Section 9.3 Area of Triangles

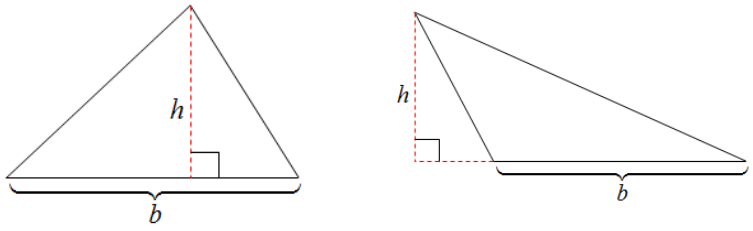
Note: A calculator is helpful on some exercises. Bring one to class for this lecture.

OBJECTIVE 1: Determining the Area of Oblique Triangles

A familiar formula for the area of a triangle is $\text{Area} = \frac{1}{2}bh$ where b is the length of the base of the triangle and h is the length of the height, or altitude, of the triangle.

Area of a Triangle

In any triangle, the area is given by $\text{Area} = \frac{1}{2}bh$ where b is the length of the base of the triangle, and h, is the length of the altitude drawn to that base (or drawn to an extension of that base.)



If the height of a triangle is not known, then the formula $\text{Area} = \frac{1}{2}bh$ cannot always be readily used.

In this section we will develop alternate formulas to find the area of a triangle.

Area of a Triangle

If A, B, and C are the measures of the angles of any triangle and if a, b, and c are the lengths of the sides opposite the corresponding angles, then the area of triangle ABC is given by

$$\text{Area} = \frac{1}{2}bc\sin A \text{ or } \text{Area} = \frac{1}{2}ac\sin B \text{ or } \text{Area} = \frac{1}{2}ab\sin C.$$

We must have a SAS (side-angle-side) triangle before using these formulas. If not enough information is known, use the Law of Sines or the Law of Cosines to determine the needed information.

EXAMPLES. Determine the area of each triangle. Round your answer to two decimal places.

OBJECTIVE 2: Using Heron's Formula to Determine the Area of an SSS Triangle

IN CLASS: Work Example 2 in Section 9.3. Use the Law of Cosines to determine the area of an SSS Triangle.

Alternatively you can use Heron's Formula for determining the area of a triangle given the side measures.

Heron's Formula

Suppose that a triangle has side lengths of a, b, and c. If the **semiperimeter** is $s = \frac{1}{2}(a+b+c)$, then the area of the triangle is

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}.$$

Redo 9.3 Example 2 above using Heron's Formula

9.3.15 Use Heron's Formula to determine the area of the triangle. Round your answer to two decimal places.

OBJECTIVE 3: Solving Applied Problems Involving the Area of Triangles

9.3.17 A triangular piece of real estate is priced at $_____/sq foot. Determine the cost of the triangular piece of land if two sides of the lot measure _____ and _____ feet and the angle between these two sides is _____. Round to the nearest dollar.

9.3.20 Determine the area of the cross section of a house. (Copy the diagram your instructor draws on the board.