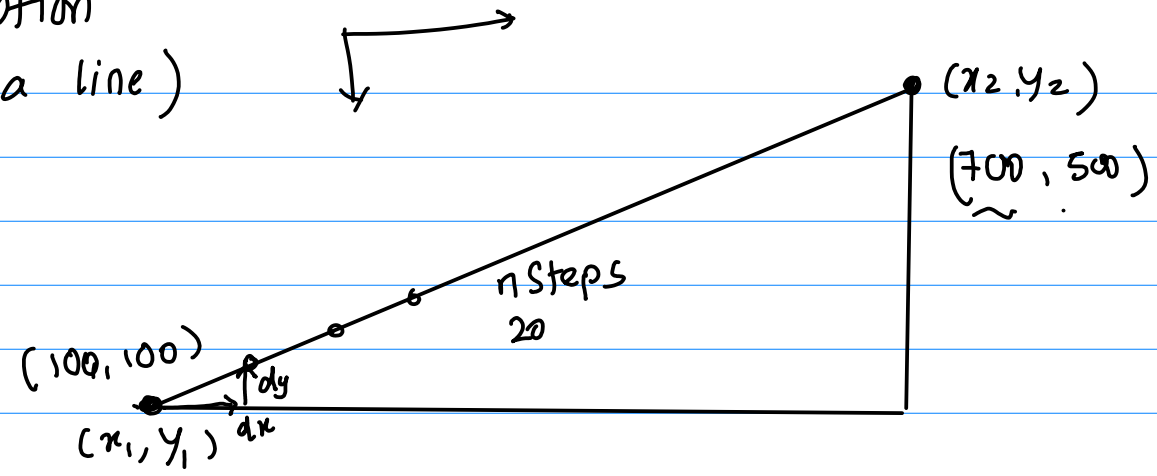
Linear Motion

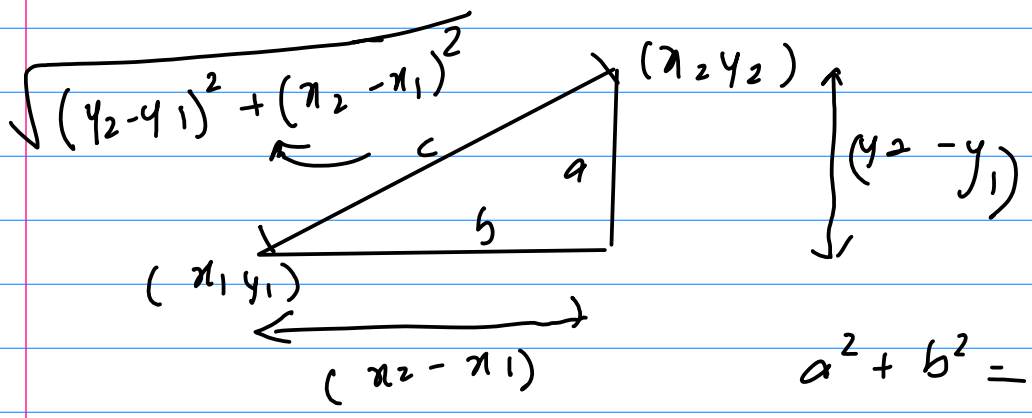
(motion in a line)



$$dx = \frac{x_2 - x_1}{n} \qquad dy = \frac{y_2 - y_1}{n}$$

$$dx = \frac{700 - 100}{20} \qquad dy = \frac{500 - 100}{20}$$

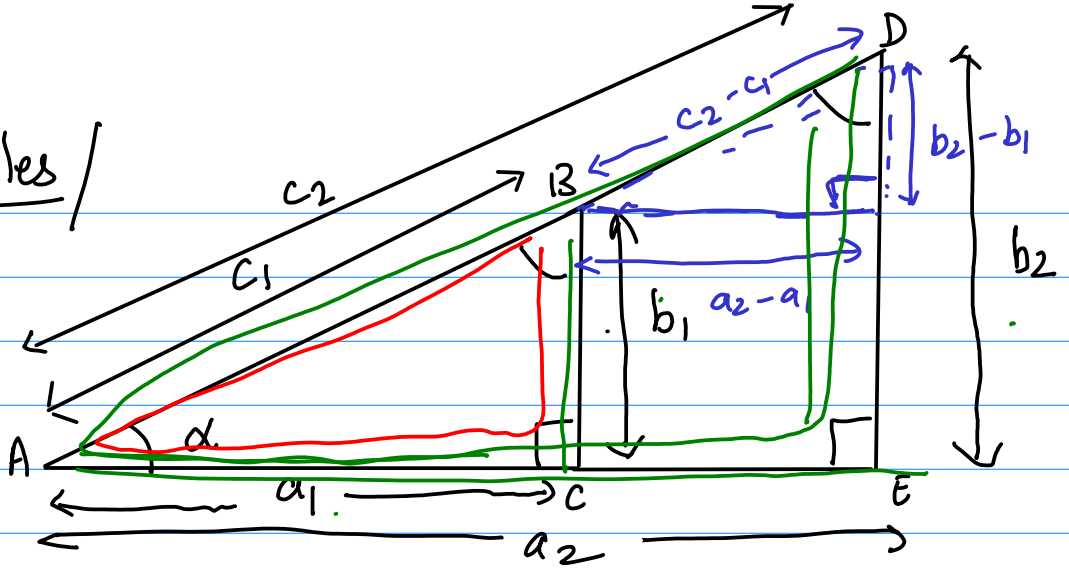
$$= 30 \qquad dy = 20$$



$$a^2 + b^2 = c^2$$

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

Similar triangles



$\triangle ABC$ $\triangle ADE$

$a_1\ b_1\ c_1$ $a_2\ b_2\ c_2$

$$\left(\frac{a_1}{b_1}\right) \sim = \left(\frac{a_2}{b_2}\right)$$

$$a_1^2 + b_1^2 = c_1^2$$

$$c_1 = \sqrt{a_1^2 + b_1^2}$$

$$a_2^2 + b_2^2 = c_2^2$$

$$c_2 = \sqrt{a_2^2 + b_2^2}$$

$$(c_2 - c_1)^2 = (a_2 - a_1)^2 + (b_2 - b_1)^2$$

$$\left(\sqrt{a_2^2 + b_2^2} - \sqrt{a_1^2 + b_1^2}\right)^2 = a_2^2 + a_1^2 - 2a_1a_2 + b_2^2 + b_1^2 - 2b_1b_2$$

$$a_2^2 + b_2^2 + a_1^2 + b_1^2 + 2\sqrt{(a_2^2 + b_2^2)(a_1^2 + b_1^2)}$$

$$\left(\sqrt{(a_2^2 + b_2^2)(a_1^2 + b_1^2)}\right)^2 = \left((a_1a_2 + b_1b_2)\right)^2$$

$$(a_2^2 + b_2^2)(a_1^2 + b_1^2) = a_1^2a_2^2 + b_1^2b_2^2 + 2a_1a_2b_1b_2$$

$$a_2^2 a_1^2 + a_2^2 b_1^2 + b_2^2 a_1^2 + b_1^2 b_2^2 = a_1^2 a_2^2 + b_1^2 b_2^2 + 2a_1 a_2 b_1 b_2$$

$$\frac{a_2^2 b_1^2}{b_1^2 b_2^2} + \frac{b_2^2 a_1^2}{b_1^2 b_2^2} = \frac{2a_1 a_2 (b_1 b_2)}{b_1^2 b_2^2} = 2\left(\frac{a_1}{b_1}\right)\left(\frac{a_2}{b_2}\right)$$

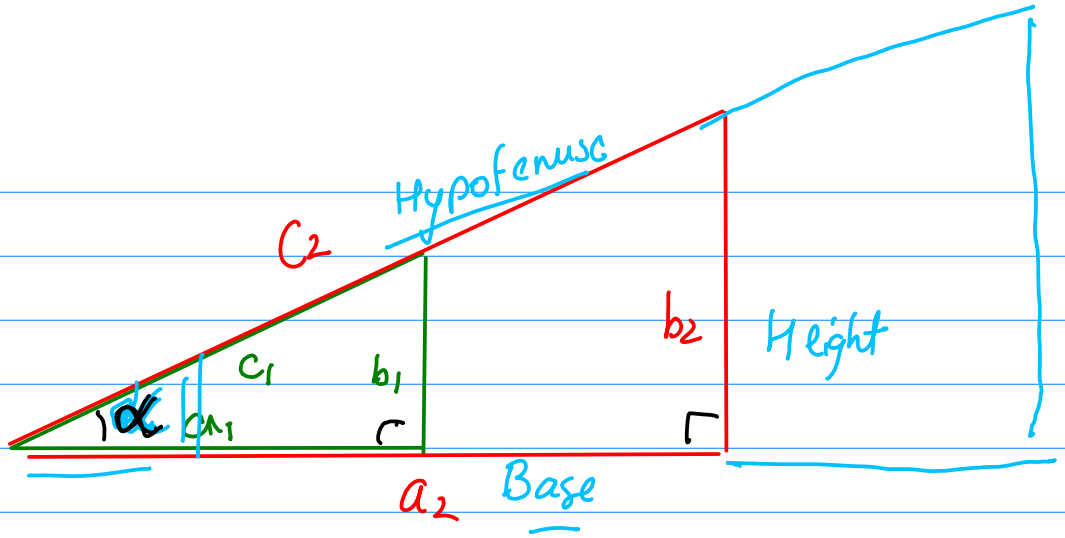
$$\Rightarrow \left(\frac{a_2}{b_2}\right)^2 + \left(\frac{a_1}{b_1}\right)^2 = 2\left(\frac{a_1}{b_1}\right)\left(\frac{a_2}{b_2}\right)$$

$$\left(\frac{a_2}{b_2}\right)^2 + \left(\frac{a_1}{b_1}\right)^2 - 2\left(\frac{a_1}{b_1}\right)\left(\frac{a_2}{b_2}\right) = 0$$

$$\left(\frac{a_2}{b_2} - \frac{a_1}{b_1}\right)^2 = 0$$

$$\frac{a_2}{b_2} - \frac{a_1}{b_1} = 0$$

$$\boxed{\frac{a_2}{b_2} = \frac{a_1}{b_1}}$$



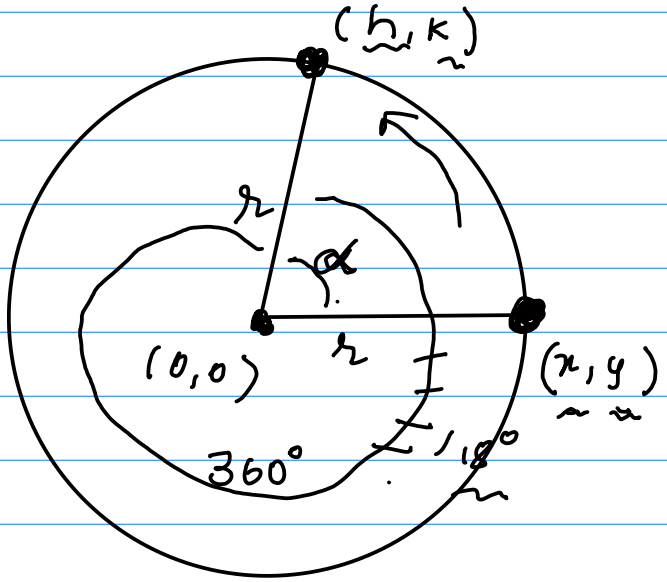
$$\frac{a_1}{b_1} = \frac{a_2}{b_2}$$

$$\left(\frac{a_1}{c_1} = \frac{a_2}{c_2}\right) = \cos(\alpha)$$

$$\left(\frac{b_1}{c_1}\right) = \left(\frac{b_2}{c_2}\right) = \sin(\alpha)$$

$$\cos(\alpha) = \left(\frac{\text{Base}}{\text{Hypofenuse}}\right) \qquad \sin(\alpha) = \left(\frac{\text{Height}}{\text{Hypotenuse}}\right)$$

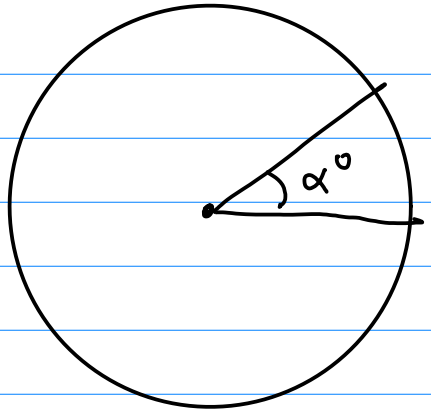
CIRCULAR MOTION



$$h = x\cos\alpha - y\sin\alpha$$
$$k = x\sin\alpha + y\cos\alpha$$

(If the center is (c_x, c_y))

$$h = (x - c_x)\cos\alpha - (y - c_y)\sin\alpha + c_x$$
$$k = (x - c_x)\sin\alpha + (y - c_y)\cos\alpha + c_y$$



360° or 2π (radians)

360	2π
α	$\left(\frac{2\pi}{360}\right)\alpha$
$\frac{2\pi}{360}$	

deg → radians

$\times\left(\frac{\pi}{180}\right)$

radians → deg

$\times\left(\frac{180}{\pi}\right)$

$90^\circ \rightarrow 90 \times \frac{\pi}{180} = \frac{\pi}{2}$ rad.

$\frac{\pi}{4}$ rad $\times \frac{180}{\pi} \rightarrow 45^\circ$