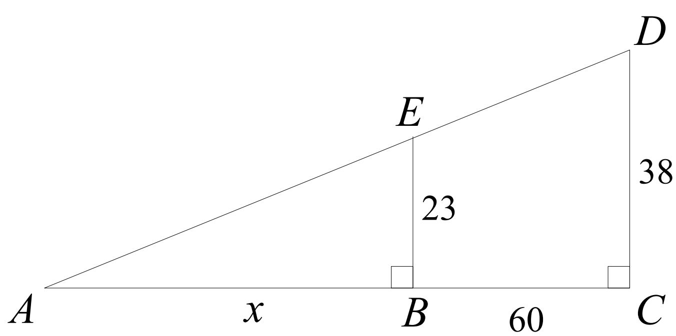
Lesson Plans - Jan. 28

Housekeeping

- Emails! (do I have all addresses?)
- Office hours (Currently: M 2-3, W 1-2, R 9-10)
- Quiz next Thursday (Ch. 1) - Feb. 4
- Final is hard!
- How long is the homework taking?
- Chapter 1 Review Problems: http://math.arizona.edu/ trig

Review Problems

1. Solve for x:



Answer. First, we can see that $\Delta ABE \sim \Delta ACD$, since $\angle B = \angle C$, and both triangles include $\angle A$. So, $\angle D = \angle E$. Since we have similary triangles, we can set up a proportion:

$$\frac{23}{38} = \frac{x}{60+x}.$$

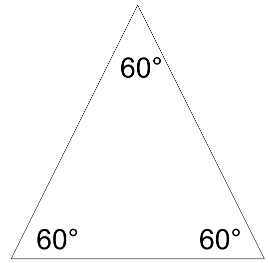
By cross-multiplying, this becomes:

$$\begin{aligned} 23(60+x) &= 38x \\ 1380 + 23x &= 38x \\ 1380 &= 15x \\ 92 &= x. \end{aligned}$$

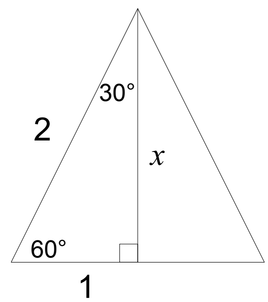
2. Is it possible to have an obtuse, isosceles triangle? If yes, sketch an example. If no, explain why.

Section 1.6: Special Angles

1. **30-60-90 Triangles**
   If we begin with an equilateral triangle, we already know all the angles, and if we know one side, then we have the entire triangle solved.



If we drop a perpendicular from the top point down to the base, since it's an equilateral triangle, this will bisect the base. So, let's say that the equilateral triangle has side lengths of 2.



The bottom leg of the triangle is 1 (since the original side was bisected). We can solve for x by using the Pythagorean Theorem.

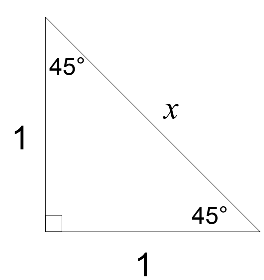
$$2^2 = 1^2 + x^2, \quad \text{so } x^2 = 3, \quad \text{therefore } x = \sqrt{3}.$$

Now we can solve for the trig functions of 30° and 60°, which are the first two of our *special angles*.

$$\begin{aligned} \sin 30^\circ &= \frac{1}{2} & \sin 60^\circ &= \frac{\sqrt{3}}{2} \\ \cos 30^\circ &= \frac{\sqrt{3}}{2} & \cos 60^\circ &= \frac{1}{2} \\ \tan 30^\circ &= \frac{1}{\sqrt{3}} & \tan 60^\circ &= \sqrt{3} \end{aligned}$$

You should memorize these, or at least memorize how to find them quickly!

2. **Isosceles Right Triangles**
   Now, let's draw an isosceles right triangle, with legs of length 1:



We can use the Pythagorean Theorem to solve for x:

$$x^2 = 1^2 + 1^2 = 1 + 1 = 1, \quad \text{so } x = \sqrt{2}.$$

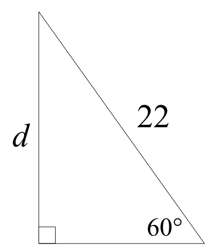
So now we can solve for the trig functions of the third special angle, 45°:

$$\begin{aligned} \sin 45^\circ &= \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} \\ \cos 45^\circ &= \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} \\ \tan 45^\circ &= 1. \end{aligned}$$

Memorize these as well!

3. Examples:

   (a) Solve for d exactly:



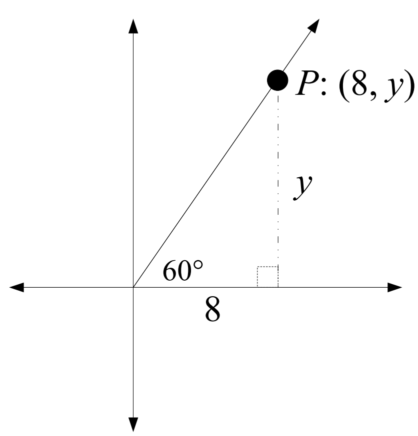
Answer. We can see that

$$\sin 60^\circ = \frac{d}{22},$$

so $d = 22 \sin 60^\circ$. We also know that $\sin 60^\circ = \frac{\sqrt{3}}{2}$. So,

$$\frac{\sqrt{3}}{2} = \frac{d}{22}, \quad \text{and } d = 22 \cdot \frac{\sqrt{3}}{2} = 11\sqrt{3}.$$

   (b) Ray R lies in Quadrant I with its vertex at the origin. This ray makes a 60° angle with the horizontal axis (x-axis). Point P lies on the ray, and its x-coordinate is 8. Find the exact value of its y-coordinate.
   Answer. First, it is important to draw a picture:



We can see that we can sketch the vertical line from P that would make this a picture of a right triangle. In fact, it is a $30-60-90$ triangle. We know that

$$\tan 60^\circ = \frac{y}{8} = \sqrt{3}, \quad \text{so } y = 8\sqrt{3}.$$

So the y-coordinate of point P is $8\sqrt{3}$.

(c) (14W in the book) The graph of $y = x$ makes what angle with the positive ray of the horizontal axis (the x-axis)? Explain how you know.

Homework
Read pages 57-62 in the book, and do the following problems:
Section 1.5: #2, 3, 4, 6, 8, 10, 12, 14W, 15, 18