

Prerequisite Skills

1. a) $\sin \theta = -\frac{4}{5}$, $\cos \theta = \frac{3}{5}$

b) $\cos \theta = -\frac{8}{17}$, $\tan \theta = -\frac{15}{8}$

c) $\sin x = -\frac{7}{25}$, $\tan x = \frac{7}{24}$

2. a) $\csc \theta = \frac{25}{7}$, $\cot \theta = -\frac{24}{7}$

b) $\sec x = \frac{5}{4}$, $\cot x = -\frac{4}{3}$

c) $\csc \theta = -\frac{13}{5}$, $\sec \theta = -\frac{13}{12}$

3. a) 0.4384 b) -0.0523

c) -3.7321 d) -0.1736

e) -0.2250 f) -0.1763

g) 1.1034 h) -2.2812

i) 2.1445 j) 1.6243

k) -1.0006 l) -1.3270

4. a) 55° b) 54°

c) 19° d) 115°

5. a) $6\sqrt{2}$ b) $5\sqrt{5}$

6. a) $f^2 + 2fg + g^2$ b) $m^2 - n^2$

c) $30a^2 - 29ab - 7b^2$

d) $1 - 2\sin x \cos x$

4.1 Radian Measure

1. a) $\frac{13\pi}{36}$ b) $\frac{17\pi}{18}$

c) $\frac{4\pi}{3}$ d) $\frac{11\pi}{15}$

e) $\frac{39\pi}{20}$

2. a) 0.82 b) 3.80

c) 5.85 d) 2.88

e) 1.27

3. a) 51.4° b) 225.0°

c) 157.5° d) 100.0°

e) 65.5°

4. 5.4 cm

5. $\frac{\pi}{9}$, $\frac{\pi}{3}$, $\frac{5\pi}{9}$

6. 18π rad/s or 56.55 rad/s

7. a) $900^\circ/\text{s}$ b) 5π rad/s

8. 0.01 rad/s

9. a) $r = \sqrt{\frac{2A}{\theta}}$

b) 9.6 cm

4.2 Trigonometric Ratios and Special Angles

1. a) -0.9587 b) 0.2198

c) -0.7975 d) 1.0470

e) 0.1844 f) 1.7953

2. a) 0.8660 b) 0.5774

c) -0.7071 d) 0.2282

e) -2.0000 f) 1.0103

3. $\sin \frac{11\pi}{6} = -\frac{1}{2}$, $\cos \frac{11\pi}{6} = \frac{\sqrt{3}}{2}$,

$\tan \frac{11\pi}{6} = -\frac{1}{\sqrt{3}}$, $\csc \frac{11\pi}{6} = -2$,

$\sec \frac{11\pi}{6} = \frac{2}{\sqrt{3}}$, $\cot \frac{11\pi}{6} = -\sqrt{3}$

4. a) $18(\sqrt{3}-1)$ m b) 13.2 m

5. a) i) $\frac{\sqrt{3}}{3}$ ii) 1 iii) $\frac{\sqrt{2}-2\sqrt{3}}{2}$

6. a) i) $\frac{\sqrt{3}}{2}$ ii) -1 iii) $-\sqrt{3}$

4.3 Equivalent Trigonometric Expressions

1. $\cos \frac{\pi}{6} = \sin \left(\frac{\pi}{2} - \frac{\pi}{6} \right)$

2. $-\tan \frac{\pi}{3} = \cot \left(\frac{\pi}{3} + \frac{\pi}{2} \right)$

3. a) 0.7818 b) -0.7818

4. a) 1.1918 b) -1.1918

5. 0.12

6. 2.36

7. $\sin \frac{\pi}{18} \approx 0.1736$

9. a) -0.9749 b) -0.9749

10. a) 0.8391 b) -0.8391

11. a) $-\frac{\pi}{2}$

4.4 Compound Angle Formulas

1. a) $\sin \left(\frac{\pi}{3} + \frac{\pi}{6} \right); 1$

b) $\cos\left(\frac{\pi}{3} + \frac{5\pi}{12}\right); -\frac{1}{\sqrt{2}}$

c) $\sin\left(\frac{5\pi}{9} - \frac{7\pi}{18}\right); \frac{1}{2}$

d) $\cos\left(\frac{5\pi}{12} - \frac{\pi}{4}\right); \frac{\sqrt{3}}{2}$

2. a) $\frac{-\sqrt{3}+1}{2\sqrt{2}}$

b) $\frac{1+\sqrt{3}}{2\sqrt{2}}$

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

3. a) $\frac{5}{13}$

b) $-\frac{24}{25}$

c) $-\frac{36}{325}$

d) $-\frac{204}{325}$

e) $-\frac{323}{325}$

f) $-\frac{253}{325}$

4. a) $\frac{\sqrt{3}-1}{2\sqrt{2}}$

b) $\frac{1+\sqrt{3}}{2\sqrt{2}}$

5. a) $\sin b = \frac{4}{5}, \tan b = -\frac{4}{3}$

b) $-\frac{7}{25}$

c) $-\frac{24}{25}$

d) $\frac{24}{7}$

e) 2.21

f) The angle $2b$ lies in the third quadrant due to signs of the three primary ratios.

6. a) $\frac{\sqrt{2-\sqrt{3}}}{2}$

4.5 Prove Trigonometric Identities

8. a) No, the graphs are not the same for all values.

b) Answers may vary. Sample answer: Let $x = 0$; **L.S.** \neq **R.S.**

Chapter 4 Review

1. a) 207.4°

c) 311.1°

2. a) 1.03

c) 2.16

3. a) $\frac{25\pi}{36}$

c) $\frac{4\pi}{45}$

4. 27.8 cm

5. a) $\frac{\sqrt{6}}{4}$

6. 22.8 m

7. $\frac{\pi}{14}$

8. 0.87 rad

9. a) 0.9511

10. a) $\frac{117}{125}$

c) $-\frac{24}{25}$

11. $15\left(\frac{\sqrt{3}-1}{2\sqrt{2}}\right)$ m

13. This is an identity.

Chapter 4 Test

1. D

2. B

3. A

4. A

5. $\frac{1-\sqrt{3}}{2\sqrt{2}}$

6. a) 1.57 rad/s

b) 94.2 cm

7. $\frac{70}{\sqrt{3}}$ m

10. Answers may vary. Sample answer: It is not an identity. Let $x = \frac{\pi}{4}$; **L.S.** \neq **R.S.**