Preparing for the New Jersey HSPA

DIRECTIONS FOR QUESTIONS 1–21: For each of the questions below, select the answer choice that is best for each case.

1 If two planes intersect, then they intersect in exactly

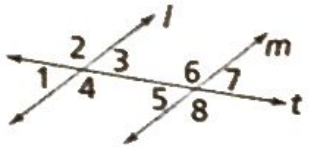
A. one line.
C. one point.
B. one plane.
D. two points.

2 Which is a possible relationship between two acute angles?

I vertical
II adjacent
III complementary
IV supplementary

A. I and II only
C. I, II, and III only
B. I and III only
D. I, II, III, and IV

3 In the figure below, $\ell \parallel m$ and $m\angle 1 = 48°$. Which other numbered angles have a measure of 48°?



A. $\angle 2$, $\angle 4$, and $\angle 8$
B. $\angle 2$, $\angle 4$, $\angle 6$, and $\angle 8$
C. $\angle 3$, $\angle 5$, and $\angle 7$
D. $\angle 3$, $\angle 4$, $\angle 5$, and $\angle 6$

4 The lengths of two sides of a triangle are 5 and 8. Which is not a possible length for the third side?

A. 5
B. 8
C. 12
D. 13

5 Given that $\overrightarrow{KM}$ bisects $\angle JKL$ and $m\angle JKM = 74°$, then $m\angle JKL =$

A. 26°
C. 106°
B. 37°
D. 148°

6 If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral must be a

A. rectangle.
C. parallelogram.
B. square.
D. trapezoid.

7 Quadrilateral $PQRS$ is an isosceles trapezoid with bases $\overline{PQ}$ and $\overline{SR}$. Given that $m\angle S = 118°$, what is $m\angle R$?

A. 59°
C. 118°
B. 62°
D. 121°

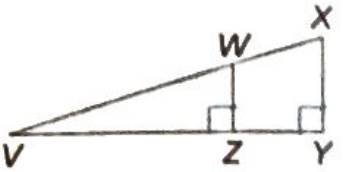
8 What is the measure of each exterior angle of a regular hexagon?

A. 45°
C. 72°
B. 60°
D. 120°

9 In the figure below, it is given that $\overline{AD}$ and $\overline{BE}$ intersect at point C and that $\overline{AC} \cong \overline{DC}$. Which additional information would not help you show that $\triangle ABC \cong \triangle DCE$?

A. $\overline{AB} \cong \overline{DE}$
B. $\overline{AB} \parallel \overline{DE}$
C. $\angle CBA \cong \angle CED$
D. Point C is the midpoint of $\overline{BE}$.

10 Which of the following justifies the conclusion $\triangle VWZ \sim \triangle VXY$?

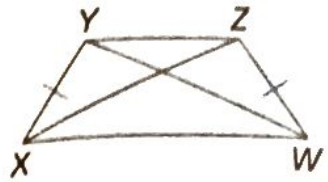


A. AA Similarity Postulate
B. SSS Similarity Theorem
C. SAS Similarity Theorem
D. definition of similar polygons

11 In which type of quadrilateral are the diagonals not necessarily perpendicular?

A. rectangle
C. kite
B. square
D. rhombus

12 This figure is a trapezoid with congruent sides as marked. Which statement is false?



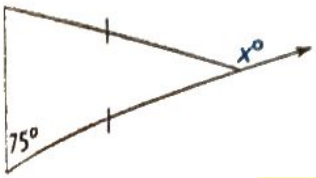
A. $\overline{YZ} \cong \overline{XW}$

B. $\overline{XZ} \cong \overline{WY}$

C. $m\angle XYZ = m\angle WZY$

D. $m\angle XYZ + m\angle YXW = 180°$

13 Find x.



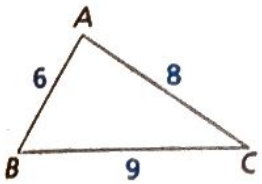
A. 75°

B. 30°

C. 150°

D. 105°

14 Identify the largest angle of $\triangle ABC$.



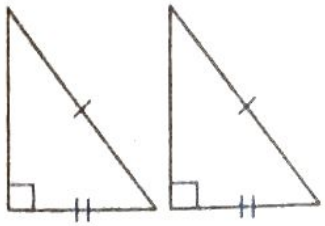
A. $\angle C$

B. $\angle A$

C. $\angle B$

D. All angles are equal in measure.

15 Using only the markings shown, the triangles below are congruent by which postulate or theorem?



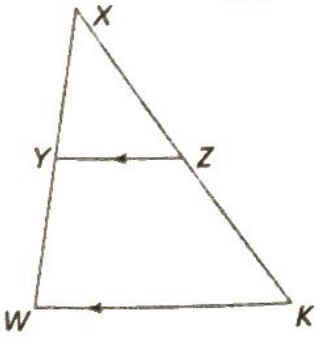
A. HL

B. SSA

C. HAL

D. CPCTC

16 Which proportion is not true for the figure?



A. $\frac{XY}{YZ} = \frac{XW}{WK}$

B. $\frac{WY}{KZ} = \frac{XY}{XZ}$

C. $\frac{XY}{XZ} = \frac{ZK}{YW}$

D. $\frac{XY}{XW} = \frac{YZ}{WK}$

17 If all sides of a quadrilateral are congruent and opposite sides are parallel, the figure must be a

A. rhombus.

B. parallelogram.

C. rectangle.

D. trapezoid.

18 The lengths of two sides of a triangle are 5 inches and 8 inches. Which can be the length of the third side?

A. 2 in. B. 13 in. C. 15 in. D. 7 in.

19 The figure to the right is a regular hexagon. Find the value of x.

A. 120°

B. 60°

C. 45°

D. 135°

20 The length of a side of a regular decagon is 11 centimeters. What is the perimeter of the decagon?

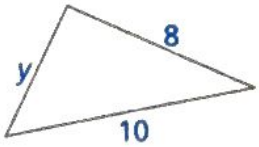
A. 132 cm

B. 220 cm

C. 110 cm

D. 55 cm

21 Given the triangle below, which is the range of all possible values of y?



A. $2 < y < 18$

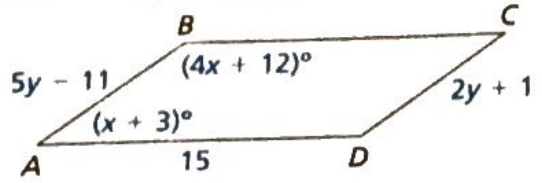
B. $8 < y < 10$

C. $2 < y < 10$

D. $y > 18$

DIRECTIONS FOR 22–24: Solve each problem and show your work.

22 $ABCD$ is a parallelogram.



a) Find x. = 33

b) Find y. = 4

c) Find AB and CD. = 9

d) Find $m\angle A$ and $m\angle B$.
36° 144°

a) $(x+3)+(4x+12)=180$
$5x+15=180$
$5x=165$
$x=33$

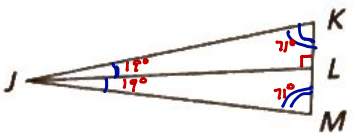
b) $5y-11=2y+1$
$3y=12$
$y=4$

c) $5y-11=?$
$5(4)-11=?$
$20-11=9$

d) $m\angle A=(33+3)=36°$
$m\angle B=(4(33)+12)=144°$

23 $\triangle JKM$ is an isosceles triangle with base $\overline{KM}$. $\overline{JL}$ bisects $\angle KJM$ and $\angle K = 71°$.

- Find $m\angle JLK$. = 90°
- Find $m\angle M$. 71°
- Find $m\angle KJM$. 38°

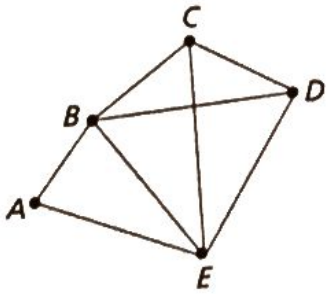


$180°-71°-71°=38°$

$2\overline{)38°}$ → 19°

$71°+19°=90°$
$180°-90°=90°$

24 Consider the following vertex-edge graph.



- Describe a situation that could be represented by the vertex-edge graph.
- What is the degree of each vertex? Vertex A is 2, the rest are 3
- Which vertices are odd and which are even? A is even, the rest are odd
- Does the vertex-edge graph have a Euler path? Explain.

Yes, because there is only one odd degree edge and each vertex is connected to another.

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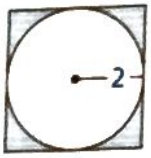
DIRECTIONS FOR QUESTIONS 1–21: For each of the questions below, select the answer choice that is best for each case.

1 Which set of numbers could be the lengths of the sides of a 45°-45°-90° triangle?

A. $3, 3, 3\sqrt{3}$ C. $\frac{1}{2}, 1, \frac{\sqrt{3}}{2}$

B. $2, 2, 2\sqrt{2}$ D. $\frac{\sqrt{3}}{2}, \sqrt{3}, 3$

2 Which represents the area of the shaded region inside the square?



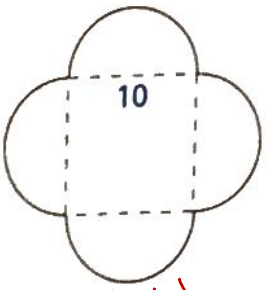
A. $4p + 16$ C. $16 - 4p$

B. $4p - 16$ D. $16p - 16$

3 One base of a trapezoid is three times as long as the other base. The height of the trapezoid is the average of the two bases. If the area of the trapezoid is 16 yd^2, how many yards long is the shorter base?

A. 2 B. 4 C. 12 D. 16

4 The figure at the right consists of four semicircles arranged along the sides of a square as shown. Find the perimeter of the figure.



A. 125.67 units

B. 62.83 units

C. 40 units

D. 31.42 units

$2(2\pi(5))$

5 Write an expression in terms of b for the area of a rectangle whose length is $2b - 1$ and whose width is $b + 3$.

A. $2b^2 + 6b - 3$ C. $7b - 3$

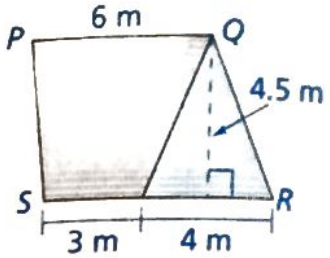
B. $3b^2 + 4b - 3$ D. $2b^2 + 5b - 3$

6 Write an expression in z for the area of a circle whose circumference is $24\pi z$.

A. $24z$ C. $144p$

B. $144\pi z^2$ D. $12z^2$

7 Find the area of trapezoid $PQRS$.



A. 58.5 m^2 C. 22.5 m^2

B. 29.25 m^2 D. 27 m^2

8 A straight length of wire 64 in. long is shaped into a circle with no wire overlapping. What are the diameter and radius of the circle formed? Give your answer to the nearest tenth of an inch.

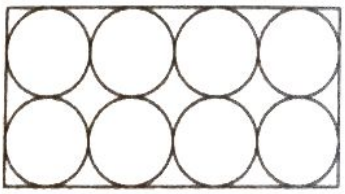
A. diameter: 9 in.; radius: 4.5 in.

B. diameter: 64 in.; radius: 32 in.

C. diameter: 10.2 in.; radius: 5.1 in.

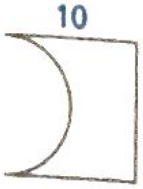
D. diameter: 20.4 in.; radius: 10.2 in.

9 Eight congruent circles with radius a are arranged inside a rectangle as shown. Write an expression in terms of a for the perimeter of the rectangle.



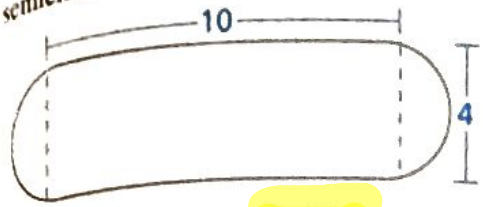
A. $24a$ B. $16a$ C. $32a$ D. $12a$

10 Find the total distance along the sides of the square and along the semicircle.



A. 40
B. 61.4
C. 45.7
D. 68.5

11 Find the total distance along the longer sides of the rectangle and along the two semicircles.



A. 28
B. 26.3
C. 32.6
D. 45.1

12 What is the midpoint of the points $(-5, 2)$ and $(3, -7)$?

A. $(3.5, 5)$
B. $(-1.5, -2)$
C. $(-1, -2.5)$
D. $(4, -4.5)$

13 Which represents the greatest possible error in a length measured to the nearest half-inch?

A. $\frac{1}{2}$ in.
B. $\frac{1}{4}$ in.
C. $\frac{1}{8}$ in.
D. $\frac{1}{16}$ in.

14 Which represents the length of a side of an equilateral triangle whose perimeter is 12.2 cm?

A. 36.6 cm
B. 9.2 cm
C. 4.1 cm
D. 12.2 cm

15 Write the sum of the vectors $\langle 2, -5\rangle$ and $\langle 10, -3\rangle$ as an ordered pair.

A. $\langle 6, -4\rangle$
B. $\langle -3, 7\rangle$
C. $\langle 8, 2\rangle$
D. $\langle 12, -8\rangle$

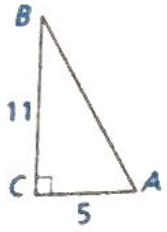
16 Which of the following is the measure of the side of a square with a diagonal of 24?

A. $12\sqrt{2}$
B. 6
C. $24\sqrt{2}$
D. $21\sqrt{3}$

17 ABC is a triangle with hypotenuse of length 16 and legs of lengths b and 6. Find the length of b rounded to the nearest tenth.

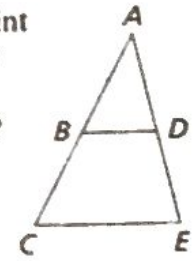
A. 17.1
B. 10
C. 14.8
D. 4.7

18 Which represents $m\angle A$ to the nearest whole degree?



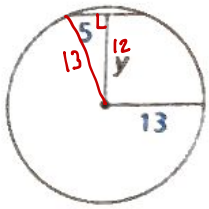
A. 55°
B. 99°
C. 66°
D. 38°

19 In the figure, B is the midpoint of $\overline{AC}$ and D is the midpoint of $\overline{AE}$. If the length of $\overline{CE}$ is 18, what is the length of $\overline{BD}$?



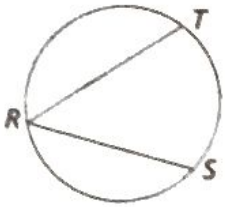
A. 6
B. 9
C. $9\sqrt{2}$
D. 10

20 Find the value of y. Note that the figure is not drawn to scale.



A. 8
B. 12
C. 13
D. 17

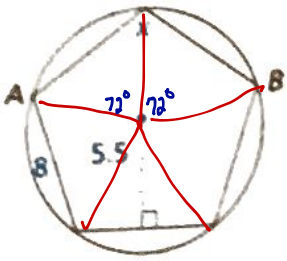
21 Find $m\angle R$ given that $mST = 110°$ and $mRS = 140°$.



A. 30°
B. 55°
C. 110°
D. 125°

DIRECTIONS FOR 22–24: Solve each problem and show your work.

22 A regular pentagon inscribed in a circle is shown in the figure below.



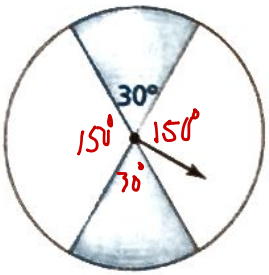
$A = 5\left[\frac{1}{2}(5.5)(8)\right] = 110 \text{ units}^2$

- Find the area of the regular pentagon.
- What is $m\overset{\frown}{AB}$? (Hint: remember that this is a regular pentagon.) 148°
- Find $m\angle x$. $= 180° - 72° = 108°$

23 Two trees are 100 ft apart on level ground. The height of the taller tree is 75 ft. The angle of depression from the top of the taller tree to the top of the shorter tree is 15°.

- Find the height of the shorter tree to the nearest tenth of a foot. 48.2ft
- What is the distance between the tops of the two trees to the nearest tenth of a foot? 103.5ft
- If all of the measurements were taken to the nearest tenth of a foot, what is the percent of error in your answer to the second part? 0.5%

24 Two diameters go through the center of a spinner, creating four sections.



$\frac{30}{360} = \frac{1}{12}$

- If the area of one of the shaded sections is 20 in.^{2}, what is the area of the entire circle? $\frac{1}{12} = \frac{20}{x}$ $x = 240 \text{ in}^2$
- What percentage of the spinner is shaded? $\frac{2}{12} = \frac{1}{6} \approx 16.7\%$
- If the arc formed by one of the white sections is 16 in. long, what is the length of the arc formed by the other white section? Explain.

The other would be 16 in as well because the central angles of both white sections are vertical angles which are congruent, making their arc lengths congruent.

Preparing for the New Jersey HSPA

DIRECTIONS FOR QUESTIONS 1–18: For each of the questions below, select the answer choice that is best for each case.

1 If the radius and height of a cylinder are doubled then its lateral area

A. stays the same.
C. triples.
B. doubles.
D. quadruples.

2 Find the number of 3 ft × 2 ft × 1 ft boxes that can be packed in the prism below.

A. 6
C. 2
B. 3
D. 4

3 The cone-shaped paper cup has a height 9 cm and a rim with circumference 12π cm. What is the volume of the cup?

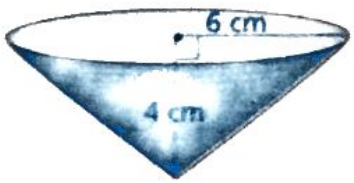
A. 169.56 cm^2
C. 508.68 cm^2
B. 339.12 cm^2
D. 1017.36 cm^2

4 Which is the surface area of a rectangular prism with length 6, width 5, and height 4?

A. 120 $units^2$
C. 154 $units^2$
B. 148 $units^2$
D. 180 $units^2$

$2(6)(5) + 2(6)(4) + 2(5)(4)$
$60 + 48 + 40 = 148$

5 Suppose that a spherical scoop of ice cream sets in the cone below so that its great circle is along the circumference of the cone, how much space is left inside the cone?

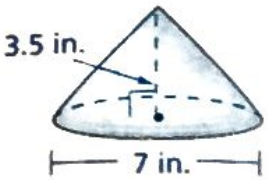


A. 75.4 cm
C. 150.8 cm
B. 301.6 cm
D. 226.2 cm

6 Which could be the dimensions of a right rectangular prism that has the same volume as a right rectangular prism with volume 132 cubic units?

A. length 11, width 2, and height 5 110
B. length 12, width 6, and height 2 144
C. length 11, width 2, and height 6 132
D. length 11, width 2, and height 12

7 Find the total surface area of the cone.



A. 76.93 $in.^2$
C. 92.32 $in.^2$
B. 75.83 $in.^2$
D. 261.56 $in.^2$

8 Find the weight of the contents of a right rectangular prism with length 15 ft, width 3 ft, and height 3.5 ft if the contents weigh 0.25 pounds per cubic ft.

$(15)(3)(3.5) = 157.5$
$\times .25$

A. 39.375 pounds
B. 630 pounds
C. 33.75 pounds
D. 540 pounds

9 The volume of a right cylinder is 245 cm^3. If the radius of the cylinder is 5.5 cm, find its height to the nearest hundredth.

A. 2.08 cm
C. 2.41 cm
B. 2.58 cm
D. 3.61 cm

10 A rectangle has an area of 504 in.^{2} What is the maximum possible perimeter of the rectangle?

A. 1000 in.
C. 508 in.
B. 260 in.
D. 1010 in.

11 A rectangular fish tank has dimensions 2.5 ft × 2 ft × 1.5 ft. It is packed in a 3 ft × 4 ft × 3 ft box. How much filler is needed to securely package the aquarium for shipping?

A. 2.5 ft^3
C. 42 ft^3
B. 4 ft^3
D. 28.5 ft^3

12 A can has a diameter of 3 inches and a height of 4.5 inches. How much paper will it take to create the label for the can?

A. 84.78 in.^{2}
B. 42.39 in.^{2}
C. 31.79 in.^{2}
D. 127.17 in.^{2}

$C = 3\pi$

$3\pi \cdot 4.5$

13 The length of each side of the Pyramid of Cheops originally measured 756 ft and its slant height was 482 ft. Find the lateral area of the pyramid when it was built.

A. 926,100 ft^2
B. 728,784 ft^2
C. 927,315 ft^2
D. 730,296 ft^2

14 If the lateral area of a right cylinder with a 1 ft radius is 9π ft^2, what is its height?

A. 6 ft
C. 4.5 ft
B. 2.9 ft
D. 0.9 ft

15 Which best describes the prism below?

A. triangular prism
B. rectangular prism
C. pentagonal prism
D. hexagonal prism

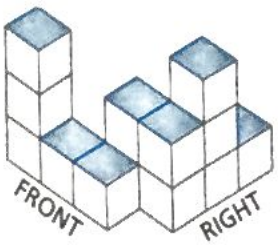
16 A cylinder has one lateral face. What is the shape of its face?

A. circle
C. rectangle
B. square
D. triangle

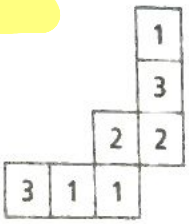
17 A right triangular prism has how many lateral faces?

A. 1
B. 2
C. 3
D. 4

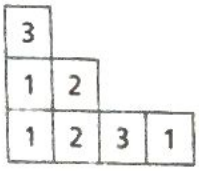
18 Assuming no cubes are hidden from view, which foundation drawing represents the set of stacked cubes?



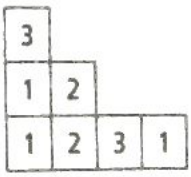
A.



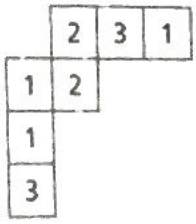
C.



B.



D.

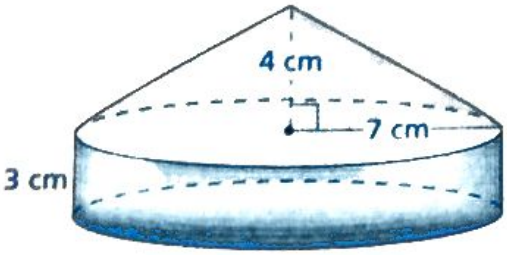


DIRECTIONS FOR 19–21: Solve each problem and show your work.

19 A circular aboveground pool has a diameter of 8 ft and stands 5.5 ft off the ground.

- Find the surface area of the pool. (Hint: The top of the pool is not enclosed.) $188.4 ft^2$
- If the pool company charges an installation fee of \$11 per square ft, how much will the installation cost? \$2,072.40
- If the pool is to only be filled to 75% of its maximum capacity, how much water can it hold? $207.26 ft^3$

20 Use the figure below.



a) Find the volume of the right cylinder. $V = r^2 h\pi = 7^2(3)\pi = 147\pi \text{ cm}^3$

b) Find the volume of the right cone. $V = \frac{r^2 h\pi}{3} = \frac{7^2(4)\pi}{3} = \frac{196\pi}{3} \text{ cm}^3$

c) Find the volume of the entire figure. $147\pi + \frac{196\pi}{3} = \frac{441\pi + 196\pi}{3} = \frac{637\pi}{3} \text{ cm}^3$

d) What is the surface area of the entire figure?

$SA(\text{cone}) = \pi r\left(r + \sqrt{h^2 + r^2}\right)$

$SA(\text{cylinder}) = 2\pi rh + 2\pi r^2$

Extra pieces $A = \pi r^2$ (two: $2\pi r^2$)

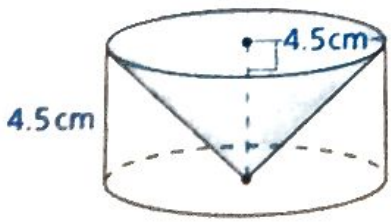
$SA = \pi r\left(r + \sqrt{h^2 + r^2}\right) + 2\pi rh + 2\pi r^2 - 2\pi r^2 = \pi(7)\left(7 + \sqrt{4^2 + 7^2}\right) + 2\pi(7)$

$= 7\pi(7 + 28) + 14\pi$

$= 7\pi(35) + 14\pi = 245\pi + 14\pi$

$= 359\pi \text{ cm}^2$

21 A right cone nests inside a right cylinder as shown.



- Find the volume of the inscribed cone. 95.38cm^3
- Find the volume of the cylinder. 286.13cm^3
- Find the volume of the space inside the cylinder but outside the cone. 190.75cm^3