Name_____ Reference Angle Worksheet

Complete each part for each expression:

> Note: If the angle is a quadrantal angle, then write "Quadrantal" for part A. Skip parts B and C, then answer part D. Your answer for Part D will then be one of the following: *0, 1, -1, or undefined.*

A. Determine in which quadrant the angle θ lies.
B. Determine the reference angle θ'.
C. Find the indicated ratio for θ'. This must be an exact value.
D. Determine the value for the original expression using the ASTC mneumonic.

1. $\sin\frac{\pi}{4}$
   A. I
   B. $\frac{\pi}{4}$
   C. $\frac{\sqrt{2}}{2}$
   D. $\frac{\sqrt{2}}{2}$

2. $\sin\frac{3\pi}{4}$
   A. II
   B. $\frac{\pi}{4}$
   C. $\frac{\sqrt{2}}{2}$
   D. $\frac{\sqrt{2}}{2}$

3. $\sin 225$
   A. III
   B. 45
   C. $\frac{\sqrt{2}}{2}$
   D. $-\frac{\sqrt{2}}{2}$

4. $\sin 315$
   A. IV
   B. 45
   C. $\frac{\sqrt{2}}{2}$
   D. $-\frac{\sqrt{2}}{2}$

5. $\cos\frac{\pi}{6}$
   A. I
   B. $\frac{\pi}{6}$
   C. $\frac{\sqrt{3}}{2}$
   D. $\frac{\sqrt{3}}{2}$

6. $\cos 150$
   A. II
   B. 30
   C. $\frac{\sqrt{3}}{2}$
   D. $-\frac{\sqrt{3}}{2}$

7. $\cos 210$
   A. III
   B. 30
   C. $\frac{\sqrt{3}}{2}$
   D. $-\frac{\sqrt{3}}{2}$

8. $\cos\frac{11\pi}{6}$
   A. IV
   B. $\frac{\pi}{6}$
   C. $\frac{\sqrt{3}}{2}$
   D. $\frac{\sqrt{3}}{2}$

9. $\sin 60$
   A. I
   B. 60
   C. $\frac{\sqrt{3}}{2}$
   D. $\frac{\sqrt{3}}{2}$

10. $\cos\frac{2\pi}{3}$
    A. II
    B. $\frac{\pi}{3}$
    C. $\frac{1}{2}$
    D. $-\frac{1}{2}$

11. $\sin\frac{4\pi}{3}$
    A. Quadrantal III
    B. $\frac{\pi}{3}$
    C. $\frac{\sqrt{3}}{2}$
    D. $-\frac{\sqrt{3}}{2}$

12. $\cos 300$
    A. IV
    B. 60
    C. $\frac{1}{2}$
    D. $\frac{1}{2}$

13. $\sin\pi$
    A. Quadrantal
    B.
    C.
    D. 0

14. $\cos\frac{3\pi}{2}$
    A. Quadrantal
    B.
    C.
    D. 0

15. $\csc 45$
    A. I
    B. 45
    C. $\sqrt{2}$
    D. $\sqrt{2}$

16. $\sec \pi$

A. Quadrantal

B.

C.

D. -1

17. $\tan 60$

A. I

B. 60

C. $\sqrt{3}$

D. $\sqrt{3}$

18. $\csc \frac{4\pi}{3}$

A. III

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

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

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

19. $\cos 480$

A. II

B. 60

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

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

20. $\sin -315$

A. I

B. 45

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

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

21. $\tan 135$

A. II

B. 45

C. 1

D. -1

22. $\tan -150$

A. III

B. 30

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

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

23. $\cos -\frac{3\pi}{2}$

A. Quadrantal

B.

C.

D. 0

24. $\sin -\frac{\pi}{6}$

A. IV

B. $\frac{\pi}{6}$

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

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

25. $\cos \frac{11\pi}{4}$

A. II

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

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

D. $-\frac{\sqrt{2}}{2}$

26. $\sin 3\pi$

A. Quadrantal

B.

C.

D. 0

27. $\cot -495$

A. II

B. 45

C. 1

D. 1

28. $\tan -\frac{\pi}{2}$

A. Quadrantal

B.

C.

D. undefined

29. $\cos \frac{5\pi}{6}$

A. II

B. $\frac{\pi}{6}$

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

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

30. $\sec -\frac{5\pi}{4}$

A. II

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

C. $\sqrt{2}$

D. $-\sqrt{2}$

Equivalent

Answers to Radians & Reference Angles

1) $\frac{17\pi}{9}$

2) $\frac{5\pi}{6}$

3) 90°

4) 15°

5) 255°

6) 20°

7) 45°

8) 300°

9) $\frac{\pi}{2}$

10) 315°

11) $\frac{\pi}{18}$

12) 60°

13) $\frac{13\pi}{12}$

14) $\frac{3\pi}{4}$

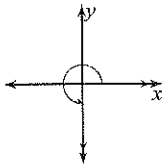
15) $\frac{19\pi}{18}$

16) $\frac{\pi}{6}$

17) $\frac{7\pi}{4}$

18) 180°

19)



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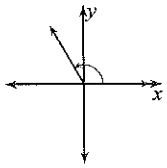

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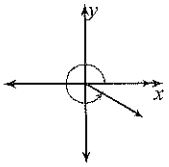

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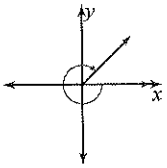

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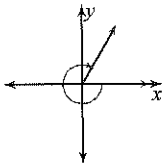

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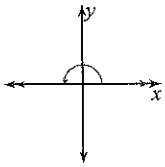

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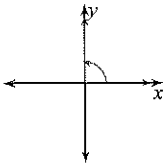

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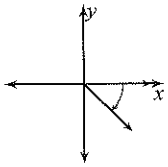


27) 30°

28) 15°

29) 45°

30) 70°

31) 50°

32) 10°

33) 50°

34) 60°

35) 80°

36) 45°

37) $\frac{\pi}{4}$

38) $\frac{\pi}{4}$

39) $\frac{\pi}{3}$

40) $\frac{\pi}{3}$

41) $\frac{\pi}{6}$

42) $\frac{\pi}{6}$

43) $\frac{\pi}{3}$

44) $\frac{\pi}{3}$

45) $\frac{\pi}{6}$

46) $\frac{\pi}{3}$

47) $\frac{\pi}{4}$

48) $\frac{\pi}{4}$

Answers to Using Reference Angles

1) 1

2) -1

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

4) -1

5) $\frac{1}{2}$

6) $\frac{\sqrt{3}}{3}$

7) $-\frac{\sqrt{3}}{2}$

8) 0

9) $\frac{\sqrt{3}}{2}$

10) $-\frac{\sqrt{2}}{2}$

11) $-\frac{\sqrt{3}}{3}$

12) $-\frac{\sqrt{3}}{2}$

13) $-\frac{\sqrt{3}}{3}$

14) $\frac{\sqrt{2}}{2}$

15) 1

16) $-\frac{1}{2}$

17) 1

18) $\frac{\sqrt{3}}{3}$

19) -1

20) $\frac{\sqrt{2}}{2}$

21) 1

22) 0

23) $\frac{\sqrt{3}}{2}$

24) $-\frac{\sqrt{3}}{2}$

25) $\sqrt{3}$

26) $-\frac{\sqrt{2}}{2}$

27) $-\frac{\sqrt{2}}{2}$

28) $\frac{\sqrt{3}}{2}$

29) $-\frac{\sqrt{3}}{2}$

30) -1

31) $\sqrt{3}$

32) 1

Answers to recently assigned book work

p. 863/ 332-38

32. about 2.09 in., about 4.19 in.^{2}

33. about 3.93 m, about 5.89 m^2

34. about 11.8 cm, about 88.4 cm^2

35. about 31.4 ft, about 188 ft^2

36. about 7.85 m, about 70.7 m^2

37. about 118 in., about 1470 in.^{2}

38. The angle measure must be in radians before using the formula; $A = \frac{1}{2}(6)^2\left(\frac{2\pi}{9}\right) \approx 12.6 \text{ cm}^2$.

p.878/#3-11, 35-37

3. $\frac{\pi}{2}$, 90°

4. $-\frac{\pi}{4}$, −45°

5. $\frac{\pi}{2}$, 90°

6. undefined

7. $\frac{\pi}{3}$, 60°

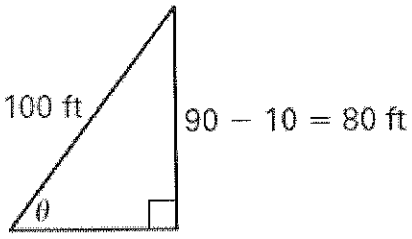
8. $\frac{\pi}{6}$, 30°

9. $-\frac{\pi}{6}$, −30°

10. $\frac{2\pi}{3}$, 120°

11. C

35.



about 53°

36. about 3.23°

37. About 32.9°; about 46.4 ft.
Sample answer: The pile is 15 feet high and the angle of repose is about 32.9°, the base of the right triangle formed is about 23.2 feet. Since this represents the radius of the pile, you need to multiply by 2 to get the diameter.