

Precalculus Law of Cosine I

Determine if you would use Law of Sine or Law of Cosine. If you are using Law of Sine, determine the number of solutions.

L.O.C = Law of Cosine

① $a=5$ $b=7$ $c=8$
SSS L.O.C

1 sol.

③ $A=43^\circ$ $b=6$ $c=5$
SAS L.O.C.

1 sol.

⑤ $a=10$ $b=5$ $c=5\sqrt{3}$
SSS L.O.C.

1 sol.

⑦ $B=109^\circ$ $b=15$ $c=20$
SSA L.O.S.

opp < adj

NO SOLUTION



⑨ $a=15$ $b=7$ $c=12$
SSS L.O.C.

1 sol.

⑪ $B=48^\circ$ $c=9$ $a=12$
SAS L.O.C.

1 sol.

L.O.S = Law of Sine

② $A=15^\circ$ $a=5$ $b=7$
SSA L.O.S

adj sin(angle) = $7 \sin(15) = 1.81$

$1.81 < 5 < 7$
height < opp < adj 2 SOLUTIONS

④ $A=51^\circ$ $B=42^\circ$ $c=5$
ASA L.O.S.

1 sol

⑥ $C=75^\circ$ $b=12$ $c=13$
SSA L.O.S

adj sin(angle) = $12 \sin(75) = 11.59$

$11.59 < 13 > 12$
height < opp > adj 1 solution

⑧ $A=13^\circ$ $C=87^\circ$ $b=10$
ASA L.O.S.

1 sol.

⑩ $B=51^\circ$ $c=12$ $b=10$
SSA L.O.S.

adj sin(angle) = $12 \sin(51) = 9.33$

$9.33 < 10 < 12$
height < opp < adj 2 solutions

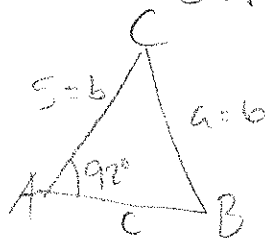
⑫ $A=92^\circ$ $a=6$ $b=5$

SSA

L.O.S

opp > adj

1 solution



Pre-calculus Law of Cosine 2

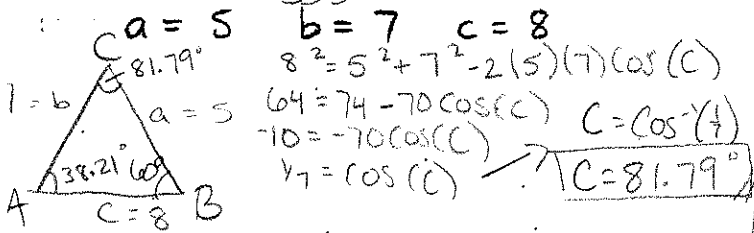
$$c^2 = a^2 + b^2 - 2ab \cos(C)$$

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

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

Solve using Law of Cosine.

SSS



$$8^2 = 5^2 + 7^2 - 2(5)(7)\cos(C)$$

$$64 = 74 - 70\cos(C) \quad C = \cos^{-1}(7)$$

$$-10 = -70\cos(C)$$

$$1/7 = \cos(C) \quad \rightarrow \quad C = 81.79^\circ$$

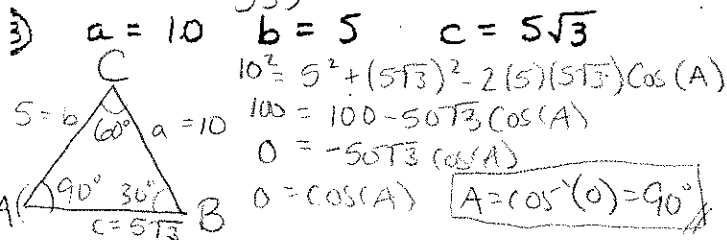
$$\frac{\sin(81.79)}{8} = \frac{\sin(A)}{5}$$

$$A = \sin^{-1}\left(\frac{5\sin(81.79)}{8}\right)$$

$$A \approx 38.21^\circ$$

$$\angle B = 180 - 81.79 - 38.21 = 60^\circ$$

SSS



$$10^2 = 5^2 + (5\sqrt{3})^2 - 2(5)(5\sqrt{3})\cos(A)$$

$$100 = 100 - 50\sqrt{3}\cos(A)$$

$$0 = -50\sqrt{3}\cos(A)$$

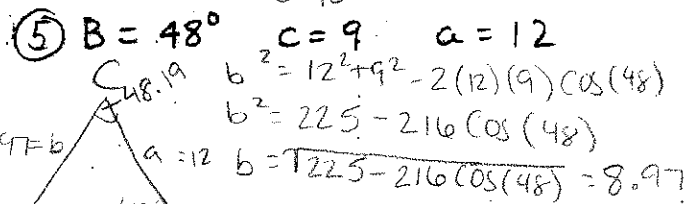
$$0 = \cos(A) \quad A = \cos^{-1}(0) = 90^\circ$$

$$\frac{\sin(90)}{10} = \frac{\sin(B)}{5}$$

$$B = \sin^{-1}\left(\frac{5\sin(90)}{10}\right) = 30^\circ$$

$$\angle C = 180 - 90 - 30 = 60^\circ$$

SAS



$$b^2 = 12^2 + 9^2 - 2(12)(9)\cos(48)$$

$$b^2 = 225 - 216\cos(48)$$

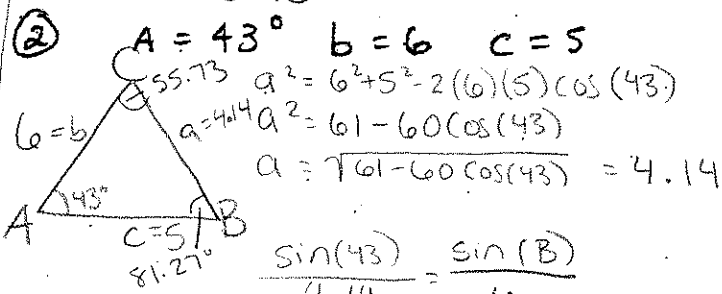
$$b = \sqrt{225 - 216\cos(48)} = 8.97$$

$$\frac{\sin(48)}{8.97} = \frac{\sin(A)}{12}$$

$$A = \sin^{-1}\left(\frac{12\sin(48)}{8.97}\right) \approx 83.81^\circ$$

$$\angle C = 180 - 48 - 83.81 = 48.19^\circ$$

SAS



$$a^2 = 6^2 + 5^2 - 2(6)(5)\cos(43)$$

$$a^2 = 61 - 60\cos(43)$$

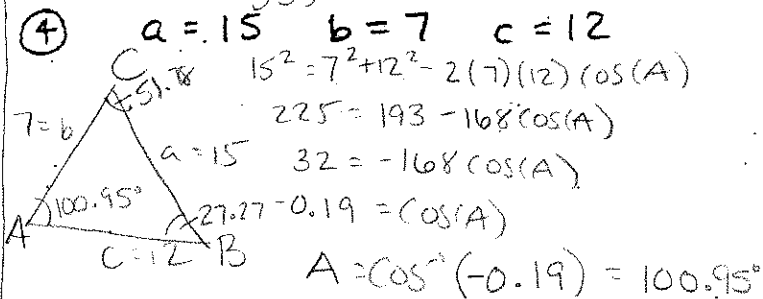
$$a = \sqrt{61 - 60\cos(43)} = 4.14$$

$$\frac{\sin(43)}{4.14} = \frac{\sin(B)}{6}$$

$$B = \sin^{-1}\left(\frac{6\sin(43)}{4.14}\right) \approx 81.27^\circ$$

$$\angle C = 180 - 43 - 81.27 = 55.73$$

SSS



$$15^2 = 7^2 + 12^2 - 2(7)(12)\cos(A)$$

$$225 = 193 - 168\cos(A)$$

$$32 = -168\cos(A)$$

$$-0.19 = \cos(A)$$

$$A = \cos^{-1}(-0.19) = 100.95^\circ$$

$$\frac{\sin(100.95)}{15} = \frac{\sin(B)}{7}$$

$$B = \sin^{-1}\left(\frac{7\sin(100.95)}{15}\right) = 27.27$$

$$\angle C = 180 - 100.95 - 27.27 = 51.78^\circ$$