ (= 1.5) $\quad\quad$ So $m^{\perp} = \frac{-1}{1.5} = \frac{-2}{3}$

   y – 7.5 = $\frac{-2}{3}$ (x – 4)

   $\boldsymbol{y = \frac{-2}{3}x + \frac{61}{6}}$

3. X = (2, 2), Y = (6, 4), Z = (4, 8). Find the equation of the line of mirror symmetry for triangle XYZ.

   Length XY = $\sqrt{(6-2)^2 + (4-2)^2}$ = √20 = Length YZ = $\sqrt{(4-6)^2 + (8-4)^2}$

   So the triangle is isosceles, with XZ as the different side. $m_{XZ} = \frac{2-8}{2-4} = \frac{-6}{-2} = 3$

   The line of symmetry will be perpendicular to this line, so will have $m^{\perp} = \frac{-1}{3}$

   and it will pass through point Y. So y – 4 = $\frac{-1}{3}$ (x – 6) $\quad\quad$ $\boldsymbol{y = \frac{-1}{3}x + 6}$

   (Can also be answered by finding the midpoint of XZ = (3, 5) and then finding the line that goes from that to Y.)

4. Find the points 10 away from (1, 6) that are on the line $y = 2x + 4$

   The point will be (x, y) so that $10^2 = \sqrt{(x-1)^2 + (y-6)^2}$

   Squaring, and using $y = 2x + 4$ we get 100 = $(x – 1)^2 + (2x + 4 – 6)^2$

   Simplifying the last bracket and then expanding, 100 = $x^2 – 2x + 1 + 4x^2 – 8x + 4$

   $5x^2 – 10x – 95 = 0$, which solves (graphics) to give x = 5.47 or ⁻3.47

   Sub into $y = 2x + 4$ and we get: **(5.47, 14.94) and (⁻3.47, ⁻2.94)**