

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

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

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

Part I: Multiple Choice. Place the correct answer in the corresponding blank at the end of this section.

1. Determine the measure of $\angle D$ to the nearest tenth of a degree.

- (A) 18.4°
- (B) 19.5°
- (C) 70.5°
- (D) 71.6°

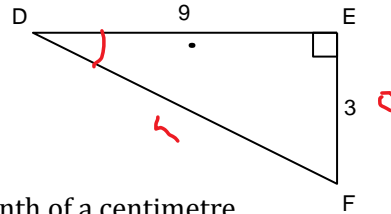
Handwritten work for Question 1:

$$\tan D = \frac{3}{9}$$

$$\tan D = 0.3333$$

$$D = \tan^{-1}(0.3333)$$

$$\theta = 18.4^\circ$$



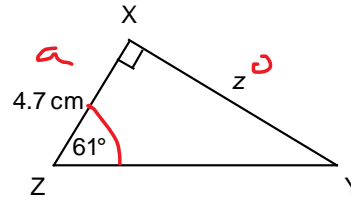
2. Determine the length of side z to the nearest tenth of a centimetre.

- (A) 9.7 cm
- (B) 2.6 cm
- (C) 5.4 cm
- (D) 8.5 cm

Handwritten work for Question 2:

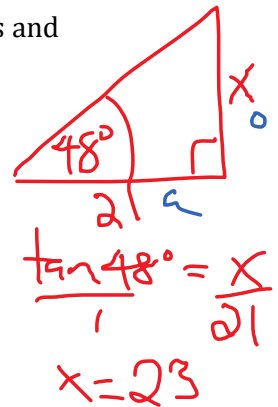
$$\tan 61^\circ = \frac{z}{4.7}$$

$$z = 8.5$$



3. A flagpole casts a shadow that is 21 m long when the angle between the sun's rays and the ground is 48° . Determine the height of the flagpole, to the nearest metre.

- A) 19 m
- B) 16 m
- C) 14 m
- (D) 23 m



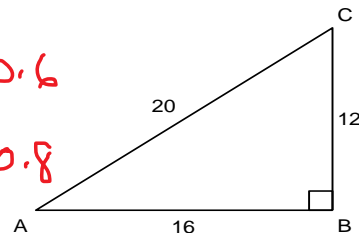
4. Determine $\sin A$ and $\cos A$ to the nearest tenth.

- (A) $\sin A = 1.7$; $\cos A = 0.8$
- (B) $\sin A = 0.6$; $\cos A = 1.3$
- (C) $\sin A = 0.8$; $\cos A = 0.6$
- (D) $\sin A = 0.6$; $\cos A = 0.8$

Handwritten work for Question 4:

$$\sin A = \frac{12}{20} = 0.6$$

$$\cos A = \frac{16}{20} = 0.8$$



5. Determine the measure of $\angle V$ to the nearest tenth of a degree.

- (A) 59.5
- (B) 36.1
- (C) 30.5
- (D) 53.9

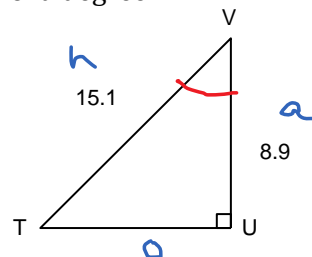
Handwritten work for Question 5:

$$\cos V = \frac{8.9}{15.1}$$

$$\cos V = 0.5894$$

$$V = \cos^{-1}(0.5894)$$

$$V = 53.9^\circ$$

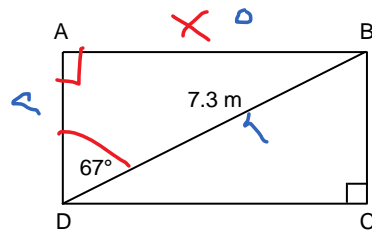


6. Calculate the length of this rectangle to the nearest tenth of a metre.

- (A) 7.9 m
 (B) 2.9 m
 (C) 6.7 m
 (D) 3.1 m

$$\sin 67^\circ = \frac{x}{7.3}$$

$$x = 6.7$$



7. An architect draws this diagram of a wheelchair entrance ramp for a building. Determine the angle of inclination of the ramp to the nearest tenth of a degree.

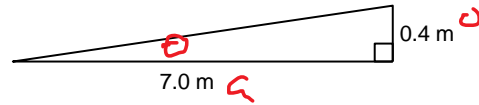
- (A) 86.7
 (B) 29.7
 (C) 3.3
 (D) 5.1

$$\sin \theta = \frac{0.4}{7.0}$$

$$\sin \theta = 0.0571$$

$$\theta = \sin^{-1}(0.0571)$$

$$\theta = 3.3$$



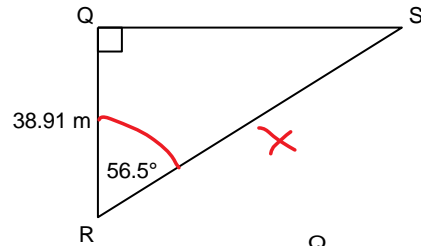
8. A surveyor made the measurements shown in the diagram. Determine the distance from R to S, to the nearest hundredth of a metre.

- (A) 46.66 m
 (B) 70.50 m
 (C) 25.75 m
 (D) 58.79 m

$$\cos 56.5^\circ = \frac{38.91}{x}$$

$$x = \frac{38.91}{\cos 56.5^\circ}$$

$$x = 70.50$$



9. Determine the length of QR to the nearest metre.

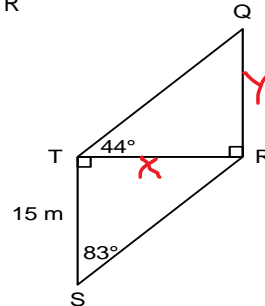
- (A) 85 m
 (B) 170 m
 (C) 127 m
 (D) 118 m

$$\tan 83^\circ = \frac{x}{15}$$

$$x = 122$$

$$\tan 44^\circ = \frac{y}{122}$$

$$y = 118$$

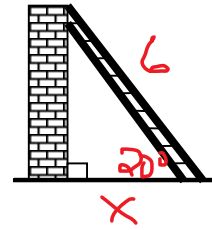


10. A ladder which is 6 m in length is resting against a house. The ladder makes an angle of 20° with the ground. How far from the base of the house is the ladder touching the ground?

- (A) 2.1 m
 (B) 2.2 m
 (C) 5.6 m
 (D) 17.5 m

$$\cos 20^\circ = \frac{x}{6}$$

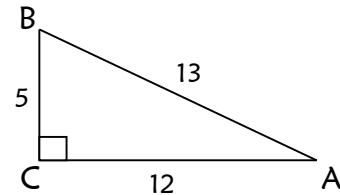
$$x = 5.6$$



11. Which of the following is the correct ratio for $\cos A$?

- (A) $\frac{5}{12}$ (B) $\frac{5}{13}$
 (C) $\frac{12}{13}$ (D) $\frac{13}{12}$

$$\cos A = \frac{12}{13}$$



12. Determine the value of x.

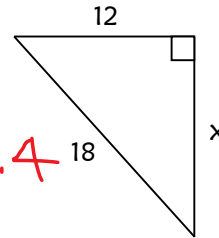
- (A) 6
 (B) 21.6
 (C) 3.5
 (D) 13.4

$$x^2 = 18^2 - 12^2$$

$$x^2 = 180$$

$$\sqrt{x^2} = \sqrt{180}$$

$$x = 13.4$$

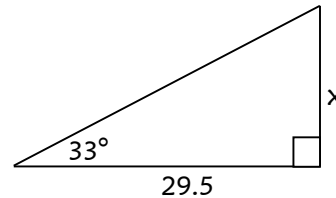


13. What is the value of x in the diagram below?

- (A) 45.4
 (B) 24.7
 (C) 19.2
 (D) 16.1

$$\tan 33^\circ = \frac{x}{29.5}$$

$$x = 19.2$$



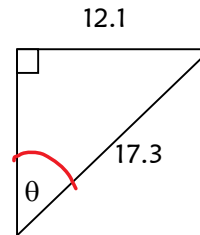
14. What is the value of θ in the diagram below?

- (A) 35°
 (B) 46°
 (C) 0.77°
 (D) 44°

$$\sin \theta = \frac{12.1}{17.3}$$

$$\sin \theta = 0.6994$$

$$\theta = 44^\circ$$



15. If a triangle has sides of lengths a , b and c , then according to the Law of Sines, what does a equal?

- (A) $\frac{c \sin C}{\sin A}$ (B) $\frac{c \sin A}{\sin C}$ (C) $\frac{c \sin B}{\sin A}$ (D) $\frac{\sin C}{a \sin A}$

$$\frac{a}{\sin A} = \frac{c}{\sin C} \cdot \sin A$$

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

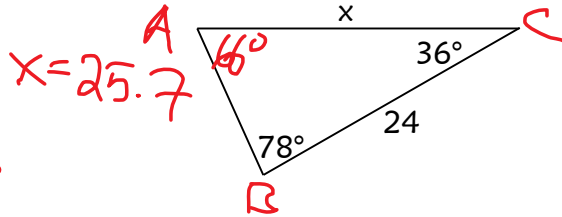
$$\angle A = 180^\circ - (36^\circ + 78^\circ) = 66^\circ$$

16. Find the value of x in the diagram below.

(A) 25.7
 (B) 39.9
 (C) 12.2
 (D) 24

$$\frac{x}{\sin 78^\circ} = \frac{24}{\sin 66^\circ}$$

$$\frac{x}{0.9781} = \frac{26.2713}{1}$$

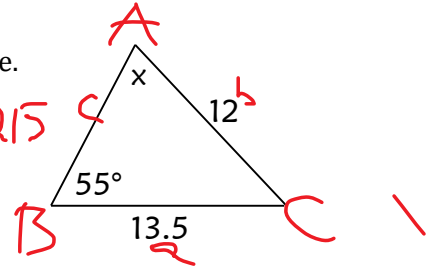


17. Find the measure of the missing angle to the nearest degree.

(A) 67°
 (B) 23°
 (C) 50°
 (D) 35°

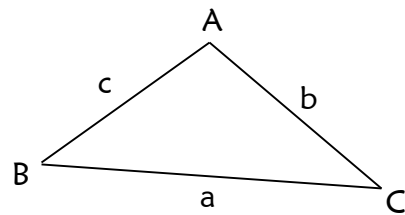
$$\frac{\sin X}{13.5} = \frac{\sin 55^\circ}{12} \rightarrow \sin X = 0.9215$$

$$\frac{\sin X}{13.5} = \frac{0.0683}{1} \rightarrow X = 67^\circ$$



18. Which of the following would be the correct formula to use for finding the length of AB?

- (A) $b^2 = a^2 + c^2 - 2ac \cos B$
 (B) $c^2 = a^2 + b^2 + 2ab \cos C$
 (C) $c^2 = a^2 + b^2 - 2ab \cos C$
 (D) $a^2 = b^2 + c^2 - 2bc \cos A$



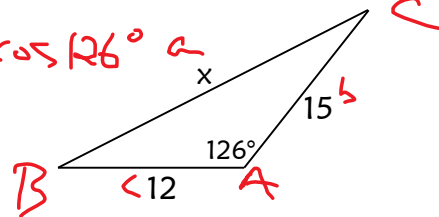
19. Find the value of x in the diagram below.

(A) 12.5
 (B) 24.1
 (C) 19.2
 (D) 8.8

$$x^2 = (12)^2 + (15)^2 - 2(12)(15)\cos 126^\circ$$

$$\sqrt{x^2} = \sqrt{580.6027}$$

$$x = 24.1$$



20. Find the measure of the **smallest** angle in the diagram below.

(A) 88°
 (B) 54°
 (C) 38°
 (D) 36°

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

$$\cos A = \frac{(31)^2 + (25)^2 - (19)^2}{2(31)(25)}$$

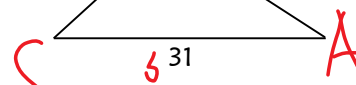
$$\cos A = \frac{1225}{1550}$$

$$\cos A = 0.7903$$

* Smallest angle opposite smallest side.

$$A = \cos^{-1}(0.7903)$$

$$A = 38^\circ$$



Part II: Constructed Response. Answer each question in the space provided. Show all workings.

21. The straight-line distance between Kelly's Island and Bell Island is 4.6 km. Bonita and John want to take their boat from Kelly's Island to the tip of Little Bell Island. How far will they travel in total? Give your answer to the nearest tenth of a metre.

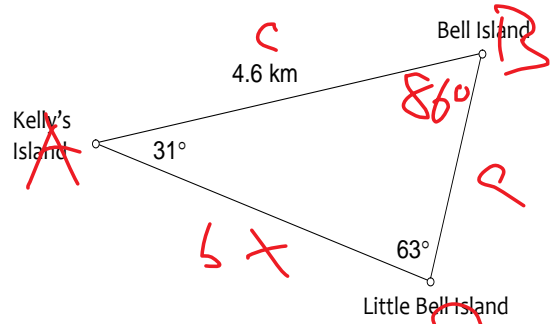
$$\frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{x}{\sin 86^\circ} = \frac{4.6}{\sin 63^\circ}$$

$$\frac{x}{0.9976} = \frac{5.1627}{1}$$

$$x = 5.2$$

$$180^\circ - (31^\circ + 63^\circ) = 86^\circ$$



They will travel 5.2 km.

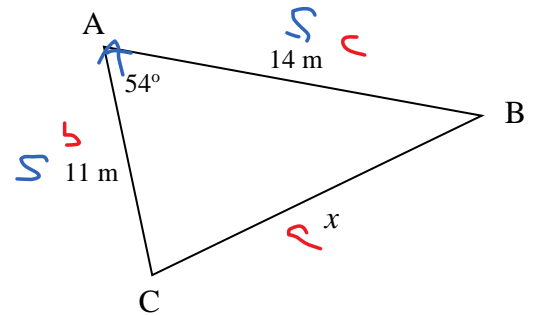
22. Find the missing value of x in the following triangle to the nearest meter.

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

$$a^2 = (11)^2 + (14)^2 - 2(11)(14) \cos 54^\circ$$

$$\sqrt{a^2} = \sqrt{135.9621}$$

$$a = 12 \text{ m}$$



23. Find the measure of θ to the nearest degree in the following triangle.

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

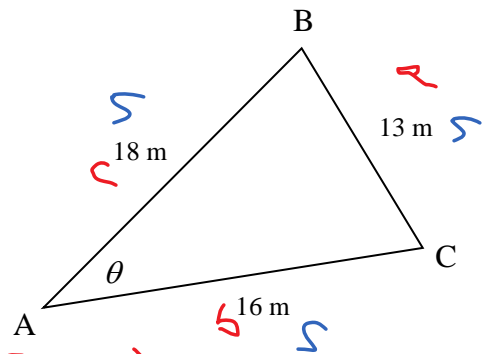
$$\cos \theta = \frac{(16)^2 + (18)^2 - (13)^2}{2(16)(18)}$$

$$\cos \theta = \frac{411}{576}$$

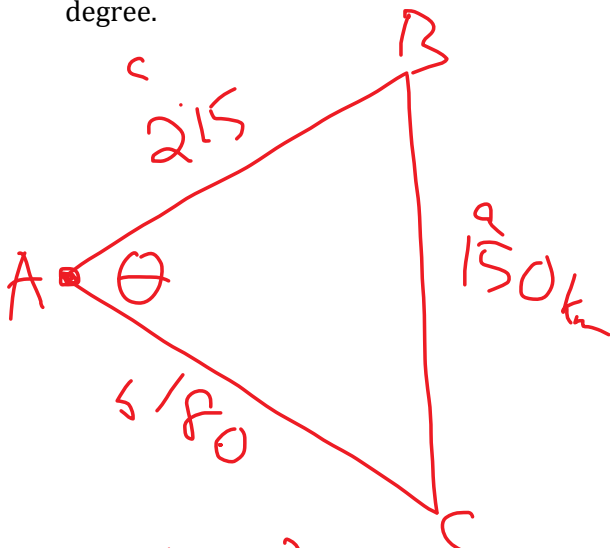
$$\cos \theta = 0.7135$$

$$\theta = \cos^{-1}(0.7135)$$

$$\theta = 44^\circ$$



24. Two airplanes leave the Fort Chipewyan airport in Alberta at the same time. One airplane travels at 360 km/h. The other airplane travels at 430 km/h. About 30 min later, they are 150 km apart. Draw a diagram and determine the angle between their paths, to the nearest degree.



$$\frac{430 \text{ km}}{\text{h}} \times 0.5 \text{ h} = 215 \text{ km}$$

$$\frac{360 \text{ km}}{\text{h}} \times 0.5 \text{ h} = 180 \text{ km}$$

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

$$\cos \theta = \frac{(180)^2 + (215)^2 - (150)^2}{2(180)(215)}$$

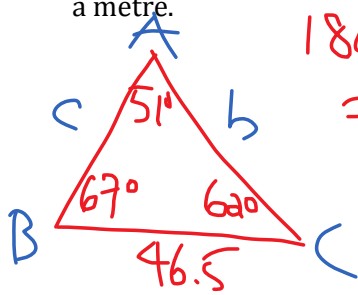
$$\cos \theta = \frac{56125}{77400}$$

$$\cos \theta = 0.7251$$

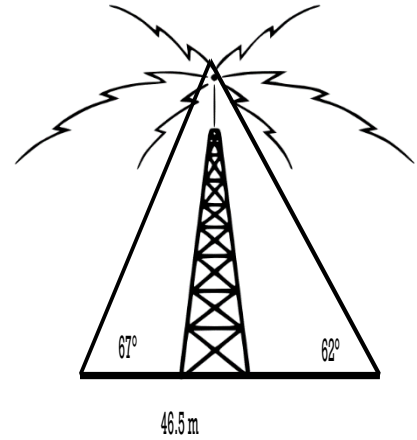
$$\theta = \cos^{-1}(0.7251)$$

$$\theta = 43^\circ$$

25. A radio tower is supported by two wires on opposite sides. On the ground, the ends of the wires are 46.5 m apart. The angles of elevation for the wires are 62° and 67° respectively. Determine the length of the **longest wire** and the height of the **tower** to the nearest tenth of a metre.



$$180^\circ - (67^\circ + 62^\circ) = 51^\circ$$



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

$$\frac{b}{\sin 67^\circ} = \frac{46.5}{\sin 51^\circ}$$

$$\frac{b}{0.9205} = \frac{59.8343}{1}$$

$$b = 55.1 \text{ m}$$

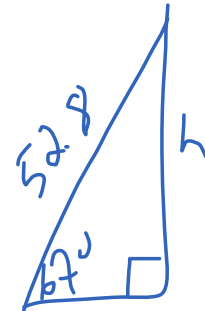
Wire b is longer.

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

$$\frac{c}{\sin 62^\circ} = \frac{46.5}{\sin 51^\circ}$$

$$\frac{c}{0.8829} = \frac{59.8343}{1}$$

$$c = 52.8 \text{ m}$$



$$\frac{\sin 67^\circ}{1} = \frac{h}{52.8}$$

$$h = 48.6 \text{ m}$$