**10.3 Applications of the Pythagorean Theorem HW**
Geometry 3313

Pythagor - _____ Key _____
Date _____ Period _____

> **Recall the Pythagorean Theorem:** If $\triangle ABC$ is a right triangle with right angle C, then $a^2 + b^2 = c^2$
>
> **Recall the Converse:** If ABC is a triangle with $a^2 + b^2 = c^2$, then $\triangle ABC$ is a right triangle with right angle C.

1. A wire stretches from the top of a 24 foot wall to a point on the ground. If we assume that the ground is horizontal and the wall is vertical, how far from the base of the wall will a 25 foot wire attach to the ground? (Sketch a diagram.)
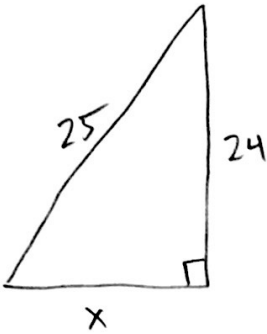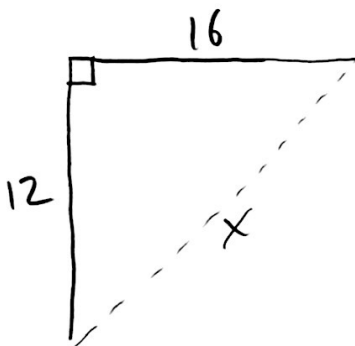
$$x^2 + 24^2 = 25^2$$
$$x^2 + 576 = 625$$
$$x^2 = 49$$
$$\boxed{x = 7 \ ft}$$

2. Jim walks 12 blocks due north in Manhattan before turning due east and walking 16 more blocks. If we can assume all blocks in Manhattan are the same size, what is the shortest distance between Jim and his starting point? (Sketch a diagram.)
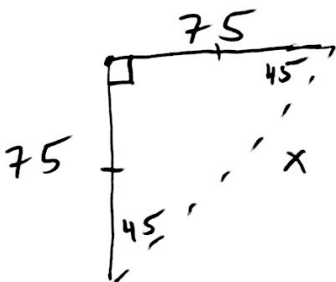
$$12^2 + 16^2 = x^2$$
$$144 + 256 = x^2$$
$$400 = x^2$$
$$x = \sqrt{400}$$
$$\boxed{x = 20 \ blocks}$$

3. Two cars leave the same point at the same time traveling at the same speed, but one travels south and the other travels east. If each car travels 50 miles per hour, exactly how far apart are the cars after 90 minutes? 1.5 hours

$$50 \ \frac{miles}{hour} \cdot 1.5 \ hours = 75 \ mi$$

$$\boxed{75^2 + 75^2 = x^2}$$
$$5625 + 5625 = x^2$$
$$11,250 = x^2$$
$$x = \sqrt{11,250}$$

11,250
2 \ 5625
75 \ 75

$$\boxed{x = 75\sqrt{2} \ miles}$$

4. A ramp rises a vertical distance of 9 inches for each 40 inches of horizontal distance. If the ramp rises a total of 180 inches, what is the length of the slanted surface of the ramp? (Sketch a diagram.)
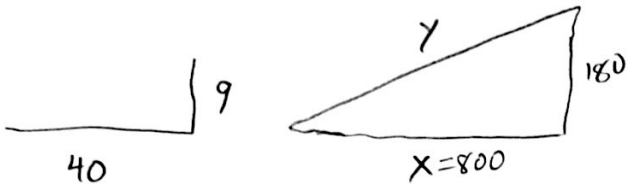
$$180^2 + 800^2 = y^2$$
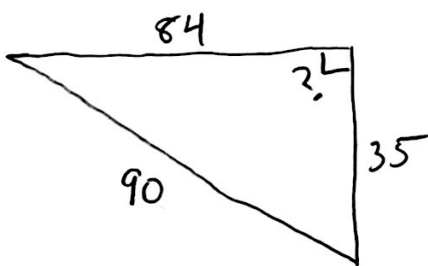
$$32,400 + 640,000 = y^2$$

$$672,400 = y^2$$

$$\frac{9}{180} = \frac{40}{x}$$

$$9x = 7200$$

$$x = 800$$

$$y = \sqrt{672,400}$$

$$\boxed{y = 820 \text{ inches}}$$

5. Charlie walks 35 yards due north, then makes a turn to the left and continues walking 84 yards in a straight line. The straight-line distance between Charlie and her starting point is 90 yards. Did Charlie turn to walk due west? Explain.

$$35^2 + 84^2 \ ? \ 90^2$$

$$1225 + 7056 \ ? \ 8100$$

$$8281 \neq 8100$$

Since $a^2 + b^2 \neq c^2$, the 84 & 35 are not perpendicular (not rt $\triangle$), so the 84 yards was NOT due west.

6. David believes he drew two perpendicular segments with a common endpoint, where one segment is 16 mm long, and the other segment is 63 mm long. Brian thinks the two segments are not perpendicular, but no one has a protractor to measure the angle. You decide to measure the distance between the uncommon endpoints and see that it is 65 mm. Who is correct, David or Brian? Explain your reasoning.

common endpoint
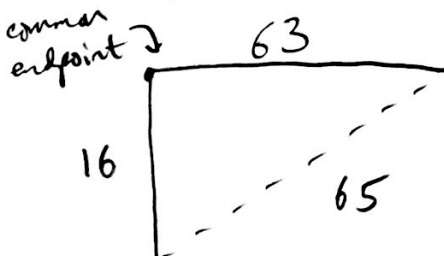
$$16^2 + 63^2 \ ? \ 65^2$$

$$256 + 3969 \ ? \ 4225$$

$$4225 = 4225$$

Since $a^2 + b^2 = c^2$, we can conclude that we have a right $\triangle$ and the two segments are perpendicular.