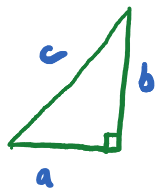
Geometric Applications

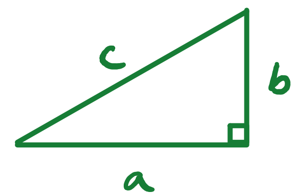
Goal: to solve applications of radicals involving triangles.

Recall: The Pythagorean Theorem



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

ex Find the length of the missing side:



a) $a=10,\ b=9$

$\sqrt{x^2}=x,\ x\geq 0$

$(\sqrt{x})^2=(3)^2$

$x=9$

other day

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

$c^2=10^2+9^2$

$c^2=100+81$

$\sqrt{c^2}=\sqrt{181}$

$c=\sqrt{181}$ exact ✓

≈ 13.45 approx.

b) $c=14,\ a=7\sqrt{3}$

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

$(7\sqrt{3})^2+b^2=(14)^2$

$$7^2\cdot(\sqrt{3})^2 + b^2 = 196$$

$$49\cdot 3 + b^2 = 196$$

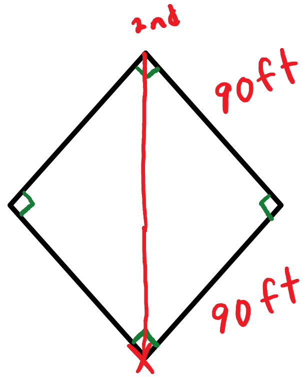
$$\cancel{147} + b^2 = 196$$

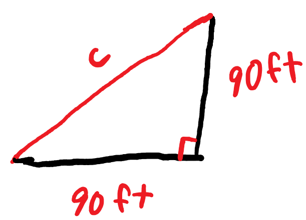
$$-\cancel{147} \qquad -147$$

$$\sqrt{b^2} = \sqrt{49}$$

$$b = 7$$

ex Find the distance from home plate to second base on a baseball diamond.





$$c^2 = 1\cdot 90^2 + 1\cdot 90^2$$

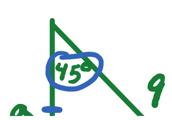
$$\sqrt{c^2} = \sqrt{2\cdot 90^2}$$

$$c = 90\sqrt{2}$$

$$c = 90\sqrt{2} \text{ ft}$$

$$\approx 127.3 \text{ ft}$$

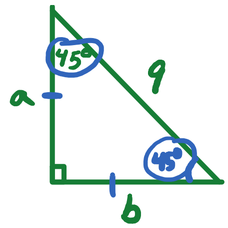
ex Solve for the missing side:

a) 

isosceles

$a = b$

a)



isosceles

$a = b$

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

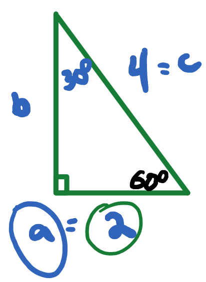
$a^2 + a^2 = 9^2$

$\frac{\cancel{2} \cdot a^2}{\cancel{2}} = \frac{81}{\cancel{2}}$

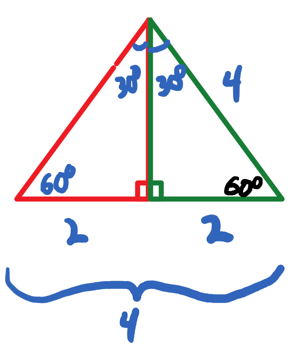
$\sqrt{a^2} = \sqrt{\frac{81}{2}}$

$a = \frac{\sqrt{81}}{\sqrt{2}} = \frac{9}{\sqrt{2}}$

b)



$180° - 90° - 60° = 30°$



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

$2^2 + b^2 = 4^2$

$4 + b^2 = 16$

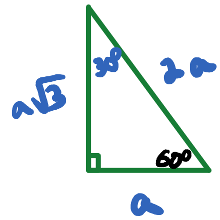
$\sqrt{b^2} = \sqrt{12}$

$b = 2\sqrt{\cancel{4} \cdot 3}$

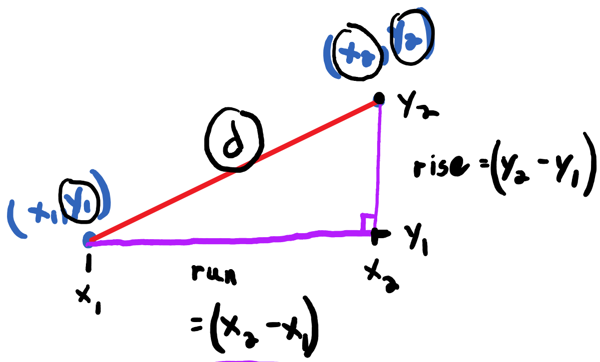
$b = 2\sqrt{3}$

$c = 4$

30° - 60° - 90° Triangle



Distance Formula



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

$$\boxed{d = \sqrt{(\underbrace{x_2 - x_1}_{\text{run}})^2 + (\underbrace{y_2 - y_1}_{\text{rise}})^2}}$$

Ex Find the distance

$(5, -2) \quad (-7, -8)$

$d = \sqrt{\text{run}^2 + \text{rise}^2}$

$$d = \sqrt{(-7-5)^2 + (-8 + (+2))^2}$$

$$= \sqrt{(-12)^2 + (-6)^2}$$

$$= \sqrt{144 + 36}$$

$$= \sqrt{180}$$

36.5

$180 = 2^2 \cdot 3^2 \cdot 5$

90 2

30 3

$$= \sqrt{180}$$

$$= 2\cdot3\sqrt{\cancel{2\cdot2}\cdot\cancel{3\cdot3}\cdot5}$$

$$= 6\sqrt{5}$$