Math: Additional Topics in Math
Practice for the New SAT (2016)
Problem Set 4: 8 Questions
(Math: Additional Topics in Math)

1. The volume of a sphere is calculated using the formula $V = \frac{4}{3}\pi r^3$. A sphere with a diameter of 3 is inside a cube, and it touches the cube at six points. What is the volume of space in the cube that is not being occupied by the sphere?

   (A) $36\pi$
   (B) $36 - 4.5\pi$
   (C) $27 - 4.5\pi$
   (D) $9 - 4.5\pi$

2. The diagram above shows a tent supported by an inner pole. If $x = 60^\circ$, what is the height of the pole, $P$, in meters?

   (A) 1
   (B) 2
   (C) $\frac{4}{\sqrt{3}}$
   (D) $\frac{8}{\sqrt{3}}$

3. Simplify the following expression:

   $i^2 - 5i^3$

   (A) $1 - 5i$
   (B) $5i - 1$
   (C) $6i$
   (D) -4

4. A circle has a radius of 1. A sector of the circle has an arc length of $\pi/3$. How many degrees is the central angle of the sector?
5. The center of the circle above is point \( N \), and its diameter is 10. Points \( J, N, \) and \( M \) lie on a line. What is the area of the shaded sector?

(A) \( \frac{100\pi}{6} \)
(B) \( \frac{100\pi}{3} \)
(C) \( \frac{25\pi}{3} \)
(D) \( 25\pi \)

6. In the figure above, \( z = 30^\circ, B = 10, \) and \( C = 30 \). What is the value of \( A \)?

(A) \( 15 + \frac{10}{\sqrt{2}} \)
(B) \( 15 + \frac{10}{\sqrt{3}} \)
(C) \( 10 + \frac{15}{\sqrt{3}} \)
(D) \( 10 + \frac{20}{\sqrt{3}} \)

7. A pole is 30 feet tall. In the diagram above, the pole casts a shadow at an angle of \( \pi/6 \) radians from the top of the pole. What is the length in feet of the pole’s shadow?

(A) \( 30 \times \tan\left(\frac{\pi}{6}\right) \)
(B) \( \tan\left(\frac{\pi}{6}\right) + 30 \)
(C) \( 30 \times \sin\left(\frac{\pi}{6}\right) \)
(D) \( \cos\left(\frac{\pi}{6}\right) + 30 \)

8. A circle is defined by the equation \((x - 1)^2 + (y - 2)^2 = 36\). The center of the circle has coordinates \((j, k)\). What is the value of \( j \)?
## Summary

| 8 Questions | 0 Easy, 2 Medium, 6 Hard | Estimated Time: 20 minutes |

## Answers

<table>
<thead>
<tr>
<th>Answers</th>
<th>Difficulty</th>
<th>Topic</th>
<th>Other Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) C</td>
<td>Medium</td>
<td>Solve problems using volume formulas.</td>
<td></td>
</tr>
<tr>
<td>2) B</td>
<td>Hard</td>
<td>Use trigonometric ratios and the Pythagorean Theorem to solve applied problems involving right triangles.</td>
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<tr>
<td>3) B</td>
<td>Hard</td>
<td>Perform arithmetic operations on complex numbers.</td>
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<td>4) 60</td>
<td>Hard</td>
<td>Convert between degrees and radians and use radians to determine arc lengths.</td>
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<tr>
<td>5) C</td>
<td>Hard</td>
<td>Apply theorems about circles to find areas of sectors.</td>
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<tr>
<td>6) B</td>
<td>Medium</td>
<td>Use theorems about congruence and similarity to determine missing lengths of triangles.</td>
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</tr>
<tr>
<td>7) A</td>
<td>Hard</td>
<td>Use trigonometry and theorems about triangles to determine a missing length that would satisfy a given theorem.</td>
<td></td>
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<tr>
<td>8) 1</td>
<td>Hard</td>
<td>Use the properties of an equation of a circle to determine a property of the circle’s graph.</td>
<td></td>
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</tbody>
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