Name: ___________________________________ Date: _________________

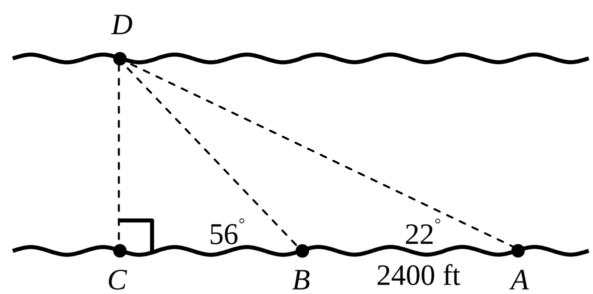
TRIGONOMETRIC APPLICATIONS
ALGEBRA 2 WITH TRIGONOMETRY

The Laws of Sines and Cosine allow us to solve for angles and sides of a triangle given a variety of different physical scenarios. Which formula we use will entirely depend on the information given and sought. In some problems, both formulas will be used in tandem to find a missing quantity.

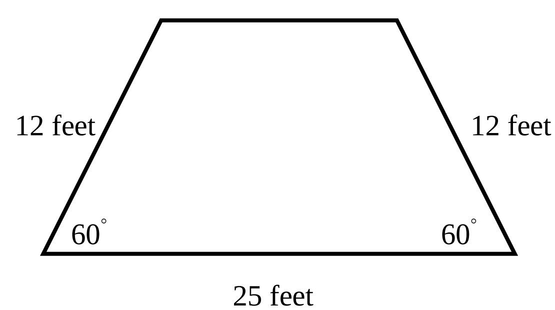
TRIGONOMETRIC APPLICATIONS FORMULAS

Law of Sines: $\frac{\sin A}{a}=\frac{\sin B}{b}$ **LAW OF COSINES**: $c^2=a^2+b^2-2ab\cos C$ **AREA**: $k=\frac{1}{2}ab\sin C$

***Exercise* #1:** To measure the distance across a wide river surveyors use a technique of measuring angles to a fixed point on the other side of the river. In the diagram below, a survey starts a point A and finds $m\angle DAC=22^\circ$. The survey then moves 2400 feet to point B and finds $m\angle DBC=56^\circ$. Using this information, find the length of $\overline{DC}$, the distance across the river, to the nearest foot. Note, although common, this survey technique assumes the river's sides are relatively parallel and straight.

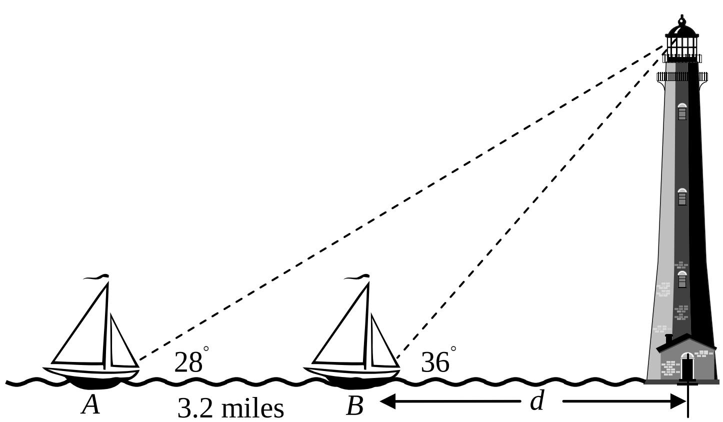


***Exercise* #2:** A carpenter is building a structure in the shape of an isosceles trapezoid whose base angles measure 60°. The base of the trapezoid has a length of 25 feet, while the legs of the trapezoid have lengths of 12 feet. The carpenter would like to stabilize the trapezoid by placing support beams along the diagonals of the trapezoid at a cost of $2.50 per linear foot. Determine the combined cost of the diagonals to the nearest dollar.



***Exercise* #3:** A town planning board wishes to place sod on their village commons that is in the shape of a triangle whose sides have lengths of 120 feet, 165 feet, and 200 feet. If the sod costs $0.35 per square foot, determine the cost, to the nearest dollar, for covering the commons in sod.

***Exercise* #4:** A ship can use angle of elevation to a lighthouse in order to determine how far it is from the shore. A boat starts at point *A* and finds the angle of elevation to the lighthouse measures 28°. After traveling 3.2 miles towards the lighthouse, the angle of elevation now measures 36°. Determine the distance, *d*, the boat is from the base of the lighthouse to the nearest *hundred* feet. There are 5,280 feet in one mile.



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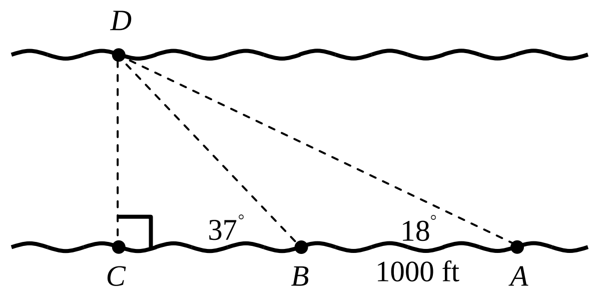
TRIGONOMETRIC APPLICATIONS
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

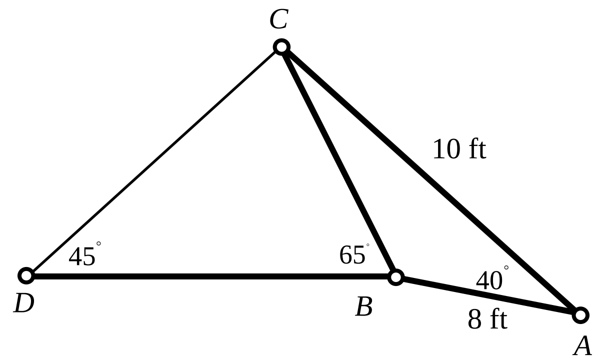
APPLICATIONS

1. Measuring Across Another River – A surveyor would like to measure the distance across a river, similar to *Exercise* #1. The surveyor spots a point D across the river at an angle of 18° from point A as marked on the diagram. The surveyor then moves 1000 feet downstream to point B and measures the angle to D as 37°. Determine the distance across the river from point C to D to the nearest *foot*.



2. A portion of a barn, in the shape of an isosceles triangle, must be painted. The base of the triangle measures 30 feet long and the legs measure 20 feet each. A can of weatherproofing paint will cover 50 square feet of area. What is the minimum number of cans needed to cover this triangular portion? Justify your answer.

3. A crane is being created by four steel members (bold) and a cable, as shown in the diagram below. It is known that $AC = 10$ ft , $AB = 8$ ft, $m\angle A = 40^\circ$, $m\angle CBD = 65^\circ$, and $m\angle D = 45^\circ$.



(a) Determine the length of support member $\overline{BC}$ to the nearest *hundredth* of a foot.

(b) Determine the length of the cable $\overline{CD}$ to the nearest *hundredth* of a foot.

4. Isaac and Albert spot a hot air balloon flying at a low altitude. They decide to calculate its height by standing 400 feet apart on a level surface and measuring the angle of elevation to the balloon. From Albert, the balloon was at an angle of elevation of 62° and from Isaac it was 48°. Determine the height, *h*, of the balloon above the ground to the nearest foot.