Co-ordinate Geometry : Merit / Excellence Practice #2

1. A = (1, 2), B = (9, 5), C = (k, 11) are on the same line. Find k.

2. X = (1, 2), Y = (5, 3), Z = ($^{-}1$, 10). Show the triangle XYZ is right-angled.

3. Find a and b so that the lines $y = ax + b$ and $y = 2ax - b$ meet at ($^{-}2$, $^{-}9$).

4. How close does the line $y = 2x + 5$ come to the point (8, 8)?

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Answers – Co-ordinate Geometry : Merit/Excellence Practice #2

1. A = (1, 2), B = (9, 5), C = (k, 11) are on the same line. Find k.

$m_{AB} = \frac{5-2}{9-1} = \frac{3}{8} = 0.375$

$y - 2 = 0.375(x - 1)$

$y = 0.375x + 1.625$ = *equation for AB*

for C to be on the line $11 = 0.375 \times k + 1.625$

k = 25

(*Alternatively, can also use that the slopes* $m_{AB} = m_{AC}$)

2. X = (1, 2), Y = (5, 3), Z = ($^-1$, 10). Show the triangle XYZ is right-angled.

$m_{XY} = \frac{3-2}{5-1} = \frac{1}{4} = 0.25$

$m_{XZ} = \frac{10-2}{-1-1} = \frac{8}{-2} = {}^-4$

Lines are perpendicular if $m^{\perp} = \frac{-1}{m}$, which is what we have here, as $^-4 = \frac{-1}{0.25}$

Perpendicular lines mean a right angle triangle.

3. Find a and b so that the lines $y = ax + b$ and $y = 2ax - b$ meet at ($^-2$, $^-9$).

lines $y = ax + b$ and $y = 2ax - b$ meet when $ax + b = 2ax - b$

rearranging this gives when $2b = ax$

substituting this into $y = ax + b$, we get $y = 2b + b$, so $y = 3b$

as the point ($^-2$, $^-9$) is on this line, $^-9 = 3b$, so $b = {}^-3$.

if $b = {}^-3$, then as $y = ax + b$ we find $^-9 = a \times {}^-2 + {}^-3$, so $a = 3$

a = 3, b = $^-3$

4. How close does the line $y = 2x + 5$ come to the point (8, 8)?

Nearest point is at 90°, so need perpendicular line: $y = 2x + 5$ has slope 2

So perpendicular line has slope = $\frac{-1}{2} = {}^-0.5$

It has equation: $y - 8 = {}^-0.5\ (x - 8) \Rightarrow y = {}^-0.5\ x + 12$

Solve where crosses $y = 2x + 5$ using simultaneous equations, gives (2.8, 10.6)

Distance = = $\sqrt{(8-2.8)^2 + (8-10.6)^2}$ = **5.81**

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