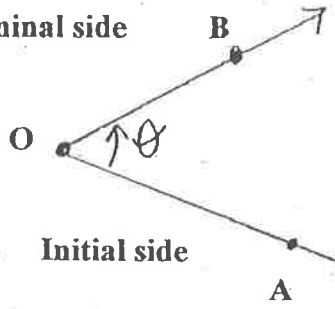
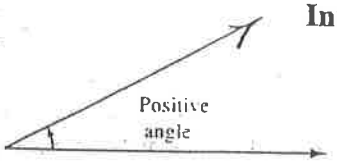
1.1 Angles, Degrees, and Special Right Triangles (page 2)
TRIGONOMETRY

Angles in General

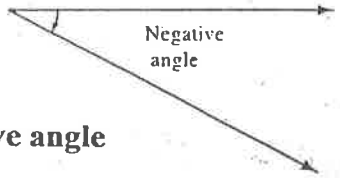
An angle is formed by two rays with the same end point. The common endpoint is called the *vertex* and the rays are called *sides* of the angle.



angle Ø also angle AOB or angle BOA



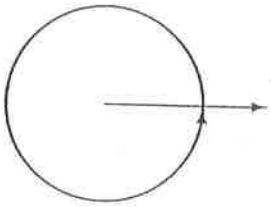
Positive angle



negative angle

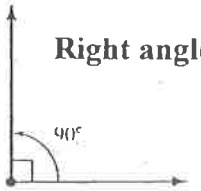
Degree Measure

One way to measure the size of an angle is with degree measure. The angle formed by rotating a ray through one complete revolution has a measure of 360 degrees.

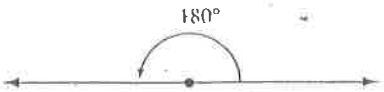


One complete revolution = 360°

Right angle (90°)



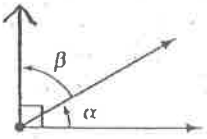
straight angle (180°)



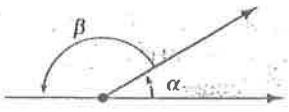
acute angle (< 90°)

Obtuse angle (>90°)

complementary angles
(2 ∠s ADDS UP TO 90)



supplementary angles
(2 ∠s ADDS UP TO 180)



EXAMPLE 1 Give the complement and the supplement of each angle.

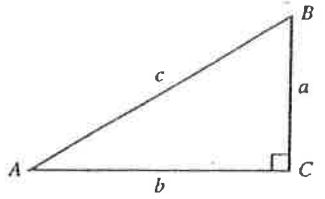
a. 40° b. 110° c. θ

Solution

A *right triangle* is a triangle in which one of the angles is a right angle.

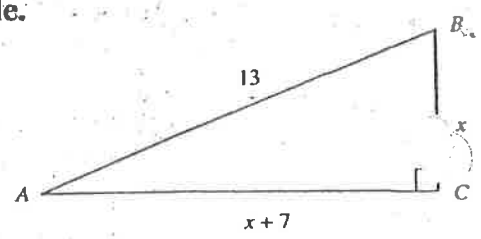
PYTHAGOREAN THEOREM

In any right triangle, the square of the length of the longest side (called the hypotenuse) is equal to the sum of the squares of the lengths of the other two sides (called legs).

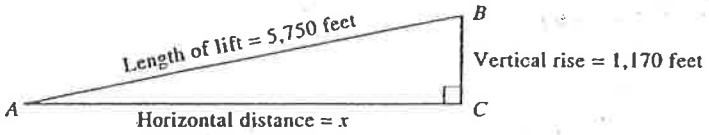


If $C = 90°$,
then $c^2 = a^2 + b^2$

EXAMPLE 2 Solve for x in the right triangle.



EXAMPLE 3 Table 1 in the introduction to this section gives the vertical rise of the Forest Double chair lift (Figure 9) as 1,170 ft and the length of the chair lift as 5,750 ft. To the nearest foot, find the horizontal distance covered by a person riding this lift.



THE 30°–60°–90° TRIANGLE

In any right triangle in which the two acute angles are 30° and 60°, the longest side (the hypotenuse) is always twice the shortest side (the side opposite the 30° angle), and the side of medium length (the side opposite the 60° angle) is always $\sqrt{3}$ times the shortest side (Figure 11).

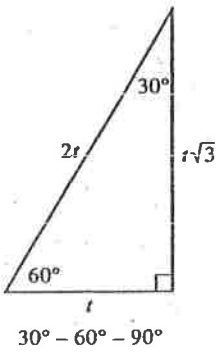


Figure 11

EXAMPLE 4 If the shortest side of a 30°–60°–90° triangle is 5, find the other two sides.

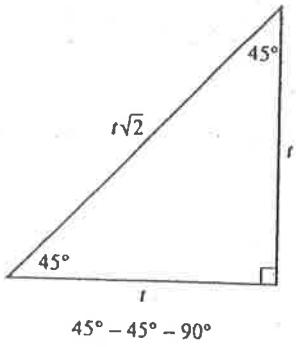
It is always a good idea to draw a picture to visualize data!

EXAMPLE 5 A ladder is leaning against a wall. The top of the ladder is 4 ft above the ground and the bottom of the ladder makes an angle of 60° with the ground (Figure 14). How long is the ladder, and how far from the wall is the bottom of the ladder?

Solution

THE 45°–45°–90° TRIANGLE

If the two acute angles in a right triangle are both 45°, then the two shorter sides (the legs) are equal and the longest side (the hypotenuse) is $\sqrt{2}$ times as long as the shorter sides. That is, if the shorter sides are of length t, then the longest side has length $t\sqrt{2}$ (Figure 16).



45° – 45° – 90°

Figure 16

EXAMPLE 6 A 10-ft rope connects the top of a tent pole to the ground. If the rope makes an angle of 45° with the ground, find the length of the tent pole

It is always a good idea to draw a picture to visualize data!

Assignment # 1: Pages 11-14: Problems #1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46,49,52,55,58,61,64; Start with one and add three;