

These questions are meant to help you gauge your readiness for Non-Euclidean Geometry. Getting the correct answers (which are on the last page) is a good, using a method that works in additional cases is better, but understanding *why* is the gold standard, and one that only you can assess. If you need to use technology to answer more than one of these questions, you are probably not a good fit.

1. A triangle has side with  $a = 7$ ,  $b = 15$ , and  $c = 20$ . Find the measure of angles  $A$ ,  $B$ , and  $C$ .

$$\cos(C) = \frac{a^2 + b^2 - c^2}{2ab}$$

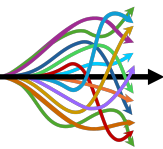
2. Compute  $\cos(\pi/12)$  exactly.

3. Suppose  $a = 12$ ,  $b = 10$ , and  $m\angle C = 75^\circ$ . Calculate the area of  $\triangle ABC$  exactly.

4. Find all values of  $\theta$  that satisfy the following equation ( $0 \leq \theta < 2\pi$ .)

$$\sec(\theta) + \cos(\theta) + 1 = \tan(\theta) \sin(\theta)$$

5. Given an equilateral triangle with side-length 1, what is the side-length of the largest square that can fit inside of it?



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Answers:

1. Using Law of Cosines:  $A = \arccos\left(\frac{24}{25}\right)$ ,  $B = \arccos\left(\frac{4}{5}\right)$  and  $C = \arccos\left(-\frac{3}{5}\right)$ .
2.  $\frac{1+\sqrt{3}}{2\sqrt{2}}$
3.  $15\sqrt{2}(1 + \sqrt{3})$
4. Simplify to  $2\cos(\theta) + 1 = 0$ , so  $\theta = \frac{2\pi}{3}$  and  $\frac{4\pi}{3}$ .
5.  $2\sqrt{3} - 3$