Precalculus A

5.5 The Law of Sines

Homework: Finish Practice Worksheet

D. Paulson

Simplify the given expression using the double and half angle formulas.

1. $2\cos^2 10° - 1$ $= \cos(2 \cdot 10) = \boxed{\cos(20)}$

2. $2\sin\frac{x}{2}\cos\frac{x}{2}$ $= \sin(2 \cdot \frac{x}{2}) = \boxed{\sin(x)}$

4. $1 - 2\sin^2 20°$ $= \cos(2 \cdot 20) = \boxed{\cos(40)}$

5. $2\sin 35° \cos 35°$ $= \sin(2 \cdot 35) = \boxed{\sin(70)}$

6. $\cos^2 4x - \sin^2 4x$ $= \cos(2 \cdot 4x) = \boxed{\cos(8x)}$

7. $\frac{2\tan 25°}{1 - \tan^2 25°}$ $= \tan(2 \cdot 25) = \boxed{\tan(50)}$

8. $2\cos^2 3x - 1$ $= \cos(2 \cdot 3x) = \boxed{\cos(6x)}$

9. $1 - 2\sin^2 \frac{x}{2}$ $= \cos(2 \cdot \frac{x}{2}) = \boxed{\cos(x)}$

10. $\cos^2 40° - \sin^2 40°$ $= \cos(2 \cdot 40) = \boxed{\cos(80}$

11. $\pm\sqrt{\frac{1 - \cos 80°}{2}}$ $= \sin(\frac{80}{2}) = \boxed{\sin(40)}$

12. $\pm\sqrt{\frac{1 + \cos 70°}{2}}$ $= \cos(\frac{70}{2}) = \boxed{\cos(35)}$

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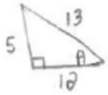
11. If $\sin A = \frac{5}{13}$, find sin 2A and cos 2A.



$\sin 2A = 2\left(\frac{5}{13}\right)\left(\frac{12}{13}\right)$

$\boxed{\sin 2A = \frac{120}{169}}$

$\cos 2A = \left(\frac{12}{13}\right)^2 - \left(\frac{5}{13}\right)^2$

$= \frac{144}{169} - \frac{25}{169}$

$\boxed{\cos 2A = \frac{119}{169}}$

12. If $\tan A = \frac{1}{2}$, find cos 2A and tan 2A.

$\cos 2A = \left(\frac{2}{\sqrt{5}}\right)^2 - \left(\frac{1}{\sqrt{5}}\right)^2$

$\cos 2A = \frac{4}{5} - \frac{1}{5} = \boxed{\frac{3}{5}}$

$\tan 2A = \frac{2\left(\frac{1}{2}\right)}{1-\left(\frac{1}{2}\right)^2} = \frac{1}{1-\frac{1}{4}} =$

$\frac{1}{\frac{3}{4}} = \boxed{\frac{4}{3}}$

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The Law of Sines

SSS - law of cosines

In any triangle ABC with angles A, B, and C and opposite sides a, b and c, respectively, the following equation is true:

$\boxed{SSA}$

$\boxed{\begin{array}{c} ASA \\ AAS \\ SAS \end{array}}$

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

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

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

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Law of Sines (AAS, ASA)

If you are given information for a triangle for AAS or ASA, there is only one triangle that can be formed.

S | A

Law of Sines: The Ambiguous Case (SSA)

If you have (SSA) then there might be one, two, or zero triangles determined.

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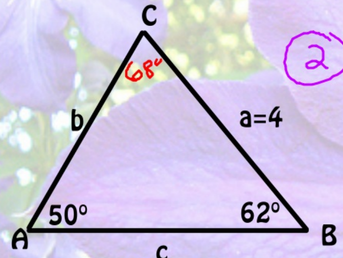
Example:

Solve the triangle.

nearest whole degree
nearest tenth for side

AAS



① $180-(50+62)=68°$

$\boxed{m\angle C=68}$

② $\dfrac{\sin 50}{4}=\dfrac{\sin 62}{b}$

$b\sin 50=4\sin 62$

$b=\dfrac{4\sin 62}{\sin 50}$

$\boxed{b=4.6}$

③ $\dfrac{\sin 50}{4}=\dfrac{\sin 68°}{c}$

$c\sin 50=4\sin 68$

$c=\dfrac{4\sin 68}{\sin 50}$ $\boxed{c=4.8}$

C= 68°

b= 4.6

c= 4.8

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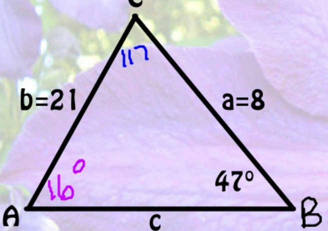
Example:

Solve the triangle.

SSA



① $\frac{\sin 47}{21} = \frac{\sin A}{8}$

$21\sin A = 8\sin 47$

$\sin A = \frac{8\sin 47}{21}$

$\boxed{m\angle A = 16^\circ}$

② $180-(16+47)=117^\circ$

$\boxed{m\angle C = 117^\circ}$

③ $\frac{\sin 47}{21} = \frac{\sin 117}{c}$

$c = \frac{21\sin 117}{\sin 47}$

④ 

$164+47=211^\circ$

1 Δ

A= 16° _____

C= 117° _____

c= 25.6 _____

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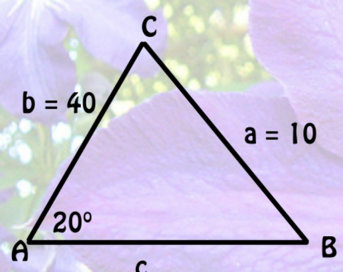
Example:

Solve the triangle.

SSA



① $\frac{\sin 20}{10} = \frac{\sin B}{40}$

$10\sin B = 40\sin 20$

$\sin B = \frac{40\sin 20}{10}$

$\sin B = 1.4$

$\boxed{\text{No triangle}}$

B= _____ _____

C= _____ _____

c= _____ _____

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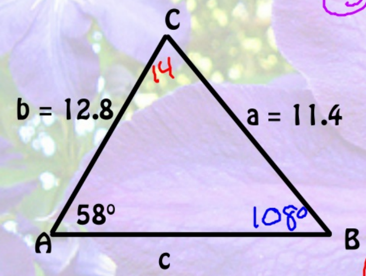
Example:

Solve the triangle.

SSA



① $\frac{\sin 58}{11.4} = \frac{\sin B}{12.8}$

$\sin B = \frac{12.8 \sin 58}{11.4}$

$\boxed{m\angle B = 72^\circ}$

② $180 - (58 + 72) =$

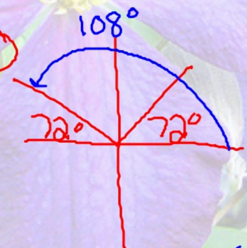
$\boxed{m\angle C = 50^\circ}$

③ $\frac{\sin 58}{11.4} = \frac{\sin 50}{c}$

$c = \frac{11.4 \sin 50}{\sin 58}$

$\boxed{c = 10.3}$

④



$108 + 58 = 166$

⑤ $180 - (58 + 108) = 14^\circ$

$\boxed{m\angle C = 14^\circ}$

⑥ $\frac{\sin 58}{11.4} = \frac{\sin 14}{c}$

$c = \frac{11.4 \sin 14}{\sin 58}$ $\boxed{c = 3.3}$

B= 72° 108°

C= 50° 14°

c= 10.3 3.3

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