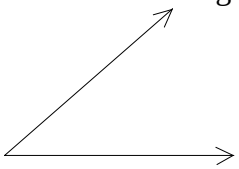
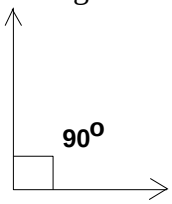
Angles and Triangles

An angle is formed when two rays have a common starting point or vertex.

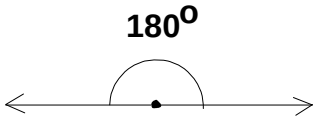


The measure of an angle is given in degrees, with a complete revolution representing 360 degrees.

Some familiar angles include a right angle, which measures 90 degrees.

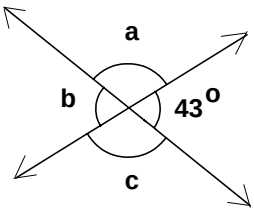


Another familiar angle would be a straight angle which measures 180 degrees.

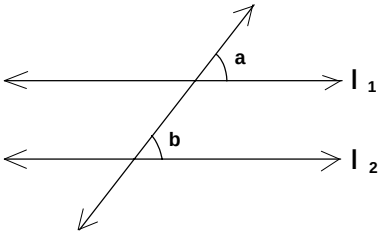


An acute angle is an angle, which measures between 0 and 90 degrees.
An obtuse angle is an angle, which measures between 90 and 180 degrees.

When two lines intersect, if the measure of one angle is known then all angles can be determined since a straight angle measures 180 degrees. In other words the sum of the measure of two adjacent angles will measure 180 degrees.



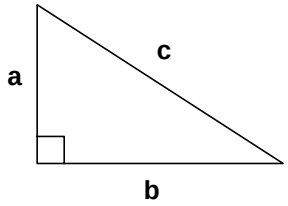
In the above figure, given the 43 degree angle, we can calculate the measure of angle a by subtracting 43 degrees from 180 degrees to obtain 137 degrees. In a similar fashion we can calculate angle b as 43 degrees and angle c as 137 degrees. Notice that the adjacent angles add up to 180 degrees while vertical angles (angles on opposite sides of intersection) have the same measure.
A similar situation arises when parallel lines are intersected by a line (called a transversal). It seems logical that when this occurs the angles created by the transversal with each parallel line would be the same. In other words it seems that the transversal would intersect each of the parallel lines at the same angle. This is the case.



In the above figure angle a and angle b would be the same. Then like the intersecting lines discussed earlier, if the measure of one angle is known, in the case of parallel lines cut by a transversal, then the measure of all angles could be calculated based on the straight angle which measures 180 degrees.

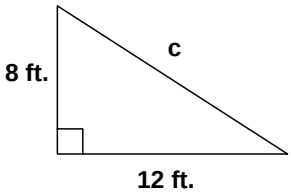
A triangle is a closed three-sided figure. The sum of the three inside angles of a triangle will measure 180 degrees. In addition, the largest inside angle will be opposite the longest side and the smallest inside angle will be opposite the shortest side. The inside angles of a triangle are proportional to opposite sides.

A right triangle is a triangle with one inside angle that measures 90 degrees.



The triangle above is a right triangle. The right angle (90 degrees)is usually represented as a square instead of an arc. The side of the triangle opposite the right angle is called the hypotenuse and is the largest side. The other two sides of the triangle are simply referred to as legs. The Pythagorean theorem relates the length of the sides of a right triangle with the following formula.

$c^2=a^2+b^2$, where c is the length of the hypotenuse, and a and b represent the two legs. The Pythagorean Theorem is used to find the missing side of a right triangle when the other 2 sides are known.



For the above figure, the missing side is the hypotenuse, which can be found using the Pythagorean theorem.

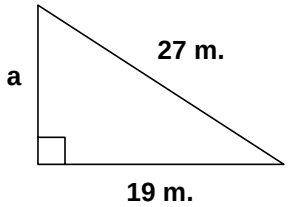
$c^2=a^2+b^2$

$c^2=8^2+12^2$

$c^2=64+144$

$c^2=208$

$c=\sqrt{208}$ ft. or 14.42 ft. if rounded to the nearest hundredth of a foot.



For the above figure, the missing side is one of the legs, which can be found using the Pythagorean theorem.

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

$27^2=a^2+19^2$

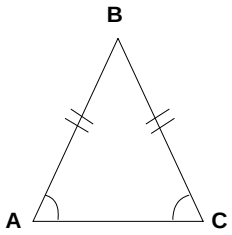
$a^2=27^2-19^2$

$a^2=729-361$

$a^2=368$

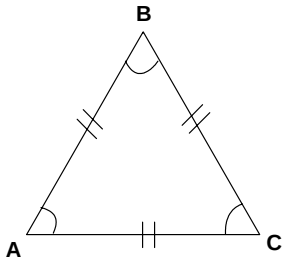
$a=\sqrt{368}$ m. or 19.18 m. rounded to the nearest hundredth of a meter.

An isosceles triangle is a triangle with two sides equal. The inside angles opposite the equal sides are also equal.



Triangle ABC above is an isosceles triangle. Sides AB and BC are equal as are inside angles A and C.

An equilateral triangle has all sides equal as well as all angles.

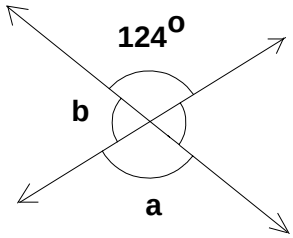


For the equilateral triangle above, all the sides are equal and each inside angle measures 60 degrees.

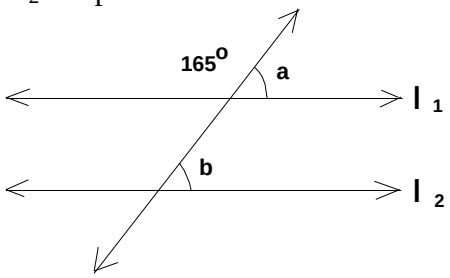
Problem Set 1:

Find the measure of angles a and b for the figures below.

1.

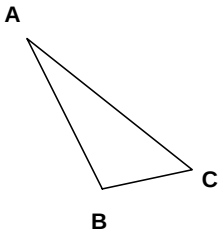


2. l_1 and l_2 are parallel

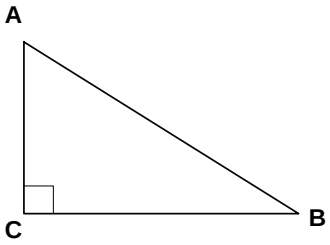


Find angle A for the figures below.

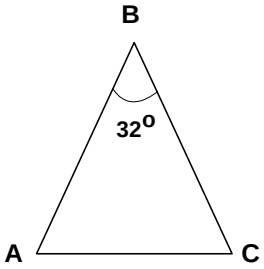
3. Angle B=108° and angle C=47°



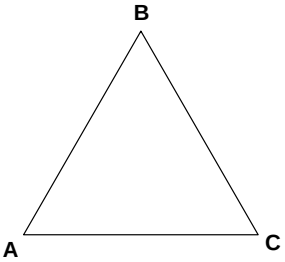
4. Angle B=37°



5. Side AB is equal to side BC

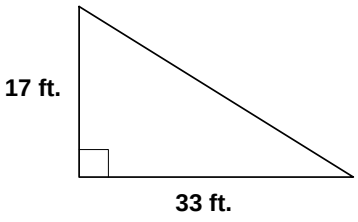


6. All sides are equal

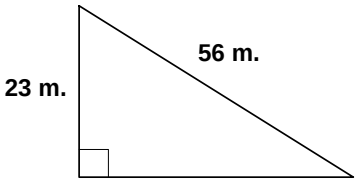


Find the unknown side for each triangle below. Round answer to nearest hundredth.

7.



8.



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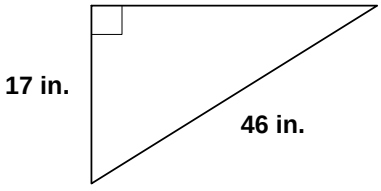
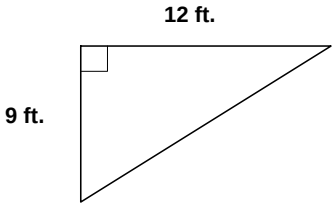


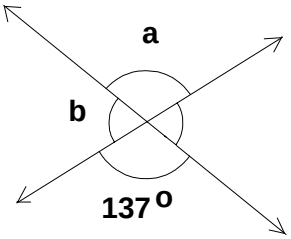
10.



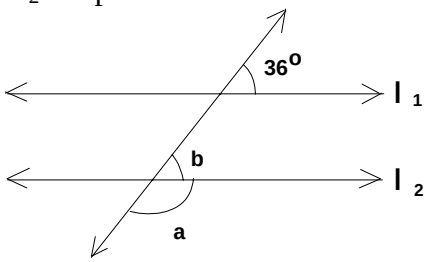
Problem Set 2:

Find the measure of angles a and b for the figures below.

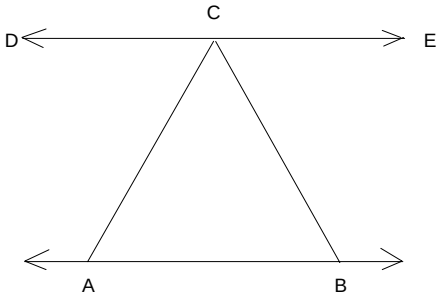
1.



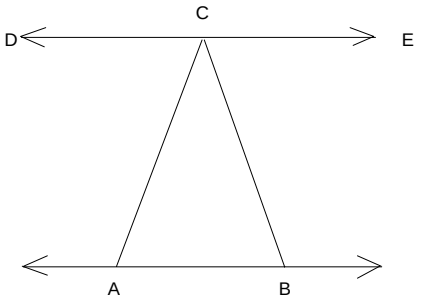
2. l_1 and l_2 are parallel



3. For the figure below, find the measure of angles CAB and BCE. Triangle ABC is an equilateral triangle and line DE is parallel to line AB.

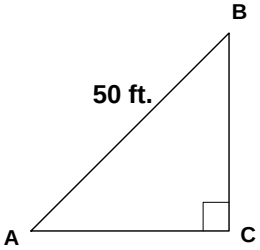


4. Triangle ABC is an isosceles triangle with side AC equal to side BC. Angle ACB measures 35 degrees. What are the measures of angles CAB and BCE.

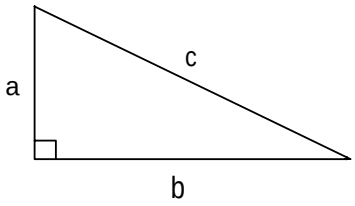


The triangle below is an isosceles right triangle.

5. Find the measure of angle CAB.
6. Find the length of side AC.



Use the triangle below for problems 7 to 10. Round answer to nearest hundredth.



7. Given: a = 9, b =11, Find c.
8. Given: c = 27, a = 13, Find b.
9. Given: c = 20, a = 12, Find b.
10. Given: a = 6, b = 8, Find c.