Arcs and Sectors in Circles

1. A sector in a circle is subtended by a central angle of $40°$. The area of the sector is $48\ \mathrm{m}^2$. Find the radius of the circle. Solution
2. Consider the triangle with sides 8, 16, and 17 units long. Is it a right triangle? Solution
3. Find the exact value of the distance between the points $A\,(3,-6)$ and $B\,(-3,1)$. Solution
4. Two sides of a right triangle are 9 and 40 units long. Find the exact value of the third side. Solution
5. Find the exact value of the height of the regular triangle with sides 14 units long. Solution
6. The base of a straight pyramid is a square with sides 14 units long. All other edges are 20 units long. Find the exact value of the height of the pyramid. Solution
7. The hypotenuse of a right triangle is $34\ \mathrm{cm}$ long. The difference between the other two sides is $14\ \mathrm{cm}$. Find the sides of the triangle. Solution
8. The shortest side of a right triangle is 24 miles long. The difference between the other two sides is 4 miles. Find the missing sides. Solution
9. Find the perimeter and area of the parallelogram determined by the points $A\,(-2,-3)$, $B\,(21,-3)$, $C\,(5,9)$, and $D\,(-18,9)$. Solution

Right Triangle Trigonometry

10. Find the exact value of all six trigonometric functions values of β in a right triangle in which $a = 28\ \mathrm{cm}$ and $b = 45\ \mathrm{cm}$. Solution
11. Suppose that C is the center of a circle with radius $2\ \mathrm{in}$ and a point P is at a distance of $17\mathrm{in}$ from C. Find an approximate value of the measure of the angle (in degrees) formed by the two tangent lines drawn to the circle from P. Solution

Radian Measure of Angles

Unit Circle Trigonometry Definitions

Part 1. Scaling Down Right Triangles

Part 2. Rotational Angles

Part 3. Unit Circle Definition of Sine and Cosine

All Together (This is another lecture)

12. Find the exact value of $\sin\alpha$ if we know that $\tan\alpha = -2$. Solution
13. Prove that the following is true for all triangles. If α, β, and γ are angles in the triangle, then $\sin(\alpha+\beta) = \sin\gamma$. Solution
14. Solve the given equations.
    a) $\sin\alpha + 1 = 2\cos^2\alpha$ Solution
    b) $\sin\gamma = \cos 2\gamma$ Solution
    c) $-\cos\alpha = \sin 2\alpha$ Solution

15. Find $\sin\alpha$ if we know that

    a) $\tan\alpha = -2$

    b) $\tan\alpha = -2$ and α is not in the 2nd quadrant. Solution

Trigonometric Identities 2

Proving the Law of Cosines

Proving the Sum Formulas Using Vectors

Deriving All Other Compound Angle Formulas

16. Simplify the given expression.
    $\dfrac{\tan 32^\circ + \tan 28^\circ}{1 - \tan 32^\circ \tan 28^\circ}$ Solution

17. Suppose that α is an angle such that $\sin\alpha = \dfrac{15}{17}$ and α is not in the second quadrant. Compute the exact value of $\sin 2\alpha$. Solution

18. Suppose that α is an angle such that $\sin\alpha = -\dfrac{5}{13}$ and α is not in the fourth quadrant. Compute the exact value of $\cos 2\alpha$. Solution

19. Suppose that α is an angle such that $\sin\alpha = -\dfrac{12}{13}$ and α is not in the third quadrant. Compute the exact value of $\tan 2\alpha$. Solution

20. Find an equation for the line that bisects the angle formed between the line $y = \dfrac{45}{28}x$ and the positive part of the x-axis. Solution

21. Prove each of the given identities.

    a) $\tan\alpha = \dfrac{\sin 2\alpha}{1 + \cos 2\alpha}$ Solution

    b) $\dfrac{\cos 2\alpha}{1 + \cos 2\alpha} = \dfrac{\tan\alpha}{\tan 2\alpha}$ Solution

    c) $\dfrac{1 + \cos 2\alpha}{\sin 2\alpha} = \cot\alpha$ Solution

Sum-Product Identities

22. Suppose that C is the center of a circle with radius 9in and a point P is at a distance of 14in from C. Find exact value of sine of the angle that is formed by two tangent lines drawn to the circle. Solution

23. Suppose that one angle in a right triangle is 24°. Find all the sides if we also know that the perimeter of the triangle is 24 units. Solution

24. Suppose that α, β, and γ are the three angles in a triangle, opposite sides a, b, and c, correspondingly. Prove that if $\dfrac{\sin^2\alpha}{\cos\alpha} = \dfrac{a^2}{bc}$, then the triangle has a right angle. Solution

25. Compute the radii of the inscribed and superscribed circle for the triangle with sides 12, 16, and 20 units long. Solution

26. Compute the radii of the inscribed and superscribed circle for the triangle with sides 12, 20, and 20 units long.
    Solution

    Proving The Area Formula $A = \frac{1}{2}R^2\left(\sin 2\alpha + \sin 2\beta + \sin 2\gamma\right)$

    Inverse Trigonometric Functions - Part 1, Part 2

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