Name: ____________________

EOC FSA

Practice Test

DEPARTMENT OF MATHEMATICS, SCIENCE, & GIFTED

BROWARD COUNTY PUBLIC SCHOOLS

Geometry

Calculator Portion

Compiled by the Broward County Public Schools
Office of Instruction and Intervention
Mathematics, Science, & Gifted Department

Geometry EOC FSA Mathematics Reference Sheet

Customary Conversions

1 foot = 12 inches
1 yard = 3 feet
1 mile = 5,280 feet
1 mile = 1,760 yards

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts

1 pound = 16 ounces
1 ton = 2,000 pounds

Metric Conversions

1 meter = 100 centimeters
1 meter = 1000 millimeters
1 kilometer = 1000 meters

1 liter = 1000 milliliters

1 gram = 1000 milligrams
1 kilogram = 1000 grams

Time Conversions

1 minute = 60 seconds
1 hour = 60 minutes
1 day = 24 hours
1 year = 365 days
1 year = 52 weeks

Geometry EOC FSA Mathematics Reference Sheet

Formulas

$\sin A° = \frac{\text{opposite}}{\text{hypotenuse}}$

$\cos A° = \frac{\text{adjacent}}{\text{hypotenuse}}$

$\tan A° = \frac{\text{opposite}}{\text{adjacent}}$

$V = Bh$

$V = \frac{1}{3}Bh$

$V = \frac{4}{3}\pi r^3$

$y = mx + b$, where m = slope and b = y-intercept

$y - y_1 = m(x - x_1)$, where m = slope and (x_1, y_1) is a point on the line

Name: ______________________ Class: _________________ Date: _________ ID: A

Geometry EOC FSA Practice Test (Calculator Portion)

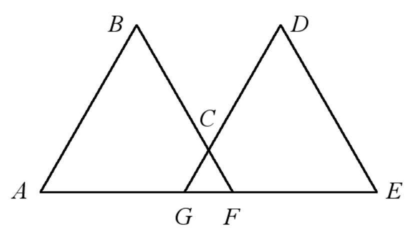
____ **1** The endpoints of $\overline{LM}$ are $L(3, -2)$ and $M(-3, 2)$. Which of the following could *not* be the endpoints of the image of $\overline{LM}$ under a dilation centered at the origin?

A. $L'(-3, -2)$ and $M'(3, 2)$
B. $L'(3, -2)$ and $M'(-3, 2)$
C. $L'\left(1\frac{1}{2}, -1\right)$ and $M'\left(-1\frac{1}{2}, 1\right)$
D. $L'(9, -6)$ and $M'(-9, 6)$

____ **2** ΔNOP has side lengths 5 cm, 7 cm, and 9 cm. If $\Delta NOP \sim \Delta RST$, which of the following could be the lengths of the sides of ΔRST?

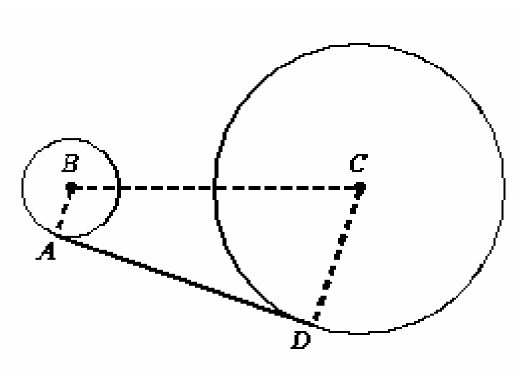
A. 1 cm, 3 cm, 5 cm
B. 6 cm, 8.4 cm, and 13.5 cm
C. 7.5 cm, 10.5 cm, 13.5 cm
D. 15 cm, 17 cm, and 19 cm

____ **3** $\Delta ABF \cong \Delta EDG$. ΔABF and ΔGCF are equilateral. $AG = 21$ and $CG = \frac{1}{4}AB$. Find the total distance from A to B to C to D to E.



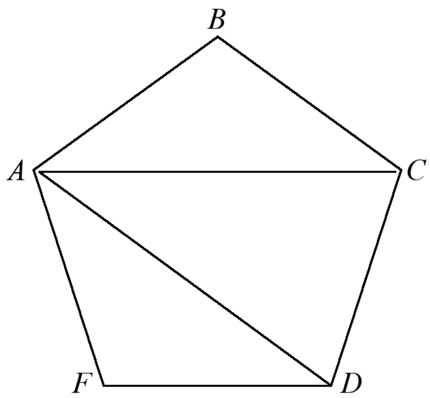
A. 112
B. 98
C. 84
D. 28

____ **4** $\overline{AD}$ is perpendicular to the radius of each circle in the figure below. If $BA = 6$ inches, $AD = 21$ inches, and $CD = 16$ inches, find the length of $\overline{BC}$ to the nearest tenth of an inch.



A. 18.9 inches
B. 29.7 inches
C. 21.8 inches
D. 23.3 inches

____ **5** $ABCDF$ is a regular pentagon. Which answer choice explains correctly how to find $m\angle B$?



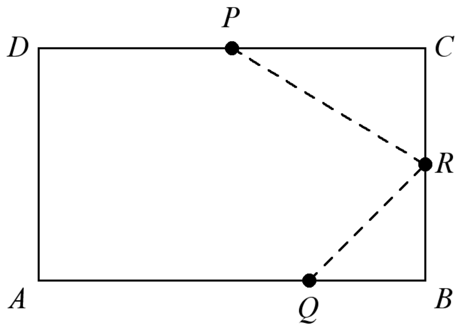
A. Since all sides of a regular polygon are congruent, $\overline{BA} \cong \overline{BC}$. Therefore, by the Isosceles Triangle Theorem, $\angle BAC \cong \angle BCA$. By the same line of reasoning, $\angle FAD \cong \angle FDA$. Then, since the sum of the measures of these four congruent angles equals $180°$, each must have measure $180° \div 4 = 45°$. Finally, by the Triangle Angle Sum Theorem, $m\angle BAC + m\angle BCA + m\angle B = 180°$. Substituting $45°$ for the first two angle measures yields $m\angle B = 180° - 90° = 90°$.

B. All angles of a regular polygon are congruent. Since the sum of the measures of a polygon is $360°$, each angle of $ABCDF$ must measure $360° \div 5 = 72°$. So, $m\angle B = 72°$.

C. Segments $\overline{AC}$ and $\overline{AD}$ break $ABCDF$ into three triangles. Therefore the sum of the measures of the interior angles of $ABCDF$ is $3 \bullet 180° = 540°$. Since all angles of a regular polygon are congruent, each angle of $ABCDF$ must measure $540° \div 5 = 108°$. So, $m\angle B = 108°$.

D. Segments $\overline{AC}$ and $\overline{AD}$ break $ABCDF$ into three triangles. Therefore the sum of the measures of the interior angles of $ABCDF$ is $3 \bullet 180° = 540°$. In the diagram, the three triangles have a total of $3 \bullet 3 = 9$ angles. Therefore, each angle in the diagram measures $540° \div 9 = 60°$. So, $m\angle B = 60°$.

____ **6** A beam of light is shot from point P in a rectangular box, as shown. The beam hits a mirror along side BC and reflects to point Q. A law of physics states that the angle at which the light beam hits the mirror ($\angle PRC$) must equal the angle at which the light beam reflects off the mirror ($\angle QRB$).



Point P is situated 14 cm from point C. Point R is situated 10 cm from point C and 5 cm from point B. A student wants to find the total distance traveled by the light beam from P to Q. Which correctly explains how the student should proceed?

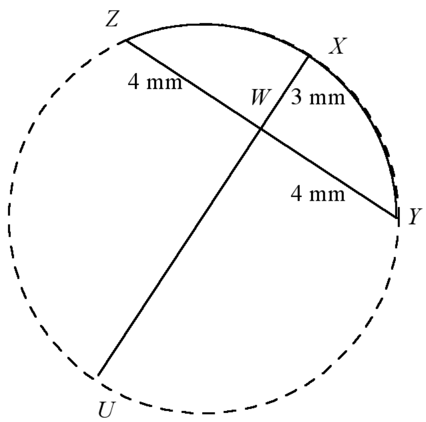
A. You will need more information before the problem can be solved. Specifically, you need to know the length (AB) of the box. Then you can use trigonometry and the Pythagorean Theorem to find the distance traveled.

B. Find PR using the Pythagorean Theorem: $PR = \sqrt{14^2 - 10^2} = \sqrt{96} \approx 9.8$. By the laws of physics, $\angle QRB \cong \angle PRC$. And, since R is one-half as far from point B as from point C, RQ must equal one-half of PR. So, the total distance traveled by the light beam is approximately $9.8 + 4.9 = 14.7$ cm.

C. Find PR using the Pythagorean Theorem: $PR = \sqrt{14^2 + 10^2} = \sqrt{296} \approx 17.2$. Then use a trigonometric ratio to find the measure of $\angle PRC$. Since $\cos(\angle PRC) \approx \frac{14}{17.2}$, $m\angle PRC \approx \arccos\left(\frac{14}{17.2}\right) \approx 35.5°$. Then, since $\angle QRB \cong \angle PRC$, use cosine on $\angle QRB$ to find QR: $\cos(\angle QRB) = \frac{RB}{QR}$. So, $QR = \frac{RB}{\cos(\angle QRB)} \approx \frac{5}{\cos(35.5)} \approx 6.1$ cm. So, the total distance traveled by the light beam is approximately $17.2 + 6.1 = 23.3$ cm.

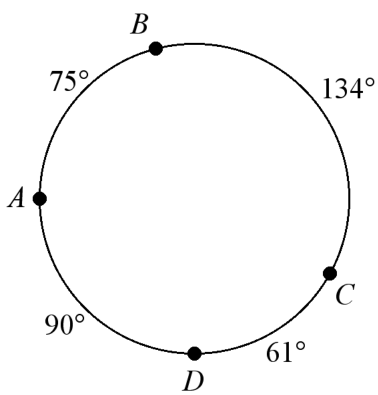
D. Find PR using the Pythagorean Theorem: $PR = \sqrt{14^2 + 10^2} = \sqrt{296} \approx 17.2$. Then use a trigonometric ratio to find the measure of $\angle PRC$. Since $\sin(\angle PRC) \approx \frac{14}{17.2}$, $m\angle PRC \approx \arcsin\left(\frac{14}{17.2}\right) \approx 54.5°$. Then, since $\angle QRB \cong \angle PRC$, use cosine on $\angle QRB$ to find QR: $\cos(\angle QRB) = \frac{RB}{QR}$. So, $QR = \frac{RB}{\cos(\angle QRB)} \approx \frac{5}{\cos(54.5)} \approx 8.6$ cm. So, the total distance traveled by the light beam is approximately $17.2 + 8.6 = 25.8$ cm.

____ **7** Archaeologists found a piece of an old coin. To calculate its original diameter, they drew a chord $\overline{XU}$ and its perpendicular bisector $\overline{ZY}$. Find the coin's diameter.



A. $5\frac{1}{3}$ mm
B. 8 mm
C. $8\frac{1}{3}$ mm
D. 16 mm

____ **8** *ABCD* is a quadrilateral inscribed in the circle with arc measures shown here. What is the measure of the smallest angle in *ABCD*?

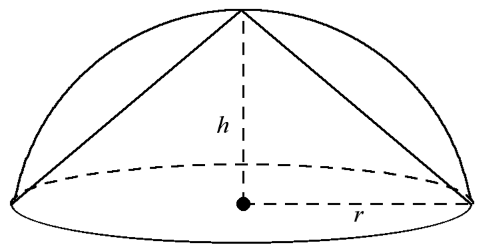


A. 75.5°
B. 68°
C. 61°
D. 30.5°

____ **9** Carlos has a collection of old vinyl records. To play some of the records, the turntable rotates through an angle of $\frac{3}{2}\pi$ radians in 1 second. How many revolutions does the record make in one minute?

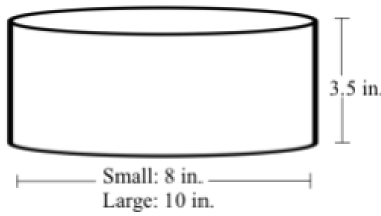
A. $33\frac{1}{3}$ revolutions per minute
B. 45 revolutions per minute
C. 78 revolutions per minute
D. $16\frac{2}{3}$ revolutions per minute

____ **10** What is the relationship between the volume of the cone inscribed in a hemisphere and the volume of the hemisphere?



A. The volume of the cone is 2 times greater than the volume of the hemisphere.
B. The volume of the hemisphere is 2 times greater than the volume of the cone.
C. The volume of the hemisphere is $\frac{2}{3}$ of the volume of the cone.
D. The volume of the cone is $\frac{2}{3}$ of the volume of the hemisphere.

____ **11** Cheesecakes are shaped like cylinders. A bakery sells cheesecakes in the two sizes labeled in the figure.



A customer is trying to decide which cheesecake to buy. He says to the clerk, “I think that the small one is enough to serve 12 but I have 18 guests. The large cheesecake costs a lot more and I don’t think it will serve 18.” The clerk replies, “Yes, it will serve 18.” Which correctly analyzes the clerk’s response?

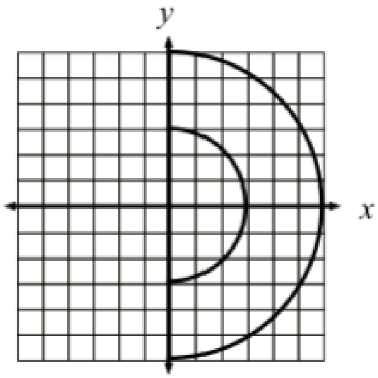
A. The clerk is trying to sell the customer a more expensive cheesecake. Without further information, there is no way to determine how many people the larger cheesecake will serve.

B. The clerk is incorrect. The large cheesecake has radius of 5 inches as opposed to 4 inches for the small one. So, its volume is $5 \div 4 = 1.25$ times as great. So, the large one will serve $12 \bullet 1.25 = 15$ guests, not 18.

C. The clerk is correct. The large cheesecake has radius of 5 inches as opposed to 4 inches for the small one. Since the formula for volume includes the term r^2, the volume of the large cheesecake is $\left(\frac{5}{4}\right)^2 = \frac{25}{16}$ times as great as that of the small cheesecake. So, it will serve $12 \bullet \frac{25}{16} = 18.75$, enough to justify the clerk saying “Yes, it will serve 18.”

D. The clerk is correct. The large cheesecake has radius of 5 inches as opposed to 4 inches for the small one. Since the formula for volume includes the terms r^2 and h, the volume of the large cheesecake is $\left(\frac{5}{4}\right)^2\left(\frac{5}{4}\right) = \frac{125}{64}$ times as great as that of the small cheesecake. So, it will serve $12 \bullet \frac{125}{64} = 23.4375$, more than enough to justify the clerk saying “Yes, it will serve 18.”

____ **12** Semicircles of radius 3 and 6 are centered on the origin of the coordinate grid shown. The region bounded by the semicircles and the portions of the y-axis between them is rotated about the y-axis. Which correctly explains how to find the volume of the solid generated?



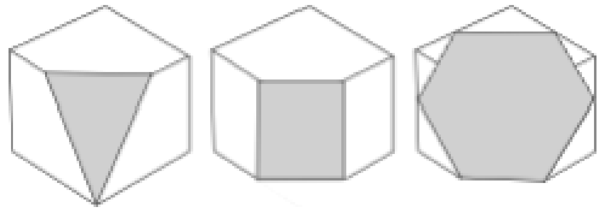
A. The solid formed is determined by the outer circle, since that solid contains the solid formed by the inner circle. So, the solid is a sphere of radius 6. Using the formula $V = \frac{4}{3}\pi r^3$, $V = \frac{4}{3}\pi(6)^3 = 288\pi$.

B. The solid formed is a sphere with an empty cavity in the middle. Since the cavity is not part of the sphere, its volume is not included. So, the volume of the solid is $\frac{4}{3}\pi(6)^3 - \frac{4}{3}\pi(3)^3 = 288\pi - 36\pi = 252\pi$.

C. The solid formed is a sphere with an empty cavity in the middle. Since the cavity is not part of the sphere, its volume is not included. To find the correct radius to use in the volume formula, subtract the radius of the smaller circle from the radius of the larger circle. So, the volume of the solid is $\frac{4}{3}\pi(6-3)^3 = \frac{4}{3}\pi(3)^3 = 36\pi$.

D. The solid formed resembles a hemisphere (half of a sphere) with an empty cavity at the middle of its base. Since the cavity is not part of the hemisphere, its volume is not included. Since a sphere has volume $\frac{4}{3}\pi r^3$, a hemisphere has volume $\frac{2}{3}\pi r^3$. So, the volume of the solid is $\frac{2}{3}\pi(6)^3 - \frac{2}{3}\pi(3)^3 = 144\pi - 18\pi = 126\pi$.

____ **13** When a cube is cut by a plane, there are many possible cross-sections. The figures below shows how a triangle, rectangle, or hexagon are possible.



A student claims that she can form a cross-section of a cube that is an octagon. Which correctly evaluates this student's claim?

A. The student's claim is not reasonable. A cube contains eight vertices forming right angles. So, the total of the angle measures is $8 \bullet 90° = 720°$. But the sum of the measures of an octagon is $180(n-2) = 180(8-2) = 1{,}080°$. Since the sums of the angle measures are not equal, you cannot form a cross-section with eight sides.
B. The student's claim is not reasonable. Each side of a cross-section must lie on a different face of the cube. Since a cube has six faces, you cannot form a cross-section with eight sides.
C. The student's claim is reasonable. Every cube has 12 edges. So, there are $\dfrac{12 \bullet 11}{2} = 66$ ways to pick two points on two different edges. Each pair of points can form the endpoints of a side of the octagon. So, you only need to pick 8 of the 66 possible edges to form your octagon.
D. The student's claim is reasonable. Every cube has 8 vertices. So, there are $\dfrac{8 \bullet 7}{2} = 28$ ways to pick two vertices. Each pair of vertices can form the endpoints of a side of the octagon. So, you only need to pick 8 of the 28 possible edges to form your octagon.

____ **14** Bert wants to identify the center and radius of the circle defined by the equation $x^2 + y^2 - 8x + 2y - 47 = 0$. He follows these steps:

Step 1: $x^2 - 8x + y^2 + 2y = 47$

Step 2: $(x^2 - 8x + 16) + (y^2 + 2y + 1) = 47$

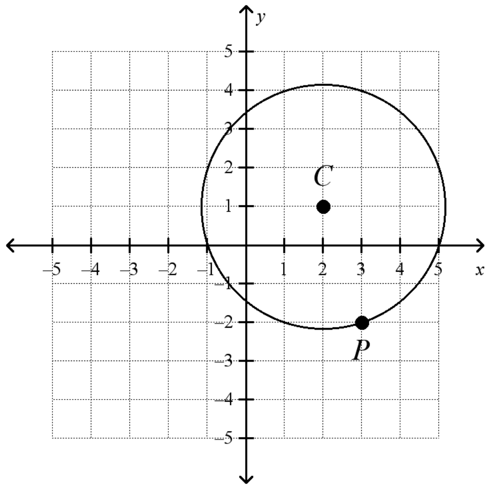
Step 3: $(x-4)^2 + (y+1)^2 = 47$

Step 4: Center: $(4, -1)$; radius: $\sqrt{47}$

At which step did Bert make a mistake, and what was it?

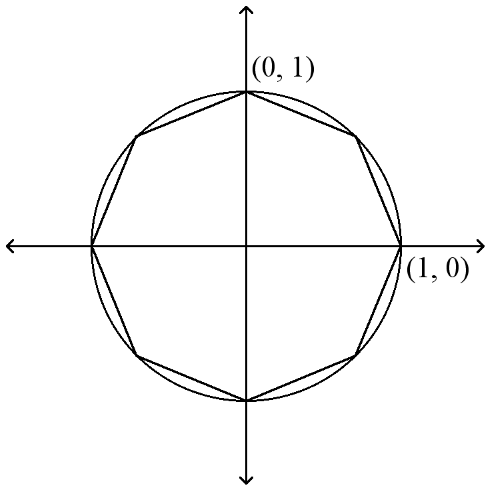
A. Step 1; he reversed the sign of -47 while rearranging the terms.
B. Step 2; he failed to add the new constant terms to both sides of the equation.
C. Step 3; he failed to square both sides of the equation.
D. Step 4; he interpreted the equation incorrectly when finding the location of the center.

____ **15** A circle with center $(2,1)$ contains the point $(3,-2)$. What is the equation of the line tangent to the circle at $(3,-2)$?



A. $y = -3x + 7$ B. $y = 3x - 9$ C. $y = \frac{1}{3}x - 3$ D. $y = -\frac{1}{3}x - 1$

____ **16** A county reservoir is surrounded by a circular running path and a walking path shaped like a regular octagon. The two paths meet at the vertices of the octagon, as shown on the coordinate grid. On that grid, each unit = 1 kilometer.



Which correctly explains how to determine the difference in the lengths of the two paths?

A. The points $(0,1)$ and $(1,0)$ are $\sqrt{1^2+1^2}=\sqrt{2}$ units apart. Since there is a vertex between $(0,1)$ and $(1,0)$, it must be $0.5\sqrt{2}$ from each of those points. So, each side of the walking path is $0.5\sqrt{2}$ km long. Since there are 8 sides, the walking path is $4\sqrt{2}$ km long. And, since the running path is a circle with radius of 1, its length is 2π km. So, the running path is about $2\pi-4\sqrt{2}\approx 0.63$ km longer than the walking path.
B. The points $(0,1)$ and $(1,0)$ are $\sqrt{1^2+1^2}=\sqrt{2}$ units apart. Since there is an intermediate point between $(0,1)$ and $(1,0)$, it must be $0.5\sqrt{2}$ from each of those points. So, each side of the walking path is $0.5\sqrt{2}$ km long. Since there are 8 sides, the walking path is $4\sqrt{2}$ km long. And, since the running path is a circle with radius of 1, its length is π km. So, the walking path is about $4\sqrt{2}-\pi\approx 2.52$ km longer than the running path.
C. Call the vertex on the walking path between $(0,1)$ and $(1,0)$ point P. Since the path is a regular octagon, P, the origin, and $(1,0)$ must form an angle of $360\div 8=45°$. Then, since the circular path has radius of 1, the coordinates of P must be $(\cos 45°, \sin 45°)\approx(0.71, 0.71)$. So, each side of the walking path has length of approximately 0.767, and the walking path is about $8\bullet 0.767=6.14$ km long. And, since the running path is a circle with radius of 1, its length is 2π km. So, the running path is about $2\pi-6.14\approx 0.14$ km longer than the walking path.
D. Call the vertex on the walking path between $(0,1)$ and $(1,0)$ point P. Since the path is a regular octagon, P, the origin, and $(1,0)$ must form an angle of $360\div 8=45°$. Then, since the circular path has radius of 1, the coordinates of P must be $(\cos 45°, \sin 45°)\approx(0.71, 0.71)$. So, each side of the walking path has length of approximately 0.767, and the walking path is about $8\bullet 0.767=6.14$ km long. And, since the running path is a circle with radius of 1, its length is π km. So, the walking path is about $6.14-\pi\approx 3.0$ km longer than the running path.

____ **17** Helium is used for balloons because it is less dense than air. This is what allows helium balloons to rise. Suppose a helium-air mixture in a spherical balloon with a diameter of 1 foot has a density of 0.04 pounds per cubic foot. What is the weight of the gas mixture in the balloon?

A. about 0.02 pound
B. about 0.03 pound
C. about 0.04 pound
D. about 0.52 pound

____ **18** Water has a density of about 62.5 pounds per cubic foot. Snow has a lower density than water, but that density can vary greatly. Suppose snow that is falling and settling has a density of about 16 pounds per cubic foot. 8 inches of snow has fallen and you have to shovel a sidewalk that is 40 feet long and 5 feet wide. How much snow must you shovel?

A. Less than 500 pounds of snow
B. Between 500 and 1,000 pounds of snow
C. Between 1,000 and 2,000 pounds of snow
D. More than 2,000 pounds of snow

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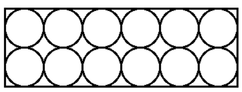
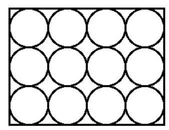
____ **19** Miguel wants to build a container out of sheet metal that has a volume of about 320 in^3. He can choose from the following designs. Which of the objects described requires the least amount of sheet metal? Assume that no sheet metal will be wasted in the construction of each object.

A. A rectangular prism with length 8 in., width 8 in., and height 5 in.
B. A rectangular prism with length 10 in., width 8 in., and height 4 in.
C. A cylinder with radius 5 in. and height 4 in.
D. A square pyramid with base length 10 in., height 10 in., and slant height about 14 in.

____ **20** When cylindrical cans are sold by the dozen, two ways they may be packed in a rectangular container are shown in the 2×6 and 3×4 arrangements below. A can of sauerkraut is 4 inches tall with a diameter of 3 inches. The company manager want to use a package design that requires the least amount of material. Which is the **best** analysis of the situation?



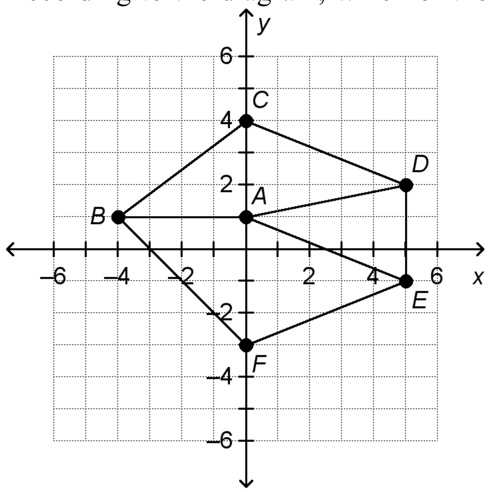


A. A 2×6 arrangement is 6 inches wide, 18 inches long and 4 inches high. A 3×4 arrangement is 9 inches across, 12 inches across and 4 inches high. Since they have the same height, you can compare the areas of their bases. Since $6 \bullet 18 = 9 \bullet 12$, the two arrangements have the same area. Either arrangement is equally cost-effective.
B. A 2×6 arrangement is 6 inches wide, 18 inches long and 4 inches high. Its total surface area will be 408 square inches. A 3×4 arrangement is 9 inches wide, 12 inches long and 4 inches high. Its total surface area is 384 square inches. Since $384 < 408$, the 3×4 arrangement should be selected.
C. A 2×3 arrangement in two layers creates a $2 \times 3 \times 2$ arrangement. This will be 6 inches wide, 9 units long and 8 units high. Its total surface area is 348 square inches, which is less than the surface areas of either arrangement shown. A $2 \times 3 \times 2$ arrangement should be recommended.
D. A 1×12 arrangement is 3 inches wide, 36 inches long and 4 inches high. Its total surface area is $3 \bullet 36 + 3 \bullet 4 + 36 \bullet 4 = 264$ square inches. The surface areas of the arrangements shown are 408 square inches and 384 square inches. $264 < 384 < 408$, so a 1×12 arrangement should be recommended.

____ **21** Consider the directed line segment from $M(-3, 1)$ to $N(3, 4)$. Determine which of the following statements are true.

A. The point $P(1, 3)$ partitions the segment in the ratio 2 to 1.
B. The point $Q(-1, 2)$ partitions the segment in the ratio 1 to 2.
C. The point $R(0, 2.5)$ partitions the segment in the ratio 1 to 2.
D. The point $S(0, 2.5)$ partitions the segment in the ratio 1 to 1.
E. The point $T(-1, 4.5)$ partitions the segment in the ratio 1 to 1.

____ **22** According to the diagram, which of the following statements are true?



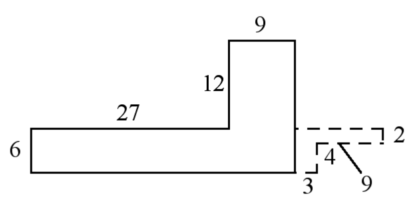
A. The area of $\triangle ACD$ is 8 square units.
B. The area of $\triangle ADE$ is 7.5 square units.
C. The perimeter of $\triangle AFB$ is greater than 13 units.
D. The perimeter of $\triangle ABC$ is 12 units.
E. The perimeter of $BCDEF$ is less than 24 units.

23 A cellular phone tower services a 20-mile radius. A rest stop on the highway is 5 miles east and 12 miles north of the tower. If you continue driving due east, for how many more miles will you be in range of the tower?

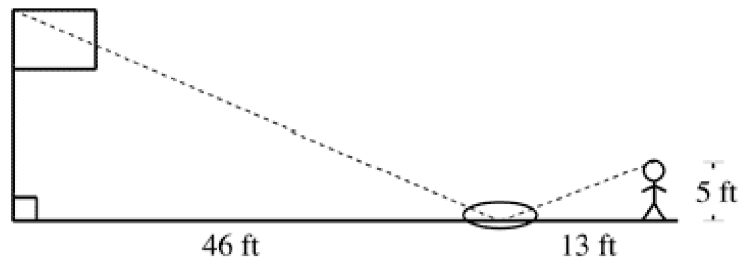
24 Tell how polygon $E(5,0)$, $F(9,4)$, $G(7,2)$, $H(0,-1)$ was mapped to polygon $J(12,6)$, $K(18,12)$, $L(15,9)$, $M(4.5,4.5)$.

25 Prove that the triangle with vertices $A(1, 2)$, $B(3, -1)$, $C(3, 5)$ is an isosceles triangle.

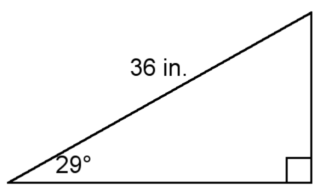
26 The dashed figure is the image of the solid figure under a transformation. Tell whether the transformation involves a dilation. (They are not drawn to scale, but assume all angles are 90°.) If so, give the scale factor of the dilation.



27 Karen wanted to measure the height of her school's flagpole. She placed a mirror on the ground 46 feet from the flagpole, and then walked backwards until she was able to see the top of the pole in the mirror. Her eyes were 5 feet above the ground and she was 13 feet from the mirror. Using similar triangles, find the height of the flagpole to the nearest hundredth of a foot. (Figures may not be drawn to scale.)

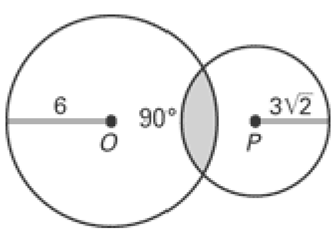


28 Stefan and Angela are building a skateboard ramp with the dimensions shown. To find the height of the ramp, Stefan says they should use the expression 36 sin 29°. Angela says they should use the expression 36 cos 29°.



Whose expression is correct? What error did the other person make? What is the height of the ramp? Round your answer to the nearest tenth.

29 Find the area of the shaded region in terms of π. Points O and P are the centers of the circles.



Name: ______________________ ID: A

30 A cylindrical water tank with radius 2 feet and length 6 feet is filled with water to a depth of 3 feet when in a horizontal position. If the tank is turned upright, what is the depth of the water? Give your answer in terms of π.