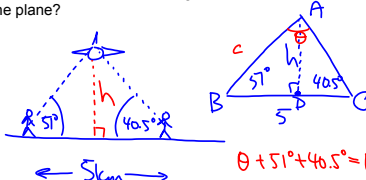Applications of Trigonometry   May 24/2016

Ex.1. Two observers on the ground are 5 km apart. At the same moment in time, they see a small airplane flying above and directly between them. One observer measures a 51° angle of inclination, while the other measures a 40.5° inclination angle. What is the altitude of the plane?
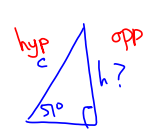

$$\theta + 51° + 40.5° = 180°$$
$$\theta = 88.5°$$

AAS → sine law

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

$$\frac{5}{\sin 88.5°} = \frac{b}{\sin 51°} = \frac{c}{\sin 40.5°}$$

$$c \sin 88.5° = 5 \sin 40.5°$$

$$c = \frac{5 \sin 40.5°}{\sin 88.5°}$$

$$c \doteq 3.2484$$

$$\sin 51° \doteq \frac{h}{3.2484}$$
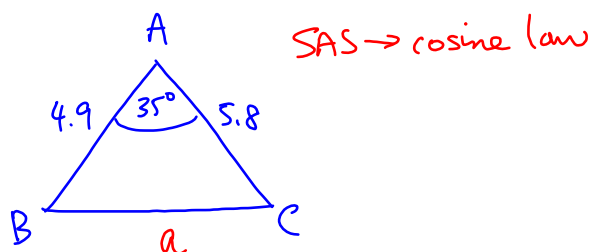
$$h \doteq 3.2484 \; \sin 51°$$

$$h \doteq 2.5$$

∴ the plane is 2.5 km high

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Ex.2

Shannon works for a landscaping business. Her job is to measure properties. For a triangular piece of land, two sides measure 4.9 m and 5.8 m and meet at a common point separated by a 35° angle.

Find the total perimeter and area of the piece of land.

SAS → cosine law

$$a^2 = b^2 + c^2 - 2bc \cos A$$
$$a^2 = 5.8^2 + 4.9^2 - 2(5.8)(4.9) \cos 35°$$

$$a \doteq 3.3301$$

$$P = a + b + c$$
$$= 14.0$$

∴ the perimeter is 14.0 m.

May 16-8:12 AM

1

$$A = \frac{(base)(height)}{2}$$

$$base \doteq 3.3301$$

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

$$\frac{\sin 35°}{3.3301} \doteq \frac{\sin \theta}{5.8}$$

$$3.3301 \sin \theta \doteq 5.8 \sin 35°$$

$$\sin \theta \doteq \frac{5.8 \sin 35°}{3.3301}$$

$$\theta \doteq \sin^{-1}\left(\frac{5.8 \sin 35°}{3.3301}\right)$$

$$\theta \doteq 87.4272°$$

Soh Cah Toa

$$\sin \theta = \frac{h}{4.9}$$

$$h = 4.9 \sin \theta$$

$$h \doteq 4.895$$

$$A = \frac{bh}{2}$$

$$\doteq \frac{(3.3301)(4.895)}{2}$$

$$\doteq 8.2$$

∴ the area is $8.2 m^2$.

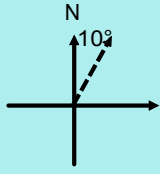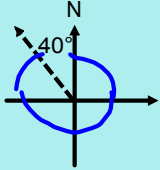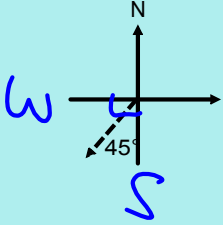May 24-2:42 PM

Compass Directions & Bearings

(a) A <u>compass direction</u> is measured from N, S, E, or W. The angles are always between 0° and 90°.
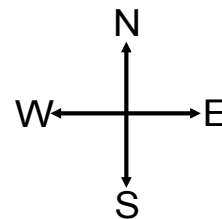
(b) A <u>bearing</u> is always measured from north, in a clockwise direction. The values are from 000 to 360 (but less than 360).

Compass Direction	Bearing	Path
N10°E	010	N, 10°
N40°W	320	N, 40°
SW	225	N, W, 45°, S

Jun 1-9:38 PM

Assigned Work:

p.450 # 4 (see Ex.2), 9 (see Ex.1)
p.450 # 5, 8, 11, 13, 15

Tomorrow is a review period.

Review Questions:

p.416 #2, 3, 5, 6, 9, 13, 14, 16
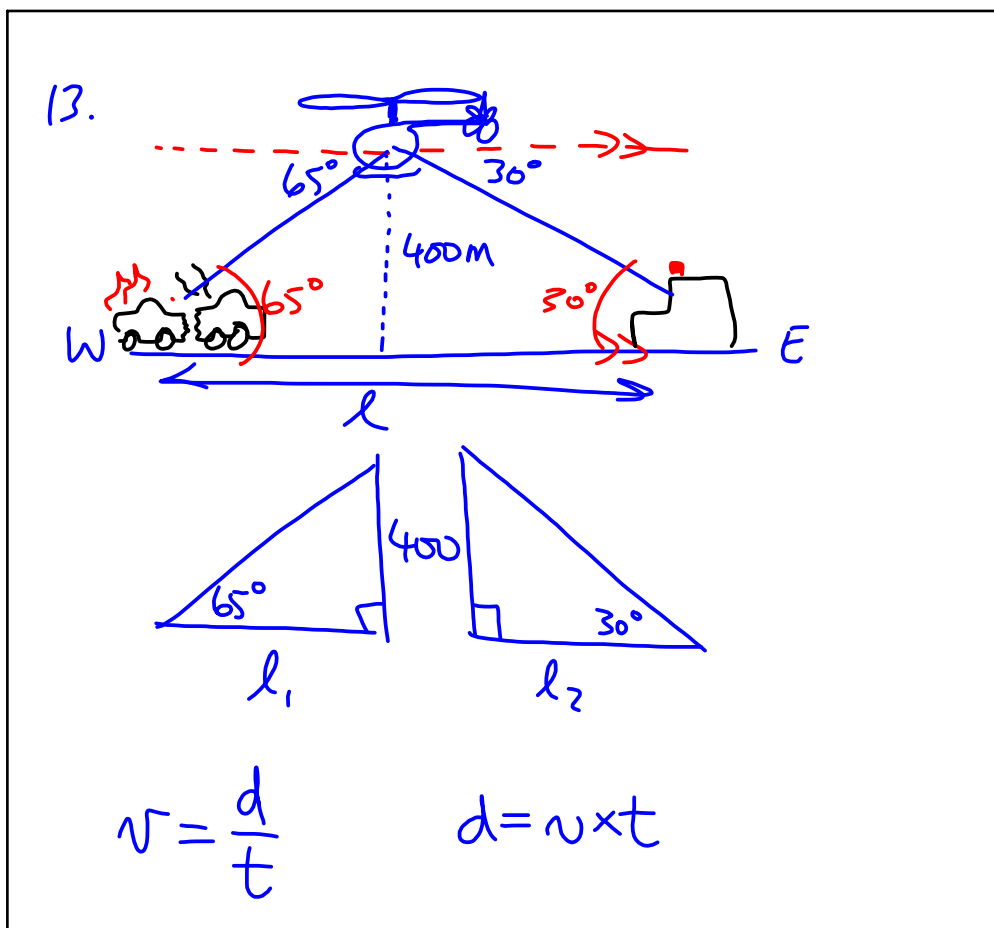p.453 #2, 3, 7, 8, 11, 12

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5.

$62°$ $56°$

$200\,m$

$62°$ $56°$

$\ell\,?$

$\ell = \ell_1 + \ell_2$

200

$62°$ $56°$

ℓ_1 ℓ_2

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8.

A

$5°$
$45°$ $50\,km$
$45°$
$45°$
$40°$
D $50°$ B

A

$40°$ 50
$85°$ B
$55°$
D

AAS : sine law

$$\frac{a\,?}{\sin A} = \frac{b\,?}{\sin B} = \frac{d}{\sin D}$$

$D = 180° - 40° - 85°$

$= 55°$

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4

13.

$65°$ $30°$

$400m$

$65°$ $30°$

W   E

ℓ

$65°$ 400 $30°$

ℓ_1 ℓ_2

$$v = \dfrac{d}{t} \qquad d = v \times t$$

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