

CPAV Test

[Circumference, Perimeter, Area, Volume]

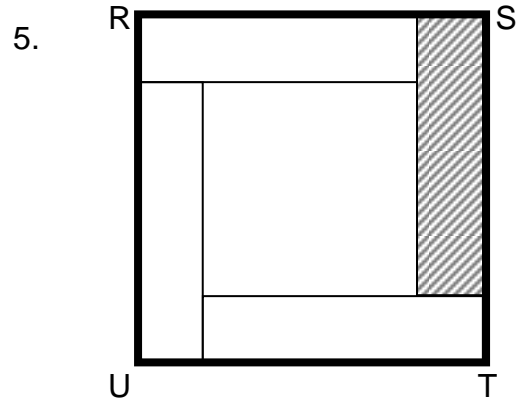
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NOTA in choice E of each question means “none of the above (answers)” and should be chosen if answers A, B, C and D are not correct.

Diagrams may not be drawn to scale.

If no units are given, then assume linear units are cm, area is square cm, and volume is cubic cm. Angle measures are in degrees.

1. A sphere has the same numerical surface area as its volume. That is, surface area is k square cm and volume is k cubic cm. What is the radius of the sphere, in cm?
A. 2 B. 3
C. 4 D. 9
E. NOTA
2. A triangle has side lengths $(4n+12)$ cm, $(3n+10)$ cm and $(5n-1)$ cm. If it has perimeter 261 cm then find the length of the triangle's longest side, in cm.
A. 101 B. 99
C. 70 D. 49
E. NOTA
3. The area of a regular hexagon is $150\sqrt{3}$ square cm. Find the length of its apothem in cm.
A. $5\sqrt{3}$ B. 10
C. $10\sqrt{3}$ D. 20
E. NOTA
4. A rhombus has perimeter 40 cm. If one of its diagonals has length 12 cm then find the length of the other diagonal, in cm.
A. 16 B. 14
C. 12 D. 10
E. NOTA



A square RSTU has in its interior four congruent rectangular regions. One of those regions is shaded. The four rectangles each have two sides on the side of RSTU. If the perimeter of the shaded rectangle is 28 cm, find the area of square RSTU in square cm.

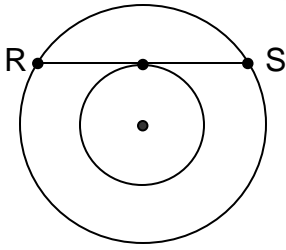
- A. 125 B. 139
C. 196 D. 225
E. NOTA
6. A right circular cone has height 12 cm and slant height 15 cm. Find its volume in cubic cm.
A. 405π B. 324π
C. 216π D. 196π
E. NOTA
 7. A sphere has surface area 40π square cm. What is the area of the Great Circle of the sphere, in square cm?
A. 4π B. 9π
C. 9.5π D. 10π
E. NOTA

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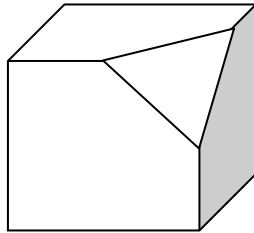
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8.



Two concentric circles are shown above. Chord \overline{RS} of the larger circle is tangent to the smaller circle. If $RS=12$ cm then find the area of that part of the interior of the larger circle that is in the exterior of the smaller circle, in square cm (the area of the annulus).

- A. 49π B. 36π
 C. 25π D. 16π
 E. NOTA



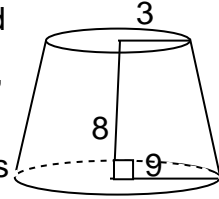
9. A cube has each side 20 cm. One "corner" of the cube is truncated (chopped off, ruthlessly and without concern for the cube's feelings) so that the vertices of the new face are each a midpoint of the cube's original sides. Now we have a solid with surface area $(a+b\sqrt{c})$ square cm, written in reduced radical form for a , b and c positive integers. Find $a+b+c$.

- A. 2453 B. 2387
 C. 2353 D. 2303
 E. NOTA

10. An isosceles trapezoid has bases 10 cm and 20 cm. It has height 12 cm. Find the perimeter in cm.

- A. 60 B. 58
 C. 56 D. 54
 E. NOTA

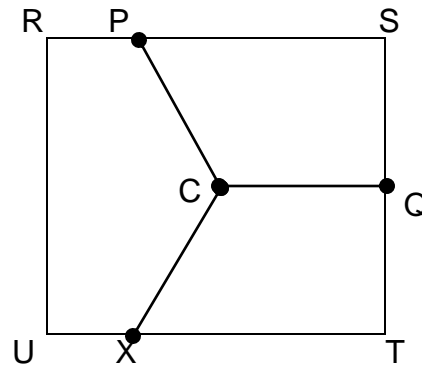
11. A right circular solid cone is truncated to create a "lampshade" figure (frustum) with parallel circular bases with radii 3 cm and



9 cm respectively. The distance between the bases is 8 cm. Find the total surface area of the new solid, in square cm.

- A. 240π B. 210π
 C. 132π D. 120π
 E. NOTA

12.



Square RSTU has each side 2 cm. C is the center of the square. Q is the midpoint of \overline{ST} . P and X are on the sides of the square so $PC=XC$. The two congruent trapezoids and the pentagon RPCXU have equal areas.

Find the length of \overline{PS} in cm.

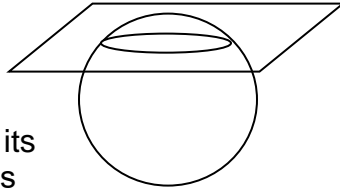
- A. $\frac{3}{2}$ B. $\frac{4}{3}$
 C. $\frac{5}{3}$ D. $\frac{7}{5}$
 E. NOTA

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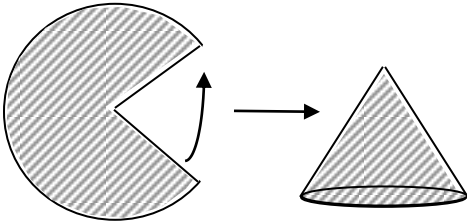
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13. A solid sphere has a 13 cm radius. A plane intersects the sphere 12 cm from its center at the plane's closest point to the sphere's center. Find the area of the circular cross section of the sphere that the plane determines, in square cm.



- A. 12.5π B. 18π
 C. 25π D. 36π
 E. NOTA

14.



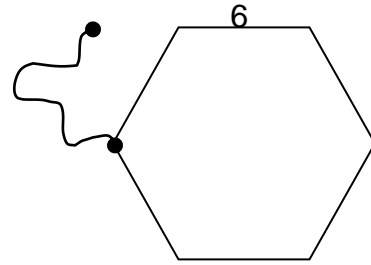
A 288 degree sector of a circle of radius 10 cm is shown. The two radii drawn are brought together to create a cone's lateral surface. Find the volume of the cone that is formed, in cubic cm.

- A. 128π B. 144π
 C. 156π D. 162π
 E. NOTA

15. A regular pentagon has one side of length 12 cm. Its apothem has length k cm. What is the area of the pentagon in square cm, in terms of k ?

- A. $38k$ B. $32k$
 C. $30k$ D. $6k$
 E. NOTA

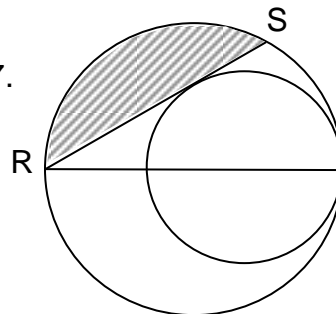
16.



One end of an 8 yard leash is attached to one vertex of a building whose floor is a regular hexagon. The hexagon has each edge 6 yards. The other end of the leash is attached to the collar of a goat. Disregarding the dimensions of the goat, give the area of the ground outside of the building, in square yards, that the goat can roam.

- A. $\frac{100}{3}\pi$ B. $\frac{112}{3}\pi$
 C. $\frac{128}{3}\pi$ D. 44π
 E. NOTA

17.



Shown are internally tangent circles. The smaller circle has diameter on the diameter of the larger circle. The

radius of the smaller circle is 12 cm and the radius of the larger circle is 18 cm. Find the area shaded, in square cm, of the segment of the larger circle determined by the chord \overline{RS} tangent to the smaller circle.

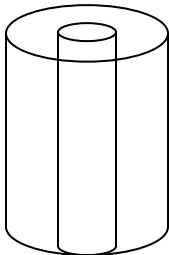
- A. $108\pi - 36\sqrt{3}$ B. $300\pi - 81\sqrt{3}$
 C. $270\pi - 36\sqrt{3}$ D. $108\pi - 81\sqrt{3}$
 E. NOTA

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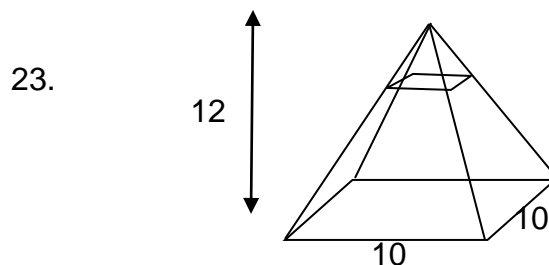
18. $\triangle RST \sim \triangle XYZ$ so that the area of $\triangle RST$ is $140\sqrt{3}$ square cm and the area of $\triangle XYZ$ is $560\sqrt{3}$ square cm. If $RS=12$ and $ST=20$ then give the length of \overline{YZ} in cm.
- A. 80 B. 40
C. 24 D. 10
E. NOTA

19.  A "pool noodle" is made out of plastic foam. It has the shape of a solid right cylindrical cylinder with a second solid right cylindrical solid drilled out of the center. The two cylinders have the same height and vertical axis. If the diameters of the cylinders are $\frac{2}{3}$ ft and $\frac{1}{3}$ ft, and noodle height is 3 ft, then find the volume of the noodle in cubic ft.
- A. $\frac{\pi}{4}$ B. $\frac{2\pi}{7}$
C. $\frac{\pi}{3}$ D. $\frac{\pi}{2}$
E. NOTA

20. The length of one side of a triangle is increased by 10%. The height to that base is decreased by 10%. What is the effect on the area of the triangle?
- A. area is unchanged
B. area is increased by 0.5%
C. area is decreased by 1%
D. area is decreased by 10%
E. NOTA

21. A square and a circle have the same area. The square has side length s cm, and the circle has radius r cm. Which is true?
- A. $r < s$ B. $r > s$
C. $r = s$ D. $r = \sqrt{s}$
E. NOTA

22. A rectangular practice field has length that is four times its width. It is completely enclosed by f feet of fencing. What is the area (in square feet) of the field in terms of f ?
- A. $\frac{1}{10}f^2$ B. $\frac{1}{12}f^2$
C. $\frac{1}{16}f^2$ D. $\frac{1}{25}f^2$
E. NOTA



- Consider that 90% of the volume of ice in an iceberg lies below the surface of water. An iceberg is in the shape of a right pyramid with a 10 km by 10 km square base and pyramid height 12 km. The base is under water and the height of the pyramid is perpendicular to the surface of the water. Find the volume of ice above the surface of the water, in cubic km.
- A. 108 B. 10.8
C. 40 D. 4
E. NOTA

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24. A regular polygon has one interior angle of measure 179.5° . One of its sides is 5 cm long. Find its perimeter in cm.

- A. 145 B. 720
C. 1795 D. 3600
E. NOTA

25. $\triangle ABC \sim \triangle DEF$. $\triangle ABC$ has area $(4k+8)$ square cm and $\triangle DEF$ has area $(50+25k)$ square cm. $\triangle ABC$ has perimeter $(k+2)$ cm and the perimeter of $\triangle DEF$ is 50 cm. Find the value of k .

- A. 9 B. 18
C. 20 D. 25
E. NOTA

26. $\triangle RST$ has side lengths $RS=10$ cm, $ST=14$ cm and $RT=8$ cm. Find the area of $\triangle RST$ in square cm.

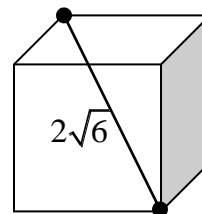
- A. $10\sqrt{3}$ B. $8\sqrt{6}$
C. $12\sqrt{3}$ D. $16\sqrt{6}$
E. NOTA

27. A semicircle has radius x cm. A triangle is inscribed in the semicircle. What is the greatest possible area of the triangle, in square cm?

- A. x^2 B. $2x^2$
C. $\frac{1}{2}x^3$ D. $2x^3$
E. NOTA

28. A cube has diagonal (joining two opposite vertices) of length $2\sqrt{6}$ cm. Find the volume of the cube in cubic cm.

- A. 8
B. $8\sqrt{2}$
C. $16\sqrt{2}$
D. 27
E. NOTA



29. What is the area in square cm of an isosceles right triangle with hypotenuse length $12\sqrt{6}$ cm?

- A. 216 B. 108
C. 72 D. 36
E. NOTA

30. Circle 1 is circumscribed about a square of side length 1 cm. Circle 2 is inscribed in the same square. What is the ratio of the areas of circle 1 to circle 2?

- A. $2\sqrt{2}:1$ B. 4:1
D. $4\sqrt{2}:1$ D. 2:1
E. NOTA