1. Express \( \frac{3}{4} \) radians in degrees.

2. What is the image of point \( A(1,3) \) after a dilation with the center at the origin and a scale factor of 4?

3. In the accompanying diagram of circle \( O \), \( \angle B = 260^\circ \). What is \( \angle ABC \)?

![Diagram](image1)

4. Solve for \( x \): \( 4^{2x} = 2^{(6x-8)} \)

5. If 0.0435 is written as \( 4.35 \times 10^n \), what is the value of \( n \)?

6. If \( f(x) = x^2 + 27 \), find \( f(4) \) in simplest form.

7. Express \( \sqrt[3]{-27} + \sqrt[4]{12} \) as a monomial in terms of \( i \).

8. If \( f(x) = \frac{x^3}{3} \) and \( g(x) = \frac{3}{x} \), find \( f(g(9)) \).

9. Evaluate:

\[
\sum_{k=3}^{6} \frac{1}{2} k^2
\]

10. Find the sum of the roots of the equation \( x^2 + 7x - 8 = 0 \).

11. In \( \triangle RST \), \( \sin T = \frac{2}{3} \), \( \angle R = 30^\circ \), and \( r = 15 \). What is the length of \( r \)?

12. In the accompanying diagram of circle \( O \), chords \( AB \) and \( CD \) intersect at \( E \), \( AE = 5 \), \( CD = 18 \), and \( ED = 8 \). Find the length of \( EB \).

![Diagram](image2)

13. Express in simplest form:

\[
\frac{x - \frac{1}{x}}{1 + \frac{1}{x}}
\]

14. What is the greatest value of \( c \) for which the roots of the equation \( x^2 + 4x + c = 0 \) are real?

15. Express \( \sin 150^\circ \) as a function of a positive acute angle.

16. In \( \triangle DEF \), \( \angle D = 40^\circ \), \( DE = 12 \) meters, and \( DF = 8 \) meters. Find the area of \( \triangle DEF \) to the nearest tenth of a square meter.

17. For which value of \( x \) is the expression \( \frac{(1 - \sin x)(1 + \sin x)}{\cos x} \) undefined?

   (1) \( 0^\circ \)   (2) \( 45^\circ \)   (3) \( 90^\circ \)   (4) \( 180^\circ \)

18. What are the coordinates of \( P' \), the image of \( P(-1,4) \) after a reflection in the line \( x = 2 \)?

   (1) (4,1)   (2) (–1,1)   (3) (0,4)   (4) (5,4)

19. The students’ scores on a standardized test with a normal distribution have a mean of 500 and a standard deviation of 40. What percent of the students scored between 420 and 580?

   (1) 47.5%   (2) 68%   (3) 95%   (4) 99.5%

20. Which trigonometric function is positive in Quadrant IV?

   (1) \( \sin x \)   (2) \( \sec x \)   (3) \( \csc x \)   (4) \( \cot x \)

21. The expression \( \frac{\sqrt{x}}{\sqrt{x} - 1} \) is equivalent to

   (1) \( x + \sqrt{x} \)   (2) \( \frac{\sqrt{x}}{\sqrt{x} - 1} \)   (3) \( \frac{x - 1}{x} \)   (4) \( 1 - \sqrt{x} \)

22. What is the solution set of the equation \( |x - 6| + 4 = 10 \)?

   (1) \{0,12\}   (2) \{–8,12\}   (3) \{–12,0\}   (4) \{–12,–8\}

23. What is the period of the graph of the equation \( y = 2 \sin \frac{3x}{3} \)?

   (1) \( \frac{2\pi}{3} \)   (2) 2   (3) \( \frac{3}{3} \)   (4) \( \pi \)
24. What is the value of \( x \) in the equation \( x = 2 \text{Arc sin } \frac{1}{2} \)?

(1) \( \frac{\pi}{6} \)  
(3) \( \frac{\pi}{3} \)  
(2) \( \frac{\pi}{2} \)  
(4) \( \frac{\pi}{4} \)

25. The expression \( \sin 2A - 2 \sin A \) is equivalent to

(1) \( (\sin A)(\sin A - 2) \)  
(3) \( (\sin A)(2 \cos A - 1) \)  
(2) \( (2 \sin A)(\sin A - 1) \)  
(4) \( (2 \sin A)(\cos A - 1) \)

26. The expression \( 2 \log x - 3 \log y \) is equivalent to

(1) \( \log \frac{2x}{3y} \)  
(3) \( \log \frac{x^2}{y^3} \)  
(2) \( \log x^2y^3 \)  
(4) \( \frac{2}{3} \log \frac{x}{y} \)

27. What is the domain of the function

\[ f(x) = \sqrt{\frac{4}{2x-1}} \] 

over the set of real numbers?

(1) \( \{x|x = i\} \)  
(3) \( \{x|x < i\} \)  
(2) \( \{x|x & i\} \)  
(4) \( \{x|x > i\} \)

28. The solution of \( \log_a 8 = 2 \) is

(1) \( x < 2 \)  
(3) \( 3 < x < 4 \)  
(2) \( 2 < x < 3 \)  
(4) \( x > 4 \)

29. Which statement is true if \( r \) varies inversely as \( s \)?

(1) Their difference will be constant.  
(2) Their sum will be constant.  
(3) Their quotient will be constant.  
(4) Their product will be constant.

30. Which two values of \( x \) satisfy the equation

\[ \sqrt{3 - 2 \cos x} = 2 ? \]

(1) \( 150^\circ \) and \( 210^\circ \)  
(3) \( 60^\circ \) and \( 300^\circ \)  
(2) \( 120^\circ \) and \( 240^\circ \)  
(4) \( 30^\circ \) and \( 330^\circ \)

31. Which statement best describes a triangle that can be constructed if \( \text{mA} = 30 \), \( a = \overline{EF} \), and \( b = \overline{JI} \)?

(1) It is a right triangle.  
(3) It is not unique.  
(2) It is an obtuse triangle.  
(4) It cannot be constructed.

32. What is the solution set of the inequality \( x^2 - x > 20? \)

(1) \( \{x >5\} \)  
(3) \( \{x > 5 \text{ or } x < -4\} \)  
(2) \( \{-4 < x < 5\} \)  
(4) \( \{x > 0\} \)

33. What is the solution set of the equation \( x^2 + 9 = 0? \)

(1) \( \{3,-3\} \)  
(3) \( \{-3,-3i\} \)  
(2) \( \{3i,-3i\} \)  
(4) \( \{ \} \)

34. In the accompanying diagram, \( TS \) is tangent to unit circle \( O \) at \( S \), \( PR \); \( OS \), and \( TS \); \( OS \)

Which line segment represents \( \sin \theta \)?

(1) \( OR \)  
(3) \( TS \)  
(2) \( OS \)  
(4) \( PR \)

35. The third term in the expansion of \( (x - 2y)^6 \) is

(1) \( 60x^4y^2 \)  
(3) \( 15x^3y^3 \)  
(2) \( 60x^3y^4 \)  
(4) \( -15x^3y^4 \)

36. \( a \) On the same set of axes, sketch and label the graphs of the equations \( y = -4 \cos x \) and \( y = \tan x \) in the interval \( -\pi \leq x \leq \pi \).

\( b \) Using the graphs sketched in part \( a \), determine the number of values of \( x \) in the interval \( -\pi \leq x \leq \pi \) that satisfy the equation \( -4 \cos x = \tan x \).

37. \( a \) On graph paper, sketch and label the graph of the equation \( y = -2^x \).

\( b \) On the same set of axes, reflect the graph drawn in part \( a \) in the line \( y = -x \) and label it \( b \).

\( c \) Write an equation of the graph drawn in part \( b \).

38. Express in simplest form:

\[ \frac{4x^2 - 100}{x^2 + x - 6} + \frac{20 - 4x}{2x^2 - 9x + 10} \]

39. Express the roots of the equation \( -6x = 2x^2 + 5 \) in simplest \( a + bi \) form.

40. Two forces of 80 pounds and 100 pounds yield a resultant force of 60 pounds. Find, to the nearest ten minutes or the nearest tenth of a degree, the angle between the two forces.

41. Prove the following identity:

\[ \frac{(\sin x + \cos x)^2 - 1}{\cos x} = (\sin 2x)(\tan x)(\csc x) \]
42. A factory that produces light bulbs determined that $\frac{1}{3}$ of all light bulbs it produces are defective.

a. If four light bulbs are selected at random, what is the probability that
   (1) no bulb selected is defective
   (2) at least three bulbs selected are defective

b. The table below shows the number of defective light bulbs that were found in 20 random samples of 40 light bulbs.

<table>
<thead>
<tr>
<th>$x_i$</th>
<th>$f_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

(1) Find the standard deviation of this set of numbers to the nearest tenth.
(2) How many samples fell within one standard deviation of the mean?

43. Find, to the nearest ten minutes or the nearest tenth of a degree, all values of $\theta$ in the interval $0^\circ \leq \theta \leq 360^\circ$ that satisfy the equation $4 \cos^2 \theta = 3 + 3 \sin \theta$.

44. In the accompanying diagram of circle $O$, secant $ABP$, secant $CDP$, and chord $AC$ are drawn; chords $AD$ and $BC$ intersect at $E$, tangent $GF$ intersects circle $O$ at $C$, and $m \angle GCF = 8:2:5:3$.

Find:

a. $m \angle GCO$
b. $m \angle ACB$
c. $m \angle P$
d. $m \angle AEB$
e. $m \angle DCF$
1. 75
2. (4,12)
3. 50
4. 4
5. –2
6. 11
7. 17
8. 3
9. 43
10. –7
11. 6
12. 16
13. x – 1
14. 4
15. sin 30º or cos 60º
16. 30.9
17. _______3
18. _______4
19. _______3
20. _______2
21. _______2
22. _______1
23. _______1
24. _______3
25. _______4
26. _______3
27. _______4
28. _______2
29. _______4
30. _______2
31. _______1
32. _______3
33. _______2
34. _______4
35. _______1
36. b 2
37. c x = 2^y
38. \( \frac{-(2x - 5)(x + 5)}{x + 3} \)
39. \( -1 \) \( i \)
40. 143.1º or 143º10'
41. proof
42. a (1) \( \frac{8561}{10000} \) (2) \( \frac{57}{10000} \) b (1) 2.6 (2) 12
43. 14.5º, 165.5º, 270º or 14º30', 165º30', 270º
44. a 60 b 80 c 10 d 130 e 50
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