

6 Applications of Trigonometry

October 3, 2018 9:58 AM

FMPC 10

updated June 2018

Applications of trigonometry.

146. A kite stuck in a nearby tree. A child standing 25 m from the base of a tree pulls the string tight. If the tree is 30 m tall, approximately how far is the kite from the child to the nearest metre?

147. A surveyor measures the angle of elevation to the top of a building to be 23° . If the surveyor is 1345 feet from the base of the building, how tall is the building to the nearest foot?

148. From the top of a 20 m cliff above a road, the angle of depression to two approaching cars is 25° and 40° respectively. How far apart are the cars to the nearest metre?

$\theta_1 = \theta_2$

$$\tan \theta = \frac{a}{A} = \frac{20\text{m}}{A_G}$$

$$A_G = \frac{20\text{m}}{\tan 25^\circ}$$

$$A_G = 42.89\text{m}$$

$$\tan \theta = \frac{a}{A}$$

$$\tan 40^\circ = \frac{20\text{m}}{A_B}$$

$$A_B = \frac{20\text{m}}{\tan 40^\circ}$$

$$A_B = 23.835$$

$$x = A_G - A_B$$

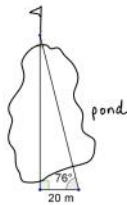
$$x = 42.89 - 23.835 = 19\text{m}$$

149. Two hot air balloons float above the ocean at a height of 1000 feet. From a sailboat an observer measures the angle of elevation to one balloon is 60° and to the other balloon is 50° . [both balloons are on the same bearing from the observer] How far apart are the balloons to the nearest foot?

150. Two boys on opposite sides of the tree below measure the angle of elevation to the top of the tree. If the tree is 175 feet tall, how many feet apart are the boys?



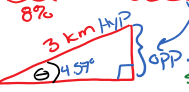
152. While golfing with his father-in-law, Mr. J hits a shot short of a pond. The flag (hole) is directly across the pond from his ball. He paces 20 m to the right of his ball and measures the angle back to the hole to be 76° . How far is the ball from the hole to the nearest metre?



151. Highway sign shows that the road descends at a rate of 8%. Draw a diagram that shows what this means.



If a 3 km section of straight road descends at this grade, what is the drop in elevation?



$$\tan \theta = \frac{O}{A}$$

$$\tan \theta = \frac{8}{100}$$

$$\theta = \tan^{-1}\left(\frac{8}{100}\right) = 4.57^\circ$$

similar triangles
same ratio
diff. size

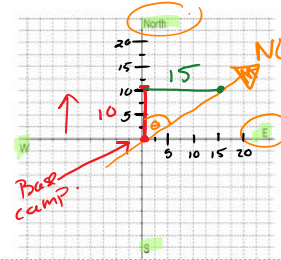
$$\sin \theta = \frac{O}{H}$$

$$\sin(4.57) = \frac{Opp}{3}$$

$$Opp = (\sin(4.57))(3)$$

$$Opp = 0.239 \text{ km}$$

153. A hiker leaves base camp travelling due north at 5 km/h. After two hours, she turns and travels east. Three hours later, she sprains her ankle. At what hour would a rescue team need to travel to reach the injured hiker? How far away is she from base camp? (nearest tenth)



always start @ (0,0)

A) $\tan \theta = \frac{O}{A}$
 $\tan \theta = \frac{15}{10}$
 $\theta = \tan^{-1}\left(\frac{15}{10}\right)$
 $\theta = 56.3^\circ$ NE
 direction

$$\sin \theta = \frac{O}{H}$$

$$\sin(56.3) = \frac{15}{H}$$

$$H = \frac{15}{\sin(56.3)}$$

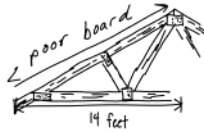
$$H = 18.02 \text{ m}$$

154. A student approaches a large Sequoia tree outside the entrance to the school and wonders how tall the tree is. He paces 150 metres from the base of the tree and measures the angle of elevation to the top of the tree to be 35° . Find the height of the tree to the nearest metre.



SECTA

155. A homeowner wants to cut a new board to replace a decaying roof truss. He can measure the horizontal distance and the angle of inclination but needs to know how long to cut the board. The horizontal distance is 14 feet and the angle of inclination is 24° . Find the distance to the nearest tenth of a foot.



156. An engineer is constructing a Ferris wheel for a downtown park. There are 16 passenger carts and the radius of the wheel is 10 metres. How far apart are the passenger carts to the nearest hundredth of a metre?

Full circle 360°
 $360 \div 16 = 22.5$

distance: d
 16 sections
 10m
 circumference
 $C = 2\pi r$
 $C = 2\pi(10) = 62.8318 \dots \text{m}$
 16 carts $\rightarrow 16$
 $d = 3.93\text{m}$

157. Find the area of the circle to the nearest square centimetre. $[A = \pi r^2]$

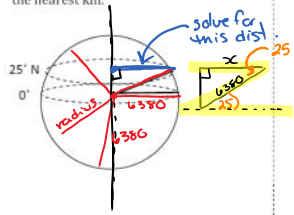


158. Find the perimeter of the octagon inscribed in a circle of radius 8 cm. (Nearest cm) $P = 16 \cdot d$

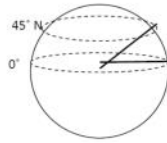
$P = 16 \cdot d$
 $\sin \theta = \frac{\text{op}}{\text{hy}}$
 $\sin 22.5^\circ = \frac{\text{op}}{8}$
 $\text{Opp} = d = (\sin 22.5^\circ)(8)$
 $d = 3.06$
 $P = 16 \cdot d = 16 \cdot (3.06) = 48.98$
 $\approx 49\text{cm}$

Thurs } Finish booklet
 Frid. } up to Q#190
 Mon - Thanksgiving!
 Tues - Quiz + Practice Test
 Wed - Practice - HW Help.
 Thurs - Test
 Friday - new book

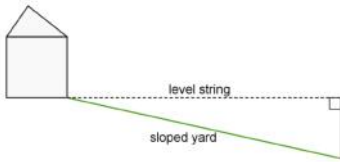
159. Find the length of the 25° line of latitude. The Earth's radius is 6380 km. Answer to the nearest km.



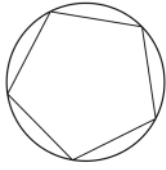
160. Find the length of the 45° line of latitude. The Earth's radius is 6380 km. Answer to the nearest km.



161. Mr. Teespre's backyard slopes away from his house towards the beach. The instructions for his new lawnmower state that the mower should not be used if the slope is greater than 15°. Being a trigonometry specialist, he extends a level string 125 feet from the base of his house. From that point, he measures that the distance along the ground back to his house is 130 m. Is his yard too steep for this mower?

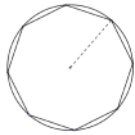


162. A regular pentagon is inscribed in a circle of radius 10 cm. Calculate the perimeter of the pentagon. Answer to the nearest cm.



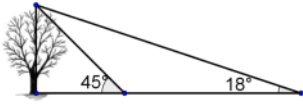
163. A regular decagon (10 sides) is inscribed inside a circle of radius 8 cm. Find the perimeter of the decagon. Answer to the nearest cm.

164. Find the area of the octagon inscribed in a circle of radius 8 cm. Answer to the nearest square cm.



165. A regular hexagon is inscribed in a circle with a radius 18 cm. What would be the side length of the hexagon? Answer to the nearest cm.

166. From a point 15 m from the base of a tree, a woman found the angle of inclination to the top of the tree to be 45° . Her sister found the angle to be 18° from a point farther away from the base of the tree. How far away are the two women away from each other? (nearest tenth of a metre)



More word problems using right triangles:

- Draw a diagram.
 - Fill in known values.
 - Let a variable represent unknown(s).
 - Choose an appropriate strategy to solve for the unknown(s).
 - Interpret the problem.
-

167. Solve the triangle given the following.

$$\begin{aligned}\triangle XYZ \\ x = 9 \text{ cm} \\ \angle Y = 90^\circ \\ \angle Z = 36^\circ\end{aligned}$$