OGUN DIGICLASS

CLASS: SECONDARY SCHOOL

SUBJECT: MATHEMATICS

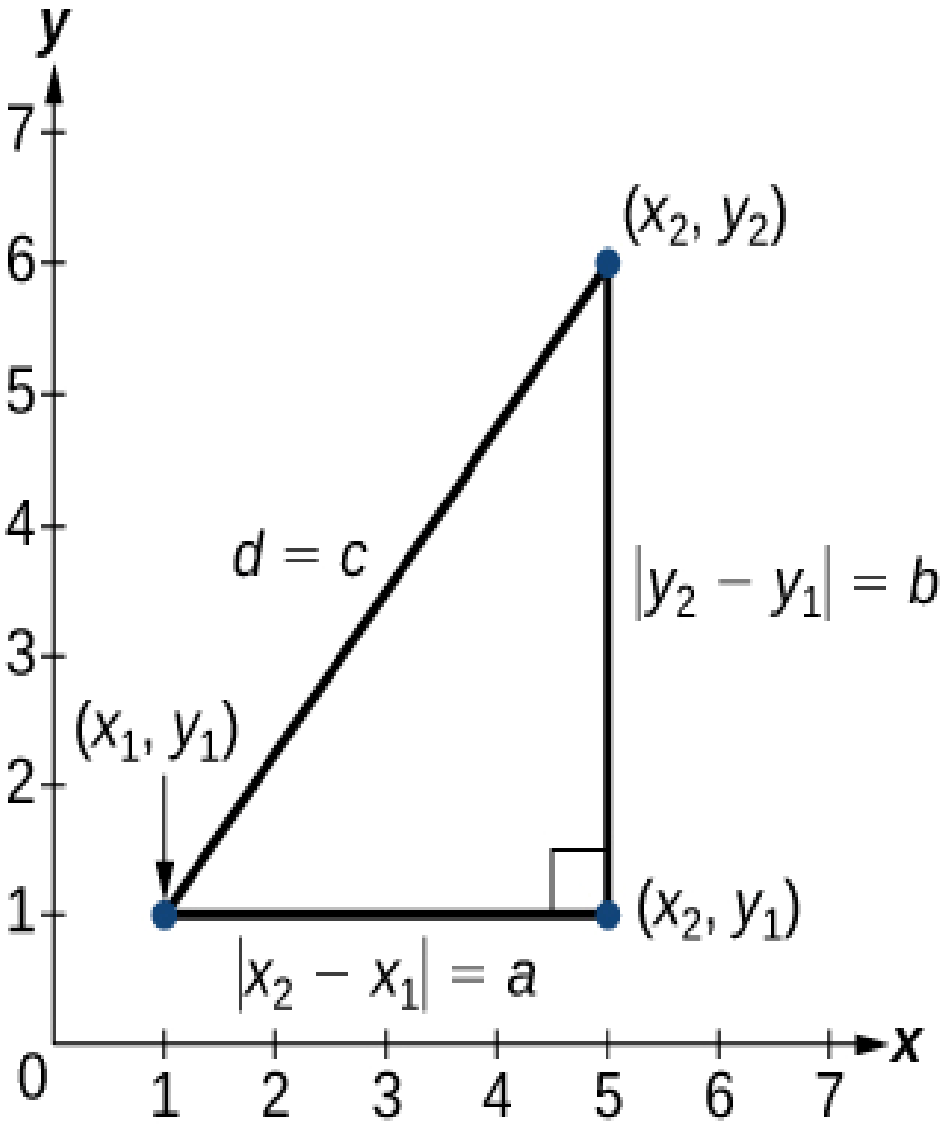
TOPIC: **COORDINATE GEOMETRY**

(PART 1)

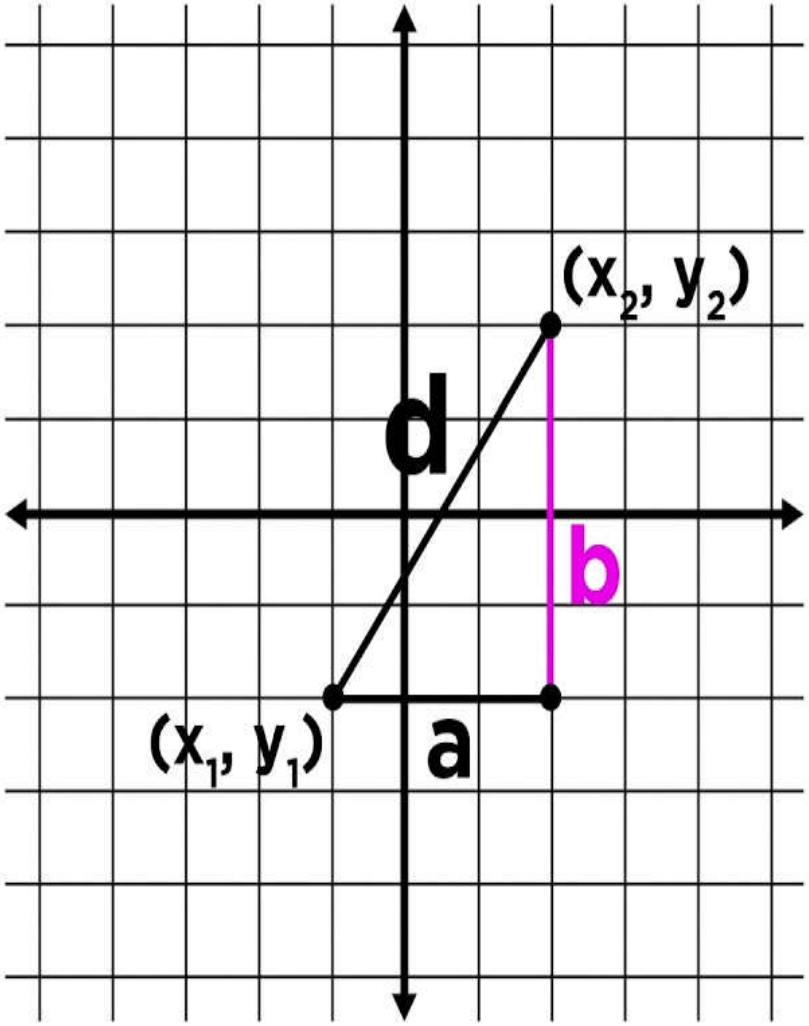
LEARNING OBJECTIVE:

- DISTANCE BETWEEN TW**O** P**O**INT
- C**OO**RDINATE **OF MID POINT**
- **GRADIENT**

d (km)
15
10
5
O
5
10
15
20
25
t (minutes)
(20, 15)


y
7
6
5
4
3
2
1
0
1
2
3
4
5
6
7
x
(x_2, y_2)
$d = c$
$|y_2 - y_1| = b$
(x_1, y_1)
(x_2, y_1)
$|x_2 - x_1| = a$

Deriving and Using the Distance Formula



solve for d

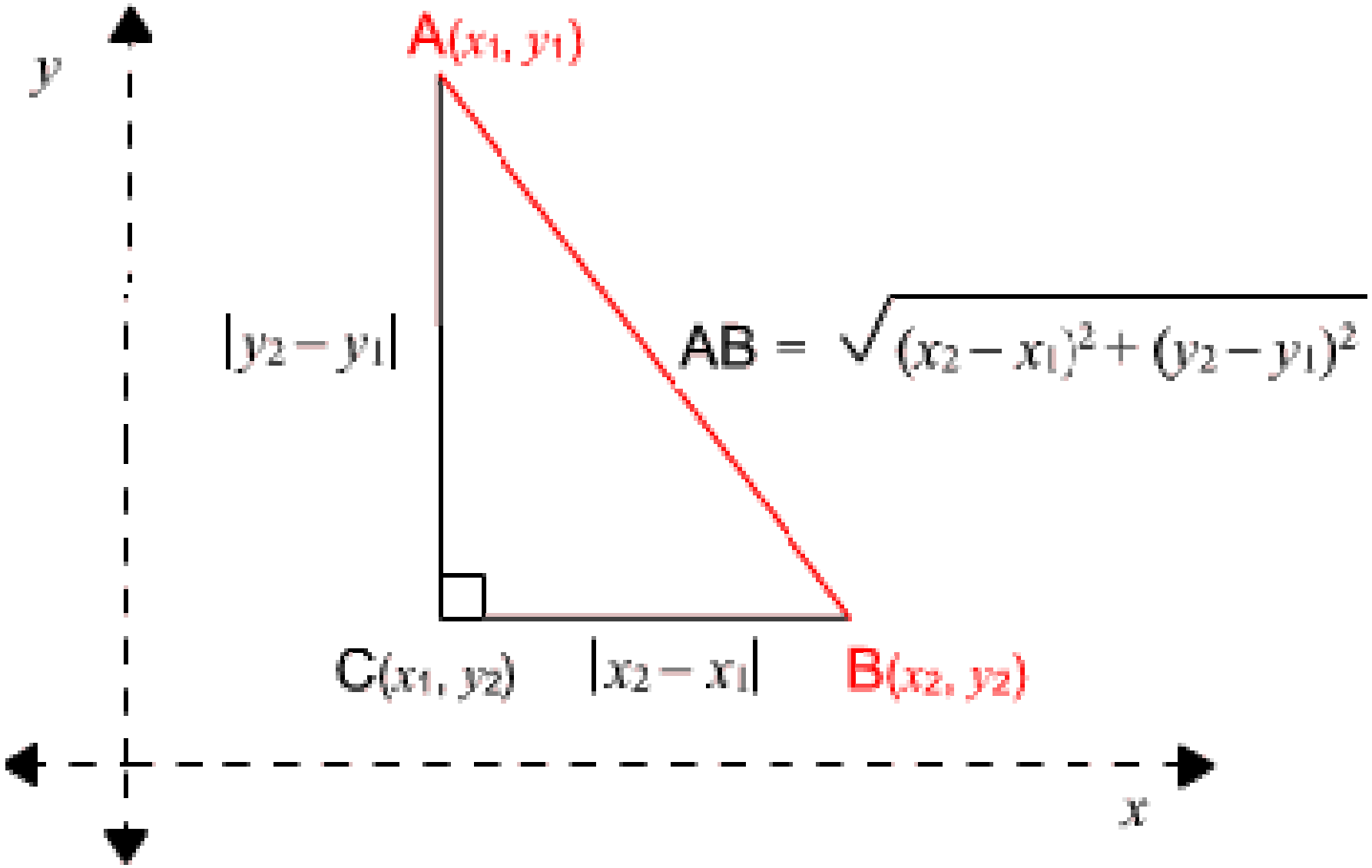
$$a = x_2 - x_1$$

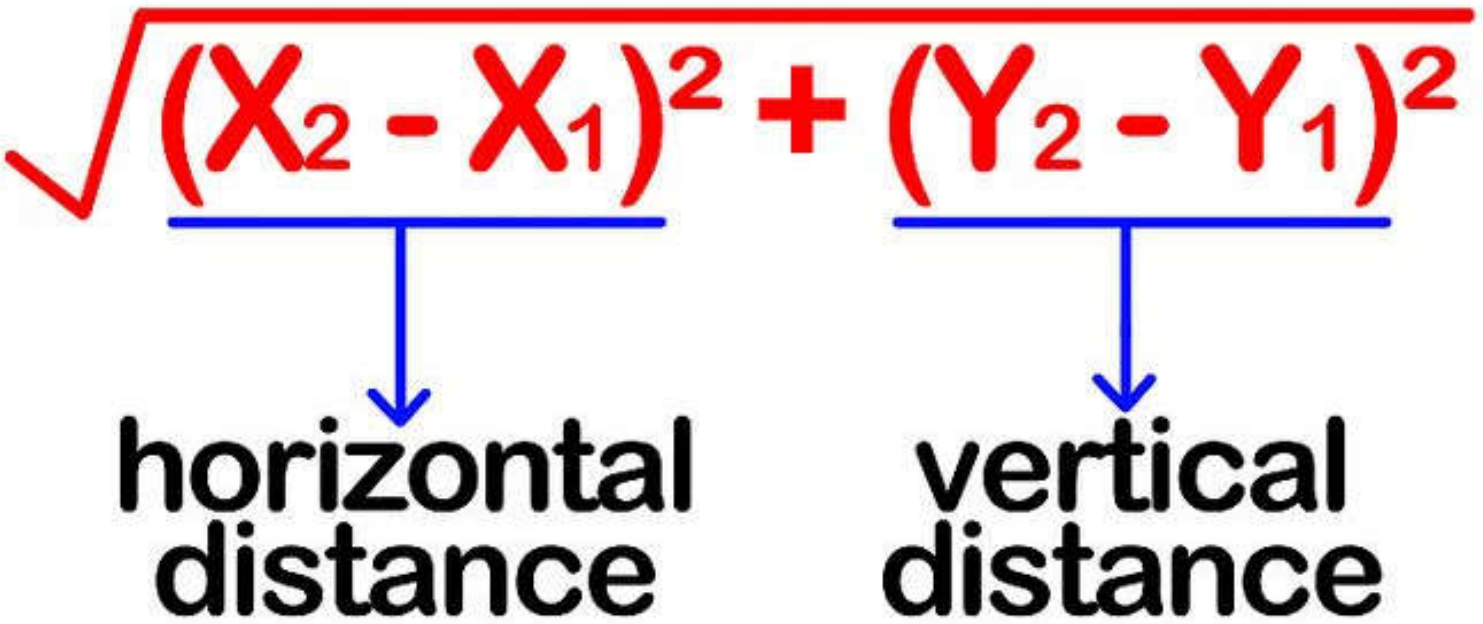
$$b = y_2 - y_1$$

$$a^2 + b^2 = d^2$$

Pythagorean Theorem

$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

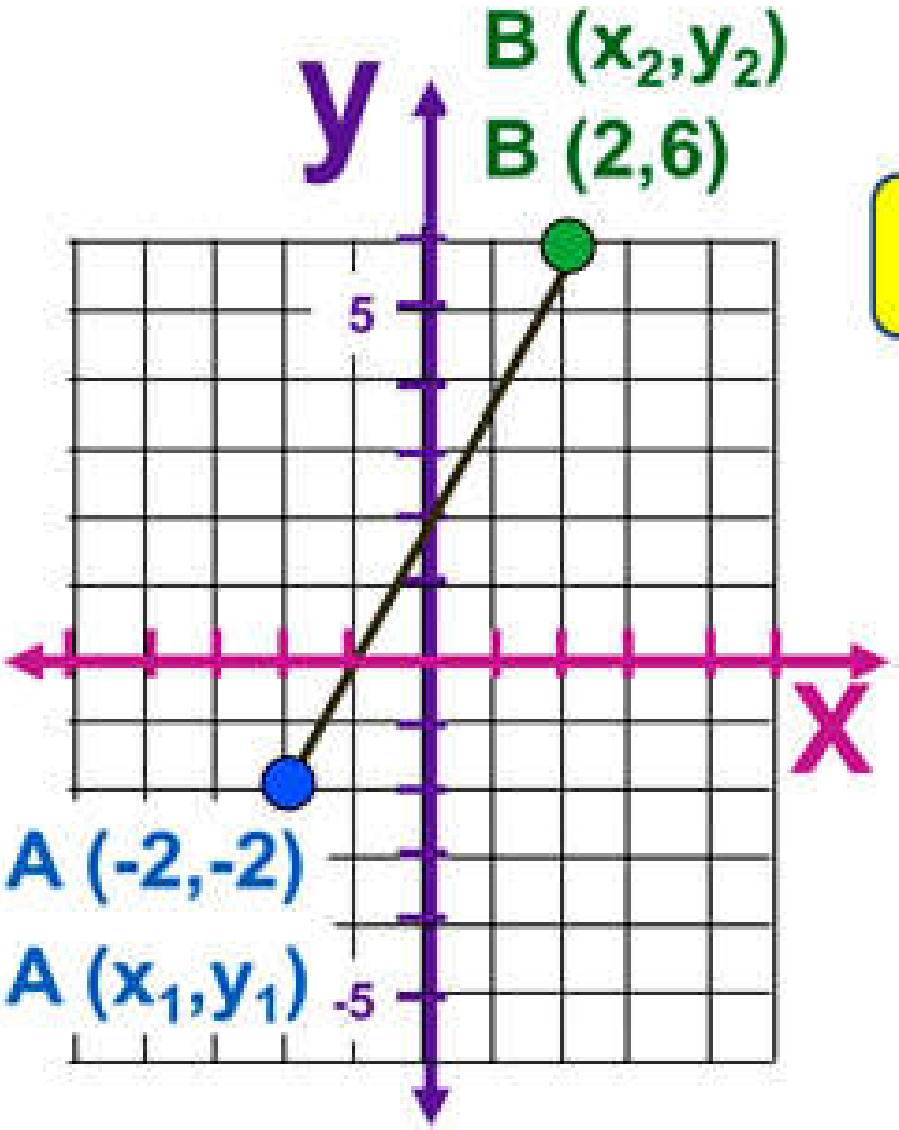

y
A(x1, y1)
|y2 − y1|
AB = √((x2 − x1)² + (y2 − y1)²)
C(x1, y2)
|x2 − x1|
B(x2, y2)
x


$\sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$
horizontal distance
vertical distance

EXAMPLE

A STRAIGHT LINE PASSES THROUGH THE POINT A(2, 2) AND B (2,6). CALCULATE THE DISTANCE AB

DISTANCE BETWEEN POINTS – EXAMPLE 1



Use the Distance Formula

$$AB = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$$

$$AB = \sqrt{(2 - {}^{-}2)^2 + (6 - {}^{-}2)^2}$$

$$AB = \sqrt{(\quad 4 \quad)^2 + (\quad 8 \quad)^2}$$

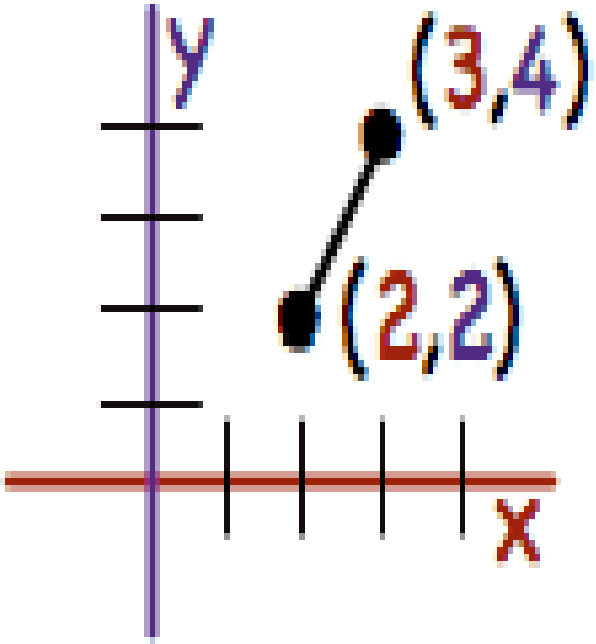
$$AB = \sqrt{\quad 16 \quad + \quad 64}$$

$$AB = \sqrt{80} \text{ or } 8.94 \checkmark$$

Find the Distance

(3,4) (2,2)

x_1 y_1 x_2 y_2

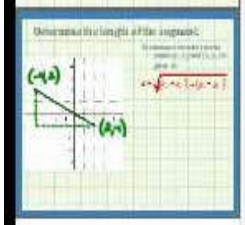


$$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

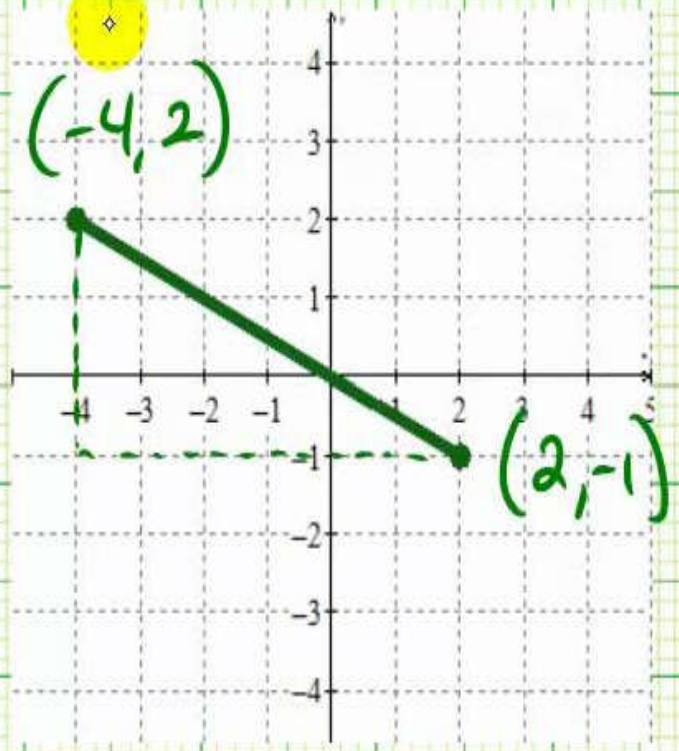
$$= \sqrt{(2-3)^2+(2-4)^2}$$

$$= \sqrt{(-1)^2+(-2)^2} = \sqrt{1+4} = \sqrt{5} \approx 2.24$$

Example: Determine the distance between two points.



Determine the length of the segment.

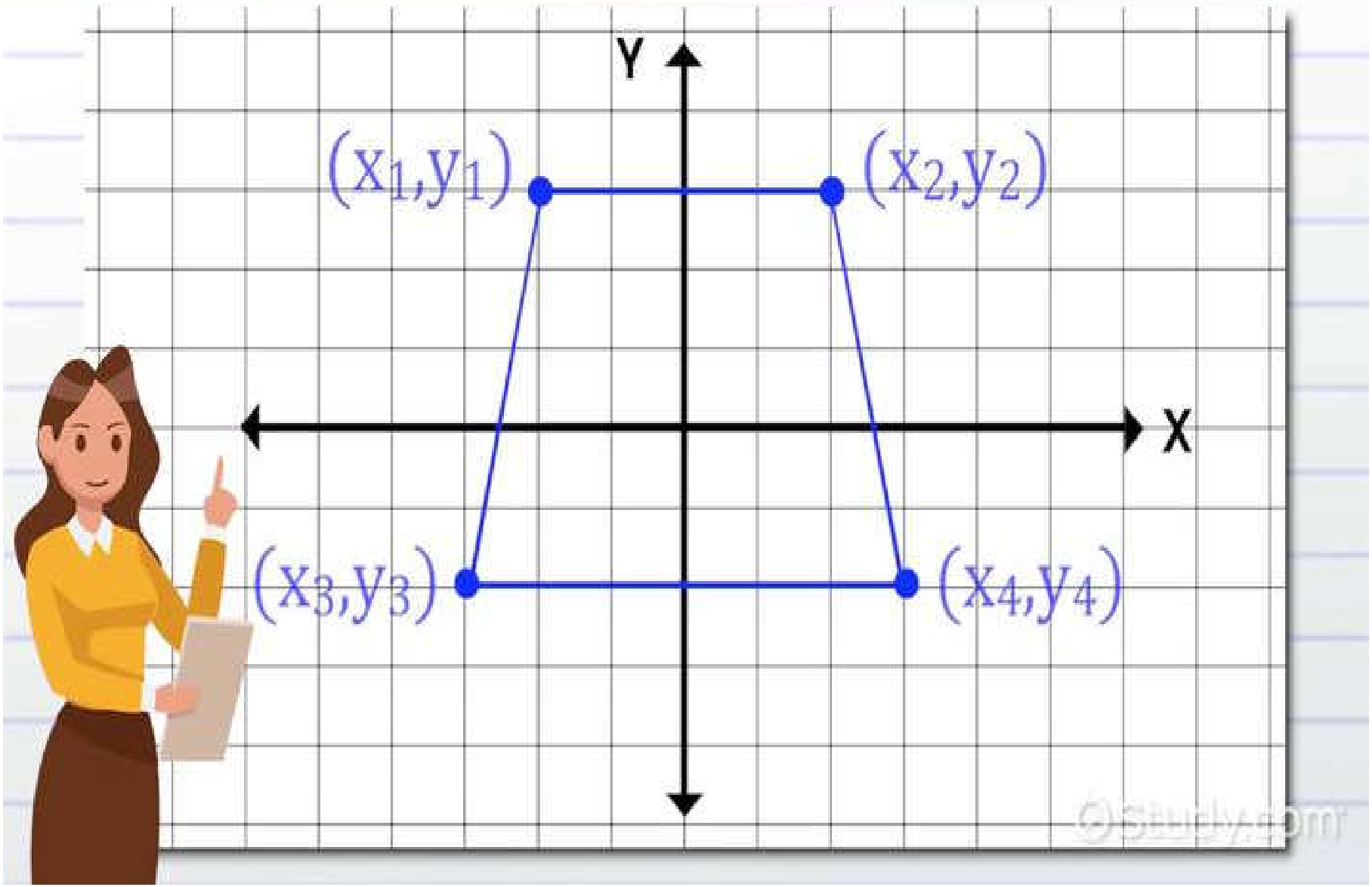


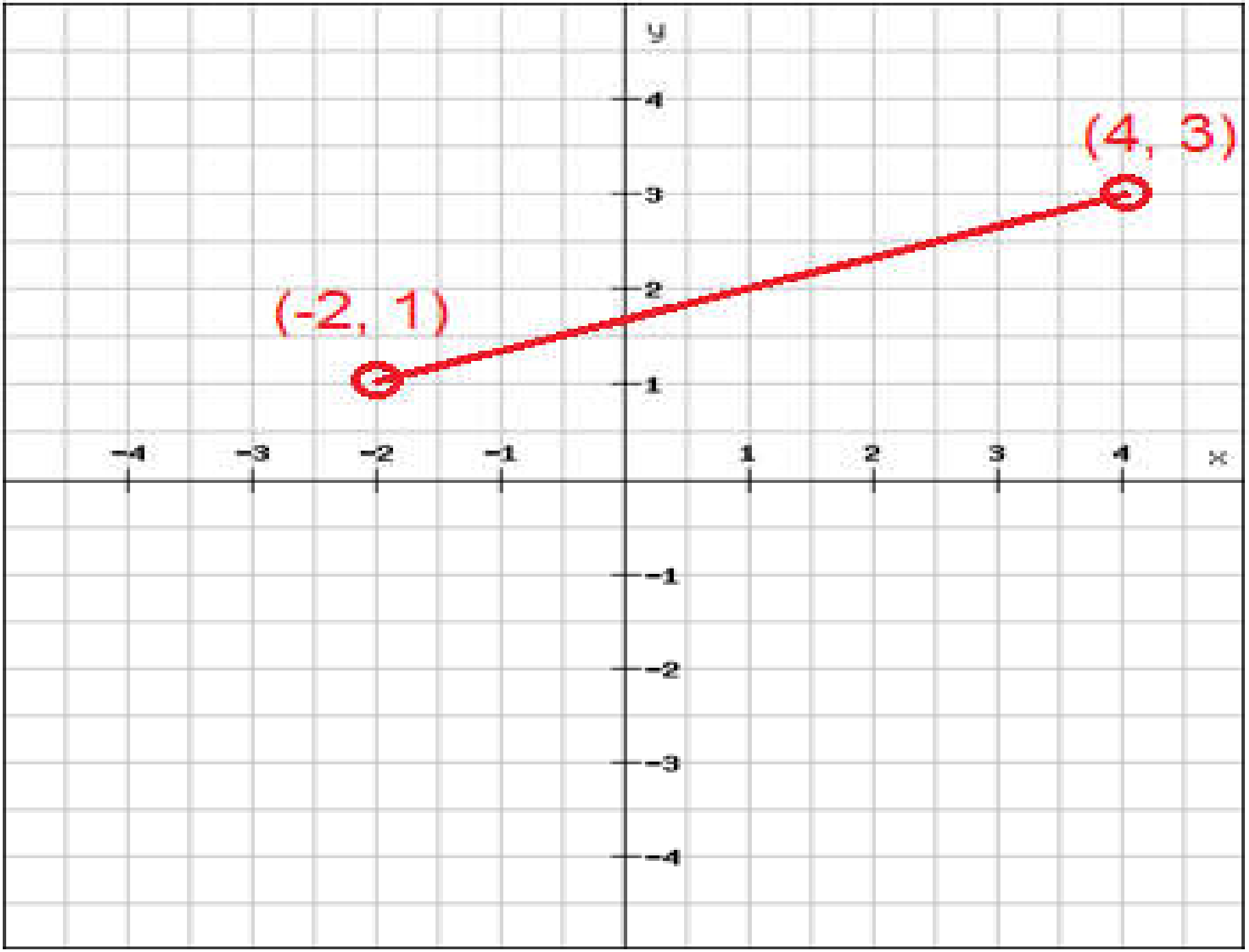
The distance between the two points (x_1, y_1) and (x_2, y_2) is given as

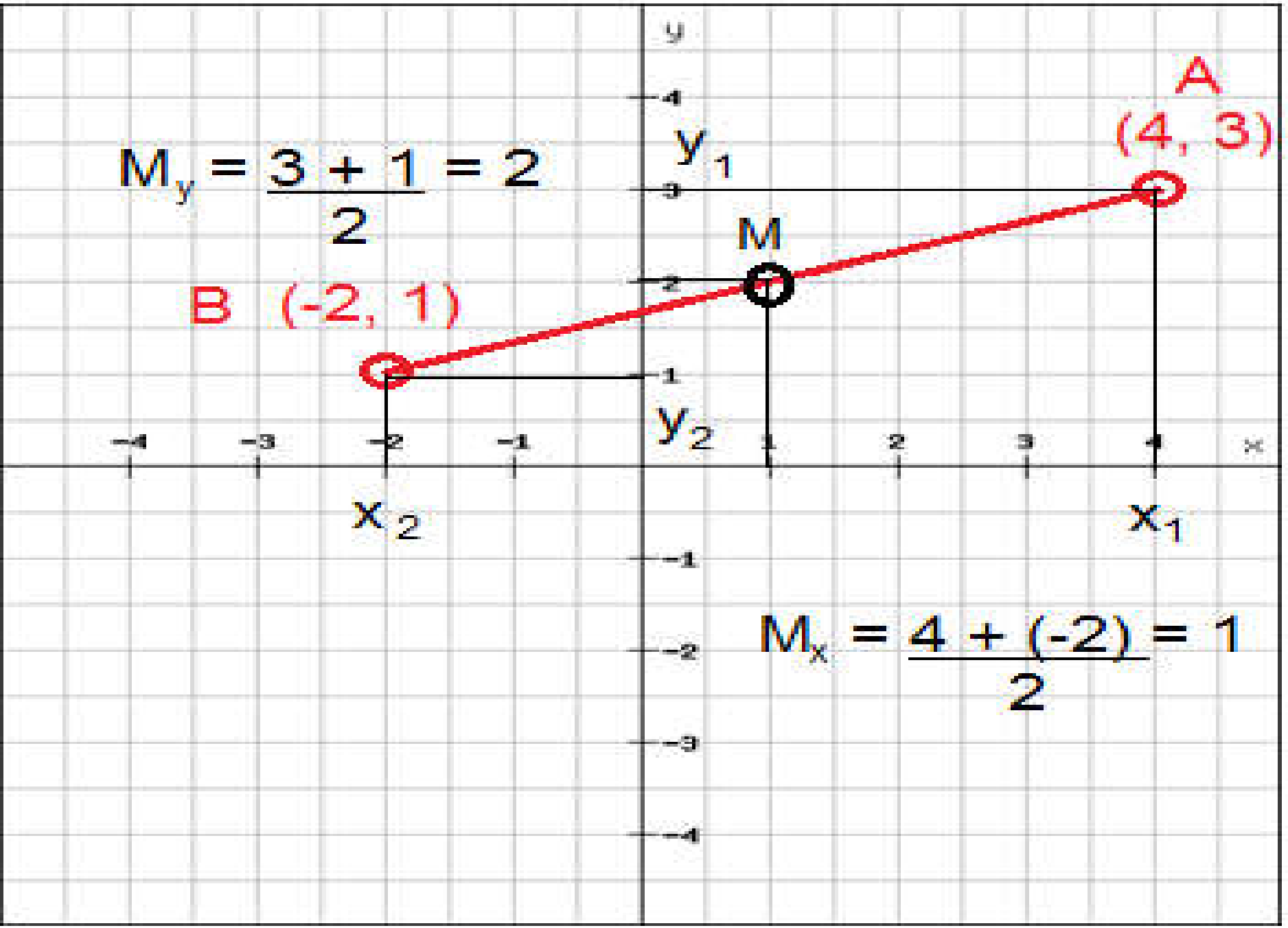
$$d = \sqrt{\left(x_2 - x_1\right)^2 + \left(y_2 - y_1\right)^2}$$

MID POINT OF A STRAIGHT LINE

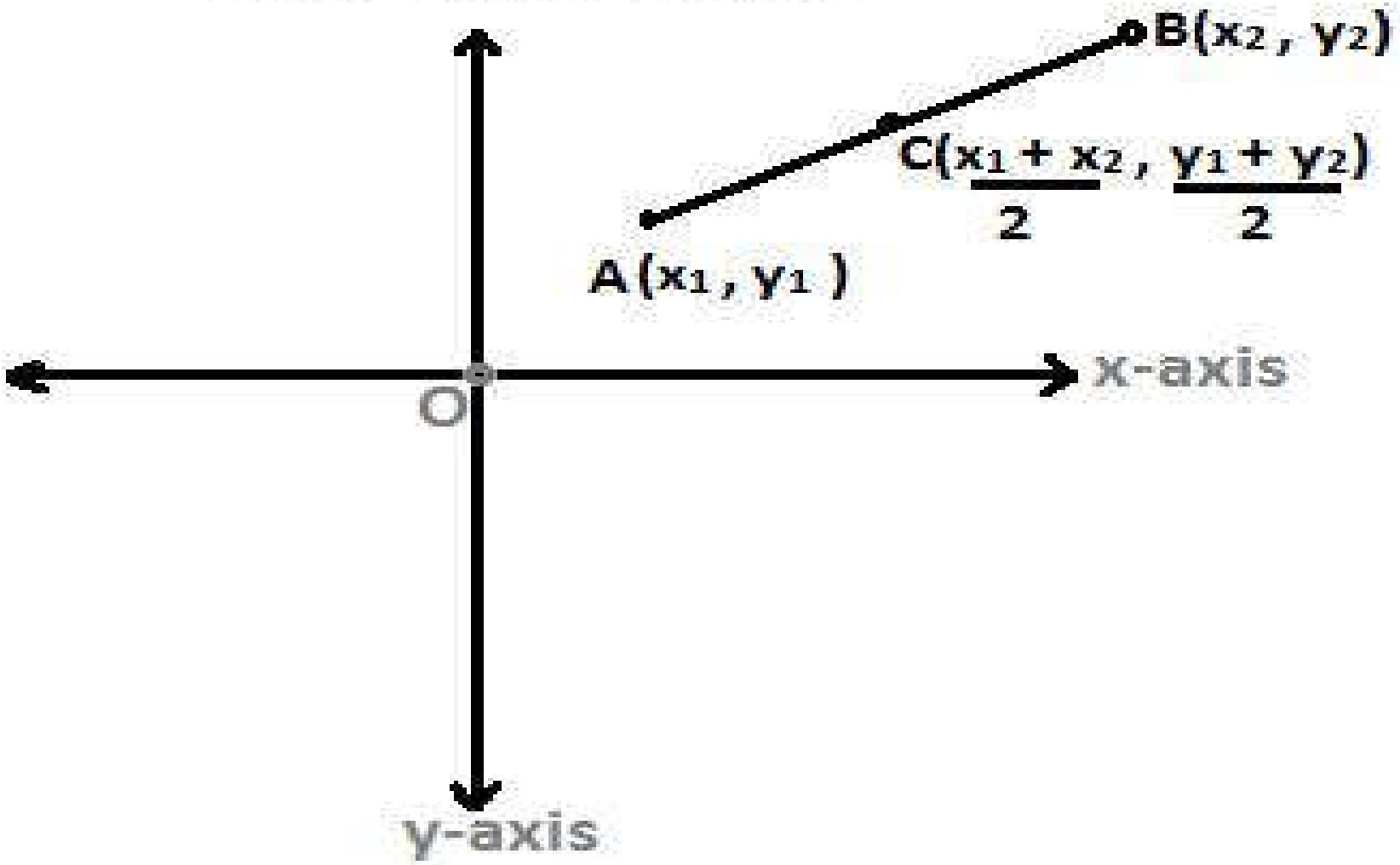
COORDINATE GRIDS




y
x
(4, 3)
(-2, 1)
4
3
2
1
−1
−2
−3
−4
−4
−3
−2
−1
1
2
3
4


$M_y = \frac{3 + 1}{2} = 2$
A
(4, 3)
y_1
M
B (-2, 1)
y_2
x_2
x_1
$M_x = \frac{4 + (-2)}{2} = 1$

Midpoint Formula



The XY coordinate plane

MID POINT FORMULA

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

The midpoint of M of the line segment from $P_1 (x_1, y_1)$ to $P_2 (x_2, y_2)$

$$\left(\frac{x_1 + x_2}{2} , \frac{y_1 + y_2}{2} \right)$$

Practice

$\overline{AB}$ has endpoints (8, 9) and (–6, –3). Find the coordinates of its midpoint M.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$\frac{8 + (-6)}{2} = \frac{2}{2} = 1 \qquad \frac{9 + (-3)}{2} = \frac{6}{2} = 3$$

The coordinates of midpoint M are (1, 3).

FIND THE MIDPOINT

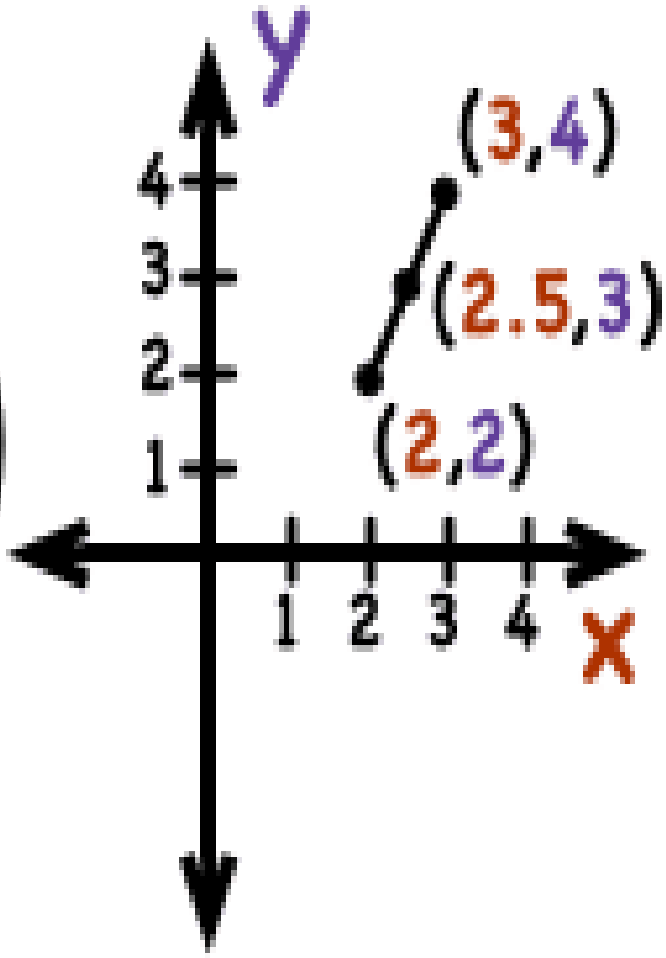
$(3,4)$ $(2,2)$

x_1 y_1 x_2 y_2

$$(x,y)_{MDPT} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

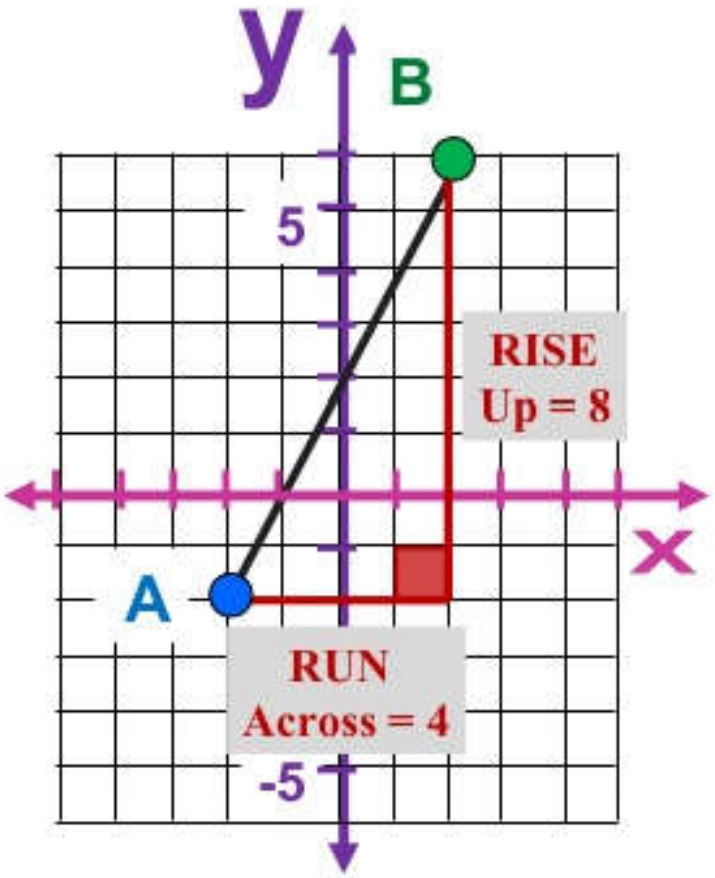
$$= \left(\frac{3+2}{2}, \frac{4+2}{2}\right)$$

$$= (2.5,3)$$



GRADIENT/SLOPE/TANGENT

Gradient Slope Calculation



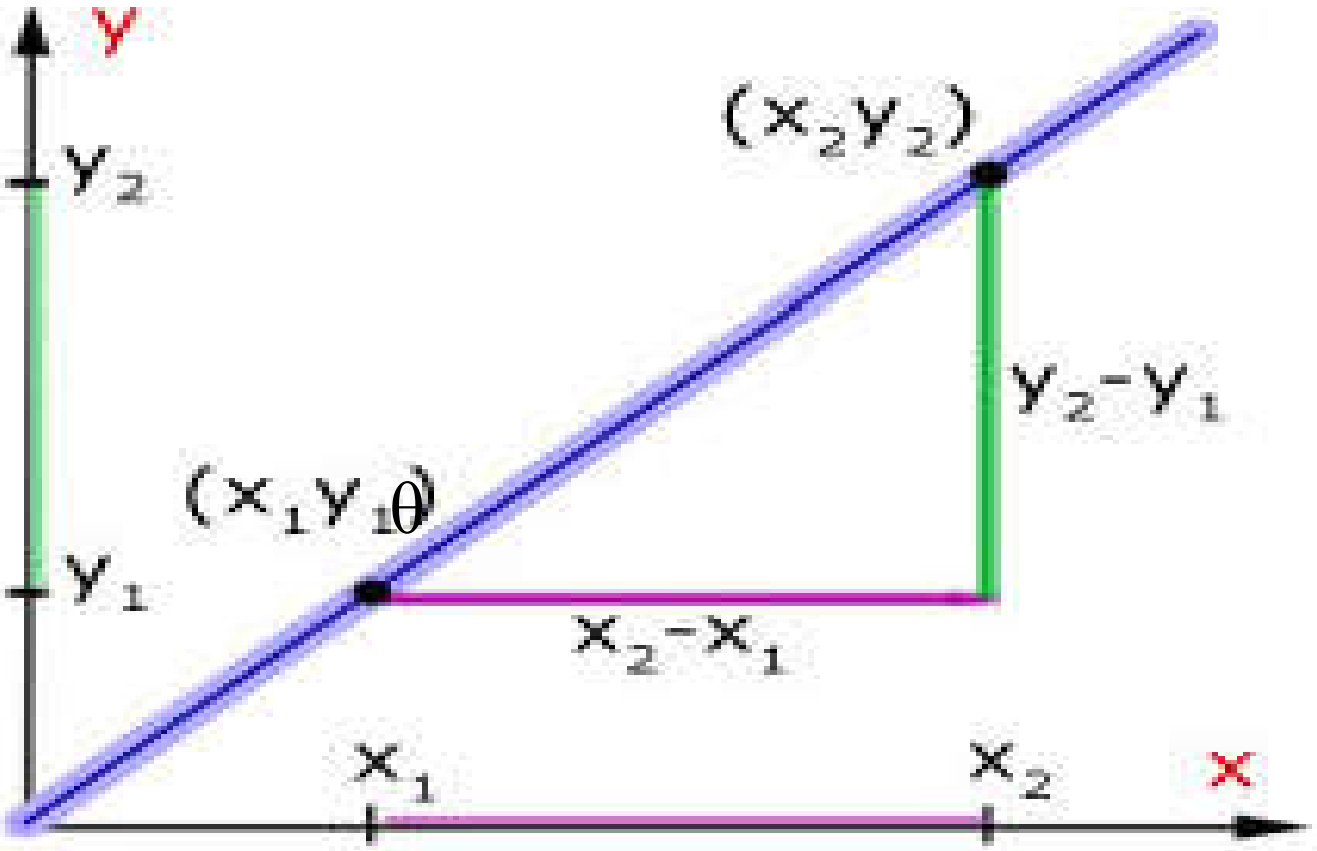
The "Gradient" or "Slope" between two points is how far UP we have gone, DIVDED BY how far we have gone ACROSS.

$$m = \frac{\text{RISE}}{\text{RUN}}$$

$$m = \frac{8}{4}$$

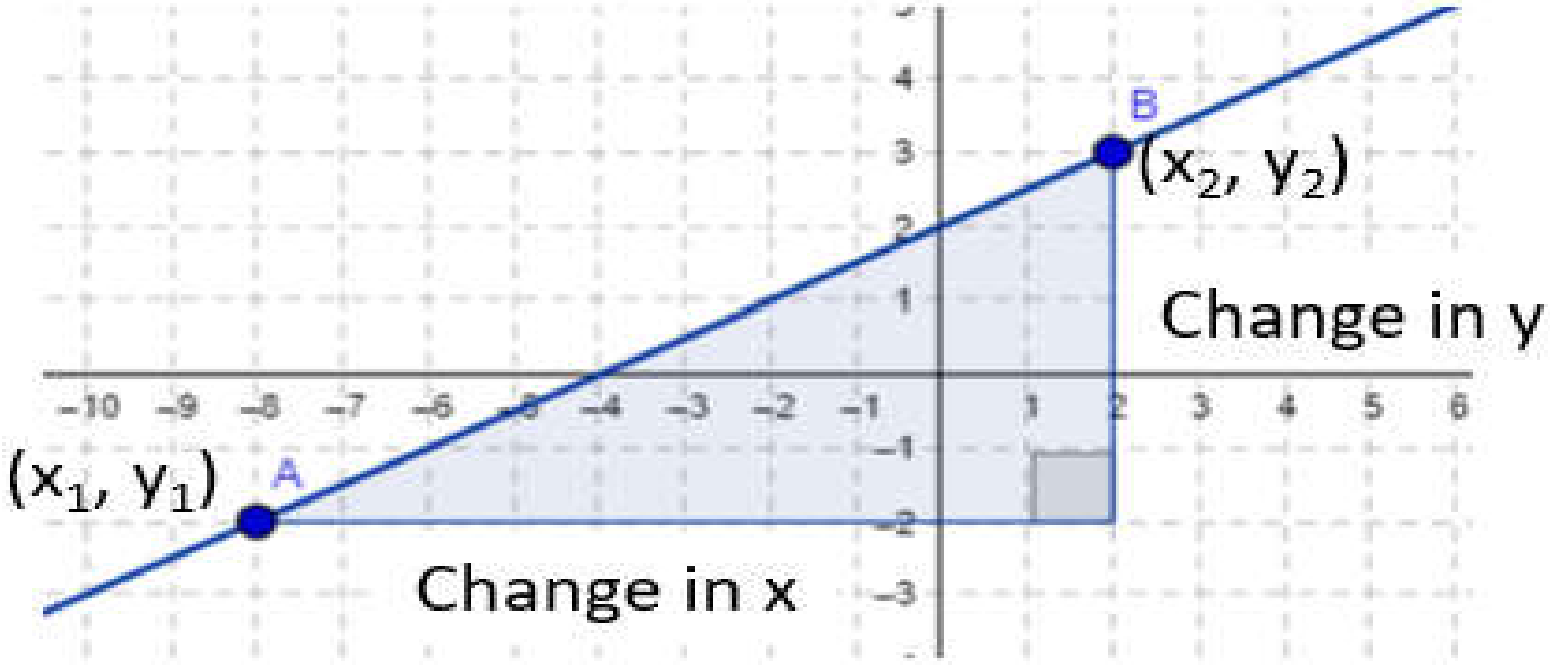
$$m = 2 \checkmark$$

GRADIENT CAN BE DESCRIBED AS TANGENT

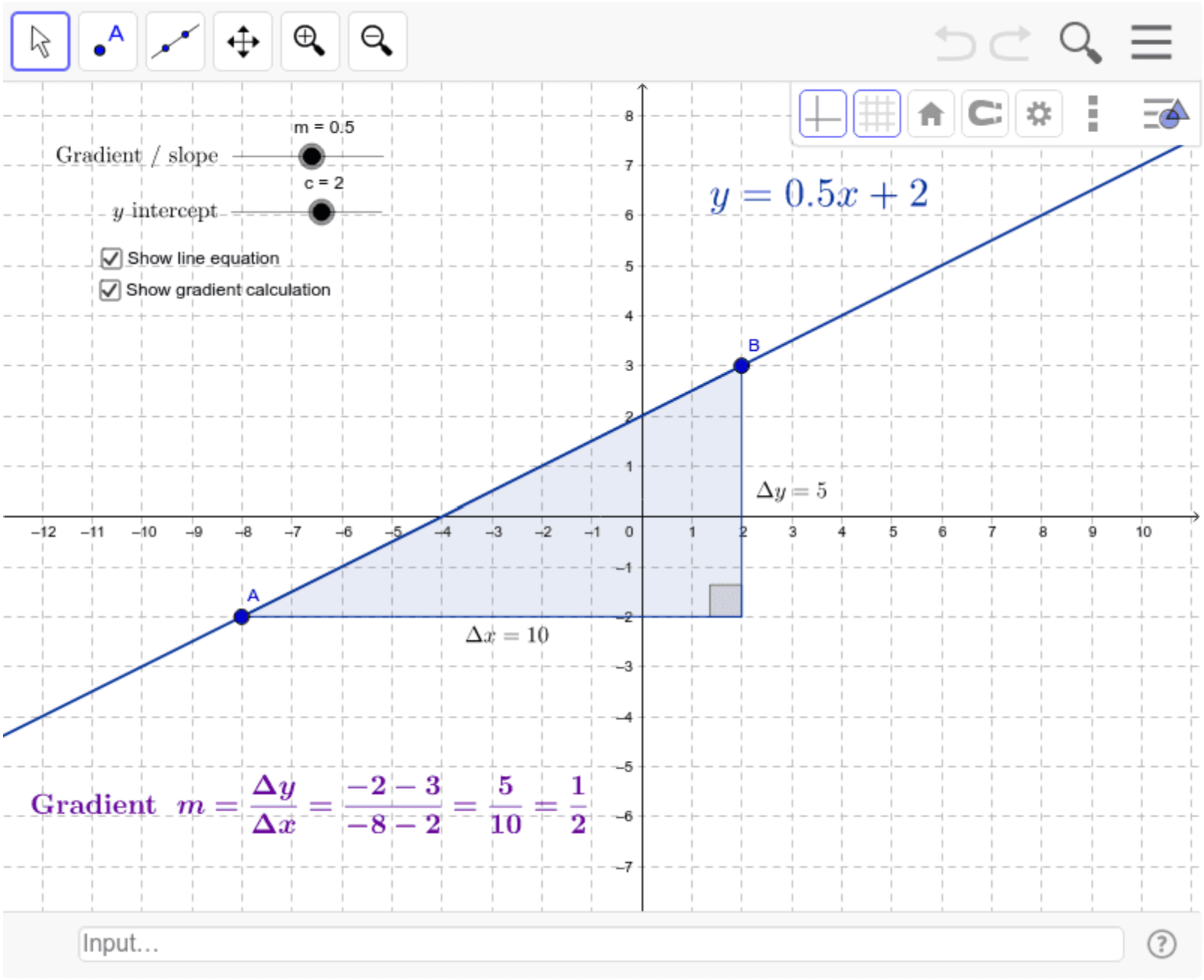


TAN θ =

Gradient of a Straight Line



$$\text{Gradient} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{Change in y}}{\text{Change in x}}$$

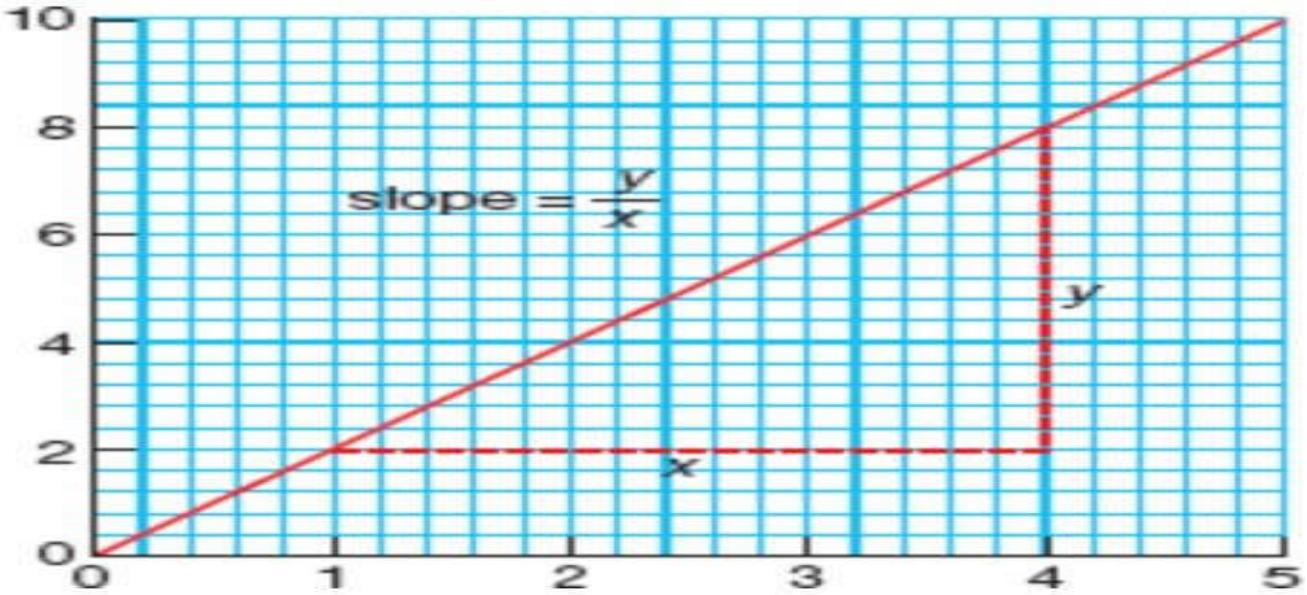

m = 0.5
Gradient / slope
c = 2
y intercept
Show line equation
Show gradient calculation
y = 0.5x + 2
A
B
Δy = 5
Δx = 10
Gradient m = Δy/Δx = (−2 − 3)/(−8 − 2) = 5/10 = 1/2
Input…

Example: what is the gradient of this graph line?

$$y = 8 - 2 = 6$$

$$x = 4 - 1 = 3$$

$$\text{slope} = \frac{y}{x} = \frac{6}{3} = 2$$



Calculating the gradient of a straight-line graph

Gradient Slope – STEPS

Step 1 - Have two points that are on a straight line

Step 2 - Work out the Vertical and Horizontal Distances

Step 3 - Substitute the Step 2 values into the Gradient Slope formula:

$$m = \frac{\text{RISE (Vertical Change)}}{\text{RUN (Horizontal Change)}}$$

Step 4 - Reduce Down Fraction Answers to simplest form

Step 5 Write Gradient Slope value as Positive for Uphill and Negative for Downhill.

DETERMINE THE SLOPE OF THE PAIR OF THE FOLLOWING POINTS ON A LINE

7. $(4, -3)$ and $(6, -3)$

8. $(2, -4)$ and $(-2, -16)$

Slope formula	$slope, m = \frac{change\ in\ y}{change\ in\ x} = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$ Parallel lines have equal slopes. The slopes of perpendicular lines are opposite reciprocals of each other
General Form	$Ax + By = C$
Slope Intercept Form	$y = mx + b$ where *m* is the slope and *b* is the y-intercept
Point Slope Form	$(y - y_1) = m(x - x_1)$ where *m* is the slope
Midpoint Formula	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$
Distance Formula	$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

ASSIGNMENT

2016 WASSCE OBJ

A STRAIGHT LINE PASSES THROUGH THE POINT P(1, 2) AND Q(5,6) ,

I) CALCULATE THE GRADIENT PQ

II) CALCULATE THE DISTANCE PQ