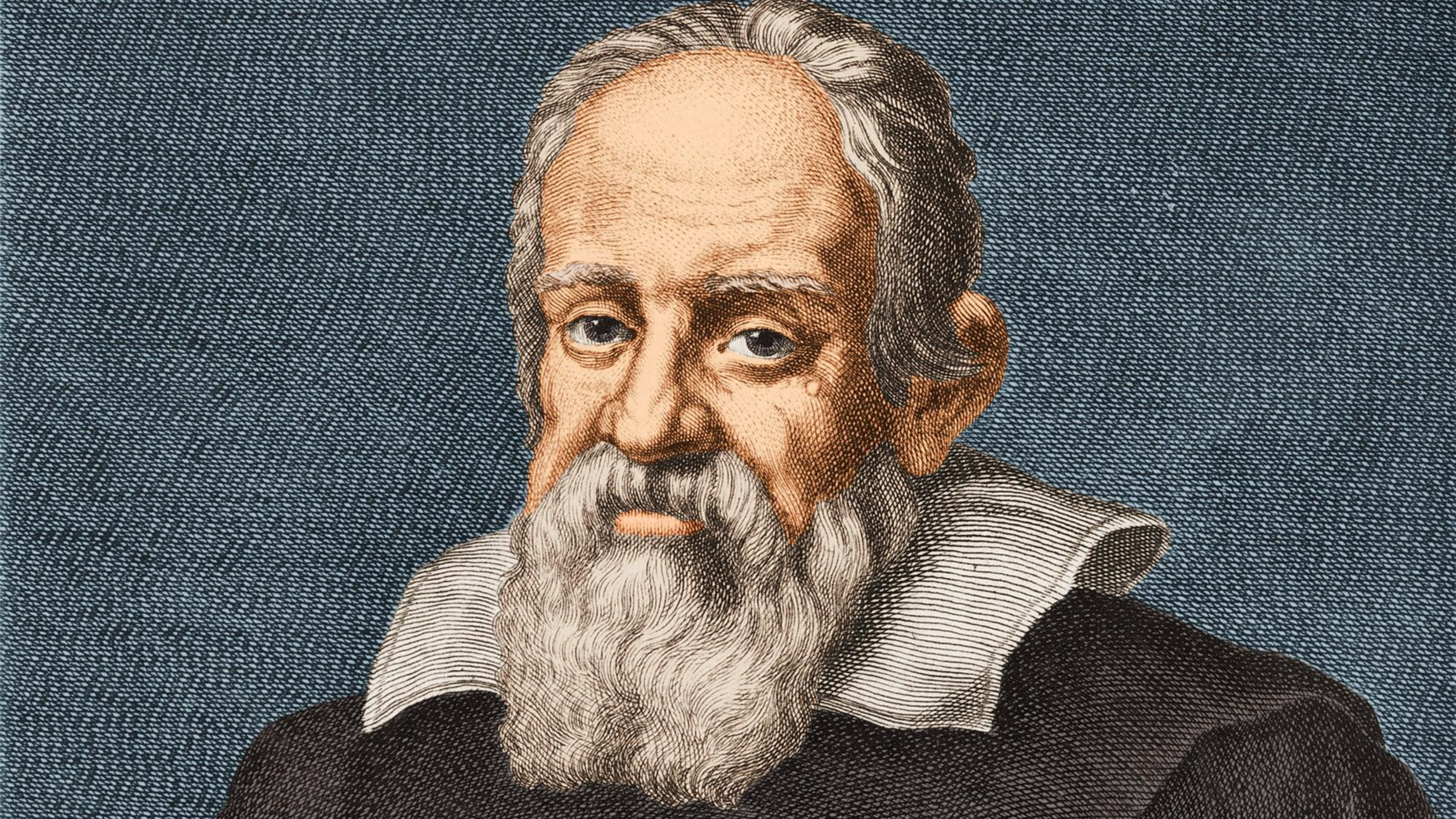


- All truths are easy to understand once they are discovered; the point is to discover them.

[Galileo Galilei]

- We cannot teach people anything; we can only help them discover it within themselves.

[Galileo Galilei]

"Passion is the genesis of genius."
— Galileo Galilei

- If you can't explain it simply, you don't understand it well enough.

Albert Einstein

- It's not that I'm so smart, it's just that I stay with problems longer.

Albert Einstein

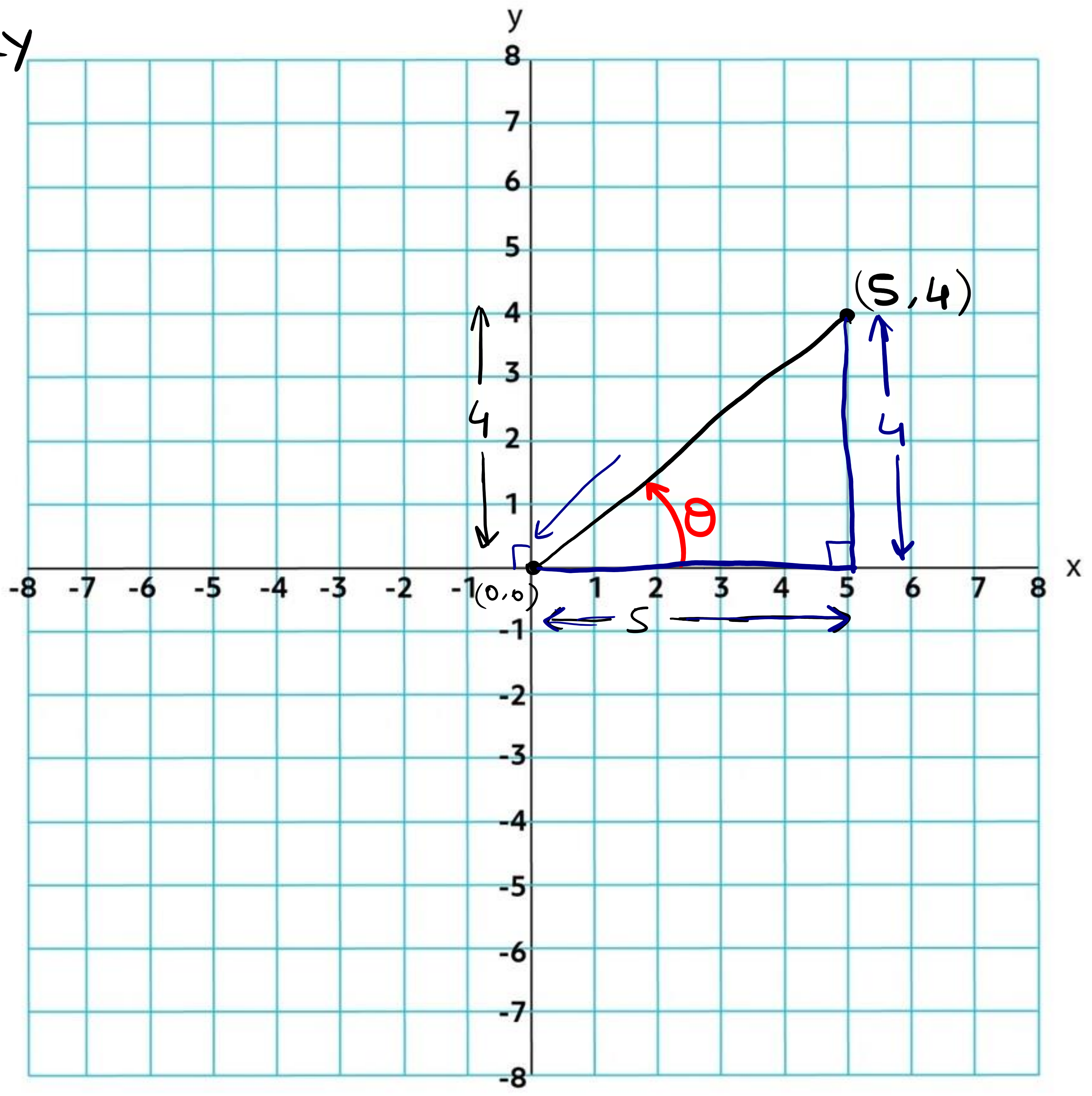
- I have no special talent. I am only passionately curious.

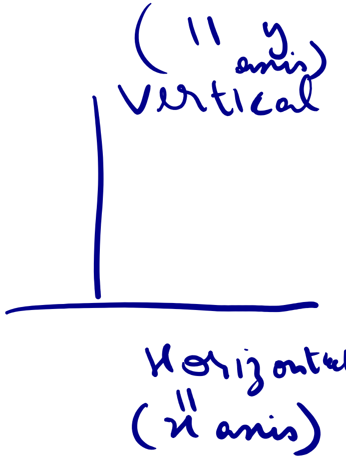
Albert Einstein

- We cannot solve our problems with the same thinking we used when we created them.

Albert Einstein

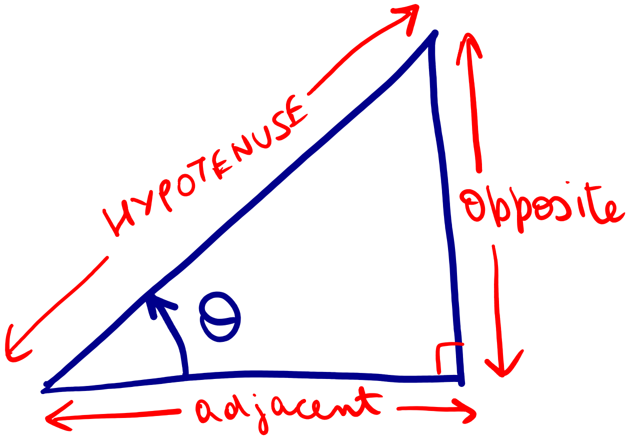
TRIGONOMETRY





$\sin\theta \qquad \cos\theta \qquad \tan\theta$

sine $\qquad$ cosine $\qquad$ tangent



SOH
CAH
TOA

$$\sin\theta = \frac{\text{OPPOSITE}}{\text{HYPOTENUSE}}$$

$$\cos\theta = \frac{\text{ADJACENT}}{\text{HYPOTENUSE}}$$

$$\tan\theta = \frac{\text{OPPOSITE}}{\text{ADJACENT}} = \frac{\sin\theta}{\cos\theta}$$

$$(\text{Hypotenuse})^2 = (\text{Adjacent})^2 + (\text{Opposite})^2$$

H.W. Use this relation to derive a relation between $\sin\theta$ & $\cos\theta$.

$$(\sin\theta)^2 + (\cos\theta)^2 = 1 \quad ✓$$

$$\sin^2\theta + \cos^2\theta = 1$$

$\theta = 30^\circ$

$\sin\theta = \frac{1}{2}$

$\cos\theta = \frac{\sqrt{3}}{2}$

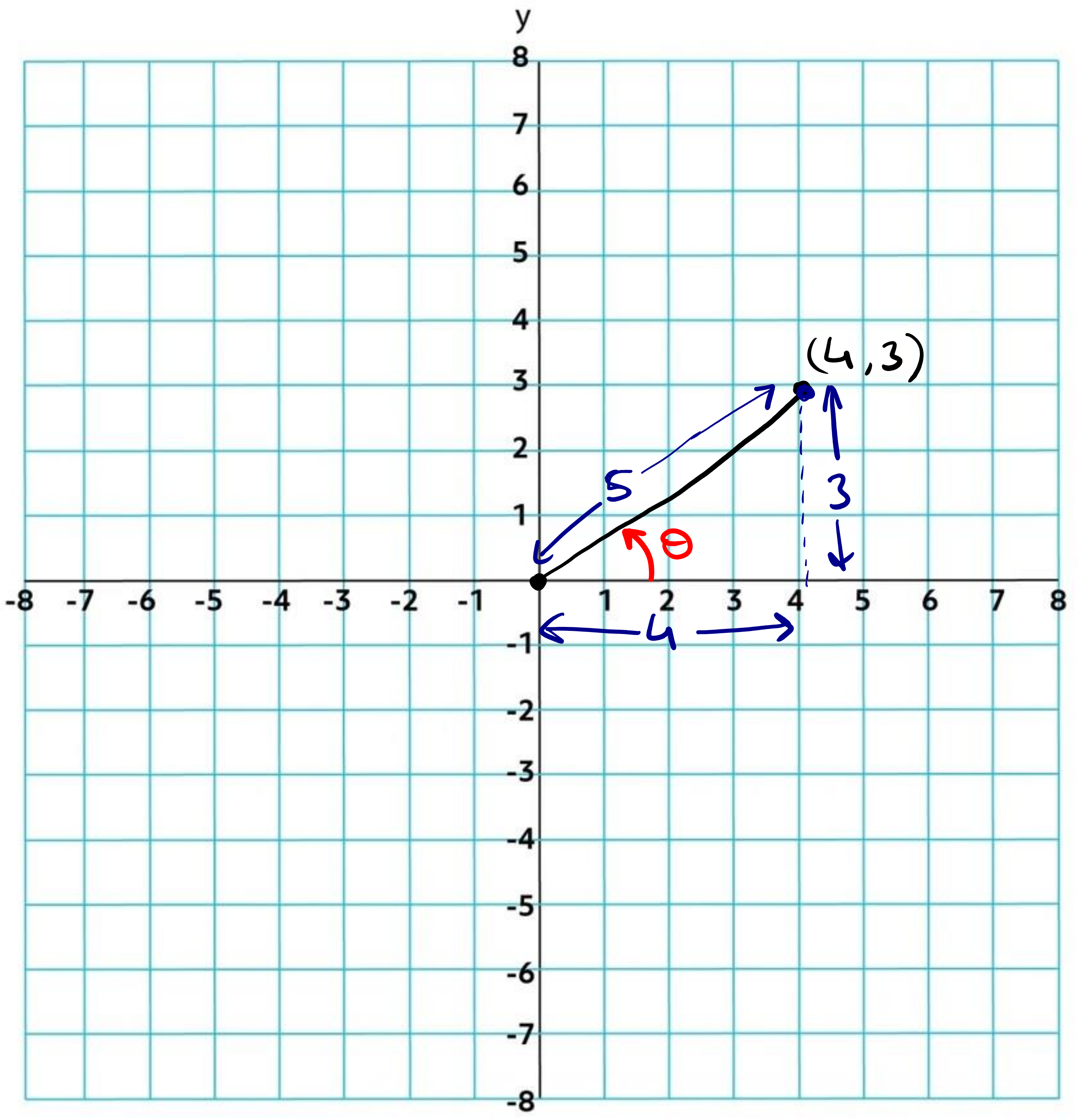
$\sin^2 30 + \cos^2 30$

$= \frac{1}{4} + \frac{3}{4} = 1$

$$(\sin\theta)^2 = \sin\theta \times \sin\theta = \boxed{\sin^2\theta}$$

$$(\sin 30)^2 = \sin^2 30$$

$\theta \sim 37°$



$\sin 53° = 4/5$

$\cos 53° = 3/5$

$\sin 37° = 3/5$

$\cos 37° = 4/5$

$\sin\theta = 3/5$

$\cos\theta = 4/5$

$\theta = ?$

$\sin\theta = ?$

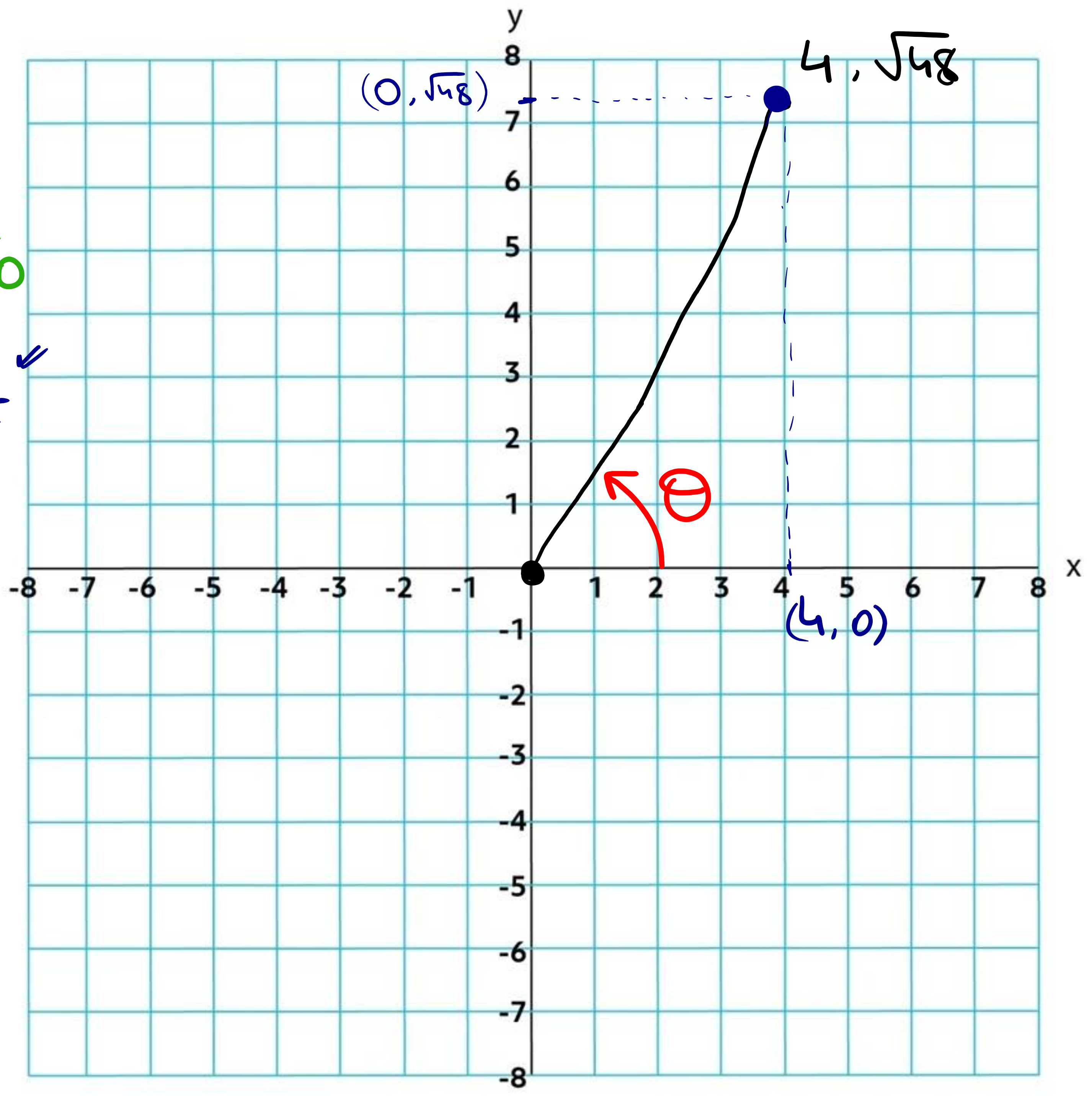
$\sin\theta = 4/\sqrt{80}$

$\cos\theta = 1/2$

$\theta = 60^\circ$

$\sin\theta = 1/2$

$\theta = 30^\circ$



$\sin\theta = \frac{opp}{hyp}$

$= \sqrt{48}$

$hyp^2 = 4^2 + (\sqrt{48})^2$

$= 16 + 48$

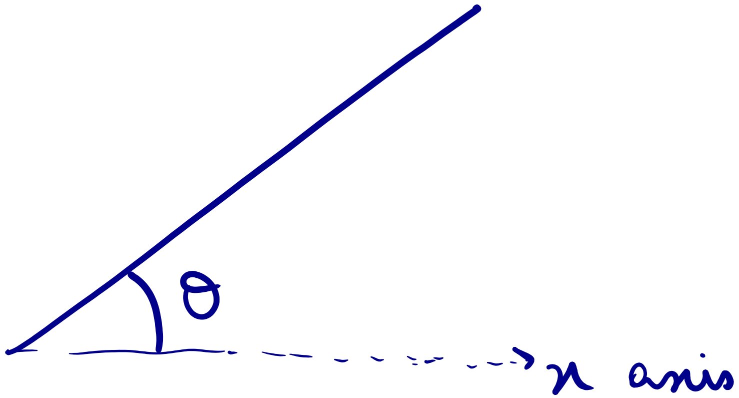
$= 64$

$hyp = \sqrt{64}$

$= 8$

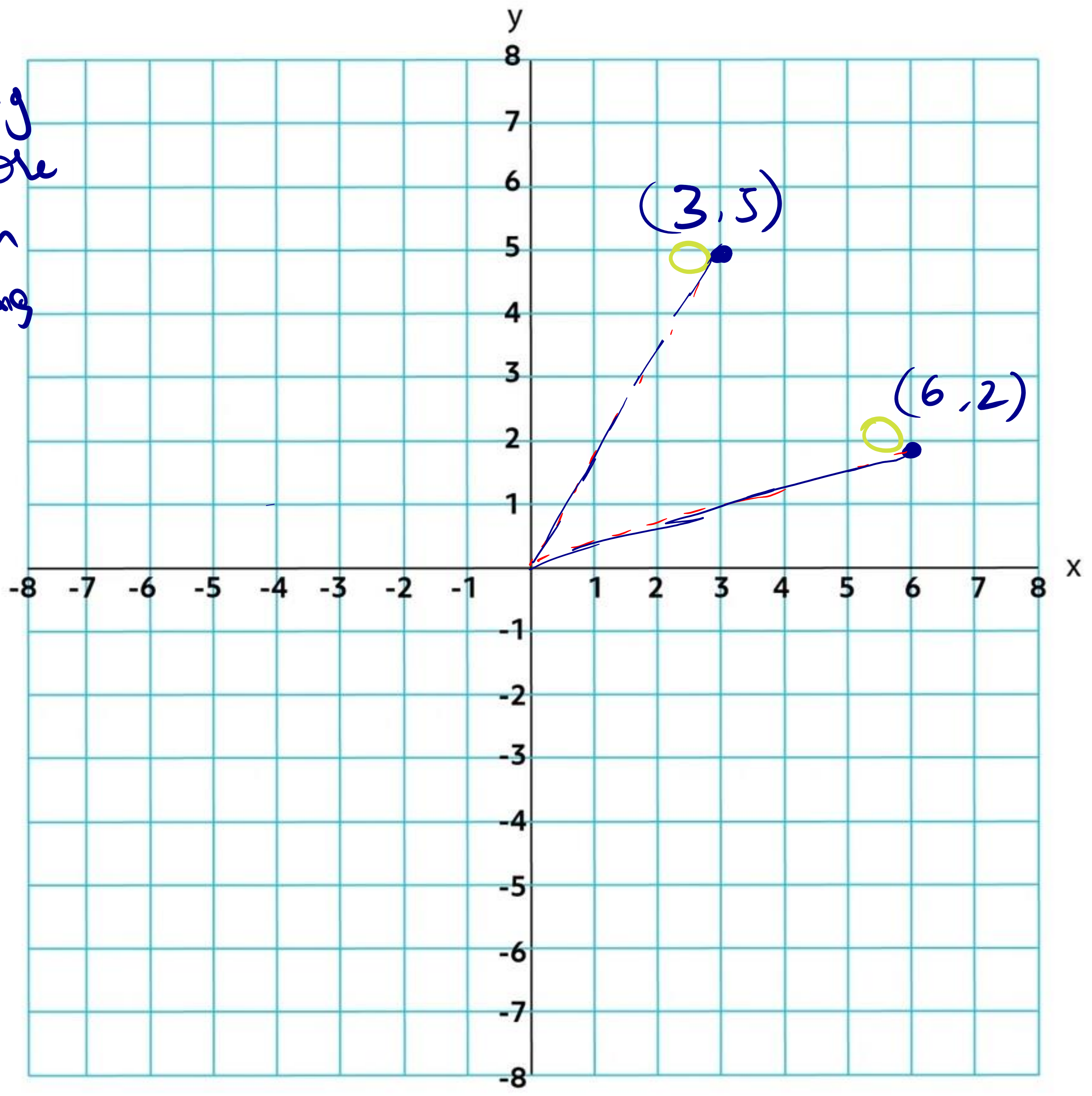
$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

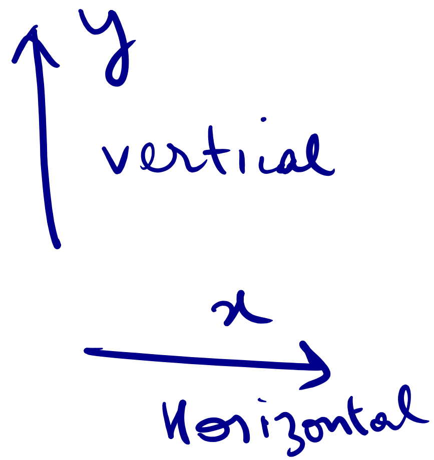
Q - How do I define SLOPE ?

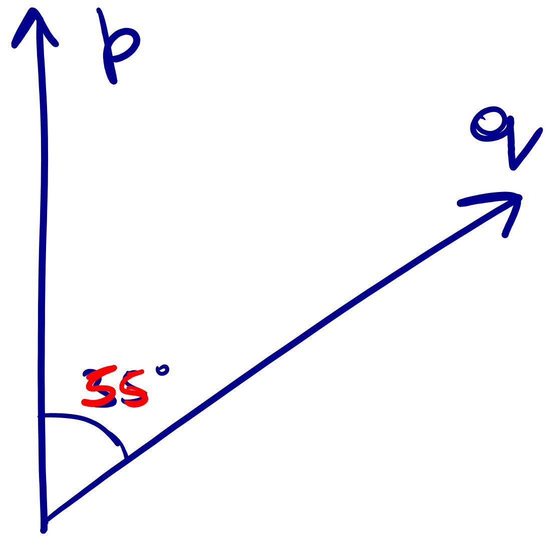


HINTS 1) Mathematically, use the coordinate axes.

The line joining (3,5) has more SLOPE than the line joining (6,2)





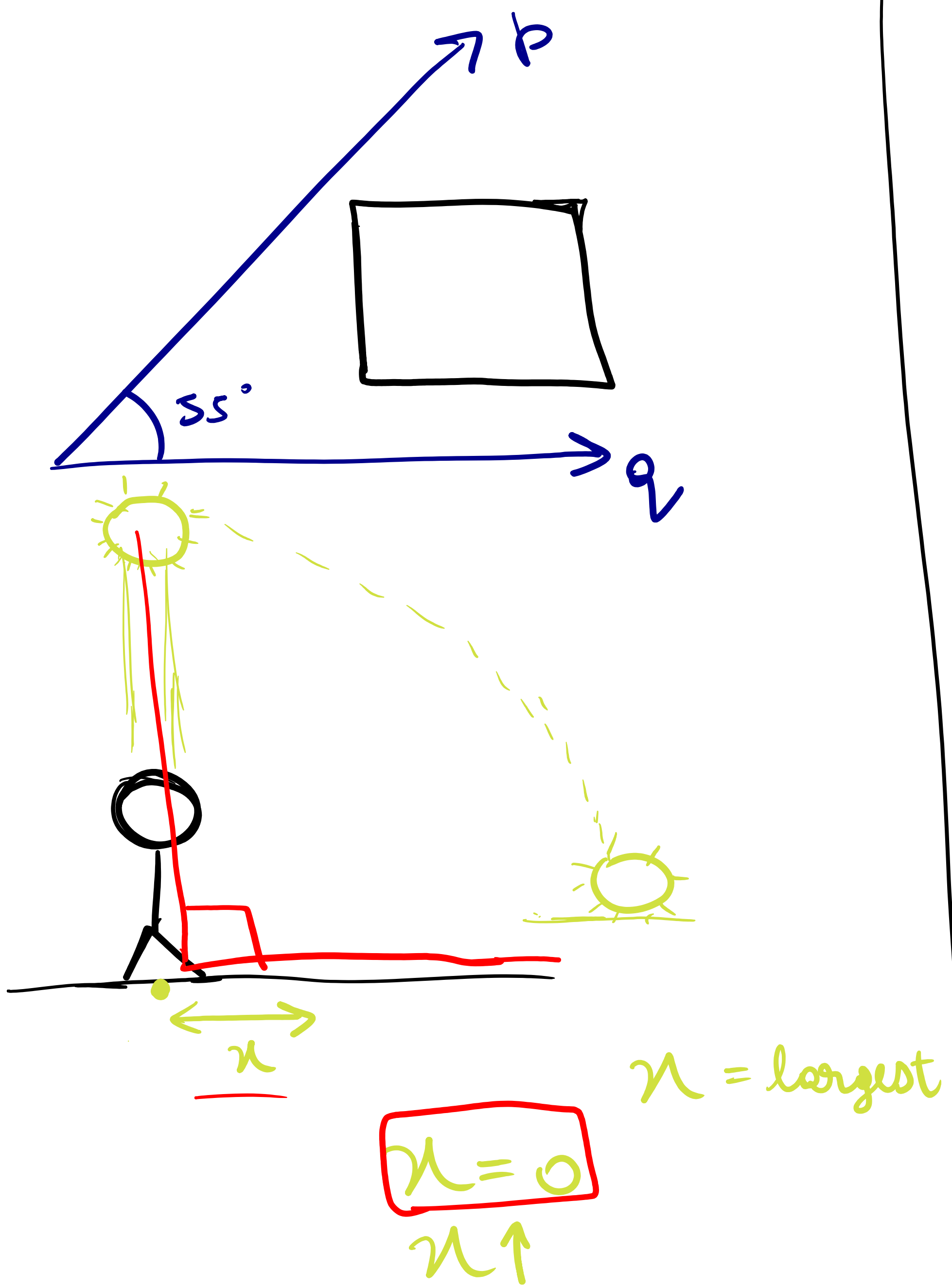


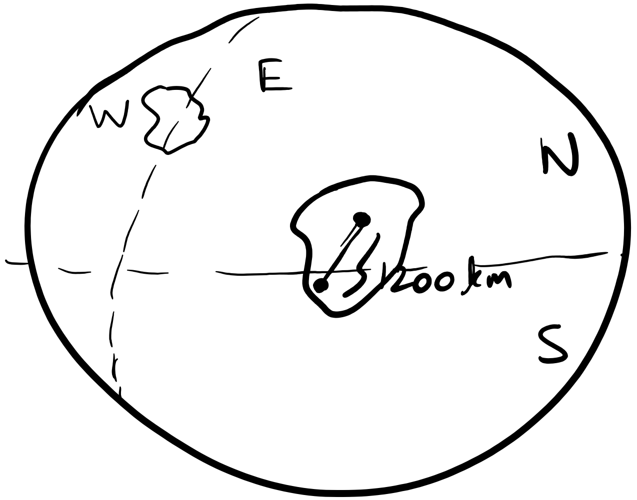
HINT

I have defined my coordinate system for my own ease

Q - a) Why don't I use p-q system as my new set of coordinate axes?

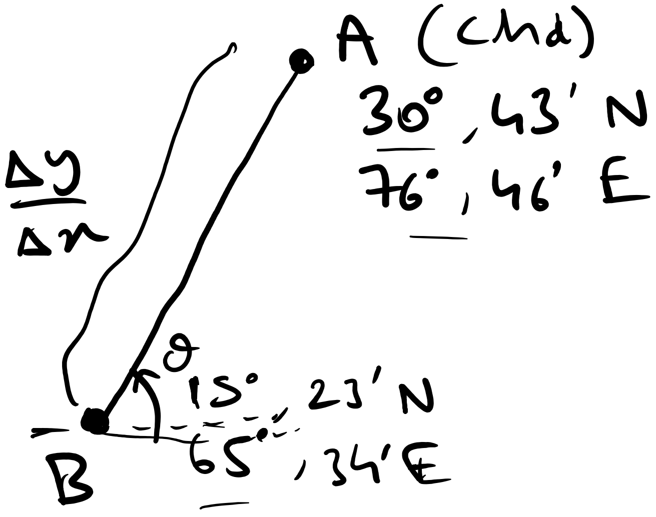
b) Why are the axes $\perp$ to each other?

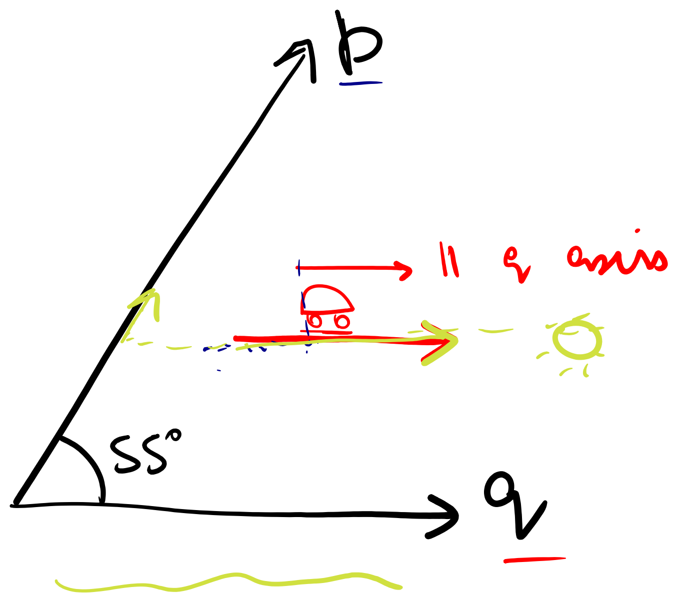


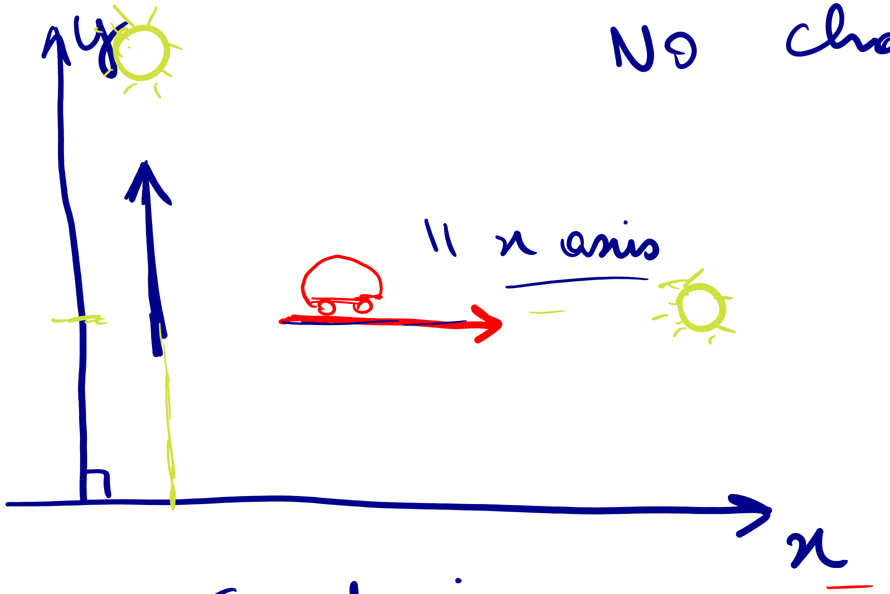


NS
EW

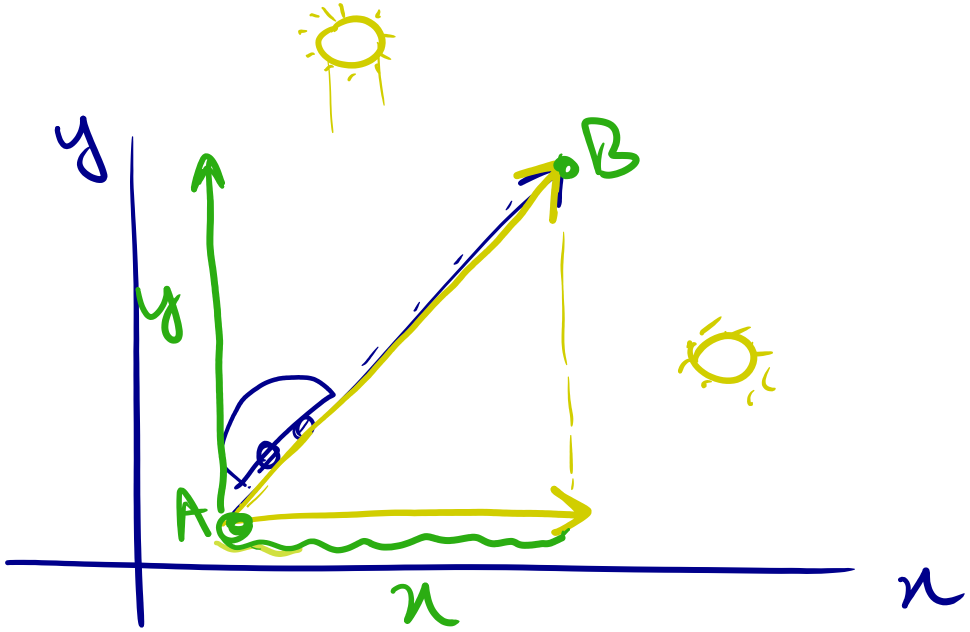
Slope = $\frac{\Delta y}{\Delta x}$



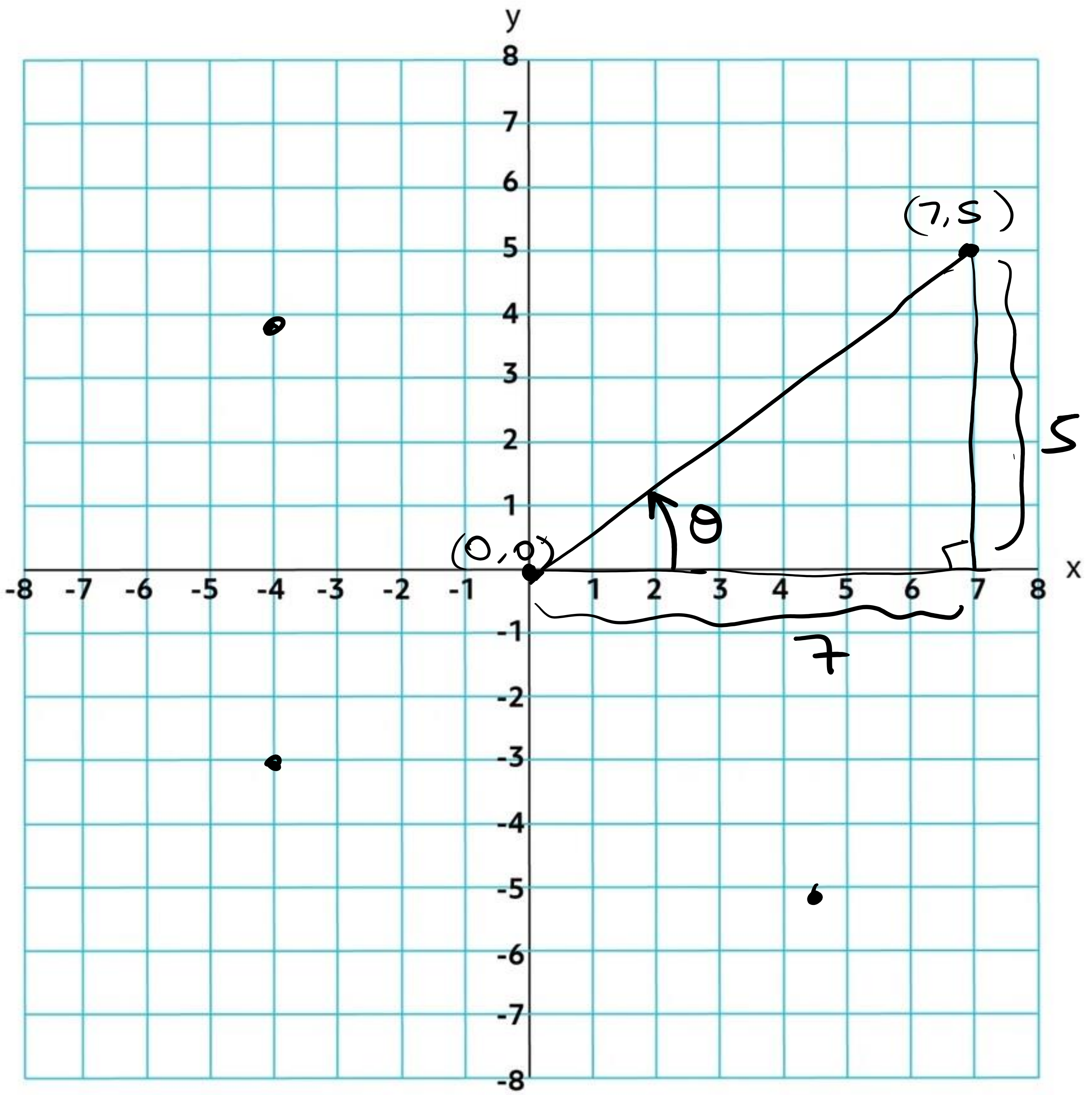




No change in y.



|| Cartesian System

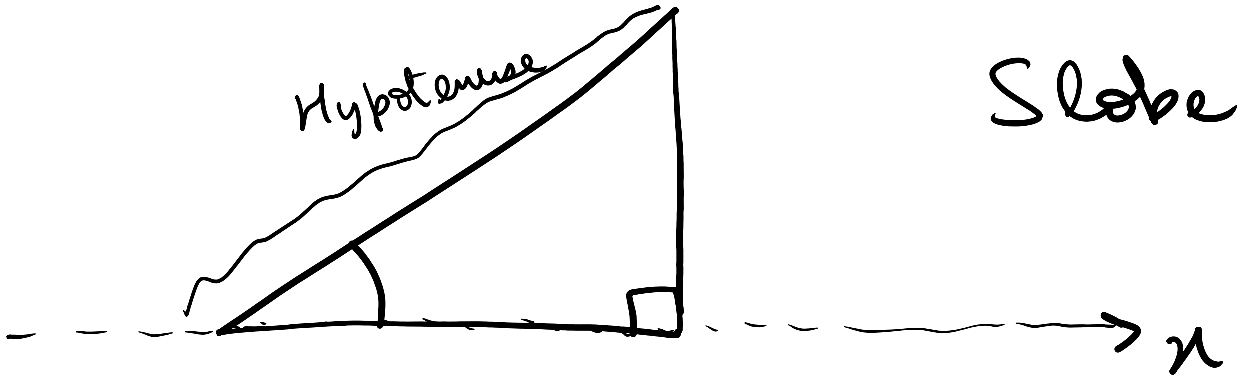


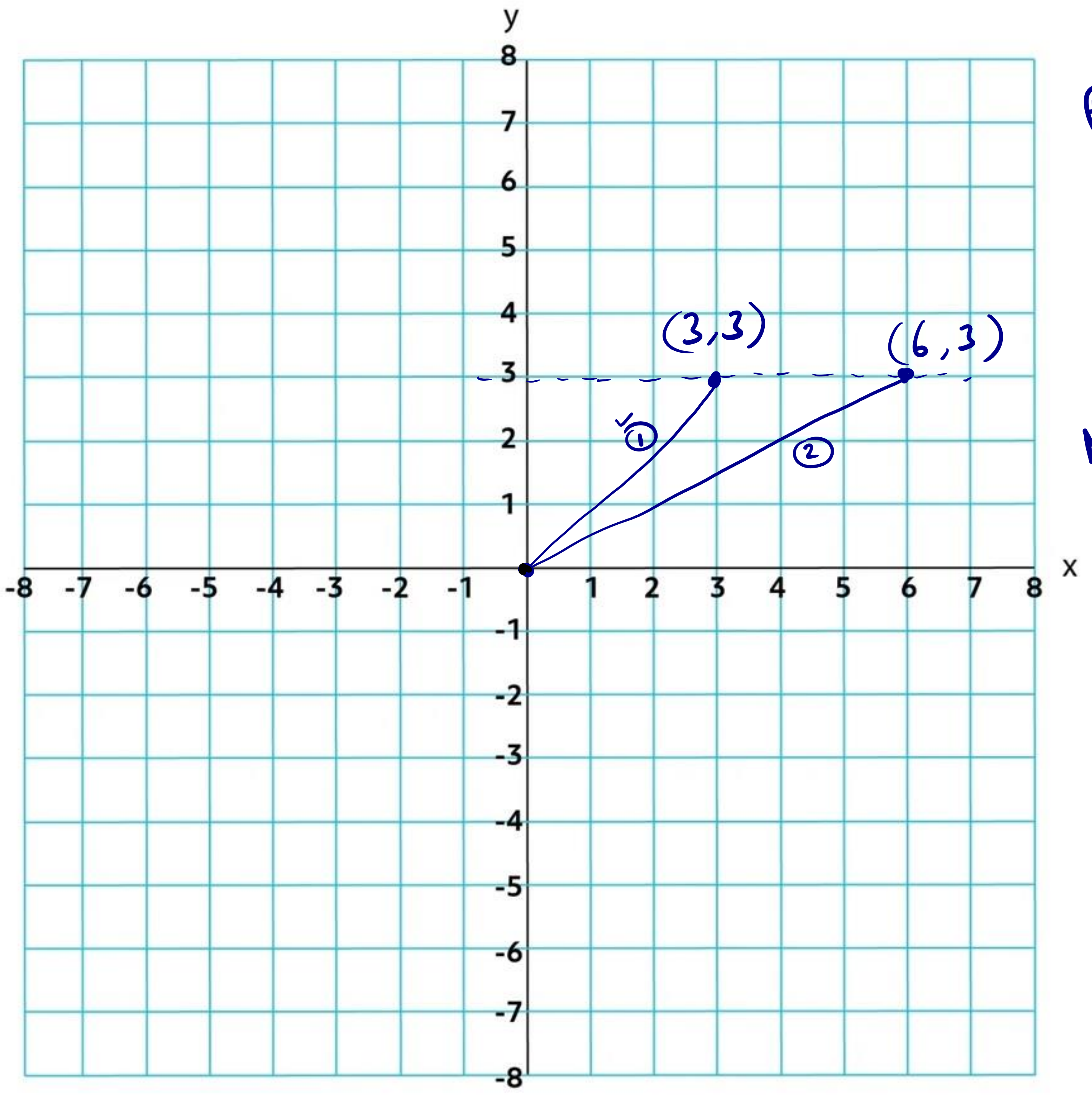
$\sin\theta = 5/\sqrt{60}$

$\cos\theta = 7/\sqrt{60}$

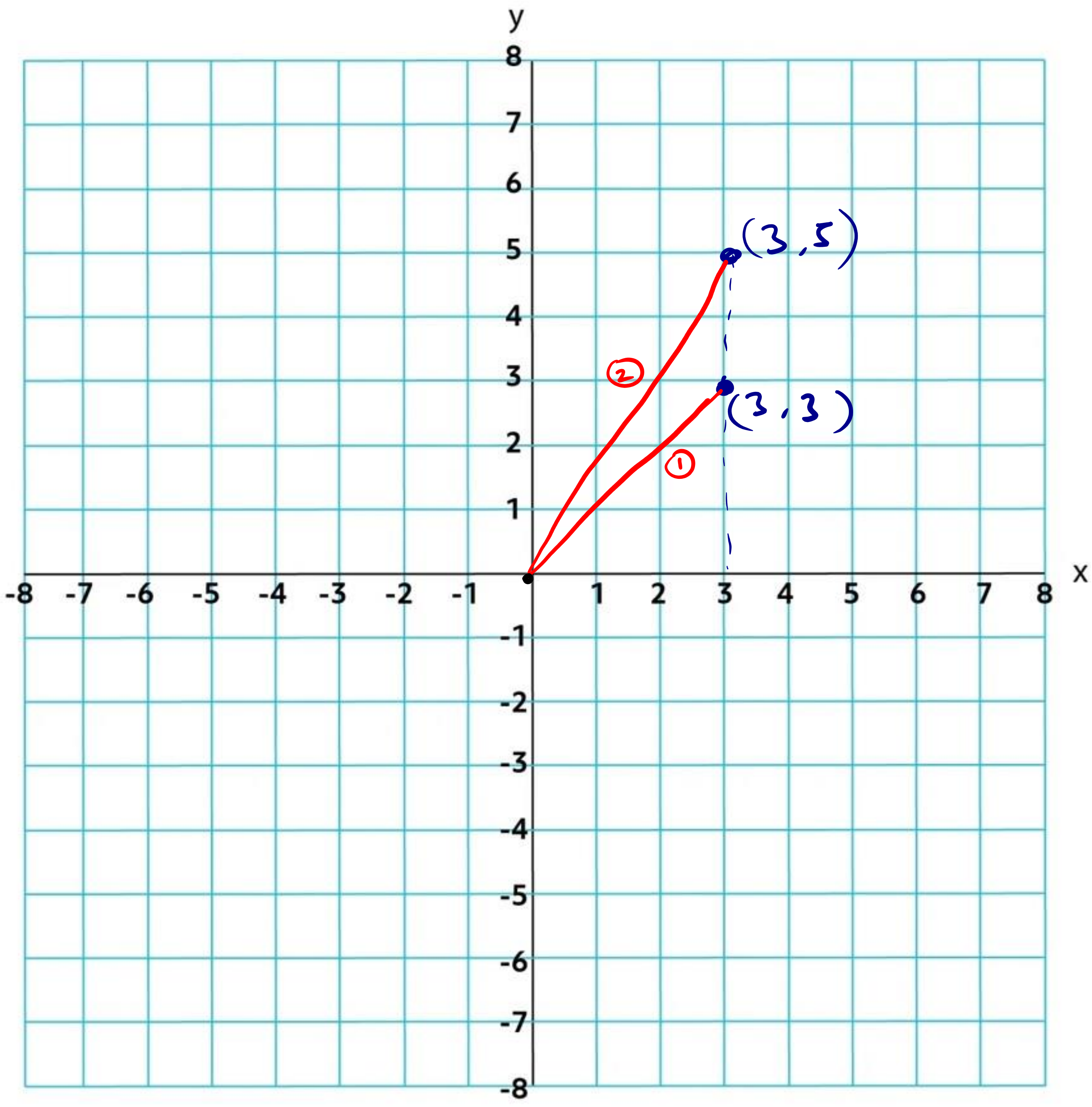
$\tan\theta = 5/7$

Slobe





For same y, lesser the x coordinate, More is the Slope ✓



For same x,
more the value
of y,
more is
the slope

$x \uparrow$, Slope $\downarrow$

$y \uparrow$, slope $\uparrow$

$$\left.\begin{aligned} \text{Slope} &\propto y \\ \text{Slope} &\propto \frac{1}{x} \end{aligned}\right\}$$

Slope $\propto \frac{y}{x}$

$B_y = 6$

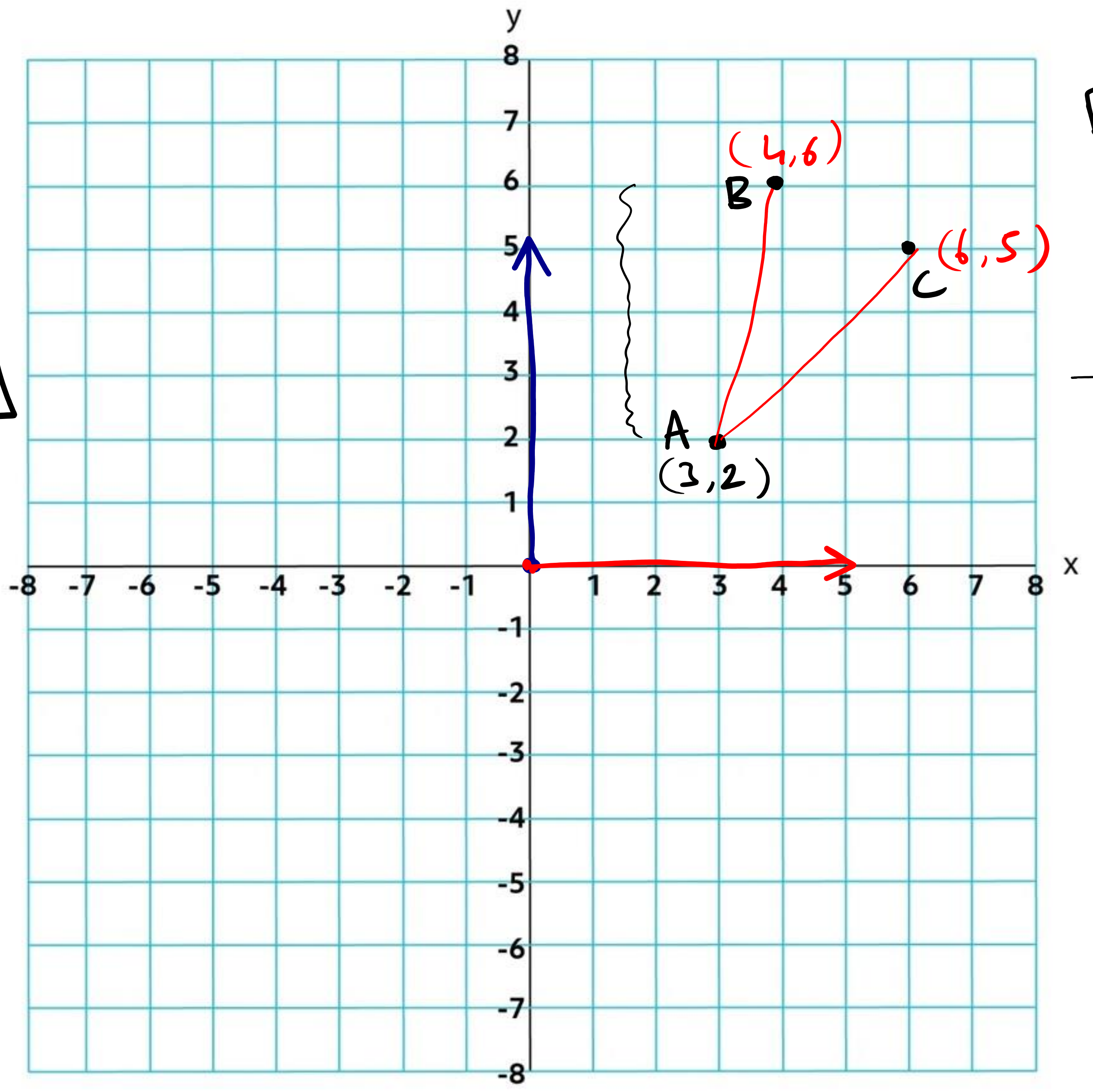
$A_y = 2$

$B_y - A_y = \boxed{4}$

$C_y = 5$

$A_y = 2$

$C_y - A_y = 3$



$B_x = 4$

$A_x = 3$

$B_x - A_x = \boxed{1}$

$C_x = 6$

$A_x = 3$

$C_x - A_x = 3$

$\Delta y = 5$

$\Delta x = 0$

Slope $= \frac{\Delta y}{\Delta x} = \frac{5}{0}$

$[0, \infty)$

$$\text{Slope}_{BA} = \frac{\Delta y}{\Delta x} = \frac{4}{1} = \underline{4}$$

$$\text{Slope}_{CA} = \boxed{\frac{\Delta y}{\Delta x}} = \frac{3}{3} = \underline{1}$$

$$\frac{5}{1} = 5$$

$$\frac{5}{0.5} = 10$$

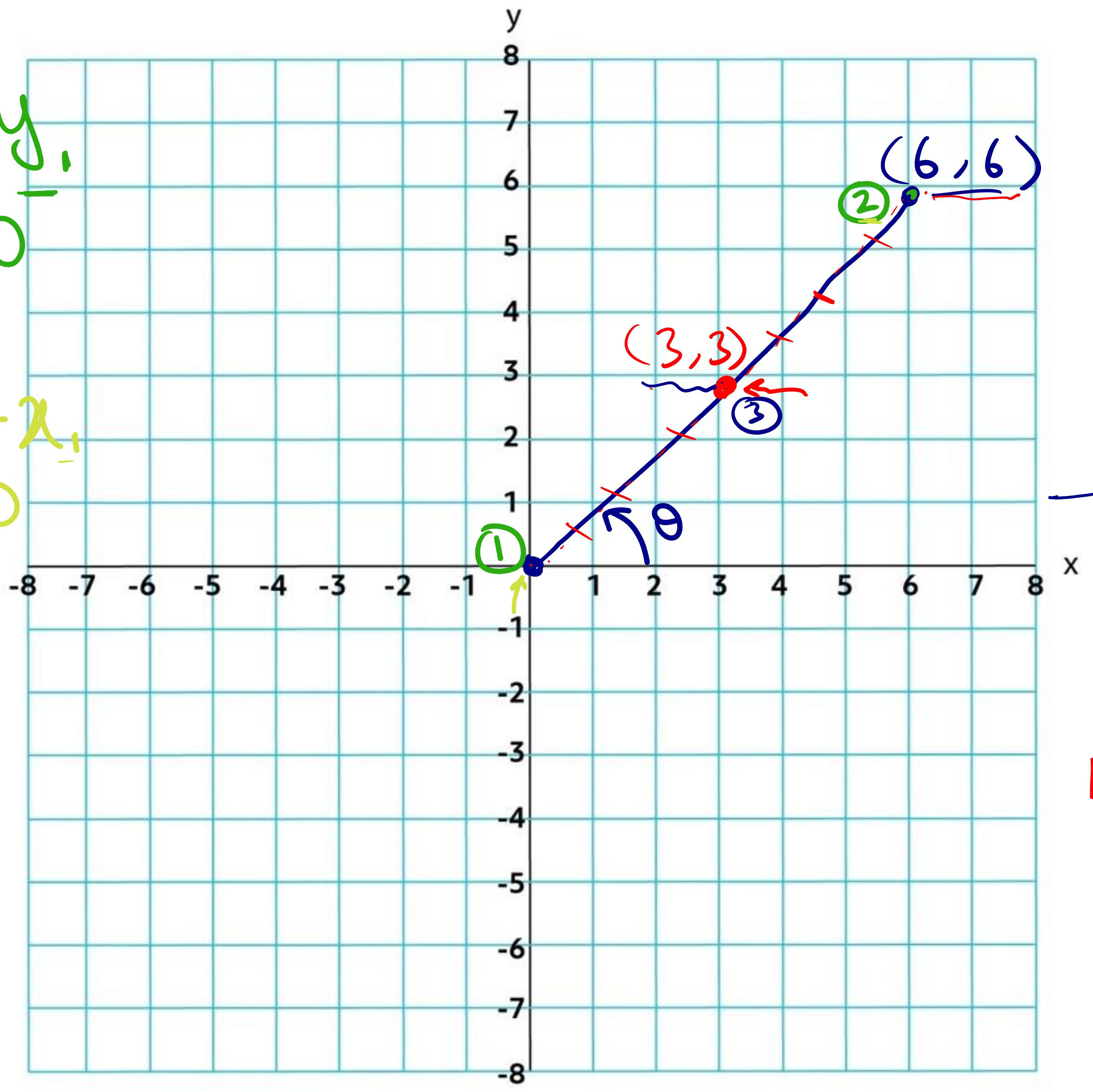
$$\frac{5}{0.05} = 100$$

$$\frac{5}{\underline{0.\cancel{0}0005}} = 10^6$$

$$\Delta y = y_2 - y_1$$
$$= 6 - 0$$
$$= 6$$

$$\Delta x = x_2 - x_1$$
$$= 6 - 0$$
$$= 6$$

$$\text{Slope} = \frac{\Delta y}{\Delta x}$$
$$= \frac{6}{6}$$
$$= 1$$



1) Slope of this line?

$y = x$

$\Delta y = 6 - 3 = 3$

$\Delta x = 6 - 3 = 3$

3 − 2

$\Delta y = 3 - 6 = -3$

$\Delta x = 3 - 6 = -3$

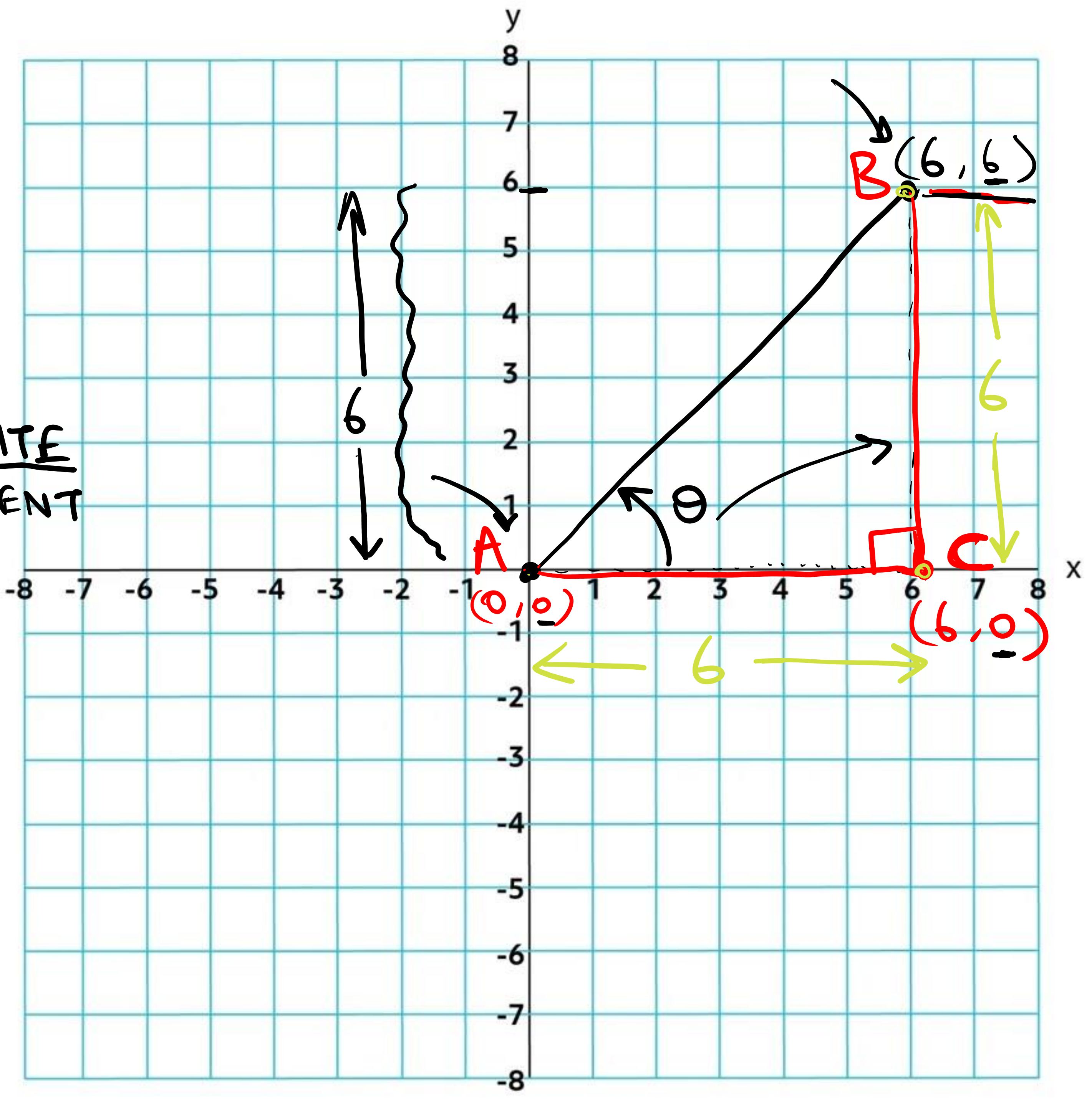
Slope = 1

$$\text{Slope} = \Delta y / \Delta x$$

$$\text{Slope}_{AB} = \frac{6-0}{6-0} = 1$$

$$\frac{\Delta y}{\Delta x} = \frac{\text{OPPOSITE}}{\text{ADJACENT}}$$

$$= \tan\theta$$



$\theta = 0°$

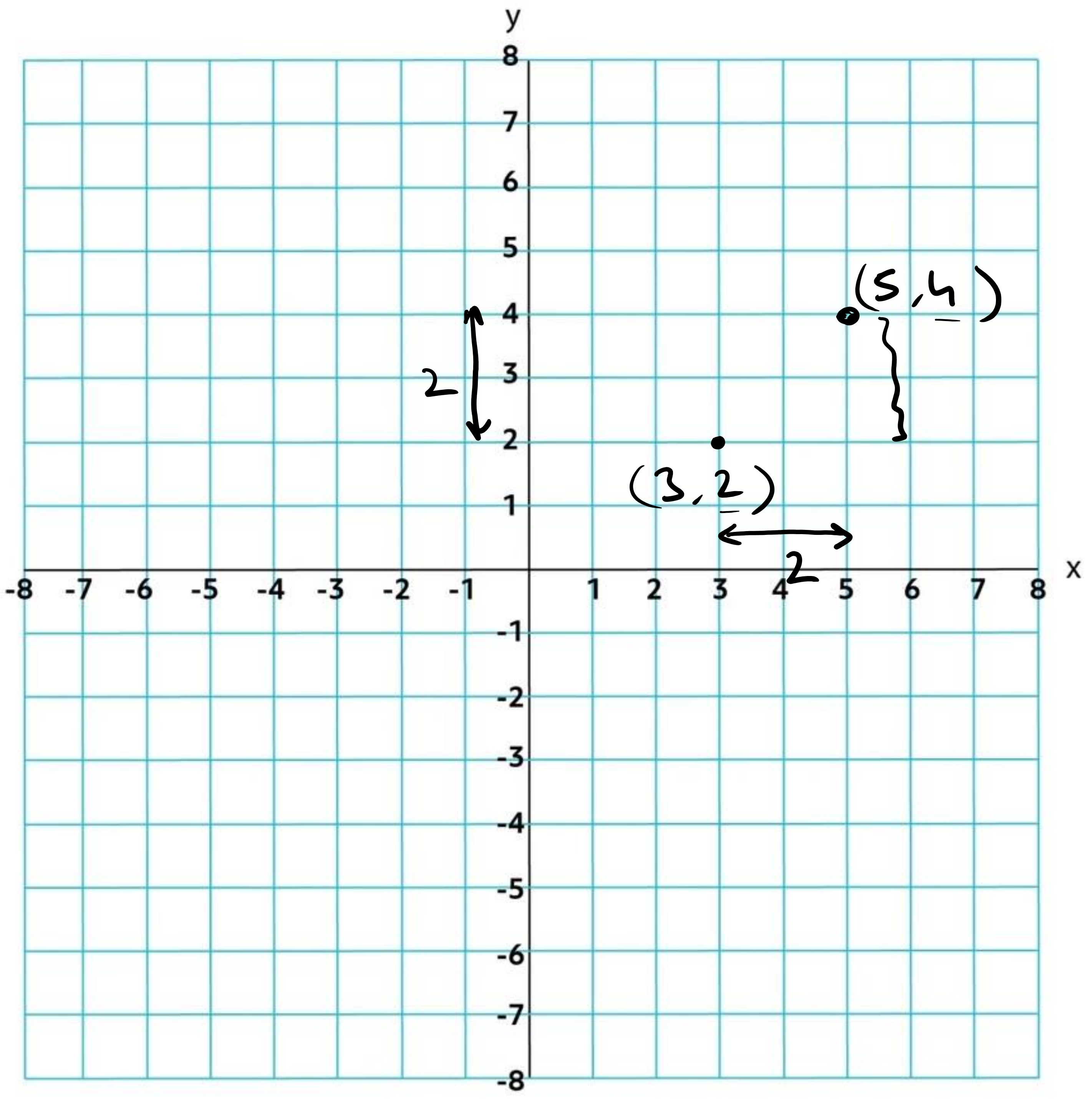
$\text{Slope} = 0$

$\theta = 90°$

$\text{Slope} \to \infty$

$$\text{Hypotenuse} = \sqrt{(6)^2 + (6)^2}$$

$$= 6\sqrt{2}$$



$4 - 2 = 2$
$5 - 3 = 2$

1) Slope of the line joining AB ?

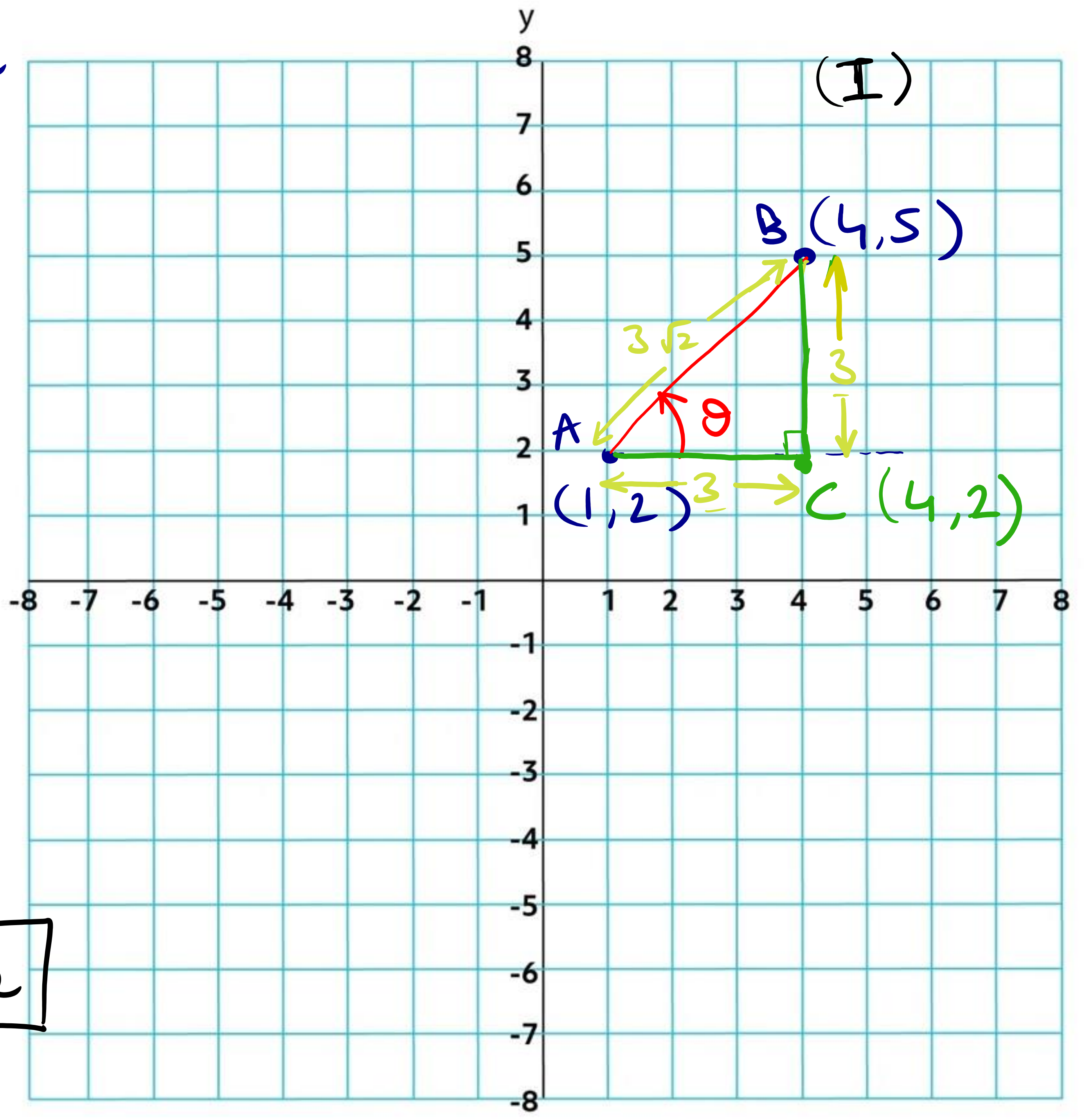
2) $\theta = ?$

$\sin 45^\circ = \frac{1}{\sqrt{2}}$

3) $\tan\theta = ?$

$$\text{Slope} = \frac{3}{3} = 1 \checkmark$$

$$\boxed{\tan\theta = \text{Slope}}$$



$\sqrt{3^2+3^2}$

$\sqrt{2\times 3^2}$

$\boxed{3\sqrt{2}}$

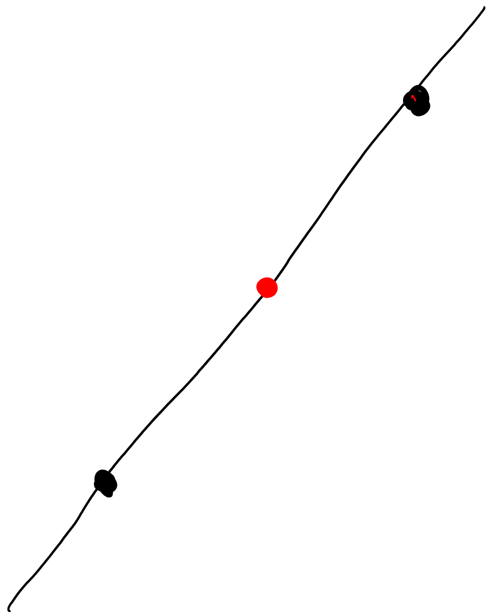
$$\sin\theta = \frac{\text{OPP}}{\text{HYP}} = \frac{3}{3\sqrt{2}} = \frac{1}{\sqrt{2}}$$

$$\sin 45^\circ = \frac{1}{\sqrt{2}}$$

$$\theta = 45^\circ$$

$$\tan\theta = 1 \checkmark$$

Line → If I join any 2 points, I get a unique line



Q- { 3rd point has to be on the line joining those points. }

HOMEWORK

Q 1) What is the value of $\tan 0°$ and $\tan 90°$?

(HINT- Use the definition of the slope of the line)

Q 2) What is $\sin 90°$ and $\sin 0°$?

Q 3) What is $\cos 90°$ and $\cos 0°$?

Q 4) a) What is $\tan 45°$?

b) Find $\sin 45°$ and $\cos 45°$. Why are they equal?

HINT - Construct a Δ on the cartesian system to approach problems 2 - 4.

Q5) Find the slopes of the following lines

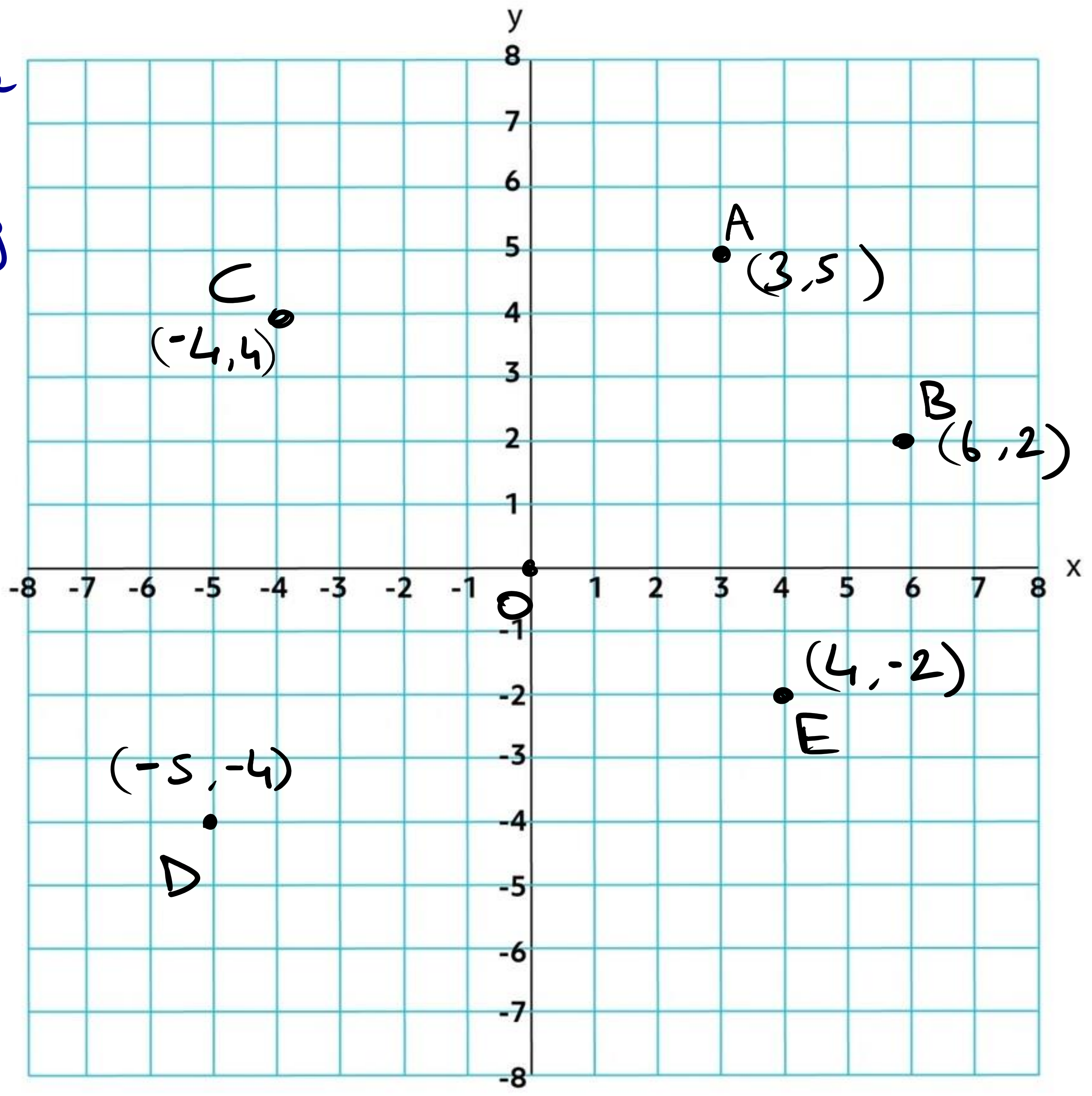
a) AO

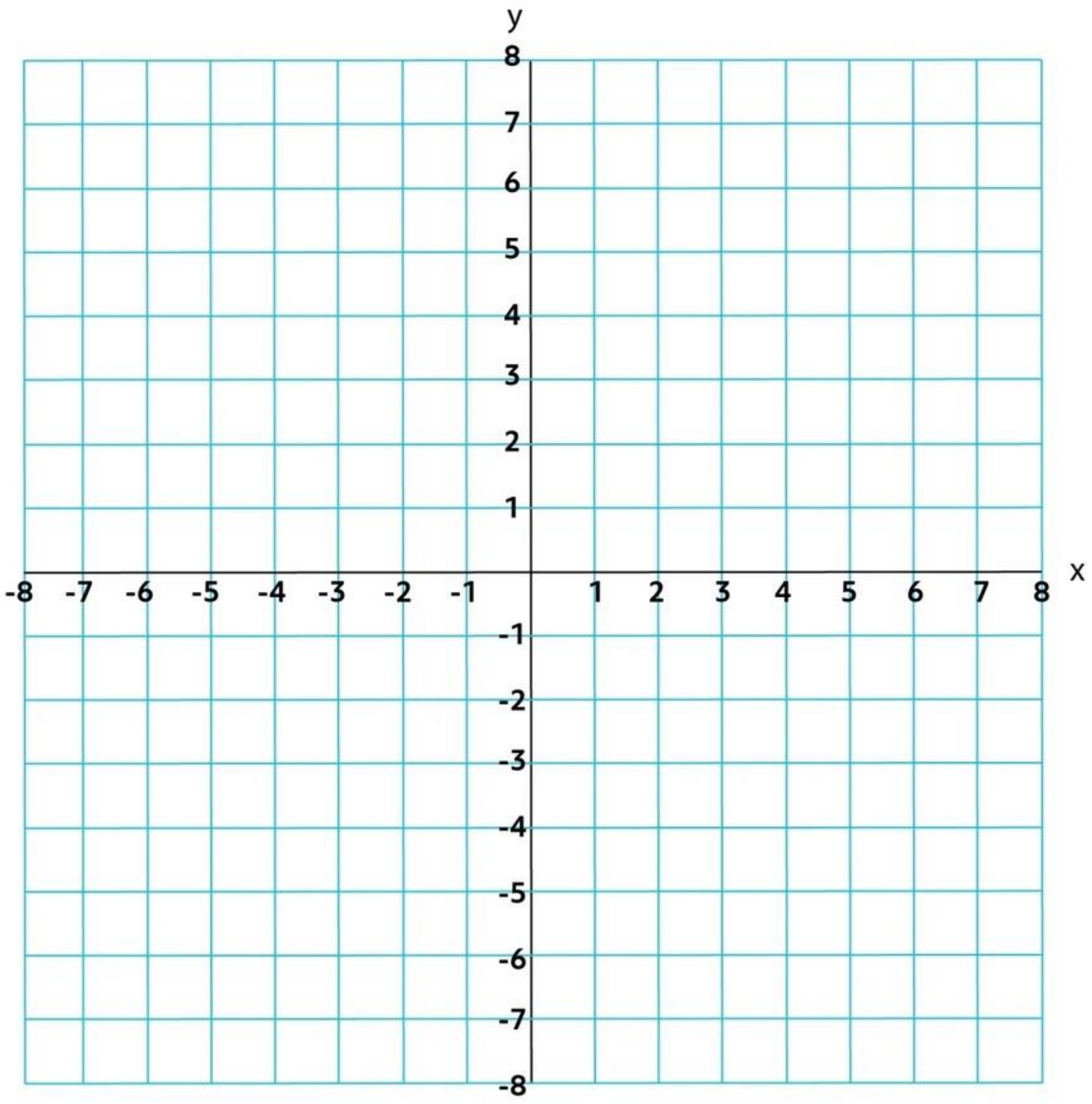
b) BO

c) CO

d) DO

e) EO




y
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6
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4
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2
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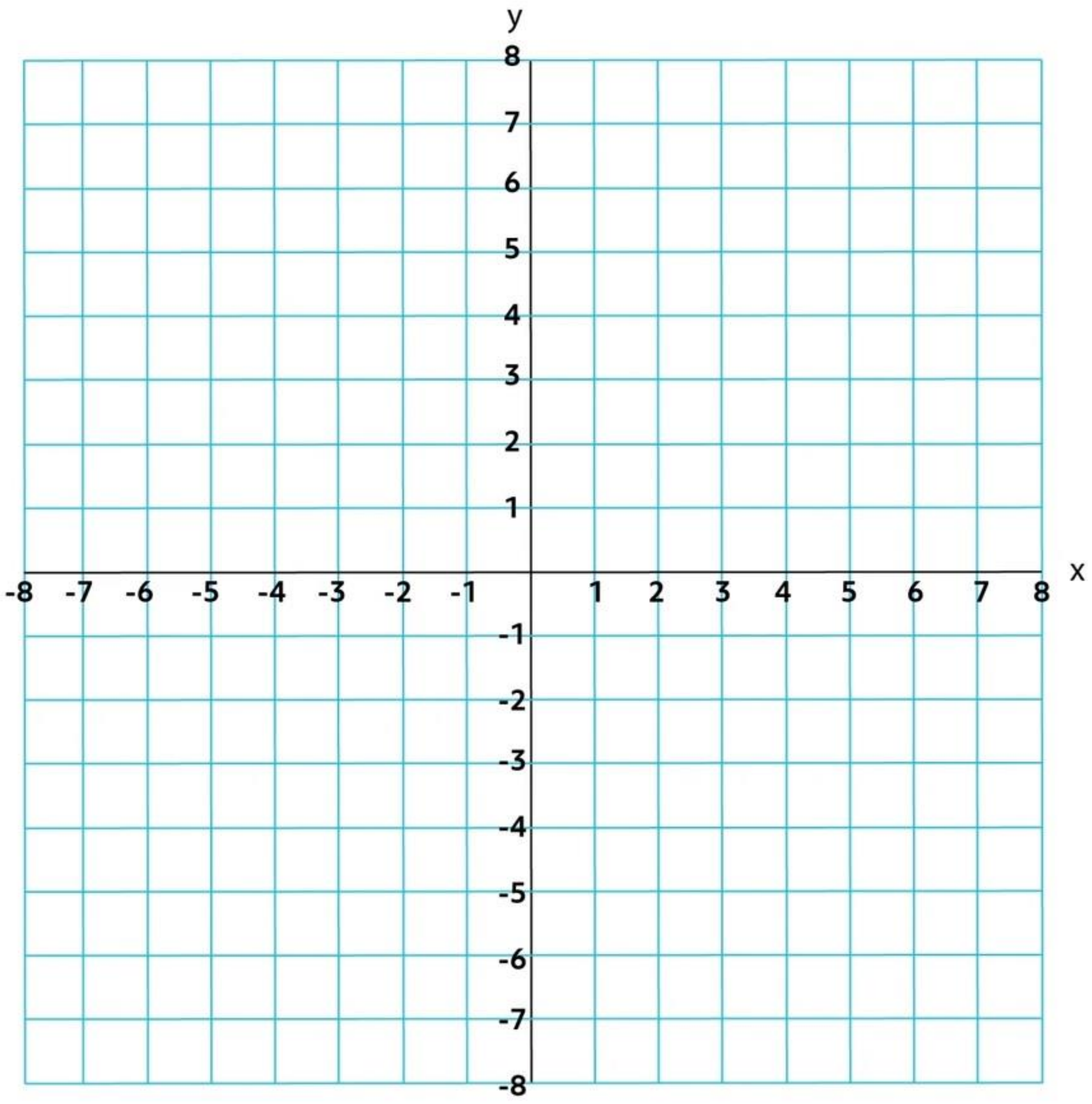
-8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8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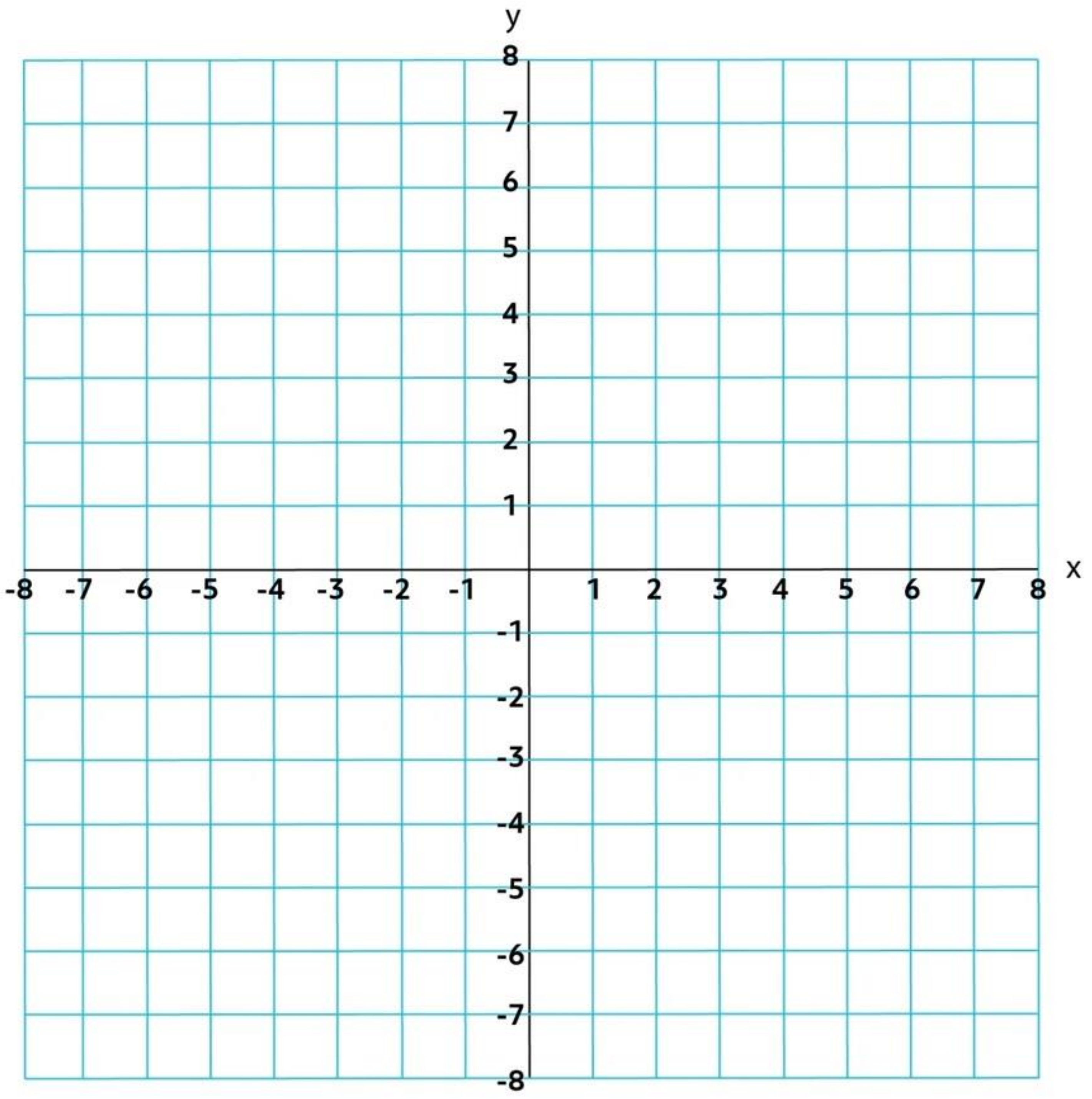
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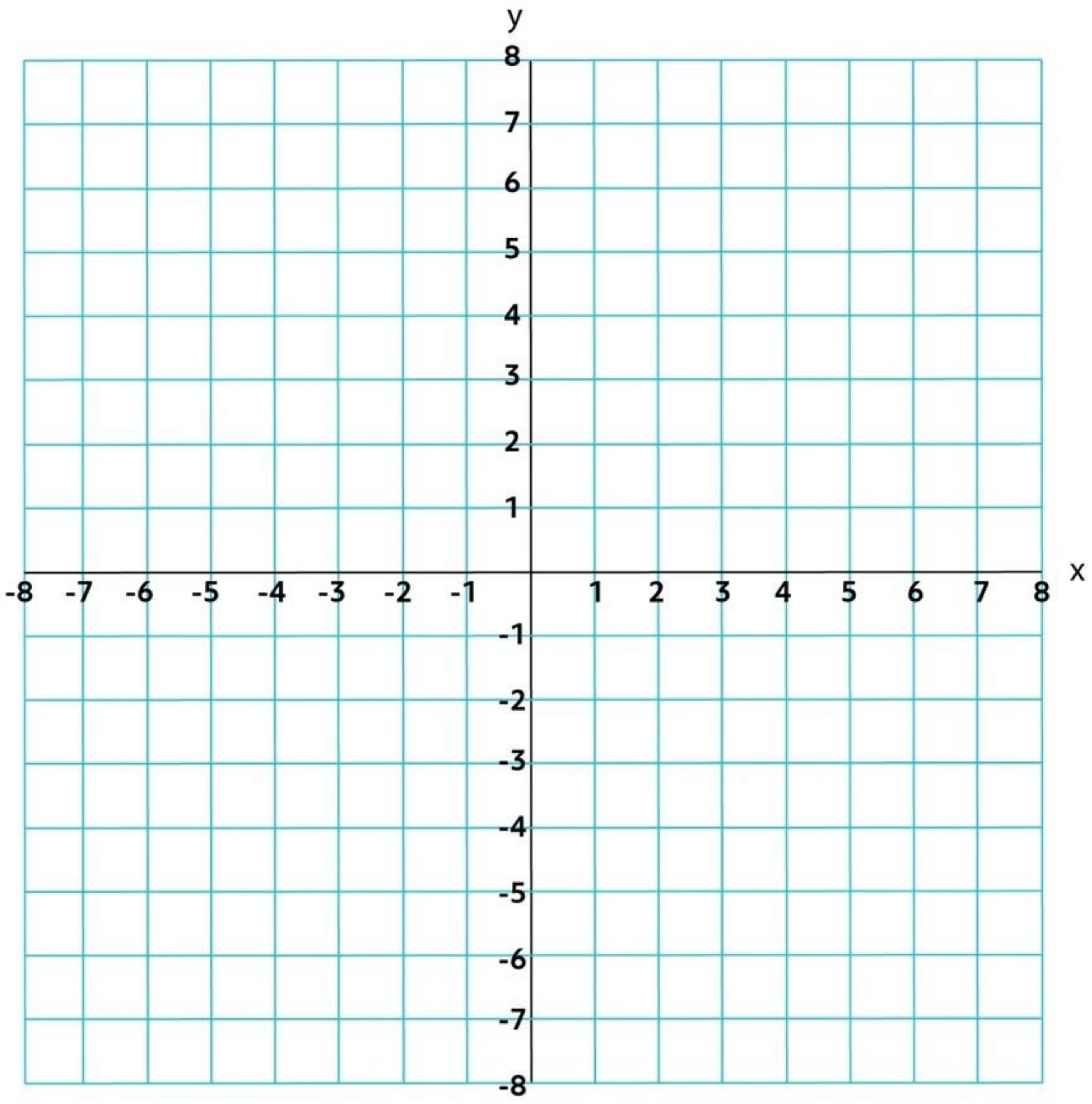
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