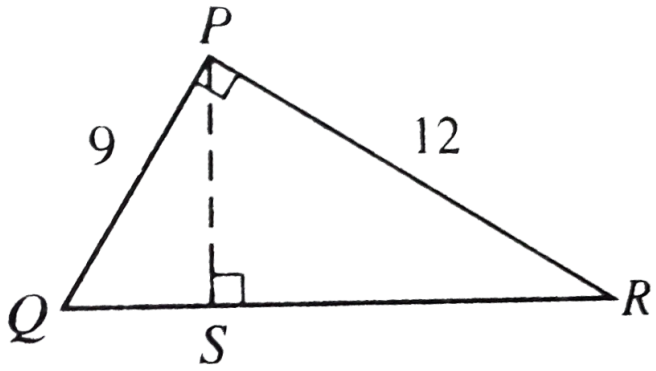
MATHS

BOOKS - INDEPENDENTLY PUBLISHED MATHS (ENGLISH)

ADDITIONAL TOPICS IN MATH

Example



1.

In the above figure, $\triangle PQR$ is a right triangle with the right angle at P . Line segment PS is an altitude , PQ=9 , and PR=12 . What is the area of $\triangle PQS$?

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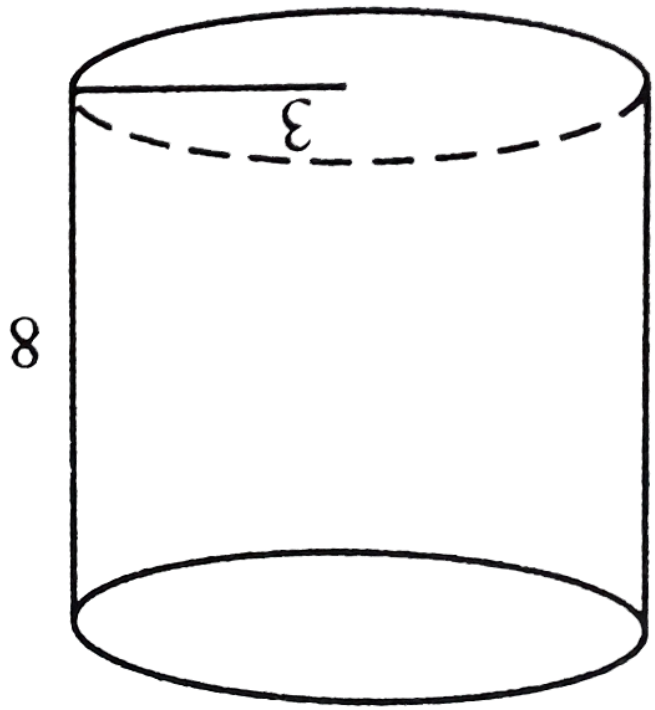

2.

What is the total surface area of the cylindrical can shown above , including its lid ?

A. $18\pi + 64$

B. $48\pi + 18$

C. 57π

D. 66π

Answer: D

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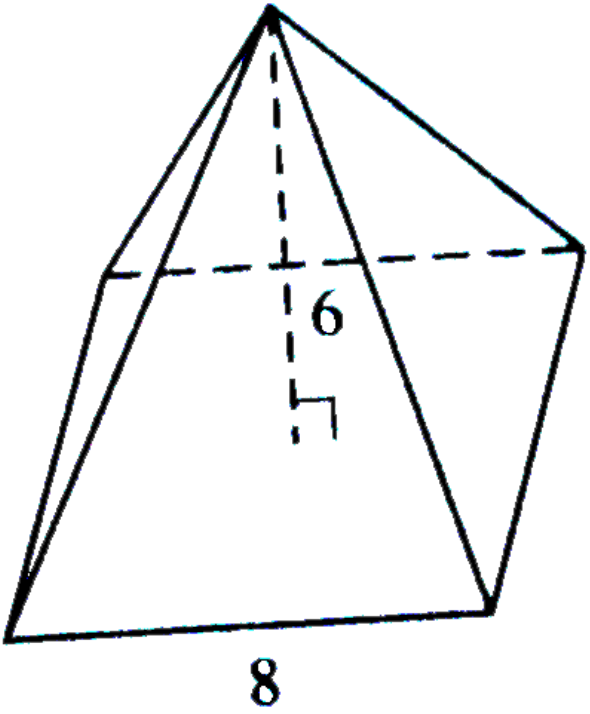

3.

The square pyramid shown above has altitude 6 and side of square base equal to 8. What is the area of one of the triangular faces of the pyramid ?

A. $8\sqrt{13}$

B. $16\sqrt{3}$

C. 24

D. 40

Answer: A

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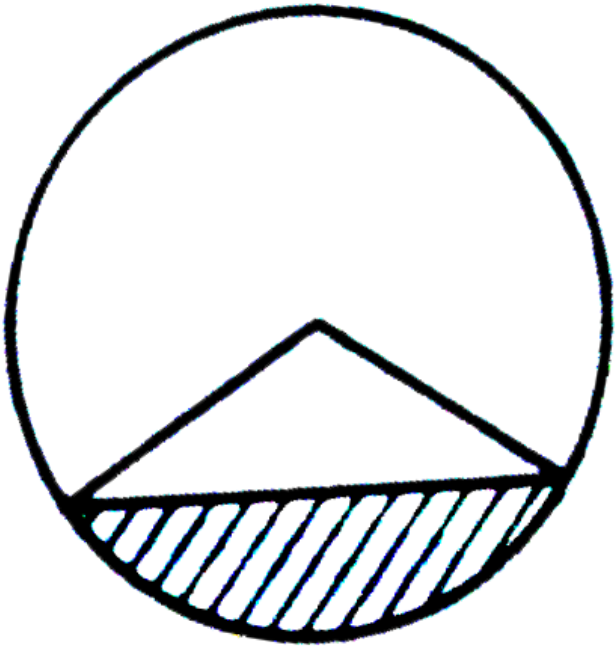

4.

In the figure above, Radius of circle is 8 and angle formed by sector at center is 120° , what is the area of the shaded region ?

A. $\frac{16\pi}{3} - 16\sqrt{3}$

B. $\frac{16\pi}{3} - 16$

C. $\frac{16\pi}{3} - 64\sqrt{3}$

D. $\frac{64\pi}{3} - 16\sqrt{3}$

Answer: D

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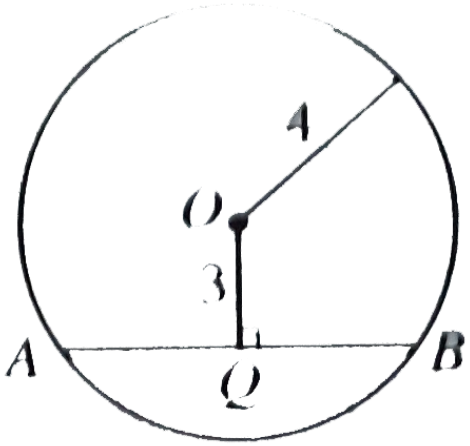

5.

A chord $\overline{AB}$ is 3 cm. from the center of a circle with radius 4. What is the length of chord $\overline{AB}$?

A. $\sqrt{7}$

B. $2\sqrt{7}$

C. 5

D. 10

Answer: B

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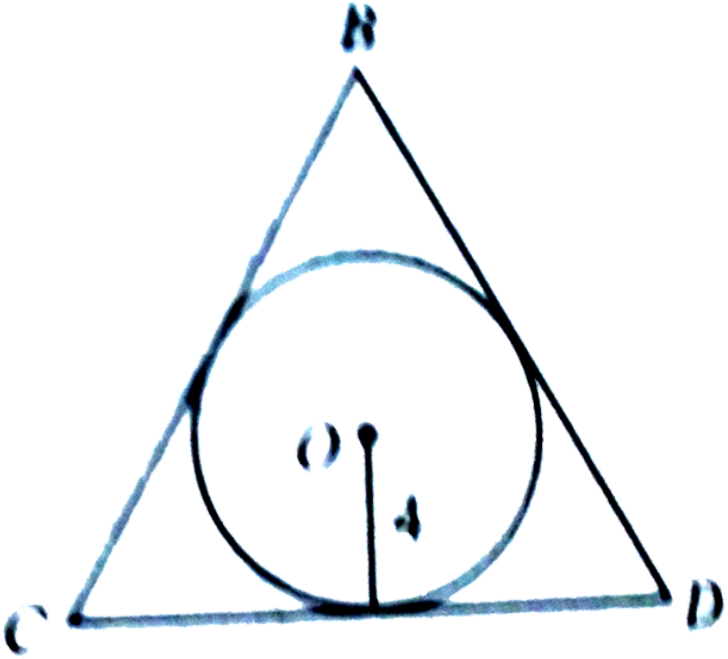
6. In the diagram to the right , the circle with center O is inscribed in equilateral triangle BCD. If the radius of the circle is 4, what is the ratio of the perimeter of $\triangle BCD$ to the area

of $\triangle BCD$?



A. $1:2\sqrt{3}$

B. $1:\sqrt{3}$

C. $1:2$

D. $1:4$

Answer: C

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7. A circle in the xy-plane is tangent to the x-axis at -10 and the y-axis at 10. Which of the following is an equation of the circle ?

A. (x-10)+(y+10)=100

B. $(x-10)^2+(y+10)^2=100$

C. $(x-10)^2+(y-10)^2=100$

D. $(x+10)^2+(y-10)^2=100$

Answer: D

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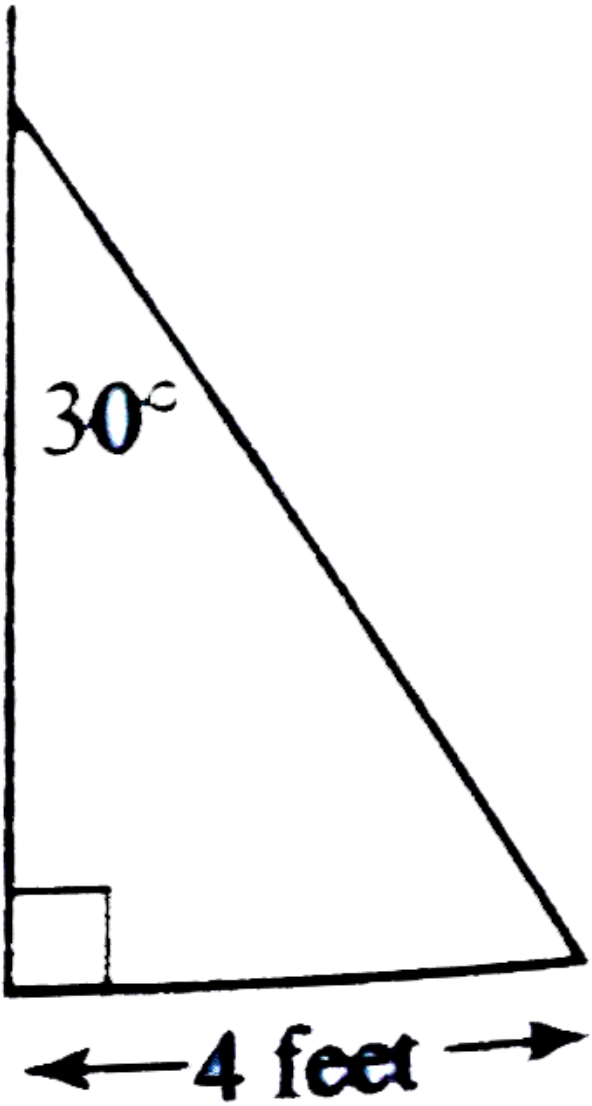
8. A foot of a ladder leaning against the wall of a house is 4 feet from the base of the wall. If the ladder makes a 30° angle with the wall,

what is the length, in feet, of the ladder ?



A. $2\sqrt{3}$

B. $4\sqrt{3}$

C. $8\sqrt{3}$

D. 8

Answer: D

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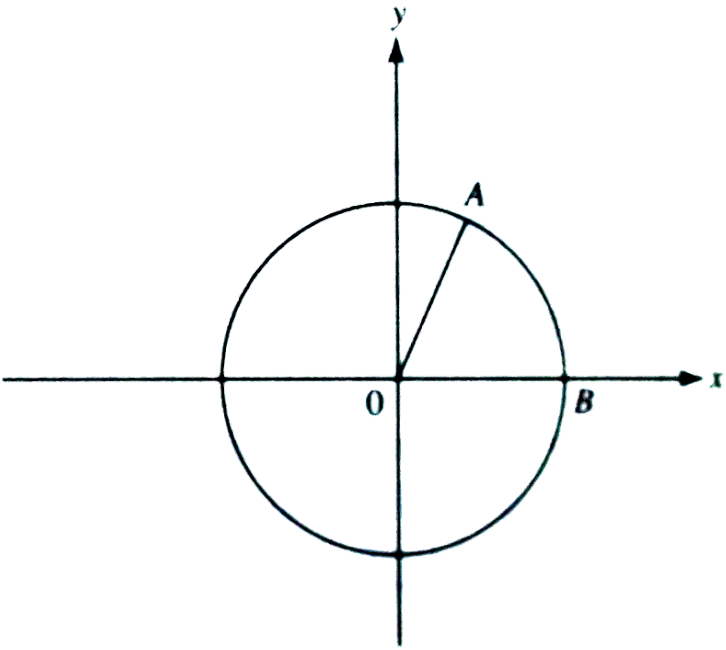

9.

The equation of the circle shown above is $x^2 + y^2 = 36$. If the measure of $\angle AOB$ is 1.2 radians , what is the length of arc AB in coordinate units ?

A. 6

B. 7.2

C. 3π

D. 6π

Answer: B

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10. If $\cos\theta = \frac{12}{13}$, and $\frac{3\pi}{2} \leq \theta < 2\pi$, then $\tan\theta$ = ?

A. $-\frac{5}{13}$

B. $-\frac{12}{5}$

C. $-\frac{5}{12}$

D. $\frac{5}{12}$

Answer: C

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11. Which is equivalent to $\frac{\sin^2\alpha+\cos^2\alpha}{\cos\alpha}$?

A. $\sin\alpha$

B. $\tan\alpha$

C. $\sec\alpha$

D. $\cos\alpha$

Answer: C

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12. If the value of the nearest thousandth of $\cos\theta$ is -0.892, which of the following could be true about θ ?

A. $0^\circ \leq \theta < 60^\circ$

B. $120^\circ \leq \theta < 180^\circ$

C. $60^\circ \leq \theta < 90^\circ$

D. $300^\circ \leq \theta < 360^\circ$

Answer: B

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13. 3i(1-i) ?

A. 3+3i

B. 3-3i

C. 6i

D. 6

Answer: A

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Practice Test

1. A rectangular box with length 22 inches , width 5 inches , and height 5 inches is to be

packed with steel balls of radius 2 inches in such a way that the centers of the balls are collinear. What is the maximum number of balls that can fit into the box, provided that no balls should protrude from the box ?

A. 0

B. 5

C. 6

D. 10

Answer: B

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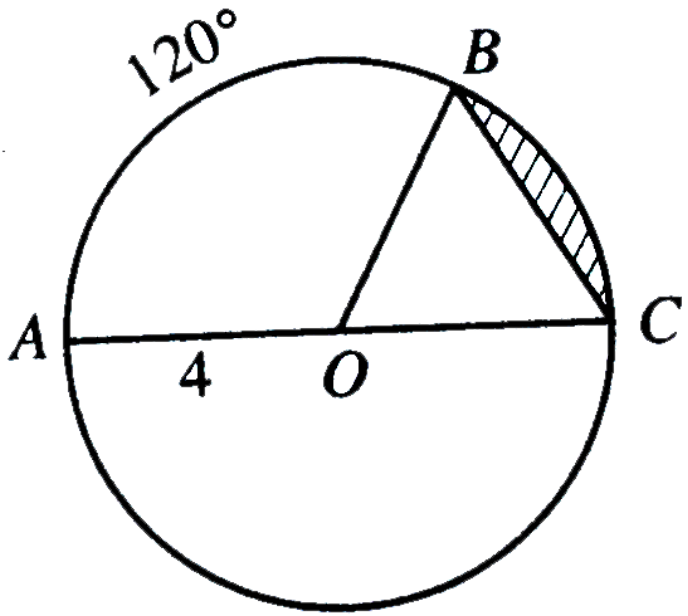

2.

In the diagram above, the circle has center O and diameter $\overline{AC}$. The measure of arc AB is 120° , and AO=4. What is the area of the shaded region ?

A. $\frac{16\pi}{3} - 8\sqrt{3}$

B. $\frac{8\pi}{3} - 2\sqrt{3}$

C. $\frac{8\pi}{3} - 4\sqrt{3}$

D. $\frac{8\pi}{3} - 8\sqrt{3}$

Answer: C

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3. In the xy-plane , a circle with center (6,0) is tangent to the line y=x. what is the radius of the circle ?

A. $2\sqrt{6}$

B. $2\sqrt{3}$

C. $3\sqrt{2}$

D. 3

Answer: C

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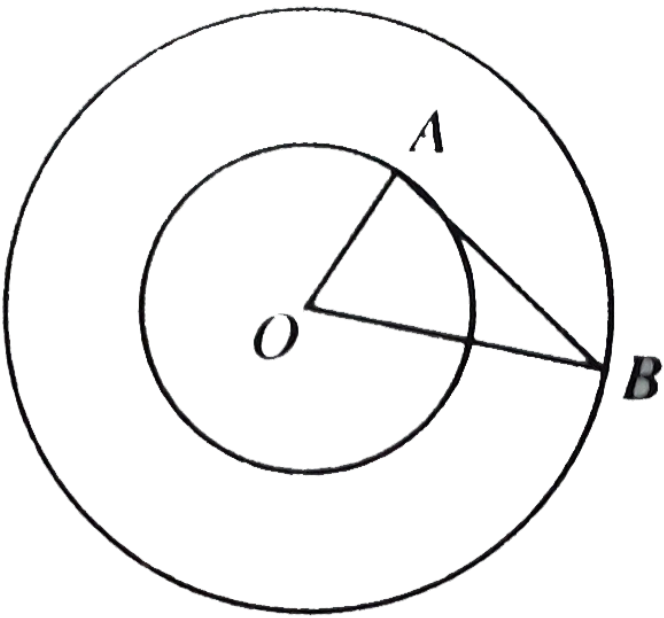

4.

The figure above shows two circles , each with center O. Line segment $\overline{AB}$ is tangent to the smaller circle . If OA=5 and AB=12, what is the ratio of the area of the smaller circle to the area of the larger circle ?

A. $5:13$

B. $5:12$

C. $25:169$

D. $25:144$

Answer: C

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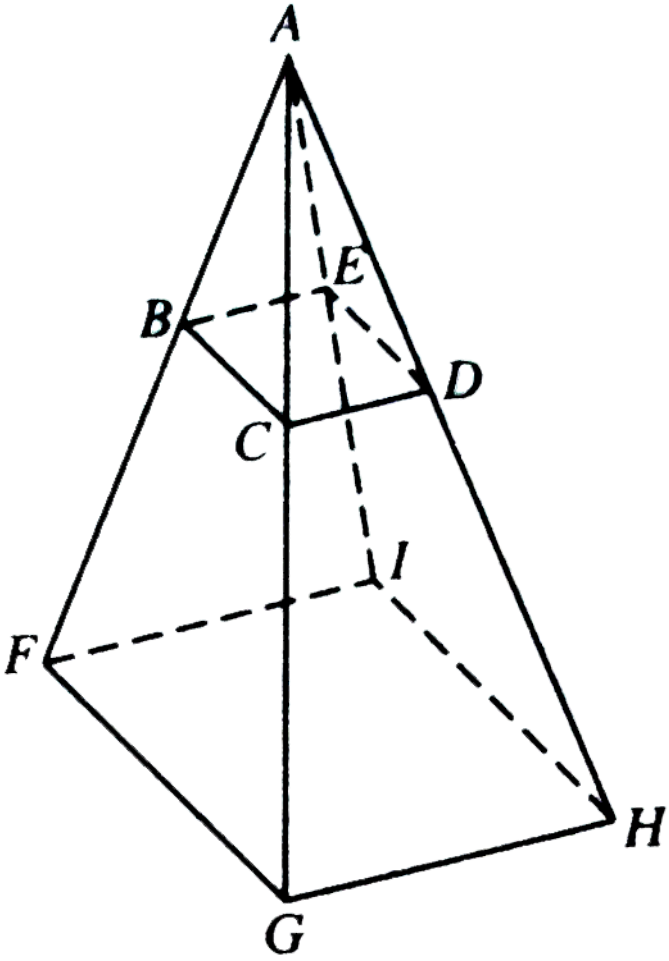

5.

The pyramid in the figure above has square base FGHI , and all triangular faces are congruent. The base BCDE of the small

pyramid is also square , and is parallel to FGHI. If the ratio of the area of square BCDE to the area of square FGHI is 1:4 , what is the ratio of the volume of the small pyramid to the volume of the large pyramid ?

A. $1:2$

B. $1:3$

C. $1:4$

D. $1:8$

Answer: D

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6. $2i^4 - i^6$ = ?

A. i-1

B. i+1

C. -3

D. 3

Answer: D

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7. A rectangular aquarium 3 ft x 2 ft x 1 ft is $\frac{2}{3}$ full of water. In cubic feet, how much water is in the tank ?

A. $14\frac{2}{3}$

B. 11

C. $7\frac{1}{3}$

D. 4

Answer: D

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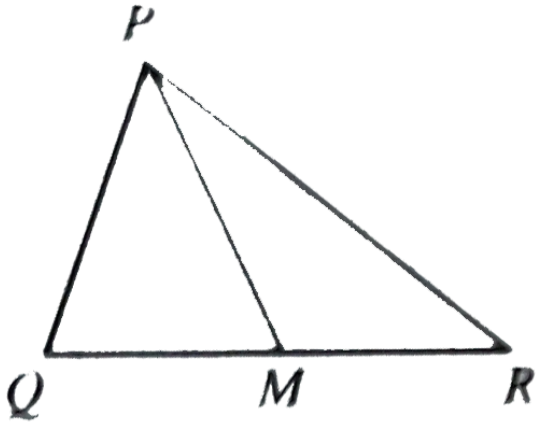
8.



In $\triangle PQR$ above , $\overline{PM}$ is a median.

which of the following assertions is justifiable from the given information ?

I. $\triangle QPM$ is congruent to $\angle RPM$.

II. Perimeter of $\triangle PQM$ equals perimeter of $\triangle PRM$.

III.area of $\triangle PQM$ equals area of $\triangle PRM$.

A. I only

B. II only

C. III only

D. II and III only

Answer: C

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9. Which of the following is the equation of a circle in the standard (x,y) coordinate plane ?

A. (x-3)+(y+6)=100

B. $y = x^2 + 25$

C. $x^2 = y^2 + 25$

D. $x^2 = 36 - y^2$

Answer: D

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10. A circle with center (5,-2) is tangent to the y-axis. What is the equation of the circle ?

A. $(x-5)^2+(y+2)^2=25$

B. $x^2+y^2=25$

C. $(x+5)^2+(y-2)^2=25$

D. $x^2+y^2=5$

Answer: A

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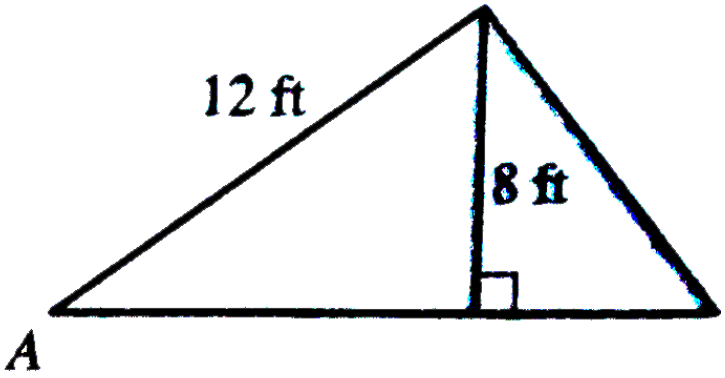
11. The center pole of a tent is 8 feet tall, and a side of the tent is 12 feet long , as shown below .



Which of the following expressions could be used to find the measure of $\angle A$?

A. $\cos A = \frac{8}{12}$

B. $\sin A = \frac{8}{12}$

C. $\tan A = \frac{8}{12}$

D. $\sin A = \frac{4\sqrt{5}}{12}$

Answer: B

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12. Which of the following expressions is not equal to $\sin(-135^\circ)$?

A. $\sin(135^\circ)$

B. $\cos(135^\circ)$

C. $-\cos(-45^\circ)$

D. $\sin(225^\circ)$

Answer: A

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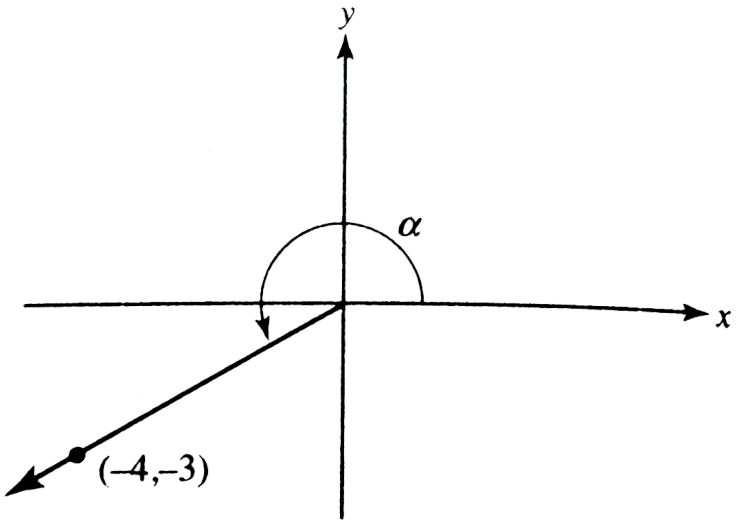
13. For the angle α shown below , which of the following statements is true ?



A. $\sin\alpha = -\frac{3}{5}$

B. $\cos\alpha = \frac{4}{5}$

C. $\tan\alpha = -\frac{3}{4}$

D. $\cot\alpha = -\frac{4}{3}$

Answer: A

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14. If $\cos\frac{2\pi}{3} = \sin\alpha$,which could be α ?

A. $\frac{\pi}{6}$

B. $-\frac{\pi}{6}$

C. $\frac{2\pi}{3}$

D. $-\frac{2\pi}{3}$

Answer: B

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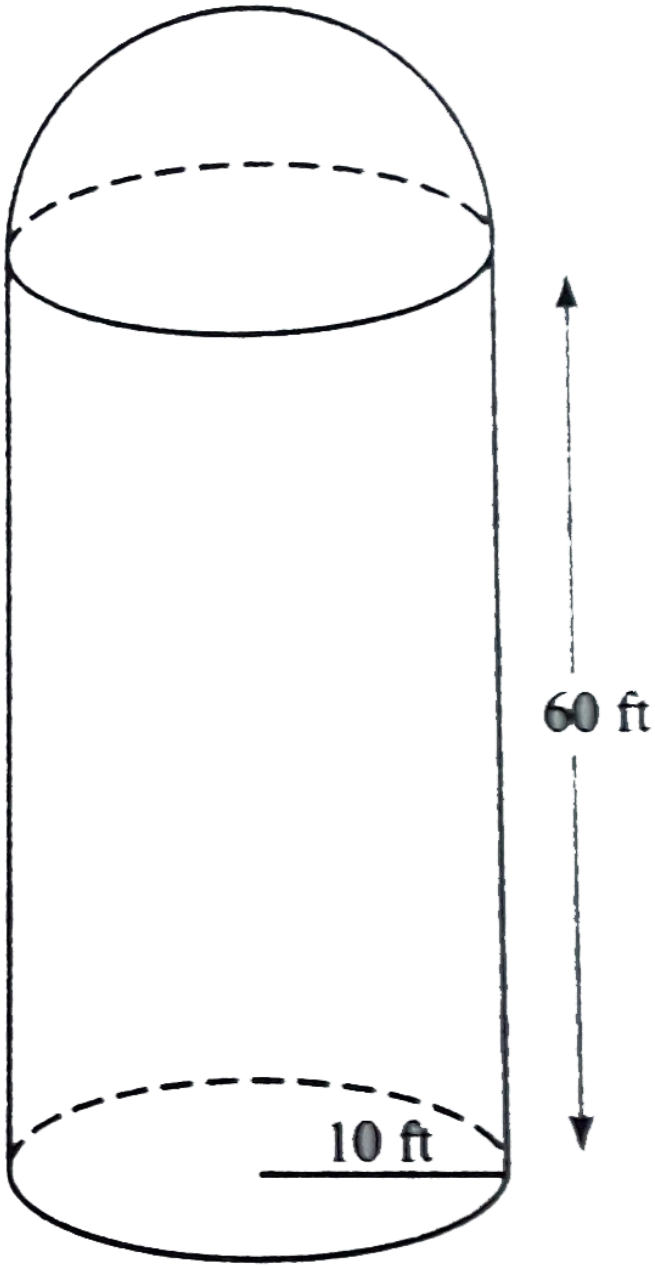
15. A grain silo, shown below, is in the shape of cylinder with a half sphere on top . The radius of the base of the cylinder is 10 feet , and the height of the cylindrical part is 60 feet, as marked



The silo, when full , can hold 2,100 bushels of

wheat . On each of five consecutive days, the farmer sells 150 bushels from an initially full silo. After these sales, approximately what percent of the silo's capacity is still filled with wheat ?

A. 16

B. 36

C. 45

D. 64

Answer: D

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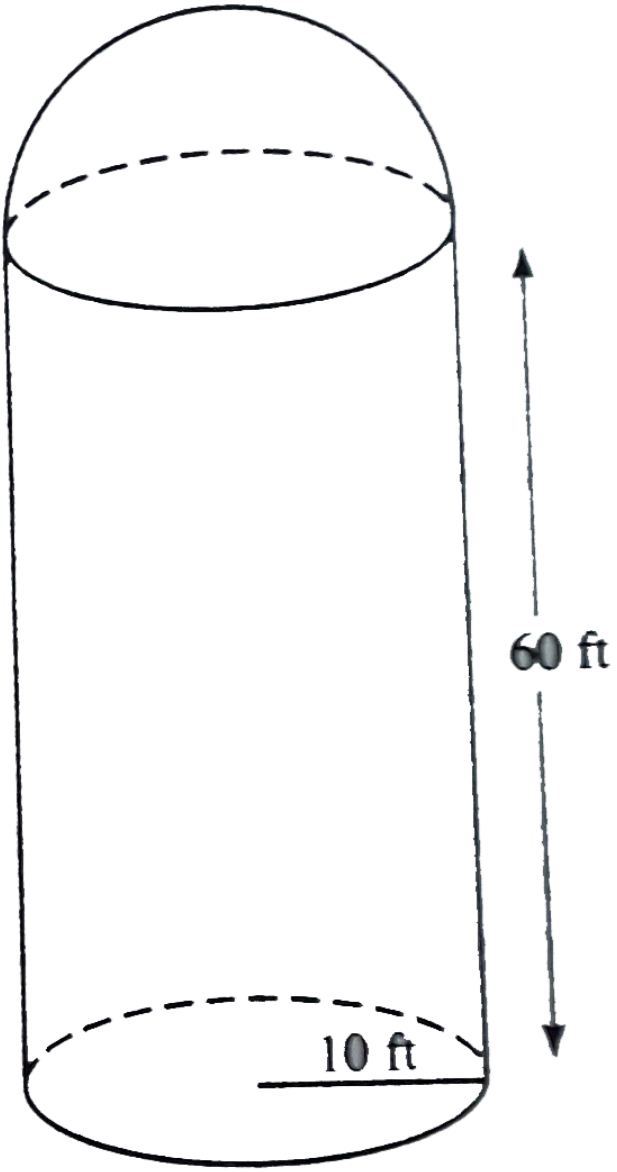
16. A grain silo, shown below, is in the shape of cylinder with a half sphere on top . The radius of the base of the cylinder is 10 feet , and the height of the cylindrical part is 60 feet, as marked



The farmer who owns the silo plans to apply a coat of paint to the cylindrical exterior . This

does not include the spherical top . A formula for the lateral surface area S of a cylinder with radius r and height h is $S = 2\pi rh$. if one can of paint covers 300 square feet of surface, what is the least number of cans that the farmer must buy to complete the job ?

A. 10

B. 11

C. 12

D. 13

Answer: D

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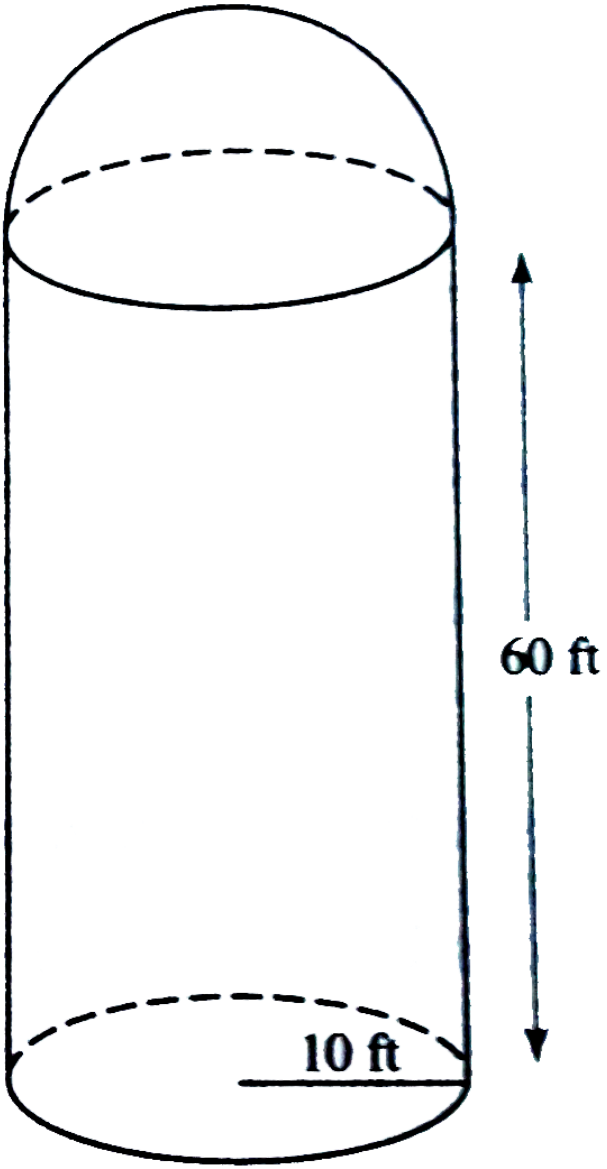
17. A grain silo, shown below, is in the shape of cylinder with a half sphere on top . The radius of the base of the cylinder is 10 feet , and the height of the cylindrical part is 60 feet, as marked



The volume of a sphere with radius r is given

by $v = \frac{4}{3}\pi r^3$, and the volume of a cylinder with height h and base area A is given by V=Ah. What is the volume of the silo to the nearest cubic foot ?

A. 5864

B. 7959

C. 20944

D. 23038

Answer: C

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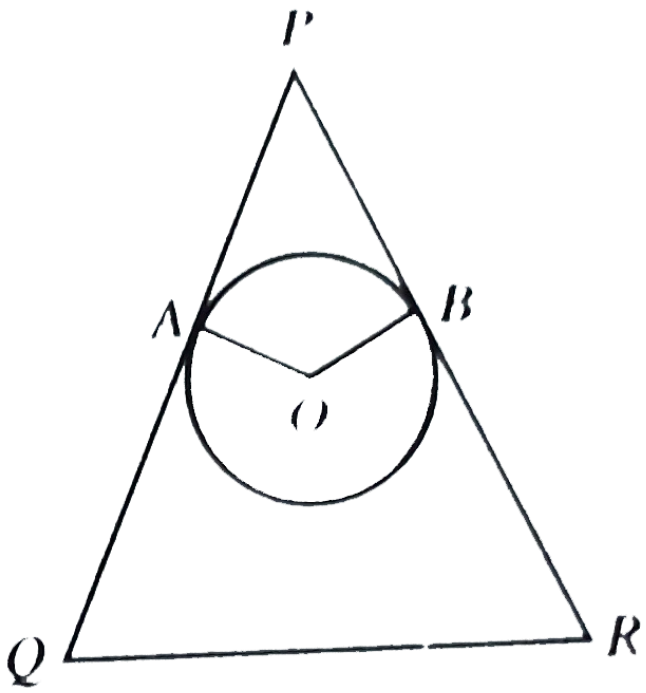

18.

In the figure shown above, $\angle Q$ measures 70° , $\overline{PQ} \cong \overline{PR}$, and $\overline{PQ}$ and $\overline{PR}$ are tangent to the circle with center O at points A and B . Find , in degrees , the measure of $\angle AOB$.

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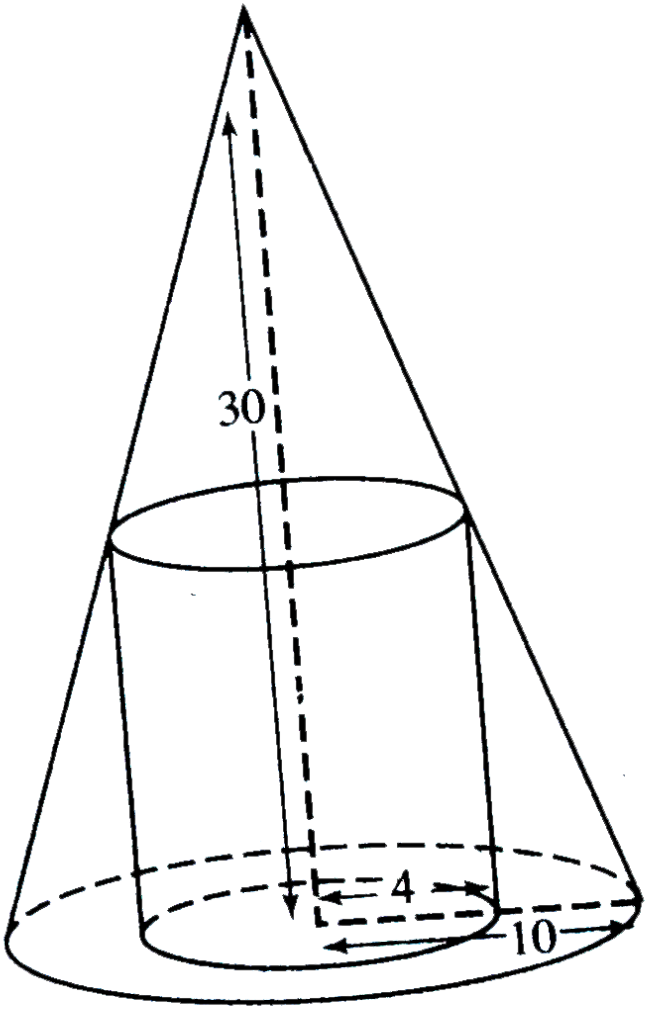

19.

A cylinder is inscribed in a cone with height 30 and base radius 10 , as shown in the above

figure . If the radius of the base of the cylinder is 4, what is the height of the cylinder ?

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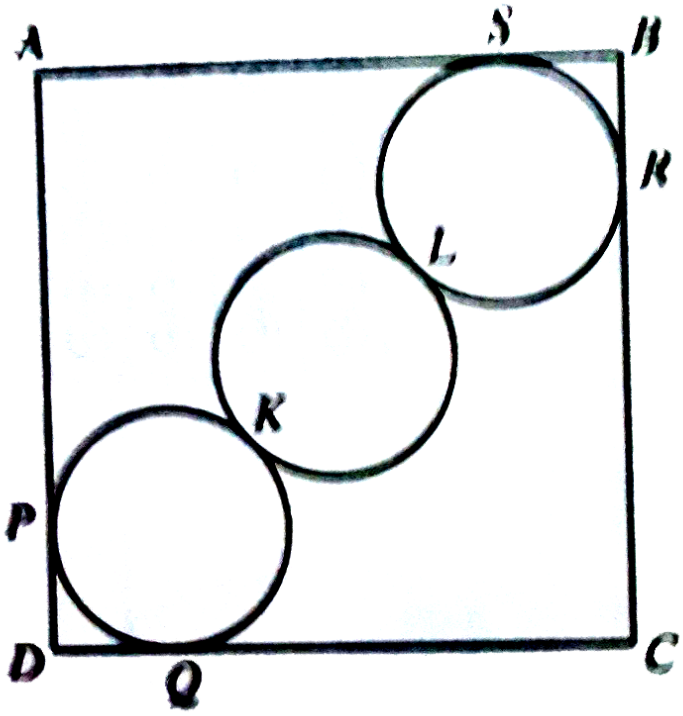

20.

In the diagram above, ABCD is a square . The circles , whose centers lie on $\overline{BD}$, are congruent to each other . The sides of the square are tangent to the outer circles at P,Q,R and S , and the circles are tangent to each

other at K and L . If the radius of each circle is 1 inch. What is the area , to the nearest square inch, of the square ?

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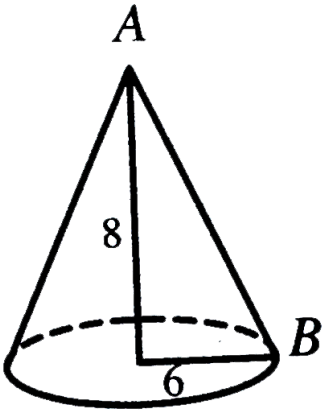

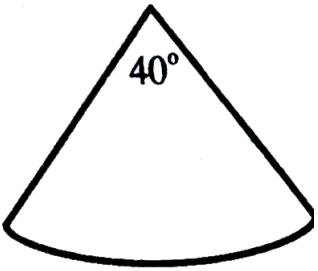

21.

When the cone shown on the left above is cut straight up the side along $\overline{AB}$ and laid down

flat, the resulting plane figure is shown on the right . The area of this figure represents the lateral surface area of the given cone. What is the lateral surface area of this cone, to the nearest integer ?

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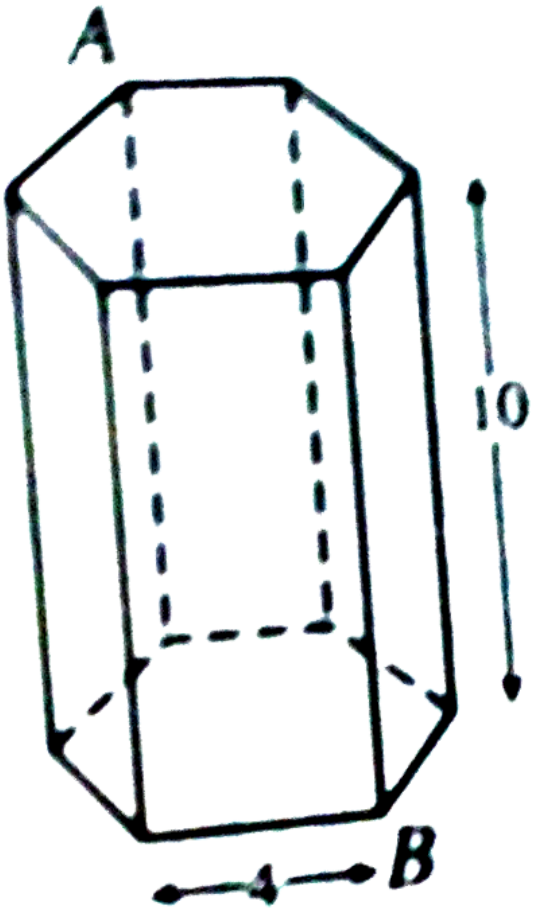

22.

The hexagonal prism shown above has a regular hexagon with side 4 as base. The height of the prism is 10. Let A be a vertex on

the "back" face of the prism, while B is a vertex on the "front" face, as shown . What is the length of the diagonal $\overline{AB}$, to the nearest tenth ?

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23. Jack waters his lawn with a sprinkler that sprays water in a circular pattern. The maximum reach of the sprinkler is 15 feet , and the sprinkler head rotates through an angle of 300° , as shown in the diagram below . The

sprinkler head is represented at point O.

To the nearest square foot , what is the area of the lawn (the shaded area) that receives water from the sprinkler ?

A. 79

B. 589

C. 94

D. 707

Answer: B

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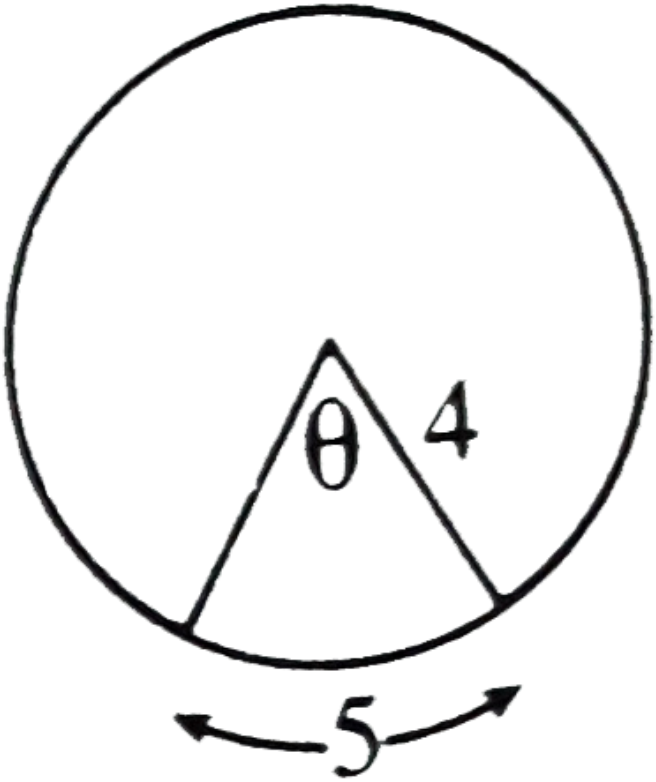

24.

In a circle of radius 4 , two radii cut off an arc of length 5, as shown above. To the nearest degree , find the acute angle θ formed by the radii.

A. 70°

B. 72°

C. 75°

D. 76°

Answer: B

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