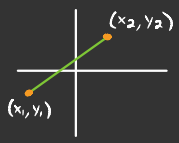
Distance Formula

Say you have 2 points on a coordinate plane & you want to find the distance between them.



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

Ex

Find the distance between $(-2, 5)$ & $(3, -1)$.

(x_1, y_1) (x_2, y_2)

$$d = \sqrt{(3-(-2))^2 + (-1-5)^2}$$
$$= \sqrt{(5)^2 + (-6)^2}$$
$$= \sqrt{25 + 36}$$
$$= \boxed{\sqrt{61}} \approx 7.8$$

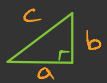
Ex

Find the distance between $(-4, -1)$ & $(-1, 3)$

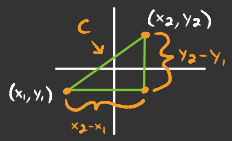
$$d = \sqrt{(-1-(-4))^2 + (3-(-1))^2}$$
$$= \sqrt{(3)^2 + (4)^2}$$
$$= \sqrt{9 + 16}$$
$$= \sqrt{25}$$
$$= \boxed{5}$$

How do we know were calculating distance & this isn't just a part of Raymond's math propoganda?

Pythagorean Theorem



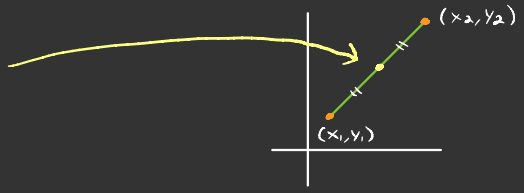
$$a^2 + b^2 = c^2$$
$$\sqrt{a^2 + b^2} = c$$



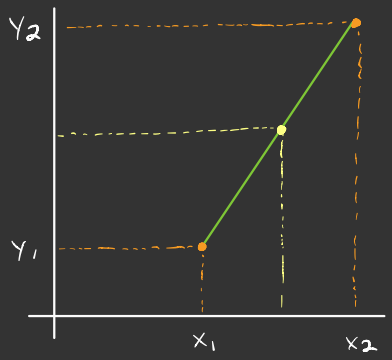
Midpoint Formula

Given 2 points on a coordinate plane we can find the midpoint using the formula

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



We're basically averaging x_1 & x_2 and y_1 & y_2.



What's the average of 4 & 6?

$$\frac{4+6}{2} = \frac{10}{2} = 5$$

Ex

① Find the midpoint of $(10, -2)$ & $(3, 4)$.

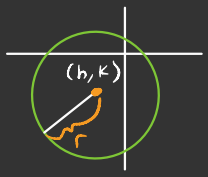
$$\left(\frac{10+3}{2}, \frac{-2+4}{2}\right) = \left(\frac{13}{2}, \frac{2}{2}\right) = \left(\frac{13}{2}, 1\right)$$

② Find the midpoint of $(6, 4)$ & $(2, -3)$.

$$\left(\frac{6+2}{2}, \frac{4+(-3)}{2}\right) = \left(\frac{8}{2}, \frac{1}{2}\right) = \left(4, \frac{1}{2}\right)$$

Circles

A circle is the set of all points that are a fixed distance, r, from a center, (h, k).



we want all (x,y) of distance r from (h,k)

$$\sqrt{(x-h)^2 + (y-k)^2} = r$$

$$(x-h)^2 + (y-k)^2 = r^2 \quad \text{– standard form}$$

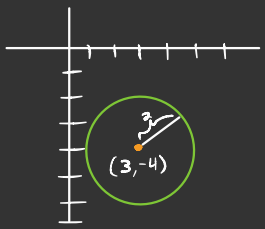
Ex

Graph $(x-3)^2 + (y+4)^2 = 4$

Write in standard form: $(x-3)^2 + (y-(-4))^2 = (2)^2$

$(h,k) = (3,-4)$

$r = 2$



Ex

Write the following circle in standard form.

$$\frac{x^2-2x+1}{169} + \frac{y^2-6y+9}{169} = 1$$

$$\frac{(x-1)(x-1)}{169} + \frac{(y-3)(y-3)}{169} = 1$$

$$\frac{(x-1)^2}{169} + \frac{(y-3)^2}{169} = 1$$

$$(x-1)^2 + (y-3)^2 = 169$$

$$(x-1)^2 + (y-3)^2 = 13^2$$

Centered at $(1, 3)$ with radius 13