Triangle Trig

1.

$\triangle$ A, $49°$, $b = 14.7$, $C = 9.6$, $a = 11.1$, $41°$, B, C

Rt $\triangle$ so use SOHCAHTOA

$\cos C = \dfrac{11.1}{14.7}$

$C = \cos^{-1} \dfrac{11.1}{14.7}$

$\boxed{C = 41°}$

$90° - 41° = \boxed{49°}$

$\sin 41° = \dfrac{C}{14.7}$

$14.7 \sin 41° = C$

$\boxed{9.6 = C}$

2.

$a = 8.3$, $42.3°$, $b = 6.1$, B, $a = 5.6$, C
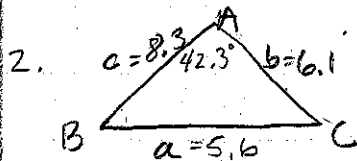
Law of Cosines

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

$a^2 = 6.1^2 + 8.3^2 - 2(6.1)(8.3) \cos 42.3°$

$a^2 = 31.2 \qquad \boxed{a = 5.6}$

Law of Sines

$\dfrac{a}{\sin A} = \dfrac{c}{\sin C}$

$\dfrac{5.6}{\sin 42.3} = \dfrac{8.3}{\sin C}$

$5.6 \sin C = 8.3 \sin 42.3$

$\sin C = \dfrac{8.3 \sin 42.3}{5.6}$

$C = \sin^{-1}\left(\dfrac{8.3 \sin 42.3}{5.6}\right)$

$\boxed{C = 85.9}$

$180 - 42.3 - 85.9 = \boxed{51.8°}$

3. $\text{Area} = \frac{1}{2} bc \sin A$

$\text{Area} = \frac{1}{2}(6.1)(8.3)\sin 42.3°$

$= \boxed{17.0 \text{ units}^2}$

4.

A, $82.1°$, c, b, B, $38.7°$, $59.2°$, C, $a = 12.9$
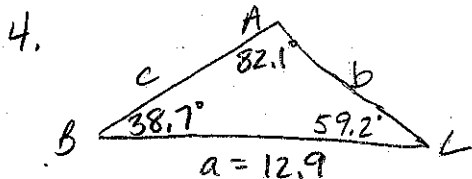
$180 - 82.1 - 38.7° = C$

$\boxed{59.2° = C}$

$\dfrac{12.9}{\sin 82.1} = \dfrac{b}{\sin 38.7}$

$12.9 \sin 38.7 = b \sin 82.1$

$b = \dfrac{12.9 \sin 38.7}{\sin 82.1}$

$\boxed{b = 8.1}$

$\dfrac{12.9}{\sin 82.1} = \dfrac{c}{\sin 59.2}$

$\dfrac{12.9 \sin 59.2}{\sin 82.1} = C$

$\boxed{C = 11.2}$

5.
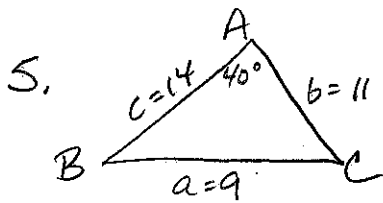
$$a^2 = b^2 + c^2 - 2bc\cos A$$
$$9^2 = 11^2 + 14^2 - 2(11)(14)\cos A$$
$$-236 = -308\cos A$$
$$\frac{236}{308} = \cos A$$
$$A = \cos^{-1}\frac{236}{308} \qquad \boxed{A = 40°}$$

$$\frac{9}{\sin 40°} = \frac{11}{\sin B}$$

$$9\sin B = 11\sin 40°$$
$$\sin B = \frac{11\sin 40°}{9}$$
$$B = \sin^{-1}\left(\frac{11\sin 40°}{9}\right)$$

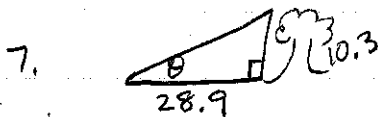$$\boxed{B = 51.8°}$$

$$180 - 40° - 51.8° = C$$
$$\boxed{88.2° = C}$$

6. $\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$ $\qquad s = \frac{a+b+c}{2} = \frac{9+11+14}{2} = 17$

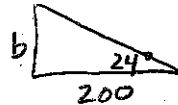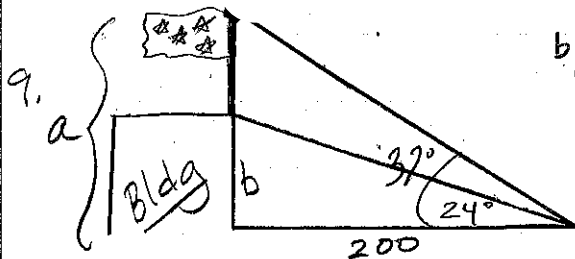$\text{Area} = \sqrt{17(17-9)(17-11)(17-14)}$ $\qquad \boxed{\text{Area} = 49.5\,u^2}$

7.

$$\tan\theta = \frac{10.3}{28.9} \qquad \theta = \tan^{-1}\frac{10.3}{28.9}$$
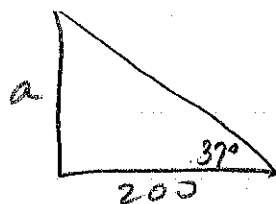$$\boxed{\theta = 19.6°}$$

8. See answer at the end of this section.

9.

$$\tan 24 = \frac{b}{200}$$
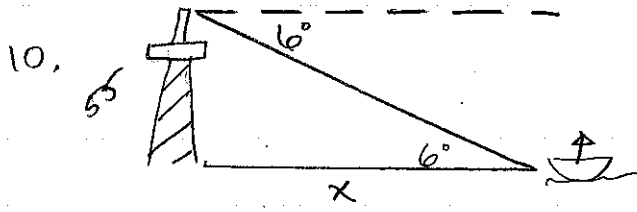$$200\tan 24 = b$$
$$\boxed{b = 89}$$

$$\tan 37° = \frac{a}{200}$$
$$200\tan 37° = a$$
$$\boxed{a = 150.7}$$
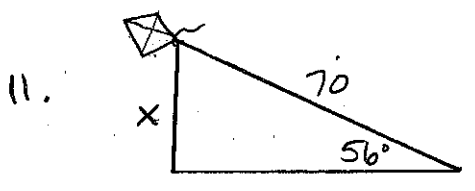
$$a - b = \text{height of flag pole}$$
$$150.7 - 89$$
$$\boxed{61.7\,ft.}$$

10.

$$\text{Tan } 6° = \frac{55}{x}$$

$$x = \frac{55}{\tan 6°}$$

$$\boxed{x = 523.3 \text{ ft.}}$$

11.

$$\text{Sin } 56° = \frac{x}{70}$$

$$70 \sin 56° = x \qquad \boxed{x = 58 \text{ ft.}}$$

12. See answer at the end of this section.

13. Skip

14. See answer at the end of this section.

15.
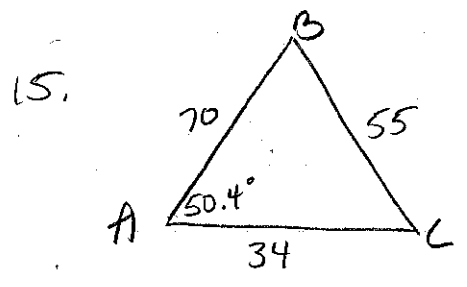
$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$55^2 = 34^2 + 70^2 - 2(34)(70) \cos A$$

$$-3031 = -4760 \cos A$$

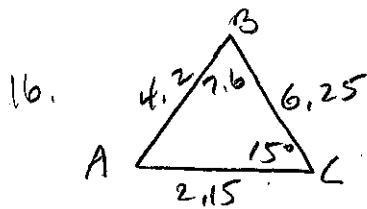$$A = \cos^{-1}\left(\frac{3031}{4760}\right)$$

$$\boxed{A = 50.4°}$$

$$\frac{55}{\sin 50.4} = \frac{34}{\sin B}$$

$$55 \sin B = 34 \sin 50.4$$

$$B = \sin^{-1}\left(\frac{34 \sin 50.4}{55}\right)$$

$$\boxed{B = 28.4°}$$

$$180 - 50.4 - 28.4 = \boxed{101.2°}$$

16.

$c^2 = a^2 + b^2 - 2ab \cos C$

$c^2 = 6.25^2 + 2.15^2 - 2(6.25)(2.15)\cos 15°$

$c^2 = 17.7$ $\boxed{c = 4.2}$

$\dfrac{4.2}{\sin 15} = \dfrac{2.15}{\sin B}$

$4.2 \sin B = 2.15 \sin 15$

$B = \sin^{-1}\left(\dfrac{2.15 \sin 15}{4.2}\right)$

$\boxed{B = 7.6°}$

$180 - 15 - 7.6 = A$

$\boxed{A = 157.4°}$

17. $\boxed{.4226}$

18. $\boxed{.4226}$

19. $\dfrac{1}{\tan 71.5} = \boxed{.3346}$

20. $\dfrac{1}{\cos 42°12'} = \boxed{1.3499}$

21. $\boxed{.9881}$

22. $\boxed{.1989}$ ← Change calc. to Radians

23. $\dfrac{1}{\sin 1.25} = \boxed{1.0538}$

24. $\dfrac{1}{\sin 0} = \boxed{\text{undefined}}$

25. $\theta = \sin^{-1} .8191$ $\boxed{\theta = 54.99°}$

26. $\theta = \cos^{-1} .9848$ $\boxed{\theta = 10.00°}$

27. $\theta = \tan^{-1} 1.1920$ $\boxed{\theta = 50.01°}$

28. $\dfrac{1}{\cos \theta} = 1.4123$

$1.4123 \cos \theta = 1$

$\cos \theta = \dfrac{1}{1.4123}$

$\theta = \cos^{-1} \dfrac{1}{1.4123}$

$\boxed{\theta = 44.92°}$

29. $\theta = \cos^{-1} .4223$

$\theta = 65.02$ $(.02)60 = 1.2$

$\boxed{\theta = 65°1'}$

30. $\theta = \tan^{-1} 1.5002$

$\theta = 56.\boxed{31} \longrightarrow$ .31(60) = 18.6

$\boxed{\theta = 56°19'}$

31. $\dfrac{1}{\sin \theta} = 1.5555$

$1 = 1.55555 \sin \theta$

$\sin \theta = \dfrac{1}{1.5555}$

$\theta = \sin^{-1} \dfrac{1}{1.555}$

$\theta = 40.0069 \longrightarrow$ .0069(60) = 0.42

$\boxed{\theta = 40°0'}$

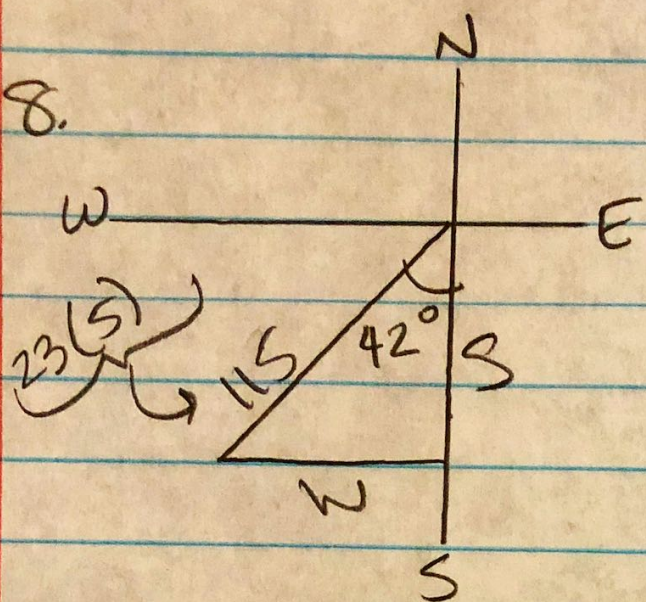32. $\dfrac{1}{\tan \theta} = 2.1234$

$2.1234 \tan \theta = 1$

$\tan \theta = \dfrac{1}{2.1234}$

$\theta = \tan^{-1} \dfrac{1}{2.1234}$

$\theta = 25.\boxed{2178} \longrightarrow$ .2178(60) = 13.068

$\boxed{\theta = 25°13'}$

8.

N

W ——————————— E

23(5) → 115 / 42° S

W

S
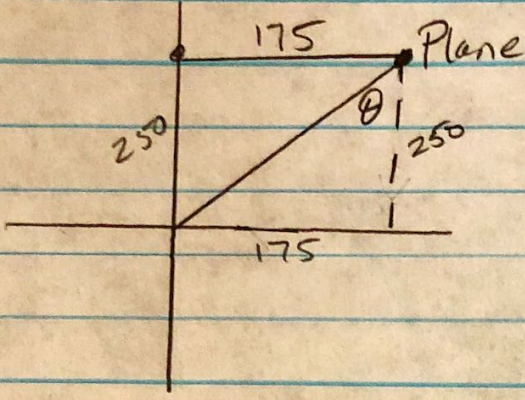
$\sin 42° = \dfrac{W}{115}$

$115 \sin 42° = W$

$\boxed{W = 77 \text{ mi}}$

$\cos 42° = \dfrac{S}{115}$

$115 \cos 42° = S$

$\boxed{S = 85.5 \text{ mi}}$

12.

$\tan \theta = \frac{175}{250}$

$\theta = \tan^{-1} \frac{175}{250}$

$\theta = 35°$

| S 35° W |

↳ or 90° − 35° = 55°

| W 55° S |

13. Skip

14.

1− LOC

$c^2 = a^2 + b^2 - 2ab \cos C$

$c^2 = 4^2 + 6^2 - 2(4)(6) \cos 120°$

$\boxed{c^2 = 8.7}$
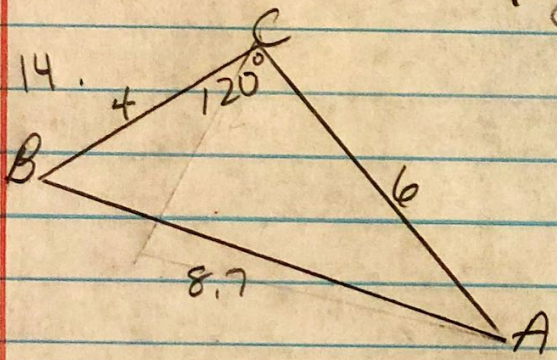
2− LOS

$\frac{8.7}{\sin 120°} = \frac{6}{\sin B}$

$8.7 \sin B = 6 \sin 120°$

$\sin B = \frac{6 \sin 120°}{8.7}$

$B = \sin^{-1} \left(\frac{6 \sin 120°}{8.7} \right)$

$\boxed{B = 36.7°}$

3− $180° - 120° - 36.7°$

$= \boxed{23.3°}$