

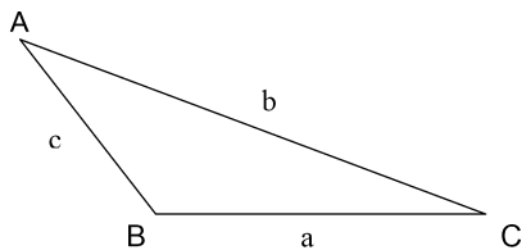
Cosine Law Part 2

May-06-19
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MATHEMATICS 10 TRIGONOMETRY COSINE LAW PART 2

A. Cosine Law

Remember how we label a non-right triangle.



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

$$b^2 = a^2 + c^2 - 2ac \cos B$$

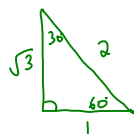
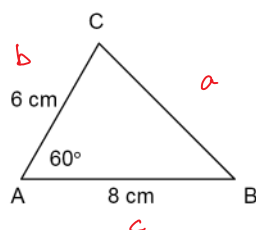
$$c^2 = a^2 + b^2 - 2ab \cos C$$

Important Points About Cosine Law

- 1) Cosine Law is used when you do not have the correct information to use Sine Law.
- 2) Be careful when you are looking for an angle with Cosine Law. You must do the calculations correctly.

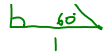
B. Examples

- 1) Find the **exact length** of BC.

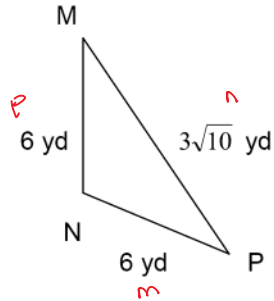


$$\begin{aligned} a^2 &= b^2 + c^2 - 2bc \cos A \\ a^2 &= (6)^2 + (8)^2 - 2(6)(8) \cos 60^\circ \\ a^2 &= (6)^2 + (8)^2 - 2(6)(8) \left(\frac{1}{2}\right) \\ a^2 &= 52 \\ a &= \pm\sqrt{52} = \sqrt{4 \cdot 13} = 2\sqrt{13} \end{aligned}$$

$$BC = 2\sqrt{13} \text{ cm}$$



2) Find the measure of $\angle N$ to the nearest degree.



$$n^2 = m^2 + p^2 - 2mp \cos N$$

$$(3\sqrt{10})^2 = (6)^2 + (6)^2 - 2(6)(6) \cos N$$

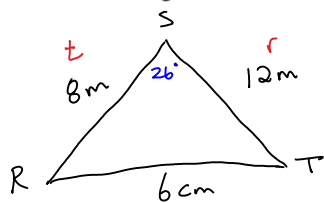
$$90 = 72 - 72 \cos N$$

$$\frac{18}{-72} = \frac{-72 \cos N}{-72}$$

$$\cos N = -\frac{18}{72}$$

$$\angle N = 104^\circ$$

3) Solve the following $\triangle RST$, $RS = 8$ m, $RT = 6$ m, and $ST = 12$ m. Round each angle to the nearest degree.



$$s^2 = r^2 + t^2 - 2rt \cos S$$

$$(6)^2 = (12)^2 + (8)^2 - 2(12)(8) \cos S$$

$$36 = 208 - 192 \cos S$$

$$-172 = -192 \cos S$$

$$\cos S = \frac{172}{192}$$

$$\angle S = 26^\circ$$

$$\frac{\sin S}{s} = \frac{\sin T}{t}$$

$$24 \left[\frac{\sin 26^\circ}{6} = \frac{\sin T}{8} \right]$$

$$(4)(\sin 26^\circ) = \frac{3}{3} \sin T$$

$$\sin T = 0.58449\dots$$

$$\angle T = 36^\circ$$

$$180^\circ - 26^\circ - 36^\circ$$

$$\angle R = 118^\circ$$

Cosine Law Assignment: #1, 2, 3, 4, 5, 6, 7, 11, 12, 13

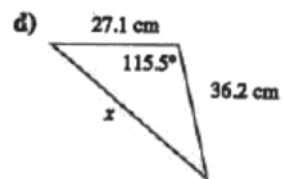
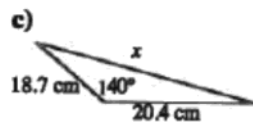
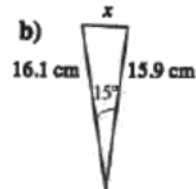
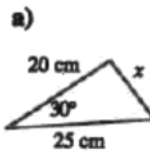
Assignment

1. Complete the following for triangle STV .

a) $s^2 =$

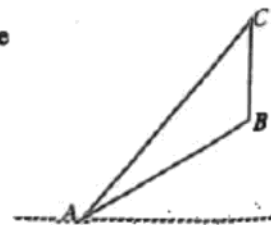
b) $v^2 =$

2. In each case find the length of the indicated side, to the nearest 0.1 cm.



3. In $\triangle ABC$, angle $A = 49^\circ$, $b = 24$ and $c = 37$. Calculate a to the nearest whole number.

4. In the diagram, AB represents part of a road constructed on the incline of a hill. BC represents a telephone pole 7.5 m tall at the side of the road. A guide wire attached to the top of the pole is joined to the ground at A . If $AB = 11.4$ m and $\angle ABC = 135^\circ$, determine the length of the guide wire to the nearest 0.1 m



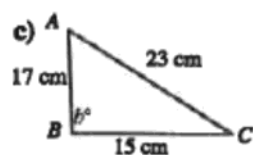
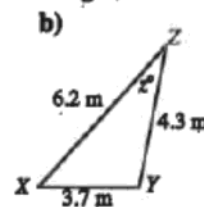
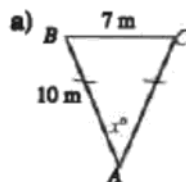
5. Solve triangle ABC in which $AB = 4.5$ cm, $BC = 7.8$ cm and angle $ABC = 79^\circ$.
Round sides to the nearest tenth of a cm and angles to the nearest tenth of a degree.

6. Complete the following for triangle DEF .

a) $\cos E =$

b) $\cos F =$

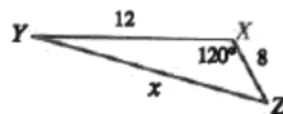
7. In each case find the measure of the indicated angle, to the nearest degree.



Multiple Choice

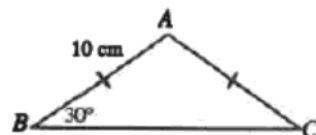
11. The value of x^2 is

- A. 112
- B. 304
- C. $208 - 96\sqrt{3}$
- D. $208 + 96\sqrt{3}$



12. The length of BC in cm is

- A. $5\sqrt{3}$
- B. 10
- C. $10\sqrt{3}$
- D. 20



Numerical Response

13. The diagram shows a glass bowl with two chop-sticks resting on the rim at points S and T . The lengths of the parts of the chop-sticks inside the bowl are 9 cm and 11.5 cm respectively.



The length of ST , to the nearest tenth of a cm, is _____.

(Record your answer in the numerical response box from left to right)

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Answer Key

1. a) $s^2 = t^2 + v^2 - 2tv \cos S$ b) $v^2 = s^2 + t^2 - 2st \cos V$

2. a) 12.6 cm b) 4.2 cm c) 36.7 cm d) 53.8 cm 3. 28 4. 17.5

5. $\angle ABC = 79^\circ, \angle BAC = 68.5^\circ, \angle ACB = 32.5^\circ, AC = 8.2 \text{ cm}, BC = 7.8 \text{ cm}, AB = 4.5 \text{ cm}.$
Answers may vary slightly depending on method.

6. a) $\cos E = \frac{d^2 + f^2 - e^2}{2df}$ b) $\cos F = \frac{d^2 + e^2 - f^2}{2de}$

7. a) 41° b) 36° c) 92° d) 138° 8. 54° 9. 40°

10. a) $PE = 30.0 \text{ cm}, PR = 33.9 \text{ cm}$ b) 69°

11. B

12. C

13.

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