Vectors: Trigonometry Review

Pythagorean theorem and SOH CAH TOA

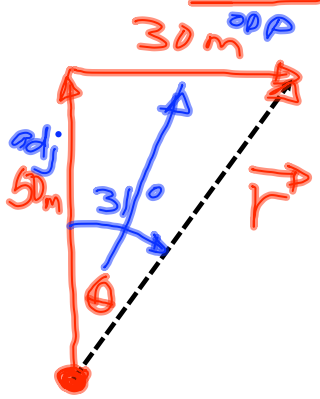
Right Δ's

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

$\sin\theta = \frac{opp}{hyp}$ $\tan\theta = \frac{opp}{adj}$

$\cos\theta = \frac{adj}{hyp}$

Julien walks 50 m [N] and then turns and walks 30 m [E]. Determine the resultant magnitude and direction.



Mag

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

$50^2+30^2=r^2$

$3400=r^2$

$58.3\text{m}=r$

Direction

$\tan\theta = \frac{o}{a}$

$\tan\theta = \frac{30}{50}$

$\theta = \tan^{-1}\left(\frac{30}{50}\right)$

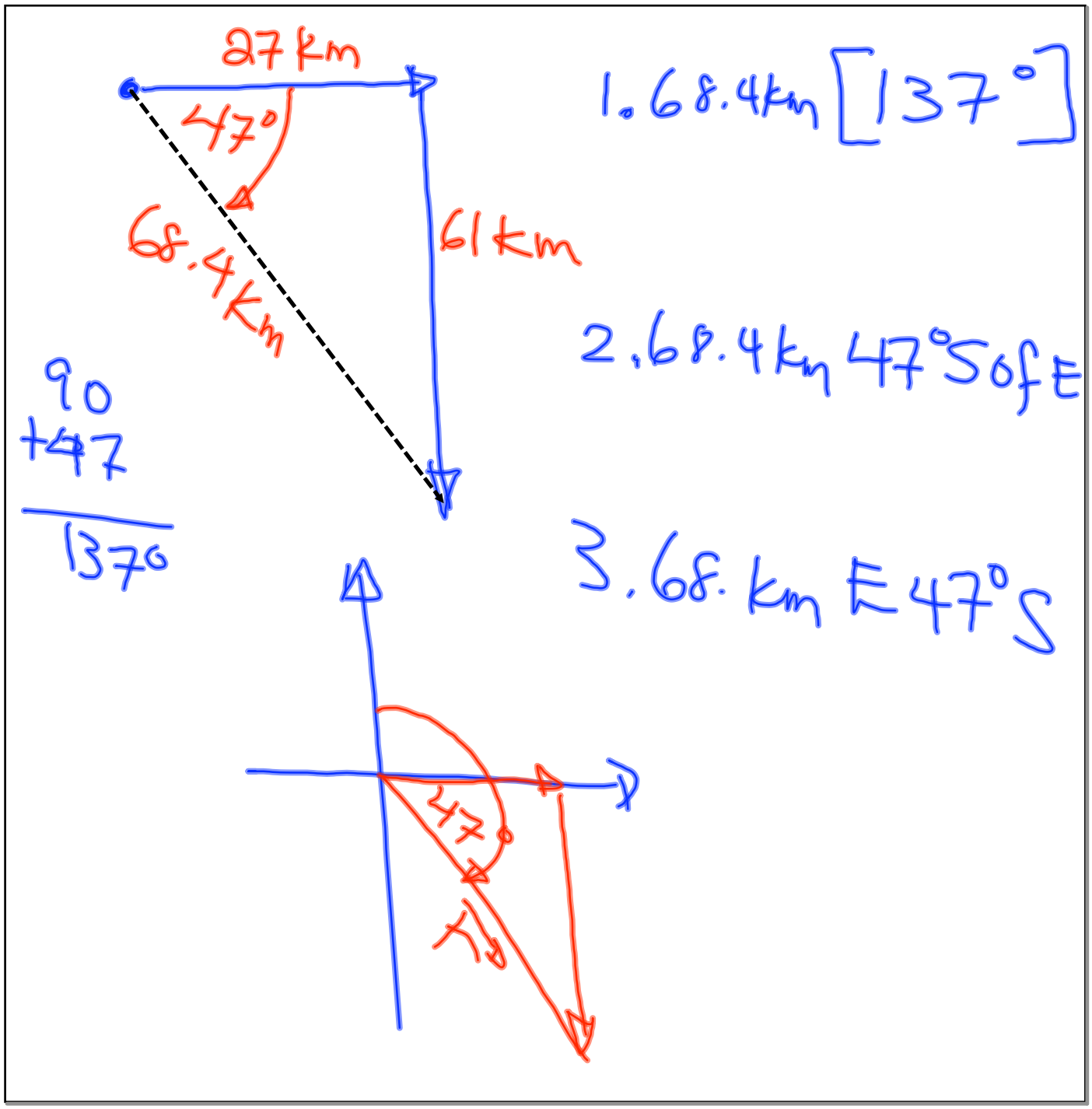
$\theta = 31°$

*Angles are rounded to whole degrees

Ans: 58.3m [31°]

58.3m E of N 31°

58.3m N 31° E


27 km
47°
68.4 km
61 km
1. 68.4km [137°]
2. 68.4 km 47° S of E
90
+47
137°
3. 68. km E 47° S
47°

Sine Law

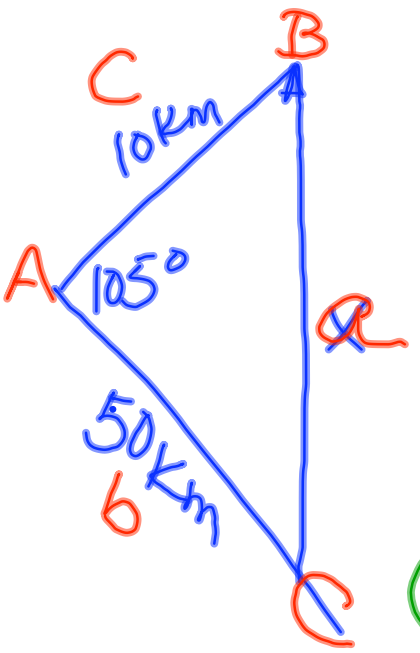
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

* To use Sine Law you MUST know one side and the angle across from that side.

Cosine Law

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

Angle: $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$



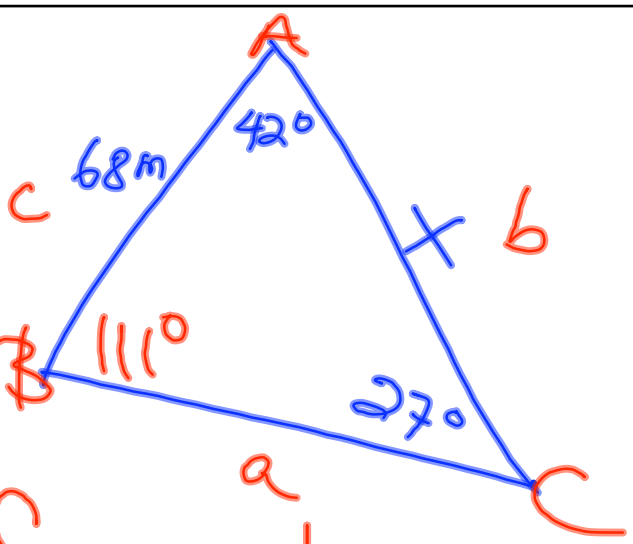
$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$a^2 = 50^2 + 10^2 - 2(50)(10)\cos(105^\circ)$$

a^2

$$a^2 = 2858.82$$

$$a = 53.5\text{ km}$$



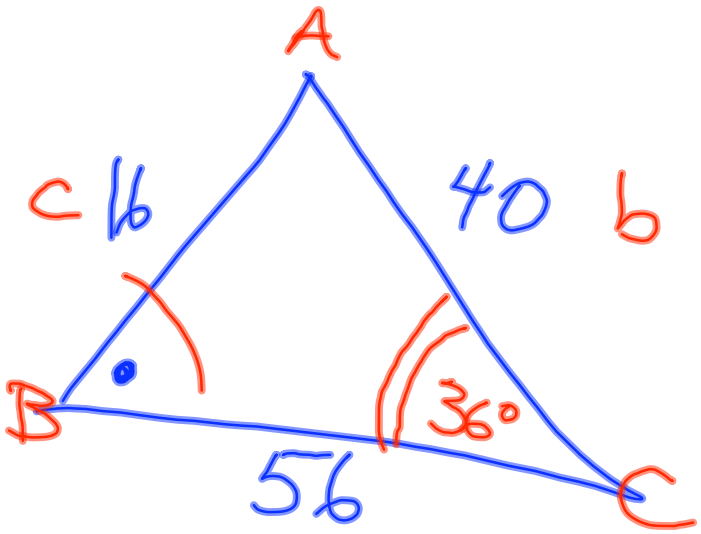
$$\frac{c}{\sin C} = \frac{b}{\sin B}$$

$$\frac{68}{\sin 27} = \frac{b}{\sin 111^\circ}$$

$$b \cdot (\sin 27) = 68 \cdot \sin 111$$

$$b = \frac{68 \cdot \sin(111)}{\sin(27)}$$

$$b = 139.8\text{m}$$



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

$$\frac{16}{\sin 36} \neq \frac{40}{\sin B}$$

$$40 \cdot \sin(36) = 16 \cdot \sin B$$

$$\frac{40 \cdot \sin(36)}{16} = \sin B$$

$$1.469\ldots = \sin B$$

$$\sin^{-1}(1.469) = B$$

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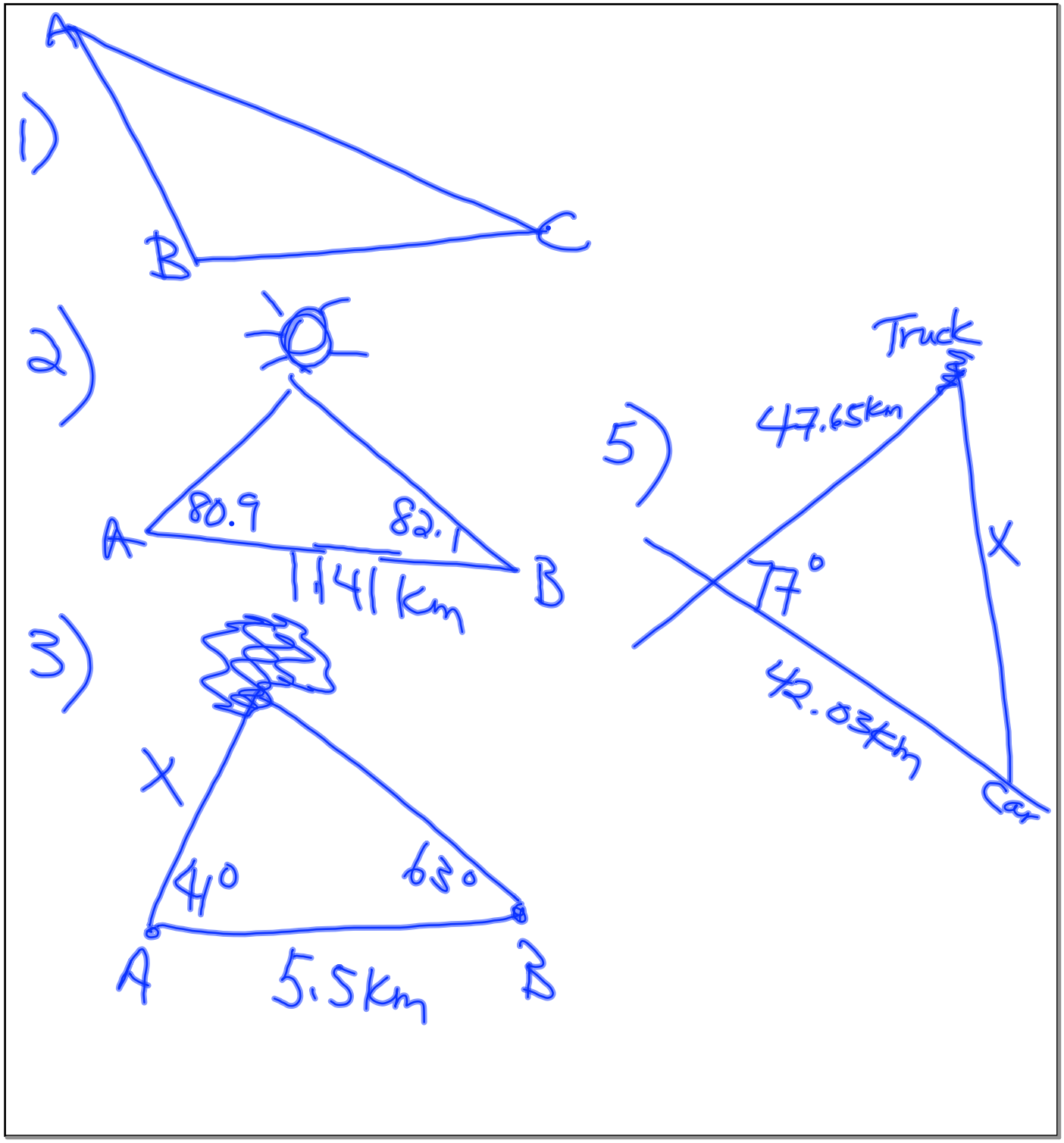
1)
A
B
C
2)
80.9
82.1
A
B
1.141 km
3)
X
40°
63°
A
5.5km
B
5)
Truck
47.65km
X
77°
42.03km
Car