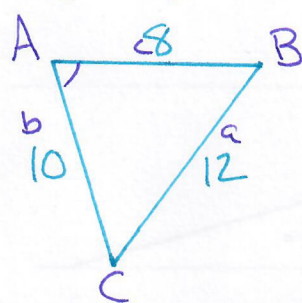
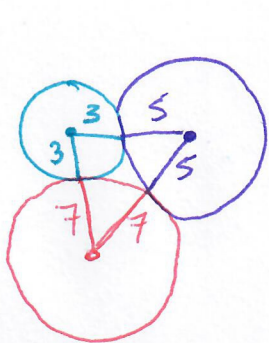




**Lesson #4.4 – Solving Problems Using Obtuse Triangles**

**Example 1:** Three circles of radius 3, 5, and 7 cm are tangent to each other. Find the largest angle formed by joining their centre.



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

$$= \frac{10^2 + 12^2 - 8^2}{2(10)(12)} = \frac{20}{160}$$

$$A = \cos^{-1}\left(\frac{2}{16}\right) = 82.8^\circ \text{ \star largest}$$

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac} = \frac{12^2 + 8^2 - 10^2}{2(12)(8)} = \frac{108}{192} \Rightarrow B = \cos^{-1}\left(\frac{108}{192}\right)$$

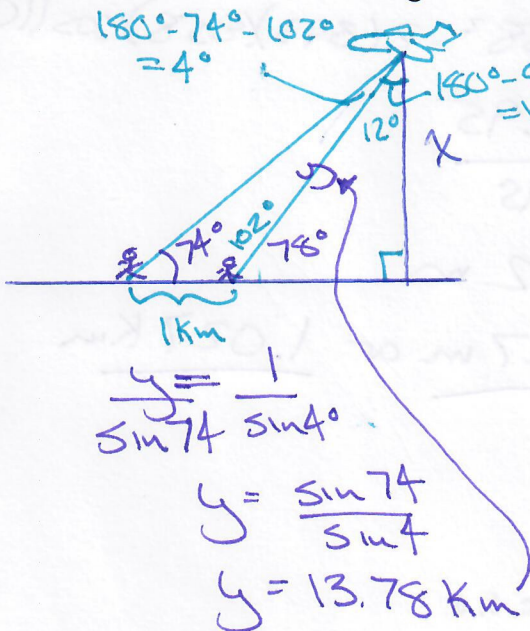
$$B = 55.8^\circ$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab} = \frac{12^2 + 10^2 - 8^2}{2(12)(10)} = \frac{180}{240} \Rightarrow C = \cos^{-1}\left(\frac{180}{240}\right)$$

$$C = 41.4^\circ$$

$$A + B + C = 82.8^\circ + 55.8^\circ + 41.4^\circ = 180^\circ$$

**Example 2:** A plane is sighted by two observers 1 km apart at angles  $74^\circ$  and  $78^\circ$ . The observers and the plane are in the same vertical plane. How high is the plane?



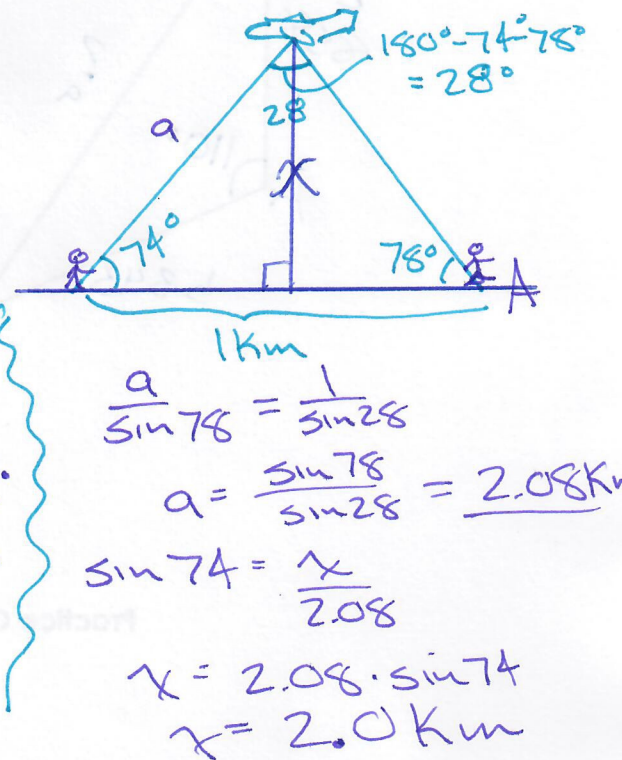
OR

$$\sin 78^\circ = \frac{x}{13.78}$$

$$x = 13.75 \times \sin 78^\circ$$

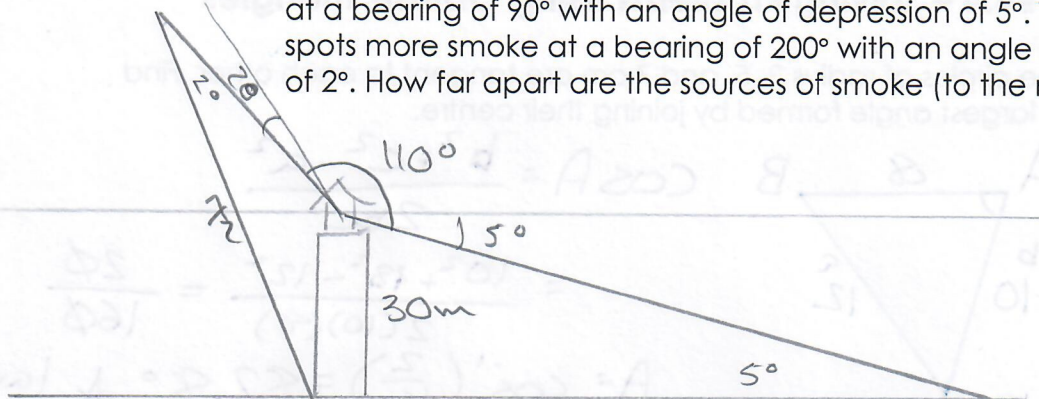
$$x = 13.48 \text{ km}$$

High





**Example 3:** From a top of a 30 m observation tower, a fire ranger observes smoke at a bearing of  $90^\circ$  with an angle of depression of  $5^\circ$ . The ranger spots more smoke at a bearing of  $200^\circ$  with an angle of depression of  $2^\circ$ . How far apart are the sources of smoke (to the nearest metre)?

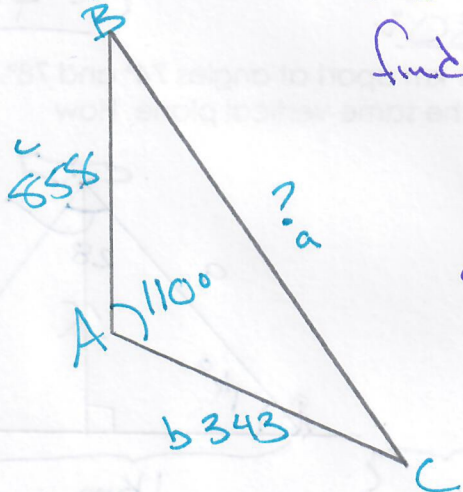


find ground distances  $x_1$

$x_1, x_2$

$$x_1 \Rightarrow \tan 5 = \frac{30}{x_1} \Rightarrow x_1 = \frac{30}{\tan 5} = 343 \text{ m}$$

$$x_2 = \frac{30}{\tan 2} = \frac{30}{\tan 2} \Rightarrow x_2 = 858 \text{ m}$$



find a:

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

$$a^2 = 343^2 + 858^2 - 2(343)(858)\cos 110$$

$$a^2 = 1055121.95$$

$$a = \sqrt{1055121.95}$$

$$a = 1027.2 \text{ m}$$

$$= \underline{1027 \text{ m}} \text{ or } \underline{1.027 \text{ km}}$$

Practice Questions: Page 183, #'s 1, 2, 4ac, 5, 6

Page 193 #1-5