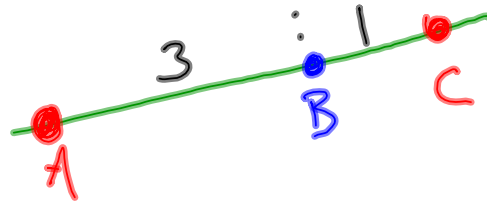
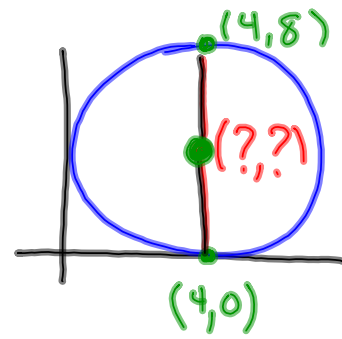


MIDPOINTS

AND

POINTS OF DIVISION



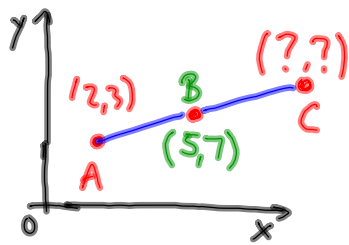
MIDPOINT → IN THE MIDDLE, TAKE THE AVERAGE.

$$(X_M, Y_M) = \left(\frac{X_1 + X_2}{2}, \frac{Y_1 + Y_2}{2} \right)$$

$$X_M = \frac{X_1 + X_2}{2}$$

$$Y_M = \frac{Y_1 + Y_2}{2}$$

MUST BE ABLE TO WORK
BACKWARD TO FIND
A MISSING VALUE.



If B is the MIDPOINT,
WHAT ARE THE COORDINATES
OF POINT C?

$$X_m = \frac{X_1 + X_2}{2}$$

$$Y_m = \frac{Y_1 + Y_2}{2}$$

$$2 \cdot 5 = \frac{2 + X_2}{2} \cdot 2$$

$$2 \cdot 7 = \frac{3 + Y_2}{2} \cdot 2$$

$$\begin{array}{r} 10 = 2 + X_2 \\ -2 \quad -2 \\ \hline 8 = X_2 \end{array}$$

$$\begin{array}{r} 14 = 3 + Y_2 \\ -3 \quad -3 \\ \hline 11 = Y_2 \end{array}$$

$$C(8, 11)$$

DIVISION PT:

$$(X_D, Y_D) = \left(X_1 + \frac{a}{b}(X_2 - X_1), Y_1 + \frac{a}{b}(Y_2 - Y_1) \right)$$

↑
STARTING
PT.

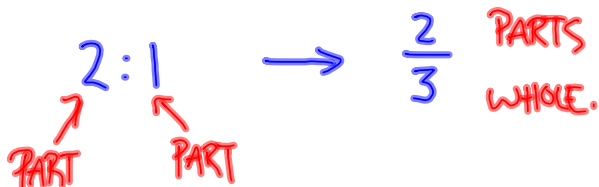
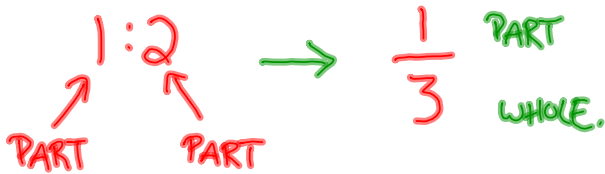
↑
STARTING
PT. * SUPER
IMPORTANT ▽

$$X_D = X_1 + \frac{a}{b}(X_2 - X_1)$$

$$Y_D = Y_1 + \frac{a}{b}(Y_2 - Y_1)$$

MUST BE ABLE TO WORK
BACKWARD TO FIND A
MISSING VALUE.

RATIOS vs. FRACTIONS



THE $\frac{a}{b}$ IN THE

$x_1 + \frac{a}{b}(x_2 - x_1)$ IS

A FRACTION, NOT

A RATIO.

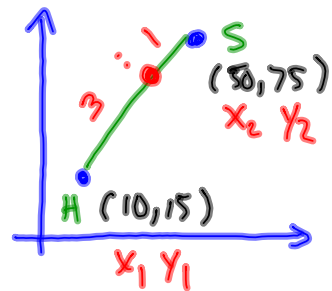
↓
YOU MAY BE GIVEN A
RATIO... CONVERT IT
TO A FRACTION FIRST.

MR. AUGER LIVES @ $(10, 15)$

HE GOES TO SCHOOL @ $(50, 75)$

HE STOPS FOR COFFEE AT A POINT
THAT DIVIDES THE LINE BETWEEN
HOME AND SCHOOL IN A RATIO OF 3:1

COORDINATES OF COFFEE?



START (x_1, y_1)
END (x_2, y_2)
RATIO 3:1 $\rightarrow \left(\frac{3}{4}\right)$

$$\begin{aligned}(x_D, y_D) &= \left(x_1 + \frac{a}{b}(x_2 - x_1), y_1 + \frac{a}{b}(y_2 - y_1) \right) \\ &= \left(10 + \frac{3}{4}(50 - 10), 15 + \frac{3}{4}(75 - 15) \right) \\ &= \left(10 + 0.75(40), 15 + 0.75(60) \right) \\ &= \left(10 + 30, 15 + 45 \right) \\ &= \left(40, 60 \right)\end{aligned}$$

COORDINATES
OF
COFFEE
SHOP $(40, 60)$