Two ideas:

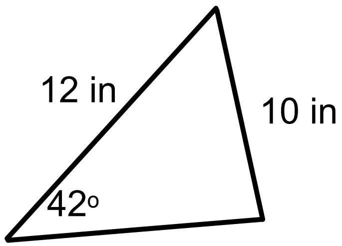
- Information adequate to prove congruence, is adequate to "solve" a triangle.
- There is a formula, like the Pythagorean theorem, that works for every triangle.

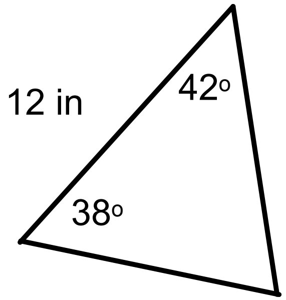
| | Recommend tool | |
|---|---|---|
| AAA - Not enough information to prove congruence | | |
| AAS - Enough (see below) | Law of Sines | |
| ASA - Enough | Law of Sines | |
| SSS - Enough | | Law of Cosines |
| SSA - Not enough | Law of Sines | |
| SAS - Enough | | Law of Cosines |

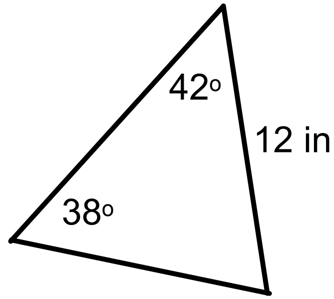
$$\frac{\sin\alpha}{A} = \frac{\sin\beta}{B} = \frac{\sin\chi}{C}$$

SSA: All about $\sin^{-1}()$ from 0 to 180°

1) Solve using law of sines.
2) $\sin^{-1}()$ will give you two "possibles"
   - Either only one can be used in a total of 180°
   - Or both can. START DRAWING



Remember using the Pythagorean theorem as a test?

$$a^2 + b^2 > c^2$$ Acute

$$a^2 + b^2 < c^2$$ Obtuse

$$a^2 + b^2 = c^2$$ Right

This views every triangle as a failed right triangle or not.
Too bad we can't use the Pythagorean theorem for everybody.

Well, actually, the Pythagorean theorem is a subset of another theorem.

$$c^2 = a^2 + b^2 - \boxed{2ab\cos\gamma}$$

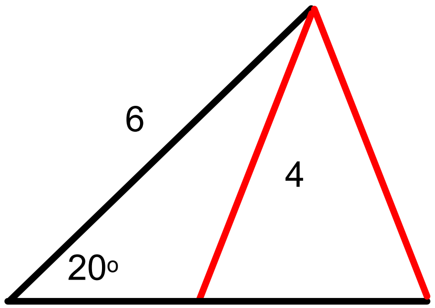
$$a^2 + b^2$$

$$(a+b)^2$$

Formulas with cross products/adjusted cross products

$$\partial_p^2 = a^2\partial_a^2 + b^2\partial_b^2 + \boxed{2ab\partial_a\partial_b\rho}$$

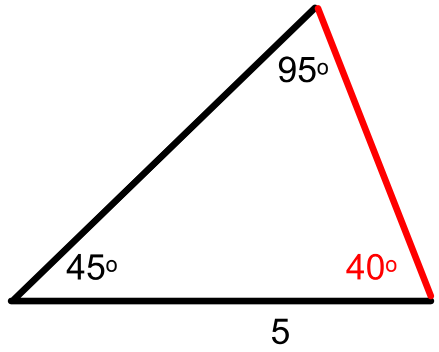
$$c^2 = a^2 + b^2 - \boxed{2ab\cos\gamma}$$

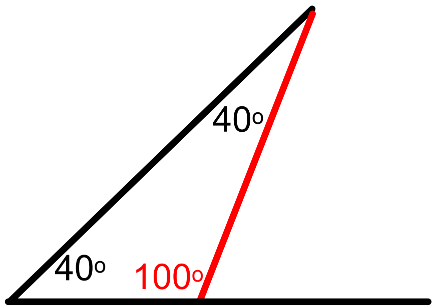


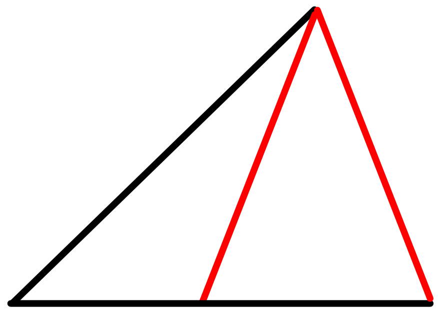

$$\frac{\sin\left(20^{o}\right)}{4}=\frac{\sin\left(\theta\right)}{6}$$

$$30.87 \quad or \quad 149.13$$

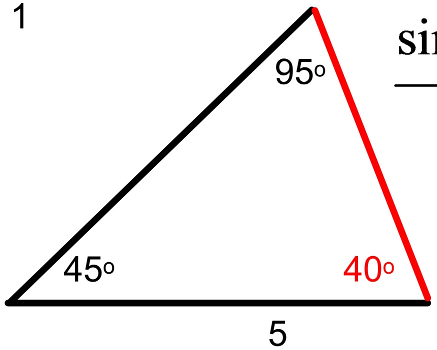
*Yes*



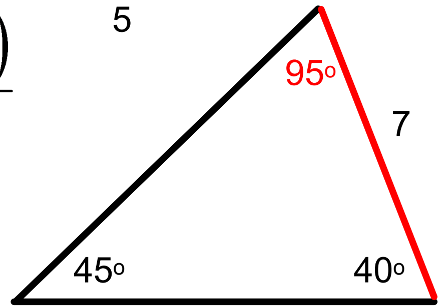
1




$$\frac{\sin(95^o)}{5} = \frac{\sin(45^o)}{x}$$

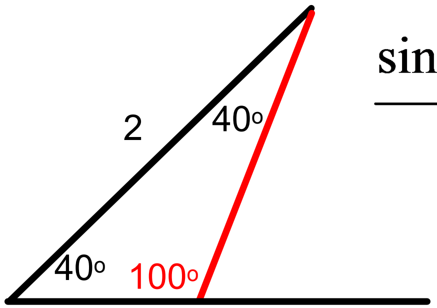
AAS

5

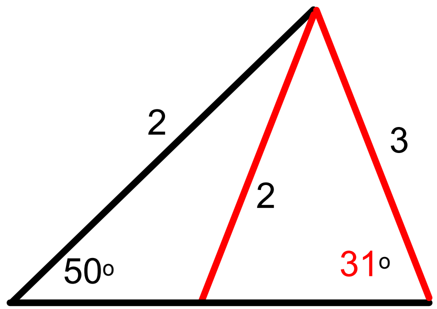



$$\frac{\sin(45^o)}{7} = \frac{\sin(40^o)}{x}$$

AAS




$$\frac{\sin(100^o)}{2} = \frac{\sin(40^o)}{x}$$




One

$$\frac{\sin(\theta)}{3} = \frac{\sin(50^o)}{2}$$

$\theta = 30.71^o$

$or \quad 149.29^o \quad nope$

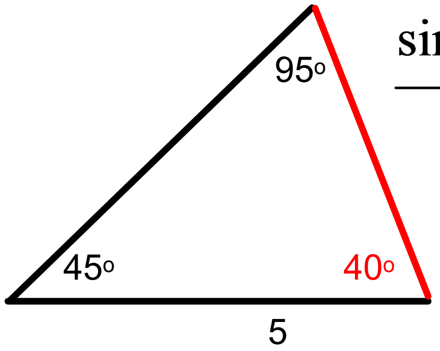
SSA

AAS

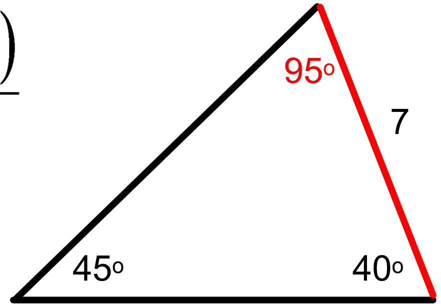
17

15

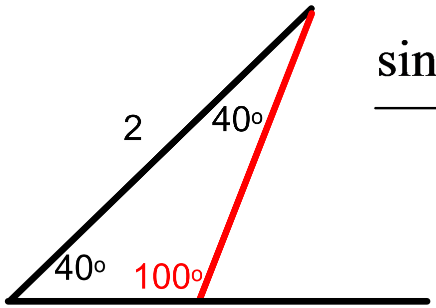
7[1]



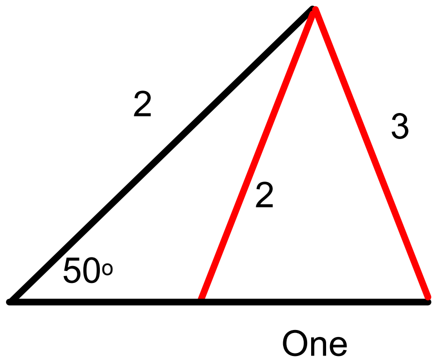

$$\frac{\sin(95^o)}{5} = \frac{\sin(45^o)}{x}$$




$$\frac{\sin(45^o)}{7} = \frac{\sin(40^o)}{x}$$




$$\frac{\sin(100^o)}{2} = \frac{\sin(40^o)}{x}$$

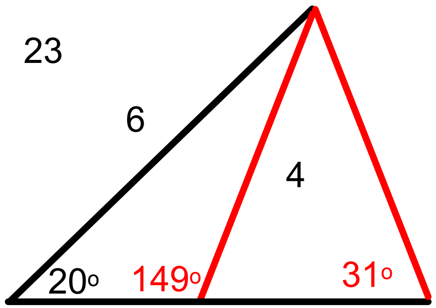



$$\frac{\sin(\theta)}{2} = \frac{\sin(50^o)}{3}$$

$$\theta = 30.71^o$$

$$or \quad 149.29^o \quad nope$$

23

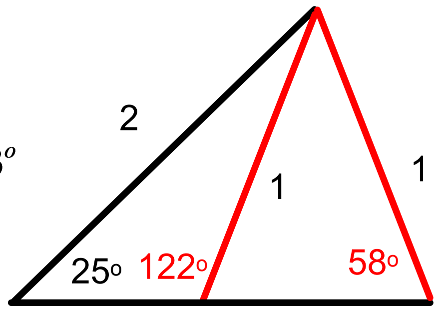



$$\frac{\sin(20^o)}{4} = \frac{\sin(\theta)}{6}$$

$30.87^o \quad or \quad 149.13^o$

*Yes*

SSA

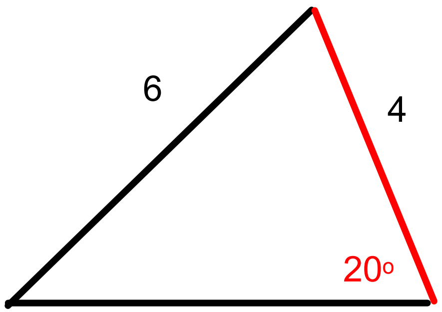



$$\frac{\sin(25^o)}{1} = \frac{\sin(\theta)}{2}$$

$57.70^o \quad or \quad 122.30^o$

*Yes*

SSA



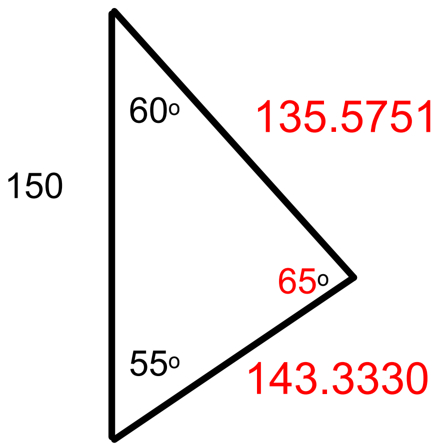

$$\frac{\sin(20^o)}{6} = \frac{\sin(\theta)}{4}$$

$13.18^o$

*One from picture*

SSA

(sketch and think)
- setup & solve
- Last step: take inverse
(- subtract from 180o
- Determine if 2 work)



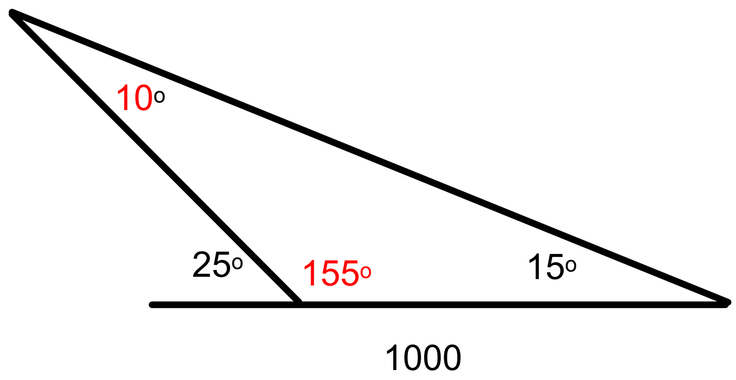

$$\frac{\sin 60^o}{x} = \frac{\sin 65^o}{150}$$

$$\frac{\sin 60^o}{143.3330} = \frac{\sin 55^o}{x}$$

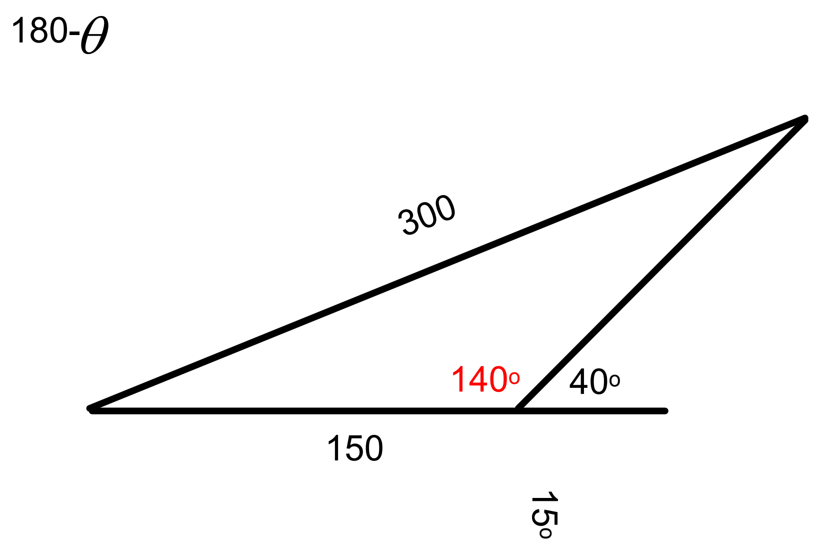
$$\frac{135.5751 miles}{200\, miles/hour} = .6779 hours * 60 \min/_{hour} = 41 \min$$

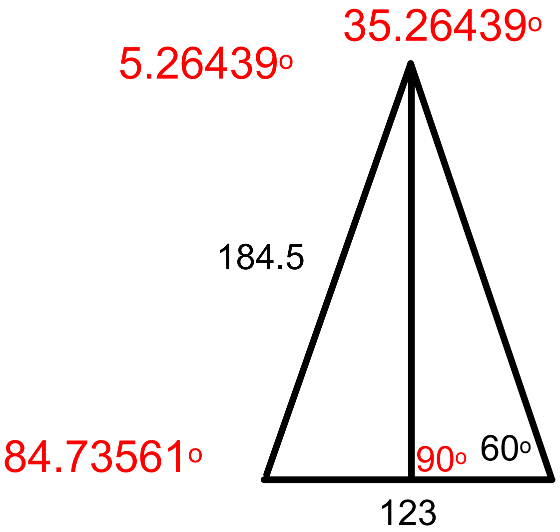
$$\frac{\sin 15^o}{x} = \frac{\sin 10^o}{1000}$$

1490.47948 ft



$$\frac{\sin\theta}{150}=\frac{\sin 140^{o}}{300}$$






30°

212.14362

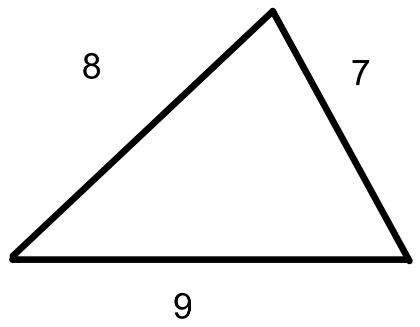
$$\frac{\sin 60^o}{184.5} = \frac{\sin\theta}{123}$$ 35.26439°

84.73561°

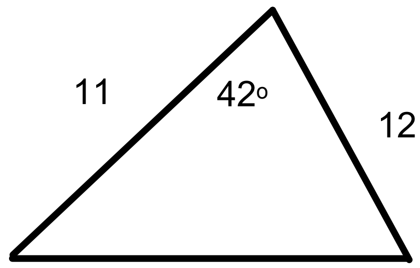
$$\frac{\sin 60^o}{184.5} = \frac{\sin 84.73561}{x}$$

212.14362

$$212.14362\,\frac{\sqrt{3}}{2} = 183.72176$$




Watch the negative!




Packet: Not all law of cosines