1.1 Lengths of Triangle Sides Using the Pythagorean Theorem

Answers

1. 5

2. 10

3. 13

4. $6\sqrt{2}$

5. $9\sqrt{2}$

6 $x\sqrt{2}$

7. $\sqrt{58}$

8. $2\sqrt{14}$

9. $4\sqrt{3}$

10. $5\sqrt{5}$

11. $2\sqrt{122}$

12. $\sqrt{x^2 + y^2}$

13. $(a + b)^2$

14. $c^2 + 2ab$

15. They are both areas of the big square. $(a + b)^2 = c^2 + 2ab$. So $a^2 + 2ab + b^2 = c^2 + 2ab$. Therefore, $a^2 + b^2 = c^2$.

1.2 Identifying Sets of Pythagorean Triples

Answers

1. Yes
2. No
3. No
4. Yes
5. No
6. Yes
7. No
8. No
9. Yes
10. Yes
11. Yes
12. No
13. It will allow you to avoid using the Pythagorean Theorem when trying to find missing sides of right triangles in problems.
14. We need to show that $(5x)^2 + (12x)^2 = (13x)^2$. Expanding the left we get $25x^2 + 144x^2$ which simplifies to $169x^2$. The right side also simplifies to$169x^2$. Therefore, any multiple of 5, 12, 13 will satisfy the Pythagorean Theorem and be a Pythagorean Triple.
15. We need to show that $(3x)^2 + (4x)^2 = (5x)^2$. Expanding the left we get $9x^2 + 16x^2$ which simplifies to $25x^2$. The right side also simplifies to$25x^2$. Therefore, any multiple of 3, 4, 5 will satisfy the Pythagorean Theorem and be a Pythagorean Triple.

1.3 Pythagorean Theorem to Classify Triangles

Answers

1. Yes
2. Yes
3. No
4. Yes
5. acute
6. obtuse
7. acute
8. right
9. acute
10. right
11. right
12. obtuse
13. obtuse
14. If the two legs are shorter than necessary to satisfy the Pythagorean Theorem, then the included angle must be greater than $90°$ in order to make the triangle. Therefore, the triangle is obtuse.
15. If the two legs are longer than necessary to satisfy the Pythagorean Theorem, then the included angle must be less than $90°$ in order to make the triangle. Therefore, the triangle is acute.

1.4 Pythagorean Theorem to Determine Distance

Answers

1. 6.7
2. 8.1
3. 8.1
4. 3.0
5. 7.0
6. 24.1
7. 13.2
8. 19.1
9. 11.7
10. 6.3
11. 12.5
12. 16.0
13. 36.8
14. 29.1
15. 10.2

1.5 Lengths of Sides in Isosceles Right Triangles

Answers

1. $3\sqrt{2}$
2. $7\sqrt{2}$
3. $x\sqrt{2}$
4. 16
5. 12
6. $11\sqrt{2}$
7. $\frac{x\sqrt{2}}{2}$
8. $16\sqrt{2}$
9. 28
10. $14\sqrt{2}$
11. 6
12. 12
13. $4\sqrt{6}$
14. $80\sqrt{2}$
15. $\frac{s\sqrt{2}}{2}$

1.6 Relationships of Sides in 30-60-90 Right Triangles

Answers

1. $8\sqrt{3};\ 16$

2. $12\sqrt{3};\ 24$

3. $\frac{10\sqrt{3}}{3};\frac{20\sqrt{3}}{3}$

4. $16\sqrt{3}; 32$

5. $\sqrt{3}; 2\sqrt{3}$

6. $x\sqrt{3}; 2x$

7. $\frac{x\sqrt{3}}{3};\frac{2x\sqrt{3}}{3}$

8. 14

9. $15\sqrt{3}$

10. $3\sqrt{3}$

11. $25\sqrt{3}$

12. $\frac{27\sqrt{3}}{2}$

13. 12

14. 7920 ft

15. $2640x\ ft$

1.7 Special Triangle Ratios

Answers

1. Yes, 45-45-90

2. No

3. Yes, 30-60-90

4. No

5. Yes, 45-45-90

6. No

7. No

8. Yes, 30-60-90

9. No

10. Yes, 45-45-90

11. Yes, 45-45-90

12. Yes, 30-60-90

13. The four sides of a square are congruent and the angles are right angles. When you cut the square in half, you create two right triangles, each with two congruent sides. Therefore, in each triangle the two non-right angles must be congruent and the triangles must be 45-45-90 triangles.

14. Cut the equilateral in half along one of its heights (a line segment perpendicular to one side that passes through the opposite vertex.)

15. No

1.8 Sine, Cosine, and Tangent Functions

Answers

1. $\sin A = \frac{16}{35}; \sin C = \frac{20}{35}$

2. $\cos A = \frac{20}{35}; \ \cos C = \frac{16}{35}$

3. $\tan A = \frac{16}{20}; \ \tan C = \frac{20}{16}$

4. $\tan A = \frac{a}{c}$

5. $\sin C = \frac{c}{b}$

6. $\tan C = \frac{c}{a}$

7. $\cos C = \frac{a}{b}$

8. $\sin A = \frac{a}{b}$

9. $\cos A = \frac{c}{b}$

10. C; C

11. reciprocals

12. The hypotenuse of a triangle is always longer than its legs.

13. $\sin 45 = \cos 45 = \frac{\sqrt{2}}{2}.\ \tan 45 = 1.$

14. $\sin 30 = \frac{1}{2}; \cos 30 = \frac{\sqrt{3}}{2}; \tan 30 = \frac{\sqrt{3}}{3}$

15. $\sin 60 = \frac{\sqrt{3}}{2}; \cos 60 = \frac{1}{2}; \tan 60 = \sqrt{3}$

16. Increase, because if the angle increases the “opposite” side must be getting longer.

1.9 Secant, Cosecant, and Cotangent Functions

Answers

1. $\csc A = \frac{35}{16}$; $\csc C = \frac{35}{20}$

2. $\sec A = \frac{35}{20}$; $\sec C = \frac{35}{16}$

3. $\cot A = \frac{20}{16}$; $\cot C = \frac{16}{20}$

4. $\frac{c}{a}$

5. $\frac{b}{c}$

6. $\frac{a}{c}$

7. $\frac{b}{a}$

8. $\frac{b}{a}$

9. $\frac{b}{c}$

10. C; C

11. reciprocals

12. The hypotenuse of a triangle is always longer than its legs.

13. $\csc 45 = \sec 45 = \sqrt{2}$; $\cot 45 = 1$

14. $\csc 30 = 2$; $\sec 30 = \frac{2\sqrt{3}}{3}$; $\cot 30 = \sqrt{3}$

15. $\csc 60 = \frac{2\sqrt{3}}{3}$; $\sec 60 = 2$; $\cot 60 = \frac{\sqrt{3}}{3}$

16. Decrease, because if the angle increases then the “opposite” side must be getting longer.

1.10 Pythagorean Theorem for Solving Right Triangles

Answers

1. 33.75°
2. 56.25°
3. 14.97
4. 30.96°
5. 59.04°
6. 17.49
7. 44.67°
8. 45.33°
9. 31.64
10. 39.4°
11. 50.6°
12. 36.23
13. 46.57°
14. 43.43°
15. 11.62
16. Use trig ratios when triangle to find missing angles or when given one non-right angle and one side in order to find missing sides. Use the Pythagorean Theorem when given two sides in order to find the third side.
17. No, you could always use sine, cosine, or tangent to solve.
18. Once you know it is a right triangle, you need one side and an additional side or angle.

1.11 Inverse Trigonometric Functions

Answers

1. 57°

2. 79°

3. 12°

4. 40°

5. 61°

6. 23°

7. 7°

8. 88°

9. 43°

10. 80°

11. 55°

12. 20°

13. 55°

14. 1.63°

15. 66.42°

1.12 Alternate Formula for the Area of a Triangle

Answers

1. a=23, b=18, C=60°

2. 179.28

3. a=8, b=4, c=72°

4. 15.217

5. 1294.615

6. 69.59

7. 111.262

8. 452.027

9. 53.795

10. 27.5

11. 57.851

12. 157.868

13. 541.644

14. You could have determined that the other angle was 80° and calculated $\frac{1}{2}(22)(25)\sin 80$ to get the same answer.

15. Sine is used to help you find the height of the triangle in the area calculation. The height of a triangle is perpendicular to its base, so right triangles are formed, which allows sine to be used.

1.13 Angles of Elevation and Depression

Answers

1. 35.54 ft

2. 26.45 ft

3. 610.2 ft

4. 90.1 ft

5. 56.00 m

6. 82.01 ft

7. 15.5 ft

8. 25.71 ft

9. 45°

10. $50\sqrt{3}$ ft

11. 49.1 ft

12. 10 miles

13. 68.2°

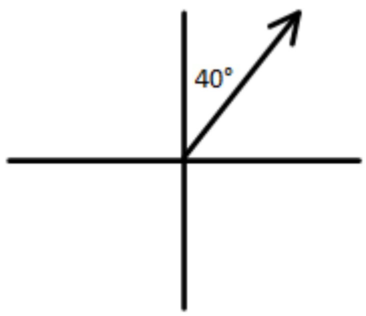
14. 3.62°

15. 2.74°

1.14 Right Triangles, Bearings, and Other Applications

Answers

1.



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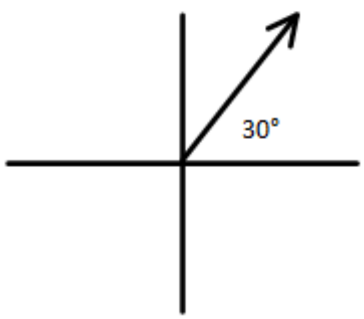

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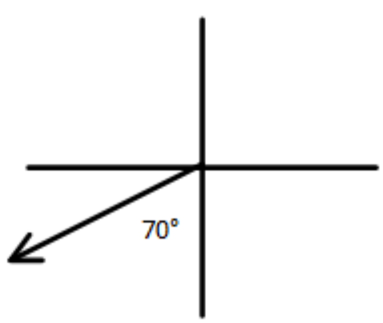

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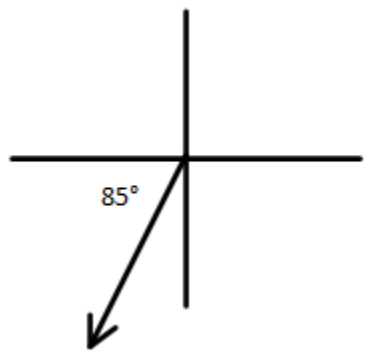

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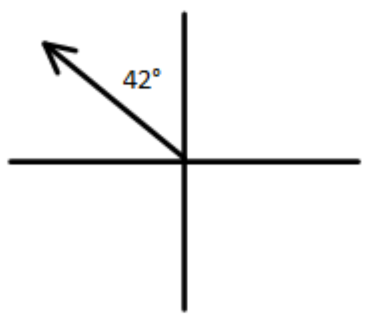


6. S 55°W

7. N 34°E

8. S 72°E

9. N 10°W

10. S 25°E

11. 3.7km

12. 4.2km

13. 2.6km

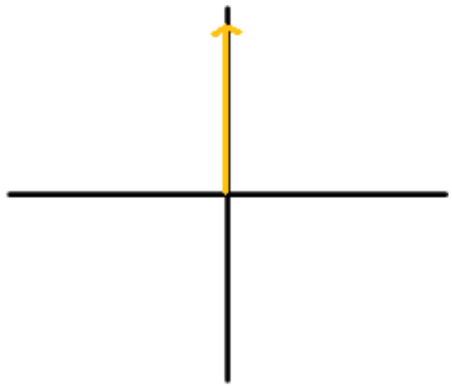
14. 0.6km

15. 5.5km

1.15 Angles of Rotation in Standard Positions

Answers

1.



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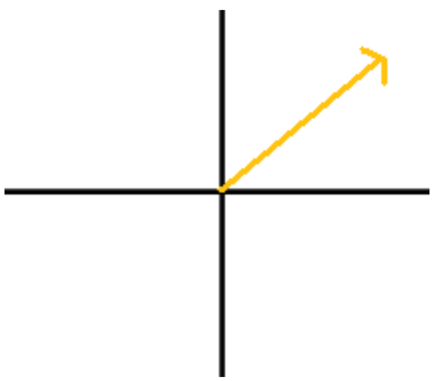

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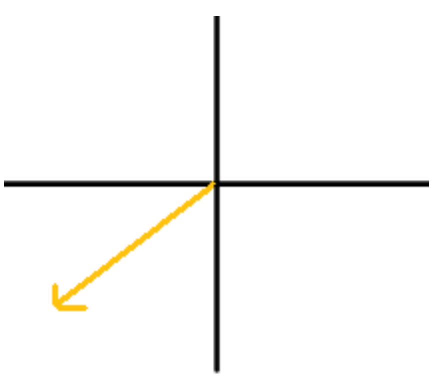

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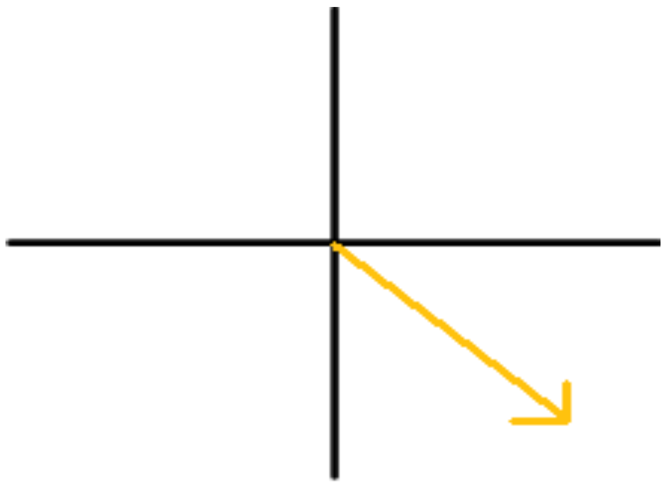

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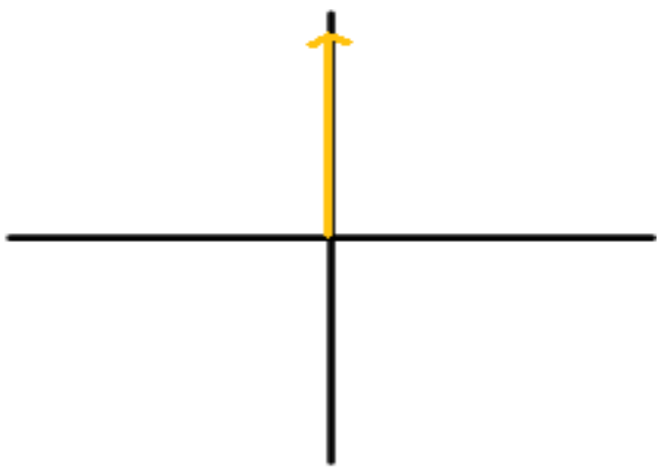

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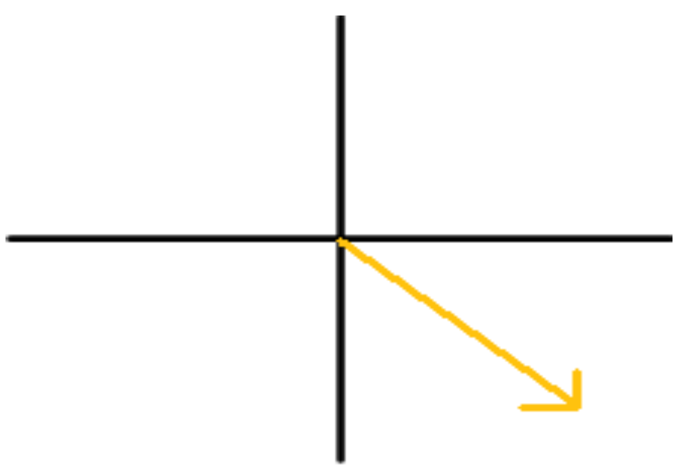


7. 270°

8. 45°

9. 135°

10. -180°

11. -45°

12. -315°

13. If you know an angle in negative degrees, add it to 360° to find the angle in positive degrees. If you know the angle in positive degrees, add it to -360° to find the angle in negative degrees.

14. 240°

15. 30°

1.16 Coterminal Angles

Answers

1. Yes

2. No

3. Yes

4. Yes

5. No

6. 270°, -90°, 630°

7. 45°, -315°, 405°

8. 135°, 495°, 855°

9. 180°, -180°, 540°

10. 315°, -45°, 675°

11. 210°, -150°

12. 120°, -240°

13. 330°, -30°

14. One possibility is to draw both of them and see if they are in the same place. You can also see if their difference is a multiple of 360 (if it is, then they are co-terminal, if it is not, then they are not co-terminal).

15. 13 full rotations

1.17 Trigonometric Functions and Angles of Rotation

Answers

1. $\sin 0° = 0, \cos 0° = 1, \tan 0° = 0, \csc 0° = undefined, \sec 0° = 1, \cot 0° = undefined.$

2. $\sin 90° = 1, \cos 90° = 0, \tan 90° = undefined, \csc 90° = 1, \sec 90° = undefined\ , \cot 90° = 0.$

3. $\sin 180° = 0, \cos 180° = -1, \tan 180° = 0, \csc 180° = undefined, \sec 18\,0° = -1, \cot 180° = undefined$

4. $\sin 270° = -1, \cos 270° = 0, \tan 270° = undefined, \csc 270° = -1, \sec 270° = undefined,$ $\cot 270° = 0.$

5. $\frac{\sqrt{2}}{2}$

6. $\frac{\sqrt{2}}{2}$

7. 1

8. $-\frac{2\sqrt{3}}{3}$

9. $\sqrt{3}$

10. 2

11. $-\frac{\sqrt{3}}{2}$

12. $-\frac{\sqrt{3}}{2}$

13. 0.968

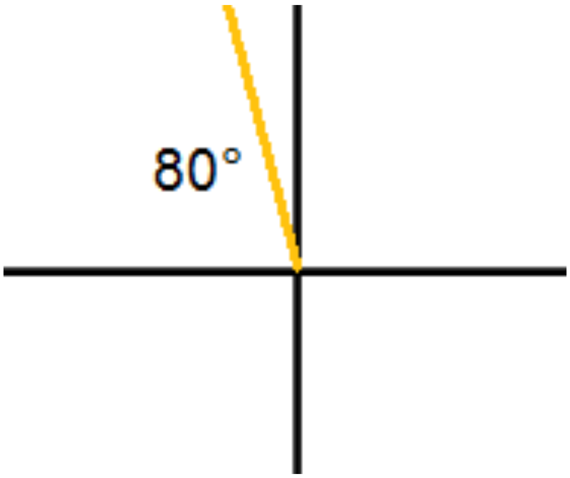
14. 0.6

15. 0.989

1.18 Reference Angles and Angles in the Unit Circle

Answers

1.



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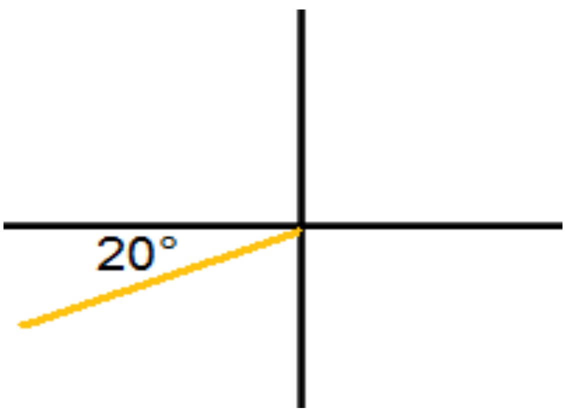

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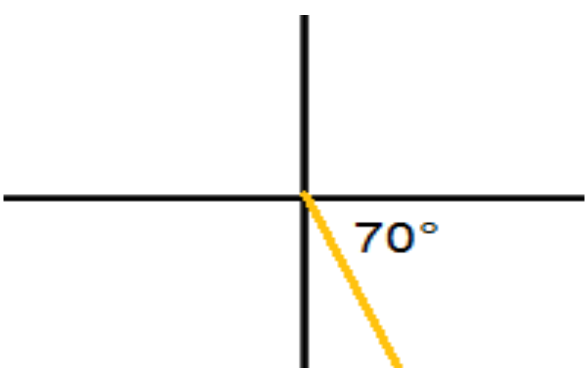


4. $\frac{\sqrt{3}}{2}$

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

6. $\frac{2\sqrt{3}}{3}$

7. $-\frac{\sqrt{2}}{2}$

8. $\frac{\sqrt{2}}{2}$

9. -1

10. $-\frac{1}{2}$

11. $-\frac{\sqrt{3}}{2}$

12. $\sqrt{3}$

13. $-\frac{\sqrt{2}}{2}$

14. $-\frac{\sqrt{2}}{2}$

15. $-\sqrt{2}$

1.19 Trigonometric Functions of Negative Angles

Answers

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

2. $-\frac{1}{2}$

3. $\sqrt{3}$

4. $-\frac{2\sqrt{3}}{3}$

5. -2

6. $\frac{\sqrt{3}}{3}$

7. $-\sqrt{2}$

8. $\sqrt{2}$

9. -1

10. $-\frac{\sqrt{2}}{2}$

11. $\sqrt{2}$

12. $-\sqrt{2}$

13. $-\frac{\sqrt{3}}{3}$

14. 1

15. undefined

1.20 Trigonometric Functions of Angles Greater than 360 Degrees

Answers

1. $\frac{\sqrt{2}}{2}$

2. 0

3. undefined

4. undefined

5. $\sqrt{2}$

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

7. $-\frac{\sqrt{2}}{2}$

8. $-\frac{\sqrt{3}}{2}$

9. -1

10. 1

11. 0

12. undefined

13. undefined

14. $\sqrt{3}$

15. $-\frac{\sqrt{2}}{2}$

16. $-\frac{\sqrt{3}}{3}$

17. Find the co-terminal angle that is less than 360 degrees and evaluate that angle for the given function.

1.21 Reciprocal Identities

Answers

1. cosine

2. tangent

3. cosecant

4. 2

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

6. 1

7. $\frac{\sqrt{2}}{2}$

8. $\frac{1}{2}$

9. -1

10. $\frac{2\sqrt{3}}{3}$

11. undefined

12. 0

13. $\frac{\sqrt{3}}{2}$

14. $-\frac{\sqrt{3}}{2}$

15. $\frac{\sqrt{2}}{2}$

1.22 Domain, Range, and Signs of Trigonometric Functions

Answers

1. 1^{st} and 2^{nd} quadrants

2. 2^{nd} and 4^{th} quadrants

3. 2^{nd} and 3^{rd} quadrants

4. 1^{st} and 3^{rd} quadrants

5. Multiples of 180°

6. positive

7. positive

8. negative

9. positive

10. positive

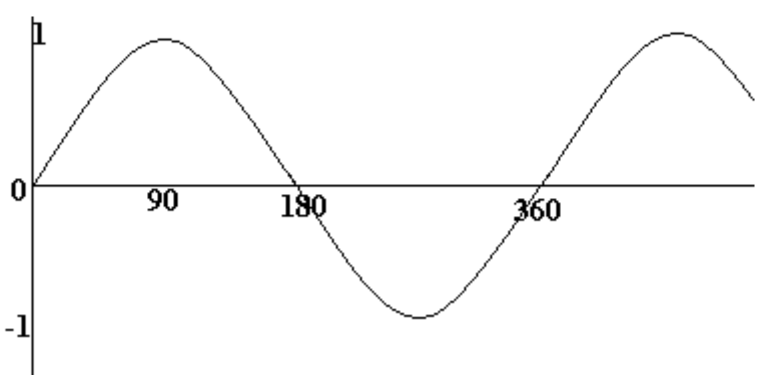
11. positive

12. positive

13. positive

14 . The cosecant function is the reciprocal of the sine function. The sine function is never undefined, so the cosecant function can never be equal to zero.

15.



1.23 Quotient Identities

Answers

1. $\cos\theta$

2. $\tan\theta$

3. $\cos\theta$

4. $\sin\theta$

5. $\frac{1}{5}$

6. $\frac{3}{4}$

7. $\frac{24}{7}$

8. $\frac{12}{35}$

9. $\frac{21}{20}$

10. $\frac{39}{80}$

11. $\frac{55}{48}$

12. $\frac{65}{72}$

13. $\frac{\sqrt{3}}{2}$

14. 0

15. $\frac{\sqrt{2}}{2}$

1.24 Cofunction Identities and Reflection

Answers

1. 75°

2. 35°

3. 10°

4. 60°

5. $\cot 15°$

6. $\cos 30°$

7. sin 40°

8. tan 10°

9. sin 10°

10. cot 30°

11. cos 10°

12. sin 20°

13. tan 30°

14. In a right triangle, θ and $90° - \theta$ are the two non-right angles. If the two legs of the triangle are a and b and the hypotenuse is c such that $\sin\theta = \frac{a}{c}$, then $\cos\theta = \frac{b}{c}$, $\sin(90° - \theta) = \frac{b}{c}$, *and* $\cos(90° - \theta) = \frac{a}{c}$.

15. $\tan(90° - \theta) = \frac{\sin(90° - \theta)}{\cos(90° - \theta)} = \frac{\cos\theta}{\sin\theta} = \cot\theta$

1.25 Pythagorean Identities

Answers

1. cosθ

2. tanθ

3. cscθ

4. secθ

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

6. $\frac{\sqrt{2}}{2}$

7. $\sqrt{2}$

8. 1

9. $\sqrt{3}$

10. 2

11. $\frac{\sqrt{15}}{4}$

12. $2\sqrt{2}$

13. $\frac{\sqrt{24}}{5}$

14. $\frac{2\sqrt{3}}{3}$

15. Divide all terms by $\cos^2\theta$ to obtain $(\sin^2\theta)/(\cos^2\theta) + (\cos^2\theta)/(\cos^2\theta) = 1/(\cos^2\theta)$. Simplify and you have $\tan^2\theta + 1 = \sec^2\theta$.