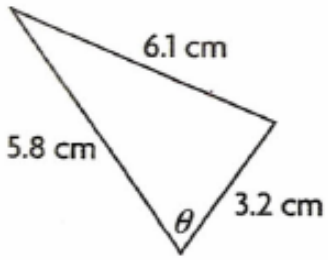
SOLUTIONS => CHAPTERS 3-5 CUMULATIVE TEST (1-13, 18, 19, 20, 26)

1.



A. 31° C. 69°

B. 65° D. 80°

$$\cos\theta = \frac{(5.8)^2 + (3.2)^2 - (6.1)^2}{2(5.8)(3.2)}$$

$$\cos\theta = \frac{33.64 + 10.24 - 37.21}{37.12}$$

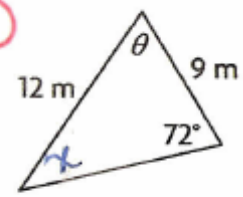
$$\cos\theta = \frac{6.67}{37.12}$$

$$\cos\theta = 0.1797$$

$$\theta = \cos^{-1}(0.1797)$$

$$\theta = 80°$$

2.



A. 62°
C. 52°
B. 56°
D. 46°

$\frac{\sin X}{9} = \frac{\sin 72^\circ}{12}$

$\frac{12 \sin X}{12} = \frac{9 \sin 72^\circ}{12}$

$\sin X = 0.7133$

$X = \sin^{-1}(0.7133)$

$X = 46^\circ$

$\theta = 180^\circ - 72^\circ - 46^\circ$

$\theta = 62^\circ$

3.

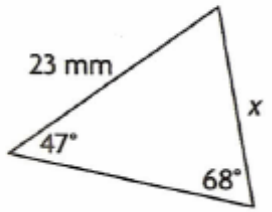
A. 16°
C. 60°
B. 32°
D. 74°

$\theta = 180^\circ - 74^\circ - 74^\circ$

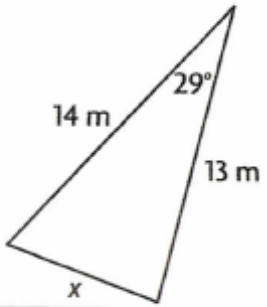
$\theta = 32^\circ$

Determine the indicated side length, to the nearest tenth.

4.



5.



$\frac{x}{\sin 47} = \frac{23}{\sin 68°}$

$x \sin 68° = 23 \sin 47°$

$\frac{x \sin 68°}{\sin 68°} = \frac{23 \sin 47°}{\sin 68°}$

$x = 18.1 \text{ mm}$

$x^2 = (13)^2 + (14)^2 - 2(13)(14)\cos 29°$

$x^2 = 169 + 196 - 364(0.8746)$

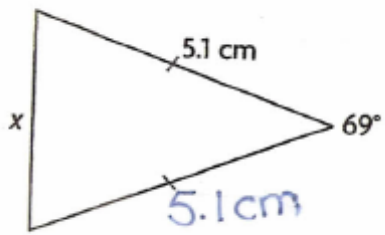
$x^2 = 365 - 318.3544$

$x^2 = 46.6456$

$x = 6.8 \text{ m}$

A. 18.1 mm	**C.** 23.5 mm	**A.** 1.9 m	**C.** 26.1 m
B. 18.6 mm	**D.** 29.2 mm	**B.** 6.8 m	**D.** 46.6 m

6.



$x^2 = (5.1)^2 + (5.1)^2 - 2(5.1)(5.1)\cos 69°$
$x^2 = 26.01 + 26.01 - 52.02(0.3584)$
$x^2 = 52.02 - 18.64$
$x^2 = 33.38$
$x = 5.8\text{ cm}$

A. 7.4 cm **C.** 4.8 cm

B. 5.8 cm **D.** 4.7 cm

7. Simon knows lengths a and c in $\triangle ABC$. He also knows one of the angles, and this gives him enough information to use the cosine law to determine b. Which angle could be the one Simon knows? $b^2 = a^2 + c^2 - 2ac\cos B$

A. $\angle A$ **B.** $\angle B$ **C.** $\angle C$ **D.** any of these

8. Which of the following ratios is the same for each side–angle pair in a triangle?

A. $\frac{\sin A}{a}$ **B.** $\frac{a}{\sin A}$ **C.** both **D.** neither

9. You are given three pieces of information about the measures of the angles and sides in a triangle. In which of the following situations can the sine law NOT be used to solve the triangle?

A. *SSA* **(B.)** *SAS* **C.** *ASA* **D.** *AAS*

Law of Cosines

10. In $\triangle XYZ$, $x = 4.3$ cm, $y = 3.1$ cm, and $z = 5.9$ cm. Which is the largest angle, and is it obtuse?

A. $\angle Y$; yes **(B.)** $\angle Z$; yes **C.** $\angle Z$; no **D.** $\angle Y$; no

Largest Angle $\Rightarrow$ Z (across from largest side)

$$\cos Z = \frac{x^2 + y^2 - z^2}{2xy}$$

$$\cos Z = \frac{(4.3)^2 + (3.1)^2 - (5.9)^2}{2(4.3)(3.1)}$$

$$\cos Z = \frac{18.49 + 9.62 - 34.81}{26.66}$$

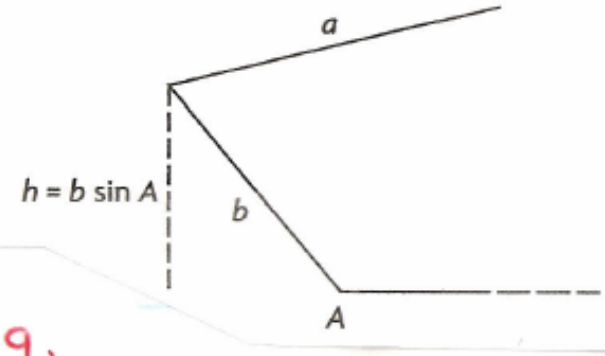
$$\cos Z = \frac{-6.7}{26.66}$$

$$\cos Z = -0.2513$$

$$Z = \cos^{-1}(-0.2513)$$

$$Z = 105^\circ \text{ (obtuse)}$$

11. Given the information shown, in which situation are two triangles possible?



A. $\angle A$ obtuse, $h < b < a$

C. $\angle A$ acute, $h < a < b$

B. $\angle$A acute, $a < h < b$

D. $\angle A$ obtuse, $a > b$

12. Which set of measurements results in no possible triangles?

obtuse $p < q$

A. $\angle P = 25°$, $p = 3.5$ m, $q = 6.2$ m

C. $\angle P = 135°$, $p = 3.8$ m, $q = 4.0$ m

B. $\angle P = 96°$, $p = 5.2$ m, $q = 5.0$ m

D. $\angle P = 48°$, $p = 7.4$ m, $q = 7.1$ m

13. The cosine law does not have an ambiguous case. Why not?

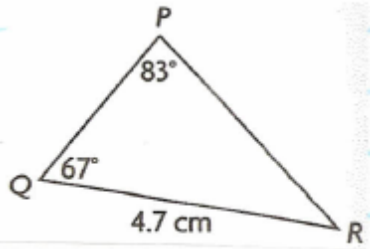
A. The cosine law does not apply to obtuse triangles.

B. The cosine of an obtuse angle is always negative.

C. The principal value of a square root is always positive.

D. The cosine law cannot be used if the unknown angle is obtuse.

18. Solve $\triangle PQR$. Round lengths to the nearest tenth of a centimetre and angles to the nearest degree.



$q =$ 4.4 cm $\quad r =$ 2.4 cm $\quad \angle R =$ 30°

$\frac{q}{\sin 67^\circ} = \frac{4.7}{\sin 83^\circ}$ $\quad \frac{r}{\sin 30^\circ} = \frac{4.7}{\sin 83^\circ}$ $\quad \angle R = 180^\circ - 67^\circ - 83^\circ = 30^\circ$

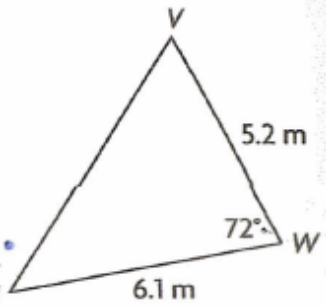
$q \sin 83^\circ = 4.7 \sin 67^\circ$ $\quad r \sin 83^\circ = 4.7 \sin 30^\circ$

$\frac{q \sin 83^\circ}{\sin 83^\circ} = \frac{4.7 \sin 67^\circ}{\sin 83^\circ}$ $\quad \frac{r \sin 83^\circ}{\sin 83^\circ} = \frac{4.7 \sin 30^\circ}{\sin 83^\circ}$

$q = 4.4\text{cm}$ $\quad r = 2.4\text{cm}$

19. Solve $\triangle UVW$. Round angles to the nearest degree and lengths to the nearest tenth of a metre.

$\angle U = 48°$ $\angle V = 60°$ $w = 6.7$ m



$$\cos U = \frac{(6.1)^2 + (6.7)^2 - (5.2)^2}{2(6.1)(6.7)}$$

$$\cos U = \frac{37.21 + 44.89 - 27.04}{81.74}$$

$$\cos U = \frac{55.06}{81.74}$$

$$\cos U = 0.6736$$

$$U = \cos^{-1}(0.6736)$$

$$U = 48°$$

$$w^2 = (5.2)^2 + (6.1)^2 - 2(5.2)(6.1)\cos 72°$$

$$w^2 = 27.04 + 37.21 - 63.44(0.3090)$$

$$w^2 = 64.25 - 19.6030$$

$$w^2 = 44.647$$

$$w = 6.7 \text{ m}$$

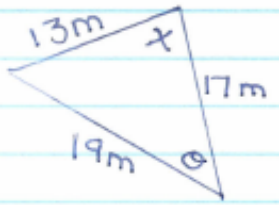
$$\angle V = 180° - 72° - 48°$$

20. *Ricardo is landscaping part of a garden in the shape of an acute triangle. He wants the sides of the triangle to be 13 m, 17 m, and 19 m long. Determine, to the nearest degree,*

a) the measure of the smallest angle in Ricardo's triangle: 42°

b) the measure of the largest angle in Ricardo's triangle: 77°

Sketch:



a) Smallest Angle is opposite smallest side:

$$\cos\theta = \frac{(17)^2+(19)^2-(13)^2}{2(17)(19)}$$

$$\cos\theta = \frac{289+361-169}{646}$$

$$\cos\theta = \frac{481}{646}$$

$$\cos\theta = 0.7446$$

$$\theta = \cos^{-1}(0.7446)$$

$$\theta = 42°$$

b) Largest Angle is opposite to largest side:

$$\cos x = \frac{(13)^2+(17)^2-(19)^2}{2(13)(17)}$$

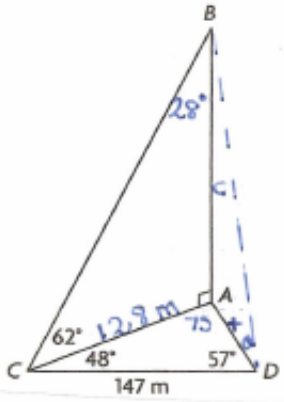
$$\cos x = \frac{169+289-361}{442}$$

$$\cos x = 0.2195$$

$$x = \cos^{-1}(0.2195)$$

$$x = 77°$$

26. The base of a cliff, *A*, is surveyed from two different points, *C* and *D*, at the same horizontal level. The elevation of the top of the cliff, *B*, is taken from *C*.



a) What is the height of the cliff, to the nearest metre?

$\angle CAD = 180° - 57° - 48°$

$\angle CAD = 75°$

$$\frac{d}{\sin 57°} = \frac{147}{\sin 75°}$$

$$\frac{d \sin 75°}{\sin 75°} = \frac{147 \sin 57°}{\sin 75°}$$

$d = 128\text{ m}$

$\angle B = 180° - 62° - 90°$

$\angle B = 28°$

$$\frac{c}{\sin 62°} = \frac{128}{\sin 28°}$$

$$\frac{c \sin 28°}{\sin 28°} = \frac{128 \sin 62°}{\sin 28°}$$

$c = 240\text{m}$

The cliff is 240m high.

b) To the nearest degree, what is the elevation of the cliff taken from *D*?

$$\frac{x}{\sin 48°} = \frac{147}{\sin 75°}$$

$$\frac{x \sin 75°}{\sin 75°} = \frac{147 \sin 48°}{\sin 75°}$$

$x = 113\text{m}$

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

$$\tan\theta = \frac{240}{113}$$

$\tan\theta = 2.1239$

$\theta = \tan^{-1}(2.1239)$

$\theta = 65°$

The elevation of the cliff taken from D is 65°.