10.5 # 15-30m3, 32, 34, 35, 38, 46

15.

60 yd
94°
46 yrd
78 yrd

SAS

$area = \frac{1}{2}(46)(60) \sin 94°$

$area = 1376.6 \ yrds^2$

18.

R
s   q
Q   S
  r
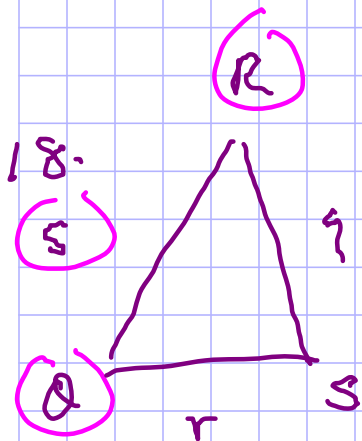
$R = 46°$ $r = \underline{10.5}$ ✓

$Q = 50°$ $q = \underline{11.1}$ ✓

$S = \underline{84°}$ $s = \underline{14.5}$ ✓

ASA → L.O.S.

$S = 180° - (R+Q)$

$S = 180° - (46+50)$

$S = 84°$

$\dfrac{r}{\sin 46°} = \dfrac{14.5}{\sin 84°}$

$r = \dfrac{14.5 \sin 46°}{\sin 84°}$

$r = 10.5$

$\dfrac{q}{\sin 50°} = \dfrac{14.5}{\sin 84°}$

$q = \dfrac{14.5 \sin 50°}{\sin 84°} = 11.1$

21.

$a = 3.0$

$118°$

A

$b = 3.5$
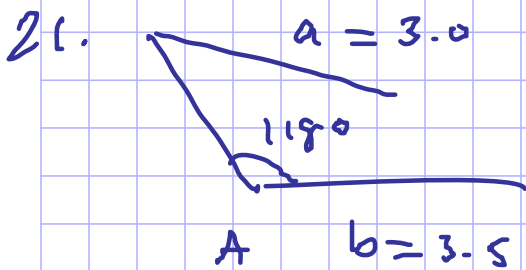
SSA → L.O.S.

(obtuse)

Since $a < b$ ∴ no triangle possible

24.

E

224 million miles

91.6 million miles

$169°$

S

e

M
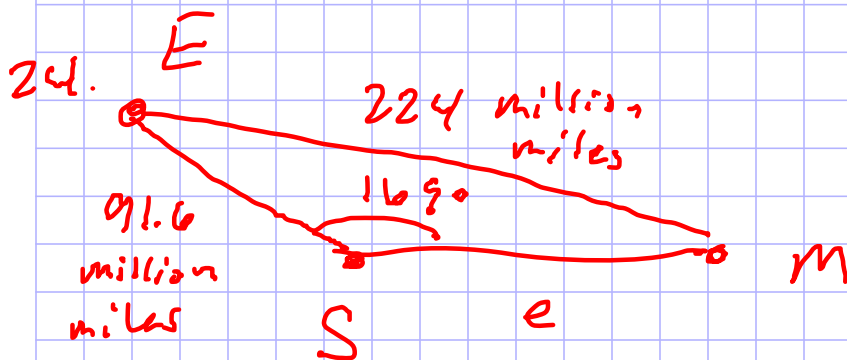
SSA → L.O.S.

(obtuse)

$a > b$ ∴ 1 triangle

$\dfrac{\sin M}{91.6} = \dfrac{\sin 169°}{224}$

$\sin M = \dfrac{91.6 \sin 169°}{224}$

$M = \sin^{-1}\left(\dfrac{91.6 \sin 169°}{224}\right)$

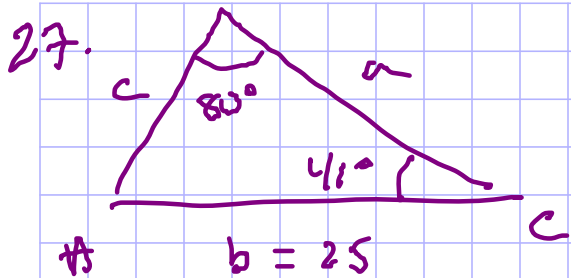$M = 4.475°$

$E = 180° - (s + m)$

$E = 180° - (169 + 4.475)$

$E = 6.525°$

$\dfrac{e}{\sin 6.525°} = \dfrac{224}{\sin 169°}$

$e = \dfrac{224 \sin 6.525°}{\sin 169°} = 133.4$

The distance between the sun and Mars that day was 133 million miles.

AAS → L.O.S.

27.

$A = \underline{59°} \quad a = \underline{21.8}$ ✓

$B = \underline{80°} \quad b = \underline{25}$ ✓

$C = \underline{41°} \quad c = \underline{16.7}$ ✓
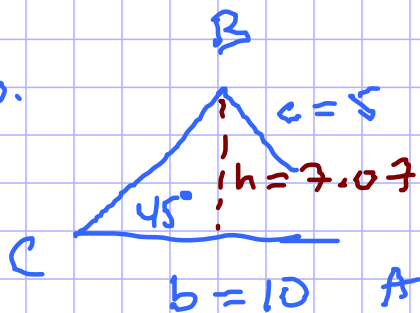
$A = 180° - (B + C)$

$A = 180° - (80° + 41°)$

$A = 59°$

$$\frac{a}{\sin 59°} = \frac{25}{\sin 80°}$$

$$a = \frac{25 \sin 59°}{\sin 80°} = 21.8$$

$$\frac{c}{\sin 41°} = \frac{25}{\sin 80°}$$

$$c = \frac{25 \sin 41°}{\sin 80°} = 16.7$$

30.

SSA → L.O.S.

(acute)

$h = b \sin C = 10 \sin 45° = 7.07$

$c < h \quad \therefore \quad \text{no triangle possible}$

32.

$a = 9$

$60°$

A

$b = 10$

SSA $\rightarrow$ L.O.S.

(acute)

$h = b \sin A = 10 \sin 60° = 8.66$

$h < a < b$ ∴ 2 $\triangle$'s possible

Case 1

$A = \underline{60°} \qquad a = \underline{\quad 9 \quad}$ ✓

$B = \underline{74.2°} \qquad b = \underline{\quad 10 \quad}$ ✓

$C = \underline{45.8°} \qquad c = \underline{7.5}$ ✓

$$\frac{\sin B}{10} = \frac{\sin 60°}{9}$$

$$\sin B = \frac{10 \sin 60°}{9}$$

$$B = \sin^{-1}\left(\frac{10 \sin 60°}{9} \right)$$

$$B = 74.2°$$

$$C = 180° - (A+B)$$

$$= 180° - (60° + 74.2°)$$
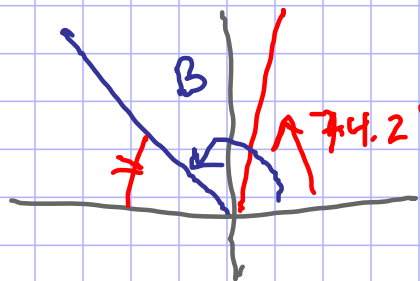
Case 2

$A = \underline{60°} \qquad a = \underline{\quad 9 \quad}$ ✓

$B = \underline{105.8°} \qquad b = \underline{\quad 10 \quad}$ ✓

$C = \underline{14.2°} \qquad c = \underline{2.5}$ ✓

B

$74.2°$

$$B = 180° - 74.2° = 105.8°$$

$$C = 180° - (A+B)$$

$$C = 180° - (60° + 105.8°)$$

$$C = 14.2°$$

Free plain graph paper from http://incompetech.com/graphpaper/plain/

$C = 45.8°$

$$\frac{c}{\sin 45.8°} = \frac{9}{\sin 60°}$$
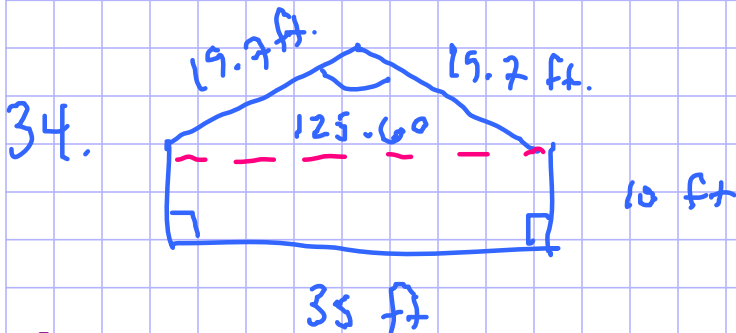
$$c = \frac{9 \sin 45.8°}{\sin 60°}$$

$$c = 7.5$$

$$\frac{c}{\sin 14.2} = \frac{9}{\sin 60°}$$

$$c = \frac{9 \sin 14.2°}{\sin 60°}$$

$$c = 2.5$$

34.

19.7 ft.   19.7 ft.
125.60°
35 ft
10 ft

$area_{house} = area_{\square} + area_{\triangle}$

$= 10(35) + 157.778$

SAS

$$area_{\triangle} = \frac{1}{2}(19.7)(19.7) \sin 125.6$$

$$= 157.778$$

$= 507.778$

$\boxed{area_{house} \approx 508 \ ft^2}$

35.

J_2
y x
60.1°
67.5°   52.4°
J_1 4.6 miles J_3
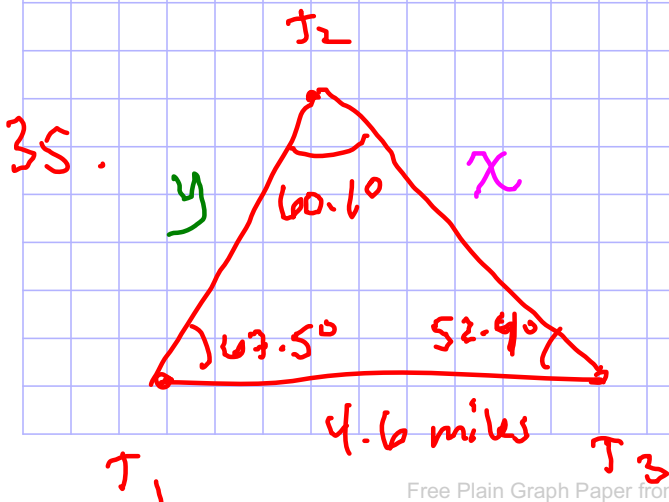
(a) $\dfrac{x}{\sin 67.5°} = \dfrac{4.6}{\sin 60.1°}$

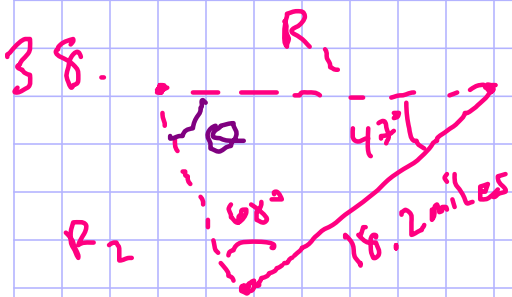$$x = \frac{4.6 \sin 67.5°}{\sin 60.1°}$$

$\boxed{x = 4.902 \ miles}$

(b)

$$\text{area} = \frac{1}{2}(4.6)(4.204)\sin(67.5°)$$

$$\boxed{\text{area} = 8.9 \text{ miles}^2}$$

$$\frac{y}{\sin 52.4°} = \frac{4.6}{\sin 60.1°}$$

$$y = \frac{4.6 \sin 52.4°}{\sin 60.1°}$$

$$\boxed{y = 4.204 \text{ miles}}$$

38.

$$\theta = 180° - (68° + 47°)$$

$$\theta = 65°$$

$$\frac{R_1}{\sin 68°} = \frac{18.2}{\sin 65°}$$

$$R_1 = \frac{18.2 \sin 68°}{\sin 65°}$$

$$R_1 = 18.619 \text{ miles}$$

$$\frac{R_2}{\sin 47°} = \frac{18.2}{\sin 65°}$$

$$R_2 = \frac{18.2 \sin 47°}{\sin 65°}$$

$$R_2 = 14.687 \text{ miles}$$

$$\boxed{\text{Route 2 is 3.932 miles shorter than Route 1.}}$$

40.
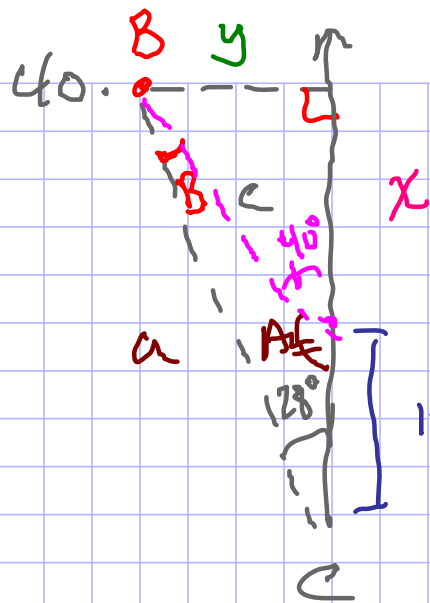
$A = 180° - 40° = 140°$

$B = 180° - (28° + 140°) = 12°$

(a) $\dfrac{c}{\sin 28°} = \dfrac{1500}{\sin 12°}$

$1500\,m = b$

$c = \dfrac{1500 \sin 28°}{\sin 12°}$

$\boxed{c = 3387.05 \text{ meters}}$

(b) $\dfrac{a}{\sin 140°} = \dfrac{1500}{\sin 12°}$

$a = \dfrac{1500 \sin 140°}{\sin 12°} = \boxed{4637.456 \text{ meters}}$

(c) $\cos 40° = \dfrac{x}{3387.05}$

$x = 2594.631$

$3387.05 (\cos 40°) = x$

$$\tan 28° = \frac{y}{1500 + 2594.631} = \frac{y}{4094.631}$$

$$4094.631 \, (\tan 28°) = y$$

$$\boxed{2177.154 \text{ meters} = y}$$