Trigonometry 11th edition Lial Test Bank

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CHAPTER TEST FORMS

ANSWERS

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CHAPTER 1, FORM A

1. 82°
2. 144°
3. 78°,112°
4. 130°,130°
5. 3.1 revolutions
6. 56.90°
7. 101.52°
8. 117.50°
9. 79° 1′ 12″
10. 135°40′ 12″
11. 59° 10′ 48″
12. 130°
13. 163°
14. 115° 1′
15. $m = 6$; $n = 10$
16. 36 ft
17. $\sin\theta = \frac{3}{5}$; $\cos\theta = -\frac{4}{5}$; $\tan\theta = -\frac{3}{4}$
18. $\csc\theta = \frac{5}{3}$; $\sec\theta = -\frac{5}{4}$; $\cot\theta = -\frac{4}{3}$
19. 3
20. 1
21. 1
22. $\tan\alpha = -\frac{3}{4}$; $\sec\alpha = -\frac{5}{4}$
23. Possible
24. Possible
25. 0, 1, or –1

CHAPTER 1, FORM B

1. 30°
2. 66°
3. 47°, 43°
4. 27°, 27°
5. 3.2 revolutions
6. 31.14°
7. 132.97°
8. 310.47°
9. 209° 38′ 24″
10. 216° 16′ 12″
11. 59° 5′ 24″
12. 75°
13. 262°
14. 82° 10′
15. $m = 15$; $n = 9$
16. 3.82 in.; 5.55 in.
17. $\sin\theta = -\frac{4}{5}$; $\cos\theta = \frac{3}{5}$; $\tan\theta = -\frac{4}{3}$
18. $\csc\theta = -\frac{\sqrt{34}}{5}$; $\sec\theta = -\frac{\sqrt{34}}{3}$; $\cot\theta = \frac{3}{5}$
19. 1
20. 0
21. 1
22. $\sin\alpha = -\frac{2\sqrt{29}}{29}$; $\cos\alpha = -\frac{5\sqrt{29}}{29}$
23. Impossible
24. Impossible
25. 0, 1, or –1

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CHAPTER 1, FORM C

1. 72°

2. 120°

3. 120°,60°

4. 66°,24°

5. 3.6 revolutions

6. 20.90°

7. 38.70°

8. 5.57°

9. 89° 2′ 24″

10. ..

11. 178° 36′

12. 157°

13. 305°

14. 79° 28′

15. $m = 28$; $n = 21$

16. 32.7 ft

17. $\sin\theta = \frac{\sqrt{5}}{5}$; $\cos\theta = \frac{2\sqrt{5}}{5}$; $\tan\theta = \frac{1}{2}$

18. $\csc\theta = \frac{\sqrt{5}}{2}$; $\sec\theta = -\sqrt{5}$; $\cot\theta = -\frac{1}{2}$

19. $\frac{1}{2}$

20. –1

21. 5

22. $\sin\alpha = -\frac{7\sqrt{58}}{58}$;
$\cos\alpha = -\frac{3\sqrt{58}}{58}$

23. Possible

24. Possible

25. 0 or undefined.

CHAPTER 1, FORM D

1. 1°

2. 162°

3. 60°,30°

4. 32°,32°

5. 7.1 revolutions

6. 34.86°

7. 165.85°

8. 184.64°

9. 122° 41′ 24″

10. 105° 8′ 24″

11. 33° 54′ 36″

12. 15°

13. 339°

14. 46° 21′

15. $m = 24$; $n = 32$

16. 48 ft

17. $\sin\theta = \frac{15}{17}$; $\cos\theta = -\frac{8}{17}$; $\tan\theta = -\frac{15}{8}$

18. $\csc\theta = \frac{\sqrt{34}}{3}$; $\sec\theta = \frac{\sqrt{34}}{5}$; $\cot\theta = \frac{5}{3}$

19. 6

20. 5

21. .5

22. $\tan\alpha = \frac{4}{3}$; $\sec\alpha = \frac{5}{3}$

23. Possible

24. Impossible

25. 1, –1 or undefined

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CHAPTER 1, FORM E

1. a
2. c
3. c
4. d
5. c
6. a
7. b
8. a
9. b
10. c
11. b
12. c
13. a
14. b
15. b
16. a
17. a
18. d
19. b
20. c
21. a
22. a
23. c
24. c
25. d

CHAPTER 1, FORM F

1. b
2. c
3. a
4. c
5. b
6. d
7. a
8. a
9. a
10. b
11. d
12. a
13. b
14. a
15. c
16. b
17. a
18. d
19. d
20. b
21. d
22. a
23. b
24. d
25. a

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CHAPTER 2, FORM A

1. sin 60° 28′
2. $\csc A = \frac{w}{120}$; $\sec A = \frac{w}{147}$; $\cot A = \frac{147}{120}$
3. $B = \frac{43}{5}^\circ$
4. $x = 3.75°$
5. b
6. $-\frac{\sqrt{3}}{3}$
7. $\frac{9-4\sqrt{3}}{12}$
8. -7
9. False
10. False
11. 1.042626068
12. –0.3398324552
13. 27.0°
14. 6.9°
15. $B = 69°$; $a = 54$; $b = 140$
16. $B = 48°$ $b = 54.6$; $c = 73.5$
17. $A = 35.6°$; $B = 54.4°$; $a = 436$
18. 135°
19. 84 ft
20. 5.4 mi

CHAPTER 2, FORM B

1. sec 70° 09′
2. $\csc A = \frac{29}{20}$; $\sec A = \frac{29}{21}$; $\cot A = \frac{21}{20}$
3. $B = \frac{32}{3}^\circ$
4. $x = 5°$
5. a
6. $-\sqrt{3}$
7. $\frac{8-3\sqrt{3}}{2}$
8. –5/3
9. True
10. False
11. 1.117594957
12. –25.07975682
13. 29.0°
14. 9.6°
15. $A = 55°$; $a = 96$; $b = 67$
16. $B = 35°$; $b = 17$; $c = 29$
17. $A = 46.5°$; $B = 43.5°$; $c = 58$
18. 315°
19. 451 ft
20. 44 mi

CHAPTER 2, FORM C

1. sin 11°
2. $\sin A = \frac{s}{h}$; $\cos A = \frac{135}{h}$; $\tan A = \frac{s}{135}$
3. $\beta = \frac{23}{5}^\circ$
4. $\theta = 4\frac{14}{19}^\circ$
5. a
6. 1
7. $-3\frac{1}{4}$
8. $\frac{1}{2}$
9. False
10. True
11. 1.042626068
12. –0.3398324552
13. 64.2°
14. 7.9°
15. $A = 54°$; $a = 41$; $b = 56$
16. $A = 36°$; $a = 44$; $b = 61$
17. $A = 25.9°$; $B = 64.1°$; $c = 96.7$
18. 135°
19. 26 ft
20. 24 mi

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CHAPTER 2, FORM D

1. csc 17° 45′
2. $\csc A = \frac{w}{120}$; $\sec A = \frac{w}{147}$; $\cot A = \frac{147}{120}$
3. $w = \frac{41^\circ}{6}$
4. $z = 3.75°$
5. b
6. 2
7. $\frac{9 - 4\sqrt{3}}{12}$
8. –7
9. False
10. False
11. 2.705740537
12. 0.9731119128
13. 52.4°
14. 85.3°
15. $B = 69°$; $a = 54$; $b = 140$
16. $B = 48°$ $b = 54.6$; $c = 73.5$
17. $A = 35.6°$; $B = 54.4°$; $a = 436$
18. 180°
19. 84 ft
20. 5.4 mi

CHAPTER 2, FORM E

1. c
2. c
3. c
4. d
5. b
6. d
7. b
8. a
9. c
10. d
11. d
12. d
13. c
14. d
15. a
16. c
17. c
18. a
19. b
20. b

CHAPTER 2, FORM F

1. c
2. a
3. b
4. a
5. c
6. d
7. a
8. c
9. a
10. b
11. c
12. b
13. b
14. a
15. c
16. a
17. d
18. c
19. b
20. d

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CHAPTER 3, FORM A

1. b
2. $\frac{7\pi}{6}$
3. $\frac{5\pi}{3}$
4. $\frac{31\pi}{36}$
5. –108°
6. 15°
7. 240°
8. $\frac{\sqrt{3}}{2}$
9. $\sqrt{2}$
10. $\frac{\sqrt{3}}{3}$
11. $\frac{4\pi}{3}$
12. 49°
13. It would be cut in half.
14. 0.833 radian; 47.7°
15. –0.9752
16. 1.2867
17. 0.668814003
18. 36.8 cm^2
19. 105π m/min (or 329.9 m/min)
20. .18 radian/sec

CHAPTER 3, FORM B

1. d
2. $\frac{\pi}{5}$
3. $\frac{11\pi}{6}$
4. $\frac{25\pi}{36}$
5. 120°
6. –45°
7. 420°
8. $-\frac{1}{2}$
9. –1
10. –2
11. $\frac{5\pi}{6}$
12. 47
13. It would be doubled.
14. 362.3 $in.^2$
15. –2.475296
16. 1.763074043
17. 0.4455988
18. 1.043317096
19. 832π in./min (or 2613.8 in./min)
20. Larger: 160π radians/min; smaller: 256π radians/min

CHAPTER 3, FORM C

1. b
2. $\frac{\pi}{3}$
3. $\frac{7\pi}{4}$
4. 4π
5. 30°
6. 135°
7. –120°
8. $-\sqrt{3}$
9. $\frac{2\sqrt{3}}{3}$
10. $-\frac{1}{2}$
11. $\frac{11\pi}{6}$
12. 48.8
13. It would be doubled.
14. 26.8 cm^2
15. –5.2448
16. –1.38756999
17. 1.04331710
18. 0.6957114552
19. 67.2π m/min (or 211.1 m/min)
20. .42 radian/sec

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CHAPTER 3, FORM D

1. d
2. $\frac{\pi}{4}$
3. $\frac{2\pi}{3}$
4. $\frac{13\pi}{12}$
5. $-30°$
6. $225°$
7. $105°$
8. $-\frac{2\sqrt{3}}{3}$
9. $-\frac{\sqrt{3}}{2}$
10. $\frac{\sqrt{3}}{3}$
11. $\frac{3\pi}{4}$
12. $50°$
13. It would have to be cut in half.
14. 17.3 cm^2
15. $-.30448$
16. 1.04669215
17. 1.4373775
18. 0.6594561178
19. 400π m/min (or 1256.6 m/min)
20. 12 sec

CHAPTER 3, FORM E

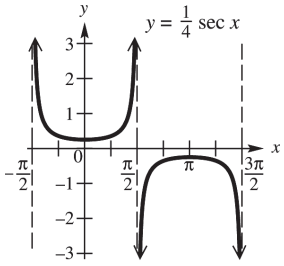
1. a
2. c
3. d
4. d
5. b
6. a
7. d
8. b
9. a
10. a
11. d
12. c
13. b
14. a
15. d
16. c
17. d
18. b
19. c
20. c

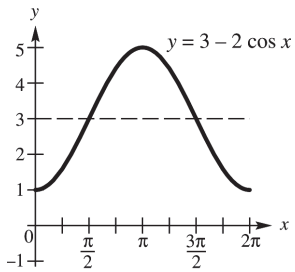
CHAPTER 3, FORM F

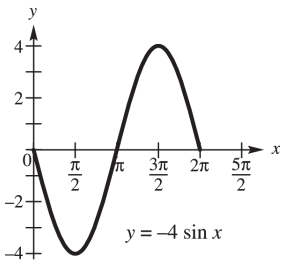
1. a
2. c
3. d
4. d
5. b
6. b
7. b
8. a
9. c
10. d
11. d
12. c
13. d
14. b
15. c
16. d
17. b
18. a
19. d
20. d

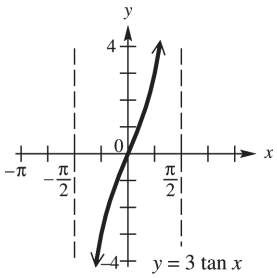
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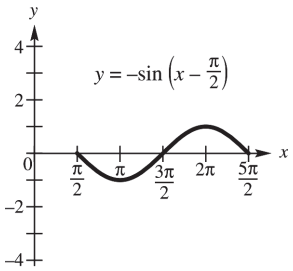
CHAPTER 4, FORM A

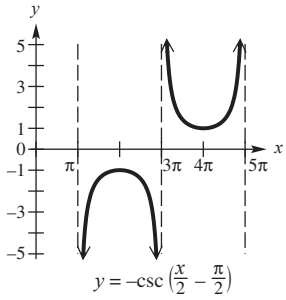
1. $\cos x$
2. $\tan x$; $\cot x$
3. The range of $\sec x$ is $(-\infty, -1] \cup [1, \infty)$, while the range of $\cos x$ is $[-1, 1]$.
4. True
5. 3
6. c
7. 5; 2π; none; none
8. 1; π; 3; none
9. Not applicable; 2π; none; $\frac{\pi}{2}$ units to the left
10. Not applicable; $\frac{\pi}{2}$; 3; none
11. Not applicable; π; $\frac{1}{2}$; $\frac{\pi}{2}$ units to the left
12. 3; π; none; $\frac{\pi}{4}$ units to the right
13. 

14. 

15. 

16. 

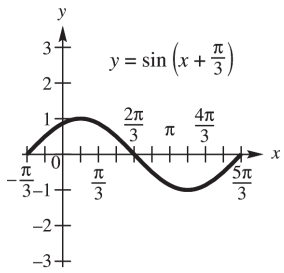
17. 

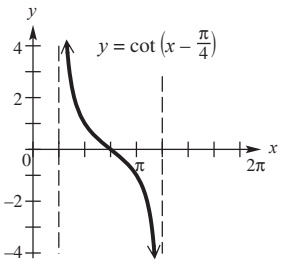
18. 

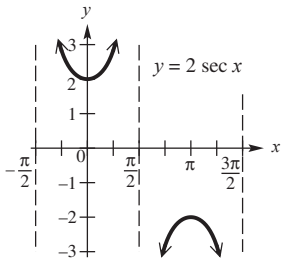
19. 1.8 ft
20. $y = 5\cos\frac{\pi}{2}t$

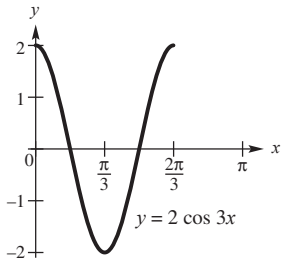
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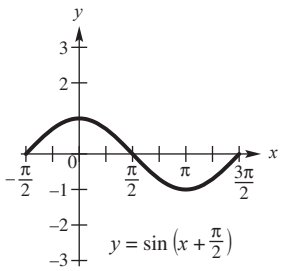
CHAPTER 4, FORM B

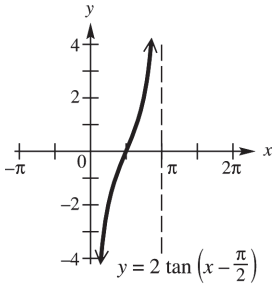
1. $\cot x$
2. $\sec x$; $\csc x$
3. The range of $\sin x$ is $[-1, 1]$, while the range of $\csc x$ is $(-\infty, -1] \cup [1, \infty)$,
4. False
5. 6.5
6. c
7. 4; 2π; none; none
8. 1; $\frac{\pi}{2}$; 5; none
9. Not applicable; 2π; none; $\frac{\pi}{4}$ units to the right
10. Not applicable; $\frac{2\pi}{3}$; 5; none
11. $\frac{5}{4}$; $\frac{\pi}{2}$; 3; $\frac{\pi}{4}$ units to the left
12. 2; $\frac{2\pi}{3}$; none; $\frac{\pi}{4}$ units to the left
13. 

14. 

15. 

16. 

17. 

18. 

19. 12 ft
20. $y = 4\cos\frac{4\pi}{5}t$

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CHAPTER 4, FORM C

1. $\cot x$

2. $\cos x$; $\sec x$

3. The range of $\cot x$ is $(-\infty, \infty)$, while the range of $\sin x$ is $[-1, 1]$.

4. False

5. -10

6. d

7. 3; 2π; none; none

8. Not applicable; π; 1; none

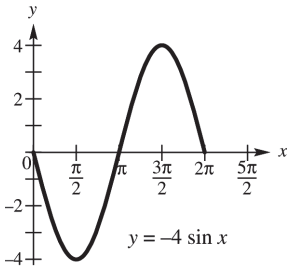
9. 2; 2π; none; $\frac{\pi}{5}$ units to the left

10. Not applicable; π; none; $\frac{\pi}{3}$ units to the left

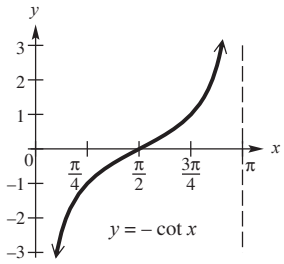
11. Not applicable; π; 3.5; none

12. $\frac{3}{4}$; $\frac{2\pi}{3}$; 4; $\frac{\pi}{3}$ units to the left

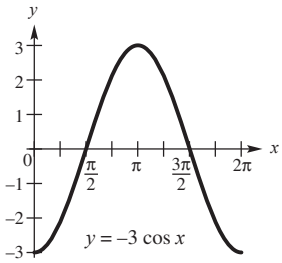
13.



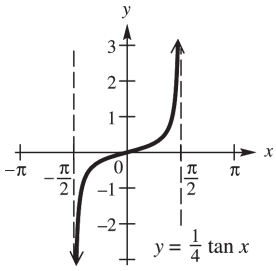
14.



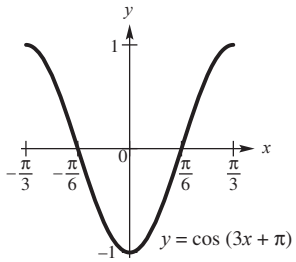
15.



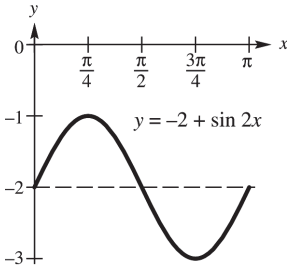
16.



17.



18.

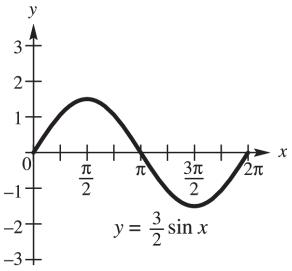


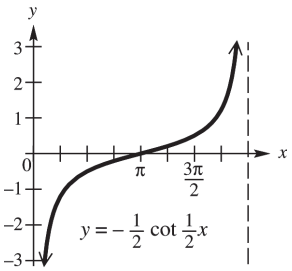
19. $\frac{5}{2\pi} \approx 0.796$

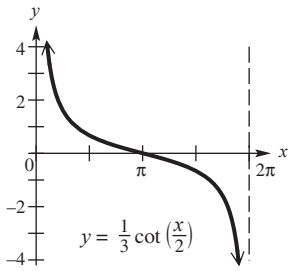
20. 73.5 ft

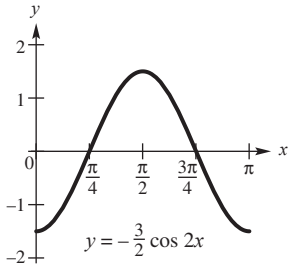
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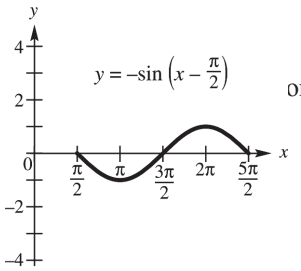
CHAPTER 4, FORM D

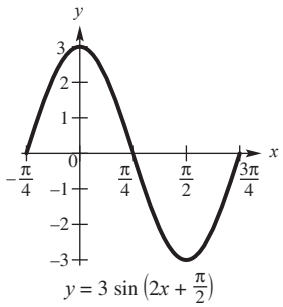
1. sec x
2. sin x; cos x
3. The range of tan x is $(-\infty, \infty)$, while the range of csc x is $(-\infty, -1] \cup [1, \infty)$.
4. True
5. –5.5
6. a
7. Not applicable; π; none; $\frac{\pi}{3}$ units to the right
8. 1; 4π; –3; none
9. $\frac{5}{3}$; 2π; none; none
10. one
11. Not applicable; $\frac{\pi}{4}$; none; $\frac{\pi}{4}$ units to the left
12. $\frac{1}{3}$; $\frac{\pi}{2}$; 5; $\frac{\pi}{4}$ units to the right
13. 

14. 

15. 

16. 

17. 

18. 

19. $\frac{3}{2\pi} \approx 0.477$
20. 12.2 ft

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CHAPTER 4, FORM E

1. d
2. c
3. c
4. c
5. d
6. b
7. a
8. c
9. d
10. b
11. c
12. a
13. b
14. d
15. a
16. a
17. c
18. a
19. d
20. b
21. a
22. d

CHAPTER 4, FORM F

1. d
2. d
3. d
4. d
5. c
6. d
7. c
8. b
9. c
10. a
11. d
12. d
13. b
14. c
15. b
16. a
17. c
18. b
19. d
20. c
21. d
22. c

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CHAPTER 5, FORM A

1.

$$\sin x = -\frac{3}{5};$$
$$\csc = -\frac{5}{3};$$
$$\tan x = -\frac{3}{4};$$
$$\cot x = -\frac{4}{3};$$
$$\sec x = \frac{5}{4}$$

2. $\frac{1}{2}$

3. $\frac{\sqrt{3}}{2}$

4. $\frac{-6\sqrt{2}-\sqrt{7}}{12}$

5. $\frac{3+2\sqrt{14}}{12}$

6. $\frac{\sqrt{2}}{4}$

7. $\frac{7}{9}$

8. $\frac{\sqrt{6}-\sqrt{2}}{4}$

9. $\frac{\sqrt{2+\sqrt{3}}}{2}$

10. True

11. False

12. False

13. $\frac{1}{\sin\theta}$

14. $\sin^2\theta - \cos^2\theta$

15.
$$\text{LHS} = \frac{1}{\tan\gamma + \cot\gamma} = \frac{1}{\frac{\sin\gamma}{\cos\gamma} + \frac{\cos\gamma}{\sin\gamma}}$$
$$= \frac{1}{\frac{\sin^2\gamma + \cos^2\gamma}{\cos\gamma\sin\gamma}} = \frac{\cos\gamma\sin\gamma}{\sin^2\gamma + \cos^2\gamma}$$
$$= \cos\gamma\sin\gamma = \text{RHS}$$

16.
$$\text{RHS} = 1 + \cot^2\frac{\gamma}{2} = 1 + \frac{1+\cos\gamma}{1-\cos\gamma}$$
$$= \frac{1-\cos\gamma+1+\cos\gamma}{1-\cos\gamma} = \frac{2}{1-\cos\gamma}$$
$$= \text{LHS}$$

17.
$$\text{RHS} = \csc^2\theta\sin 2\theta = \frac{2\sin\theta\cos\theta}{\sin^2\theta}$$
$$= \frac{2\cos\theta}{\sin\theta} = 2\cot\theta = \text{LHS}$$

18.
$$\text{LHS} = 2\tan x\sec x\csc x$$
$$= 2\frac{\sin x}{\cos x}\sec x\frac{1}{\sin x}$$
$$= 2\sec x\sec x = 2\sec^2 x$$
$$= 2(1+\tan^2 x)$$
$$= 2 + 2\tan^2 x = \text{RHS}$$

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CHAPTER 5, FORM B

1.

$$\sin x = \frac{\sqrt{7}}{4};$$
$$\csc x = \frac{4\sqrt{7}}{7};$$
$$\tan x = -\frac{\sqrt{7}}{3};$$
$$\cot x = -\frac{3\sqrt{7}}{7};$$
$$\sec x = -\frac{4}{3}$$

2. $\sqrt{3}$

3. -2

4. $\dfrac{\sqrt{5}-4\sqrt{2}}{9}$

5. $\dfrac{2-2\sqrt{10}}{9}$

6. $\sqrt{2}$

7. $\dfrac{4\sqrt{5}}{9}$

8. $\dfrac{\sqrt{6}+\sqrt{2}}{4}$

9. $\dfrac{\sqrt{2-\sqrt{3}}}{2}$

10. False

11. False

12. True

13. $\dfrac{\cos\theta}{\sin\theta}$

14. 1

15.
$$\text{RHS} = \frac{\cot^2\beta - \tan^2\beta}{\cot\beta - \tan\beta}$$
$$= \frac{\frac{\cos^2\beta}{\sin^2\beta} - \frac{\sin^2\beta}{\cos^2\beta}}{\frac{\cos\beta}{\sin\beta} - \frac{\sin\beta}{\cos\beta}}$$
$$= \frac{\frac{\cos^4\beta - \sin^4\beta}{\sin^2\beta\cos^2\beta}}{\frac{\cos^2\beta - \sin^2\beta}{\sin\beta\cos\beta}}$$
$$= \frac{(\cos^2\beta + \sin^2\beta)(\cos^2\beta - \sin^2\beta)}{\sin^2\beta\cos^2\beta} \cdot \frac{\sin\beta\cos\beta}{\cos^2\beta - \sin^2\beta}$$
$$= \frac{\cos^2\beta + \sin^2\beta}{\sin\beta\cos\beta} = \frac{1}{\sin\beta\cos\beta}$$
$$\text{LHS} = \frac{\sec^2\beta}{\tan\beta} = \frac{1}{\cos^2\beta} \cdot \frac{\cos\beta}{\sin\beta}$$
$$= \frac{1}{\sin\beta\cos\beta};$$
$$\text{LHS} = \text{RHS}$$

16.
$$\text{RHS} = \frac{2}{\csc^2\frac{x}{2}} = 2\sin^2\frac{x}{2} = 2\left(\frac{1-\cos x}{2}\right)$$
$$= 1 - \cos x = \text{LHS}$$

17.
$$\text{RHS} = 2\sin^3\beta\cos\beta + 2\sin\beta\cos^3\beta$$
$$= 2\sin\beta\cos\beta(\sin^2\beta + \cos^2\beta)$$
$$= 2\sin\beta\cos\beta = \sin 2\beta = \text{LHS}$$

18.
$$\text{LHS} = 2\tan\alpha\sin\alpha\sec\alpha$$
$$= 2\tan\alpha\frac{\sin x}{\cos x}$$
$$= 2\tan^2\alpha = 2(\sec^2\alpha - 1)$$
$$= 2\sec^2\alpha - 2 = \text{RHS}$$

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CHAPTER 5, FORM C

1. $\cos x = -\frac{2\sqrt{2}}{3}$;
$\sec x = -\frac{3\sqrt{2}}{4}$;
$\tan x = -\frac{\sqrt{2}}{4}$;
$\cot x = -2\sqrt{2}$;
$\csc x = 3$

2. $\frac{1}{2}$

3. $-\sqrt{3}$

4. $\frac{\sqrt{21}-2\sqrt{15}}{20}$

5. $\frac{2-3\sqrt{35}}{20}$

6. $\frac{\sqrt{70}}{10}$

7. $\frac{7}{8}$

8. $\frac{\sqrt{6}-\sqrt{2}}{4}$

9. $-\frac{\sqrt{2+\sqrt{3}}}{2}$

10. False

11. True

12. True

13. $\frac{1}{\cos\theta}$

14. $\cos^2\theta - \sin^2\theta$

15. $\text{LHS} = \frac{\cos^2 t}{1-\sin t} = \frac{1-\sin^2 t}{1-\sin t}$
$= \frac{(1-\sin t)(1+\sin t)}{1-\sin t}$
$= 1+\sin t = \text{RHS}$

16. $\text{LHS} = \tan\beta - \tan\frac{\beta}{2} = \frac{\sin\beta}{\cos\beta} - \frac{\sin\beta}{1+\cos\beta}$
$= \frac{\sin\beta(1+\cos\beta)-\sin\beta\cos\beta}{\cos\beta(1+\cos\beta)}$
$= \frac{\sin\beta+\sin\beta\cos\beta-\sin\beta\cos\beta}{\cos\beta(1+\cos\beta)}$
$\text{RHS} = \sec\beta\tan\frac{\beta}{2} = \frac{1}{\cos\beta}\cdot\frac{\sin\beta}{1+\cos\beta}$
$= \frac{\sin\beta}{\cos\beta(1+\cos\beta)}$;
LHS = RHS

17. $\text{LHS} = \cos 2\theta\sec\theta = \frac{2\cos^2\theta-1}{\cos\theta}$
$= 2\cos\theta - \sec\theta = \text{RHS}$

18. $\text{LHS} = 2\cot\alpha\sin\alpha\cos\alpha$
$= 2\frac{\cos\alpha}{\sin\alpha}\sin\alpha\cos\alpha = 2\cos^2\alpha$
$= 2(1-\sin^2\alpha) = 2-2\sin^2\alpha = \text{RHS}$

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CHAPTER 5, FORM D

1.

$$\cos x = -\frac{24}{25};$$
$$\sec x = -\frac{25}{24};$$
$$\tan x = \frac{7}{24};$$
$$\cot x = \frac{24}{7};$$
$$\csc x = -\frac{25}{7}$$

2. 1

3. $-\sqrt{2}$

4. $-\dfrac{\sqrt{21}+2\sqrt{15}}{20}$

5. $\dfrac{2+3\sqrt{35}}{20}$

6. $\dfrac{\sqrt{6}}{4}$

7. $-\dfrac{4\sqrt{21}}{25}$

8. $\dfrac{\sqrt{2}+\sqrt{6}}{4}$

9. $-\dfrac{\sqrt{2-\sqrt{3}}}{2}$

10. True

11. True

12. False

13. 0

14. $1-\sin\theta$

15. $\text{RHS} = \dfrac{\cos\gamma - \cos^3\gamma}{\sin\gamma} = \dfrac{\cos\gamma(1-\cos^2\gamma)}{\sin\gamma}$

$= \dfrac{\cos\gamma\sin^2\gamma}{\sin\gamma} = \sin\gamma\cos\gamma = \text{LHS}$

16. $\text{LHS} = \cot\dfrac{\gamma}{2}\cdot\sin\gamma = \dfrac{1+\cos\gamma}{\sin\gamma}\cdot\sin\gamma$

$= 1+\cos\gamma = \text{RHS}$

17. $\text{LHS} = 2\sin^2 2\theta + \cos 4\theta$

$= 2\sin^2 2\theta + \cos^2 2\theta - \sin^2 2\theta$

$= \sin^2 2\theta + \cos^2 2\theta = 1 = \text{RHS}$

18. $\text{RHS} = 2\cot x\sec x\csc x$

$= 2\dfrac{\cos x}{\sin x}\cdot\dfrac{1}{\cos x}\cdot\csc x$

$= 2\csc^2 x = 2(1+\cot^2 x)$

$= 2+2\cot^2 x = \text{LHS}$

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CHAPTER 5, FORM E

1. c
2. a
3. b
4. d
5. b
6. a
7. b
8. b
9. c
10. c
11. a
12. d
13. b
14. c
15. a
16. a
17. c
18. d

CHAPTER 5, FORM F

1. b
2. c
3. c
4. d
5. c
6. d
7. a
8. c
9. a
10. a
11. d
12. b
13. c
14. b
15. d
16. c
17. a
18. b

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CHAPTER 6, FORM A

1. D: $[-1, 1]$, R: $[0, \pi]$

2. $\frac{2\pi}{3}$

3. $-\frac{\pi}{4}$

4. 1.12

5. $\frac{\pi}{2}$

6. $\frac{\sqrt{7}}{3}$

7. $\frac{2\sqrt{42}-2}{15}$

8. $\frac{5\pi}{4}$ not in range of $\csc^{-1}$

9. 135°, 225°

10. 0°, 60°, 180°, 300°

11. 0°, 90°, 180°, 270°

12. 199.47°, 340.53°

13. $0, \frac{\pi}{3}, \frac{5\pi}{3}$

14. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$

15. $\frac{\pi}{3}, \frac{5\pi}{3}$

16. 0.126, 1.444, 3.268, 4.586

17. $x = \frac{1}{2}\arcsin\frac{y}{3}$

18. $x = \operatorname{arcscos}\frac{5y-1}{4}$

19. $\frac{6\sqrt{61}}{61}$

20. $-\frac{1}{3}$

CHAPTER 6, FORM B

1. D: $[-1, 1]$, R: $[0, \pi]$

2. $\frac{\pi}{4}$

3. $\frac{\pi}{2}$

4. 1.79

5. 0

6. $\frac{\sqrt{2}}{4}$

7. $\frac{5\sqrt{3}-2}{12}$

8. $-\frac{\pi}{3}$ not in range of $\sec^{-1}$

9. 35.26°, 144.74°, 215.26°, 324.74°

10. 120°, 240°

11. 150°, 210°

12. 0°, 30°, 180°, 330°

13. $\frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$

14. 0.361, 2.780, 3.503, 5.922

15. $\frac{\pi}{3}, \frac{5\pi}{3}$

16. $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}$

17. $x = \frac{1}{3}\arccos\frac{y}{2}$

18. $x = 5 + \arctan\frac{3y}{8}$

19. $\frac{12}{5}$

20. $\frac{\sqrt{2}}{4}$

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CHAPTER 6, FORM C

1. D: $(-\infty, \infty)$, R: $(0, \pi)$
2. $-\frac{\pi}{4}$
3. $\frac{2\pi}{3}$
4. -0.58
5. v
6. $\frac{\sqrt{2}}{4}$
7. $\frac{2\sqrt{7}+3\sqrt{5}}{12}$
8. $-\frac{\pi}{6}$ not in range of $\cos^{-1}$
9. 45°, 90°, 225°, 270°
10. 54.74°, 125.26°, 234.74°, 305.26°
11. 60°, 300°
12. 30°, 90°, 150°, 270°
13. $\frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$
14. $0, \frac{\pi}{2}, \frac{3\pi}{2}$
15. 0.322, 1.249, 3.463, 4.391
16. $0, \frac{\pi}{3}, \pi, \frac{5\pi}{3}$
17. $x = 2 \arctan\left(-\frac{y}{3}\right)$
18. $x = \arccos\frac{8y}{3} - 5$
19. $\frac{24}{25}$
20. $-\frac{1}{3}$

CHAPTER 6, FORM D

1. D: $(-\infty, \infty)$, R: $(0, \pi)$
2. $\frac{\pi}{6}$
3. $\frac{\pi}{4}$
4. 2.09
5. $\frac{\pi}{3}$
6. $\frac{2\sqrt{5}}{5}$
7. $\frac{4\sqrt{10}+3\sqrt{21}}{35}$
8. $\frac{3\pi}{4}$ not in range of $\tan^{-1}$
9. 0°, 180°
10. 45°, 135°
11. 50.77°, 129.23°, 230.77°, 309.23°
12. 60°, 90°, 120°, 270°
13. $0, \frac{2\pi}{3}, \frac{4\pi}{3}$
14. 0.561, 2.580, 3.703, 5.722
15. $\frac{\pi}{2}, \pi, \frac{3\pi}{2}$
16. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$
17. $x = 3 \operatorname{arccsc}\left(-\frac{y}{5}\right)$
18. $x = \arcsin\frac{2y-5}{7}$
19. $\frac{1}{2}$
20. $\frac{2\sqrt{5}}{5}$

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CHAPTER 6, FORM E

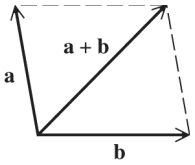
1. c
2. c
3. c
4. b
5. a
6. d
7. a
8. a
9. c
10. c
11. b
12. d
13. d
14. c
15. d
16. b
17. d
18. d
19. a
20. c

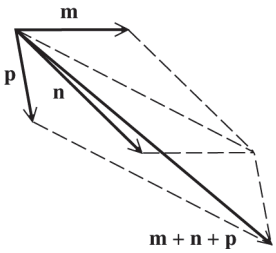
CHAPTER 6, FORM F

1. a
2. d
3. c
4. b
5. b
6. d
7. d
8. b
9. b
10. b
11. a
12. d
13. d
14. d
15. b
16. c
17. a
18. d
19. d
20. d

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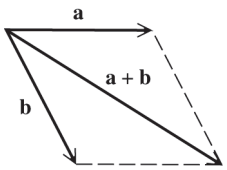
CHAPTER 7, FORM A

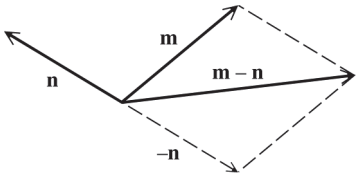
1. a
2. 36.8 m
3. 56° 39′ or 123° 21′
4. If C is a right angle, then $\frac{\sin A}{a} = \frac{\sin C}{c}$ becomes $\sin A = \frac{a}{c}$, the right triangle definition of sine.
5. $A = 18.8°$; $B = 27.2°$; $C = 134.0°$
6. $b = 125.9$ cm; $A = 31° \ 50'$; $C = 22° \ 50'$
7. 98.3 cm^2
8. 26,062.8 ft^2
9. 135.9 mi
10. False
11. 

12. 

13. 42.6 lb
14. 10.3; 119.1°
15. $\left\langle \frac{9\sqrt{3}}{2}, \frac{9}{2} \right\rangle$
16. 119.3
17. 62.1
18. 4.4°
19. 161° 5′
20. 426 mph

CHAPTER 7, FORM B

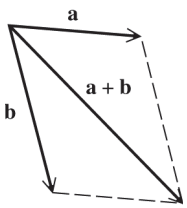
1. d
2. 52° 14′ or 127° 46′
3. 33.1 ft
4. When the measures of two angles and one side or two sides and one opposite angle are known, use the Law of Sines.
5. $A = 27.5°$; $B = 21.4°$; $C = 131.1°$
6. $a = 106.4$ m; $B = 38° \ 45'$; $C = 32° \ 35'$
7. 1236.3 $in.^2$
8. 113.1 m^2
9. 75 yd
10. True
11. 

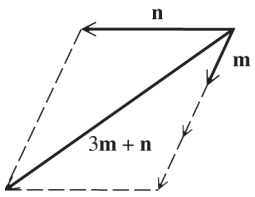
12. 

13. 80.6 lb
14. 10.6; 138.8°
15. $\langle 3.75, 3.75\sqrt{3} \rangle$
16. 47.4
17. 17.6
18. 120 lb
19. 157° 45′
20. 424 mph

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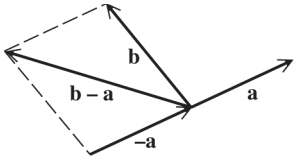
CHAPTER 7, FORM C

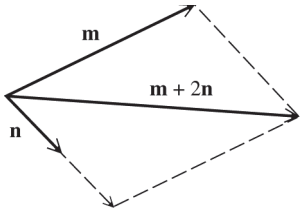
1. a
2. 18.7 cm
3. 41° 36′
4. When the measures of two sides and the included angle or three sides are known, use the Law of Cosines.
5. $A = 11.9°$; $B = 12.2°$; $C = 155.9°$
6. $c = 40.9$ in.; $A = 25°\ 50'$; $B = 85°\ 50'$
7. 833.4 ft^2
8. 2157 yd^2
9. 142.1 mi
10. True
11. 

12. 

13. 95.7 lb
14. 11.7; 19.9°
15. $\langle 5.05\sqrt{2}, 5.05\sqrt{2} \rangle$
16. 90.3
17. 55.9
18. 10°
19. 161° 21′
20. 460 mph

CHAPTER 7, FORM D

1. d
2. 54° 20′
3. 52.1 m
4. $\dfrac{15}{\sin 86°} = \dfrac{30}{\sin B}$
becomes $\sin B \approx 1.995$, which is impossible.
5. $b = 107.7$ cm; $A = 43°\ 57'$; $C = 6°\ 3'$
6. $A = 17°$; $B = 27°$; $C = 136°$
7. 795.4 yd^2
8. 428.2 ft^2
9. 2.1 mi from A; 2.8 mi from B
10. True
11. 

12. 

13. 48.6 lb
14. 10.8; 146.3°
15. $\langle 6\sqrt{2}, 6\sqrt{2} \rangle$
16. 47.8
17. 3.5
18. 14°
19. 159° 2′
20. 461 mph

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CHAPTER 7, FORM E

1. d
2. b
3. c
4. d
5. c
6. a
7. c
8. d
9. b
10. d
11. c
12. b
13. a
14. b
15. a
16. d
17. b
18. d
19. b
20. d

CHAPTER 7, FORM F

1. a
2. d
3. d
4. b
5. b
6. c
7. d
8. b
9. d
10. a
11. b
12. c
13. d
14. c
15. a
16. b
17. c
18. c
19. b
20. c

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CHAPTER 8, FORM A

1. False

2. $4 + 5i$

3. 0

4. $\frac{10}{13} + \frac{11}{13}i$

5. $-9 - 46i$

6. $-\frac{81}{2} + \frac{81i\sqrt{3}}{2}$

7. $\frac{2}{5}i$

8. $-4,\ 2 \pm 2i\sqrt{3}$

9. $-\frac{1}{4} \pm \frac{\sqrt{23}}{4}i$

10. $\sqrt{3} - i,\ -\sqrt{3} + i$

11. $26 + 26i\sqrt{3}$

12. $2\sqrt{2}\ (\cos 225° + i \sin 225°)$

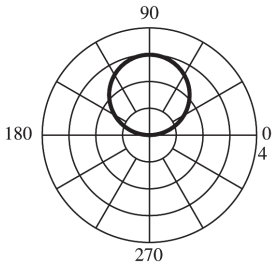
13. $\frac{5\sqrt{2}}{2} + \frac{5\sqrt{2}}{2}i,\ -\frac{5\sqrt{2}}{2} - \frac{5\sqrt{2}}{2}i$

14. $3(\cos 36° + i \sin 36°)$
$3(\cos 108° + i \sin 108°)$
-3
$3(\cos 252° + i \sin 252°)$
$3(\cos 324° + i \sin 324°)$

15. $r = 4$

16. $x^2 + y^2 - 6y = 0$

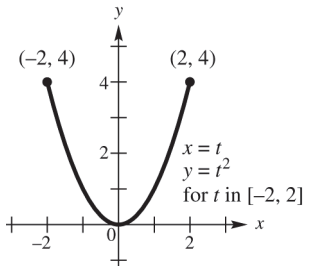
17.



$r = 3 \sin \theta$

18. $9x^2 + y^2 = 9$

19.



20. $x^2 + y^2 = (2\cos t)^2 + (2\sin t)^2$
$= 4\cos^2 t + 4\sin^2 t$
$= 4(\cos^2 t + \sin^2 t)$
$= 4,$

which is the equation of a circle centered at (0, 0) with radius 2.

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CHAPTER 8, FORM B

1. False

2. $\sqrt{3}+7i$

3. -1

4. $-\frac{8}{10}+\frac{16}{10}i$

5. $-236+115i$

6. -16

7. $\frac{3}{4}i$

8. $3, -\frac{3}{2}\pm\frac{3\sqrt{3}}{2}i$

9. $-\frac{1}{3}\pm\frac{\sqrt{14}}{3}i$

10. $\sqrt{2}+i, -\sqrt{2}-i$

11. $-\frac{13}{2}+\frac{13\sqrt{3}}{2}i$

12. $2(\cos 225° + i \sin 225°)$

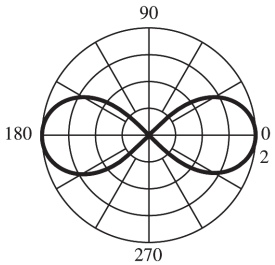
13. $-3, \frac{3}{2}+\frac{3\sqrt{3}}{2}i, \frac{3}{2}-\frac{3\sqrt{3}}{2}i$

14. $2\sqrt{2}(\cos 45°+i\sin 45°)$
$2\sqrt{2}(\cos 135°+i\sin 135°)$
$2\sqrt{2}(\cos 225°+i\sin 225°)$
$2\sqrt{2}(\cos 315°+i\sin 315°)$

15. $r = 2 \sec \theta$

16. $x^2+y^2=9$

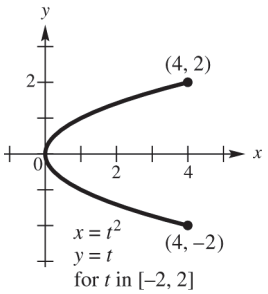
17.



$r^2 = 4 \cos 2\theta$

18. $y=\sqrt{\frac{x}{2}-1}$, for x in $[4, 20]$

19.



20. $x^2+y^2=(3\sin t)^2+(3\cos t)^2$
$=9\sin^2 t+9\cos^2 t$
$=9(\sin^2 t+\cos^2 t)$
$=9,$

which is the equation of a circle centered at (0, 0) with radius 3.

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CHAPTER 8, FORM C

1. False

2. $7+5i\sqrt{2}$

3. -128

4. $-\frac{11}{34}+\frac{7}{34}i$

5. $-5 + 12i$

6. -16

7. $\frac{2\sqrt{2}}{5}+\frac{2\sqrt{2}}{5}i$

8. $-2, 1\pm i\sqrt{3}$

9. $-\frac{1}{5}\pm\frac{2}{5}i$

10. $1+i\sqrt{3}, -1-i\sqrt{3}$

11. $\frac{9\sqrt{2}}{2}+\frac{9\sqrt{2}}{2}i$

12. $8(\cos 150° + i \sin 150°)$

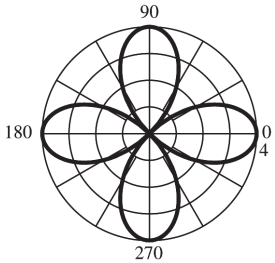
13. $3, -3, 3i, -3i$

14. $5(\cos 22.5° + i \sin 22.5°)$
$5(\cos 112.5° + i \sin 112.5°)$
$5(\cos 202.5° + i \sin 202.5°)$
$5(\cos 292.5° + i \sin 292.5°)$

15. $r=\frac{1}{2}\tan\theta\sec\theta$

16. $x^2+y^2-4x=0$

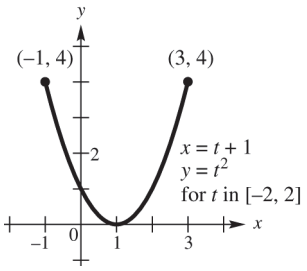
17.



$r = 4 \cos 2\theta$

18. $y=\left(\frac{x-1}{3}\right)^3$, for x in $[-5, 10]$

19.



20.

$$x^2+y^2=\left(\frac{1}{2}\sin t\right)^2+\left(\frac{1}{2}\cos t\right)^2$$
$$=\frac{1}{4}\sin^2 t+\frac{1}{4}\cos^2 t$$
$$=\frac{1}{4}(\sin^2 t+\cos^2 t)$$
$$=\frac{1}{4},$$

which is the equation of a circle centered at $(0, 0)$ with radius $\frac{1}{2}$.

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CHAPTER 8, FORM D

1. True

2. $6+2i\sqrt{2}$

3. 1

4. $-1-i$

5. $52-47i$

6. $-8-8i\sqrt{3}$

7. $-\frac{5}{4}\pm\frac{5\sqrt{3}}{4}i$

8. $5, -\frac{5}{2}\pm\frac{5\sqrt{3}}{2}i$

9. $\frac{1}{3}\pm\frac{\sqrt{2}}{3}i$

10. $1-i\sqrt{2}, -1+i\sqrt{2}$

11. $6\sqrt{2}+6i\sqrt{2}$

12. $6(\cos 150° + i \sin 150°)$

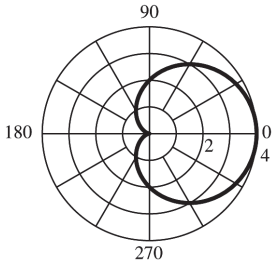
13. $\frac{7\sqrt{2}}{2}+\frac{7\sqrt{2}}{2}i, -\frac{7\sqrt{2}}{2}-\frac{7\sqrt{2}}{2}i$

14. $2(\cos 36° + i \sin 36°)$
$2(\cos 108° + i \sin 108°)$
-2
$2(\cos 252° + i \sin 252°)$
$2(\cos 324° + i \sin 324°)$

15. $x^2+y^2-3x-3y=0$

16. $r=6$

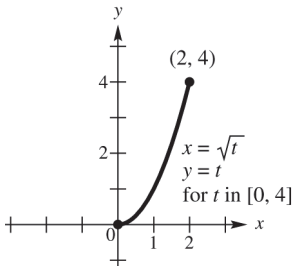
17.



$r = 2 + 2\cos\theta$

18. $y=\frac{3}{2}x+\frac{17}{2}$, for x in $[-7, 7]$

19.



20. $x^2+y^2=(4\cos t)^2+(4\sin t)^2$
$=16\cos^2 t+16\sin^2 t$
$=16(\cos^2 t+\sin^2 t)$
$=16,$
which is the equation of a circle centered at (0, 0) with radius 4.

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CHAPTER 8, FORM E

1. c
2. d
3. a
4. d
5. b
6. c
7. a
8. d
9. b
10. a
11. c
12. c
13. d
14. a
15. d
16. b
17. c
18. a
19. b
20. c

CHAPTER 8, FORM F

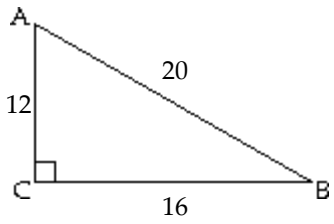
1. d
2. b
3. d
4. a
5. b
6. b
7. b
8. c
9. b
10. d
11. a
12. c
13. b
14. a
15. d
16. a
17. a
18. c
19. c
20. b

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MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Evaluate the function requested. Write your answer as a fraction in lowest terms.

1)

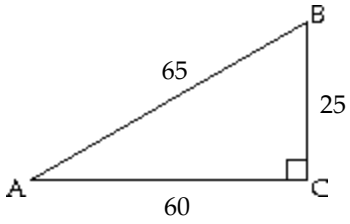


Find sin A.

A) $\sin A = \frac{5}{4}$ B) $\sin A = \frac{3}{5}$ C) $\sin A = \frac{4}{5}$ D) $\sin A = \frac{4}{3}$

Answer: C

2)

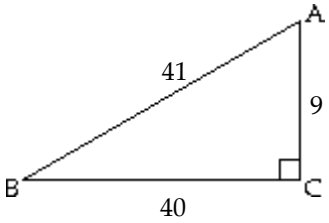


Find tan A.

A) $\tan A = \frac{5}{13}$ B) $\tan A = \frac{12}{5}$ C) $\tan A = \frac{13}{5}$ D) $\tan A = \frac{5}{12}$

Answer: D

3)



Find cos B.

A) $\cos B = \frac{41}{40}$ B) $\cos B = \frac{9}{40}$ C) $\cos B = \frac{9}{41}$ D) $\cos B = \frac{40}{41}$

Answer: D

Suppose ABC is a right triangle with sides of lengths a, b, and c and right angle at C. Find the unknown side length using the Pythagorean theorem and then find the value of the indicated trigonometric function of the given angle. Rationalize the denominator if applicable.

4) Find sin A when b = 33 and c = 55

A) $\frac{4}{5}$ B) $\frac{5}{4}$ C) $\frac{3}{5}$ D) $\frac{3}{4}$

Answer: A

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5) Find csc A when b = 24 and c = 51

A) $\frac{15}{17}$ B) $\frac{17}{8}$ C) $\frac{17}{15}$ D) $\frac{8}{15}$

Answer: C

6) Find tan B when a = 48 and c = 50.

A) $\frac{7}{24}$ B) $\frac{24}{7}$ C) $\frac{7}{25}$ D) $\frac{24}{25}$

Answer: A

7) Find sin A when a = 4 and b = 5.

A) $\frac{4\sqrt{41}}{41}$ B) $\frac{\sqrt{41}}{5}$ C) $\frac{5\sqrt{41}}{41}$ D) $\frac{\sqrt{41}}{4}$

Answer: A

8) Find cos A when a = 5 and b = 3.

A) $\frac{\sqrt{34}}{5}$ B) $\frac{\sqrt{34}}{3}$ C) $\frac{5\sqrt{34}}{34}$ D) $\frac{3\sqrt{34}}{34}$

Answer: D

9) Find cos A when a = $\sqrt{7}$ and c = 6.

A) $\frac{\sqrt{7}}{6}$ B) $\frac{\sqrt{29}}{6}$ C) $\frac{29}{7}$ D) $\frac{7}{6}$

Answer: B

10) Find csc B when a = 6 and b = 7.

A) $\frac{6\sqrt{85}}{85}$ B) $\frac{\sqrt{85}}{6}$ C) $\frac{7\sqrt{85}}{85}$ D) $\frac{\sqrt{85}}{7}$

Answer: D

11) Find sec B when a = 2 and b = 9.

A) $\frac{2\sqrt{85}}{9}$ B) $\frac{9\sqrt{85}}{85}$ C) $\frac{\sqrt{85}}{2}$ D) $\frac{2\sqrt{85}}{85}$

Answer: C

12) Find cot A when a = 5 and c = 6.

A) $\frac{\sqrt{11}}{6}$ B) $\frac{5\sqrt{11}}{11}$ C) $\frac{6\sqrt{11}}{11}$ D) $\frac{\sqrt{11}}{5}$

Answer: D

13) Find tan B when b = 8 and c = 9.

A) $\frac{\sqrt{17}}{8}$ B) $\frac{9\sqrt{17}}{17}$ C) $\frac{\sqrt{17}}{9}$ D) $\frac{8\sqrt{17}}{17}$

Answer: D

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Without using a calculator, give the exact trigonometric function value with rational denominator.

14) sin 30°

A) $\sqrt{3}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{1}{2}$ D) $\frac{\sqrt{2}}{2}$

Answer: C

15) cos 30°

A) $\frac{\sqrt{2}}{2}$ B) $\sqrt{3}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{1}{2}$

Answer: C

16) cos 60°

A) $\frac{1}{2}$ B) $\sqrt{3}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{\sqrt{2}}{2}$

Answer: A

17) sin 60°

A) $\sqrt{3}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{1}{2}$ D) $\frac{\sqrt{2}}{2}$

Answer: B

18) tan 60°

A) $\sqrt{3}$ B) $\frac{\sqrt{2}}{2}$ C) $\frac{1}{2}$ D) $\frac{\sqrt{3}}{2}$

Answer: A

19) tan 45°

A) $\frac{2\sqrt{3}}{3}$ B) $\sqrt{2}$ C) 1 D) $\frac{1}{2}$

Answer: C

20) cot 45°

A) 1 B) $\frac{2\sqrt{3}}{3}$ C) $\frac{1}{2}$ D) $\sqrt{2}$

Answer: A

21) sec 45°

A) $\sqrt{2}$ B) 1 C) $\frac{2\sqrt{3}}{3}$ D) $\frac{1}{2}$

Answer: A

22) csc 45°

A) $\frac{1}{2}$ B) $\sqrt{2}$ C) $\frac{2\sqrt{3}}{3}$ D) 1

Answer: B

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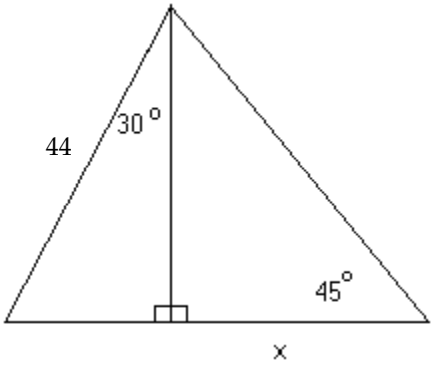
23) sec 30°

A) $\frac{2\sqrt{3}}{3}$ B) 1 C) $\frac{1}{2}$ D) $\sqrt{2}$

Answer: A

Solve the problem.

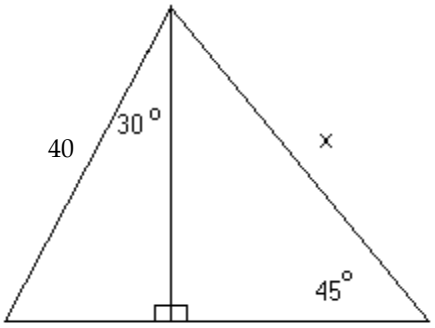
24) Find the exact value of x in the figure.



A) $23\sqrt{3}$ B) $20\sqrt{3}$ C) $22\sqrt{3}$ D) $22\sqrt{6}$

Answer: C

25) Find the exact value of x in the figure.

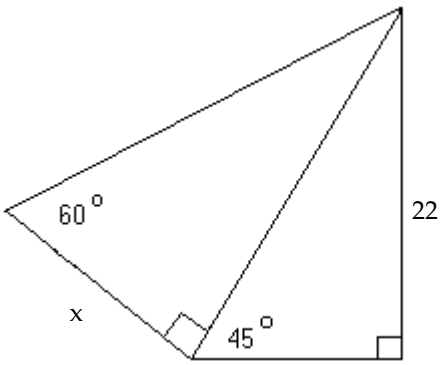


A) $20\sqrt{6}$ B) $20\sqrt{3}$ C) $20\sqrt{5}$ D) $20\sqrt{2}$

Answer: A

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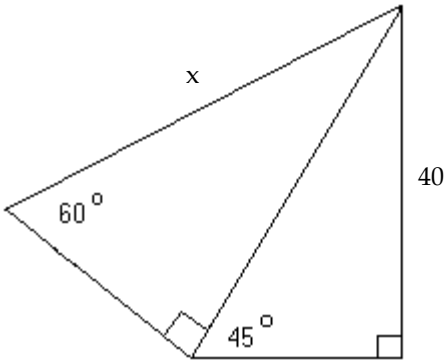
26) Find the exact value of x in the figure.



A) $\frac{22\sqrt{6}}{3}$ B) $\frac{22\sqrt{3}}{3}$ C) $11\sqrt{3}$ D) $11\sqrt{6}$

Answer: A

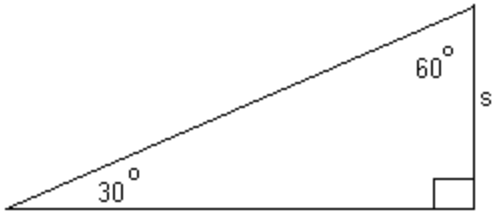
27) Find the exact value of x in the figure.



A) $79\sqrt{6}$ B) $\frac{80\sqrt{6}}{3}$ C) $\frac{20\sqrt{6}}{3}$ D) $\frac{74\sqrt{3}}{3}$

Answer: B

28) Find a formula for the area of the figure in terms of s.

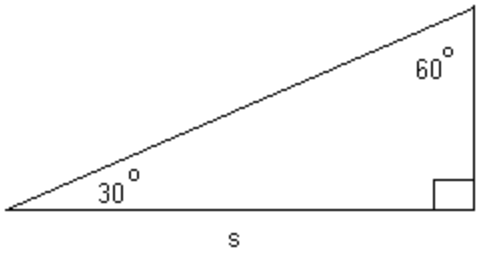


A) $\frac{\sqrt{3}}{6}s^2$ B) $\frac{\sqrt{s}}{3}$ C) $\frac{\sqrt{3}}{2}s^2$ D) $\frac{\sqrt{2}}{2}s^2$

Answer: C

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29) Find a formula for the area of the figure in terms of s.



A) $\frac{\sqrt{3}}{6}s^2$ B) $\sqrt{6}\,s^2$ C) $\frac{\sqrt{6}}{4}s^2$ D) $\frac{\sqrt{3}}{2}s^2$

Answer: A

Write the function in terms of its cofunction. Assume that any angle in which an unknown appears is an acute angle.

30) sin 77°

A) cos 77° B) cos 13° C) csc 13° D) sin 167°

Answer: B

31) cos 33°

A) sec 57° B) sin 57° C) sin 33° D) cos 123°

Answer: B

32) tan 41°

A) cot 139° B) tan 131° C) cot 41° D) cot 49°

Answer: D

33) csc 35°

A) csc 145° B) sec 55° C) sin 55° D) sec 35°

Answer: B

34) sin(θ + 14°)

A) cos (104° – θ) B) csc(76° – θ) C) cos(76° – θ) D) sin (104° – θ)

Answer: C

35) tan(θ + 22°)

A) cot(112° – θ) B) tan(68° – θ) C) cot(68° – θ) D) cot(158° – θ)

Answer: C

36) sec(θ – 13°)

A) cos(103° – θ) B) csc(103° – θ) C) sec(167° – θ) D) csc(77° – θ)

Answer: B

37) cot 31.1°

A) tan 148.9° B) tan 31.1° C) tan 58.9° D) cot 58.9°

Answer: C

38) cos 31.2°

A) sec 148.8° B) sin 31.2° C) sin 58.8° D) cos 148.8°

Answer: C

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39) sec 29.7°

A) cos 60.3° B) cos 150.3° C) csc 60.3° D) csc 29.7°

Answer: C

Find a solution for the equation. Assume that all angles are acute angles.

40) sin A = cos 8A

A) 10° B) 8° C) 82° D) 80°

Answer: A

41) sec θ = csc(θ + 46°)

A) 23° B) 22° C) 68° D) 67°

Answer: B

42) tan(3α + 12°) = cot(α + 36°)

A) 14.5° B) 12° C) 10.5° D) 16°

Answer: C

43) sin(2β + 5°) = cos(3β – 25°)

A) 22° B) 24° C) 23° D) 21.5°

Answer: A

44) sec(θ + 12°) = csc(2θ + 15°)

A) 23.5° B) 21° C) 15° D) 19°

Answer: B

45) tan(3θ + 16°) = cot(θ + 4°)

A) 17.5° B) 16.5° C) 17° D) 19°

Answer: A

Decide whether the statement is true or false.

46) sin 86° > sin 24°

A) True B) False

Answer: A

47) cos 43° ≤ cos 5°

A) True B) False

Answer: A

48) tan 23° < tan 4°

A) True B) False

Answer: B

49) sin 59° < cos 59°

A) True B) False

Answer: B

50) tan 28° > cot 28°

A) True B) False

Answer: B

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51) $\sec 50° < \sec 4°$

A) True B) False

Answer: B

Solve the problem for the given information.

52) Find the equation of a line passing through the origin and making a 45° angle with the positive x–axis.

A) $y = x$ B) $y = \frac{\sqrt{2}}{2}x$ C) $y = -x$ D) $y = \frac{\sqrt{3}}{3}x$

Answer: A

53) What angle does the line $y = x$ make with the positive x–axis?

A) 60° B) 30° C) 45° D) 90°

Answer: C

54) Find the equation of a line passing through the origin so that the sine of the angle between the line in quadrant I and the positive x–axis is $\frac{\sqrt{3}}{2}$.

A) $y = \sqrt{3}x$ B) $y = x$ C) $y = \frac{\sqrt{3}}{3}x$ D) $y = \frac{\sqrt{3}}{2}x$

Answer: A

55) Find the equation of a line passing through the origin so that the sine of the angle between the line in quadrant I and the positive x–axis is $\frac{\sqrt{2}}{2}$.

A) $y = x$ B) $y = \sqrt{3}x$ C) $y = \frac{\sqrt{3}}{3}x$ D) $y = \frac{\sqrt{2}}{2}x$

Answer: A

56) Find the equation of a line passing through the origin so that the cosine of the angle between the line in quadrant I and the positive x–axis is $\frac{\sqrt{3}}{2}$.

A) $y = \frac{\sqrt{3}}{3}x$ B) $y = \frac{\sqrt{3}}{2}x$ C) $y = x$ D) $y = \sqrt{3}x$

Answer: A

57) Find the equation of a line passing through the origin so that the cosine of the angle between the line in quadrant I and the positive x–axis is $\frac{1}{2}$.

A) $y = \frac{\sqrt{3}}{2}x$ B) $y = \frac{1}{2}x$ C) $y = \sqrt{3}x$ D) $y = \frac{\sqrt{3}}{3}x$

Answer: C

Find the reference angle for the given angle.

58) 39°

A) 129° B) 141° C) 51° D) 39°

Answer: D

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59) 129°

A) 51° B) 61° C) 39° D) 49°

Answer: A

60) 236.6°

A) 146.6° B) 33.4° C) 123.4° D) 56.6°

Answer: D

61) –7.5°

A) 82.5° B) 7.5° C) 83° D) 8°

Answer: B

62) 388°

A) 152° B) 118° C) 28° D) 62°

Answer: C

63) –403°

A) 133° B) 137° C) 47° D) 43°

Answer: D

Find the exact value of the expression.

64) sin 30°

A) $\frac{\sqrt{3}}{2}$ B) $\frac{\sqrt{2}}{2}$ C) $\frac{\sqrt{3}}{3}$ D) $\frac{1}{2}$

Answer: D

65) cot 60°

A) 1 B) $\sqrt{3}$ C) $\frac{1}{2}$ D) $\frac{\sqrt{3}}{3}$

Answer: D

66) cos 45°

A) $\frac{\sqrt{3}}{2}$ B) $\sqrt{2}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{1}{2}$

Answer: C

67) cos 210°

A) $-\frac{\sqrt{3}}{2}$ B) $-\frac{\sqrt{2}}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{\sqrt{2}}{2}$

Answer: A

68) tan 300°

A) $\sqrt{3}$ B) $-\frac{\sqrt{3}}{3}$ C) $\frac{\sqrt{3}}{3}$ D) $-\sqrt{3}$

Answer: D

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69) cot 120°

A) $\frac{\sqrt{3}}{3}$ B) –1 C) $-\frac{\sqrt{3}}{3}$ D) $-\sqrt{3}$

Answer: C

70) sec 240°

A) $-\frac{2\sqrt{3}}{3}$ B) –2 C) 2 D) $\frac{2\sqrt{3}}{3}$

Answer: B

71) sec 150°

A) $\frac{2\sqrt{3}}{3}$ B) $-\sqrt{2}$ C) $\sqrt{2}$ D) $-\frac{2\sqrt{3}}{3}$

Answer: D

72) csc 240°

A) 2 B) –2 C) $\frac{2\sqrt{3}}{3}$ D) $-\frac{2\sqrt{3}}{3}$

Answer: D

73) csc 330°

A) 2 B) $\frac{2\sqrt{3}}{3}$ C) $-\frac{2\sqrt{3}}{3}$ D) –2

Answer: D

74) csc 840°

A) $\frac{2\sqrt{3}}{3}$ B) –2 C) $-\frac{\sqrt{3}}{3}$ D) $\sqrt{2}$

Answer: A

75) csc (–2460°)

A) $\frac{2\sqrt{3}}{3}$ B) –2 C) $\sqrt{2}$ D) $-\frac{\sqrt{3}}{3}$

Answer: A

76) sec 3105°

A) $\frac{\sqrt{2}}{2}$ B) $-\sqrt{2}$ C) $\frac{2\sqrt{3}}{3}$ D) 2

Answer: B

77) sec (–1215°)

A) $-\frac{\sqrt{3}}{3}$ B) $-\sqrt{2}$ C) –1 D) $\frac{\sqrt{2}}{2}$

Answer: B

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78) tan 2130°

A) $\frac{\sqrt{2}}{2}$ B) 1 C) $-\frac{\sqrt{3}}{3}$ D) $-\sqrt{3}$

Answer: C

79) cot (–1575°)

A) –1 B) 1 C) $\sqrt{3}$ D) $\frac{\sqrt{3}}{3}$

Answer: B

80) sin (–2040°)

A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{\sqrt{2}}{2}$ D) –1

Answer: B

81) sin 2835°

A) $-\frac{\sqrt{2}}{2}$ B) $-\frac{1}{2}$ C) $-\frac{\sqrt{3}}{2}$ D) $2\sqrt{3}$

Answer: A

82) cos 840°

A) $-\sqrt{3}$ B) $-\frac{1}{2}$ C) $\frac{\sqrt{2}}{2}$ D) $-\frac{\sqrt{3}}{2}$

Answer: B

83) cos (–390°)

A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $-\frac{\sqrt{3}}{2}$ D) $-\frac{1}{2}$

Answer: B

Evaluate.

84) $\sin^2 45° + \cos^2 45°$

A) $\frac{1}{4}$ B) 1 C) 0 D) 2

Answer: B

85) $2 \tan^2 120° + 2 \sin^2 150° - \cos^2 0°$

A) $\frac{15}{2}$ B) $\frac{11}{2}$ C) $\frac{9}{2}$ D) $-\frac{15}{2}$

Answer: B

86) $\cos^2 315° - \sin^2 270° + 4 \tan^2 30°$

A) $\frac{17}{6}$ B) $\frac{5}{6}$ C) $\frac{11}{6}$ D) $-\frac{1}{6}$

Answer: B

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87) $5 \sin^2 300° + \csc^2 150° - \sec^2 30°$

A) $\frac{29}{6}$ B) $\frac{13}{12}$ C) $\frac{8}{3}$ D) $\frac{77}{12}$

Answer: D

88) $\cot^2 45° + \sin 150° + 4 \tan^2 45°$

A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{11}{2}$ D) $\frac{9}{2}$

Answer: C

89) $2 \cot^2 270° + 2 \sec^2 0° - \csc^2 225°$

A) $\frac{3}{2}$ B) $\frac{5}{2}$ C) 4 D) 0

Answer: D

90) $3 \cot^2 45° + \tan^4 300° - 5 \sin^4 0°$

A) 7 B) 12 C) 84 D) 14

Answer: B

Determine whether the statement is true or false.

91) $\cos 30° + \cos 45° = \cos 75°$

A) True B) False

Answer: B

92) $\cos(30° + 45°) = \cos 30° \cdot \cos 45° - \sin 30° \cdot \sin 45°$

A) True B) False

Answer: A

93) $\cos 60° = 1 - 2 \sin^2 30°$

A) True B) False

Answer: A

94) $\cos 300° = 1 - \sin^2 150°$

A) True B) False

Answer: B

95) $\cos 60° = \cos 180° - \cos 120°$

A) True B) False

Answer: B

96) $\cos 135° = \cos 225° \cos 90° + \sin 225° \sin 90°$

A) True B) False

Answer: A

97) $\cos 195° = 2 \cos 225° \cos 30° + 2 \sin 225° \sin 30°$

A) True B) False

Answer: B

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98) $\sin 60° = 2 \sin 30°$

A) True B) False

Answer: B

99) $\sin 120° = 2 \sin 60° \cos 60°$

A) True B) False

Answer: A

100) $\sin 390° = \sin 120° \cos 270° + \cos 120° \sin 270°$

A) True B) False

Answer: A

Find the sign of the following.

101) $\tan \frac{\theta}{2}$, given that θ is in the interval $(90°, 180°)$.

A) positive B) negative

Answer: A

102) $\sin \frac{\theta}{2}$, given that θ is in the interval $(180°, 270°)$.

A) positive B) negative

Answer: A

103) $\cos (\theta + 180°)$, given that θ is in the interval $(90°, 180°)$.

A) positive B) negative

Answer: A

104) $\cot (\theta + 180°)$, given that θ is in the interval $(270°, 360°)$.

A) negative B) positive

Answer: A

105) $\csc (-\theta)$, given that θ is in the interval $(90°, 180°)$.

A) negative B) positive

Answer: A

106) $\sec (-\theta)$, given that θ is in the interval $(180°, 270°)$.

A) negative B) positive

Answer: A

Find all values of θ, if θ is in the interval $[0, 360°)$ and has the given function value.

107) $\cos \theta = \frac{1}{2}$

A) 150° and 210° B) 60° and 300° C) 210° and 330° D) 60° and 120°

Answer: B

108) $\sin \theta = \frac{\sqrt{3}}{2}$

A) 210° and 330° B) 60° and 120° C) 60° and 300° D) 150° and 210°

Answer: B

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109) $\sin \theta = -\frac{1}{2}$

A) 60° and 120° B) 150° and 210° C) 210° and 330° D) 60° and 300°

Answer: C

110) $\cos \theta = -\frac{\sqrt{3}}{2}$

A) 210° and 330° B) 150° and 210° C) 60° and 300° D) 60° and 120°

Answer: B

111) sec θ is undefined

A) 90° B) 0° and 180° C) 0° D) 90° and 270°

Answer: D

112) $\cos \theta = \frac{\sqrt{3}}{2}$

A) 45° and 225° B) 135° and 225° C) 30° and 330° D) 225° and 315°

Answer: C

113) $\sec \theta = -\sqrt{2}$

A) 45° and 315° B) 45° and 225° C) 225° and 315° D) 135° and 225°

Answer: D

114) $\sin \theta = -\frac{\sqrt{2}}{2}$

A) 45° and 225° B) 135° and 225° C) 225° and 315° D) 45° and 315°

Answer: C

115) $\tan \theta = 1$

A) 45° and 225° B) 135° and 225° C) 45° and 315° D) 225° and 315°

Answer: A

116) $\cot \theta = 1$

A) 225° and 315° B) 45° and 225° C) 45° and 315° D) 135° and 225°

Answer: B

Use a calculator to find the function value. Give your answer rounded to seven decimal places, if necessary.

117) sin 304°53′

A) −0.8203183 B) −0.8213183 C) −0.8103183 D) −0.8303183

Answer: A

118) cos 164°5′

A) −0.7616616 B) −0.4808308 C) −0.9616616 D) −0.5808308

Answer: C

119) tan 55°50′

A) 1.4738983 B) 1.4741983 C) 1.4735983 D) 1.4732983

Answer: D

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120) csc 30°5′

A) 1.9949764 B) 1.9939764 C) 1.9969764 D) 1.9959764

Answer: A

121) sec 70°28′

A) 2.9898312 B) 5.9826624 C) 5.9816624 D) 2.9908312

Answer: D

122) cot 40°44′

A) 1.16144 B) 1.16104 C) 1.16124 D) 1.16064

Answer: C

123) sin (−34°20′)

A) −0.5543603 B) −0.5562956 C) −0.5620834 D) −0.5640066

Answer: D

124) $\dfrac{1}{\tan 38°46'}$

A) 0.7942967 B) 1.245232 C) 0.8030632 D) 1.2589754

Answer: B

125) $\dfrac{\sin 79°}{\cos 79°}$

A) 0.0174551 B) 5.144554 C) 0.1943803 D) 1

Answer: B

126) cos 47° cos 133° − sin 47° sin 133°

A) 2 B) −1 C) 1 D) 0

Answer: B

127) cos 39° 5' cos 50° 55' − sin 39° 5' sin 50° 55'

A) 0 B) 2 C) −1 D) 1

Answer: A

128) $\sin^2 57° + \cos^2 57°$

A) −1 B) 2 C) 1 D) 0

Answer: C

129) 2 sin 44° 14' cos 44° 14' − sin 88° 28'

A) −1 B) 1 C) 2 D) 0

Answer: D

Use a calculator to decide whether the statement is true or false.

130) sin (150° + 30°) = sin 150° + sin 30°

A) True B) False

Answer: B

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131) $\sin(180° + 225°) = \sin 180° \cdot \cos 225° + \cos 180° \cdot \sin 225°$

A) True B) False

Answer: A

132) $\sin(2 \cdot 30°) = 2 \cdot \sin 30°$

A) True B) False

Answer: B

133) $\sin(2 \cdot 150°) = 2 \cdot \sin 150° \cdot \cos 150°$

A) True B) False

Answer: A

134) $\cos(2 \cdot 30°) = 2 \cdot \cos 30°$

A) True B) False

Answer: B

135) $\cos(2 \cdot 90°) = \cos^2 90° - \sin^2 90°$

A) True B) False

Answer: A

Find a value of θ in [0°, 90°] that satisfies the statement. Leave answer in decimal degrees rounded to seven decimal places, if necessary.

136) $\sin \theta = 0.81107642$

A) 35.7987657° B) 234.201234° C) 54.2012343° D) 125.798766°

Answer: C

137) $\cos \theta = 0.49566425$

A) 119.713561° B) 299.713561° C) 29.7135613° D) 60.2864387°

Answer: D

138) $\tan \theta = 0.83799703$

A) 219.962908° B) 39.9629076° C) 320.037092° D) 50.0370924°

Answer: B

139) $\tan \theta = 1.5047547$

A) 123.606428° B) 236.393572° C) 33.6064283° D) 56.3935717°

Answer: D

140) $\cot \theta = 1.7009187$

A) 36.0093720° B) 30.4520188° C) 59.5479812° D) 53.9906280°

Answer: B

141) $\sec \theta = 2.7259498$

A) 68.4788525° B) 21.5211475° C) 20.1452902° D) 54.5922708°

Answer: A

142) $\csc \theta = 1.7437345$

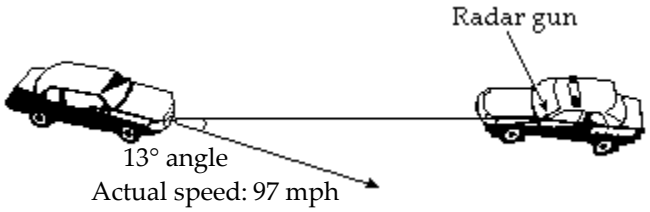
A) 60.1665137° B) 55.0066191° C) 29.8334863° D) 34.9933809°

Answer: D

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Solve the problem.

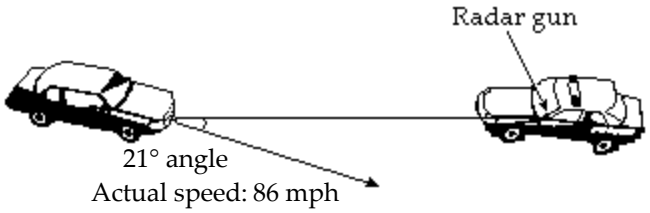
143) Any offset between a stationary radar gun and a moving target creates a "cosine effect" that reduces the radar mileage reading by the cosine of the angle between the gun and the vehicle. That is, the radar speed reading is the product of the actual reading and the cosine of the angle. Find the radar reading to the nearest hundredth for the auto shown in the figure.



A) 97.97 mph B) 94.51 mph C) 21.82 mph D) 96.03 mph

Answer: B

144) Any offset between a stationary radar gun and a moving target creates a "cosine effect" that reduces the radar mileage reading by the cosine of the angle between the gun and the vehicle. That is, the radar speed reading is the product of the actual reading and the cosine of the angle. Find the radar reading to the nearest hundredth for the auto shown in the figure.



A) 30.82 mph B) 80.29 mph C) 85.07 mph D) 86.93 mph

Answer: B

145) The grade resistance F of a car traveling up or down a hill is modeled by the equation $F = W \sin \theta$, where W is the weight of the car and θ is the angle of the hill's grade ($\theta > 0$ for uphill travel, $\theta < 0$ for downhill travel). What is the grade resistance (to the nearest pound) of a 3000–lb car traveling uphill on a 3° grade ($\theta = 3°$)?

A) –3003 lb B) –157 lb C) 3003 lb D) 157 lb

Answer: D

146) The grade resistance F of a car traveling up or down a hill is modeled by the equation $F = W \sin \theta$, where W is the weight of the car and θ is the angle of the hill's grade ($\theta > 0$ for uphill travel, $\theta < 0$ for downhill travel). Find the weight of the car (to the nearest pound) that is traveling on a –2.2° downhill grade and which has a grade resistance of –153.55 lb.

A) 3800 lb B) 4000 lb C) 4100 lb D) 4300 lb

Answer: B

147) The grade resistance F of a car traveling up or down a hill is modeled by the equation $F = W \sin \theta$, where W is the weight of the car and θ is the angle of the hill's grade ($\theta > 0$ for uphill travel, $\theta < 0$ for downhill travel). What is the grade resistance (to the nearest pound) of a 2100–lb car traveling downhill on a 5° grade ($\theta = -5°$)?

A) 2105 lb B) 183 lb C) –2105 lb D) –183 lb

Answer: D

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148) The grade resistance F of a car traveling up or down a hill is modeled by the equation $F = W \sin \theta$, where W is the weight of the car and θ is the angle of the hill's grade ($\theta > 0$ for uphill travel, $\theta < 0$ for downhill travel). What is the grade resistance (to the nearest pound) of a 1750–lb car on a level road ($\theta = 0°$)?

A) –1750 lb B) 1750 lb C) undefined D) 0 lb

Answer: D

149) The grade resistance F of a car traveling up or down a hill is modeled by the equation $F = W \sin \theta$, where W is the weight of the car and θ is the angle of the hill's grade ($\theta > 0$ for uphill travel, $\theta < 0$ for downhill travel). A 2025–lb car has just rolled off a sheer vertical cliff ($\theta = -90°$). What is the car's grade resistance?

A) 0 lb B) 2025 lb C) –2025 lb D) undefined

Answer: C

150) If an automobile is traveling at velocity V (in feet per second) , the safe radius R for a curve with superelevation α is given by the formula $R = \dfrac{V^2}{g(f + \tan \alpha)}$, where f and g are constants. A road is being constructed for automobiles traveling at 50 miles per hour. If $\alpha = 4°$, $g = 32.4$, and $f = 0.16$, calculate R. Round to the nearest foot. (Hint: 1 mile = 5280 feet)

A) R = 722 ft B) R = 706 ft C) R = 742 ft D) R = 1172 ft

Answer: A

151) A formula used by an engineer to determine the safe radius of a curve, R, when designing a road is: $R = \dfrac{V^2}{g(f + \tan \alpha)}$, where α is the superelevation of the road and V is the velocity (in feet per second) for which the curve is designed. If V = 84 ft per sec, f = 0.1, g = 30, and $\alpha = 1.1°$, find R. Round to the nearest foot.

A) R = 1973 ft B) R = 1983 ft C) R = 1970 ft D) R = 1977 ft

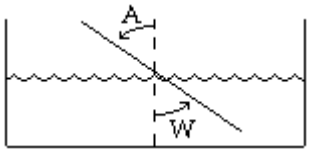
Answer: A

152) A formula used by an engineer to determine the safe radius of a curve, R, when designing a particular road is: $R = \dfrac{V^2}{g(f + \tan \alpha)}$, where α is the superelevation of the road and V is the velocity (in feet per second) for which the curve is designed. If $\alpha = 2.1°$, f = 0.1, g = 30, and R = 1229.5 ft, find V. Round to the nearest foot per second.

A) V = 67 ft per sec B) V = 69 ft per sec C) V = 71 ft per sec D) V = 74 ft per sec

Answer: C

153) The index of refraction for air, I_a, is 1.0003. The index of refraction for water, I_W, is 1.3. If $\dfrac{I_W}{I_a} = \dfrac{\sin A}{\sin W}$, and $A = 31.5°$, find W to the nearest tenth.



A) 20.7° B) 21.7° C) 22.7° D) 23.7°

Answer: D

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154) Snell's Law states that $\frac{c_1}{c_2} = \frac{\sin \theta_1}{\sin \theta_2}$. Use this law to find the requested value. If $c_1 = 7 \times 10^7$, $\theta_1 = 48°$, and $\theta_2 = 33°$, find c_2.

A) $c_2 = 5.13 \times 10^6$ B) $c_2 = 5.66 \times 10^7$ C) $c_2 = 5.13 \times 10^7$ D) $c_2 = 4.89 \times 10^9$

Answer: C

155) Snell's Law states that $\frac{c_1}{c_2} = \frac{\sin \theta_1}{\sin \theta_2}$. Use this law to find the requested value. If $c_1 = 6 \times 10^8$, $c_2 = 4.66 \times 10^8$, $\theta_1 = 43°$, find θ_2. Round your answer to the nearest degree.

A) $\theta_2 = 32°$ B) $\theta_2 = 35°$ C) $\theta_2 = 31°$ D) $\theta_2 = 34°$

Answer: A

156) Snell's Law states that $\frac{c_1}{c_2} = \frac{\sin \theta_1}{\sin \theta_2}$. Use this law to find the requested value. If $c_1 = 8 \times 10^8$, $c_2 = 6.14 \times 10^8$, $\theta_2 = 36°$, find θ_1. Round your answer to the nearest degree.

A) $\theta_1 = 50°$ B) $\theta_1 = 53°$ C) $\theta_1 = 48°$ D) $\theta_1 = 51°$

Answer: A

The number represents an approximate measurement. State the range represented by the measurement.

157) 21 ft

A) 20 ft to 22 ft B) 20.9 ft to 21.1 ft C) 20.75 ft to 21.25 ft D) 20.5 ft to 21.5 ft

Answer: D

158) 17.3 m

A) 16.3 m to 18.3 m
B) 17.25 m to 17.35 m
C) 17.29 m to 17.31 m
D) 17.275 m to 17.325 m

Answer: B

159) 24.35 k

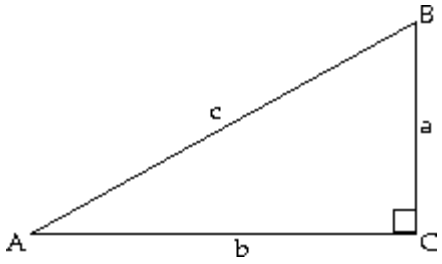
A) 24.3475 kg to 24.3525 kg
B) 24.345 kg to 24.355 kg
C) 24.349 kg to 24.351 kg
D) 23.35 kg to 25.35 kg

Answer: B

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Solve the right triangle. If two sides are given, give angles in degrees and minutes.

160)



A = 11° 32′, c = 213 ft

Round side lengths to two decimal places.

A) B = 78° 28′; a = 42.59 ft; b = 208.70 ft

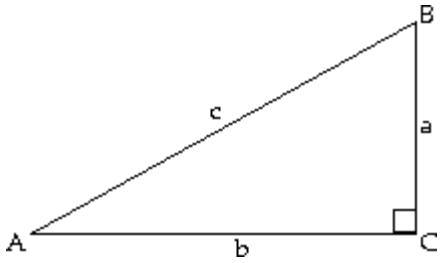
B) B = 78° 27′; a = 45.79 ft; b = 209.90 ft

C) B = 79° 27′; a = 42.59 ft; b = 204.70 ft

D) B = 78° 28′; a = 42.02 ft ; b = 207.81 ft

Answer: A

161)



B = 53°47', b = 25 km

Round side lengths to one decimal place.

A) A = 36°13'; c = 31.0 km; a = 18.3 km

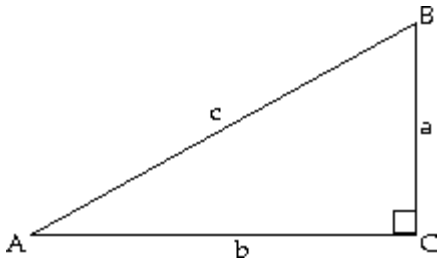
B) A = 36°13'; c = 31.1 km; a = 42.0 km

C) A = 36°13'; c = 42.3 km; a = 31.0 km

D) A = 36°13'; c = 42.3 km; a = 18.3 km

Answer: A

162)



A = 41.3°, b = 2.5 m

Round side lengths to one decimal place.

A) B = 48.7°; a = 4.0 m; c = 4.7 m

B) B = 48.7°; a = 1.1 m; c = 2.7 m

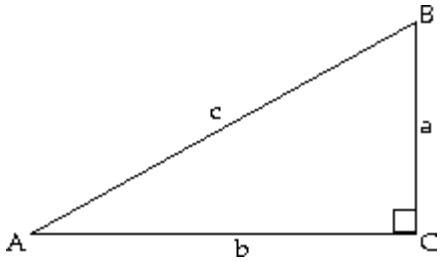
C) B = 48.7°; a = 1.1 m; c = 4.0 m

D) B = 48.7°; a = 2.2 m; c = 3.3 m

Answer: D

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163)

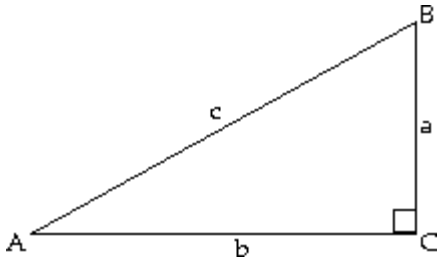


B = 65.4834°, c = 3618.6 m
Give side lengths to two decimal places.

A) A = 24.5166°; a = 1416.68 m; b = 3277.05 m
B) A = 24.5166°; a = 1560.70 m; b = 3292.35 m
C) A = 24.5166°; a = 1501.56 m; b = 3292.35 m
D) A = 24.5166°; a = 1501.56 m; b = 3246.96 m

Answer: C

164)

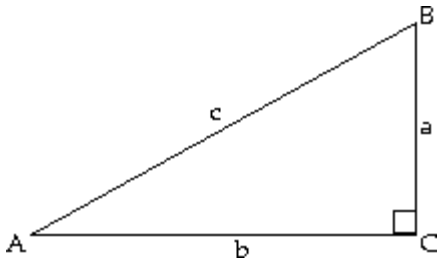


B = 58.45°, a = 434.7 m
Give side lengths to two decimal places.

A) A = 31.55°; b = 707.98 m; c = 830.78 m
B) A = 31.55°; b = 664.51 m; c = 830.78 m
C) A = 31.55°; b = 707.98 m; c = 843.43 m
D) A = 31.55°; b = 751.45 m; c = 817.21 m

Answer: A

165)



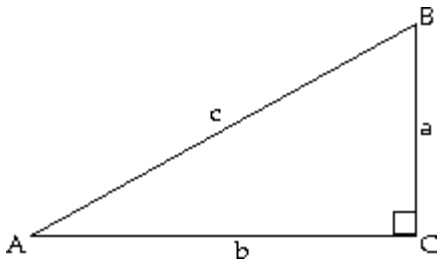
a = 10.9 cm, b = 21.7 cm
Round the missing side length to one decimal place.

A) A = 26°40'; B = 63°20'; c = 25.8 cm
B) A = 30°9'; B = 59°51'; c = 22.6 cm
C) A = 26°40'; B = 63°20'; c = 24.3 cm
D) A = 30°9'; B = 59°51'; c = 24.3 cm

Answer: C

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166)



a = 50.26 ft, c = 231 ft

Round the missing side length to two decimal places.

A) A = 13° 34′, B = 76° 26′, b = 225.47 ft
B) A = 10° 34′, B = 79° 26′, b = 236.74 ft
C) A = 12° 34′; B = 77° 26′; b = 225.47 ft
D) A = 12° 34′, B = 77° 26′, b =209.69 ft

Answer: C

Solve the right triangle.

167) a = 2.6 cm, b = 1.3 cm, C = 90°

Round values to one decimal place.

A) A = 26.6°, B = 63.4°, c = 2.9 cm
B) A = 63.4°, B = 26.6°, c = 2.9 cm
C) A = 58.9°, B = 31.1°, c = 2.9 cm
D) A = 30.0°, B = 60.0°, c = 3.9 cm

Answer: B

168) a = 3.6 m, B = 30.3°, C = 90°

Round values to one decimal place.

A) A = 59.7°, b = 1 m, c = 3.7 m
B) A = 59.7°, b = 2.1 m, c = 4.2 m
C) A = 59.7°, b = 4.4 m, c = 4.2 m
D) A = 59.7°, b = 4.4 m, c = 5.7 m

Answer: B

169) a = 2.6 in., A = 49.8°, C = 90°

Round values to one decimal place.

A) b = 1.1 in., B = 40.2°, c = 2.8 in.
B) b = 4.0 in., B = 40.2°, c = 4.8 in.
C) b = 2.2 in., B = 40.2°, c = 3.4 in.
D) b = 4.0 in., B = 40.2°, c = 3.4 in.

Answer: C

170) B = 25.9°, c = 4.1 mm, C = 90°

Round values to one decimal place.

A) a = 3.7 mm, A = 64.1°, b = 1.8 mm
B) a = 2.9 mm, A = 64.1°, b = 2.9 mm
C) a = 3.7 mm, A = 64.1°, b = 2.9 mm
D) a = 1.8 mm, A = 64.1°, b = 3.7 mm

Answer: A

171) A = 19° 17′, c = 287 ft, C = 90°

Round side lengths to two decimal places, if necessary.

A) B = 70° 43′, a = 94.78 ft, b = 270.9 ft
B) B = 71° 42′, a = 94.78 ft, b = 266.9 ft
C) B = 70° 43′, a = 94.21 ft , b = 270.01 ft
D) B = 70° 42′, a = 97.98 ft, b = 272.1 ft

Answer: A

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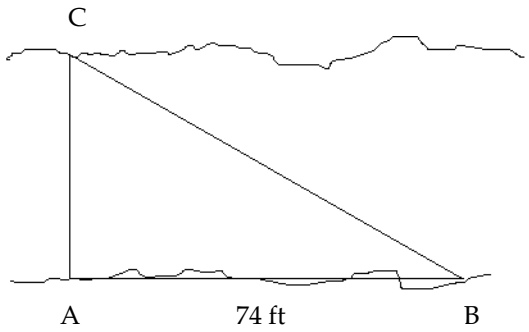
172) A = 72° 6′, c = 278 m , C = 90°
Round side lengths to two decimal places, if necessary.
A) B = 17° 54′, a = 264.74 m, b = 92.45 m
B) B = 17° 54′, a = 264.54 m, b = 85.45 m
C) B = 18° 44′, a = 264.74 m, b = 85.45 m
D) B = 17° 6′, a = 265.74 m, b = 78.45 m
Answer: B

Solve the problem.

173) On a sunny day, a flag pole and its shadow form the sides of a right triangle. If the hypotenuse is 35 meters long and the shadow is 28 meters, how tall is the flag pole?
A) 45 m
B) 63 m
C) 21 m
D) 49 m
Answer: C

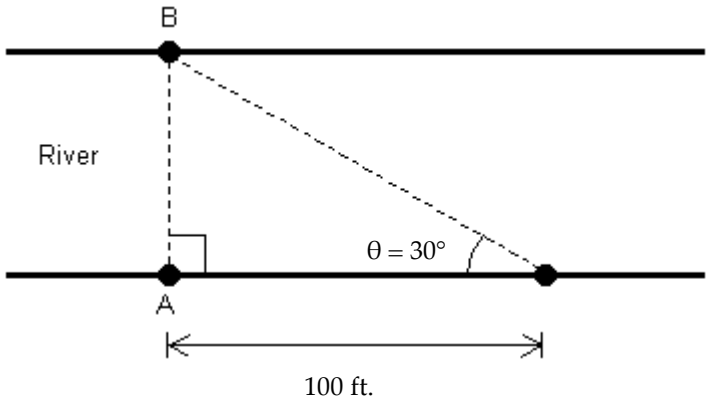
174) On a sunny day, a tree and its shadow form the sides of a right triangle. If the hypotenuse is 40 meters long and the tree is 32 meters tall, how long is the shadow?
A) 72 m
B) 24 m
C) 51 m
D) 64 m
Answer: B

175) To measure the width of a river, a surveyor starts at point A on one bank and walks 74 feet down the river to point B. He then measures the angle ABC to be 25°36'14". Estimate the width of the river to the nearest foot. See the figure below.



A) 67 ft
B) 154 ft
C) 35 ft
D) 32 ft
Answer: C

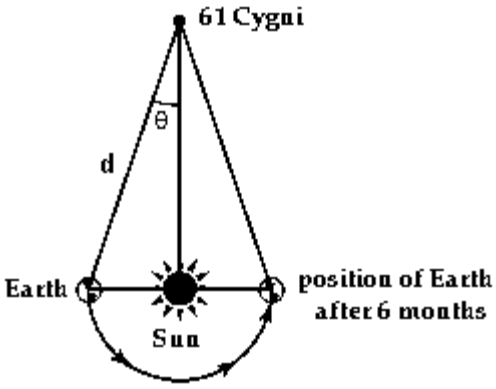
176) A conservation officer needs to know the width of a river in order to set instruments correctly for a study of pollutants in the river. From point A, the conservation officer walks 100 feet downstream and sights point B on the opposite bank to determine that θ = 30° (see figure). How wide is the river (round to the nearest foot)?



A) 173 ft
B) 50 ft
C) 58 ft
D) 115 ft
Answer: C

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177) In 1838, the German mathematician and astronomer Friedrich Wilhelm Bessel was the first person to calculate the distance to a star other than the Sun. He accomplished this by first determining the parallax of the star, 61 Cygni, at 0.314 arc seconds (Parallax is the change in position of the star measured against background stars as Earth orbits the Sun. See illustration.) If the distance from Earth to the Sun is about 150,000,000 km and $\theta = 0.314$ seconds $= \frac{0.314}{60}$ minutes $= \frac{0.314}{60 \cdot 60}$ degrees, determine the distance d from Earth to 61 Cygni using Bessel's figures. Express the answer in scientific notation.



A) 2.28×10^{13} km B) 1.97×10^{14} km C) 9.85×10^{13} km D) 1.05×10^{14} km

Answer: C

178) A tunnel is to be dug from point A to point B. Both A and B are visible from point C. If AC is 235 miles and BC is 625 miles, and if angle C is 90°, find the measure of angle B. Round your answer to the tenths place.

A) 31.4° B) 34.1° C) 20.6° D) 18.7°

Answer: C

179) The length of the base of an isosceles triangle is 33.28 meters. Each base angle is 37.57°. Find the length of each of the two equal sides of the triangle. Round your answer to the hundredths place.

A) 21.63 m B) 20.99 m C) 41.99 m D) 27.29 m

Answer: B

180) From a boat on the lake, the angle of elevation to the top of a cliff is 13°11'. If the base of the cliff is 1683 feet from the boat, how high is the cliff (to the nearest foot)?

A) 404 ft B) 397 ft C) 394 ft D) 407 ft

Answer: C

181) From a boat on the river below a dam, the angle of elevation to the top of the dam is 14°57'. If the dam is 1286 feet above the level of the river, how far is the boat from the base of the dam (to the nearest foot)?

A) 4796 ft B) 4806 ft C) 4816 ft D) 4786 ft

Answer: C

182) From a balloon 1037 feet high, the angle of depression to the ranger headquarters is 58°41'. How far is the headquarters from a point on the ground directly below the balloon (to the nearest foot)?

A) 631 ft B) 621 ft C) 636 ft D) 626 ft

Answer: A

183) When sitting atop a tree and looking down at his pal Joey, the angle of depression of Mack's line of sight is 51°11'. If Joey is known to be standing 32 feet from the base of the tree, how tall is the tree (to the nearest foot)?

A) 40 ft B) 46 ft C) 44 ft D) 42 ft

Answer: A

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184) From the top of a vertical tower, 319 feet above the the surface of the earth, the angle of depression to a doghouse is 23° 3′. How far is it from the doghouse to the foot of the tower? Round your answer to the hundredths place when necessary.

A) 734.11 ft B) 749.7 ft C) 762.1 ft D) 852.3 ft

Answer: B

185) A 35–foot ladder is leaning against the side of a building. If the ladder makes an angle of 24° 10′ with the side of the building, how far is the bottom of the ladder from the base of the building? Round your answer to the hundredths place when necessary.

A) 4.96 ft B) 15.63 ft C) 20.03 ft D) 14.33 ft

Answer: D

186) A 37–foot ladder is leaning against the side of a building. If the ladder makes an angle of 24° 16′ with the side of the building, how far up from the ground does the ladder make contact with the building? Round your answer to the hundredths place when necessary.

A) 36.89 ft B) 31.16 ft C) 33.73 ft D) 34.93 ft

Answer: C

187) A contractor needs to know the height of a building to estimate the cost of a job. From a point 90 feet away from the base of the building, the angle of elevation to the top of the building is found to be 42° 17′. Find the height of the building. Round your answer to the hundredths place when necessary.

A) 84.75 ft B) 86.08 ft C) 81.85 ft D) 80.32 ft

Answer: C

An observer for a radar station is located at the origin of a coordinate system. For the point given, find the bearing of an airplane located at that point. Express the bearing using both methods.

188) $(9, 0)$

A) 90°; N 90° E or S 90° E B) 90°; N 90° W or S 90° W

C) 270°; N 90° W or S 90° W D) 270°; N 90° E or S 90° E

Answer: A

189) $(6, 6)$

A) 45°; S 45° E B) 45°; N 45° E C) 45°; S 45° W D) 45°; N 45° W

Answer: B

190) $(7, -7)$

A) 45°; S 45° E B) 135°; S 45° E C) 45°; N 45° W D) 135°; N 45° W

Answer: B

191) $(0, 7)$

A) 0°; S 0° W or S 0° E B) 0°; N 0° W or N 0° E

C) 180°; N 0° W or N 0° E D) 180°; S 0° W or S 0° E

Answer: B

Solve the problem.

192) A fire is sighted due west of lookout A. The bearing of the fire from lookout B, 14.1 miles due south of A, is N 32°57'W. How far is the fire from B (to the nearest tenth of a mile)?

A) 17.8 mi B) 19.8 mi C) 16.8 mi D) 18.8 mi

Answer: C

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193) A boat sails for 3 hours at 25 mph in a direction 93°2'. How far south has it sailed (to the nearest mile)?

A) 6 mi B) 4 mi C) 2 mi D) 0 mi

Answer: B

194) A boat sails for 2 hours at 30 mph in a direction 95°58'. How far south has it sailed (to the nearest mile)?

A) 6 mi B) 4 mi C) 8 mi D) 2 mi

Answer: A

195) An airplane travels at 195 km/h for 1 hr in a direction of 287° from Greenville. At the end of this time, how far west of Greenville is the plane (to the nearest kilometer)?

A) 57 km B) 186 km C) 204 km D) 60 km

Answer: B

196) An airplane travels at 165 km/h for 3 hr in a direction of 174° from a local airport. At the end of this time, how far east of the airport is the plane (to the nearest kilometer)?

A) 52 km B) 4710 km C) 4736 km D) 492 km

Answer: A

197) A ship travels 82 km on a bearing of 24°, and then travels on a bearing of 114° for 162 km. Find the distance from the starting point to the end of the trip, to the nearest kilometer.

A) 244 km B) 182 km C) 33 km D) 75 km

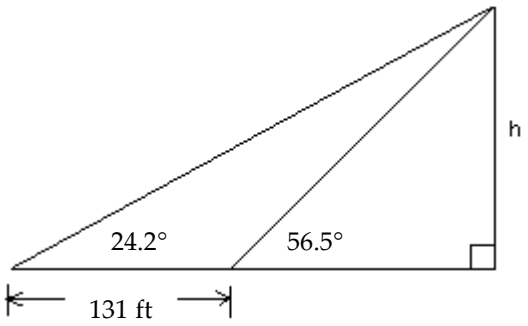
Answer: B

198) Radio direction finders are set up at points A and B, 8.68 mi apart on an east–west line. From A it is found that the bearing of a signal from a transmitter is N 54.3°E, while from B it is N 35.7°W. Find the distance of the transmitter from B, to the nearest hundredth of a mile.

A) 4.57 mi B) 5.07 mi C) 7.55 mi D) 7.05 mi

Answer: B

199) Find h as indicated in the figure. Round to the nearest foot.

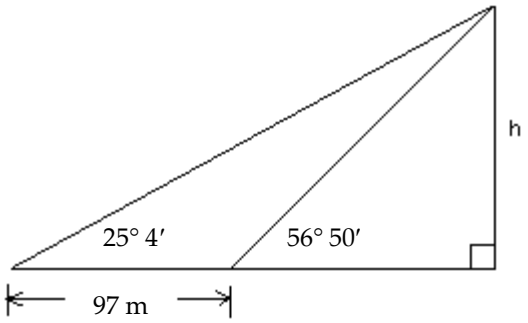


A) 89 ft B) 86 ft C) 80 ft D) 84 ft

Answer: D

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200) Find h as indicated in the figure. Round to the nearest meter.



A) 86 m B) 50 m C) 65 m D) 165 m

Answer: C

201) The angle of elevation from a point on the ground to the top of a tower is 39° 16′. The angle of elevation from a point 114 feet farther back from the tower is 24° 38′. Find the height of the tower. Round to the nearest foot.

A) 1190 ft B) 115 ft C) 130 ft D) 119 ft

Answer: D

202) Bob is driving along a straight and level road straight toward a mountain. At some point on his trip he measures the angle of elevation to the top of the mountain and finds it to be 21° 32′. He then drives 1 mile (1 mile = 5280 ft) more and measures the angle of elevation to be 35° 7′. Find the height of the mountain to the nearest foot.

A) 474,672 ft B) 4847 ft C) 4747 ft D) 47,467 ft

Answer: C

203) A person is watching a boat from the top of a lighthouse. The boat is approaching the lighthouse directly. When first noticed, the angle of depression to the boat is 13° 12′. When the boat stops, the angle of depression is 49° 49′. The lighthouse is 200 feet tall. How far did the boat travel from when it was first noticed until it stopped? Round to the nearest foot.

A) 706 ft B) 684 ft C) 729 ft D) 668 ft

Answer: B

204) A person is watching a car from the top of a building. The car is traveling on a straight road directly toward the building. When first noticed, the angle of depression to the car is 26° 53′. When the car stops, the angle of depression is 42° 31′. The building is 240 feet tall. How far did the car travel from when it was first noticed until it stopped? Round to the nearest foot.

A) 191 ft B) 212 ft C) 412 ft D) 238 ft

Answer: B

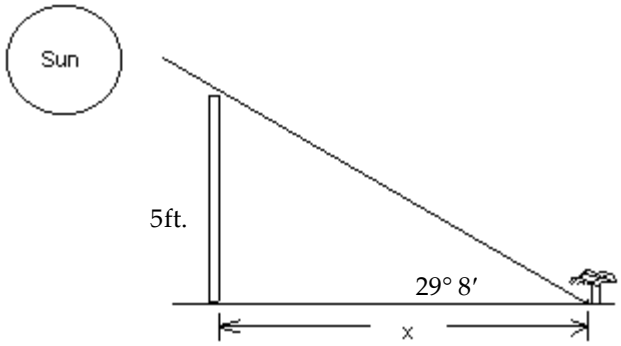
205) A person is watching a car from the top of a building. The car is traveling on a straight road away from the building. When first noticed, the angle of depression to the car is 45° 56′. When the car stops, the angle of depression is 22° 34′. The building is 270 feet tall. How far did the car travel from when it was first noticed until it stopped? Round to the nearest foot.

A) 367 ft B) 388 ft C) 588 ft D) 415 ft

Answer: B

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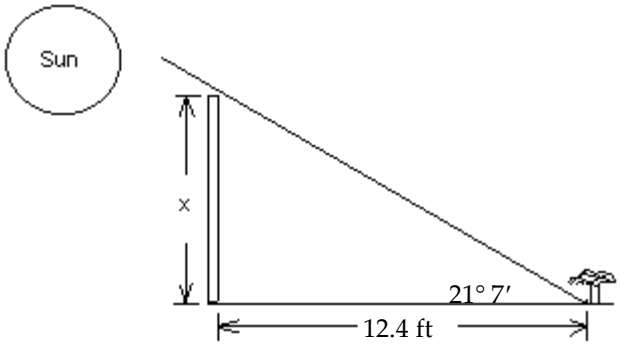
206) In one area, the lowest angle of elevation of the sun in winter is 29° 8′. Find the minimum distance x that a plant needing full sun can be placed from a fence that is 5 feet high. Round your answer to the tenths place when necessary.



A) 9 ft B) 9.2 ft C) 12.4 ft D) 8.6 ft

Answer: A

207) In one area, the lowest angle of elevation of the sun in winter is 21° 7′. A fence is to be built 12.4 ft away from a plant in the direction of the sun. (See drawing) Find the maximum height, x , for the fence so that the plant will get full sun. Round your answer to the tenths place when necessary.

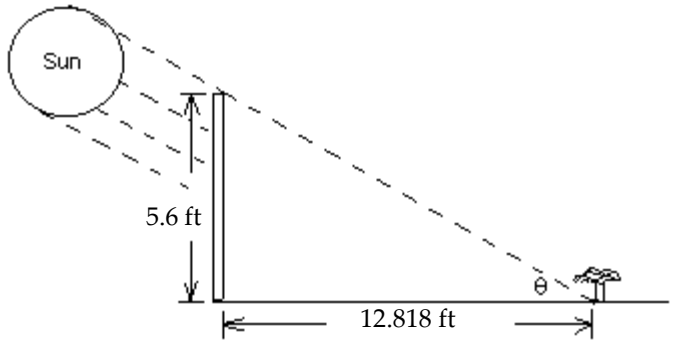


A) 4.8 ft B) 6.3 ft C) 5.1 ft D) 4.1 ft

Answer: A

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208) A 5.6–ft fence is 12.818 ft away from a plant in the direction of the sun. It is observed that the shadow of the fence extends exactly to the bottom of the plant. (See drawing) Find θ, the angle of elevation of the sun at that time. Round the measure of the angle to the nearest tenth of a degree when necessary.



A) $\theta = 25°$ B) $\theta = 23.6°$ C) $\theta = 23.4°$ D) $\theta = 23.8°$

Answer: B

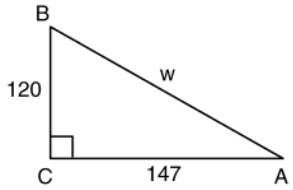
Trigonometry 11th edition Lial Test Bank

NAME _____
DATE _____

For Problems 1-10, do not use a calculator.

1. Write cos 29° 32′ in terms of its cofunction. **1.** _____

2. Find the exact value of cos A, sec A, and cot A for the figure below. **2.** cos A: _____
sec A: _____
cot A: _____



Solve each equation. Assume that all angles are acute angles.

3. $\sin(4B + 12°) = \cos(6B - 8°)$ **3.** _____

4. $\sec(18x) = \csc(6x)$ **4.** _____

5. Which of the following has the same absolute value as cot 315° 13′ ? **5.** _____

a. cot 115° 13′ **b.** cot 44° 47′
c. cot 45° 13′ **d.** None of these

Evaluate each expression. Give exact values. Rationalize denominators when applicable.

6. cot 120° **6.** _____

7. $3\sin^2 210° + \tan 150°$ **7.** _____

8. $4(\csc 60°)(\sin 300°) - \tan^2 240°$ **8.** _____

Answer *true* or *false* for each statement.

9. tan 41° < tan 26° **9.** _____

10. sin 240° = 2 sin 30° cos 120° **10.** _____

A calculator may be used for Problems 11-20.

Find a decimal approximation for each.

11. csc 73.56° **11.** _____

12. cos 109° 52′ **12.** _____

Find an angle θ in the interval [0°, 90°) that satisfies each statement. Give answers to the nearest tenth of a degree.

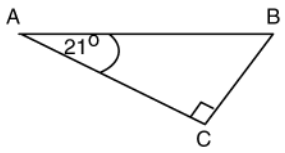
13. $\cos\theta = .8910$ **13.** _____

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14. sin θ = .1200593 **14.** _____

Solve each of the following right triangles. The right angle is at C.

15. 

15. _____

16. $A = 42°$, $a = 49.2$ **16.** _____

17. $b = 610$, $c = 750$ **17.** _____

18. An observer is located at the origin of a coordinate system. Find the bearing of an object located at the point (4,–4). **18.** _____

19. From a point 250 ft from the base of a tower, the angle of elevation to the top of the tower is 18.5°. How tall is the tower? **19.** _____

20. From a point 5.0 miles due north of a radio antenna, a hiker walks 2.0 mi west. The antenna is now S 21.8° E of the hiker. How far is the hiker from the antenna now? **20.** _____

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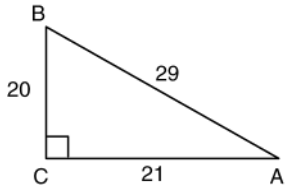
CHAPTER 2, FORM B
TRIGONOMETRY

NAME _____
DATE _____

For Problems 1-10, do not use a calculator.

1. Write csc 19° 51¢ in terms of its cofunction. **1.** _____

2. Find the exact values of csc A, sec A, and cot A for the figure below. **2.** csc A:_____
sec A:_____
cot A:_____



Solve each equation. Assume that all angles are acute angles.

3. $\tan(4B + 20°) = \cot(2B + 6°)$ **3.** _____

4. $\tan(8x) = \cot(10x)$ **4.** _____

5. Which of the following has the same absolute value as tan 464° 19¢? **5.** _____

a. tan 75° 41¢ **b.** tan 64° 19¢
c. tan 14° 19¢ **d.** None of these

Evaluate each expression. Give exact values. Rationalize denominators when applicable.

6. tan 300° **6.** _____

7. $\sec^2 60° + 3\cos 210°$ **7.** _____

8. $\sec^2 390° + 2(\tan 60°)(\cos 150°)$ **8.** _____

Answer *true* or *false* for each statement.

9. tan 45° < tan 60° **9.** _____

10. cot 60° = 2 cot 30° **10.** _____

A calculator may be used for Problems 11-20.

Find a decimal approximation for each.

11. csc 116.52° **11.** _____

12. tan 92° 17¢ **12.** _____

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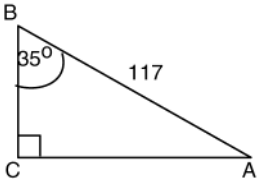
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Find an angle θ in the interval $[0°, 90°)$ that satisfies each statement. Give answers to the nearest tenth of a degree.

13. $\sin \theta = .4848$ **13.** _____

14. $\cot \theta = 5.937006$ **14.** _____

Solve each of the following right triangles. The right angle is at C.

15. 

15. _____

16. $A = 55°$, $a = 24$ **16.** _____

17. $a = 42$, $b = 39.8$ **17.** _____

18. An observer is located at the origin of a coordinate system. Find the bearing of an object located at the point $(-4, 4)$. **18.** _____

19. From the top of a 150-foot-tall lighthouse, a boat is spotted with an angle of depression of 18.4°. How far is the boat from the base of the lighthouse? **19.** _____

20. The bearing from A to C is 36°. The bearing from C to B is 126°. The bearing from A to B is 76°. If the distance from A to C is 53 miles, what is the distance from C to B? **20.** _____

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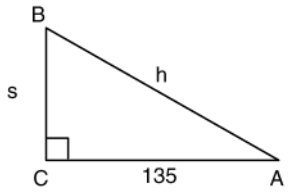
CHAPTER 2, FORM C
TRIGONOMETRY

NAME _____
DATE _____

For problems 1-10, do not use a calculator.

1. Write cos 79° in terms of its cofunction. **1.** _____

2. Find the exact values for sin A, cos A, and tan A for the figure below. **2.** sin A: _____
cos A: _____
tan A: _____



Solve each equation. Assume that all angles are acute angles.

3. $\tan(12\beta + 9°) = \cot(8\beta - 11°)$ **3.** _____

4. $\sin(12\theta) = \cos(7\theta)$ **4.** _____

5. Which of the following has the same absolute value as sec 198° 21¢? **5.** _____

a. sec 18° 21¢ **b.** sec 1° 39¢
c. sec 98° 21¢ **d.** None of these

Evaluate each expression. Give exact values. Rationalize denominators when applicable.

6. tan 225° **6.** _____

7. $\sin^2 60° + 2\sec 240°$ **7.** _____

8. $\tan^2 60° + 5(\sin 210°)(\tan 45°)$ **8.** _ _____

Answer *true* or *false* for each statement.

9. cos 49° > cos 12° **9.** _____

10. 2(sin 45°)(cos 45°) = sin 90° **10.** _____

A calculator may be used for Problems 11-20.

Find a decimal approximation for each.

11. csc 73.56° **11.** _____

12. cos 109° 52¢ **12.** _____

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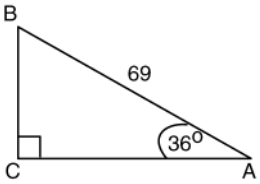
Find an angle θ in the interval $[0°, 90°)$ that satisfies each statement. Give answers to the nearest tenth of a degree.

13. $\sin \theta = 0.90015493$ **13.** _____

14. $\cot \theta = 7.2309185$ **14.** _____

Solve each of the following right triangles. The right angle is at C.

15. **15.** _____



16. $B = 54°$, $c = 75$ **16.** _____

17. $a = 42.3$, $b = 87$ **17.** _____

18. An observer is located at the origin of a coordinate system. Find the bearing of an object located at the point $(4, -4)$. **18.** _____

19. A laser gun is located 3000 ft from the base of a wall. The beam makes an angle of 1/2° with the horizon. How far up will the laser ray hit the wall? **19.** _____

20. A ship travels 14 miles on a bearing of 21°, and then it travels on a bearing of 111° for 20 miles. How far is it from its starting point? **20.** _____

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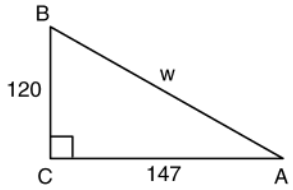
CHAPTER 2, FORM D
TRIGONOMETRY

NAME _____
DATE _____

For Problems 1-10, do not use a calculator.

1. Write sec 72° 15′ in terms of its cofunction. **1.** _____

2. Find the exact values for csc A, sec A, and cot A for the figure below. **2.** cos A: _____
sec A: _____
cot A: _____



Solve each equation. Assume that all angles are acute angles.

3. $\sin(5w + 6°) = \cos(7w + 3°)$ **3.** _____

4. $\sec(18z) = \csc(6z)$ **4.** _____

5. Which of the following has the same absolute value as cot 315° 13′ ? **5.** _____

a. cot 115° 13′ **b.** cot 44° 47′
c. cot 45° 13′ **d.** None of these

Evaluate each expression. Give exact values. Rationalize denominators when applicable.

6. sec 60° **6.** _____

7. $3\sin^2 210° + \tan 150°$ **7.** _____

8. $4(\csc 60°)(\sin 300°) - \tan^2 240°$ **8.** _____

Answer *true* or *false* for each statement.

9. sin 80° < sin 50° **9.** _____

10. cot 30° + cot 60° = cot 90° **10.** _____

A calculator may be used for Problems 11-20.

Find a decimal approximation for each.

11. sec 68.31° **11.** _____

12. sin 463° 19′ **12.** _____

Find an angle θ in the interval [0°, 90°) that satisfies each statement. Give answers to the nearest tenth of a degree.

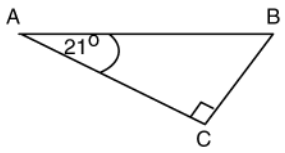
13. $\cos\theta = 0.61011032$ **13.** _____

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14. $\sec\theta = 12.12003458$ **14.** _____

Solve each of the following right triangles. The right angle is at C.

15. 

15. _____

16. $A = 42°$, $a = 49.2$ **16.** _____

17. $b = 610$, $c = 750$ **17.** _____

18. An observer is located at the origin of a coordinate system. Find the bearing of an object located at the point $(0, -5)$. **18.** _____

19. From a point 250 ft from the base of a tower, the angle of elevation to the top of the tower is 18.5°. How tall is the tower? **19.** _____

20. From a point 5.0 miles due north of a radio antenna, a hiker walks 2.0 mi west. The antenna is now S 21.8° E of the hiker. How far is the hiker from the antenna now? **20.** _____

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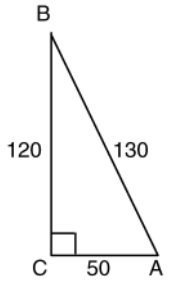
Choose the best answer.

For Problems 1-10, do not use a calculator.

1. What is the cofunction of cos 31° 19¢? **1.** _____

a. sin 121° 19¢ **b.** cos 58° 41¢
c. sin 58° 41¢ **d.** cos 121° 19¢

2. Find sin A, cos A, and tan A for the figure below. **2.** _____



a. $\sin A = \frac{12}{13}, \cos A = \frac{5}{13}, \tan A = \frac{12}{13}$

b. $\sin A = \frac{5}{13}, \cos A = \frac{12}{13}, \tan A = \frac{12}{13}$

c. $\sin A = \frac{12}{13}, \cos A = \frac{5}{13}, \tan A = \frac{12}{5}$

d. $\sin A = \frac{12}{13}, \cos A = \frac{5}{13}, \tan A = \frac{5}{12}$

Solve each equation. Assume that all angles are acute angles.

3. $\tan(\beta + 10°) = \cot(2\beta - 10°)$ **3.** _____

a. $\beta = 15°$ **b.** $\beta = 30°$
c. $\beta = 45°$ **d.** $\beta = 50°$

4. $\sin(3\alpha) = \cos(6\alpha)$ **4.** _____

a. $\alpha = 5°$ **b.** $\alpha = 9°$
c. $\alpha = 10°$ **d.** $\alpha = 20°$

5. Which of the following has the same absolute value as sin 195° 29¢? **5.** _____

a. sin 95° 29¢ **b.** sin 85° 31¢
c. sin 25° 31¢ **d.** None of these

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Evaluate each expression. Give exact values. Rationalize denominators when applicable.

6. $\sin 420°$ **6.** _____

a. $\frac{1}{2}$ **b.** $-\frac{\sqrt{3}}{2}$

c. 2 **d.** $\frac{\sqrt{3}}{2}$

7. $\sin^2 135° + 3\cos 120°$ **7.** _____

a. $\frac{\sqrt{2} - 3}{2}$ **b.** -1

c. $\frac{\sqrt{2} - 1}{2}$ **d.** $-\frac{3}{2}$

8. $2(\csc 210°)(\tan 45°) + \sec^2 315°$ **8.** _____

a. -2 **b.** $\frac{6 - 4\sqrt{3}}{3}$

c. $-4 + \sqrt{2}$ **d.** $\frac{-4\sqrt{3} - 3\sqrt{2}}{3}$

9. Determine which of the following is not true. **9.** _____

a. $\sin 37° < \sin 56°$ **b.** $\cos 36° < \cos 35°$

c. $\sin 45° < \sin 42°$ **d.** $\tan 10° < \tan 80°$

10. Determine which of the following is true. **10.** _____

a. $\cos 45° + \cos 45° = \cos 90°$

b. $\cos 30° + \sin 60° = \tan 90°$

c. $\sin 45° + \sin 60° = \frac{\sqrt{5}}{2}$

d. $\sin 30° + \cos 60° = \tan 45°$

A calculator may be used for Problems 11-20.

Find a decimal approximation for each.

11. $\cos 425° 32'$ **11.** _____

a. 0.3928 **b.** 0.4175

c. –0.4142 **d.** 0.4142

12. $\sec 95.29°$ **12.** _____

a. 1.004 **b.** –0.0922

c. 0.9957 **d.** –10.846

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Find an angle in the interval $[0°, 90°)$ that satisfies each statement. Give answers to the nearest tenth of a degree.

13. $\sin \beta = 0.213459$ **13.** _____

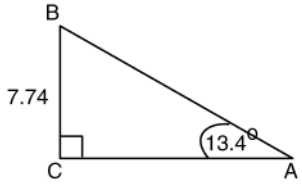
a. 37.3° **b.** 0.2°
c. 12.3° **d.** 87.7°

14. $\tan \beta = 12.34285$ **14.** _____

a. 14.6° **b.** 21.9°
c. 24.9° **d.** 85.4°

Solve each of the following right triangles. The right angle is at C.

15. **15.** _____



a. $b = 32.5$, $c = 33.4$, $B = 76.6°$
b. $b = 7.1$, $c = 10.5$, $B = 76.6°$
c. $b = 8.1$, $c = 11.2$, $B = 46.3°$
d. $b = 29.6$, $c = 30.6$, $B = 75.3°$

16. $A = 42°$, $b = 9.1$ **16.** _____

a. $a = 10.1$, $c = 13.6$, $B = 48°$
b. $a = 6.3$, $c = 15.4$, $B = 36°$
c. $a = 8.2$, $c = 12.2$, $B = 48°$
d. $a = 12.2$, $c = 8.2$, $B = 58°$

17. $a = 12.3$, $b = 19.2$ **17.** _____

a. $c = 31.5$, $A = 23.0°$, $B = 67.0°$
b. $c = 14.7$, $A = 50.2°$, $B = 39.8°$
c. $c = 22.8$, $A = 32.6°$, $B = 57.4°$
d. $c = 22.8$, $A = 52.3°$, $B = 37.7°$

18. The observer deck of a ship is located at the origin of a coordinate system. Find the bearing of an object located at the point (5, 5). **18.** _____

a. 45° **b.** 135°
c. 225° **d.** 315°

19. A radio technician is at a spot that has an angle of elevation of 18.5° to the top of the 255-foot-tall transmitting antenna. How far is the radio technician from the base of the transmitting antenna? **19.** _____

a. 269 ft **b.** 762 ft
c. 804 ft **d.** 925 ft

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20. The bearing from A to C is N 50° E. The bearing from C to B is S 40° E. The bearing from B to A is S 60° W. If the distance from A to C is 45 miles what is the distance from C to B?

a. 6 mi **b.** 8 mi
c. 12 mi **d.** 20 mi

20. _____

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NAME _____
DATE _____

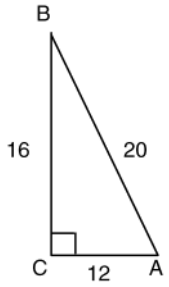
Choose the best answer.

For Problems 1-10, do not use a calculator.

1. What is the cofunction of sin 35° 26¢? **1.** _____

a. csc 65° 26¢ **b.** cos 125° 26¢
c. cos 54° 34¢ **d.** csc 54° 34¢

2. Find sin B, cos B, and tan B for the figure below. **2.** _____



a. $\sin B = \frac{3}{5}, \cos B = \frac{4}{5}, \tan B = \frac{3}{4}$ **b.** $\sin B = \frac{4}{5}, \cos B = \frac{3}{5}, \tan B = \frac{3}{4}$

c. $\sin B = \frac{4}{5}, \cos B = \frac{3}{5}, \tan B = \frac{4}{5}$ **d.** $\sin B = \frac{5}{3}, \cos B = \frac{4}{3}, \tan B = \frac{4}{3}$

Solve each equation. Assume that all angles are acute angles.

3. $\cos(\theta + 15°) = \sin(2\theta + 30°)$ **3.** _____

a. $\theta = 12°$ **b.** $\theta = 15°$
c. $\theta = 30°$ **d.** $\theta = 45°$

4. $\csc(\beta) = \sec(3\beta)$ **4.** _____

a. $\beta = 22.5°$ **b.** $\beta = 15°$
c. $\beta = 45°$ **d.** $\beta = 60°$

5. Which of the following has the same absolute value as csc 212° 43¢? **5.** _____

a. csc 12° 17¢ **b.** csc 122° 43¢
c. csc 147° 17¢ **d.** None of these

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Evaluate each expression. Give exact values. Rationalize denominators when applicable.

6. sec 690° **6.** _____

a. $\frac{1}{2}$ **b.** $-\frac{\sqrt{3}}{3}$

c. -2 **d.** $\frac{2\sqrt{3}}{3}$

7. $\sec^2 135° + 2 \sin 210°$ **7.** _____

a. 1 **b.** $-1-\sqrt{2}$

c. $\frac{2\sqrt{2}-1}{2}$ **d.** $-\frac{3\sqrt{2}}{2}$

8. $4(\sin 30°)(\sec 135°) + \tan^2 225°$ **8.** _____

a. $\frac{1+2\sqrt{6}}{3}$ **b.** $\frac{3-2\sqrt{2}}{2}$

c. $1-2\sqrt{2}$ **d.** $-1+2\sqrt{2}$

9. Determine which of the following is *not* true. **9.** _____

a. csc 22° < csc 72° **b.** sec 45° < sec 65°

c. tan 18° < tan 73° **d.** cos 29° < cos 24°

10. Determine which of the following is true. **10.** _____

a. sin 45° + cos 45° = tan 45°

b. sec 45° + csc 45° = 4 sin 45°

c. cos 30° + tan 30° = sin 30°

d. tan 60° + tan 30° = tan 90°

A calculator may be used for Problems 11-20.

Find a decimal approximation for each.

11. tan 753° 24¢ **11.** _____

a. –0.6594 **b.** 0.3406

c. 0.6594 **d.** 0.2133

12. csc 219.44° **12.** _____

a. –0.6353 **b.** –1.574

c. –1.295 **d.** 0.8223

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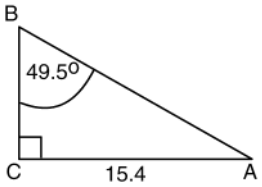
Find an angle in the interval [0°, 90°) that satisfies each statement.
Give answers to the nearest tenth of a degree.

13. sec $\theta = 1.2938$ **13.** _____
a. 24.5° **b.** 39.4°
c. 50.6° **d.** 72.3°

14. cot $A = 6.3847$ **14.** _____
a. 8.9° **b.** 22.3°
c. 42.8° **d.** 90.1°

Solve each of the following right triangles. The right angle is at C.

15. **15.** _____



a. $a = 20.2$, $c = 13.7$, $A = 41.4°$
b. $a = 18.1$, $c = 23.8$, $A = 54.6°$
c. $a = 13.2$, $c = 20.3$, $A = 40.5°$
d. $a = 13.1$, $c = 28.5$, $A = 51.4°$

16. $B = 68°$, $b = 5.6$ **16.** _____
a. $a = 2.3$, $c = 6.0$, $A = 22°$
b. $a = 14.9$, $c = 13.8$, $A = 68°$
c. $a = 9.3$, $c = 14.9$, $A = 32°$
d. $a = 7.8$, $c = 13.2$, $A = 74$

17. $a = 4.6$, $c = 8.7$ **17.** _____
a. $b = 9.8$, $A = 43.2°$, $B = 46.8°$
b. $b = 4.1$, $A = 61.9°$, $B = 28.1°$
c. $b = 2.3$, $A = 25.7°$, $B = 64.3°$
d. $b = 7.4$, $A = 31.9°$, $B = 58.1°$

18. The observer deck of a ship is located at the origin of a coordinate system. Find the bearing of a buoy located at the point (–4, –4). **18.** _____
a. 45° **b.** 135°
c. 225° **d.** 315°

19. A scientist is at a spot that has an angle of elevation of 22.7° to the top of the 315-foot-tall observatory. How far is the scientist from the base of the observatory? **19.** _____
a. 341 ft **b.** 753 ft
c. 816 ft **d.** 1003 ft

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20. A sailboat travels 6 miles on a bearing of 48°, and then it travels on a bearing of 138° for 22 miles. How far is the sailboat from its starting position?

a. 12 mi **b.** 15 mi
c. 20 mi **d.** 23 mi

20. _____

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