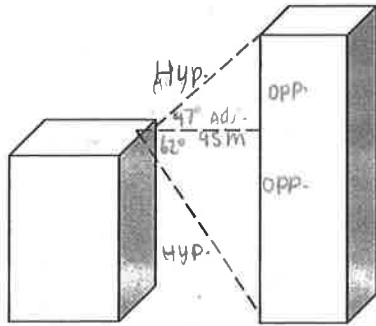


169. Anya stands on top of a building in downtown Victoria. From her position, the angle of elevation to the top of an adjacent building is 47° . The angle of depression to the base of the building is 62° . She is told that the buildings are 45 m apart. Based on this information, what is the height of the taller building to the nearest metre?



$$45(\tan 47) = \left(\frac{\text{opp}}{45}\right) \frac{45}{1}$$

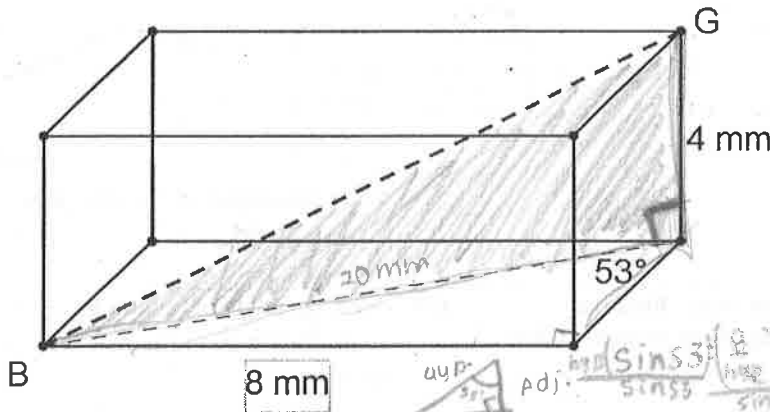
$$\text{opp}_2 = 48.25659195 \text{ m} \Rightarrow B$$

$$45(\tan 62) = \left(\frac{\text{opp}}{45}\right) \frac{45}{1}$$

$$\text{opp}_1 = 84.63269094 \Rightarrow A$$

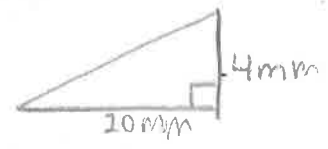
$$\text{opp}_1 + \text{opp}_2 = \boxed{133 \text{ m}}$$

170. Find the length of diagonal BG in the rectangular prism. Answer to the nearest tenth of a millimeter.



$$4^2 + 10^2 = \sqrt{116}$$

$$\text{BG} = 10.8 \text{ mm}$$

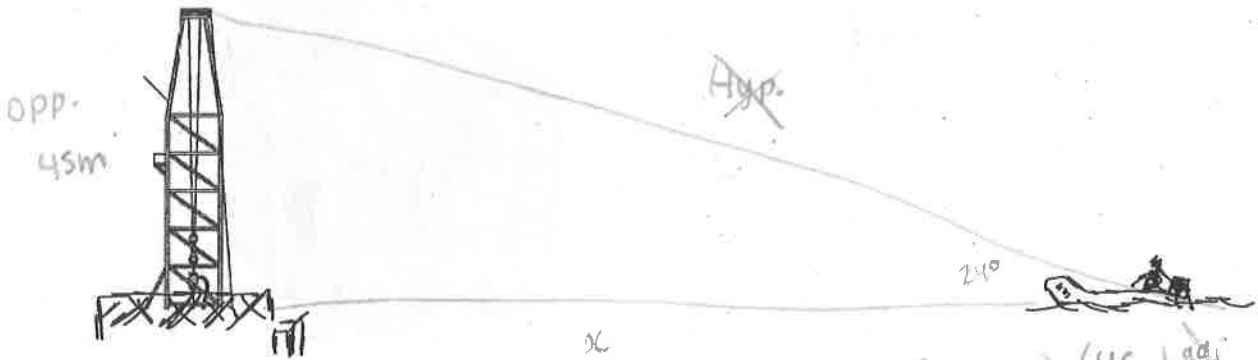


$$\frac{\text{opp}}{\sin 53} = \frac{\text{hyp}}{\sin 90}$$

$$\frac{4}{\sin 53} = \frac{\text{hyp}}{1}$$

$$\text{hyp} = 10 \text{ mm} \Rightarrow A$$

171. The line of sight from an inflatable boat to the top of an oil derrick is 24 degrees. If the derrick is 45 m tall, how far is the boat from its base? (nearest tenth)



$$\frac{\text{opp}}{\tan 24} = \frac{\text{adj}}{\tan 24}$$

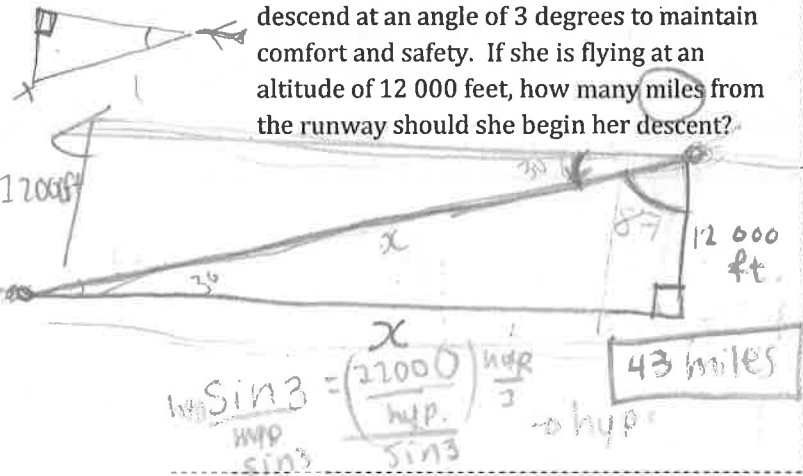
$$\frac{45}{\tan 24} = \frac{\text{adj}}{\tan 24}$$

$$\text{adj} = \boxed{101.1 \text{ m}}$$

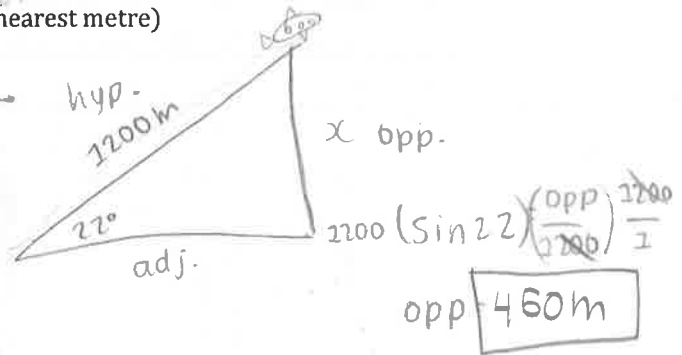


* Why angle of depression?

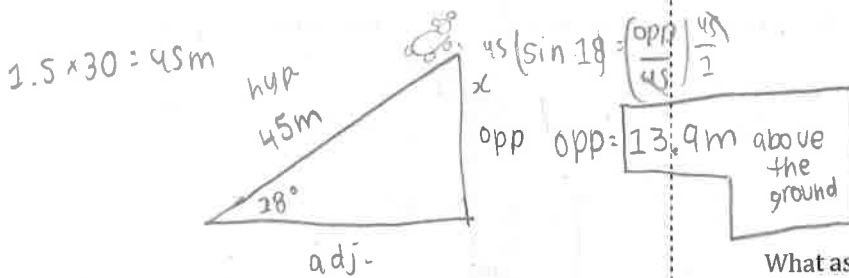
172. A pilot on a level path knows she should descend at an angle of 3 degrees to maintain comfort and safety. If she is flying at an altitude of 12 000 feet, how many miles from the runway should she begin her descent?



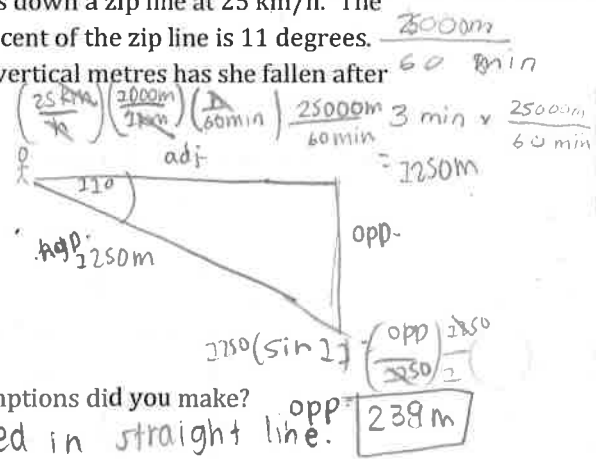
173. An aircraft ascends after takeoff at an angle of 22 degrees. What will be the altitude of the aircraft after it flies at that angle for 1200 m? (nearest metre)



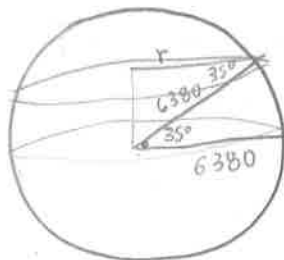
174. A hamster scurries up a ramp at a speed of 1.5 m/s. The ramp is inclined at an angle of 18 degrees. How many metres above the ground will the hamster be after 30 seconds?



175. Anya travels down a zip line at 25 km/h. The angle of descent of the zip line is 11 degrees. How many vertical metres has she fallen after 3 minutes?



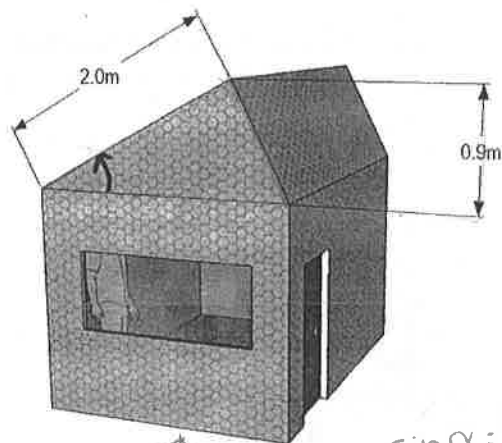
176. The Earth's radius is 6380 km. Find the length of the 35 degree latitude to the nearest 10 km.



Handwritten calculation: $6380 \cos 35 = \frac{\text{adj.}}{6380} \Rightarrow \text{adj.} = 5230 \text{ km}$

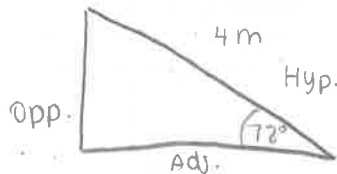
Handwritten calculation: $2\pi r \approx 2\pi (5230) \approx 32840 \text{ km}$

177. Find the angle of inclination at the back of the roof. The "rise" of the roof is 0.9 m. (nearest tenth)



Handwritten calculation: $\sin \alpha = \frac{0.9}{2}$
 $\alpha = \sin^{-1}(\frac{0.9}{2})$
 $\alpha = 26.7^\circ$

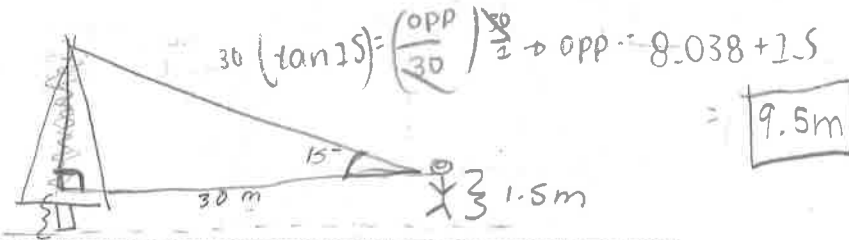
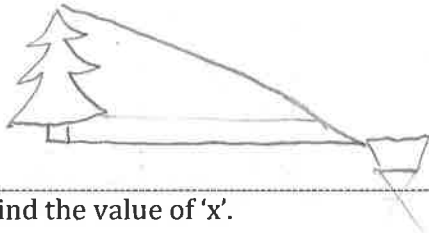
178. A ladder should make an angle of 72° with the ground for maximum safety. If the ladder is 4 m long, how far should it reach up the wall? (nearest tenth)



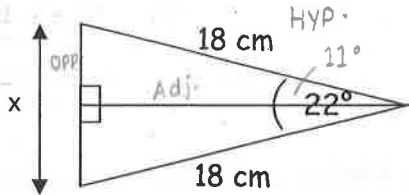
$$4(\sin 72) = \left(\frac{\text{opp}}{4}\right)^{\frac{4}{2}}$$

$$\text{opp} = \boxed{3.8\text{m}}$$

179. The angle of elevation to the top of a tree, measured on a 1.5 m transit from a distance of 30 m, is 15° . Find the height of the tree. (nearest tenth)



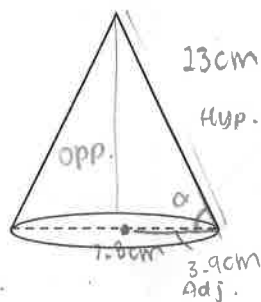
180. Find the value of 'x'.



$$18(\sin 11) = \left(\frac{\text{opp}}{18}\right)^{\frac{18}{2}}$$

$$\text{opp} = 3.434561917 \times 2 = \boxed{6.9\text{cm}}$$

181. Mr. J has developed the ideal ice cream cone. The cone has a slant height of 13 cm and a diameter of 7.8 cm. Find the angle that the curved surface makes with the diameter.



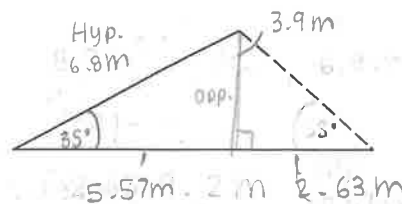
$$\cos \alpha = \frac{3.9}{13}$$

$$\alpha = \cos^{-1}\left(\frac{3.9}{13}\right)$$

$$\alpha = \boxed{72.5^\circ}$$

182. Mr. J continues to work on his isolated surf hut. Below is two-thirds of a roof truss he wants to complete. Find the length of wood he must cut (nearest tenth) to complete the truss. The long side is 8.2 m and the short side is 6.8 m. The angle between them is 35° .

★ ROOF TRUSS: OUTLINE ★



$$3.9^2 + 2.63^2 = \boxed{4.7\text{m}}$$

$$6.8(\cos 35) = \left(\frac{\text{adj}}{6.8}\right)^{\frac{6.8}{2}}$$

$$\text{adj} = 5.57\text{m} \Rightarrow A$$

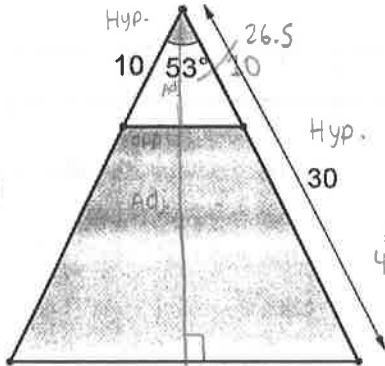
$$6.8(\sin 35) = \left(\frac{\text{opp}}{6.8}\right)^{\frac{6.8}{2}}$$

$$\text{opp} = 3.9\text{m} \Rightarrow C$$

$$3.9\text{m} + 5.57\text{m} = 10.8628467 \Rightarrow D$$



183. Both triangles (large and smaller inset) are isosceles. Find the area of the shaded trapezoid to the nearest tenth of a square unit.

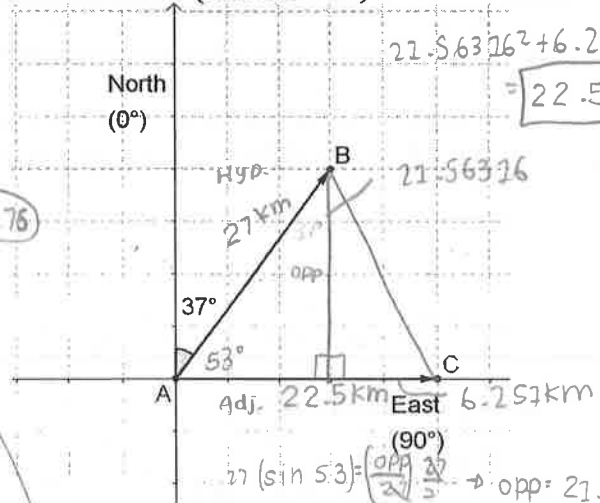


$$\begin{aligned} &359.3846 - \\ &39.93176 \\ &= \boxed{319.5} \end{aligned}$$

$$\begin{aligned} \text{AREA: } &8.94934 \times \\ &4.461978 = \boxed{39.93176} \end{aligned}$$

$$\begin{aligned} \text{BIG: } &_{30} (\cos 26.5) = \left(\frac{\text{adj}}{30}\right) \frac{30}{2} \rightarrow \text{adj} = 26.848 \\ &_{30} (\sin 26.5) = \left(\frac{\text{opp}}{30}\right) \frac{30}{2} \rightarrow \text{opp} = 13.3859 \\ \text{AREA: } &26.848 \times 13.3859 = \boxed{359.3846} \\ \text{SMALL: } &_{26.5} (\cos 26.5) = \left(\frac{\text{adj}}{26.5}\right) \frac{26.5}{2} \rightarrow \text{adj} = 8.94934 \\ &_{26.5} (\sin 26.5) = \left(\frac{\text{opp}}{26.5}\right) \frac{26.5}{2} \rightarrow \text{opp} = 4.461978 \end{aligned}$$

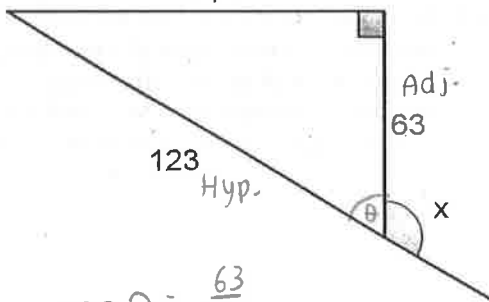
184. From a fire station in central BC, Georgia travels on a bearing of 37° at 6 km/h. Shelby leaves the station at the same time travelling due east at 5 km/h. How far apart are they after 4.5 hours? (Nearest tenth)



$$\begin{aligned} &21.56316^2 + 6.251^2 \\ &= \boxed{22.5 \text{ km}} \end{aligned}$$

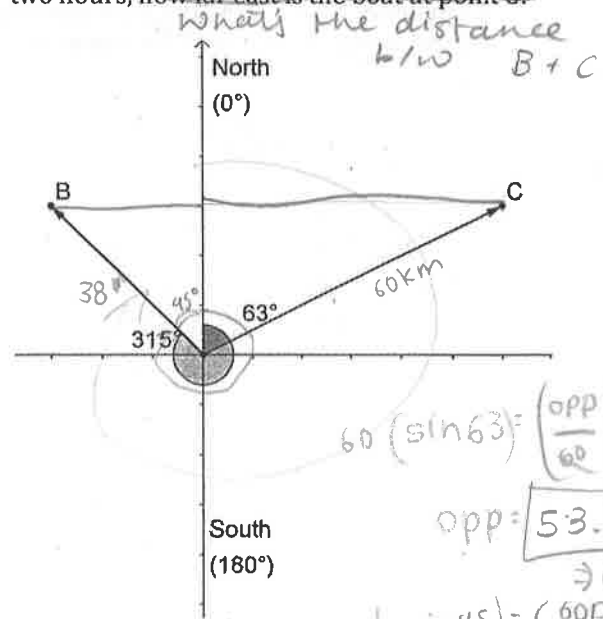
$$\begin{aligned} &_{27} (\sin 53) = \left(\frac{\text{opp}}{27}\right) \frac{27}{2} \rightarrow \text{opp} = 21.56316 \text{ km} \\ &_{27} (\cos 53) = \left(\frac{\text{adj}}{27}\right) \frac{27}{2} \rightarrow \text{adj} = 16.249 \text{ km} \\ &22.5 - 16.249 = 6.251 \text{ km} \end{aligned}$$

185. Find the measure of angle x to the nearest tenth of a degree.



$$\begin{aligned} \cos \theta &= \frac{63}{123} \\ \theta &= \cos^{-1}\left(\frac{63}{123}\right) \\ \theta &= 59.18984336^\circ \rightarrow A \\ 180 - \theta &= \boxed{120.8^\circ} \end{aligned}$$

186. At 9:00 am, a ship leaves port traveling at 30 km/h on a bearing of 63°. At the same time, another ship leaves port on a bearing of 315° at a speed of 19 km/h. When the boats stop after two hours, how far east is the boat at point C?

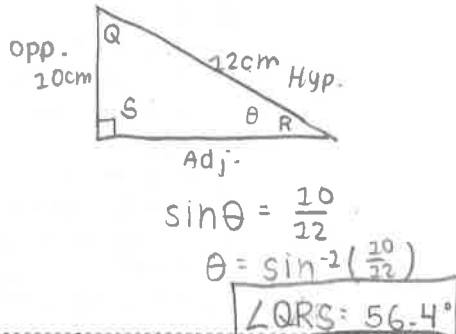


$$\begin{aligned} &60 (\sin 63) = \left(\frac{\text{opp}}{60}\right) \frac{60}{2} \\ &\text{opp} = \boxed{53.5 \text{ km}} \rightarrow A \\ &_{38} (\sin 45) = \left(\frac{\text{opp}}{38}\right) \frac{38}{2} \\ &\text{opp} = \boxed{26.87 \text{ km}} \rightarrow B \end{aligned}$$

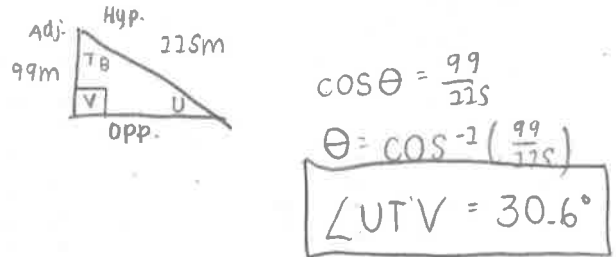
$$\boxed{80.3 \text{ km}} \checkmark$$

Draw an accurate diagram to answer each of the following questions.

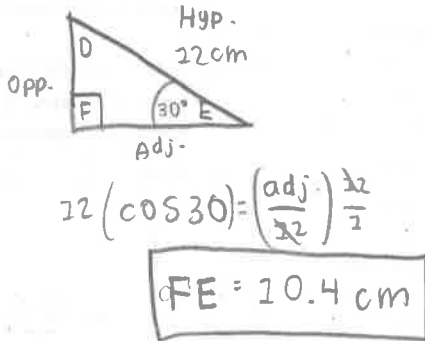
187. In $\triangle QRS$, $\angle QSR = 90^\circ$, $QR = 12 \text{ cm}$ and $QS = 10 \text{ cm}$. Find the measure of $\angle QRS$



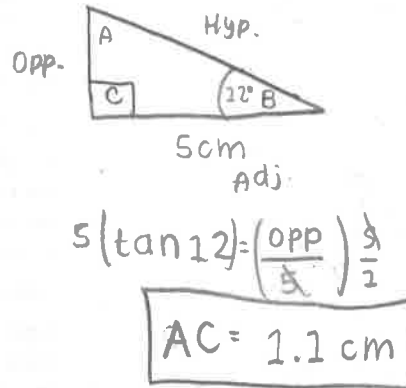
188. In $\triangle TUV$, $\angle TVU = 90^\circ$, $TU = 115 \text{ m}$ and $TV = 99 \text{ m}$. Find the measure of $\angle UT'V$



189. In $\triangle DEF$, $\angle DFE = 90^\circ$, $DE = 12 \text{ cm}$ and $\angle DEF = 30^\circ$. Find the length of FE .

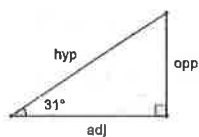


190. In $\triangle ABC$, $\angle ACB = 90^\circ$, $BC = 5 \text{ cm}$ and $\angle ABC = 12^\circ$. Find the length of AC .

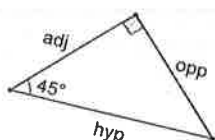


Answers:

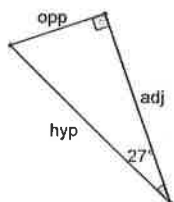
1. 25.0
2. 18.9
3. 24.0
4. 8.0
5. 84.0
6. 54.4
- 7.



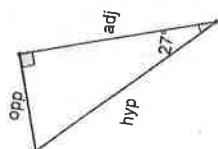
8.



9.



10.



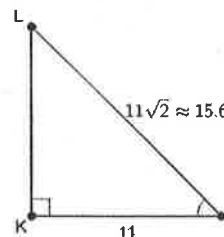
11. $\tan\theta = \frac{3}{4}$
 $\sin\theta = \frac{3}{5}$
 $\cos\theta = \frac{4}{5}$
12. $\sin\theta = \frac{6}{7}$
 $\cos\theta = \frac{4}{7}$
 $\tan\theta = \frac{3}{2}$
13. $\sin\theta = \frac{8}{17}$
 $\cos\theta = \frac{15}{17}$
 $\tan\theta = \frac{8}{15}$
14. $\sin\theta = \frac{1}{\sqrt{2}}$

$$\cos\theta = \frac{1}{\sqrt{2}}$$

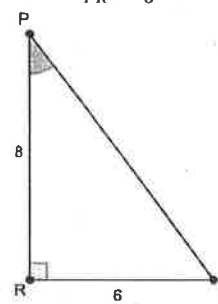
$$\tan\theta = 1$$

15. $\sin\theta = \frac{4}{5}$
16. $\cos\theta = \frac{6.4}{17.5}$
17. $\tan\theta = \frac{5.7}{16}$
18. Tangent
19. Tangent
20. Sine
21. 0.5000
22. 2.7475
23. 0.8192
24. 0.6691
25. 1.0000
26. 0.5000
27. A right triangle with an acute angle of 45° is an isosceles triangle with equal legs therefore $\frac{\text{opp}}{\text{adj}}$ will always equal 1, tangent 45 will always equal 1.
28. Sine is a ratio of opposite to hypotenuse. If the sine ratio is $\frac{1}{2}$ it means the hypotenuse is twice as long as the opposite side.
29. $x = 3$
30. $x = 24$
31. $x = 2.2$
32. $x = 25$
33. $x = 1.54$
34. $x = 15$
35. $x = 10 \text{ cm}$
36. $y = 5.3$
37. Answered on page.
38. Answered on page.
39. 261.8 miles
40. $w = 5.5 \text{ feet}$
41. $x = 17.0$
42. $t = 7.9 \text{ cm}$
43. $t = 6.4 \text{ mm}$
44. $q = 374.0 \text{ km}$
45. $w = 2.3 \text{ cm}$
46. $y = 3.3 \text{ m}$
47. $v = 13.6 \text{ m}$
48. $r = 47.1 \text{ miles}$
49. $d = 22.2 \text{ cm}$
50. $x = 56.7 \text{ mm}$
51. $z = 159.2 \text{ mm}$

52. $z = 67.2 \text{ inches}$
53. 12.7 km, 6.5 km
54. $x = 22.6 \text{ mm}$
55. $x = 7.6$
56. Opposite and adjacent
57. Not directly. The tangent ratio does not involve the hypotenuse.
58. Yes, the sine ratio involves the hypotenuse.
59. 16 cm and 12 cm
60. 3.6 m and 7.1 m
61. Not possible, the hypotenuse would need to be shorter than the adjacent side to have a cosine ratio greater than 1.
62. Not possible, like the answer above, a sine ratio cannot be greater than 1.
63. $\cos J = \frac{JK}{JL} = \frac{11}{11\sqrt{2}} = \frac{1}{\sqrt{2}}$

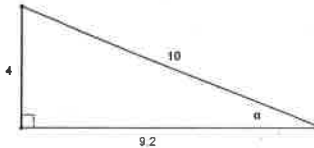


$$64. \tan P = \frac{QR}{PR} = \frac{6}{8}$$

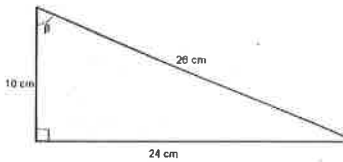


65. Answer will vary. But you will need to use the given side and angle to find another side length. Then choose to find another side or remaining angles.
66. $AB = 11.9, AC = 11.3$
67. 16.6 in, 20.8 in

- 68. 84.3 m, 150.8 m
- 69. 4.7 m, 6.4 m, 8.8 m
- 70. 381 m
- 71. 4.5 km
- 72. 7 km (7057 m)
- 73. 153.2 m²
- 74. 354 cm
- 75. 777 ft
- 76. 41.6 km
- 77.

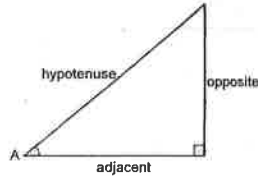


78.



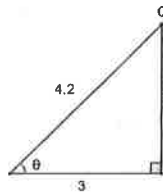
- 79. 11.7, 16.2, 36°
- 80. 6.3 cm, 13.8 cm, 27°
- 81. 38.2 mm
- 82. 10 cm²
- 83. 53.4 m
- 84. 54.5 cm²
- 85. 102 feet, assuming the ground is level and the string is straight.
- 86. 6.14 m
- 87. 22 in²
- 88. 90 m
- 89. 78 yd
- 90. 69 cm²
- 91. 7000 cm²
- 92. 3 m
- 93. 40.2 mm
- 94. 24.9 cm²
- 95. 45°
- 96. 30°
- 97. Tangent ratio, 47.3°
- 98. Answered on page.
- 99. Answered on page.
- 100. Answered on page.
- 101. 15.4°
- 102. 44.4°
- 103. 61.9°
- 104. 42.3°
- 105. No Solution
- 106. 69.5°

- 107. 0.8660 or $\frac{\sqrt{3}}{2}$
- 108. 0.7071 or $\frac{1}{\sqrt{2}}$
- 109. 0.5774 or $\frac{1}{\sqrt{3}}$
- 110. Tangent
- 111.

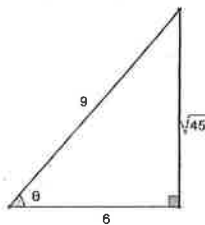


The side opposite to angle A can be greater than the side adjacent to angle A. As a ratio, $\frac{\text{opposite}}{\text{adjacent}}$ would be greater than 1. The sine and cosine ratios can not produce values greater than 1 because the denominator in the ratio will always be larger than the numerator.

112. $\cos\theta = 0.7071$

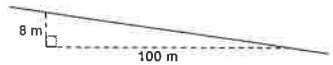


113. $\cos\theta = 0.6667$



- 114. 14°, 157 m
- 115. 73.5°, 14.8 in
- 116. Tangent
- 117. Sine
- 118. Cosine
- 119. 53.8°
- 120. 52.1°
- 121. 66.4°
- 122. Cosine
- 123. Tangent
- 124. Sine
- 125. 66.1°

- 126. 36.5°
- 127. 23.4°
- 128. 46.8°
- 129. 40.2°
- 130. 38.3°
- 131. 44.8°
- 132. 120.8°
- 133. 236.1°
- 134. 20.9°, 69.1°, 13.1 mm
- 135. 45°, 45°, 24.0 m
- 136. 30°, 60°, 1
- 137. 81.7 m, 160.4 m, 90°
- 138. 12.7 mm, 29.1 mm
- 139. 1.2 m²
- 140. Answered on page.
- 141. 29 m²
- 142. 4190 cm²
- 143. 34 square feet
- 144. 27 cm²
- 145. 59 km²
- 146. 39 m
- 147. 571 ft
- 148. 19 m
- 149. 262 ft
- 150. 293 ft
- 151.



The units are simply an example. A descent of 8% means that the road "falls" 8 units for every 100 units of horizontal travel.

A 3 km section of road falls 0.24km.

- 152. 80 m
- 153. A rescue team would need to travel 18.0 km at 56.3°.
- 154. 105 m
- 155. 15.3 ft
- 156. 3.90 m
- 157. 78.5 cm²
- 158. 49 cm
- 159. 36 331 km
- 160. 28 346 km
- 161. Yes. His yard slopes at an angle of 16°. Too steep for the mower.
- 162. 59 cm
- 163. 49 cm
- 164. 181 cm²
- 165. 18 cm

166. 31.2 m
167. 6.5 cm, 11.1 cm, 54°
168. 522 m
169. 133 m
170. 10.8 mm
171. 101.1 m
172. 43 miles
173. 450 m
174. 14 m

175. 239 m
176. 32 840 km
177. 26.7°
178. 3.8 m
179. 9.5 m
180. 6.9 cm
181. 72.5°
182. 4.7 m
183. 319.6 square units

184. 22.4 km
185. 120.8°
186. 80 km
187. $\angle QRS = 56.4^\circ$
188. $\angle UTV = 30.6^\circ$
189. 10.4 cm
190. 1.1 cm