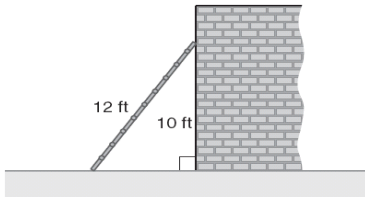**NC MATH 2 NCFE STUDY GUIDE**

Unit 5 – Trigonometry
Pythagorean Theorem
1. A 12-foot ladder is leaning against the side of a building. The top of the ladder reaches 10 feet up the side of the building. Approximately how far is the bottom of the ladder from the base of the building?


2. A baseball diamond is a square with a side length of 90 feet. To the nearest foot, what is the distance between first base and third base?
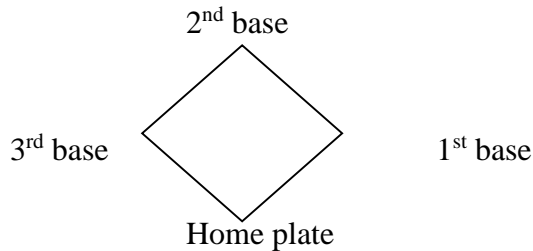

3. A flower garden is in the shape of a right triangle. One leg of the triangle is 6 ft long and the hypotenuse is 12 ft long. What is the length of the other leg?

4. Which of the following sets of numbers represents a Pythagorean Triple?
   A { 10, 5, 12}
   B { 2, 4, 5}
   C {1, 2, 3 }
   D {14, 48, 50 }
5. Which of the following sets of numbers does NOT represent a Pythagorean Triple?
   A {34, 16, 30}
   B {10, 24, 26}
   C {19, 21, 23}
   D {5, 12, 13}
6. A right triangle has legs of lengths 9 cm and 12 cm. What is the length of the hypotenuse?

7. A triangle has legs which measure 15 inches and 20 inches. Find the length of the hypotenuse.

8. A 20-ft-long wire is used to support a television antenna. The wire is connected to the antenna 15 ft above the ground. How far away from the base of the tower will the other end of the wire be located?

9. Gina is making a quilt in the shape of a right triangle. The measurement of the diagonal of the quilt is 36 in. long. The width of the quilt is 15 in. long. What is the approximate length?

10. The drawing shows how three squares can be joined to form a triangle.
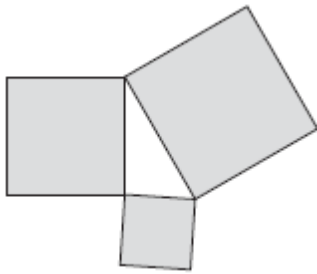
Which set of squares could form a right triangle?

A

7

5

4

B

3.5

4

4.5

C

1.5

2

2.5

D

5

3

3
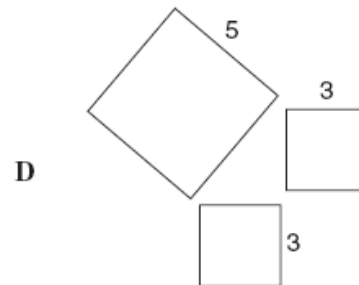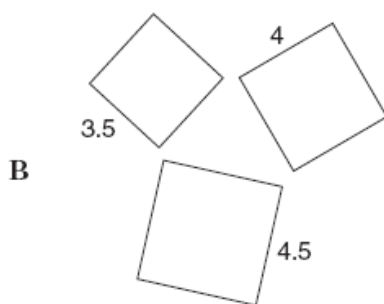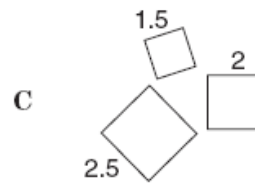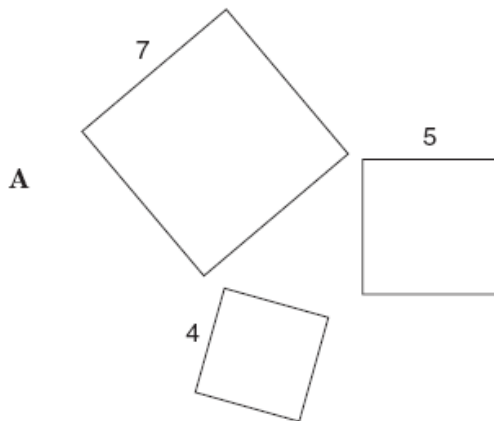
SOH CAH TOA

Use this when you are trying to find the side of a right triangle.

Sine
Opposite
Hypotenuse

$$\sin(\theta) = \frac{opp}{hyp}$$

Cosine
Adjacent
Hypotenuse
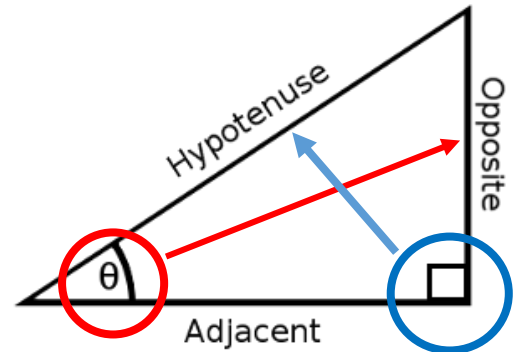
$$\cos(\theta) = \frac{adj}{hyp}$$

Tangent
Opposite
Adjacent

$$\tan(\theta) = \frac{opp}{adj}$$

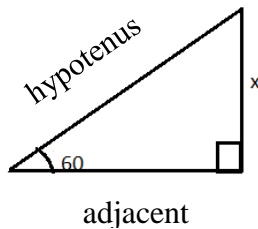How to label the sides as opposite, hypotenuse, and adjacent.

Straight across from the angle we are using (the angle that is measured or labeled) is the opposite side.
Straight across from the right angle is the hypotenuse.
The third side that is left is the adjacent side.

Examples:

Solve for x.
Step 1. Label sides as opposite, hypotenuse, and adjacent.
Step 2. Choose which trig function (sine, cosine, or tangent) to use based on which sides are labeled.

Step 3. Set up the right equation.
Step 4. Solve for the variable.

Tangent uses the angle, the opposite, and adjacent sides to solve for the variable.
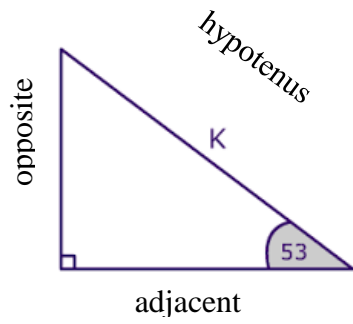$$\tan(\theta) = \frac{opp}{adj}$$
$$\tan(60) = \frac{x}{13}$$
$$13 * \tan(60) = x$$
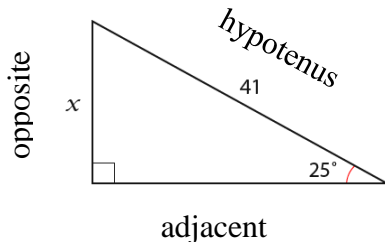$$22.5167 = x$$
So the opposite side measures 22.5167 cm

opposite

hypotenus

K

53

adjacent

$$\cos(53) = \frac{45}{k}$$

$$k * \cos(53) = 45$$

$$k = \frac{45}{\cos(53)}$$

$$k = 74.7738$$

opposite

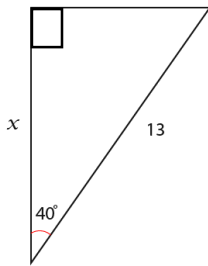*hypotenus*

41

x

25°

adjacent

$$\sin(25) = \frac{x}{41}$$

$$41 * \sin(25) = x$$

$$17.3273 = x$$

You try these:
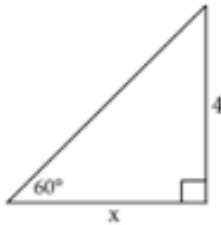
11. Solve for x.

x

13

40°

12. Solve for x.

7

x

35°

13. Solve for x.
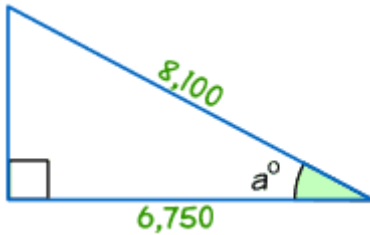
4

60°
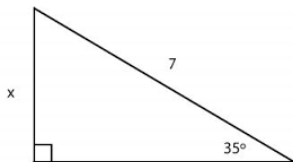
x

SOH CAH TOA inverse

You use the same equations as SOHCAH TOA, but you have to use the inverses when solving for an angle.
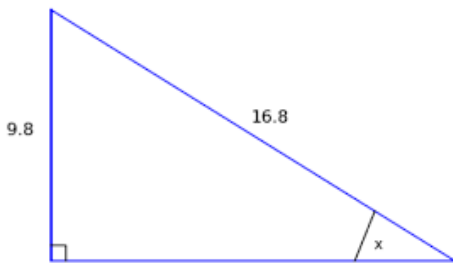
Example:

Solve for a.

$$\cos(a) = \frac{6{,}750}{8{,}100}$$

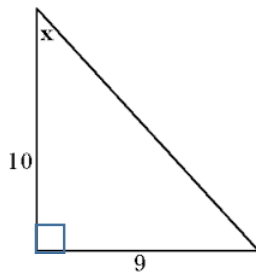$$\cos^{-1}\left(\frac{6{,}750}{8{,}100}\right) = a$$

$$34° = a$$

8,100

6,750

$a°$

You try these.

14. Solve for x.

9.8   16.8   x

15. Solve for x.
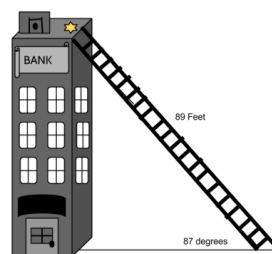
x   10   9

SOH CAH TOA word problems

You use the same methods as SOHCAHTOA, but you have to first set up the picture/problem.

You try these:

16. A ladder 14 feet long rests against the side of a building. The base of the ladder rests on level ground 2 feet from the side of the building. What angle does the ladder form with the ground?

17. How tall is the bank?
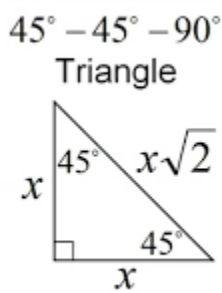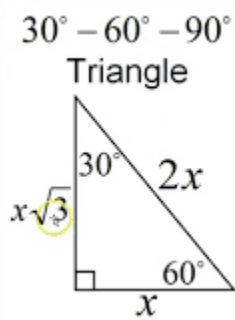
BANK

89 Feet

87 degrees

18. A 24-foot ladder leaning against a building forms an 18° angle with the side of the building. How far is the base of the ladder from the base of the building?

19. What's the angle of elevation from the ground to the plane?
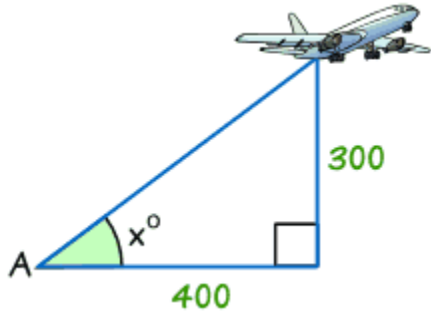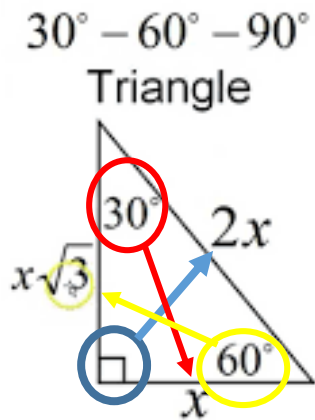

Special Right Triangles
You can use these shortcuts when you know the triangle is either a 30-60-90 or a 45-45-90.

$30° - 60° - 90°$ Triangle

$45° - 45° - 90°$ Triangle

30-60-90 Rules:
Short leg * $\sqrt{3}$ = long leg
Short leg * 2 = hypotenuse

45-45-90 Rules:
Leg * $\sqrt{2}$ = hypotenuse

How to label the sides of a 30-60-90 triangle.

$$30° - 60° - 90°$$
Triangle

Straight across (opposite) from the right angle is the hypotenuse.
Straight across (opposite) from the 30 degree angle is the short leg.
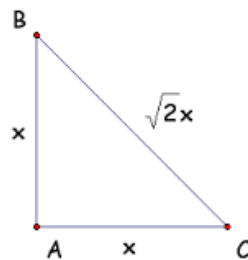Straight across (opposite) from the 60 degree angle is the long leg.

How to label the sides of a 45-45-90 triangle.

$$45° - 45° - 90°$$
Triangle
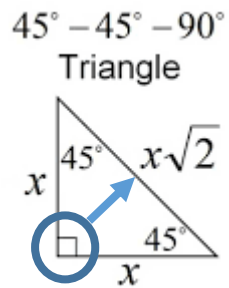
Straight across (opposite) from the right angle is the hypotenuse.
The other two sides are the legs.

You try these:

20. Solve for x.

21. Solve for x and y.