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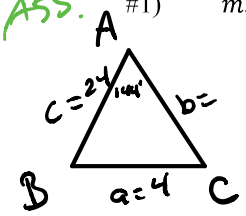
# Solving Triangles
## 12.1 Practice – The Law of Sines

State the number of possible triangles that can be formed using the given measurements.

ASS!

#1) $m\angle A = 144°, c = 24\ km, a = 4\ km$

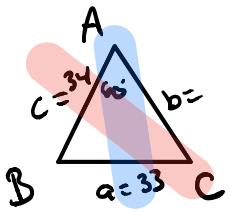



NO Triangle b/c

$\angle A$ is the largest angle but the opposite side isn't the largest side.

ASS!

#2) $m\angle A = 60°, c = 34\ mi, a = 33\ mi$




$\frac{\sin 60°}{33} = \frac{\sin C}{34}$

$\frac{34 \cdot \sin 60°}{33} = \sin C$

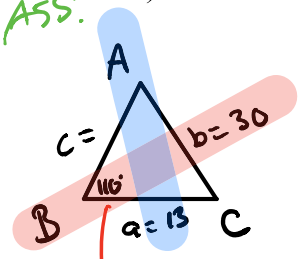
$\sin^{-1}\left(\frac{34 \sin 60°}{33}\right) = C$

$63.160° \approx C$

Possibly 2 solutions

ASS!

#3) $m\angle B = 110°, a = 13\ yd, b = 30\ yd$




$\frac{\sin 110°}{30} = \frac{\sin A}{13}$

$\frac{13 \sin 110°}{30} = \sin A$

$\sin^{-1}\left(\frac{13 \sin 110}{30}\right) = A$

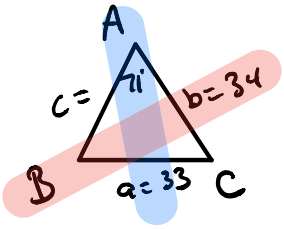
acute $24.030° \approx A$

obtuse

Possibly 1 solution

ASS!

#4) $m\angle A = 71°, b = 34\ m, a = 33\ m$




$\frac{\sin 71°}{33} = \frac{\sin B}{34}$

$\frac{34 \sin 71°}{33} = \sin B$

$\sin^{-1}\left(\frac{34 \sin 71°}{33}\right) = B$

$76.950° \approx B$

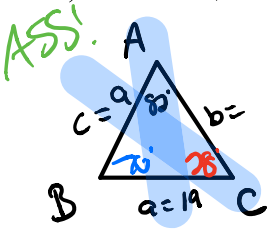
Possibly 2 solutions

Solve each triangle. Round angles and sides to the nearest tenth.

$m\angle C = 28°$ $m\angle B = 70°$ $b = 18$

#5) $m\angle A = 82°, a = 19\ km,$ ~~$a = 9\ km$~~ $c = 9$

ASS!




① $\frac{\sin 82°}{19} = \frac{\sin C}{9}$

$\frac{9 \sin 82°}{19} = \sin C$

$\sin^{-1}\left(\frac{9 \sin 82°}{19}\right) = C$

$28.0° \approx C$

maybe 2 solutions

③ $m\angle B + 28° + 82° = 180$

$m\angle B + 110° = 180$

$m\angle B = 70°$

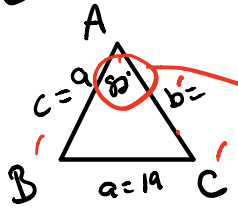
④ $\frac{\sin 82°}{19} = \frac{\sin 70°}{b}$

$b \sin 82° = 19 \sin 70°$

$b = \frac{19 \sin 70°}{\sin 82°}$

$b \approx 18.0\ km$

## Solution 2




$m\angle C + m\angle C' = 180°$

$28° + m\angle C' = 180°$

$m\angle C' = 152°$

Not possible,

1 solution

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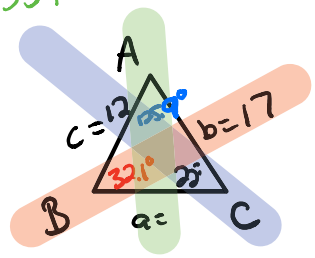
# Solving Triangles
## 12.1 Practice – The Law of Sines

#6) $m\angle C = 22°, b = 17\ yd, c = 12\ yd$

ASS!




$\frac{\sin 22°}{12} = \frac{\sin B}{17}$

$\frac{17 \sin 22°}{12} = \sin B$

$\sin^{-1}\left(\frac{17 \sin 22°}{12}\right) = B$

$32.1° \approx B$

Maybe 2 solutions

$m\angle A + 32.1° + 22° = 180°$

$m\angle A + 54.1° = 180°$

$m\angle A = 125.9°$

$\frac{\sin 22°}{12} = \frac{\sin 125.9°}{a}$

$a \sin 22° = 12 \sin 125.9°$

$a = \frac{12 \sin 125.9°}{\sin 22°}$

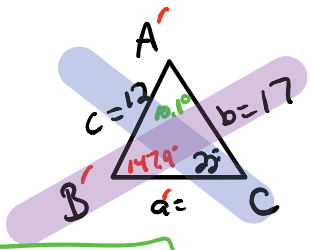
$a \approx 25.9\ yd$

Solution 2

$m\angle B + m\angle B' = 180°$

$32.1° + m\angle B' = 180°$

$m\angle B' = 147.9°$




$m\angle A' + 147.9° + 22° = 180°$

$m\angle A' + 169.9° = 180°$

$m\angle A' = 10.1°$

$\frac{\sin 22°}{12} = \frac{\sin 10.1°}{a'}$

$a' \cdot \sin 22° = 12 \cdot \sin 10.1°$

$a' = \frac{12 \sin 10.1°}{\sin 22°}$

$a' \approx 5.6\ yd$

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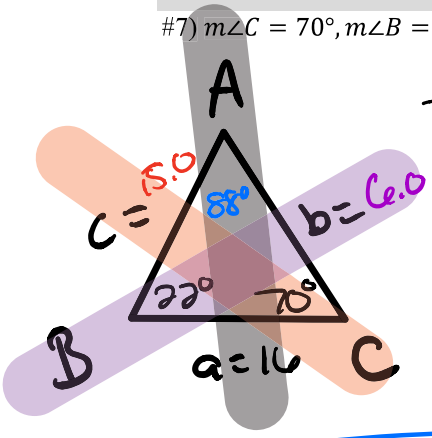
# Solving Triangles
## 12.1 Practice – The Law of Sines

#7) $m\angle C = 70°, m\angle B = 22°, a = 16\ m$

1 solution




$m\angle A + 22° + 70° = 180°$

$m\angle A + 92° = 180°$

$m\angle A = 88°$

$\frac{\sin 88°}{16} = \frac{\sin 70°}{c}$

$c \sin 88° = 16 \sin 70°$

$c = \frac{16 \sin 70°}{\sin 88°}$

$c \approx 15.0\ m$

$\frac{\sin 88°}{16} = \frac{\sin 22°}{b}$

$b \sin 88° = 16 \sin 22°$

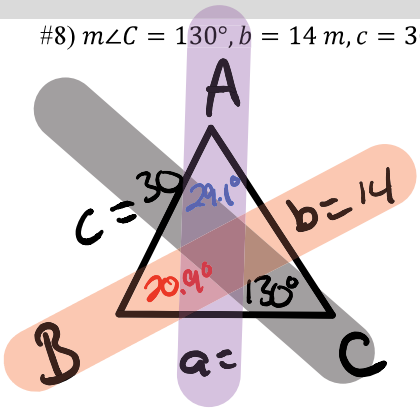
$b = \frac{16 \sin 22°}{\sin 88°}$

$b \approx 6.0\ m$

#8) $m\angle C = 130°, b = 14\ m, c = 30\ m$

ASS!

one solution




$\frac{\sin 130°}{30} = \frac{\sin B}{14}$

$\frac{14 \sin 130°}{30} = \sin B$

$\sin^{-1}\left(\frac{14 \sin 130°}{30}\right) = B$

$20.9° \approx B$

$20.9° + 130° + m\angle A = 180°$

$150.9 + m\angle A = 180°$

$m\angle A = 29.1°$

$\frac{\sin 130°}{30} = \frac{\sin 29.1°}{a}$

$a \sin 130° = 30 \sin 29.1°$

$a = \frac{30 \sin 29.1°}{\sin 130°}$

$a \approx 19.0\ m$

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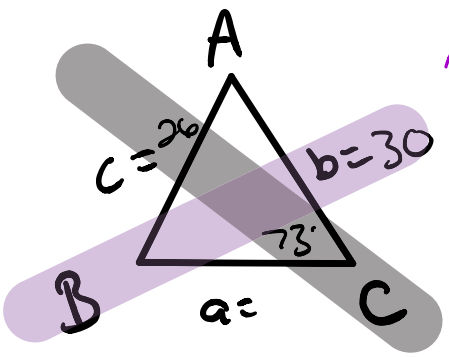
# Solving Triangles
## 12.1 Practice – The Law of Sines

#9) $m\angle C = 73°, b = 30\ in, c = 26\ in$




ASS!

$$\frac{\sin 73°}{26} = \frac{\sin B}{30}$$

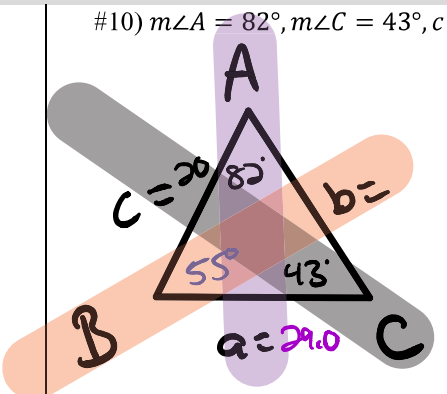
$$\frac{30 \sin 73°}{26} = \sin B$$

$$\sin^{-1}\left(\frac{30 \sin 73°}{26}\right) = B$$

Error,

No Solution

#10) $m\angle A = 82°, m\angle C = 43°, c = 20\ km$




One solution

$82° + 43° + m\angle B = 180°$

$125° + m\angle B = 180°$

$m\angle B = 55°$

$$\frac{\sin 43°}{20} = \frac{\sin 82°}{a}$$

$$a \sin 43° = 20 \sin 82°$$

$$a = \frac{20 \sin 82°}{\sin 43°}$$

$$a \approx 29.0\ km$$

$$\frac{\sin 43°}{20} = \frac{\sin 55°}{b}$$

$$b \sin 43° = 20 \sin 55°$$

$$b = \frac{20 \sin 55°}{\sin 43°}$$

$$b \approx 24.0\ km$$

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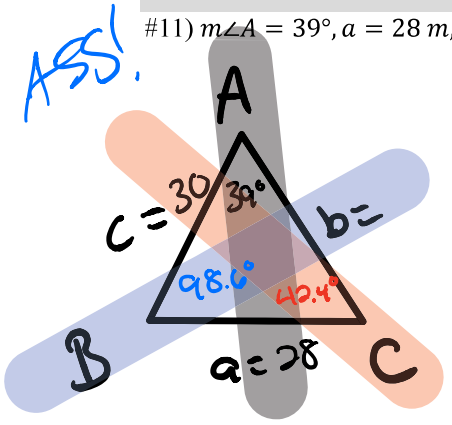
# Solving Triangles
## 12.1 Practice – The Law of Sines

#11) $m\angle A = 39°, a = 28\ m, c = 30\ m$

ASS!




$$\frac{\sin 39°}{28} = \frac{\sin C}{30}$$

$$\frac{30 \sin 39°}{28} = \sin C$$

$$\sin^{-1}\left(\frac{30 \sin 39°}{28}\right) = C$$

$$42.4° \approx C$$

Maybe 2 solutions

$$m\angle B + 39° + 42.4° = 180°$$

$$m\angle B + 81.4° = 180°$$

$$m\angle B = 98.6°$$

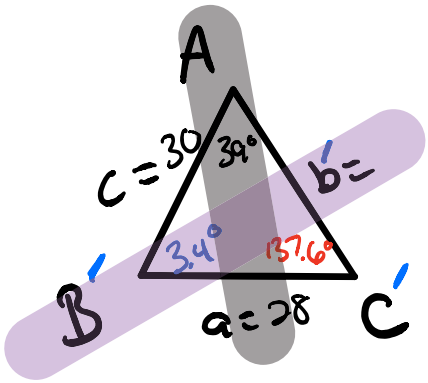
$$\frac{\sin 39°}{28} = \frac{\sin 98.6°}{b}$$

$$b \sin 39° = 28 \sin 98.6°$$

$$b = \frac{28 \sin 98.6°}{\sin 39°}$$

$$b \approx 44.0\ m$$

## Solution 2




$$m\angle C + m\angle C' = 180°$$

$$42.4° + m\angle C' = 180°$$

$$m\angle C' = 137.6°$$

$$m\angle B' + 39° + 137.6° = 180°$$

$$m\angle B' + 176.6° = 180°$$

$$m\angle B' = 3.4°$$

$$\frac{\sin 39°}{28} = \frac{\sin 3.4°}{b'}$$

$$b' \sin 39° = 28 \sin 3.4°$$

$$b' = \frac{28 \sin 3.4°}{\sin 39°}$$

$$b' \approx 2.6\ m$$

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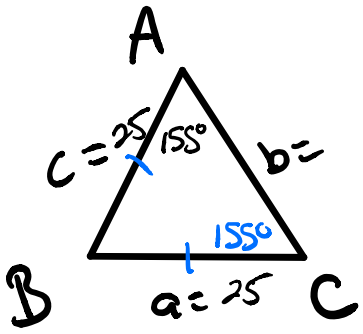
# Solving Triangles
## 12.1 Practice – The Law of Sines

#12) $m\angle A = 155°, c = 25\ mi, a = 25\ mi$




This Δ is bonkers.

no such Δ exists.

#1) No possible triangle
#2) 2 triangles possible
#3) 1 triangle possible
#4) 2 triangles possible
#5) 1 triangle,
$m\angle C = 28°, m\angle B = 70°, b = 18\ m$
#6) 2 triangles
$m\angle A = 125.9°, m\angle B = 32.1°, a = 25.9\ yd$
$m\angle A' = 10.1°, m\angle B' = 147.9°, a' = 5.6\ yd$
#7) 1 triangle,
$m\angle A = 88°, b = 6\ m, c = 15\ m$
#8) 1 triangle,
$m\angle C = 29.1°, m\angle B = 20.9°, a = 19.0\ m$
#9) No possible triangle
#10) 1 triangle
$m\angle B = 55°, a = 29.0, b = 24.0\ m$
#11) 2 triangles
$m\angle B = 98.6°, m\angle C = 42.4°, b = 44.0\ m$
$m\angle B' = 3.4°, m\angle C' = 137.6°, b' = 2.6\ m$
#12) No possible triangle