ANSWERS

Geometry

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Core 1 - Bronze

Topic: Coordinate Geometry

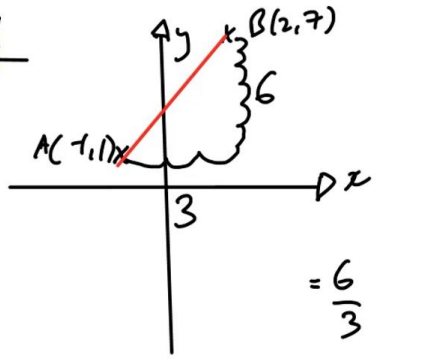
Question 1

A straight line L1 passes through the coordinates A(-1,1)and B(2,7).
Find the gradient of L1.

① Algebra $A=(-1,1)$, $B=(2,7)$ (x_1,y_1) (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{7-1}{2-(-1)}=\frac{6}{3}=2$$

② Graphical



$=\frac{6}{3}$

$=2$

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Core 2 - Bronze

Topic: Coordinate Geometry

Question 2

Which ONE line below is parallel to $y=1/2x-3$.

A: $y=-1/2x+1/2$ ✗

B: $2y=1-x$ ✗ $y=\frac{1-x}{2}$ $\Rightarrow y=\frac{1}{2}-\frac{1}{2}x$ $\Rightarrow y=-\frac{1}{2}x+\frac{1}{2}$ ✗

C: $2x-4y=6$ ✓ $-4y=-2x+6$ $\Rightarrow y=\frac{-2x+6}{-4}$ $\Rightarrow y=\frac{1}{2}x-\frac{3}{2}$

D: $2y=4x+3$ ✗ $y=\frac{4x}{2}+\frac{3}{2}$ $\Rightarrow y=2x+\frac{3}{2}$

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Core 3 - Bronze Topic: Coordinate Geometry

Question 3

Find the equation of the line that passes through point (3,7) and the midpoint between (1,5) and (3,7).

gradient

(x_1, y_1) $(3,7)$ $(2,6)$ (x_2, y_2)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6-7}{2-3} = \frac{-1}{-1} = 1 \therefore m = 1$$

y-intercept

$y = mx + c$

$y = 1x + c$

$7 = (1 \times 3) + c$

$7 = 3 + c \therefore c = 4$

$y = 1x + 4$

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Core 4 - Silver Topic: Coordinate Geometry

Question 4

Find the equation of the line that passes through points (-2,3) and which is parallel to the line $2x+3y-10=0$.

$+2x + 3y - 10 = 0$

$3y = -2x + 10$

$y = \frac{-2x}{3} + \frac{10}{3}$

$y = mx + c$

(x, y)

$y = mx + c$

$y = -\frac{2}{3}x + c$

$3 = \left(\frac{-2}{3} \times \frac{-2}{1}\right) + c$

$3 = \frac{4}{3} + c$

$\frac{3}{1} - \frac{4}{3} = c \therefore \frac{9-4}{3} = \frac{5}{3}$

$y = -\frac{2}{3}x + \frac{5}{3}$

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Core 5 - Silver Topic: Coordinate Geometry

Question 5

i) Find the intersection point of $y = 3x+4$ and $y = 6 - x$

$(\frac{1}{2}, \frac{11}{2})$

$3x+4 = 6-x$

$3x + x = 6-4$

$4x = 2 \quad \therefore x = \frac{2}{4} = \frac{1}{2}$

ii) Find the intersection point of $3x + 2y = 12$ and $2x + 4y = 8$

$3x+2y=12$

$2y = -3x+12$

$y = -\frac{3x}{2} + \frac{12}{2}$

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

$2x+4y=8$

$4y = -2x+8$

$y = -\frac{2x}{4} + \frac{8}{4}$

$y = -\frac{1}{2}x + 2$

$= (4, 0)$

$-\frac{3x}{2} + 6 = -\frac{1}{2}x + 2$

$-x = 2-6$

$-x = -4$

$x = 4$

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Core 6 - Gold Topic: Coordinate Geometry

Question 6

i) Find the perpendicular gradient to:

a) $4/1$

b) $2/3$

c) $-5/2$

F: $\frac{1}{4}$ M: $-\frac{1}{4} \Rightarrow -\frac{1}{4}$

F: $\frac{3}{2}$ M: $-\frac{3}{2} \Rightarrow -\frac{3}{2}$

F: $\frac{2}{-5}$ M: $\frac{2}{5} \Rightarrow \frac{2}{5}$

ii) Find the equation of the line passing through the mid point of A(-3, 2) and B(1, -6) and perpendicular to AB.

(x_1, y_1) (x_2, y_2)

$(-1, -2)$ (x_1, y_1)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-6-2}{1--3} = \frac{-8}{4} = \frac{-2}{1} \therefore \frac{1}{2}$

$y = \frac{1}{2}x + c \qquad -2 = (\frac{1}{2} \times -1) + c \qquad -2 = -\frac{1}{2} + c$

$-2 + \frac{1}{2} = c \quad \therefore c = -\frac{3}{2}$

$y = \frac{1}{2}x - \frac{3}{2}$

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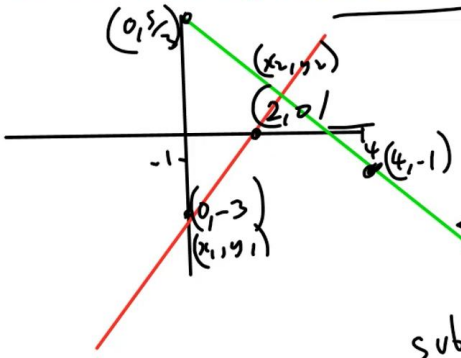
Core 7 - Gold Topic: Coordinate Geometry

Question 7

Find the equation of the line passing through point (4, - 1) and perpendicular to the line crossing the x-axis at 2 and the y axis at -3.



$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - -3}{2 - 0} = \frac{3}{2}$

$\frac{3}{2} \Rightarrow \frac{2}{3} \Rightarrow -\frac{2}{3}$

$y = -\frac{2}{3}x + c$

sub →

$-1 = (-\frac{2}{3} \times 4) + c$

$-1 = -\frac{8}{3} + c$

$\frac{-1}{1} + \frac{8}{3} = c$

$C = -3 + \frac{8}{3} = \frac{5}{3}$

$y = -\frac{2}{3}x + \frac{5}{3}$

Gold

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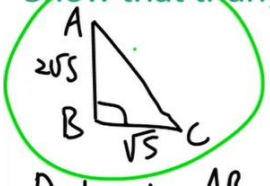
Core 8 - Platinum Topic: Coordinate Geometry

Question 8

Show that triangle ABC is a right angle where A = (-2,-1), B= (2,1) and C= (1,3).



Distance AB

$A = (-2,-1), B = (2,1)$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= ((2 - -2)^2 + (1 - -1)^2$

$= 4^2 + 2^2 = 16 + 4 = \sqrt{20}$

$= \sqrt{4 \times 5} = 2\sqrt{5}$

Distance BC

$B = (2,1), C = (1,3)$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$d = \sqrt{(1 - 2)^2 + (3 - 1)^2}$

$= (-1)^2 + (2)^2$

$= \sqrt{5}$

Distance AC

$A = (-2,-1), C = (1,3)$

$(3 - -1)^2 + (1 - -2)^2$

$= 4^2 + 3^2 = 16 + 9 = \sqrt{25} = 5$

$(2\sqrt{5})^2 + (\sqrt{5})^2 = AC^2$

$(4 \times 5) + 5 = AC^2$

$20 + 5 = AC^2$

$25 = AC^2$

$\sqrt{25} = AC$

$5 = AC$

Platinum