67.
$$\tan A = \frac{20.5}{31.4}$$
$$= 0.6529$$
$$A = \tan^{-1}(0.6529)$$
$$= 33.1^\circ$$

$$B = 90^\circ - 33.1^\circ$$
$$= 56.9^\circ$$
$$c = \sqrt{a^2 + b^2}$$
$$= \sqrt{(20.5)^2 + (31.4)^2}$$
$$= \sqrt{1406.21}$$
$$= 37.5$$

69.
$$b = \sqrt{c^2 - a^2}$$
$$= \sqrt{(6.21)^2 - (4.37)^2}$$
$$= \sqrt{19.4672}$$
$$= 4.41$$

$$\sin A = \frac{4.37}{6.21}$$
$$= 0.7037$$
$$A = 44.7^\circ$$

$$B = 90^\circ - 44.7^\circ$$
$$= 45.3^\circ$$

Problem Set 3.4

1.

$s = r\theta$	Formula for arc length
$= 3(2)$	Substitute given values
$= 6$ in	Simplify

3.

$s = r\theta$	Formula for arc length
$= 1.5(1.5)$	Substitute given values
$= 2.25$ ft	Simplify

5.

$s = r\theta$	Formula for arc length
$= 12\left(\frac{\pi}{6}\right)$	Substitute given values
$= 2\pi$ cm	Simplify
$= 6.28$ cm	Rounded to 3 significant digits

7. Remember to change θ to radians by multiplying by $\frac{\pi}{180}$:

$s = r\theta$ Formula for arc length

$= 4\left[(60)\left(\frac{\pi}{180}\right)\right]$ Substitute given values (θ in radians)

$= \frac{4\pi}{3}$ mm Simplify

$= 4.19$ mm Rounded to 3 significant digits

9. Remember to change θ to radians by multiplying by $\frac{\pi}{180}$:

$s = r\theta$ Formula for arc length

$= 10\left[(240)\left(\frac{\pi}{180}\right)\right]$ Substitute given values (θ in radians)

$= \frac{40\pi}{3}$ in Simplify

$= 41.9$ in Rounded to 3 significant digits

11. First, we find θ: $\frac{\theta}{2\pi} = \frac{20}{60}$ One complete rotation is 60 minutes or 2π radians

$\theta = \frac{20}{60} \cdot 2\pi$ Multiply both sides by 2π

$= \frac{2\pi}{3}$ Simplify

The radius is 2.4 cm. Therefore, $s = r\theta$

$= 2.4\left(\frac{2\pi}{3}\right)$

$= 5.03$ cm

13. First, we find θ: $\frac{\theta}{2\pi} = \frac{1}{6}$ One complete rotation is 6 hours or 2π radians

$\theta = \frac{2\pi}{6}$ Multiply both sides by 2π

$= \frac{\pi}{3}$ Simplify

Also, the radius is 200 + 4,000 or 4,200 miles.

Therefore, $s = r\theta = 4{,}200\left(\frac{\pi}{3}\right) = 1{,}400\pi$ miles = 4,400 miles

15. Remember to change θ to radians by multiplying by $\frac{\pi}{180}$:

$$s = r\theta$$
$$= 4\left[20\left(\frac{\pi}{180}\right)\right]$$
$$= \frac{4\pi}{9} \text{ ft}$$
$$= 1.40 \text{ ft}$$

17. We are given that the diameter is 14 ft. Therefore, $r = \frac{1}{2}(14) = 7$ ft.

$$s = r\theta$$
$$= 7\left[270\left(\frac{\pi}{180}\right)\right]$$
$$= \frac{21\pi}{2} \text{ ft}$$
$$= 33.0 \text{ ft}$$

19. We are given that the diameter is 320 mm. Therefore, $r = \frac{1}{2}(320) = 160$ mm.

$$\theta = \frac{s}{r}$$
$$= \frac{307}{160}$$
$$= 1.92 \text{ radians}$$

$$\theta = 1.92\left(\frac{180}{\pi}\right)$$
$$= 110^\circ$$

21. We convert 0.5° to radians by multiplying by $\frac{\pi}{180}$.

$$s = r\theta$$
$$= 240{,}000\left[(0.5)\left(\frac{\pi}{180}\right)\right]$$
$$= \frac{2000\pi}{3} \text{ mi}$$
$$= 2{,}100 \text{ mi}$$

23. $s = r\theta$

$= 125\left[30\left(\frac{\pi}{180}\right)\right]$

$= \frac{125\pi}{6}$ ft

$= 65.4$ ft

25. $s = r\theta$

$= 125\left[(220)\left(\frac{\pi}{180}\right)\right]$

$= \frac{1{,}375\pi}{9}$ ft

$= 480$ ft

27. $r = \frac{1}{2}(197) = 98.5$ ft

(a) $s = r\theta$

$= 98.5\left[(60)\left(\frac{\pi}{180}\right)\right]$

$= 103$ ft

(b) $s = r\theta$

$= 98.5\left[(210)\left(\frac{\pi}{180}\right)\right]$

$= 361$ ft

(c) $s = r\theta$

$= 98.5\left[(285)\left(\frac{\pi}{180}\right)\right]$

$= 490$ ft

29. $r = \frac{s}{\theta}$ Formula for arc length

$= \frac{3}{6}$ Substitute known values

$= 0.5$ ft Simplify

31. $r = \frac{s}{\theta}$ Formula for arc length

$= \frac{4.2}{1.4}$ Substitute known values

$= 3$ in Simplify

33. $r = \frac{s}{\theta}$ Formula for arc length

$= \frac{\pi}{\pi/4}$ Substitute known values

$= 4$ cm Simplify

35. Remember to convert θ to radians:

$r = \frac{s}{\theta}$ Formula for arc length

$= \frac{\frac{\pi}{2}}{90\left(\frac{\pi}{180}\right)}$ Substitute known values

$= 1$ m Simplify

37. Remember to convert θ to radians:

$r = \frac{s}{\theta}$ Formula for arc length

$= \frac{4}{225\left(\frac{\pi}{180}\right)}$ Substitute known values

$= \frac{16}{5\pi}$ or 1.02 km Simplify

39.

$A = \frac{1}{2}r^2\theta$ Formula for area of a sector

$= \frac{1}{2}(3)^2(2)$ Substitute known values

$= 9 \text{ cm}^2$ Simplify

41.

$A = \frac{1}{2}r^2\theta$ Formula for area of a sector

$= \frac{1}{2}(4)^2(2.4)$ Substitute known values

$= 19.2 \text{ in}^2$ Simplify

43.

$A = \frac{1}{2}r^2\theta$ Formula for area of a sector

$= \frac{1}{2}(3)^2\left(\frac{\pi}{5}\right)$ Substitute known values

$= \frac{9\pi}{10} = 2.83 \text{ m}^2$ Simplify

45.

$A = \frac{1}{2}r^2\theta$ Formula for area of a sector

$= \frac{1}{2}(5)^2\left(15 \cdot \frac{\pi}{180}\right)$ Substitute known values

$= \frac{25\pi}{24}$ or 3.27 m^2 Simplify

47.

$r = \frac{s}{\theta} = \frac{4 \text{ in}}{2 \text{ rad}} = 2 \text{ in}$

$A = \frac{1}{2}r^2\theta$ Formula for area of a sector

$= \frac{1}{2}(2)^2(2)$ Substitute known values

$= 4 \text{ in}^2$ Simplify

49.

$A = \frac{1}{2}r^2\theta$ Formula for area of a sector

$r^2 = \frac{2A}{\theta}$ Solve for r^2

$= \frac{2\left(\frac{\pi}{3}\right)}{30\left(\frac{\pi}{180}\right)}$ Substitute known values

$= 4$ Simplify right side

$r = 2 \text{ cm}$ Take square root of both sides (r must be positive.)

51. $\theta = 45^\circ = \frac{\pi}{4}$ radians

$A = \frac{1}{2}r^2\theta$ Formula for area of a sector

$r^2 = \frac{2A}{\theta}$ Solve for r^2

$= \frac{2\left(\frac{2\pi}{3}\right)}{\frac{\pi}{4}}$ Substitute known values

$= \frac{16}{3}$ Simplify right side

$r = \frac{4}{\sqrt{3}} = 2.31$ in Take square root of both sides. (r must be positive)

53. $A = \frac{1}{2}r^2\theta$ Formula for area of a sector

$= \frac{1}{2}(60)^2\left(90 \cdot \frac{\pi}{180}\right)$ Substitute known values

$= 900\pi$ or $2{,}830$ ft^2 Simplify

55. $r = \frac{700}{2} = 350$ mm

$\theta = \frac{2\pi}{8} = \frac{\pi}{4}$

$s = r\theta$

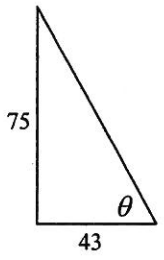
$= 350\left(\frac{\pi}{4}\right) = 275$ mm

57. $\tan\theta = \frac{75}{43}$

$= 1.7442$

$\theta = \tan^{-1}(1.7442)$

$= 60.2^\circ$



59. $\tan 12^\circ = \dfrac{x}{5.2}$

$x = 5.2\tan 12^\circ$

$= 5.2(0.2126)$

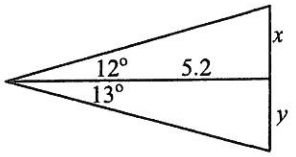
$= 1.11$

$\tan 13^\circ = \dfrac{y}{5.2}$

$y = 5.2\tan 13^\circ$

$= 5.2(0.2309)$

$= 1.20$



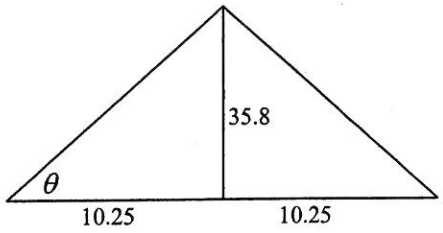
The vertical dimension of the mirror is
$x + y = 1.11 + 1.20 = 2.31$ ft

61. $\tan\theta = \dfrac{35.8}{10.25}$

$= 3.4927$

$\theta = \tan^{-1}(3.4927)$

$= 74.0^\circ$



63. $\theta = 90^\circ - 43.2^\circ$

$= 46.8^\circ$

$\tan\theta = \dfrac{x}{86}$

$x = 86\tan 46.8^\circ$

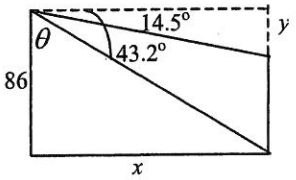
$= 91.6$

$\tan 14.5^\circ = \dfrac{y}{x}$

$= \dfrac{y}{91.6}$

$y = 91.6\tan 14.5^\circ$

$= 23.7$



The height of the building is $86 - y = 86 - 23.7$

$= 62.3$ ft

Problem Set 3.5

1. $v = \dfrac{s}{t}$ Formula for linear velocity

$= \dfrac{3}{2}$ Substitute known values

$= 1.5$ ft/min Simplify

3. $v = \dfrac{s}{t}$ Formula for linear velocity

$= \dfrac{12}{4}$ Substitute known values

$= 3$ cm/sec Simplify