

Lesson Plans - Jan. 21

Housekeeping

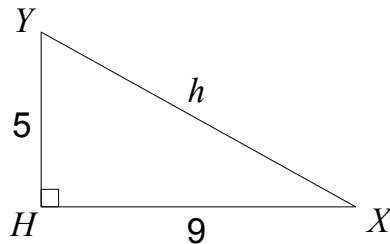
- Email address
- Office hours (Currently: M 2-3, W 1-2, R 9-10)
- Calculator needed!

Section 1.4: Inverse Trigonometric Functions Involving Acute Angles

1. In a right triangle, the non-right angles are acute. Fill in the following table: Consider the

A	$\sin A$
5°	0.087
10°	0.174
15°	0.259
20°	0.342
25°	0.423
30°	0.500
35°	0.574
40°	0.643
45°	0.707
50°	0.766
55°	0.819
60°	0.866
65°	0.906
70°	0.940
75°	0.966
80°	0.985
85°	0.996

following triangle:



From the table, try to come up with the best approximation of $\angle X$ that you can. (You might have to solve for the hypotenuse first).

$$h^2 = 5^2 + 9^2 = 25 + 81 = 106,$$

so $h = \sqrt{106} \approx 10.30$.

If you know the three sides of a triangle, there's only one possibility of what it looks like.

This means there should be a way to figure out what the angles of the triangle are. If we know that we are dealing with a right triangle, we could use the table above to approximate the angle, knowing its sine. For example, we actually know:

$$\sin X = \frac{5}{10.30} \approx 0.485,$$

so we can guess that $\angle X$ has a measure between 25° and 30° , which we can approximate by finding the sines of 26° , 27° , 28° , and 29° .

2. Or, we could use **inverse trig functions**. For now, we can think of these as functions which undo the trig functions we know. The way these work is:

$$\text{If } \sin A = n, \text{ then } A = \sin^{-1} n,$$

where \sin^{-1} is pronounced **sine inverse**. Given the triangle above, we know that

$$\sin X = \frac{5}{10.30},$$

so

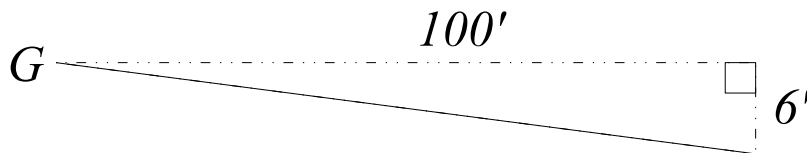
$$X = \sin^{-1} \left(\frac{5}{10.30} \right).$$

By putting this into the calculator, we get $X \approx 29.04^\circ$. Then, since the non-right angles in a right triangle are complementary, we know that $Y \approx 60.96^\circ$. Now we know all the sides and all the angles in the triangle, so we have **solved** the triangle.

3. Examples:

- (a) (# 11W in the book) $\triangle XYH$ has $H = 90^\circ$, $X = 40^\circ$ and $Y = 50^\circ$. Explain why this is not enough information to solve the triangle.
- (b) A road is posted as a 6% grade down hill. This means that for every 100 feet of horizontal distance, the road drops by 6 feet. By what angle does the road drop?

Answer. First, we should draw a picture:



We want to find the measure of $\angle G$. We have the side opposite $\angle G$ and the side adjacent to it, so we want to use the tan function. We know

$$\tan G = \frac{6}{100},$$

so

$$G = \tan^{-1} \left(\frac{6}{100} \right) \approx 3.4^\circ.$$

Homework

Read pages 37-39 in the book, and do the following problems:

Section 1.4: #1, 2, 3, 4, 7, 8, 11W, 12, 13, 16, 17