2. **(a)** 0.5736 **(b)** 0.5000 **(c)** 1.000
   (d) 0.2588 **(e)** 0.3090 **(f)** 0.7813
   (g) 0.0349 **(h)** 0.1219
3. **(a)** 32° **(b)** 65° **(c)** 77°
   (d) 60° **(e)** 14° **(f)** 5°
   (g) 45° **(h)** 62° **(i)** 58°
4. **(a)** 4.6 **(b)** 5.1 **(c)** 6.9
   (d) 5.6 **(e)** 69.1 **(f)** 5.2
5. **(a)** 68° **(b)** 61° **(c)** 59°
   (d) 39° **(e)** 64° **(f)** 30°
6. **(a)** $\sin B = \frac{3}{5}$, $\cos B = \frac{4}{5}$, $\tan B = \frac{3}{4}$

   (b) $\sin B = \frac{4}{5}$, $\cos B = \frac{3}{5}$, $\tan B = \frac{4}{3}$

   (c) $\sin B = \frac{12}{13}$, $\cos B = \frac{5}{13}$, $\tan B = \frac{12}{5}$

   (d) $\sin B = \frac{1}{\sqrt{2}}$, $\cos B = \frac{1}{\sqrt{2}}$, $\tan B = 1$

7. **(a)** 36.9° **(b)** 53.1°
   (c) 67.4 **(d)** 45°
8. **(a)** $\frac{1}{2}$ **(b)** $\frac{\sqrt{3}}{2}$

   (c) $\frac{3}{5}$ **(d)** $\frac{4}{5}$

   (e) 53° **(f)** 78°
9. **(a)** $\sin 50° = \frac{x}{90}$, $\cos 40 = \frac{x}{90}$, $x = 68.9°$

   (b) $\tan 51° = \frac{x}{30}$, $\tan 39° = \frac{30}{x}$, $x = 37.0°$

10. **(a)** 5.2 m **(b)** 6.4 m
11. **(a)** 12.2 m **(b)** 8.0 km
12. Answers will vary.
13. $\tan 50° = \frac{y}{120}$, $y = 143.0$ cm
14. 25.5 m
15. 3.09 m
16. **(a)** 45° **(b)** 60°
    (c) 36.9°
17. **(a)** 117.5 mm **(b)** 9.6 km
    (c) 14.4 km **(d)** 14.4 km
18. **(a)** $x = 45°$, $y = 45°$
    (b) $x = 60°$, $y = 30°$
    (c) $x = 36.9°$, $y = 53.1°$
19. $\sin A = \frac{250}{1600}$, $\angle A = 8.9°$
20. **(a)** change 12 to 22.5
    (b) correct
    (c) change 4.706 to 0.4706
    (d) correct
    (e) change 65° to 62°
    (f) correct
21. **(a)** 20° **(b)** 79°
    (c) 48° **(d)** 68°
22. **(a)** $\angle A = 51°$, $\angle B = 39°$
    (b) $\angle A = 26°$, $\angle B = 64°$
23. no, 79°
24. **(a)** 8.2 cm **(b)** 8.7 cm
    (c) 44.4° **(d)** 60.0°
25. **(a)** 71.6° **(b)** 14.0° **(c)** 26.6°
    (d) 14.0° **(e)** −26.6° **(f)** −26.6°
26. **(a)** $x = 61.9°$, $y = 28.1°$, $z = 17$ cm

(b) $a = 45°$, $b = 45°$, $e = 7\sqrt{2}$ cm
(c) $j = 4\sqrt{3}$ cm, $i = 8$ cm
(d) $x = 18°$, $j = 9.5$ cm, $l = 3.1$ cm
(e) $x = 18°$, $q = 3.2$ cm, $n = 10.5$ cm
(f) $x = 64.2°$, $y = 25.8°$, $q = \sqrt{19}$ cm
(g) $x = 66.0°$, $y = w = 132.0°$
(h) $a = \frac{20}{3}$ cm, $b = \frac{10}{3}$ cm, $x = 65.8°$
27. 1635.4 m
28. no, $\tan^{-1}\left(\frac{1}{9}\right) = 6.3°$; no, $\tan^{-1}\left(\frac{1}{7.5}\right) = 7.6°$
29. 28.9°
30. 14.8 km
31. **(a)** $y = 0.75x - 4$
    (b) $y = 1.11x - 0.22$
32. **(a)** $\tan^{-1}(-3) = -71.6°$, $\tan^{-1}(2) = 63.4°$
    (b) 135° or 45°
33. **(a)** $\left(\frac{8}{7}, \frac{46}{7}\right)$
    (b) $\tan^{-1}(-3) = -71.6°$, $\tan^{-1}(4) = 76.0°$
    (c) 147.6° or 32.4°
34. $\angle A = \sin^{-1}(\sin A)$
35. Changing the lengths of the sides will create similar triangles. The values of the trigonometric ratios of corresponding sides in similar triangles will be equal.

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1. 54.8°
2. 567.1 m
3. 24.4°
4. 35.8°
5. 42.0°
6. 52.0 m
7. 38.7°
8. 7.1 m
9. 9.4 m
10. 23.8 km
11. 5.85 m
12. 311.1 m
13. **(a)** 58.8° **(b)** 193 sections
14. **(a)** 26.6° **(b)** 11.3° **(c)** 5.7° **(d)** 4.8°
15. 7.9° west
16. Possible answers: sketch showing all information; statement regarding which trigonometric ratio to use, full solution.
17. 20.6 m
18. **(a)** 143.4 cm²
    (b) $V = 4779.1$ cm³, $SA = 2647.5$ cm²
19. **(a)** 12 shafts **(b)** 176 sections
20. **(a)** $\tan \angle PAB = \frac{y}{x}$, $\sin \angle PAB = y$, $\cos \angle PAB = x$
    (b) (0.98, 0.17), ($\cos θ$, $\sin θ$), ($\cos(θ + 10)$, $\sin (θ + 10)$)