Angle measure: radians, radius, and arc length

1. What is the measure of the angle $\theta$?
   (a) $4\pi$ radians
   (b) $4\pi/5$ radians
   (c) $5\pi/4$ radians
   (d) $5\pi$ radians
   (e) $4/5$ radians
   (f) $5/4$ radians

2. What is the measure of the angle $\theta$?
   (a) $5/3$ radians
   (b) $3/5$ radians
   (c) $4$ radians
   (d) $5\pi/3$ radians
   (e) $3\pi/5$ radians
   (f) $5\pi$ radians

3. What is the measure of the angle $\theta$?
   (a) $8/5$ radians
   (b) $5/8$ radians
   (c) $\sqrt{39}$ radians
   (d) $8\pi/5$ radians
   (e) $5\pi/8$ radians
   (f) $\sqrt{39\pi}$ radians

4. What is the measure of the angle $\theta$?
   (a) $5/14$ radians
   (b) $5\pi/14$ radians
   (c) $\sqrt{179}$ radians
   (d) $14/5$ radians
   (e) $14\pi/5$ radians
   (f) $\sqrt{179\pi}$ radians

5. What is the length of the arc $s$ if $\theta = 0.8$ radians?
   (a) $4$
   (b) $4\pi$
   (c) $4/\pi$
   (d) $25/4$
   (e) $25\pi/4$
   (f) $25/4\pi$

6. What is the length of the arc $s$ if $\theta = 2.5$ radians?
   (a) $5\pi/8$
   (b) $4\pi$
   (c) $25\pi$
   (d) $5/8$
   (e) $4$
   (f) $25$
7. What is the length of the arc $s$ if $\theta = 1.5$ radians?

(a) $\frac{40\pi}{3}$  
(b) $30\pi$  
(c) $\frac{20}{\pi}$  
(d) $\frac{40}{3}$  
(e) $30$  
(f) $\frac{\pi}{20}$

8. What is the length of the arc $s$ if $\theta = 0.5$ radians?

(a) $2.5\pi$  
(b) $10$  
(c) $1$  
(d) $2.5$  
(e) $10\pi$  
(f) $\pi$

9. What is the length of the radius $r$ if $\theta = 0.8$ radians?

(a) $1.6$  
(b) $4$  
(c) $\frac{25}{4}$  
(d) $1.6\pi$  
(e) $4\pi$  
(f) $\frac{25}{4}\pi$

10. What is the length of the radius $r$ if $\theta = 1.8$ radians?

(a) $5$  
(b) $16.2$  
(c) $0.2$  
(d) $5\pi$  
(e) $16.2\pi$  
(f) $0.2\pi$

11. What is the length of the radius $r$ if $\theta = 2.5$ radians?

(a) $6$  
(b) $37.5\pi$  
(c) $10\pi$  
(d) $6\pi$  
(e) $37.5$  
(f) $10$

12. What is the length of the radius $r$ if $\theta = 0.5$ radians?

(a) $3\pi$  
(b) $12$  
(c) $30$  
(d) $3$  
(e) $12\pi$  
(f) $30\pi$
13 What is the measure of the angle $\theta$?
   (a) $4\pi a$ radians  (b) $\pi a/4$ radians  (c) $a/4$ radians
   (d) $4a$ radians     (e) $4\pi/a$ radians    (f) $4/a$ radians

14 What is the measure of the angle $\theta$?
   (a) $10\pi a$ radians  (b) $\pi a/10$ radians  (c) $a/10$ radians
   (d) $10a$ radians     (e) $10\pi/a$ radians    (f) $10/a$ radians

15 What is the length of the arc $s$ if $\theta = 2$ radians?
   (a) $2\pi/a$       (b) $2\pi a$           (c) $\sqrt{a^2 + 4}$
   (d) $2/a$         (e) $2a$              (f) $\pi \sqrt{a^2 + 4}$

16 If $\theta$ is the measure of the central angle in radians, what is the
   length of the arc $s$?
   (a) $5\pi/\theta$ (b) $5/\theta$ (c) $\sqrt{\theta^2 + 25}$
   (d) $5\pi \theta$ (e) $5\theta$ (f) $\pi \sqrt{\theta^2 + 25}$

17 What is the length of the radius $r$ if $\theta = 2.2$ radians?
   (a) $2.2\pi s$  (b) $2.2s$ (c) $2.2/s$
   (d) $\pi s/2.2$ (e) $s/2.2$ (f) $2.2\pi/s$

18 What is the length of the radius $r$ if $\theta$ is the measure of the central
   angle in radians?
   (a) $\theta/8$  (b) $8\theta$ (c) $8\pi/\theta$
   (d) $\theta\pi/8$  (e) $8/\theta$ (f) $\theta/8\pi$
Angle measure: radians and degrees

19. An angle measures 20°. What is its measure in radians?
(a) 1/9  (b) π/18  (c) π/9
(d) 1/18  (e) 18/π  (f) 9/π

20. An angle measures 15°. What is its measure in radians?
(a) 1/12  (b) π/12  (c) π/24
(d) 1/24  (e) 12/π  (f) 24/π

21. An angle measures 36°. What is its measure in radians?
(a) π/5  (b) π/10  (c) 1/5
(d) 1/10  (e) 1/10π  (f) 10/π

22. An angle measures 54°. What is its measure in radians?
(a) 3π/20  (b) 20π/3  (c) 20/3π
(d) 3π/10  (e) 10π/3  (f) 10/3π

23. An angle measures α degrees. What is its measure in radians?
(a) 360/πα  (b) πα/360  (c) 360π/α
(d) 180/πα  (e) πα/180  (f) 180π/α

24. An angle measures 2 radians. What is its measure in degrees?
(a) 360/π  (b) π/180  (c) 360
(d) 720/π  (e) π/360  (f) 720

25. An angle measures 1/4 radians. What is its measure in degrees?
(a) 45/π  (b) 90/π  (c) 4/π
(d) 45  (e) 90  (f) π/4

26. An angle measures π/5 radians. What is its measure in degrees?
(a) π²/900  (b) 72  (c) 72/π
(d) 36  (e) π²/36  (f) 45/4

27. An angle measures 3/2 radians. What is its measure in degrees?
(a) 270  (b) 120  (c) 24
(d) 270/π  (e) 120/π  (f) 24/π

28. An angle measures α radians. What is its measure in degrees?
(a) 180/πα  (b) 180α/π  (c) πα/180
(d) 360/πα  (e) 360α/π  (f) πα/360
29. An angle measures $3\pi$ degrees. What is its measure in radians?
(a) $\pi^2/60$  (b) 60  (c) 270
(d) 120  (e) $120/\pi$  (f) $120\pi$

30. An angle measures $2/\pi$ radians. What is its measure in degrees?
(a) $360/\pi^2$  (b) 90  (c) 360
(d) $1/90$  (e) $\pi/180$  (f) $\pi/90$
Angle types

31. The angle $\theta$ is
(a) right
(b) prolate
(c) acute
(d) alkaloid
(e) straight
(f) obtuse

32. The angle $\theta$ is
(a) right
(b) prolate
(c) acute
(d) alkaloid
(e) straight
(f) obtuse

33. The angle $\theta$ is
(a) right
(b) prolate
(c) acute
(d) alkaloid
(e) straight
(f) obtuse

34. The angle $\theta$ is
(a) right
(b) prolate
(c) acute
(d) alkaloid
(e) straight
(f) obtuse

35. The angle $\theta$ is
(a) right
(b) prolate
(c) acute
(d) alkaloid
(e) straight
(f) obtuse

36. The angle $\theta$ is
(a) right
(b) prolate
(c) acute
(d) alkaloid
(e) straight
(f) obtuse

37. The angle $\theta$ is
(a) right
(b) prolate
(c) acute
(d) alkaloid
(e) straight
(f) obtuse

38. The angle $\theta$ is
(a) right
(b) prolate
(c) acute
(d) alkaloid
(e) straight
(f) obtuse

39. An angle of 37º is
(a) right
(b) prolate
(c) acute
(d) alkaloid
(e) straight
(f) obtuse
40. An angle of 158° is
   (a) right  (b) prolate  (c) acute
   (d) alkaloid (e) straight (f) obtuse

41. An angle of 76° is
   (a) right  (b) prolate  (c) acute
   (d) alkaloid (e) straight (f) obtuse

42. An angle of 1.8 radians is
   (a) right  (b) prolate  (c) acute
   (d) alkaloid (e) straight (f) obtuse

43. An angle of 0.6 radians is
   (a) right  (b) prolate  (c) acute
   (d) alkaloid (e) straight (f) obtuse

44. An angle of 6π/13 radians is
   (a) right  (b) prolate  (c) acute
   (d) alkaloid (e) straight (f) obtuse

45. An angle of 3π/5 radians is
   (a) right  (b) prolate  (c) acute
   (d) alkaloid (e) straight (f) obtuse
Complements and supplements

46. What is the complement of 42°?
   (a) 318° (b) 48° (c) 132°
   (d) 222° (e) 28° (f) 138°

47. What is the complement of 11°?
   (a) 349° (b) 89° (c) 79°
   (d) 101° (e) 169° (f) 34°

48. What is the complement of 73°?
   (a) 253° (b) 107° (c) 17°
   (d) 18° (e) 287° (f) 163°

49. What is the supplement of 31°?
   (a) 76° (b) 121° (c) 59°
   (d) 14° (e) 211° (f) 149°

50. What is the supplement of 58°?
   (a) 238° (b) 148° (c) 22°
   (d) 103° (e) 122° (f) 13°

51. What is the supplement of 36°?
   (a) 144° (b) 54° (c) 9°
   (d) 91° (e) 216° (f) 126°

52. What is the complement of π/6 radians?
   (a) 5π/6 (b) 2π/3 (c) 7π/6
   (d) 11π/6 (e) 5π/12 (f) π/3

53. What is the complement of 2π/7 radians?
   (a) 11π/14 (b) π/28 (c) 5π/7
   (d) 9π/7 (e) 15π/28 (f) 3π/14

54. What is the complement of 3π/10 radians?
   (a) 4π/5 (b) 17π/10 (c) 13π/10
   (d) 7π/10 (e) 2π/10 (f) π/20

55. What is the supplement of π/5 radians?
   (a) 4π/5 (b) π/20 (c) 3π/10
   (d) 7π/10 (e) 6π/5 (f) 2π/5

56. What is the supplement of 3π/20 radians?
   (a) 17π/20 (b) π/10 (c) 13π/10
   (d) 7π/20 (e) 13π/20 (f) 3π/10
57. What is the supplement of π/8 radians?
(a) 3π/8  (b) 5π/8  (c) 7π/8
(d) 9π/8  (e) π/8  (f) π/4

58. What is the complement of α degrees?
(a) 90+α  (b) 45+α  (c) 180+α
(d) 90−α  (e) 45−α  (f) 180−α

59. What is the supplement of α degrees?
(a) 90+α  (b) 45+α  (c) 180+α
(d) 90−α  (e) 45−α  (f) 180−α

60. What is the complement of α radians?
(a) π+α  (b) 2π+α  (c) π/2 + α
(d) π−α  (e) 2π−α  (f) π/2 − α

61. What is the supplement of α radians?
(a) π+α  (b) 2π+α  (c) π/2 + α
(d) π−α  (e) 2π−α  (f) π/2 − α
Degrees, minutes, and seconds

62. Evaluate the sum: 32°11'41" + 10°12'13"
(a) 42°24'04"   (b) 42°23'54"   (c) 42°33'04"
(d) 42°24'14"   (e) 42°23'54"   (f) 43°03'04"

63. Evaluate the sum: 18°24'53" + 11°40'17"
(a) 29°64'70"   (b) 29°65'10"   (c) 29°04'10"
(d) 30°15'20"   (e) 29°16'36"   (f) 30°05'10"

64. Evaluate the difference: 46°09'23" − 20°18'44"
(a) 25°50'39"   (b) 25°00'79"   (c) 25°40'29"
(d) 26°09'21"   (e) 25°30'19"   (f) 26°27'07"

65. Evaluate the difference: 98°19'36" − 20°27'15"
(a) 78°08'21"   (b) 78°52'21"   (c) 78°46'21"
(d) 77°42'21"   (e) 77°52'21"   (f) 77°46'21"

66. What formula would you use to convert 30°25'18" to decimal degrees?
(a) $30 + \frac{25}{100} + \frac{18}{1000}$
(b) $30 + \frac{25}{10} + \frac{18}{100}$
(c) $30 + \frac{25}{100} + \frac{18}{10000}$
(d) $30 + \frac{25}{60} + \frac{18}{600}$
(e) $30 + \frac{25}{60} + \frac{18}{3600}$
(f) $30 + \frac{25}{60} + \frac{18}{6000}$
Word problems

67. The radius of a circle is 20 cm. A central angle intercepts an arc of length 9 cm. What is the measure of the central angle in radians?
   (a) \(\frac{20}{9}\)  (b) \(\sqrt{\frac{319}{9}}\)  (c) \(\frac{20\pi}{9}\)
   (d) 4.5  (e) \(\sqrt{481}\)  (f) 1.8\(\pi\)

68. The radius of a circle is 12 m. A central angle measures 0.4 radians. What is the length of the arc intercepted by the angle?
   (a) \(\frac{1}{30}\) m  (b) 0.48 m  (c) 4.8 m
   (d) 3 m  (e) 3.6 m  (f) 30 m

69. A central angle in a circle measures 1.6 radians. The arc intercepted by the angle is 6 cubits. What is the radius of the circle?
   (a) 9.6 cubits  (b) \(\sqrt{33.44}\) cubits  (c) \(\frac{4}{15}\) cubits
   (d) \(\sqrt{38.56}\) cubits  (e) 3.75 cubits  (f) 4.4 cubits

70. A wheel has a radius of 40 cm. The distance along the rim between two neighboring spokes is 25 cm. What is the angle formed by the two spokes?
   (a) 0.375 radians  (b) 0.625 radians  (c) \(\frac{5\sqrt{39}}{9}\) radians
   (d) \(\frac{8}{3}\) radians  (e) 1.6 radians  (f) \(\frac{5\sqrt{89}}{9}\) radians

71. A disc has a radius of 6 cm. It is spinning at an angular speed of 300 radians/sec. How fast is a point on the edge of the disc moving?
   (a) 1800 cm/sec  (b) 50 cm/sec  (c) 0.02 cm/sec
   (d) 3600 cm/sec  (e) 500 cm/sec  (e) 0.5 cm/sec

72. The reflector on a bicycle wheel is 8 inches from the center of the wheel. The wheel is rotating at an angular speed of 6 radians/sec. How fast is the reflector moving?
   (a) 48 in/sec  (b) 0.75 in/sec  (c) \(\frac{4}{3}\) in/sec
   (d) 10 in/sec  (e) \(2\sqrt{7}\) in/sec  (f) \(4\pi/3\) in/sec

73. A pizza has a diameter of 16 inches. A slice cut from it has an angle of 0.6 radians. What is the length of the outer crust on the slice?
   (a) \(\frac{8}{3}\) in  (b) 9.6 in  (c) \(\frac{4}{3}\) in
   (d) 3.75 in  (e) 4.8 in  (f) 7.5 in

74. A rotating wheel is 30 inches in diameter. A point on the rim is moving at 24 in/sec. What is the angular speed of the wheel?
   (a) 0.625 rad/sec  (b) 0.8 rad/sec  (c) 1.25 rad/sec
   (d) 1.6 rad/sec  (e) 18 rad/sec  (f) \(6\sqrt{41}\) rad/sec
75. A gate is 10 ft wide. If it swings through 1.5 radians, how far does the outer edge travel?
(a) 20/3 ft (b) 3 ft (c) 10/3 ft (d) 15 ft (e) 8.5 ft (f) 7.5 ft

76. A clock has a pendulum 2 m long. The tip of the pendulum traverses a distance of 30 cm in one swing. What is the angle through which the pendulum swings?
(a) 15 rad (b) 0.6 rad (c) 0.15 rad (d) 1/15 rad (e) 20/3 rad (f) 60 rad

77. A wheel has a radius of 40 cm. It is spinning at a rate of 200 revolutions per minute. What is its angular speed?
(a) 200 rad/min (b) 500 rad/min (c) 400 rad/min (d) 200π rad/min (e) 500π rad/min (f) 400π rad/min

78. A wheel has a diameter of 30 inches. There are 40 spokes on the wheel. What is the angle formed by two adjacent spokes?
(a) π/20 rad (b) 3π/4 rad (c) 0.15π rad (d) 1/40 rad (e) 4π/3 rad (f) 2/3 rad

79. The moon Titan is 1,200,000 km from the center of Saturn, and orbits the planet at a rate of 0.4 rad/day. How fast is Titan moving? (Ignore the fact that Saturn is moving around the sun, which is rotating around the center of the galaxy, which is moving relative to neighboring galaxies...)
(a) 4,800,000 km/day (b) 480,000 km/day (c) 48,000π km/day (d) 300,000 km/day (e) 3,000,000 km/day (f) 300,000/π km/day

80. You are designing a catapult, from which you need to launch a rock at 30 m/sec. The arm can only reach an angular velocity of 12 rad/sec. How long does the arm have to be to launch the rock at the necessary speed?
(a) 4π m (b) 36 m (c) 4 m (d) 4/π m (e) 9 m (f) 2.5 m