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## Find the Intersection – Co-ordinate Geometry Trial #1

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### Introduction

This assessment requires you to apply co-ordinate geometry methods using a specific shape on a co-ordinate plane.

The quality of your discussion and reasoning will determine your overall grade.

- Show your calculations.
- Use appropriate mathematical statements.
- Clearly communicate your strategy and method at each stage of your solution.

### Context

This task is set in a mathematical context only.

### Task

Point **X** = (0, -1), point **Y** = (5, 3) and point **Z** (*k*, 3).

- find the features of line segment **XY**.
- calculate the *y*-intercept of the perpendicular bisector of **XY**.
- calculate the *y*-intercept of the perpendicular bisector of **XZ** in terms of *k*.

Formula:  $y - y_1 = m(x - x_1)$

**Solutions to "Find the Intersection":**

$$m_{XY} = \frac{3 - -1}{5 - 0} = \frac{4}{5} = 0.8$$

$$\text{Equation XY : } y - 3 = 0.8(x - 5) \Rightarrow y - 3 = 0.8x - 4 \quad \Rightarrow \mathbf{y = 0.8x - 1}$$

$$|XY| = \sqrt{(5 - 0)^2 + (3 - -1)^2} = \sqrt{41} = \mathbf{6.40}$$

$$\text{Midpoint of XY} = \left( \frac{0+5}{2}, \frac{-1+3}{2} \right) = \mathbf{(2.5, 1)}$$

$$\text{Perpendicular slope to XY} = \frac{-1}{0.8} = \mathbf{-1.25}$$

$$\text{Equation of Perpendicular bisector is: } y - 1 = -1.25(x - 2.5) \text{ which gives } \mathbf{y = -1.25x + 4.125}$$

***Achieved** is obtained by showing three basic skills in co-ordinate geometry. While it cannot be put in black and white, a reasonable standard would be getting most of the answers above.*

The y-intercept is **4.125** (from the equation of the perpendicular bisector)

***Merit** would be to get almost all of the above, certainly needing to have identified how to find the y-intercept of the perpendicular bisector, although a minor arithmetic error might be corrected on resubmission.*

$$m_{XZ} = \frac{3 - -1}{k - 0} = \frac{4}{k} \quad (\text{Equation XZ is not required})$$

$$\text{Midpoint of XZ} = \left( \frac{0+k}{2}, \frac{-1+3}{2} \right) = \left( \frac{k}{2}, 1 \right) \text{ or } (0.5k, 1)$$

$$\text{Perpendicular slope to XY} = \frac{-1}{4/k} = \frac{-k}{4}$$

$$\text{Equation of Perpendicular bisector is: } y - 1 = \frac{-k}{4} \left( x - \frac{k}{2} \right) \text{ which gives } y = \frac{-k}{4}x + \frac{k^2}{8} + 1$$

$$\mathbf{y\text{-intercept is } \frac{k^2}{8} + 1}$$

***Excellence** requires this answer. (Because it can be checked back against the answer for an actual value of k in the first part any error should be spotted.)*