1. Describe a single transformation that is a composition of the following pair of transformations: A translation \((x, y) \rightarrow (x - 5, y - 3)\) followed by a translation \((x, y) \rightarrow (x - 4, y - 2)\).
   
   - A translation \((x, y) \rightarrow (x - 1, y - 5)\)
   - B translation \((x, y) \rightarrow (x - 9, y - 5)\)
   - C translation \((x, y) \rightarrow (x - 9, y - 1)\)
   - D translation \((x, y) \rightarrow (x - 1, y - 1)\)

2. Reflect the figure below across the \(y\)-axis. What are the new coordinates of Point \(B\)?

   \(A\) \((-2, 2)\)
   \(B\) \((-2, -2)\)
   \(C\) \((-2, 1)\)
   \(D\) \((2, -2)\)

3. If you rotated \(\overline{AB}\) 90 degrees around Point \(A\) the same way the hands of a clock move, what would be the coordinates of Point \(A'\)?

   \(A\) \((-1, 0)\)
   \(B\) \((0, 0)\)
   \(C\) \((0, -1)\)
   \(D\) \((2, -1)\)

4. Which type of symmetry does the pear below have?

   - F rotational symmetry
   - G reflectional symmetry
   - H both
   - J neither
5. Which type of symmetry does the tennis racket have?

- A rotational symmetry
- B reflectional symmetry
- C both
- D neither

6. Which type of symmetry does the coffee mug below have?

- F rotational symmetry
- G reflectional symmetry
- H both
- J neither

7. A dilation has center (0, 0). What is the image of $H(-2, 4)$ for scale factor 1.5?

- A $H'(3, 6)$
- B $H'(-3, 6)$
- C $H'(-0.05, 5.5)$
- D $H'(-\frac{4}{3}, \frac{8}{3})$

8. N-scale model trains have a scale factor 1 : 160. An N-scale model engine measures 3.75 in. What is the length of the actual engine?

- F 163.75 in.
- G 60 in.
- H $42\frac{2}{3}$ ft
- J 600 in.

9. $P'Q'R'S'$ is a dilation of $PQRS$. Describe the dilation.

- A enlargement; center $P$; scale factor 2
- B enlargement; center $O$; scale factor 2
- C reduction; center $P$; scale factor $\frac{1}{2}$
- D reduction; center $O$; scale factor $\frac{1}{2}$

10. Find the glide reflection image of $P(4, 1)$ for the translation $(x, y) \rightarrow (x - 2, y + 2)$ and reflection across $x = 0$.

- F $P'(-2, 3)$
- G $P'(-6, 3)$
- H $P'(2, -3)$
- J $P'(0, 3)$
11. Identify the mapping of \( \triangle UVW \) to \( \triangle U'V'W' \).

A glide reflection; \((x, y) \rightarrow (x + 2, y); x = 0\)
B translation; \((x, y) \rightarrow (x + 4, y)\)
C reflection; \(x = 1\)
D rotation; center \((1, 1)\); \(\angle\) of rotation \(180^\circ\)

12. Which of the following mappings of is not the result of just a single rotation?

F OPEN
G OPEN
H OPEN
J OPEN

13. Which of the following polygons will not tessellate?

A triangle
B octagon
C parallelogram
D hexagon

14. Which of the following regular polygons can tessellate?

F heptagon
G nonagon
H hexagon
J decagon

15. Joey is planning to tile his bathroom floor. If he wants to construct a repeating pattern that will cover the floor without gaps or overlaps, which tile shape will always work?

A triangle
B hexagon
C pentagon
D heptagon

16. Arkansas is approximately the shape of a trapezoid with bases of 250 miles and 190 miles and a height of 242 miles. What is the approximate area of Arkansas?

F 26,620 square miles
G 53,240 square miles
H 106,405 square miles
J 5,747,500 square miles
17. What is the area of the kite shown below?

A 12 square units
B 24 square units
C 30 square units
D 36 square units

18. The apothem of a regular hexagon is $5\sqrt{3}$. Find the area of the hexagon.

F $75\sqrt{3}$
G $150\sqrt{3}$
H 300
J $300\sqrt{3}$

19. What is the area of the regular pentagon?

$10\text{ in.}$

A about 345 in.$^2$
B about 180 in.$^2$
C about 172.5 in.$^2$
D about 90.5 in.$^2$

20. What is the perimeter of the regular octagon?

$8\text{ cm}$

F about 18 cm
G about 39 cm
H about 49 cm
J about 118 cm
21. What is the area of the regular dodecagon?

A  about 53.9 ft²  
B  about 107.9 ft²  
C  about 139.2 ft²  
D  about 171.1 ft²

22. The area of two similar pentagons are 48 in.² and 75 in.². What is the ratio of their sides?

F  16 : 25  
G  1 : 3  
H  4 : 5  
J  48 : 75

23. Two equilateral triangles have sides of lengths 7 cm and 11 cm. What is the ratio of their perimeters?

A  \( \frac{7}{11} \)  
B  \( \frac{7}{77} \)  
C  \( \frac{11}{77} \)  
D  \( \frac{49}{121} \)

24. The package of a model car states that the ratio of the length of the model to the length of a real car is 1 : 25. What is the ratio of the amount of paint required to cover the model to the amount required to cover the real car?

F  1 : 25  
G  1 : 50  
H  1 : 625  
J  1 : 15,625

25. Find the area of sector TOP. Round your answer to the nearest tenth.

A  19.8 in.²  
B  138.5 in.²  
C  9.9 in.²  
D  277.1 in.²

26. The radius of a circle is 63 cm. What is the length of an arc of 120°?

F  36.75\pi \text{ cm}  
G  2315.35\pi \text{ cm}  
H  73.5\pi \text{ cm}  
J  42\pi \text{ cm}
27. The percent of each type of book sold yesterday is shown in the table. If this information were organized in a circle graph, what would be the measure of the central angle for romance?

<table>
<thead>
<tr>
<th>Book Type</th>
<th>% of Books</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mystery</td>
<td>19</td>
</tr>
<tr>
<td>Romance</td>
<td>10</td>
</tr>
<tr>
<td>Science</td>
<td>16</td>
</tr>
<tr>
<td>Fiction</td>
<td>42</td>
</tr>
<tr>
<td>Nonfiction</td>
<td>13</td>
</tr>
</tbody>
</table>

A. 72  
B. 36  
C. 18  
D. 10

28. Assume that a dart you throw hits the dartboard shown and is equally likely to hit any spot on the board. Find the probability of hitting the shaded region.

29. A square dart board at a carnival has a target that is shaped like a regular hexagon. Since few players were winning, the size of the target was increased as shown. What is the probability that a dart that hits the new board lands on the target?

Old Board

New Board

A. 30%  
B. 43%  
C. 54%  
D. 65%

30. Four circles, each of radius 7 inches, are packed in a square as shown. If you throw a dart and hit the square target, what is the probability that your dart will land inside one of the circles? Express your answer as a percent to the nearest tenth.

F. 67.5%  
G. 78.5%  
H. 75.0%  
J. 50.0%
31. Find the number of faces in a polyhedron made up of 9 edges and 5 vertices using Euler’s formula.
   A 6  
   B 7  
   C 12  
   D 14

32. Use Euler’s formula to find the number of edges in the polyhedron made up of 5 faces: 2 triangles and 3 rectangles.
   F 6  
   G 7  
   H 8  
   J 9

33. Find the number of vertices in the polyhedron made up of 12 faces: 2 decagons and 10 rectangles.
   A 22  
   B 20  
   C 14  
   D 12

34. Suppose you are building a storage box with a volume of 4368 cubic inches. The box will be 24 inches long. The height of the box will be 1 inch more than its width. Find the width of the box in inches.
   F 12 inches  
   G 13 inches  
   H 14 inches  
   J 15 inches

35. The surface area of a cone is $600\pi$ square inches. If the lateral area of the cone is $375\pi$ square inches, what is the radius of the base?
   A 15 inches  
   B $15\pi$ inches  
   C 25 inches  
   D $225\pi$ inches

36. Rhonda is blowing up a balloon. The radius $r$, in centimeters, of the balloon is given by $r = \sqrt[3]{45t}$, where $t$ is the time in seconds since she began.

   Find the volume of the balloon after 20 seconds.
   F 972  
   G $972\pi$  
   H 1200  
   J $1200\pi$
37. A given tangent to a sphere intersects how many great circles of the sphere?
   A 0
   B 1
   C 2
   D infinitely many

38. Jason bought a bowling ball that had a diameter of about 8.75 in. What is the surface area of the bowling ball rounded to the nearest tenth of a square inch?
   F 2806.2 in.²
   G 701.6 in.²
   H 350.8 in.²
   J 240.5 in.²

39. Points A and B are on sphere O. What is the best description of a segment with endpoints at A and B and that passes through the center of the sphere?
   A chord
   B secant
   C diameter
   D tangent