For all questions, answer choice "E. NOTA" means none of the above answers is correct

1.   The center of an 8-inch diameter circle is also a vertex of a square whose perimeter is 40 inches. What is the area of the region that is inside the square but outside the circle?

A. $100-16\pi$ 　　　B. $100-4\pi$ 　　　C. $1600-16\pi$ 　　　D. $100+16\pi$ 　　　E. NOTA

2.   The diameter of a sphere is 20 feet. What is the sum of the numerical values of its surface area (in square feet) and its volume (in cubic feet)?

A. $36800\pi/_3$ 　　　B. $16000\pi/_3$ 　　　C. $5200\pi/_3$ 　　　D. $4400\pi/_3$ 　　　E. NOTA

3. The diameter of a pitcher's mound is 18 feet. What is the circumference of the mound, in feet?

A. 9π 　　　B. 18π 　　　C. 27π 　　　D. 36π 　　　E. NOTA

4. A regular tetrahedron has a side length of 12. What is its volume?

A. $144\sqrt{2}$ 　　　B. $432\sqrt{3}$ 　　　C. $108\sqrt{2}$ 　　　D. $4608\sqrt{3}$ 　　　E. NOTA

5. A circle whose circumference is 40 has a 45° angle inscribed in it. A chord is drawn connecting the endpoints of the inscribed angle's arc to form a segment of the circle. What is the perimeter of that segment?

A. $\frac{40}{\pi} + 10$ 　　　B. $\frac{20}{\pi} + 5$ 　　　C. $\frac{40+20\sqrt{2}}{\pi}$ 　　　D. $\frac{20\sqrt{2}}{\pi} + 10$ 　　　E. NOTA

6.   If the volume of a sphere is $\frac{125\pi\sqrt{3}}{2}$ in^3, what is the surface area of the sphere's inscribed cube?

A. $125\ in^2$ 　　　B. $150\ in^2$ 　　　C. $75\pi\ in^2$ 　　　D. $125\pi\ in^2$ 　　　E. NOTA

7.   A cylindrical candle burns until its height is not changed but a hemisphere of wax is melted away. If the ratio of the radius of the candle to its height is 1:3 and the area of a cross-section perpendicular to its vertical axis is $9\pi\ in^2$, what is the sum of the numerical values of the used candle's volume (in in^3) and surface area (in in^2)?

A. 126π 　　　B. 90π 　　　C. 180π 　　　D. 144π 　　　E. NOTA

8.   One face of a regular hexahedron has perimeter 16 inches. What is the volume of the hexahedron?

A. $3\sqrt{3}/_2\ in^3$ 　　　B. $71\sqrt{3}/_{10}\ in^3$ 　　　C. $512\ in^3$ 　　　D. $64\ in^3$ 　　　E. NOTA

9.   If the area enclosed by a circle is $36\ in^2$, what is the perimeter of its semicircular segment?

A. $6\pi + 12\ in$ 　　　B. $6\pi\ in$ 　　　C. $\frac{6\sqrt{\pi}(\pi+2)}{\pi}\ in$ 　　　D. $18\sqrt{\pi}\ in$ 　　　E. NOTA

10. The space diagonal of a cube is $\sqrt{6}$ cm. What is the surface area of the cube?

A. $12\ cm^2$ B. $18\ cm^2$ C. $2\sqrt{2}\ cm^2$ D. $\sqrt{63}\ cm^2$ E. NOTA

11. The surface area of a sphere is 256π cm. What is the volume of the sphere?

A. $2176\pi/3\ cm^3$ B. $2048\pi/3\ cm^3$ C. $768\pi\ cm^3$ D. $4\pi\sqrt[3]{192^2}\ cm^3$ E. NOTA

12. The greatest distance between two vertices of a regular hexagon is 10 inches. What is the area enclosed by the hexagon?

A. $150\sqrt{3}\ in^2$ B. $75\sqrt{3}/2\ in^2$ C. $75\sqrt{3}\ in^2$ D. $150\ in^2$ E. NOTA

13. Two points on each side of a square divide the sides into equal thirds; connecting those points consecutively form an octagon. If a diagonal of the square has length 6, what is the perimeter of the octagon?

A. $8 + 8\sqrt{3}$ B. $8 + 4\sqrt{2}$ C. $24\sqrt{2}$ D. $12(\sqrt{6} + \sqrt{2})$ E. NOTA

14. A solid sphere is cut into two pieces by a great circle cross-section. If the volume of the sphere is $288\pi\ in^3$, what is the surface area of one of the pieces of the sphere?

A. $72\pi\ in^2$ B. $108\pi\ in^2$ C. $144\pi\ in^2$ D. $180\pi\ in^2$ E. NOTA

15. A regular hexagonal prism has volume $108\sqrt{3}\ in^3$ and height of 2 in. What is the surface area of the prism?

A. $108\sqrt{3}\ in^2$ B. $180\sqrt{3}\ in^2$ C. $188\sqrt{3} + 36in^2$ D. $108\sqrt{3} + 72in^2$ E. NOTA

16. A sphere has a great circle whose circumference is 14π. What is the volume of the sphere?

A. $1372\pi/3$ B. $10976\pi^4/3$ C. $196\pi^3$ D. $196\pi^3/3$ E. NOTA

17. A right circular cone with slant height $4\sqrt{10}$ in and a base area of $16\pi\ in^2$ has a cross-section that is parallel to the base and one third the distance from the tip of the cone to the base of the cone. What is the circumference of the cross-section?

A. $16\pi/9$ in   B. $4\sqrt{10}/3$ in   C. $64\pi/27$ in   D. $8\pi/3$ in   E. NOTA

18. A cylinder has base area 9π and height 9 is surmounted on one of its bases by a hemisphere to form a new solid. What is the sum of the numerical values of the volume and surface area of the new solid, using consistent units?

A. 99π B. 90π C. 108π D. 180π E. NOTA

19. If the surface area of a regular octahedron is $200\sqrt{3}\ in^2$, what is its volume?

A. $1000\sqrt{2}/_3\ in^3$ B. $2000\sqrt{2}/_3\ in^3$ C. $125\sqrt{6}\ in^3$ D. $250\sqrt{6}\ in^3$ E. NOTA

20. A 5-inch radius circle overlaps a single side of a square so that a 60°arc lies inside the square and the rest of the circle is outside the square. If the square has side length 8 in, what is the perimeter of the area that is inside the square but outside the circle?

A. $29 + 10\pi\ in$ B. $27 + 5\pi/_3\ in$ C. $24 + 5\sqrt{3}\ in$ D. $32 + 5\pi/_6\ in$ E. NOTA

21. A cylinder and cone each have based radius 5 inches and height 7 inches. What is the ratio of the cone's lateral area to the cylinder's lateral area?

A. $1:2$ B. $1:4$ C. $\sqrt{37}:7$ D. $\sqrt{74}:14$ E. NOTA

22. A region bounded by a square, whose enclosed area is 36 in^2, is revolved around one of its diagonals to sweep out a solid. What is the surface area of the solid?

A. $18\pi\ in^2$ B. $36\pi\ in^2$ C. $18\pi\sqrt{2}\ in^2$ D. $36\pi\sqrt{2}\ in^2$ E. NOTA

23. A conical tent is formed using a semicircular piece of canvas whose radius is 6 feet by connecting the two radius parts of the diameter of the piece of canvas. When placed on flat land, what is the volume enclosed by the tent?

A. $243\pi\sqrt{3}\ ft^3$ B. $81\pi\sqrt{3}\ ft^3$ C. $9\pi\sqrt{3}\ ft^3$ D. $3\pi\sqrt{3}\ ft^3$ E. NOTA

24. A solid metal cylinder whose base radius is 2 inches and height is 6 inches is melted down and reformed as a solid cone with radius 3 inches. What is the surface area of the cone?

A. $24\pi\ in^2$ B. $33\pi\ in^2$ C. $48\pi\ in^2$ D. $64\pi\ in^2$ E. NOTA

25. A cylinder is inscribed in a cube, meaning each base of the cylinder is inscribed in a face of the cube. If the cube has side length 6 inches, what is the volume of the portion of the cube that is not in the cylinder?

A. $216 - 54\pi\ in^3$ B. $27 - 8\pi\ in^3$ C. $216 - 18\pi\ in^3$ D. $27 - 18\pi\ in^3$ E. NOTA

26. A cone is inscribed in a regular square pyramid, meaning the base of the cone is inscribed in the base of the pyramid and the cone and the pyramid share the same vertex. If the pyramid has slant height 9 in and base edge of 6 in, what is the volume of the cone?

A. $9\pi\sqrt{3}\ in^3$ B. $18\pi\sqrt{2}\ in^3$ C. $3\pi\sqrt{17}\ in^3$ D. $216\pi\sqrt{3}\ in^3$ E. NOTA

27. A cylindrical tank, 20 feet long and 8 feet in diameter, is placed so that its axis is horizontal. When the tank is filled to a depth of 2 feet from the bottom of the tank, how many cubic feet of the liquid is in the tank?

A.
$$\frac{128\pi - 1920\sqrt{2}}{3}$$

B.
$$\frac{64\pi - 384\sqrt{2}}{3}$$

C.
$$\frac{320\pi - 120\sqrt{3}}{3}$$

D.
$$\frac{320\pi - 240\sqrt{3}}{3}$$

E. NOTA

28. A cylinder's lateral surface area is equal to the sum of the areas of its bases. If the cylinder has a 2-inch radius what is the perimeter of the right triangle whose legs are the diameter and the height of the cylinder?

A. $6 + 2\sqrt{5}$ in   B. $6 + 4\sqrt{5}$ in   C. $4 + 8\sqrt{2}$ in   D. 26 in   E. NOTA

29. A regular hexahedron is inscribed in a cylinder, meaning a face of the hexahedron is inscribed in each base of the cylinder. If the edge of the hexahedron is 3 inches, what is the sum of the surface areas of the regions not shared by the hexahedron and the cylinder, in square inches?

A. $18\pi\sqrt{2} - 54$ B. $18\pi\sqrt{2} - 18$ C. $18\pi\sqrt{2} - 9$ D. $54 + 9\pi\sqrt{2}$ E. NOTA

30. An equilateral triangular region with perimeter 12 inches is revolved around one of its sides to form a solid. What is the volume of the solid?

A. $8\pi \ in^3$ B. $16\pi \ in^3$ C. $\frac{16\pi\sqrt{2}}{3} \ in^3$ D. $\frac{16\pi\sqrt{3}}{2} \ in^3$ E. NOTA