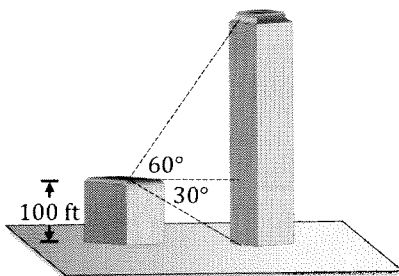


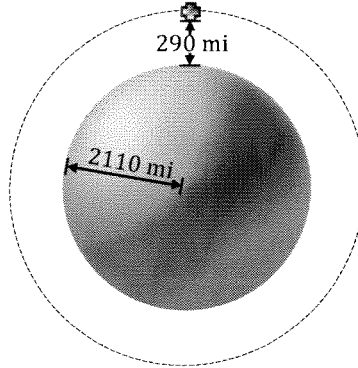
Please show all work and answers in a neat, organized manner in your blue books.

- Perform each of the following:
 - Find an angle of *least positive measure* co-terminal with an angle of measure -675° .
 - Convert $\frac{9\pi}{4}$ radians to degree measure.
 - Find the measure of the angle supplementary to $32^\circ 15'$.
- Given vectors $\mathbf{u} = 3\mathbf{i} - 5\mathbf{j}$ and $\mathbf{v} = -\mathbf{i} + 2\mathbf{j}$,
 - find the magnitude of the vector $\mathbf{w} = 2\mathbf{u} + \mathbf{v}$.
 - find the dot product $\mathbf{u} \cdot \mathbf{v}$.
- For each item below, decide whether the statement is true or false:
 - It is impossible to find an angle θ for which $\sec \theta = -\frac{2}{3}$.
 - If $0 < A < B < \frac{\pi}{2}$, then $\cos A < \cos B$.
 - An angle measure of 3 degrees is larger than an angle measure of 3 radians.
 - For every angle θ , $\cos \theta = \sin\left(\frac{\pi}{2} - \theta\right)$.
- Find $\csc t$ and $\cot t$ given that $\sin t = \frac{\sqrt{3}}{4}$ and $\cos t < 0$.
- Solve the equation $2 \tan s \sin s - \tan s = 0$ for all values s in the interval $[0, 2\pi)$.
- From the top of a small building, the angle of elevation to the top of a nearby, taller building is 60° and the angle of depression to the base of the taller building is 30° . If the small building has a height of 100 feet, what is the height of the taller building?

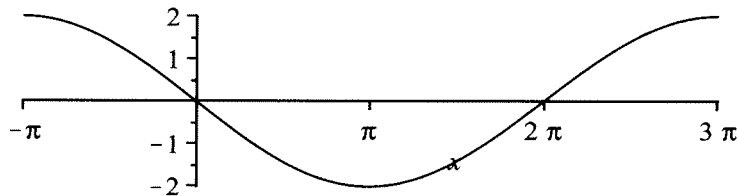


- An arc of length 20π cm is intercepted on a circle of radius 15 cm by a central angle of measure θ . Find the radian measure of θ .
- Verify that $\tan^2 x - \sin^2 x = \tan^2 x \sin^2 x$ is an identity.
- If $\cos A = \frac{3}{5}$, $\sin B = -\frac{5}{13}$, $0 < A < \frac{\pi}{2}$, and $0 < B < \frac{3\pi}{2}$, find each of the following:
 - $\cos(A - B)$.
 - $\sin(A - B)$.
 - The quadrant of angle $A - B$.

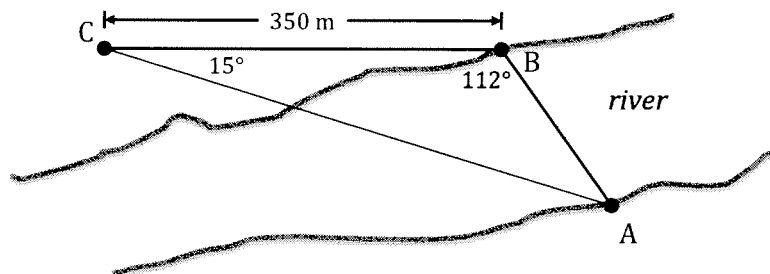
10. Without using a calculator, evaluate $2 \cos^2(15^\circ) - 1$. You must show *all* steps and your final answer must be *exact*.
11. A satellite 290 miles above Mars' surface makes one revolution every 2 hours. What is the linear speed of the satellite in miles per hour (to the nearest mile), given that the radius of Mars is 2110 miles?



12. One period of the graph $f(x) = a \cos(bx + c)$ is shown below. Determine the values of a , b , and c .



13. Without using a calculator, evaluate the trigonometric expressions below. Remember you must show *all* steps and your final answers must be *exact*.
- $\arccos\left(-\frac{\sqrt{2}}{2}\right)$.
 - $\sin\left(2 \arctan\left(\frac{3}{4}\right)\right)$.
14. To find the distance AB across a river, a surveyor laid off on one side a distance of $BC = 350$ m. She then found that the angles B and C formed to be 112° and 15° , respectively. Find AB to the nearest meter. See the figure below.



15. An oblique triangle has sides of length 9.3 cm, 5.7 cm, and 8.2 cm. To the nearest tenth of a degree, find the measure of the largest angle of this triangle.

Trig Identities and Formulas

Sum and Difference Formulas

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Law of Sines

In triangle ABC with sides a, b, c :

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Law of Cosines

In triangle ABC with sides a, b, c :

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

Double Angle Formulas

$$\cos(2A) = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A$$

$$\sin(2A) = 2\sin A \cos A$$

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

Half-Angle Formulas

$$\cos\left(\frac{A}{2}\right) = \pm \sqrt{\frac{1 + \cos A}{2}}$$

$$\sin\left(\frac{A}{2}\right) = \pm \sqrt{\frac{1 - \cos A}{2}}$$

$$\tan\left(\frac{A}{2}\right) = \pm \sqrt{\frac{1 - \cos A}{1 + \cos A}} = \frac{\sin A}{1 + \cos A} = \frac{1 - \cos A}{\sin A}$$