

CO-ORDINATE GEOMETRY

[THE LINE]

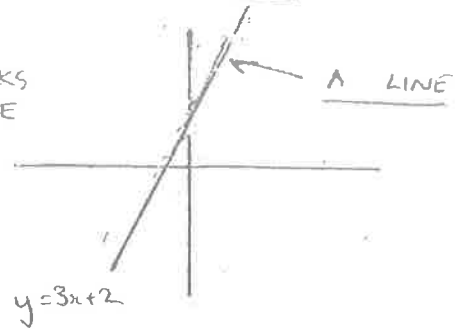
• CO-ORDINATE GEOMETRY IS VERY IMPORTANT.

• IT LINKS ALGEBRA AND GEOMETRY.

• SO

$$y = 3x + 2$$

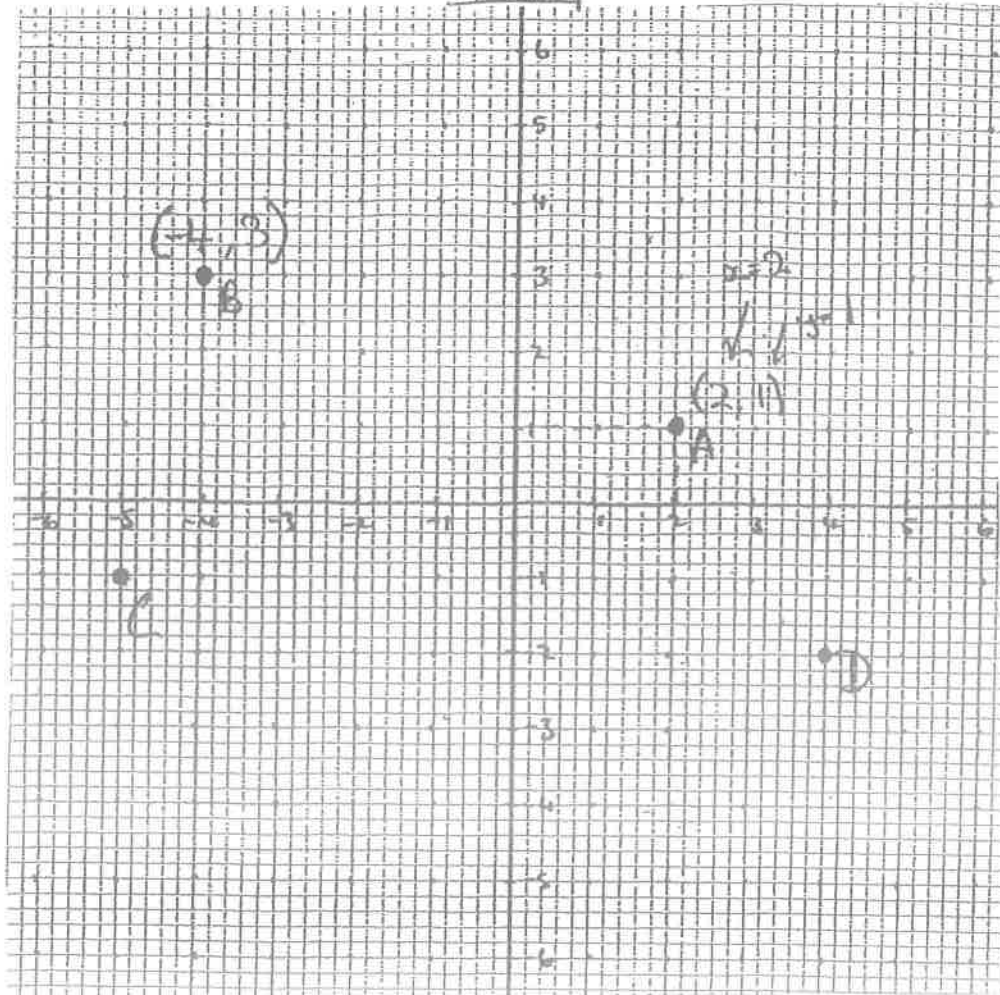
LOOKS LIKE



EVERY POINT ON THE CO-ORDINATE DIAGRAM HAS
X-CO-ORDINATE Y-CO-ORDINATE
 (X, Y)
THINK OF YOUR ALPHABET. X COMES BEFORE Y.

DON'T MIX THESE UP

Y-AXIS



- A = (2, 1)
- B = (-4, 3)
- C = (-5, -1)
- D = (4, -2)

X-AXIS

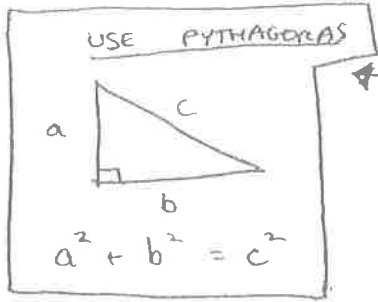
REMEMBER!

"X IS A CROSS"
AND IT GOES
"ACROSS"

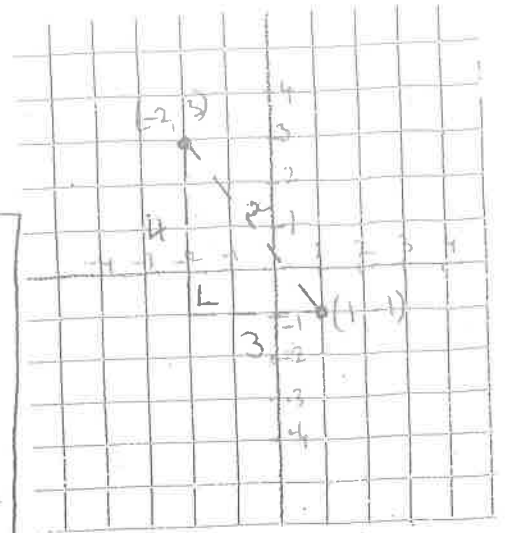
DISTANCE (HOW FAR?)

- YOU MIGHT BE ASKED TO FIND THE DISTANCE BETWEEN 2 POINTS.

- THE EASIEST WAY IS TO



- PLOT THE TWO POINTS
- MAKE A RIGHT-ANGLED TRIANGLE
- FIND THE LENGTH OF THE HYPOTENUSE



eg FIND THE DISTANCE BETWEEN

$(-2, 3)$ AND $(1, -1)$

$$3^2 + 4^2 = x^2$$

$$9 + 16 = x^2$$

$$25 = x^2$$

$$x = 5$$

- THE OLD-FASHIONED WAY IS TO USE THE FORMULA

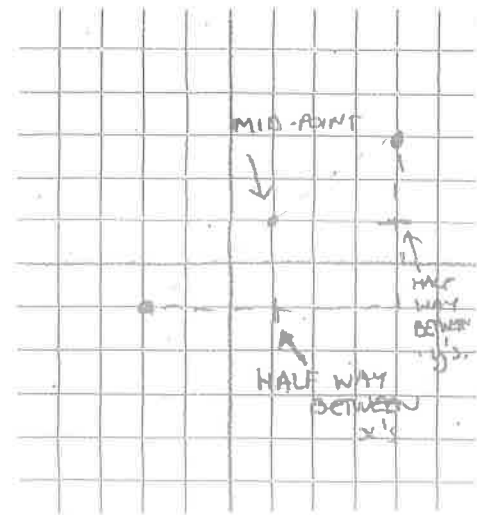
$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

MID-POINT (HALF-WAY POINT)

- HALF-WAY BETWEEN THE x 's AND HALF-WAY BETWEEN THE y 's.

- DRAW A DIAGRAM. (USE SQUARED PAPER)

- WHAT IS HALF-WAY BETWEEN TWO NUMBERS? THE AVERAGE ADD TOGETHER + DIVIDE BY 2



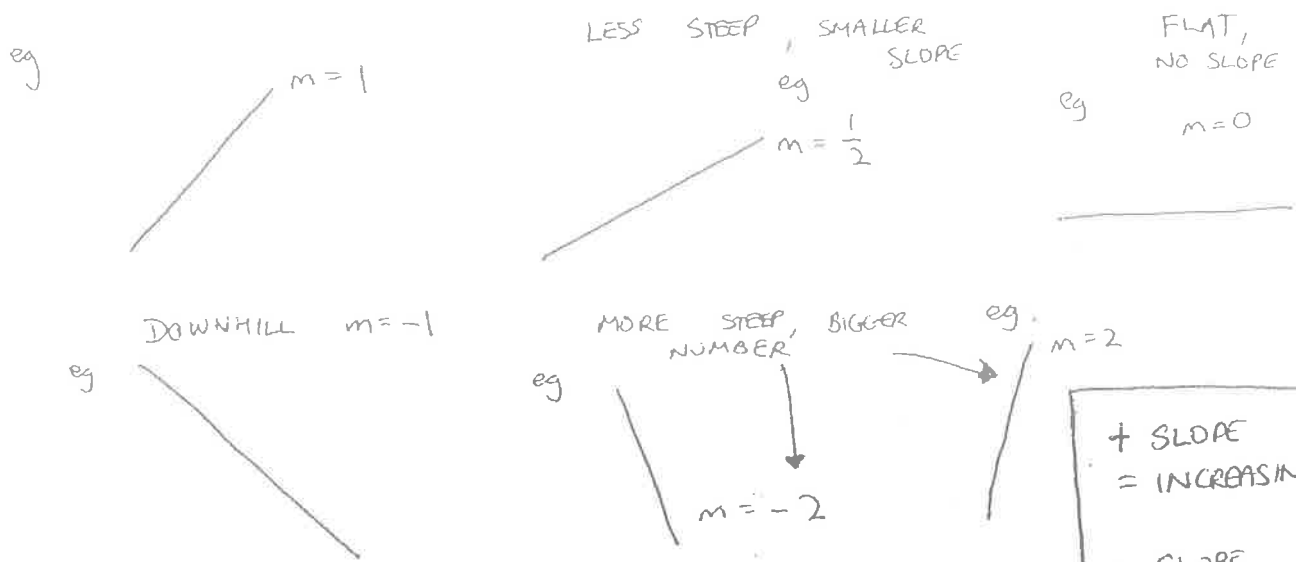
eg WHAT IS THE MID-POINT OF $(-2, -1)$ AND $(4, 3)$

- OR USE THE OLD-FASHIONED FORMULA:

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

SLOPE (HOW STEEP IS THAT LINE?)

WE USE THE LETTER **M** FOR SLOPE

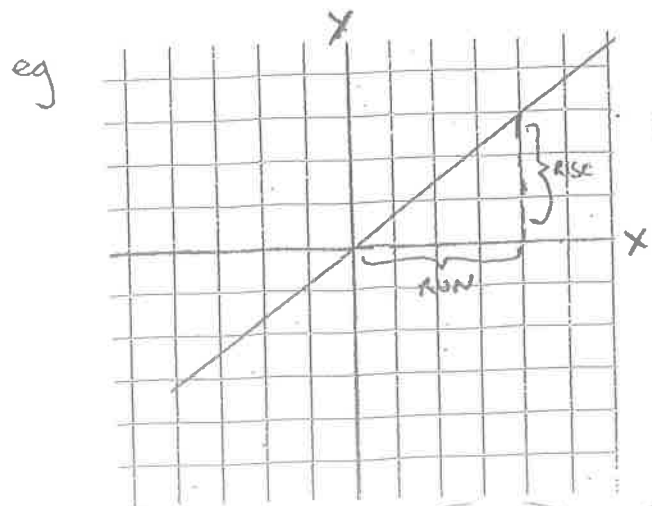


+ SLOPE = INCREASING
- SLOPE = DECREASING

LEARN THIS:
SLOPE = $\frac{\text{RISE}}{\text{RUN}}$

HOW HIGH DOES IT GO UP COMPARED TO HOW FAR IT GOES ACROSS

REMEMBER THAT'S WHAT SLOPE IS

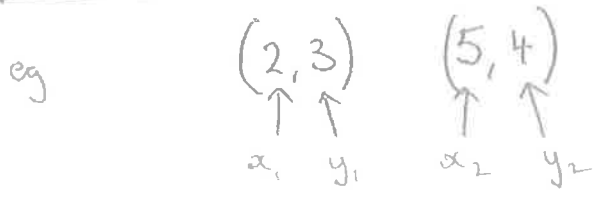


$\frac{\text{RISE}}{\text{RUN}} = \frac{3}{4}$

IF YOU'RE ASKED TO FIND SLOPE, DRAW X+Y AXES; PLOT POINTS; WORK OUT $\frac{\text{RISE}}{\text{RUN}}$

OR

OLD FASHIONED WAY:

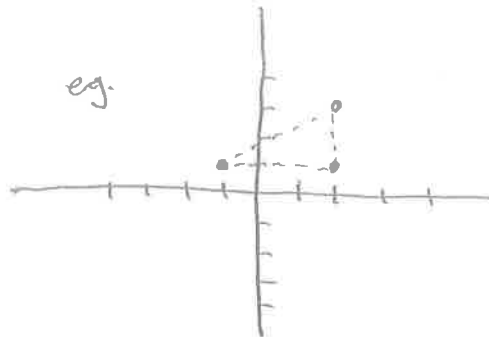


$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 3}{5 - 2} = \frac{1}{3}$$

- ① LABEL POINTS (x_1, y_1) AND (x_2, y_2)
- ② USE SLOPE FORMULA
 $m = \frac{y_2 - y_1}{x_2 - x_1}$

SLOPE / MID-POINT / DISTANCE

◦ DRAW X + Y AXES



◦ PLOT 2 POINTS

◦ DRAW OUT THE RIGHT-ANGLED TRIANGLE

◦ WORK OUT THE LENGTHS OF THE SIDES

BE VERY CAREFUL ABOUT WHICH THING YOU
ARE LOOKING FOR...

eg DON'T GET THE SLOPE WHEN
YOU WERE ASKED FOR DISTANCE

◦ MAKE SURE YOU
THEY ASKED...

ANSWER THE EXACT QUESTION

DOUBLE-CHECK THIS AT THE END !!

EQUATION OF A LINE

• EVERY LINE THAT YOU CAN DRAW ON THE X+Y AXES HAS A MATHEMATICAL "NAME", OR "EQUATION"

eg $3x + 2y = 5$ OR $y = 2x + 1$

2 DIFFERENT WAYS OF WRITING THE "EQUATION OF A LINE"

• WHAT IS THE DIFFERENCE BETWEEN ANY 2 LINES?
— HOW SLANTED ARE THEY?
— WHERE ARE THEY

SLOPE

POSITION

2 IMPORTANT THINGS TO DISTINGUISH BETWEEN LINES

2 FORMULAS

OR

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

USE THIS ONE WHEN WE KNOW A POINT ON THE LINE

eg $m = 2$ $(3, 4)$

$$y - 4 = m(x - 3)$$

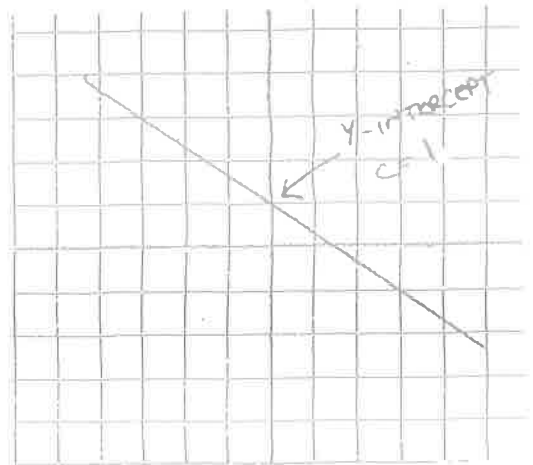
NOTE DON'T REPLACE THE y OR x IN THE FORMULA!

$$y = mx + c$$

y-INTERCEPT

USE THIS ONE WHEN YOU KNOW WHERE THE LINE CROSSSES THE Y-AXIS

THIS IS c



EQUATION OF A LINE CONTD...

BE ABLE TO LOOK AT A LINE AND WRITE EQUATION OF THE LINE BY LOOKING AT

- SLOPE (m)
- Y-INTERCEPT (c)

USE

$$y = mx + c$$

BE ABLE TO WRITE DOWN THE SLOPE OF A LINE VERY QUICKLY

eg

$$y = 3x + 9$$

↑

$$\boxed{\text{SLOPE} = 3}$$

BEFORE DOING THIS, YOUR EQUATION OF A LINE HAS TO LOOK LIKE THIS

$$y = mx + c$$

ANY 2 PARALLEL LINES HAVE THE SAME SLOPE

SO $y = 2x + 4$
IS PARALLEL TO
 $y = 2x - 1$

GRAPHING LINES

• TO GRAPH A LINE, WE NEED 2 POINTS

• THE EASIEST POINTS TO FIND ARE WHERE $x = 0$
 $y = 0$

• USE THE "T" METHOD

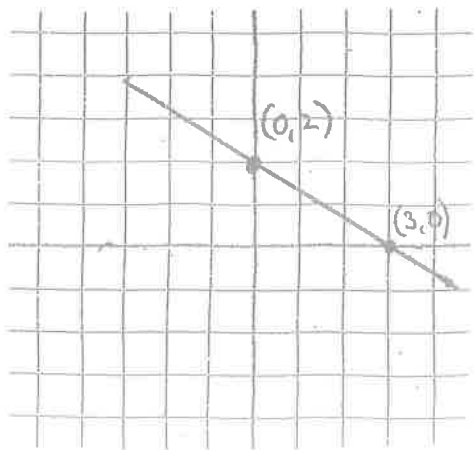
eg GRAPH $2x + 3y = 6$

② $2x + 3y = 6$

| | |
|------------------------------------------|------------------------------------------|
| ③ $x = 0$ | ③ $y = 0$ |
| ④ $2(0) + 3y = 6$ $3y = 6$ $y = 2$ | ④ $2x + 3(0) = 6$ $2x = 6$ $x = 3$ |
| ⑥ $(0, 2)$ | $(3, 0)$ |

REMEMBER (x, y)

- ① DRAW THE BIG T
- ② WRITE THE EQUATION OF THE LINE ON TOP
- ③ WRITE DOWN $x = 0$ AND $y = 0$
- ④ SUBSTITUTE THESE VALUES OF 0 INTO THE EQUATION
- ⑤ SOLVE FOR THE OTHER LETTER
- ⑥ WRITE DOWN YOUR TWO POINTS
- ⑦ PLOT THESE POINTS + LINK WITH RULER.



PRACTICE A FEW OF THESE

NOTE • YOU MAY BE ASKED TO GRAPH 2 LINES ON THE SAME DIAGRAM

• DO EACH ONE USING THE METHOD IN THE BOX ABOVE

POINT OF INTERSECTION : THIS IS THE POINT WHERE 2 LINES CROSS (INTERSECT)

