

Chapter 7

Exercise 7.1

- 1 $\frac{5}{\sqrt{89}} = \frac{5\sqrt{89}}{89}$ 2 $\frac{8}{\sqrt{89}} = \frac{8\sqrt{89}}{89}$ 3 $\frac{5}{8}$
 4 $\frac{8}{\sqrt{89}} = \frac{8\sqrt{89}}{89}$ 5 $\frac{5}{\sqrt{89}} = \frac{5\sqrt{89}}{89}$ 6 $\frac{8}{5}$
 7 $\hat{BAC} \approx 32.0^\circ, \hat{ABC} \approx 58.0^\circ$
 8 $\cos \theta = \frac{4}{5}, \tan \theta = \frac{3}{4}$
 9 $\sin \theta = \frac{\sqrt{39}}{8}, \tan \theta = \frac{\sqrt{39}}{5}$
 10 $\sin \theta = \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}, \cos \theta = \frac{1}{\sqrt{5}} = \frac{\sqrt{5}}{5}$
 11 $\sin \theta = \frac{\sqrt{51}}{10}, \tan \theta = \frac{\sqrt{51}}{7}$
 12 $\sin \theta = \frac{1}{\sqrt{10}} = \frac{\sqrt{10}}{10}, \cos \theta = \frac{3}{\sqrt{10}} = \frac{3\sqrt{10}}{10}$
 13 $\sin \theta = \frac{3}{4}, \tan \theta = \frac{3}{\sqrt{7}} = \frac{3\sqrt{7}}{7}$
 14 $\frac{\sqrt{2}}{2}$ 15 $\frac{\sqrt{3}}{2}$ 16 1
 17 $\frac{\sqrt{3}}{2}$ 18 $\frac{\sqrt{3}}{3}$ 19 $\frac{1}{2}$
 20 $60^\circ, \frac{\pi}{3}$ 21 $45^\circ, \frac{\pi}{4}$ 22 $60^\circ, \frac{\pi}{3}$
 23 $60^\circ, \frac{\pi}{3}$ 24 $45^\circ, \frac{\pi}{4}$ 25 $30^\circ, \frac{\pi}{6}$
 26 $46.5^\circ, 0.812$ 27 $43.5^\circ, 0.759$ 28 $52.3^\circ, 0.913$
 29 $80.6^\circ, 1.41$ 30 $28.2^\circ, 0.492$ 31 $33.1^\circ, 0.577$
 32 $x \approx 86.6$ 33 $x \approx 8.60$ 34 $x \approx 20.6$
 35 $x \approx 374$ 36 $x = 18$ 37 $x = 200$
 38 $\hat{QPR} = 75^\circ, r \approx 5.36, q \approx 20.7$
 39 $\hat{BAC} \approx 22.6^\circ, \hat{ABC} \approx 67.4^\circ$
 40 114 metres
 41 67.4°
 42 4.05 metres
 43 5.71 metres
 44 44.0°
 45 572 metres

Exercise 7.2

- 1 $\sin \theta = \frac{3}{5}, \cos \theta = \frac{4}{5}, \tan \theta = \frac{3}{4}$
 2 $\sin \theta = \frac{5}{13}, \cos \theta = -\frac{12}{13}, \tan \theta = -\frac{5}{12}$
 3 $\sin \theta = -\frac{1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}, \cos \theta = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}, \tan \theta = -1$
 4 $\sin \theta = -\frac{1}{2}, \cos \theta = -\frac{\sqrt{3}}{2}, \tan \theta = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$
 5 $\sin \theta = \frac{3}{\sqrt{10}} = \frac{3\sqrt{10}}{10}, \cos \theta = \frac{1}{\sqrt{10}} = \frac{\sqrt{10}}{10}, \tan \theta = 3$
 6 $\sin \theta = -\frac{1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}, \cos \theta = -\frac{1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}, \tan \theta = 1$
 7 a) $\sin 120^\circ = \frac{\sqrt{3}}{2}, \cos 120^\circ = -\frac{1}{2}, \tan 120^\circ = -\sqrt{3}$
 b) $\sin 135^\circ = \frac{\sqrt{2}}{2}, \cos 135^\circ = -\frac{\sqrt{2}}{2}, \tan 135^\circ = -1$
 c) $\sin 150^\circ = \frac{1}{2}, \cos 150^\circ = -\frac{\sqrt{3}}{2}, \tan 150^\circ = -\frac{\sqrt{3}}{3}$
 8 a) $\sin 225^\circ = -\frac{\sqrt{2}}{2}, \cos 225^\circ = -\frac{\sqrt{2}}{2}, \tan 225^\circ = 1$
 b) $\sin 330^\circ = -\frac{1}{2}, \cos 330^\circ = \frac{\sqrt{3}}{2}, \tan 330^\circ = -\frac{\sqrt{3}}{3}$

- c) $\sin \frac{7\pi}{6} = -\frac{1}{2}, \cos \frac{7\pi}{6} = -\frac{\sqrt{3}}{2}, \tan \frac{7\pi}{6} = \frac{\sqrt{3}}{3}$
 d) $\sin(-60^\circ) = -\frac{\sqrt{3}}{2}, \cos(-60^\circ) = \frac{1}{2}, \tan(-60^\circ) = -\sqrt{3}$
 e) $\sin 270^\circ = -1, \cos 270^\circ = 0, \tan 270^\circ$ is undefined
 f) $\sin \frac{5\pi}{3} = -\frac{\sqrt{3}}{2}, \cos \frac{5\pi}{3} = \frac{1}{2}, \tan \frac{5\pi}{3} = -\sqrt{3}$
 g) $\sin(-120^\circ) = -\frac{\sqrt{3}}{2}, \cos(-120^\circ) = -\frac{1}{2}, \tan(-120^\circ) = \sqrt{3}$
 h) $\sin\left(-\frac{\pi}{4}\right) = -\frac{\sqrt{2}}{2}, \cos\left(-\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}, \tan\left(-\frac{\pi}{4}\right) = -1$
 i) $\sin \pi = 0, \cos \pi = -1, \tan \pi = 0$
 9 $\sin \theta = -\frac{4}{5}, \tan \theta = -\frac{4}{3}$
 10 $\cos \theta = -\frac{15}{17}, \tan \theta = -\frac{8}{15}$
 11 $\sin \theta = -\frac{12}{13}, \cos \theta = \frac{5}{13}$
 12 $\cos \theta = -1, \tan \theta = 0$
 13 a) (i) 30° (ii) 85°
 b) (i) 45° (ii) 7°
 c) (i) 60° (ii) 20°
 14 a) $6\sqrt{3}$ units² b) 88.9 units² c) $675\sqrt{2}$ units²
 15 a) $75\pi \approx 236$ cm² b) $\frac{225\sqrt{3}}{4} \approx 97.4$ cm²
 16 a) $\frac{50\pi}{3} - 25\sqrt{3} \approx 9.06$ cm² b) $54\pi - 36\sqrt{2} \approx 119$ cm²
 17 121.4 cm²

Exercise 7.3 and 7.4

- 1 Infinite, not one triangle 2 One triangle
 3 One triangle 4 One triangle
 5 Two triangles 6 One triangle
 7 $BC \approx 17.9, AC \approx 27.0, \hat{ACB} = 115^\circ$
 8 $AB \approx 18.1, BC \approx 22.5, \hat{BAC} = 65^\circ$
 9 $AB \approx 3.91, BC \approx 1.56, \hat{ABC} = 111^\circ$
 10 $AB \approx 326, AC \approx 149, \hat{BAC} = 43^\circ$
 11 $AB \approx 74.1, \hat{BAC} \approx 60.2^\circ, \hat{ABC} \approx 48.8^\circ$
 12 $\hat{BAC} \approx 75.5^\circ, \hat{ABC} \approx 57.9^\circ, \hat{ACB} \approx 46.6^\circ$
 13 $\hat{BAC} \approx 81.6^\circ, \hat{ABC} \approx 60.6^\circ, \hat{ACB} \approx 37.8^\circ$
 14 Two possible triangles:
 (1) $\hat{BAC} \approx 55.9^\circ, \hat{ACB} \approx 81.1^\circ, AB \approx 40.6$
 (2) $\hat{BAC} \approx 124.1^\circ, \hat{ACB} \approx 12.9^\circ, AB \approx 9.17$
 15 Two possible triangles:
 (1) $\hat{ABC} \approx 72.2^\circ, \hat{ACB} \approx 45.8^\circ, AB \approx 0.414$
 (2) $\hat{ABC} \approx 107.8^\circ, \hat{ACB} \approx 10.2^\circ, AB \approx 0.102$
 16 10.8 cm and 30.4 cm
 17 $51.3^\circ, 51.3^\circ, 77.4^\circ$
 18 25.8 metres
 19 71.6° or 22.4°
 20 Distance ≈ 743 metres
 21 20.7°
 22 Area ≈ 151.2 cm²
 23 a) $BC = 5 \sin 36^\circ$ or $BC \geq 5$
 b) $5 \sin 36^\circ < BC < 5$
 c) $BC < 5 \sin 36^\circ$
 24 a) $BC = 5\sqrt{3}$ or $BC \geq 10$
 b) $5\sqrt{3} < BC < 10$
 c) $BC < 5\sqrt{3}$
 25 $x \approx 64.9$ m, $y \approx 56.9$ m

