

53.

	Volume (cubic units)
Cylinder A	112π
Cylinder B	$3,024\pi$

The table shows the volume of two similar solids, right circular cylinder A and right circular cylinder B. The radius of right circular cylinder A is 4 units. The surface area of right circular cylinder A is $k\pi$ square units, and the surface area of right circular cylinder B is $n\pi$ square units, where k and n are constants. What is the value of $n - k$? (The surface area of a right circular cylinder with radius r and height h is $2\pi r^2 + 2\pi rh$.)

54.

Point M lies on a unit circle in the xy -plane and has coordinates $(1, 0)$. Point C is the center of the circle at $(0, 0)$. Point N also lies on the unit circle, and the measure of angle MCN is $\frac{385\pi}{6}$ radians. If the coordinates of point N are (p, q) , where p and q are constants, what is the value of q ?

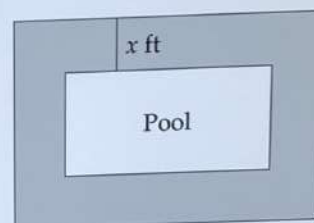
- A) $-\frac{1}{2}$
 B) $\frac{\sqrt{3}}{2}$
 C) $-\frac{\sqrt{3}}{2}$
 D) $\frac{1}{2}$

55.

$$2x^2 + 2y^2 + tx + ty - 78 = 0$$

The given equation, where t is a positive constant, defines a circle in the xy -plane. The radius of this circle is $\sqrt{41}$. What is the value of t ?

56.

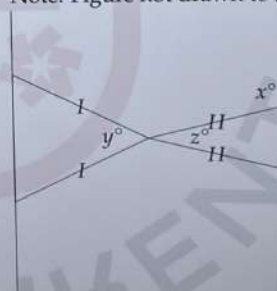


The figure shows a rectangular pool surrounded by a concrete path that is x feet (ft) wide on all sides. The pool is 21 ft long and 13 ft wide. The area of the concrete path is 240 ft^2 . What is the value of x ?

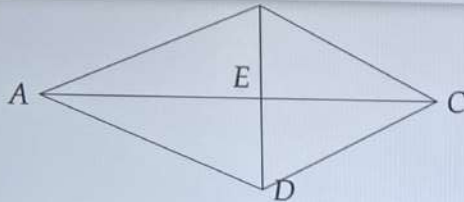
- A) 3
 B) 6
 C) 20
 D) 40

57.

Note: Figure not drawn to scale.



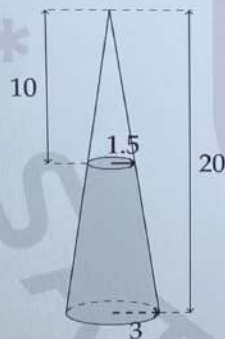
Two isosceles triangles are shown above. If $180 - z = 3y$ and $y = 50$, what is the value of x ?



In the figure above, $AB = AD$, $BC = CD$, $BE = 4$, $BC = 8$, and $AC = 12$. What is the area of triangle ABD ?

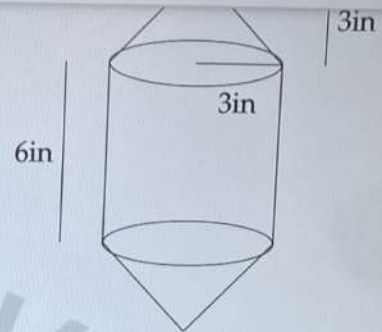
- A) $96 - 32\sqrt{3}$
- B) $48 - 16\sqrt{3}$
- C) $24 - 8\sqrt{3}$
- D) $12 - 4\sqrt{3}$

59.



The solid in the figure below is the shaded part of a cone with a height of 10 cm obtained by cutting its top parallel to the base, 10 cm from its tip. The volume of the solid is

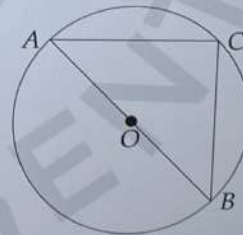
- A) 188.52 cm^3
- B) 23.57 cm^3
- C) 164.93 cm^3
- D) 145.29 cm^3



A futuristic football is built from two right circular cones and a right circular cylinder with internal measurements represented by the figure above. Of the following, which is closest to the volume of the football, in cubic inches?

- A) 56.1
- B) 169.6
- C) 197.9
- D) 226.2

61.

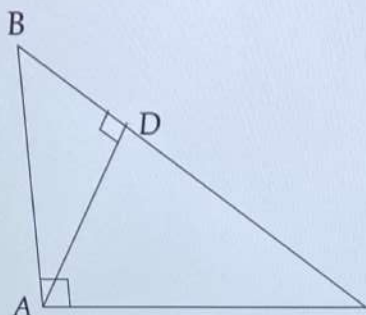


The area of an isosceles right triangle inscribed in the circle with center at O and radius $5\sqrt{2}$ is

- A) 100
- B) 50
- C) $10\sqrt{2}$
- D) $25\sqrt{2}$
- E) $50\sqrt{2}$

62.

Note: Figure not drawn to scale.



In the figure, $\angle ABD = w^\circ$, $\angle CAD = z^\circ$, and $\cos w = \frac{9}{41}$. What is the value of $\tan z$?

63.

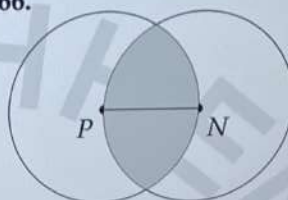
In the xy -plane, a circle has center C with coordinates $(p, 8)$, where p is a constant. Points G and H lie on the circle. Point G has coordinates $(p + 3\sqrt{5}, 14)$, and point H has coordinates $(q, 8)$, where q is a constant greater than p . What is the area, in square units, of triangle CGH ?

- A) $27\sqrt{5}$
- B) 27
- C) $5\sqrt{27}$
- D) $27\sqrt{6}$

65.

Identical rectangles X and Y each have an area of $\frac{49}{5}$ square meters and a perimeter of P meters. If one of the shorter sides of rectangle X is glued to one of the shorter sides of rectangle Y , the resulting rectangle has a perimeter of $\frac{14}{9}P$ meters. What is the value of P ?

66.



In the figure above, P and N are the centers of the circles and $PN = 6$. What is the area of the intersection?

- A) $18\pi - 9\sqrt{3}$
- B) $24\pi - 9\sqrt{3}$
- C) $24\pi - 18\sqrt{3}$
- D) $36\pi - 18\sqrt{3}$

67.



is the value of $\frac{\cos p}{\sin p}$?

138.

A line intersects two parallel lines, forming four acute angles and four obtuse angles. The measure of one of the acute angles is $(9x - 490)^\circ$. The sum of the measures of one of the acute angles and three of the obtuse angles is $(-18x + w)^\circ$. What is the value of w ?

88

139.

$$2x^2 + 2y^2 + tx + ty - 78 = 0$$

The given equation, where t is a positive constant, defines a circle in the xy -plane. The radius of this circle is $\sqrt{41}$. What is the value of t ?

140.

Point M lies on a unit circle in the xy -plane and has coordinates $(1, 0)$. Point C is the center of the circle at $(0, 0)$. Point N also lies on the unit circle, and the measure of angle MCN is $\frac{385\pi}{6}$ radians. If the coordinates of point N are (p, q) , where p and q are constants, what is the value of q ?

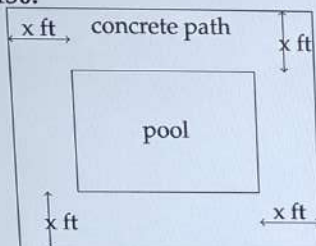
A $-\frac{1}{2}$

B $\frac{\sqrt{3}}{2}$

C $-\frac{\sqrt{3}}{2}$

D $\frac{1}{2}$

130.



The figure shows a rectangular pool surrounded by a concrete path that is x feet (ft) wide on all sides. The pool is 21 ft long and 13 ft wide. The area of the concrete path is 240 ft^2 . What is the value of x ?

- A 3
- B 6
- C 20
- D 40

131.

Right rectangular prism X is similar to right rectangular prism Y . The surface area of right rectangular prism X is 59 cm^2 , and the surface area of right rectangular prism Y is $1,475 \text{ cm}^2$. The volume of right rectangular prism Y is $1,500 \text{ cm}^3$. What is the sum of the volumes, in cm^3 , of right rectangular prism X and right rectangular prism Y ?

132.

In the xy -plane, a unit circle with center O contains point A with coordinates $(1, 0)$ and point B with coordinates $\left(\frac{5}{\sqrt{34}}, -\frac{3}{\sqrt{34}}\right)$. If the measure of angle AOB is p radians, what is the value of $\frac{\cos p}{\sin p}$?

133.

In triangle ABC , $\angle C$ is a right angle. Point D lies on $\overline{AB}$, point E lies on $\overline{BC}$, and $\overline{DE}$ is parallel to $\overline{AC}$. If the length of $\overline{AB}$ is 39 units, $\overline{DE}$ is 8 units, the length of $\overline{AC}$ is greater than the length of $\overline{BC}$, and the area of triangle ABC is 270 square units, what is the length of $\overline{BE}$, in units?

134.

The perimeter of a right isosceles triangle is $52 + 52\sqrt{2}$. What is the length of the hypotenuse?

135.

The points $(0, 15)$, $(10, 8)$, and $(10, 3)$ define one base of a triangular prism. The distance between the two bases of the prism is 20 units. What is the volume, in cubic units, of the prism?

136.

$$2x^2 + 2y^2 + tx + ty - 78 = 0$$

The given equation, where t is a positive constant, defines a circle in the xy -plane. The radius of this circle is $\sqrt{41}$. What is the value of t ?

137.

$$8x^2 + 112px + 8y^2 - 64py = -448p^2$$

In the xy -plane, the graph of the given equation is a circle. The length of the radius is np , where n and p are positive constants. What is the value of n ?

138.

A line intersects two parallel lines, forming

124.

A circle has center G , and points M and N lie on the circle. Line segments MH and NH are tangent to the circle at M and N , respectively. If the radius is 168 mm and the perimeter of quadrilateral $GMHN$ is 3,856 mm, what is the distance, in mm, between G and H ?

- A) 168
- B) 1,752
- C) 1,760
- D) 1,768

125.

A triangular prism has an equilateral triangle base with side length x and a prism height of $x\sqrt{3}$. If the volume of the prism is $\frac{2187}{4}$, what is the value of x ?

- A 3
- B 9
- C 27
- D 81

126.

$$(x - 5)^2 + (y + 12)^2 = 169$$

The given equation represents a circle. If the point (r, s) lies on the circle, which of the following could NOT be the point (r, s) ?

- A $(-7, -7)$
- B $(10, -24)$
- C $(\sqrt{140} + 5, \sqrt{29} - 12)$
- D $(\sqrt{140} - 5, \sqrt{29} + 12)$

127.

A regular polygon has exactly 45 sides. If the measure of each exterior angle is $(180k)^\circ$, what is the value of k ?

128.

A regular polygon has exactly 57 sides. If the measure of each interior angle is $(180p)^\circ$, what is the value of p ?

129.

Point N lies on a unit circle in the xy -plane and has coordinates $(1, 0)$. Point O is the center at $(0, 0)$. Point M also lies on the unit circle, and the measure of angle NOM is $\frac{272\pi}{3}$ radians. If the coordinates of point M are (a, b) , what is the value of a ?

- A $\frac{1}{2}$
- B $\frac{\sqrt{3}}{2}$
- C $-\frac{1}{2}$
- D $-\frac{\sqrt{3}}{2}$

D (15,3)

B $\frac{\sqrt{3}}{2}$

120.

In triangles RST and XTZ , XZ is parallel to RS , and $\tan R = \frac{216}{713}$. What is the value of $\sin X$ in triangle XYZ ?

C $-\frac{\sqrt{3}}{2}$

D $\frac{1}{2}$

A $\frac{216}{929}$

B $\frac{216}{745}$

C $\frac{713}{745}$

D $\frac{713}{216}$

123.

A right square pyramid has a total surface area of 36,864 square inches, and the combined surface area of the four lateral faces is 20,480 square inches. What is the height, in inches, of this pyramid?

A 48

B 64

C 80

D 128

121.

A circle in the xy -plane has its center at $(-7,3)$ and has a radius of 9. An equation of this circle is $x^2 + y^2 + ax + by + c = 0$, where a , b , and c are constants. What is the value of c ?

116.

A hollow steel pipe is in the shape of a right circular cylinder. The steel pipe has an outside diameter of 48 inches, a wall thickness of $\frac{3}{5}$ inches, and a height of 144 inches. Which of the following is closest to the volume, in cubic inches, of the wall of this steel pipe?

- A) 177
- B) 565
- C) 2,160
- D) 13,395

B) $64\pi - 24\sqrt{3}$

C) $64\pi - 32\sqrt{3}$

D) $16\pi - 12\sqrt{3}$

85

119.

A circle in the xy -plane has its center at $(-3, 3)$. Line t is tangent to this circle at the point $(6, -3)$. Which of the following points also lies on line t ?

- A) $(0, \frac{5}{2})$
- B) $(3, 12)$
- C) $(12, 6)$
- D) $(15, 3)$

120.

In triangles RST and XTZ , XZ is parallel to RS , and $\tan R = \frac{216}{713}$. What is the value of $\sin X$ in triangle XYZ ?

A) $\frac{216}{713}$

122.

Point M lies on a unit circle in the xy -plane and has coordinates $(1, 0)$. Point C is the center of the circle at $(0, 0)$. Point N also lies on the unit circle, and the measure of angle MCN is $\frac{385\pi}{6}$ radians. If the coordinates of point N are (p, q) , what is the value of q ?

A) $-\frac{1}{2}$

B) $\frac{\sqrt{3}}{2}$

C) $-\frac{\sqrt{3}}{2}$

D) $\frac{1}{2}$

123.

114.

$$x^2 - 16x + y^2 - 10y - 55 = 0$$

In the xy -plane, the graph of the given equation is a circle. If this circle is inscribed in a square, what is the perimeter of the square?

- A) 24
- B) 48
- C) 96
- D) 220

115.

In triangles PQR and XYZ , angles R and Z each have a measure of 38° . The length of side QR is equal to 11. The length of side YZ is equal to 27.5. Which additional piece of information is sufficient to prove that triangle PQR is similar to triangle XYZ ?

- A) The measure of angle P is 46°
- B) The length of side PR is 14 and the length of side XZ is 35
- C) The measure of angle Q is 49° and the measure of angle Y is 94°
- D) No additional information is necessary

116.

A hollow steel pipe is in the shape of a right circular cylinder. The steel pipe has an outside diameter of 48 inches, a wall thickness of $\frac{3}{8}$ inches, and a height of 144 inches. Which of the following is closest to the volume, in cubic inches, of the wall of this steel pipe?

- A) 177
- B) 565
- C) 2,160

117.

In triangle ABC and triangle DEF , sides AB and DE each have a side length of 10 inches, and angles A and D each have an angle measure of 40° . Which of the following additional pieces of information is (are) sufficient to prove whether triangle ABC is congruent to triangle DEF ?

- I. The measures of angles B and C are equal.
 - II. The lengths of sides AC and DF are equal.
 - III. The lengths of sides BC and EF are equal.
- A) I is sufficient, but II and III are not.
 - B) II is sufficient, but I and III are not.
 - C) III is sufficient, but I and II are not.
 - D) II is sufficient and III is sufficient, but I is not.

118.

An equilateral triangle is inscribed in a circle with a radius of 8 inches. What is the area of the region that lies within the circle but outside the triangle, in square inches?

- A) $64\pi - 48\sqrt{3}$
- B) $64\pi - 24\sqrt{3}$
- C) $64\pi - 32\sqrt{3}$
- D) $16\pi - 12\sqrt{3}$

A) $\frac{116}{3}$

B) 29

C) $\frac{87}{2}$

D) 58

108.

A triangular pyramid with edge length 48 has a surface area equal to $k\sqrt{3}$. Find the value of k .

109.

In isosceles triangle RST , $SR = ST$ and the length of RT is 76. If $\tan(\angle R) = \frac{2}{35}$, what is the area of triangle RST ?

112.

A circle in the xy -plane has its center at $(-3, 3)$. Line t is tangent to this circle at the point $(6, -3)$. Which of the following points also lies on line t ?

A $(0, \frac{5}{2})$

B $(3, 12)$

C $(12, 6)$

D $(15, 3)$

113.

In the xy -plane, the line $y = 3x - 14$ is tangent to a circle with center $(h, 1)$. Which of the following is a possible value for h if the center lies to the right of the tangent line?

A) 2

B) 3

C) 5

D) 7

114.

117.

In triangle ABC and triangle DEF , sides

103.

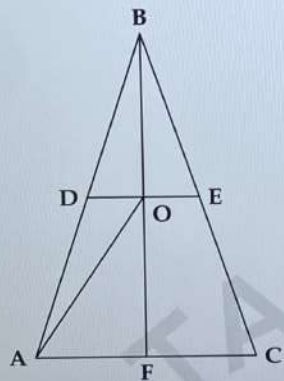
D) 111

	Radius	Height
Cylinder A	R	H
Cylinder B	$4R$	$3H + 24$

Cylinders A and B are similar. The volume of cylinder A is $1176\pi \text{ cm}^3$. If the surface areas of cylinder B and A are $n\pi \text{ cm}^2$ and $k\pi \text{ cm}^2$, respectively, what is the value of $(n - k)$?

83

107.



In the diagram below, $OB=OA$, $AB=BC$, the measure of angle $FAO = 30^\circ$, DE is parallel to AC , and $AB = 58$. What is the length of BE ?

- A) $\frac{116}{3}$
 B) 29
 C) $\frac{87}{2}$
 D) 58

110.

The perimeter of an isosceles right triangle is $48 + 48\sqrt{2}$ inches. What is the length, in inches, of the hypotenuse of this triangle?

- A 24
 B $24\sqrt{2}$
 C 48
 D $48\sqrt{2}$

111.

A right square pyramid has a surface area of $64 + 16\sqrt{357}$ square inches, which includes a base area of 64 square inches. What is the height, in inches, of this pyramid?

112.

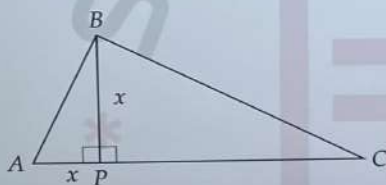
A circle in the xy -plane has its center at $(-3, 3)$. Line t is tangent to this circle at the point $(6, -3)$. Which of the following points also lies on line t ?

101.

Two identical rectangular prisms each have a height of 90 centimeters (cm). The base of each prism is a square, and the surface area of each prism is $K \text{ cm}^2$. If the prisms are glued together along a square base, the resulting prism has a surface area of $\frac{92}{47}K \text{ cm}^2$. What is the side length, in cm, of each square base?

- A) 4
- B) 8
- C) 9
- D) 16

102.



In the figure above, the area of triangle ABC is equal to $2x^2$. What is the cosine of $\angle BCP$?

- A) $1/\sqrt{10}$
- B) $3/\sqrt{10}$
- C) $1/3$
- D) 3

103.

104.

For triangles PQR and KLM, the angles Q and L are equivalent and $PR = \frac{3}{4}KM$. Which of the following information is enough to claim that PQR and KLM are similar?

- I. The length of PQ is $\frac{3}{4}$ of the length of KL.
 - II. The length of LM is $\frac{3}{4}$ of the length of QR.
- A) Only I
 - B) I and II
 - C) Only II
 - D) Neither I nor II

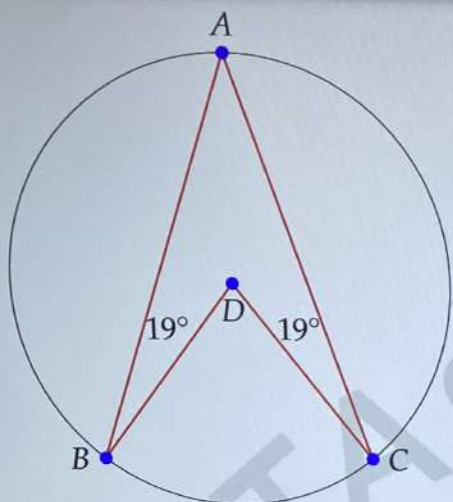
105.

A circle with radius of 8 cm is inscribed in an equilateral triangle. If the length of the triangle is $k\sqrt{3}$ cm, what is the value of k ?

106.

Right triangle ABC is inscribed in a circle with angle $B = 90$ degrees, $BC > AB$ and AC is a diameter of the circle. BD is perpendicular to AC with point D on AC. $AC = 113$ and $BD = \sqrt{222}$. What is the ratio of CD/AD?

- A) $\frac{111}{2}$
- B) $\frac{2}{111}$
- C) $\frac{\sqrt{222}}{2}$
- D) 111



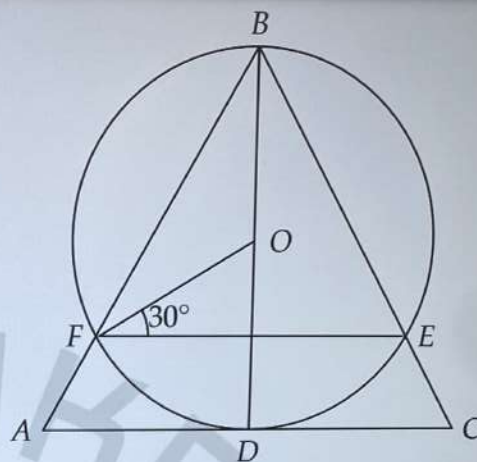
The measure of angle BDC , in radians, is equal to $\frac{a\pi}{b}$ where a and b are positive integer constants. What is the smallest possible value of $a + b$?

98.

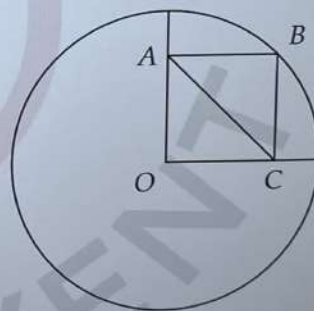
A regular hexagonal prism has a volume of 350 cubic inches and a height of 14 inches. What is the perimeter of each of the hexagonal bases, in inches? Round your answer to the nearest tenth of an inch.

- A) $10\sqrt[4]{12}$
- B) $10\sqrt{3}$
- C) $6\sqrt{25}$
- D) $25\sqrt{3}$

100.



In the figure above, O is the center of the circle and AC is tangent to the circle at D . If triangle ABC is equilateral, what is the ratio $\frac{FE}{AC}$?

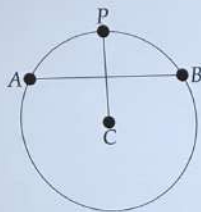


In the figure below, if the radius of circle O is 10, what is the length of diagonal AC of rectangle $OABC$?

- A) $\sqrt{2}$
- B) $\sqrt{10}$
- C) $5\sqrt{2}$
- D) 10

93.

Note: Figure not drawn to scale.



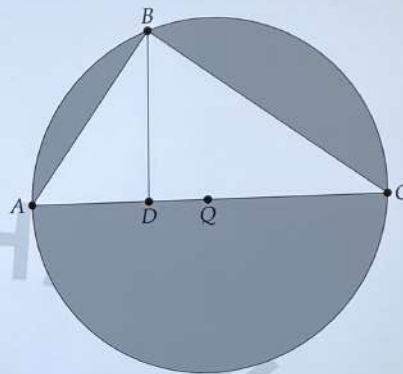
In the circle shown, point C is the center, and radius PC bisects AB at point Q . The diameter of the circle has a length of 22. Line segment QP has a length of 3. If the length of line segment AQ is equal to $\sqrt{x}$, what is the value of x ?

94.

A right circular cone has a volume of $71,148\pi$ cubic centimeters and the area of its base is $5,929\pi$ square centimeters. What is the slant height, in centimeters, of this cone?

- A) 12
- B) 36
- C) 77
- D) 85

95.



Point Q is the center of the circle. Point A , point B , and point C all lie on the circle. Point D lies on segment AC as shown. Segment BD is perpendicular to segment AC . In the figure shown, $AB = 58$ and $AD = 40$. If a point within the figure is selected at random, what is the probability that the point is within the shaded region? (Express your answer as a decimal or fraction, not as a percent.) Round your answer to the nearest thousandth.

96.

1. In circle O , there are two diameters, AC and BD . The circumference of the circle is 96π and arc AB is three times the length of arc AD . What is the length of arc BC ?

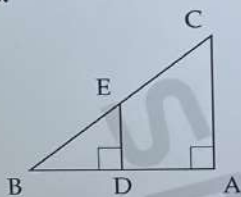
- A) 12π
- B) 24π
- C) 36π
- D) 48π

89.

In triangle ABC and triangle DEF, sides AB and DE each have a side length of 10 inches, and angles A and D each have an angle measure of 40° . Which of the following additional pieces of information is (are) sufficient to prove whether triangle ABC is congruent to triangle DEF?

- I. The measures of angles B and C are equal.
 - II. The lengths of sides AC and DF are equal.
 - III. The lengths of sides BC and EF are equal.
- A) I is sufficient, but II and III are not.
 B) II is sufficient, but I and III are not.
 C) III is sufficient, but I and II are not.
 D) II is sufficient and III is sufficient, but I is not.

90.



In the figure above, $\tan B = \frac{3}{4}$ if $BC = 15$ and $DA = 4$, what is the length of DE ?

91.

	Volume
Square pyramid A	16
Square pyramid B	5488

In geometry, a square pyramid is a pyramid that has a square base and four lateral faces. Square Pyramid A is similar to Square Pyramid B. The table gives the volumes, in cubic inches, of the two square pyramids. If the height of Square pyramid A is 8 inches, what is the perimeter of the square base of Square pyramid B, in inches? (Round your answer to the nearest tenth of an inch)

- A) $28\sqrt{6}$
 B) $4\sqrt{6}$
 C) $196\sqrt{6}$
 D) $7\sqrt{6}$

92.

A circle has a center A, and points B and C lie on the circle. Line segments BD and CD are tangent to the circle at points B and C, respectively. The measure of angle BDC is 120° . The length of line segment CD is 12 inches. What is the area of the region that is both inside quadrilateral ABDC and outside the circle, in square inches? (Round your answer to the nearest hundredth of a square inch)

- A) $144\sqrt{3} - 72\pi$
 B) $72\sqrt{3} - 36\pi$
 C) $144\sqrt{3} - 24\pi$
 D) $144 - 36\pi$

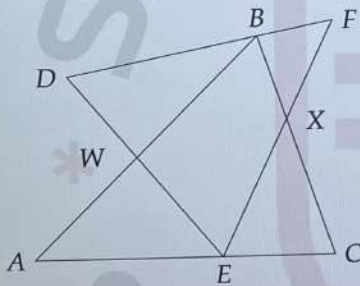
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In triangles PQR and XYZ , angles R and Z each have a measure of 38° . The length of side QR is equal to 11. The length of side YZ is equal to 27.5. Which additional piece of information is sufficient to prove that triangle PQR is similar to triangle XYZ ?

- A) The measure of angle P is 46°
- B) The length of side PR is 14 and the length of side XZ is 35
- C) The measure of angle Q is 49° and the measure of angle Y is 94°
- D) No additional information is necessary

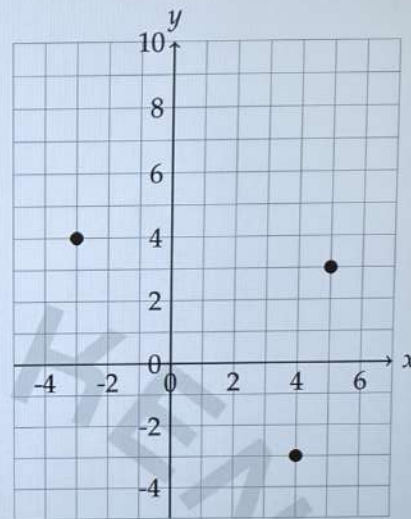
86.

Note: Figure not drawn to scale.



In the figure shown, point B lies on line segment DF , point E lies on line segment AC , line segments AB and DE intersect at point W , and line segments BC and EF intersect at point X . The measure of $\angle A$ is 40° , the measure of $\angle C$ is 60° , the measure of $\angle D$ is 68° , and the measure of $\angle FBC$ is 72° . What is the measure, in degrees, of $\angle AED$?

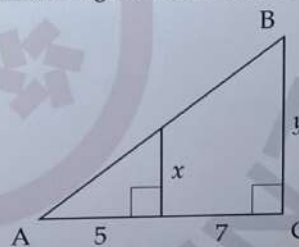
87.



What is the area, in square units, of the triangle formed by connecting the three points shown?

88.

Note: Figure not drawn to scale.



The area of triangle ABC above is at least 48 but no more than 60. If y is an integer, what is one possible value of x ?