13. $\sin\theta = \frac{opp}{hyp} = \frac{3.5}{12.5} = \frac{7}{25}$

14. $\cos\theta = \frac{adj}{hyp} = \frac{12}{12.5} = \frac{24}{25}$

15. $\tan\theta = \frac{opp}{adj} = \frac{3.5}{12} = \frac{7}{24}$

16. $\sin\alpha = \frac{opp}{hyp} = \frac{12}{12.5} = \frac{24}{25}$

17. $\cos\alpha = \frac{adj}{hyp} = \frac{3.5}{12.5} = \frac{7}{25}$

18. $\tan\alpha = \frac{opp}{adj} = \frac{12}{3.5} = \frac{24}{7}$

19. $\sin\theta = \frac{opp}{hyp} = \frac{4}{9}$

20. $\cos\theta = \frac{adj}{hyp} = \frac{8.5}{9} = \frac{17}{18}$

21. $\tan\theta = \frac{opp}{adj} = \frac{4}{8.5} = \frac{8}{17}$

22. $\sin\alpha = \frac{opp}{hyp} = \frac{8.5}{9} = \frac{17}{18}$

23. $\cos\alpha = \frac{adj}{hyp} = \frac{4}{9}$

24. $\tan\alpha = \frac{opp}{adj} = \frac{8.5}{9} = \frac{17}{18}$

Lesson 1C

1. $\sin\theta = \frac{opp}{hyp} = \frac{8}{12.8} = \frac{80}{128} = \frac{5}{8}$

2. $\cos\theta = \frac{adj}{hyp} = \frac{10}{12.8} = \frac{5}{6.4} = \frac{50}{64} = \frac{25}{32}$

3. $\tan\theta = \frac{opp}{adj} = \frac{8}{10} = \frac{4}{5}$

4. $\sin\alpha = \frac{opp}{hyp} = \frac{10}{12.8} = \frac{5}{6.4} = \frac{50}{64} = \frac{25}{32}$

5. $\cos\alpha = \frac{adj}{hyp} = \frac{8}{12.8} = \frac{80}{128} = \frac{5}{8}$

6. $\tan\alpha = \frac{opp}{adj} = \frac{10}{8} = \frac{5}{4}$

7. $\sin\theta = \frac{opp}{hyp} = \frac{12}{13.4} = \frac{120}{134} = \frac{60}{67}$

8. $\cos\theta = \frac{adj}{hyp} = \frac{6}{13.4} = \frac{60}{134} = \frac{30}{67}$

9. $\tan\theta = \frac{opp}{adj} = \frac{12}{6} = 2$

10. $\sin\alpha = \frac{opp}{hyp} = \frac{6}{13.4} = \frac{60}{134} = \frac{30}{67}$

11. $\cos\alpha = \frac{adj}{hyp} = \frac{12}{13.4} = \frac{120}{134} = \frac{60}{67}$

12. $\tan\alpha = \frac{opp}{adj} = \frac{6}{12} = \frac{1}{2}$

13. $\sin\theta = \frac{opp}{hyp} = \frac{13.6}{15} = \frac{136}{150} = \frac{68}{75}$

14. $\cos\theta = \frac{adj}{hyp} = \frac{6.4}{15} = \frac{64}{150} = \frac{32}{75}$

15. $\tan\theta = \frac{opp}{adj} = \frac{13.6}{6.4} = \frac{136}{64} = \frac{17}{8}$

16. $\sin\alpha = \frac{opp}{hyp} = \frac{6.4}{15} = \frac{64}{150} = \frac{32}{75}$

17. $\cos\alpha = \frac{adj}{hyp} = \frac{13.6}{15} = \frac{136}{150} = \frac{68}{75}$

18. $\tan\alpha = \frac{opp}{adj} = \frac{6.4}{13.6} = \frac{64}{136} = \frac{8}{17}$

19. $\sin\theta = \frac{opp}{hyp} = \frac{X}{2X} = \frac{1}{2}$

20. $\cos\theta = \frac{adj}{hyp} = \frac{X\sqrt{3}}{2X} = \frac{\sqrt{3}}{2}$

21. $\tan\theta = \frac{opp}{adj} = \frac{X}{X\sqrt{3}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

22. $\sin\alpha = \frac{opp}{hyp} = \frac{X\sqrt{3}}{2X} = \frac{\sqrt{3}}{2}$

23. $\cos\alpha = \frac{adj}{hyp} = \frac{X}{2X} = \frac{1}{2}$

24. $\tan\alpha = \frac{opp}{adj} = \frac{X\sqrt{3}}{X} = \sqrt{3}$

Lesson 2A

1. $6^2 + 9^2 = H^2$

$36 + 81 = H^2$

$117 = H^2$

$H \approx 10.82$

$\sin\theta = \frac{6}{10.82} \approx .5545$

$\cos\theta = \frac{9}{10.82} \approx .8318$

$\tan\theta = \frac{6}{9} \approx .6667$

$\csc\theta = \frac{10.82}{6} \approx 1.8033$

$\sec\theta = \frac{10.82}{9} \approx 1.2022$

$\cot\theta = \frac{9}{6} \approx 1.5000$

2.

$$13^2 + 7^2 = H^2$$
$$196 + 49 = H^2$$
$$218 = H^2$$
$$H = \sqrt{218}$$
$$H \approx 14.76$$

$$\sin\theta = \frac{7}{14.76} \approx .4743$$
$$\cos\theta = \frac{13}{14.76} \approx .8808$$
$$\tan\theta = \frac{7}{13} \approx .5385$$
$$\csc\theta = \frac{14.76}{7} \approx 2.1086$$
$$\sec\theta = \frac{14.76}{13} \approx 1.1354$$
$$\cot\theta = \frac{13}{7} \approx 1.8571$$

3.

$$7^2 + L^2 = 9.9^2$$
$$49 + L^2 = 98.01$$
$$L^2 = 98.01 - 49$$
$$L^2 = 49.01$$
$$L = \sqrt{49.01} \approx 7$$

$$\sin\theta = \frac{7}{9.9} \approx .7071$$
$$\cos\theta = \frac{7}{9.9} \approx .7071$$
$$\tan\theta = \frac{7}{7} \approx 1.0000$$
$$\csc\theta = \frac{9.9}{7} \approx 1.4143$$
$$\sec\theta = \frac{9.9}{7} \approx 1.4143$$
$$\cot\theta = \frac{7}{7} = 1.0000$$

4.

$$8^2 + L^2 = 15^2$$
$$64 + L^2 = 225$$
$$L^2 = 225 - 64$$
$$L^2 = 161$$
$$L = \sqrt{161}$$
$$L \approx 12.69$$

$$\sin\theta = \frac{12.69}{15} \approx .8460$$
$$\cos\theta = \frac{8}{15} \approx .5333$$
$$\tan\theta = \frac{12.69}{8} \approx 1.5863$$
$$\csc\theta = \frac{15}{12.69} \approx 1.1820$$
$$\sec\theta = \frac{15}{8} = 1.8750$$
$$\cot\theta = \frac{8}{12.69} \approx .6304$$

5.

$$L^2 + 8^2 = 20^2$$
$$L^2 + 64 = 400$$
$$L^2 = 400 - 64$$
$$L^2 = \sqrt{336}$$
$$L \approx 18.33$$

$$\sin\theta = \frac{8}{20} = .4000$$
$$\cos\theta = \frac{18.33}{20} = .9165$$
$$\tan\theta = \frac{8}{18.33} \approx .4364$$
$$\csc\theta = \frac{20}{8} = 2.5000$$
$$\sec\theta = \frac{20}{18.33} \approx 1.0911$$
$$\cot\theta = \frac{18.33}{8} \approx 2.2913$$

6.

$$L^2 + 6.2^2 = 14^2$$
$$L^2 + 38.44 = 196$$
$$L^2 = 196 - 38.44$$
$$L^2 = 157.56$$
$$L = \sqrt{157.56}$$
$$L \approx 12.55$$

$$\sin\theta = \frac{12.55}{14} \approx .8964$$
$$\cos\theta = \frac{6.2}{14} \approx .4429$$
$$\tan\theta = \frac{12.55}{6.2} \approx 2.0242$$
$$\csc\theta = \frac{14}{12.55} \approx 1.1155$$
$$\sec\theta = \frac{14}{6.2} \approx 2.2581$$
$$\cot\theta = \frac{6.2}{12.55} \approx .4940$$

Lesson 2B

1.

$$4.5^2 + 6.6^2 = H^2$$
$$20.25 + 43.56 = H^2$$
$$63.81 = H^2$$
$$\sqrt{63.81} = H$$
$$H \approx 7.99$$

$$\sin\theta = \frac{4.5}{7.99} \approx .5632$$
$$\cos\theta = \frac{6.6}{7.99} \approx .8260$$
$$\tan\theta = \frac{4.5}{6.6} \approx .6818$$
$$\csc\theta = \frac{7.99}{4.5} \approx 1.7756$$
$$\sec\theta = \frac{7.99}{6.6} \approx 1.2106$$
$$\cot\theta = \frac{6.6}{4.5} \approx 1.4667$$

2.

$$L^2 + 6.8^2 = \sqrt{51}^2$$
$$L^2 + 46.24 = 51$$
$$L^2 = 51 - 46.24$$
$$L^2 = 4.76$$
$$L = \sqrt{4.76}$$
$$L \approx 2.18$$

$$\sqrt{51} \approx 7.14$$
$$\sin\theta = \frac{2.18}{7.14} \approx .3053$$
$$\cos\theta = \frac{6.8}{7.14} \approx .9524$$
$$\tan\theta = \frac{2.18}{6.8} \approx .3206$$
$$\csc\theta = \frac{7.14}{2.18} \approx 3.2752$$
$$\sec\theta = \frac{7.14}{6.8} = 1.0500$$
$$\cot\theta = \frac{6.8}{2.18} \approx 3.1193$$

3.

$$10^2 + \sqrt{3}^2 = H^2$$
$$100 + 3 = H^2$$
$$103 = H^2$$
$$\sqrt{103} = H$$
$$H \approx 10.15$$

$$\sqrt{3} \approx 1.73$$
$$\sin\theta = \frac{1.73}{10.15} \approx .1704$$
$$\cos\theta = \frac{10}{10.15} \approx .9852$$
$$\tan\theta = \frac{1.73}{10} = .1730$$
$$\csc\theta = \frac{10.15}{1.73} \approx 5.8671$$
$$\sec\theta = \frac{10.15}{10} = 1.0150$$
$$\cot\theta = \frac{10}{1.73} \approx 5.7803$$

4.

$$\left(7\sqrt{2}\right)^2 + \left(7\sqrt{3}\right)^2 = H^2$$
$$(7)(7)\sqrt{2}\sqrt{2} + (7)(7)\sqrt{3}\sqrt{3} = H^2$$
$$(49)(2) + (49)(3) = H^2$$
$$98 + 147 = H^2$$
$$245 = H^2$$
$$H \approx 15.65$$

$$7\sqrt{2} \approx 9.9$$
$$7\sqrt{3} \approx 12.12$$
$$\sin\theta = \frac{9.9}{15.65} \approx .6326$$
$$\cos\theta = \frac{12.12}{15.65} \approx .7744$$
$$\tan\theta = \frac{9.9}{12.12} \approx .8168$$
$$\csc\theta = \frac{15.65}{9.9} \approx 1.5808$$
$$\sec\theta = \frac{15.65}{12.12} \approx 1.2913$$
$$\cot\theta = \frac{12.12}{9.9} \approx 1.2242$$

5.

$$\left(2\sqrt{3}\right)^2 + 11^2 = H^2$$
$$(2)(2)\sqrt{3}\sqrt{3} + 121 = H^2$$
$$4(3) + 121 = H^2$$
$$133 = H^2$$
$$H \approx 11.53$$

$$2\sqrt{3} \approx 3.46$$
$$\sin\theta = \frac{3.46}{11.53} \approx .3001$$
$$\cos\theta = \frac{11}{11.53} \approx .9540$$
$$\tan\theta = \frac{3.46}{11} \approx .3145$$
$$\csc\theta = \frac{11.53}{3.46} \approx 3.3324$$
$$\sec\theta = \frac{11.53}{11} \approx 1.0482$$
$$\cot\theta = \frac{11}{3.46} \approx 3.1792$$

6.

$$5^2 + 12^2 = H^2$$
$$25 + 144 = H^2$$
$$169 = H^2$$
$$\sqrt{13} = H^2$$
$$H = 13$$

$$\sin\theta = \frac{5}{13} \approx .3846$$
$$\cos\theta = \frac{12}{13} \approx .9231$$
$$\tan\theta = \frac{5}{12} \approx .4167$$
$$\csc\theta = \frac{13}{5} = 2.6000$$
$$\sec\theta = \frac{13}{12} \approx 1.0833$$
$$\cot\theta = \frac{12}{5} = 2.4000$$

Lesson 2C

1.

$$9^2 + 8^2 = H^2$$
$$81 + 64 = H^2$$
$$145 = H^2$$
$$\sqrt{145} = H^2$$
$$H \approx 12.04$$

$$\sin\theta = \frac{8}{12.04} \approx .6645$$
$$\cos\theta = \frac{9}{12.04} \approx .7475$$
$$\tan\theta = \frac{8}{9} \approx .8889$$
$$\csc\theta = \frac{12.04}{8} \approx 1.5050$$
$$\sec\theta = \frac{12.04}{9} \approx 1.3378$$
$$\cot\theta = \frac{9}{8} = 1.1250$$

2. $5^2 + 5^2 = H^2$
$25 + 25 = H^2$
$50 = H^2$
$\sqrt{50} = H$
$H \approx 7.07$

$\sin\theta = \frac{5}{7.07} \approx .7072$

$\cos\theta = \frac{5}{7.07} \approx .7072$

$\tan\theta = \frac{5}{5} = 1.0000$

$\csc\theta = \frac{7.07}{5} = 1.4140$

$\sec\theta = \frac{7.07}{5} = 1.4140$

$\cot\theta = \frac{5}{5} = 1.0000$

3. $3^2 + 3^2 = H^2$
$9 + 9 = H^2$
$18 = H^2$
$\sqrt{18} = H$
$H \approx 4.24$

$\sin\theta = \frac{3}{4.24} \approx .7075$

$\cos\theta = \frac{3}{4.24} \approx .7075$

$\tan\theta = \frac{3}{3} = 1.0000$

$\csc\theta = \frac{4.24}{3} \approx 1.4133$

$\sec\theta = \frac{4.24}{3} \approx 1.4133$

$\cot\theta = \frac{3}{3} = 1.0000$

4. $12^2 + L^2 = 13^2$
$144 + L^2 = 169$
$L^2 = 169 - 144$
$L^2 = 25$
$L = \sqrt{25}$
$L = 5$

$\sin\theta = \frac{5}{13} \approx .3846$

$\cos\theta = \frac{12}{13} \approx .9231$

$\tan\theta = \frac{5}{12} \approx .4167$

$\csc\theta = \frac{13}{5} = 2.6000$

$\sec\theta = \frac{13}{12} \approx 1.0833$

$\cot\theta = \frac{12}{5} = 2.4000$

5. $4^2 + 6^2 = H^2$
$16 + 36 = H^2$
$52 = H^2$
$\sqrt{52} = H$
$H \approx 7.21$

$\sin\theta = \frac{6}{7.21} \approx .8322$

$\cos\theta = \frac{4}{7.21} \approx .5548$

$\tan\theta = \frac{6}{4} = 1.5000$

$\csc\theta = \frac{7.21}{6} \approx 1.2017$

$\sec\theta = \frac{7.21}{4} = 1.8025$

$\cot\theta = \frac{4}{6} \approx .6667$

6. $7^2 + 7^2 = H^2$
$49 + 49 = H^2$
$98 = H^2$
$\sqrt{98} = H$
$H \approx 9.90$

$\sin\theta = \frac{7}{9.9} \approx .7071$

$\cos\theta = \frac{7}{9.9} \approx .7071$

$\tan\theta = \frac{7}{7} = 1.0000$

$\csc\theta = \frac{9.9}{7} \approx 1.4143$

$\sec\theta = \frac{9.9}{7} \approx 1.4143$

$\cot\theta = \frac{7}{7} = 1.0000$

Lesson 3A

1. $\cos 37° = .7986$
2. $\tan 51° = 1.2349$
3. $\sin 20° = .3420$
4. $\sin 49° = .7547$
5. $\cos 65° = .4226$
6. $.6249 = \tan 32°$
7. $.4540 = \cos 63°$
8. $.0875 = \tan 5°$
9. $.9781 = \sin 78°$
10. $14.3007 = \tan 86°$
11. $\sin\theta = \frac{20}{26.9} \approx .7435$

$\cos\theta = \frac{18}{26.9} \approx .6691$

$\tan\theta = \frac{20}{18} \approx 1.1111$

$\theta = 48°$

$\sin\alpha = \frac{18}{26.9} \approx .6691$

$\cos\alpha = \frac{20}{26.9} \approx .7435$

$\tan\alpha = \frac{18}{20} = .9000$

$\alpha = 42°$