# Unit 1 Assessment • Similarity, Congruence, and Proofs

1. Which of the following statements is **not** true?

A. Similar figures have corresponding angles that are equal in measure.

B. Similar figures have corresponding sides that are equal in length.

C. Dilating a triangle by a scale factor less than 1 results in a similar triangle with shorter sides.

D. Dilating a triangle by a scale factor greater than 1 results in a similar triangle with longer sides.

2. Which set of statements are accurate and can be used to show that $\triangle PQR$ is similar to $\triangle TUV$ by the AA~ postulate? Use only the information given.
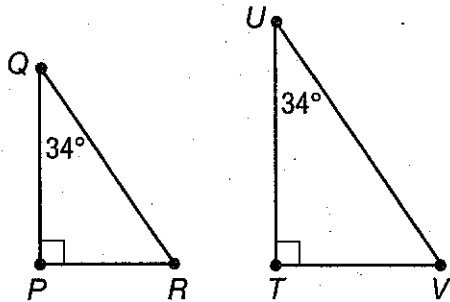

A. $\angle P \cong \angle T$ and $\angle Q \cong \angle U$.

B. $\angle P \cong \angle T$ and $\angle Q \cong \angle V$.

C. $\angle P \cong \angle T$ and $QP = TU$.

D. $\angle Q \cong \angle U$ and sides QP and TU have proportional lengths.

3. Two parallel lines are cut by two different transversals, as shown.
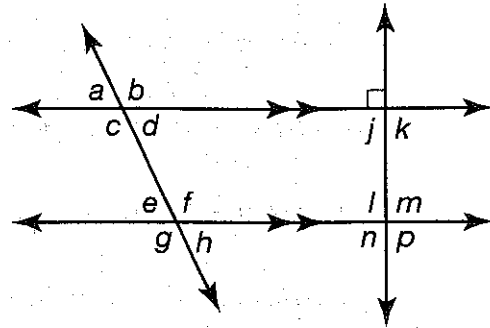
Which shows all of the angles that are congruent to $\angle f$?

A. Angle g

B. Angles c and g

C. Angles b, c, and g

D. Angles b, c, g, j, m, and n

4. Which set of statements are accurate and could be used to prove that $\triangle ABC$ is **not** similar to $\triangle DEF$ by the SSS~ theorem?
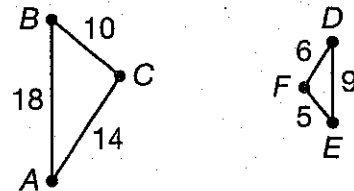
A. $AB \neq DE$, $BC \neq DE$, and $AC \neq DF$

B. $\frac{AB}{DE} = \frac{BC}{EF}$

C. $\frac{AB}{DE} \neq \frac{BC}{DF}$

D. $\frac{AB}{DE} \neq \frac{AC}{DF}$

Go On ▶

5. Line AB will be dilated by a scale factor of 3 with the origin as the center of dilation.
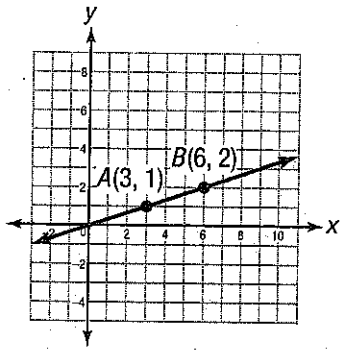
Which best describes the line that is the result of this dilation?

A. It will be parallel to line AB and will pass through (0, 3) and (6, 5).

B. It will be parallel to line AB and will pass through (0, −3) and (3, −2).

C. It will intersect with line AB at only one point, the origin.

D. It will look identical to line AB and will share all points in common with line AB.

**6.** Triangle DEF is rotated 180° around the origin to form △JKL.
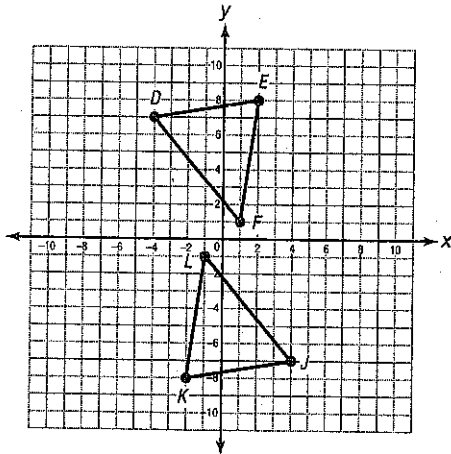
Which of the following statements must be true?

A. $\overline{DF} \cong \overline{JL}$ **C.** $\overline{EF} \cong \overline{JK}$

B. $\angle D \cong \angle K$ **D.** $\angle F \cong \angle J$

7. A quadrilateral has one pair of opposite sides that are congruent and parallel. Which of the following is also true of the quadrilateral?

A. It must be a parallelogram.

B. It must be a rectangle.

C. It must be a trapezoid.

D. It could be either a parallelogram or a trapezoid.

8. Which sequence of rigid motions would move △DEF so it completely covers △D'E'F'?
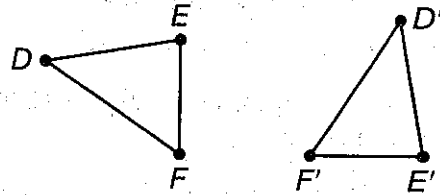
**A.** reflection of △DEF across a vertical line followed by a translation to the right

B. reflection of △DEF across a vertical line followed by a translation down

C. 90° clockwise rotation of △DEF about point E followed by a translation down

D. 90° clockwise rotation of △DEF about point F followed by a translation to the right

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9. Rectangle *QRST* is graphed below.
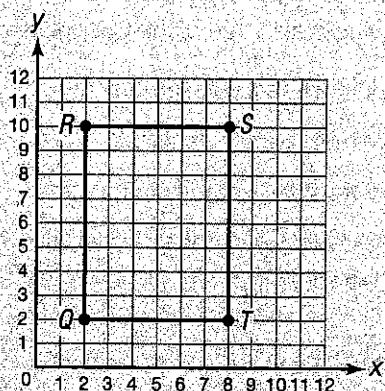
If rectangle *QRST* is dilated from the origin by a scale factor of $\frac{1}{2}$, which of the following will be true of the dilated image of side *QT*?

A. It will be 3 units long with endpoints at (1, 1) and (4, 1).

B. It will be 4 units long with endpoints at (1, 1) and (5, 1).

C. It will be 3 units long with endpoints at (1, 1) and (1, 4).

D. It will be 4 units long with endpoints at (1, 1) and (1, 5).

10. Triangle *ABC* is an isosceles triangle with $AB = BC$.
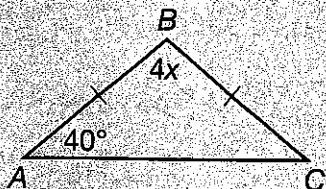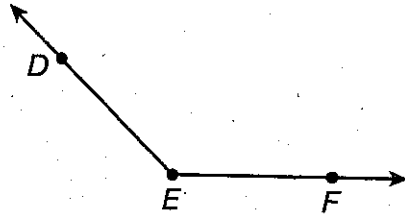

What is the value of *x*?

A. 10°

B. 25°

C. 50°

D. 100°

11. Which of the following can be used to show that $\triangle ABC$ is similar to $\triangle HJK$ using the information given?
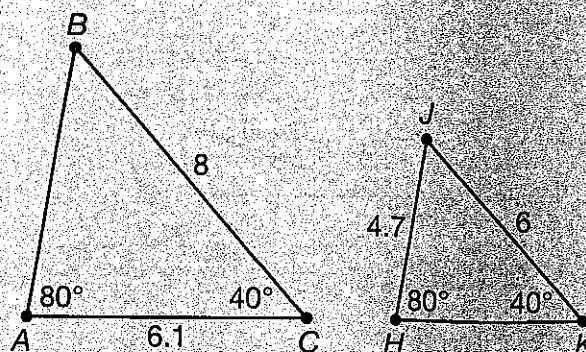
A. AA~ postulate

**B.** triangle similarity theorem

C. SAS~ theorem

D. SSS~ theorem

12. Angle *DEF* is shown below.

Aaron uses the following steps to construct an angle, ∠*GHI*, congruent to ∠*DEF*.

1. Draw a line with points labeled *H* and *I*.

2. Draw an arc centered at point *E* that intersects both $\overline{DE}$ and $\overline{EF}$.

3. Without changing the compass width, make an arc centered at point *H* that intersects line *HI*.

4. Set the compass width to the distance between the intersection points of the arc centered at point *E* and $\overline{DE}$ and $\overline{EF}$.

5. Without changing the compass width, make an arc through the intersection of line *HI* and the arc centered at point *H*.

6. Label the point of intersection of the arcs constructed in steps 3 and 5 as point *G*.

7. Draw a line through *GH*.

Which of the following could be the result of Aaron's work?

A.

B.

C.

D.
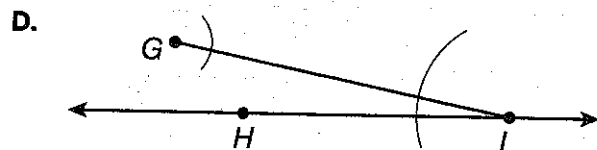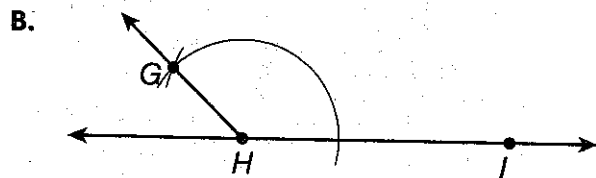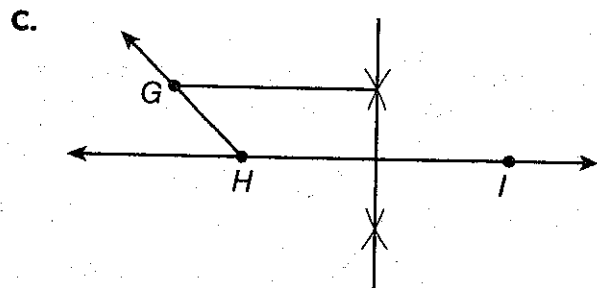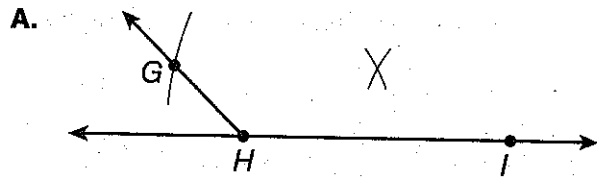
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13. Triangle *RST* is graphed below.
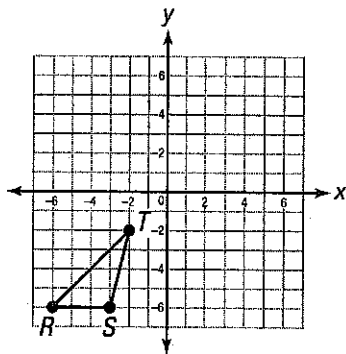
Which would **not** be one of the effects of rotating △*RST* 90° counterclockwise about the origin and then reflecting the rotated image across the *x*-axis to produce △*R"S"T"*?

A. Line segment *T"S"* would have endpoints *T"*(6, 3) and *S"*(6, 6).

B. Point *T"* would be at (2, 2).

C. The length of *R"S"* would be 3 units.

D. Triangle *R"S"T"* would be congruent to △*RST*.

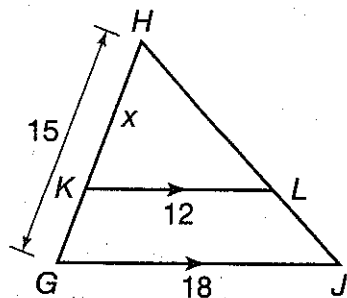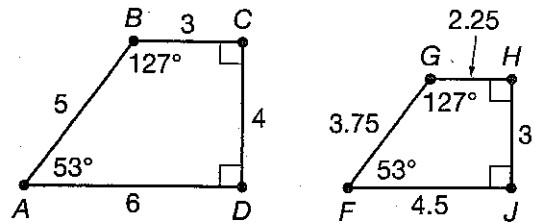**14.** In △*GHJ*, $\overline{KL}$ was drawn parallel to $\overline{GJ}$ to create △*KHL*. What is the value of *x*?

A. 5 units

B. 7.5 units

C. 10 units

D. 12 units

15. Which statement is true of trapezoid *ABCD* and trapezoid *FGHJ*?

A. They are similar because corresponding angles are congruent and corresponding side lengths are in the same ratio, $\frac{5}{3}$.

B. They are similar because corresponding angles are congruent and corresponding side lengths are in the same ratio, $\frac{4}{3}$.

C. They are not similar because corresponding angles are not congruent.

D. They are not similar because corresponding sides are not proportional in length.

16. Triangle *MNP* was dilated with the origin as the center of dilation to produce △*M'N'P'*.
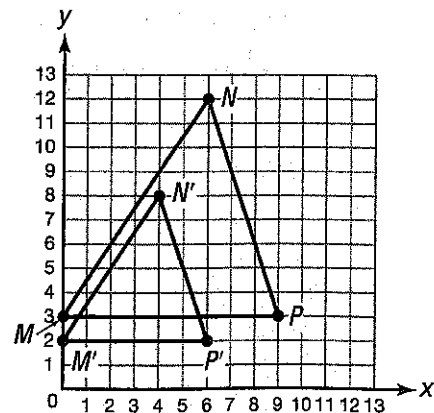
What was the scale factor of the dilation?

A. 3   **C.** $\frac{2}{3}$

B. $\frac{3}{2}$ **D.** $\frac{1}{3}$

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17. Triangles *ABC* and *XYZ* are shown below.
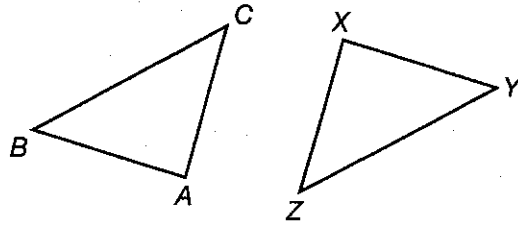
Which of the following properties of triangles *ABC* and *XYZ* would indicate that $\triangle ABC \cong \triangle XYZ$?

A. $\angle A \cong \angle X, \overline{AB} \cong \overline{BC}, \overline{XY} \cong \overline{XZ}$

B. $\angle B \cong \angle Y, \overline{AB} \cong \overline{XY}, \angle A \cong \angle X$

C. $\angle C \cong \angle Z, \overline{CA} \cong \overline{ZX}, \overline{AB} \cong \overline{XY}$

D. $\angle A \cong \angle X, \angle B \cong \angle Y, \angle C \cong \angle Z$

18. Nathan works on his homework on the bus ride home. Later, he returns to his partly-finished construction of a line parallel to $\overleftrightarrow{GH}$ through point *I*. He has made a list of the steps he's already taken.

1. Draw a line through points *I* and *G*.

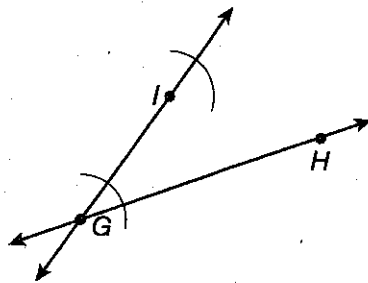2. Draw an arc through $\overleftrightarrow{IG}$ and $\overleftrightarrow{GH}$ centered at point *G*.

3. Without changing the compass width, make an arc centered at point *I*.

4. Set the compass width to the distance between the intersection of the arc centered at point *G* and $\overleftrightarrow{IG}$ and the intersection of this arc and $\overleftrightarrow{GH}$.

5. ... (?)

Which of the following should be Nathan's step 5?

A. Without changing the compass width, draw a line through points *I* and *H*.

B. Without changing the compass width, make an arc centered at the intersection of the arc drawn in step 2 and $\overleftrightarrow{IG}$.

C. Without changing the compass, make an arc centered at point *H*.

D. Without changing the compass, make an arc centered at the intersection of the arc drawn in step 3 and $\overleftrightarrow{IG}$.

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19. Mariana is building a picnic table using the diagram below as a guide.
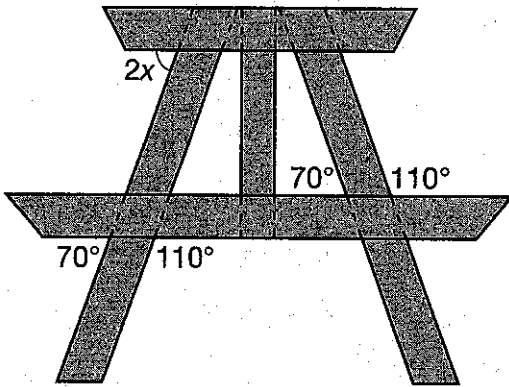
If the top of the picnic table is parallel to the benches, what is the value of x in the diagram?

A. $35°$

B. $55°$

C. $70°$

D. $110°$

20. Which of the following sets of statements are accurate and can be used to prove or disprove that $\triangle ABC \sim \triangle EDC$?
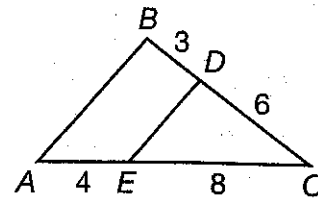
A. $\frac{BD}{BC} = \frac{1}{3}, \frac{AE}{AC} = \frac{1}{3}$, and $\angle C$ is common to both triangles, so by the SAS$\sim$ theorem, they are similar.

B. $\frac{BD}{BC} = \frac{1}{2}, \frac{AE}{AC} = \frac{1}{2}$, and $\angle C$ is common to both triangles, so by the SAS$\sim$ theorem, they are similar.

C. $\frac{BD}{BC} = \frac{1}{3}, \frac{AE}{AC} = \frac{1}{3}$, and side AB is common to both triangles, so by the SSS$\sim$ theorem, they are similar.

D. $\frac{BD}{BC} = \frac{1}{3}, \frac{AE}{AC} = \frac{1}{2}$, so side lengths are not proportional and the triangles are not similar.

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21. Willow says that $\triangle PQR$ is similar to $\triangle P'Q'R'$ because a dilation of $\triangle PQR$ from the origin by a scale factor of $\frac{5}{3}$ would produce $\triangle P'Q'R'$. Is Willow correct? Explain your answer. If not, identify the error Willow made and describe the correct dilation. Show all work.

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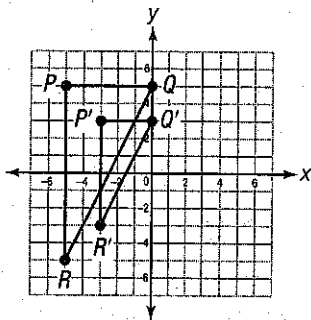
22. Triangle *NPQ* is an isosceles triangle with $\overline{NP} \cong \overline{QP}$ as shown on the left. On the right, a median of the triangle, $\overline{PM}$, has been drawn.
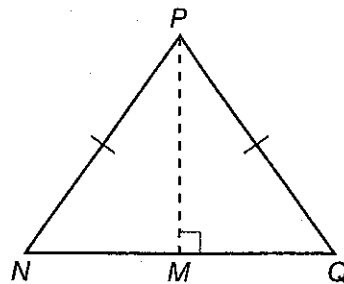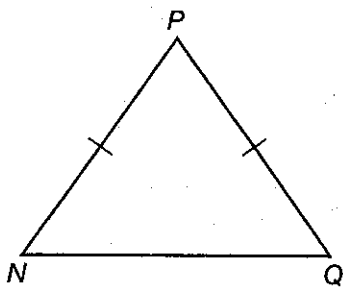
Use the triangles that are formed by this median to prove that $\angle N \cong \angle Q$. Use drawings, equations, and/or words to show all work. What does this prove about the angles of an isosceles triangle?

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23. Right triangle JKL is shown at left. An altitude, $\overline{KM}$, was drawn to the hypotenuse dividing it into two right triangles as shown at right.
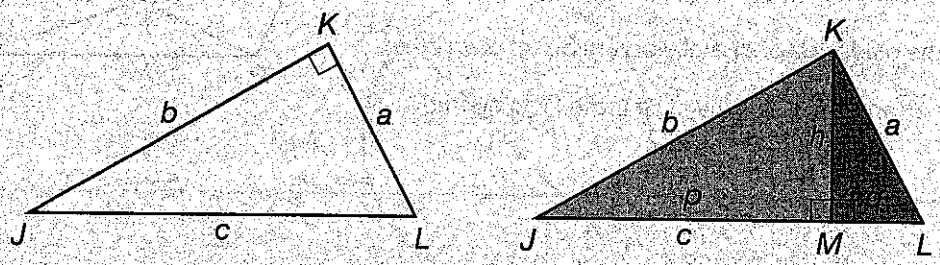
Given: $\triangle JKL \sim \triangle JMK$ and $\triangle JKL \sim \triangle KML$. Use these triangles to prove the Pythagorean theorem.

A. Set up a proportion that compares two pairs of corresponding side lengths of $\triangle JKL$ and $\triangle KML$. Be sure that both ratios contain a. Then solve the proportion to find an expression that shows the value of the square of leg a in $\triangle JKL$.

_____

_____

$a^2 =$ _____

B. Set up a proportion that compares two pairs of corresponding side lengths of $\triangle JKL$ and $\triangle JMK$. Be sure that both ratios contain b. Then cross-multiply to find an expression that shows the value of the square of leg b in $\triangle JKL$.

_____

_____

$b^2 =$ _____

C. Use the expressions you found above to prove the Pythagorean theorem. Show all work.

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24. Quadrilateral *QPRS* is a parallelogram.

Line segments *QS* and *RP* are diagonals.

Prove that the diagonals of a parallelogram bisect each other.
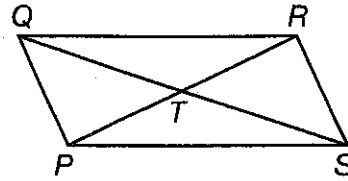
A. $\overline{QR} \cong \overline{SP}$ and $\overline{QR} \parallel \overline{SP}$. Why must these facts be true?

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B. Use what you know about parallel lines cut by a transversal to explain why the following must be true:
$\angle RQS \cong \angle PSQ$

_____

_____

$\angle QRP \cong \angle SPR$

_____

_____

C. Explain why $\triangle QRT \cong \triangle SPT$. Then use that fact to show that $\overline{QT} = \overline{ST}$ and $\overline{RT} = \overline{PT}$. Explain what this shows about the diagonals of a parallelogram.

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25. Circle L has diameter $\overline{MP}$.
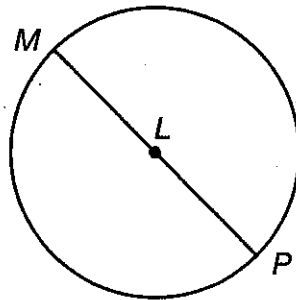
A. Construct the perpendicular bisector of diameter $\overline{MP}$.

B. Construct a regular hexagon $MNOPRQ$ that is inscribed in circle L.

STOP

1. If $\sin 22.6° \approx \frac{10}{26}$ and $\cos 22.6° \approx \frac{24}{26}$, which is true?

   A. $\tan 22.6° \approx \frac{10}{24}$

   B. $\tan 22.6° \approx \frac{14}{24}$

   C. $\tan 22.6° \approx \frac{24}{10}$

   D. $\tan 22.6° \approx \frac{26}{10}$

2. Which equation is true?

   A. $\cos 10° = \tan 10°$

   B. $\cos 10° = \cos 80°$

   C. $\sin 80° = \tan 80°$

   D. $\sin 80° = \cos 10°$

3. An escalator lifts people to the second floor of a store, which is 9 meters above the first floor. The escalator rises at a 30° angle. What is d, the total distance a person travels from the bottom of the escalator to the top of the escalator?
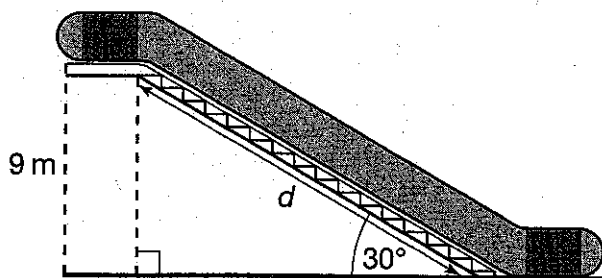
   A. 4.5 meters

   B. $9\sqrt{2}$ meters

   C. $9\sqrt{3}$ meters

   D. 18 meters

4. Which of the following is a trigonometric ratio for this triangle?
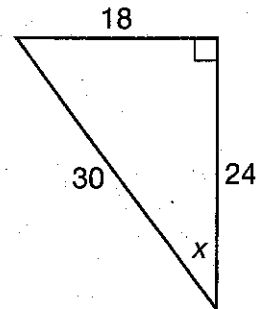
   A. $\cos x = \frac{24}{30}$

   B. $\cos x = \frac{18}{24}$

   C. $\tan x = \frac{24}{18}$

   D. $\tan x = \frac{18}{30}$

5. At a certain time of day, a building that is 60 feet tall casts a 75-foot shadow. What is the approximate angle of elevation of the sun when this shadow is cast? Give the answer to the nearest degree.

   A. 37°

   B. 39°

   C. 51°

   D. 53°

Go On ▶

6. In $\triangle ABC$, $m\angle C = 55°$ and $\sin C \approx 0.82$.
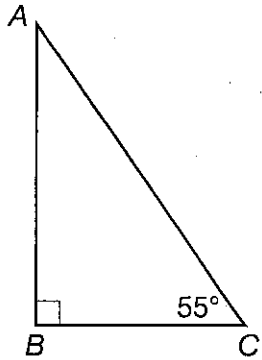
What is $m\angle A$ and cosine of $\angle A$?

A. $m\angle A = 35°$ and $\cos A \approx 0.18$.

B. $m\angle A = 35°$ and $\cos A \approx 0.82$.

C. $m\angle A = 45°$ and $\cos A \approx 0.18$.

D. $m\angle A = 45°$ and $\cos A \approx 0.82$.

7. What is x, the length of $\overline{BC}$ in $\triangle ABC$?
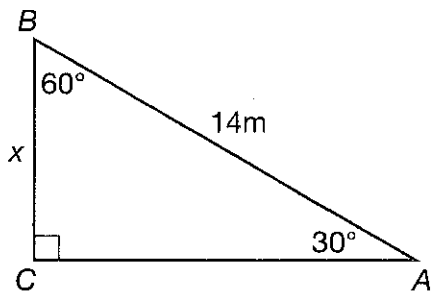
A. 7 meters

B. $7\sqrt{3}$ meters

C. 28 meters

D. $14\sqrt{3}$ meters

8. Which shows the approximate lengths of sides x and y of $\triangle JKL$?
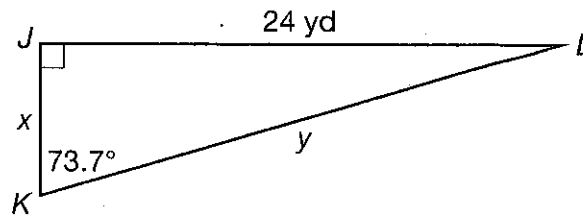
A. $x = 6.7$ yd and $y = 23$ yd

B. $x = 7$ yd and $y = 25$ yd

C. $x = 23$ yd and $y = 6.7$ yd

D. $x = 25$ yd and $y = 7$ yd

9. In a right triangle, one of the acute angles measures x and the other acute angle measures y. If $\sin x = \frac{11}{61}$ and $\cos x = \frac{60}{61}$, what are the values of $\cos y$ and $\tan y$?

A. $\cos y = \frac{11}{61}$ and $\tan y = \frac{11}{60}$

B. $\cos y = \frac{60}{61}$ and $\tan y = \frac{11}{60}$

C. $\cos y = \frac{11}{61}$ and $\tan y = \frac{60}{11}$

D. $\cos y = \frac{60}{61}$ and $\tan y = \frac{60}{11}$

Unit 2

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10. Julio is flying in a hot air balloon approximately 500 feet above the ground. He sees a boat in a nearby lake. The angle of depression from Julio to the boat is 6°. What is d, the approximate straight-line distance from Julio to the boat to the nearest tenth of a foot?
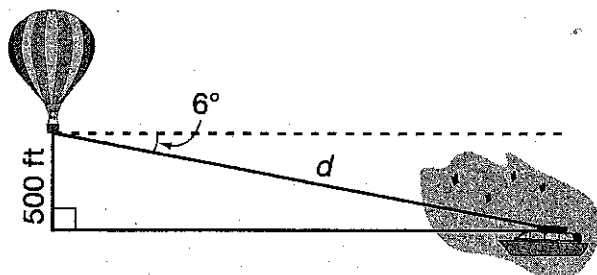
A. 52.3 feet

B. 502.8 feet

C. 4,757.2 feet

D. 4,783.4 feet

11. What is the length of $\overline{PQ}$ in $\triangle PQR$?
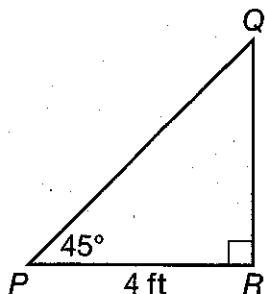
A. $2\sqrt{2}$ feet

B. $4\sqrt{2}$ feet

C. $4\sqrt{3}$ feet

D. 8 feet

12. Let x be the measure of an acute angle in a right triangle. For $0° < x < 90°$, which of the following statements is true?

A. As x increases, the values of the sine of x and the cosine of x both decrease.

B. As x increases, the values of the sine of x and the cosine of x both increase.

C. As x increases, the values of the sine of x and the tangent of x both decrease.

D. As x increases, the values of the sine of x and the tangent of x both increase.

13. Given that $\sin 20° \approx 0.34$ and $\sin 70° \approx 0.94$, what is the approximate value of $\tan 20°$?

A. 0.34

B. 0.36

C. 0.52

D. 2.76

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14. Triangle *DEF* was dilated by a scale factor of $\frac{3}{2}$ and translated to the right to form $\triangle D'E'F'$.
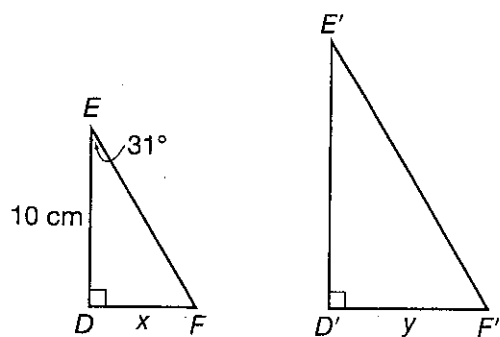
Which statement about these two triangles is **not** true?

A. The tangent of $\angle E$ is equal to the tangent of $\angle E'$.

B. The tangent of $\angle E$ is $\frac{3}{2}$.

C. The value of *x* is 6 centimeters.

D. The value of *y* is 9 centimeters.

15. A 12-foot extension ladder makes a 75° angle with the ground, which is level. The ladder reaches a height of *h* feet above the ground as shown.
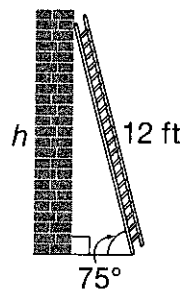
If the ladder is adjusted so it makes a 60° angle with the ground instead, how will the height the ladder reaches on the building differ from its previous height, *h*?

A. The height the ladder reaches on the building will be 1.2 feet lower.

B. The height the ladder reaches on the building will be 2.9 feet lower.

C. The height the ladder reaches on the building will be 1.2 feet higher.

D. The height the ladder reaches on the building will be 2.9 feet higher.

Go On ▶

16. Calculate the exact area, A, of equilateral triangle *FGH* using trigonometric functions. Use numbers, words, and/or drawings to show all of your work.
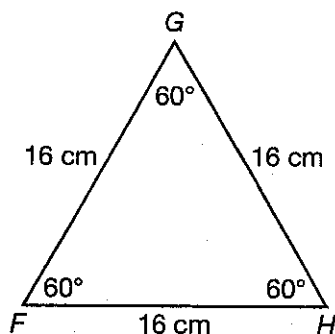
$A =$ _____ square centimeters

17. Shaya looks up and sees a kite stuck in a tree. She is 60 feet from the trunk of the tree. Her eye level is 5 feet above the ground. The angle of elevation from her eyes to the kite is 42°. How many feet above the ground is the kite to the nearest tenth of a foot?

Show all of your work.

_____ feet

18. Right triangle *ABC* is given below.
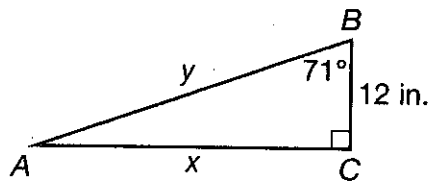
A. Use a trigonometric ratio to find the length of *x* to the nearest inch. Show all work.

$x \approx$ _____

B. Use a trigonometric ratio to find the length of *y* to the nearest inch. Show all work.

$y \approx$ _____

C. Show that the side lengths found for $\triangle ABC$ satisfy the formula for the Pythagorean theorem. Explain what this indicates about the values of *x* and *y* found above.

_____

_____

_____

_____

Go On ▶

19. This right triangle has sides lengths a, b, and c as shown.
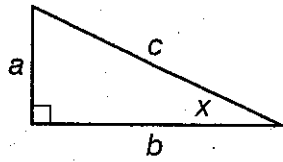
A. Use the formula for the Pythagorean theorem to write an equation showing how sides a, b, and c are related above.

_____ + _____ = _____

Divide the terms on both sides of that equation by c^2 and write the new equation below. Do not simplify.

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$$

B. Use the side lengths a, b, and c to write trigonometric ratios for the following.

$\sin x =$ _____ $\cos x =$ _____

Square and simplify the ratios above to determine values for the following:

$\sin^2 x =$ _____ $\cos^2 x =$ _____

C. Use your answers from Parts A and B to prove that the Pythagorean identity shown below is true:

$\sin^2 x + \cos^2 x = 1$

Show and explain your work.

_____

_____

_____

Go On ▶

20. A local park has a wooden gazebo. Its floor, shown below, is shaped like a regular octagon with sides 10 feet long and interior angle measures of 135°.
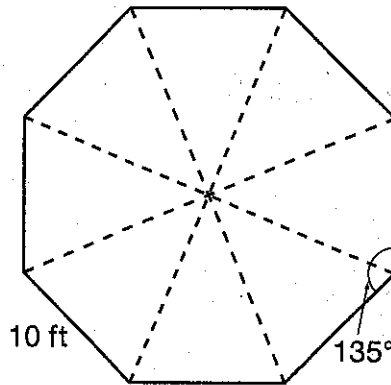
A. The octagon is divided into eight congruent triangles. Divide one of those triangles into two congruent, right triangles. Identify the measures of the acute angles of the right triangles.

_____

B. What is the length of a, the apothem of the octagon, to the nearest hundredth of a foot? Use words, numbers, and/or drawings to explain the steps used to determine your answer.

$a \approx$ _____

C. What is the approximate area, A, of the floor of the gazebo? Show or explain your work.

$A \approx$ _____ square feet

STOP

Unit 3 Assessment • Circles and Volume

1. In circle O, which term does **not** describe $\overline{PR}$?
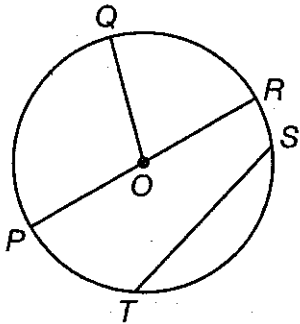
A. chord

B. diameter

C. radius

D. secant segment

2. What is the area of the circle shown below?

14 cm
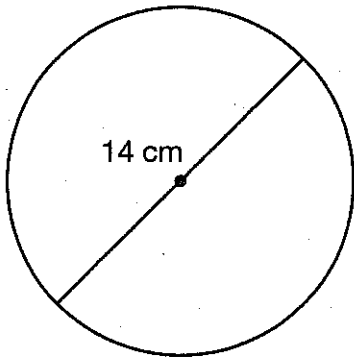
A. 14π square centimeters

B. 28π square centimeters

C. 49π square centimeters

D. 196π square centimeters

3. In circle O, $m\angle\theta = \frac{\pi}{3}$ and $\overline{OM} = 9$ inches.

9 in.
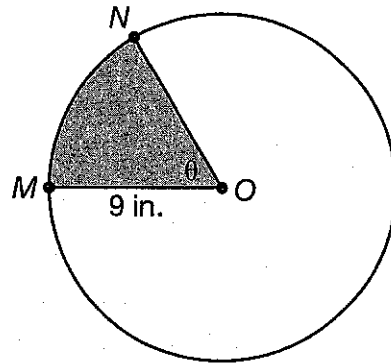
What is the length of $\overset{\frown}{MN}$?

A. $\frac{\pi}{27}$ inches

B. 3π inches

C. 6π inches

D. 18π inches

4. Jane drew several circles, with different radii, using a compass. What must be true of the circles she drew?

A. All of the circles are similar, but not necessarily congruent.

B. All of the circles are congruent, but not necessarily similar.

C. All of the circles are similar and congruent to one another.

D. None of the circles are similar or congruent to one another.

Go On ▶

5. Circle G is shown.
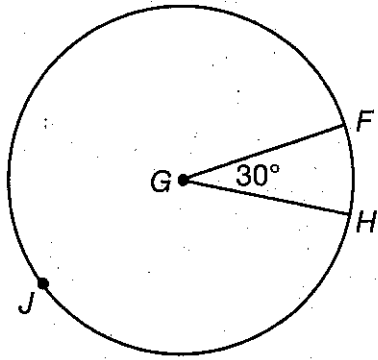
What is the measure of $\overset{\frown}{FH}$?

A. 15°

B. 30°

C. 60°

D. 330°

6. The sphere shown has a radius of 12 meters. What is the volume of the sphere?
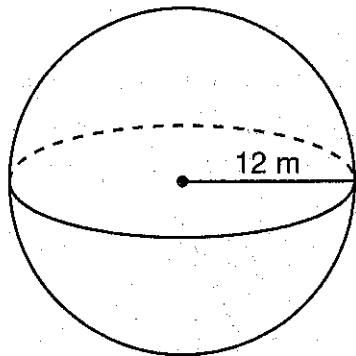
A. 288π cubic meters

B. 576π cubic meters

C. 1,296π cubic meters

D. 2,304π cubic meters

7. Two cylinders are shown below. Each has a height of 10 units and a radius of r units, and each has been cut by a horizontal plane that is parallel to the bases of both cylinders.

Right Cylinder   Oblique Cylinder
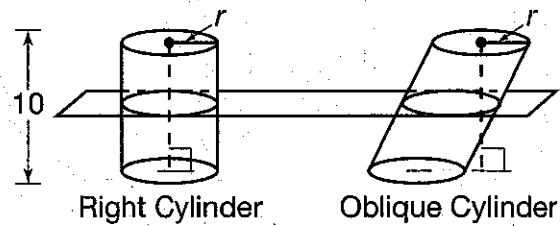
Which statement accurately compares the volumes of these two cylinders?

A. The right cylinder has a greater volume than the oblique cylinder because its cross-section has a greater area.

B. The oblique cylinder has a greater volume than the right cylinder because its cross-section has a greater area.

C. Both cylinders have the same volume because their cross-sections have the same area.

D. It is not possible to determine which cylinder has a greater volume because the length of the radius, r, is not given.

8. In circle O, $\angle QMP$ measures 41°.
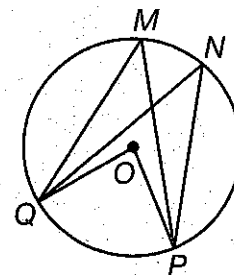
Which of the following must also be true?

A. $m\angle QNP = 20.5°$ and $m\angle QOP = 20.5°$

B. $m\angle QNP = 41°$ and $m\angle QOP = 20.5°$

C. $m\angle QNP = 41°$ and $m\angle QOP = 82°$

D. $m\angle QNP = 82°$ and $m\angle QOP = 82°$

Go On ▶

9. Figure A shows a square inscribed in a circle. Figure B shows a decagon inscribed in a circle.
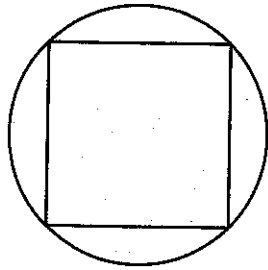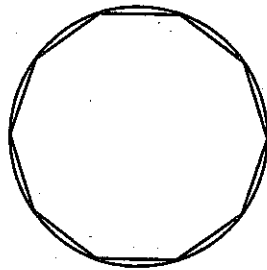
Figure A   Figure B

Aviva wants to use a polygon inscribed in a circle to approximate the area of the circle. Which polygon described below has an area that most closely approximates the area of the circle in which it is inscribed?

A. the square in figure A

B. the decagon in figure B

C. a polygon inscribed in a circle that has fewer than 4 sides

D. a polygon inscribed in a circle that has more than 10 sides

10. The Pyramid of Cestius is an ancient pyramid in Rome, Italy. It has a height of 37 meters and a square base with sides measuring 30 meters.

37 m

30 m
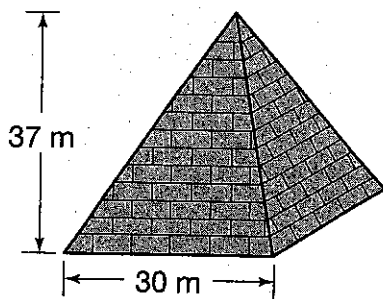
What is the volume of the pyramid?

A. 5,550 cubic meters

B. 11,100 cubic meters

C. 13,690 cubic meters

D. 33,300 cubic meters

11. Pablo drew point B outside circle A. He then constructed line CD, which is shown below.
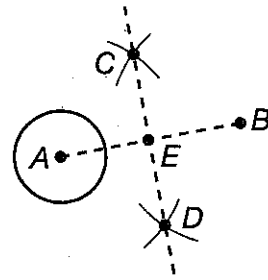
Suppose Pablo uses a compass to construct a circle with center E and radius $\overline{AE}$. What will his construction produce?

A. a circle that is inscribed in a triangle

B. a circle that is circumscribed about a triangle

C. the points of tangency for two lines that can be drawn from point E to the circle

D. the points of tangency for two lines that can be drawn from point B to the circle

12. The circle shows intersecting chords.
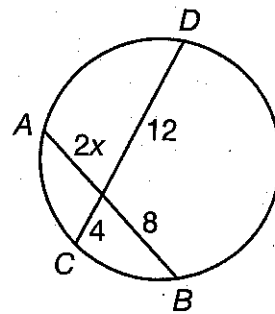
What length is represented by x?

A. 3 units

B. 4 units

C. 6 units

D. 8 units

Go On ▶

13. The napkin ring has a height of 3 centimeters and a thickness of 0.2 centimeter. The diameter of the hole in the center is 3.8 centimeters as shown.
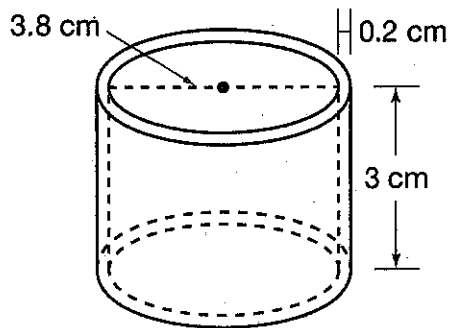
If the napkin ring is made of solid silver, approximately what is the volume of silver in the napkin ring? Give your answer to the nearest tenth of a cubic centimeter.

A. 7.53 cubic centimeters

B. 34.4 cubic centimeters

C. 37.7 cubic centimeters

D. 113.0 cubic centimeters

14. A flood light in a storage yard spreads light over a distance of 30 feet and is set to rotate through an angle of 150°.
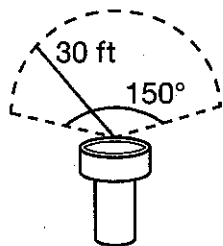
How many square feet of the yard will be lit by the flood light?

A. 78.5 square feet

B. 188.4 square feet

C. 1,177.5 square feet

D. 2,826 square feet

15. The cup dispenser at a water cooler contains cone-shaped paper cups with the dimensions shown.
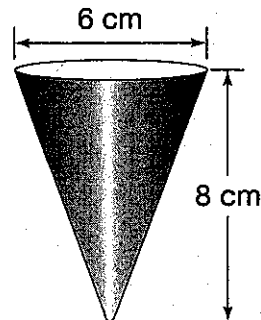
Approximately how many cubic centimeters of water can each cup hold?

A. 75.36 cubic centimeters

B. 200.96 cubic centimeters

C. 226.08 cubic centimeters

D. 301.44 cubic centimeters

16. In the circle, $\overline{FG}$ and $\overline{HJ}$ are intersecting chords.
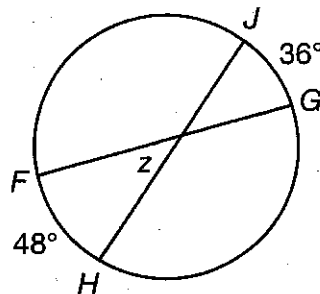
What is the value of z?

A. 6°

B. 24°

C. 42°

D. 44°

17. The cube below has length l, width w, and height h. Its volume is denoted as V_{cube}.
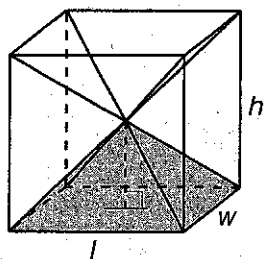
Six congruent pyramids, like the shaded pyramid above, were fit inside the cube. Which of the following statements is **not** true and could **not** help derive the formula for the volume of one of those pyramids, V_{pyr}?

A. The cube has length l, width w, and height h, the pyramid has length l, width w, and height $\frac{h}{2}$.

B. $V_{cube} = l \cdot w \cdot h$, and $V_{pyr} = k_{pyr} \cdot l \cdot w \cdot h$, where k_{pyr} is the constant of proportionality.

C. $V_{cube} = 6 \cdot V_{pyr}$, so $lwh = 6 \cdot k_{pyr} \cdot (lw)\left(\frac{h}{2}\right)$.

D. $V_{cube} = 6 \cdot V_{pyr}$, so $V_{pyr} = \frac{1}{6} \cdot V_{cube}$.

18. Jonah accurately constructed point Z for $\triangle WXY$ as shown.
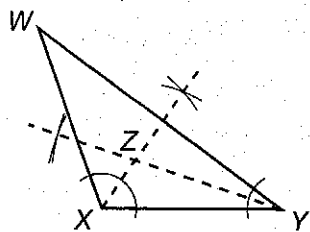
Which of the following is true of this construction?

A. $\overleftrightarrow{YZ}$ is the angle bisector of $\angle X$.

B. $\overleftrightarrow{YZ}$ is the perpendicular bisector of $\overline{WX}$.

C. Point Z is the center of the circle that can be circumscribed about $\triangle WXY$.

D. Point Z is the center of the circle that can be inscribed in $\triangle WXY$.

19. Line segments AC and BC are radii of circle C. Points A and B are connected to form the vertices of $\triangle ABC$. The radius is 12 centimeters long, and $\angle ACB$ measures $60°$.
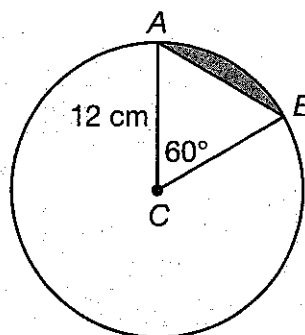
The shaded area bound by $\overline{AB}$ and $\overarc{AB}$ is called a segment of the circle. What is the area of this segment to the nearest square centimeter?

A. 6 square centimeters

B. 13 square centimeters

C. 62 square centimeters

D. 75 square centimeters

20. The diameter of a circle is 8 meters. If the line of the diameter is extended 2 meters beyond the circle to point P, and a tangent is drawn from point P to the circle, how long is the tangent from point P to the circle? Give your answer to the nearest tenth of a meter.

A. 4.0 meters

B. 4.5 meters

C. 8.0 meters

D. 8.9 meters

Go On ▶

21. Point *P* is outside circle *Q*. Construct two lines through point *P* that are tangent to circle *Q*. Show all your work.

Q•   •*P*
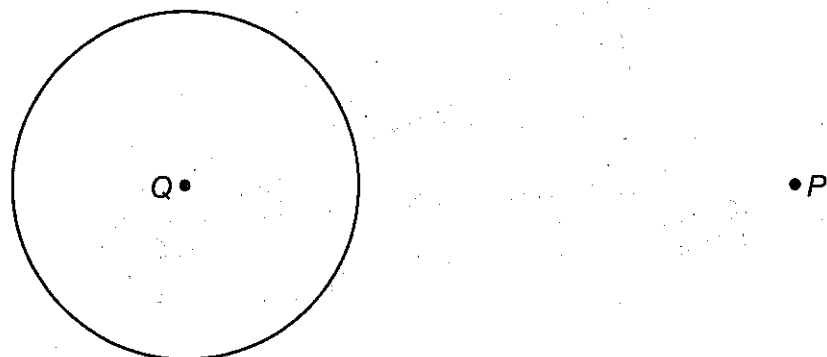
22. A barn silo used to hold grain consists of a cylinder with a height of 25 meters capped by a semisphere with a diameter of 6 meters.

6 m

25 m
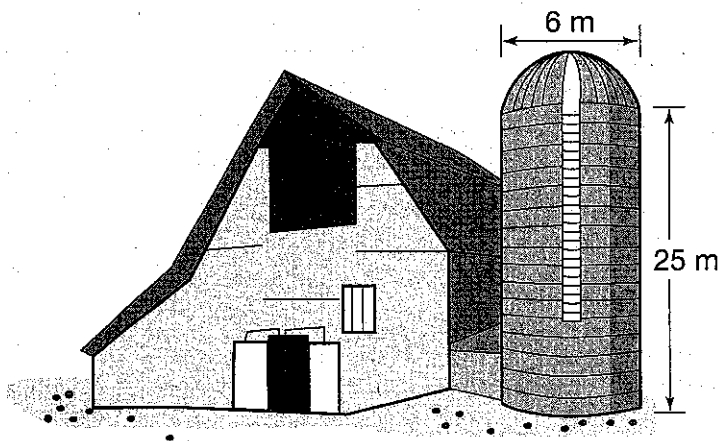
What is the approximate volume of the silo to the nearest hundredth of a meter? Show all of your work.

V ≈ _____ cubic meters

Go On ▶

23. At Camp Coyote, campers from Cabins A, B, and C will compete in a scavenger hunt. To make the game fair, the first clue will be placed at a location that is equidistant from all three cabins. The three cabins form the vertices of a triangle as shown on the map.
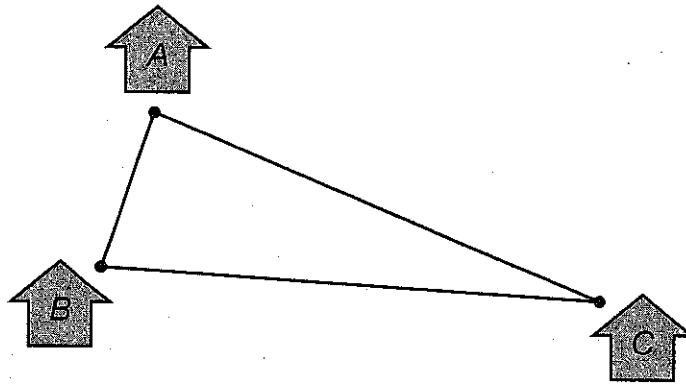
A. The leader of Cabin A, Alicia, says the circumcenter of △ABC will show the location of the first clue. The leader of Cabin B, Bella, says the incenter will show the location. Who is correct—Alicia, Bella, neither, or both? Explain.

_____

_____

_____

B. Construct a point to indicate the correct location of the first clue.

C. Show that the point you constructed is correct by constructing a circle with that point as the center. Explain how the circle you drew shows that your point is correct.

_____

_____

_____

Go On ▶

24. Regular octagon *ABCDEFGH* is circumscribed about circle *O*.
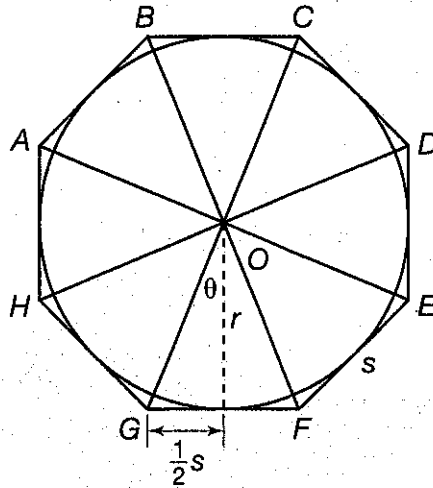
A. Let *n* be the number of sides in the polygon. Use the radian measure of the circle and angle θ to show why $n = \frac{\pi}{\theta}$.

_____

_____

_____

B. Let *s* be the length of one side of the polygon. Angle θ is opposite a side that is equal to $\frac{1}{2}$ of *GF*, or $\frac{1}{2}s$. Use the tangent ratio to find a value for *s*. Show all of your work.

$s = $ _____

C. Use the values you found for *n* and for *s* to write an expression for the perimeter, *P*, of a polygon circumscribed about a circle in terms of the radius, *r*, and central angle θ. Simplify.

$P = n \cdot s$

$P = $ _____

Explain why the value of $\frac{\tan \theta}{\theta}$ goes to 1 as the number of sides of the polygon increases. Use this argument to explain why $P_{circle} = 2\pi r$.

_____

_____

_____

Go On ▶

25. A dock that is anchored in the middle of a lake is 20 feet wide and 30 feet long. The bow (front end) of a kayak is tied to a corner of the dock by a rope that is 12 feet long as shown.
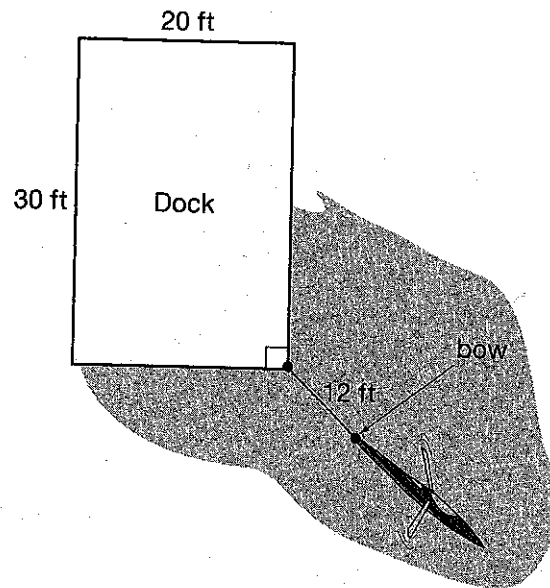
A. Use your compass to draw the section of the lake in which the bow of the kayak can drift. Use letters to name angles and endpoints that are part of your drawing. Describe the geometric figure you drew and what it indicates about where the bow can drift.

_____

_____

B. What is the approximate area, in square feet, in which the bow of the kayak can drift? Show all of your work.

$A \approx$ _____

C. If the 12-foot long rope is replaced with a rope that is 10 feet long, how will the area in which the bow can drift change? Show or explain your work.

_____

STOP

1. Which of these expressions is **not** a polynomial?

  A. $-x^2 - 3x - 5$

  B. $21 + x + 2x^2 + 11x^3$

  C. $\frac{2}{3}x^7 + \frac{5}{7}x^2$

  D. $-2x^{\frac{1}{2}} + 12x + 5$

2. Marco is trying to decide whether the product of two irrational numbers is rational or irrational.

Which of the following correctly describes this product and gives the appropriate supporting examples?

  A. The product is always rational. Example factors: $\sqrt{3} \cdot \sqrt{3}$, $\sqrt{4} \cdot \sqrt{1}$

  B. The product is always irrational. Example factors: $\sqrt{5} \cdot \sqrt{2}$, $\sqrt{8} \cdot \sqrt{2}$

  C. The product may be either rational or irrational. Example factors: $\sqrt{2} \cdot \sqrt{3}$, $\sqrt{12} \cdot \sqrt{3}$

  D. The product will be neither rational nor irrational. Example factors: $\sqrt{9} \cdot \sqrt{9}$, $\sqrt{1} \cdot \sqrt{0}$

3. Which statement best describes the number $-\frac{2}{3}i$?

  A. It is a rational number.

  B. It is an irrational number.

  C. It is a complex number with no real part.

  D. It is a complex number with no imaginary part.

4. The side lengths of a polygon are shown in the figure below.
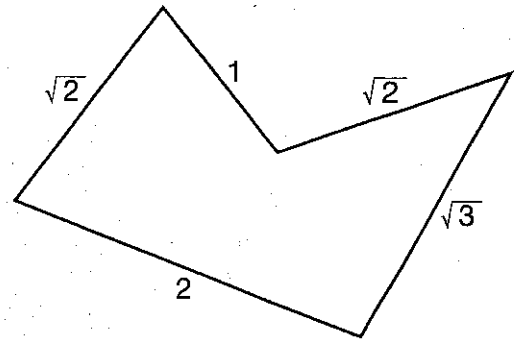
Which of these expressions represents the perimeter of the figure?

  A. $3 + 2\sqrt{3}$

  B. $5 + \sqrt{3}$

  C. $3 + \sqrt{7}$

  D. $3 + 2\sqrt{2} + \sqrt{3}$

5. Which is equivalent to $x^{\frac{7}{3}}$?

  A. $x \cdot \sqrt[3]{x^2}$

  B. $x^2 \cdot \sqrt[3]{x}$

  C. $\sqrt[7]{x^3}$

  D. $3x \cdot \sqrt[7]{x^2}$

Go On ▶

6. Which of the following expresses the polynomial below in standard form?

$$-\frac{2}{3}x^4 + 7x^2 - 3x^6 + 6x^8 - \frac{4}{5}x^5 + 8 - x$$

A. $8 + 7x^2 + 6x^8 - \frac{2}{3}x^4 - \frac{4}{5}x^5 - x - 3x^6$

B. $6x^8 - 3x^6 - \frac{4}{5}x^5 - \frac{2}{3}x^4 + 7x^2 - x + 8$

C. $8 + 7x^2 + 6x^8 - 3x^6 - x - \frac{4}{5}x^5 - \frac{2}{3}x^4$

D. $6x^8 + 7x^2 + 8 - x - \frac{2}{3}x^4 - \frac{4}{5}x^5 - 3x^6$

7. Given this property of exponents:

$$a^m \cdot a^n = a^{m+n}$$

Which of the following must also be true?

A. $a^{\frac{2}{3}} \cdot a^{\frac{1}{3}} = a^{\frac{2}{9}}$

B. $a^{\frac{2}{3}} \cdot a^{\frac{1}{3}} = a^{\frac{1}{3}}$

C. $a^{\frac{2}{3}} \cdot a^{\frac{1}{3}} = a^{\frac{3}{6}}$

D. $a^{\frac{2}{3}} \cdot a^{\frac{1}{3}} = a$

8. What is the value of this expression?

$$(7 + 4i) - (2 - 5i)$$

A. $5 - i$

B. $5 + 9i$

C. $9 + 9i$

D. $11 + 3i$

9. What is the complex conjugate of $-1 + 3i$?

A. $-1 - 3i$

B. $-1 + 3i$

C. $1 - 3i$

D. $-3i$

10. The height of a foam ball dropped from a 64-foot high platform t seconds after it is released is given by the equation $h(t) = -16t^2 + 64$. For what values of t that make sense in this situation is the height equal to 0?

A. 4 and −4 seconds

B. 4 seconds

C. 2 and −2 seconds

D. 2 seconds

11. Which of these is equivalent to the product of the expressions $3x^2 - 7$ and $5x^3 - 8x - 6$?

A. $8x^5 - 56x - 6$

B. $5x^3 + 3x^2 - 8x - 13$

C. $15x^5 - 59x^3 - 18x^2 + 56x + 42$

D. $15x^6 - 35x^3 - 42x^2 + 56x + 42$

Go On ▶

12. Which of these expressions is equivalent to the following difference?

$$(x^2 + 14x^3 - 6x^4) - (14x^3 + 6x^4 - 5x^5)$$

A. $x^2 - 12x^4 + 5x^5$

B. $x^2 - 5x^5$

C. $x^2 + 28x^3 - 12x^4 + 5x^5$

D. $-13x^3 + 8x^4 + 5x^5$

13. What is the product?

$$(6 - 5i)(2 + 3i)$$

A. $-3 - 18i$

B. $-3 + 8i$

C. $27 - 18i$

D. $27 + 8i$

14. Given that $(5^{\frac{1}{3}})^3 = 5$, what must be the value of $5^{\frac{1}{3}}$?

A. $3\sqrt{5}$

B. $\sqrt[3]{5}$

C. $(\sqrt[3]{5})^3$

D. $\frac{5}{3}$

15. What is the quotient?

$$\frac{8 + 6i}{2i}$$

A. $-4 + 3i$

B. $-3 - 4i$

C. $3 + 4i$

D. $3 - 4i$

Go On ▶

16. Solve for x. Show all of your work.

$$2^{\frac{x}{2}} = 8\sqrt{2}$$

$x =$ _____

17. This table shows several powers of i.

Powers of i
$i^1 = i$
$i^2 = -1$
$i^3 = i^2 \cdot i = -1 \cdot i = -i$
$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$

Use this table to determine the following powers of i. Show all of your work.

$i^5 =$ _____

$i^{12} =$ _____

$i^{18} =$ _____

Go On ▶

18. Hector drew the rectangle shown below.

$$5x + 2$$

$$3x - 1$$
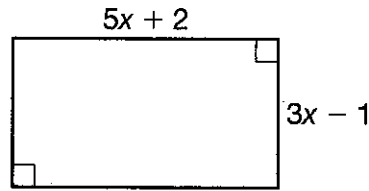
A. Find an expression for the perimeter, P, of the rectangle using the formula $P = l + w + l + w$. Show all of your work.

P = _____

B. Find an expression for the area, A, of the rectangle using the formula $A = lw$. Show all of your work.

A = _____

C. Hector states, "The set of polynomials is closed under both addition and multiplication."

Do your answers from Parts A and B support or refute Hector's statement? Explain.

_____

_____

_____

Go On ▶

19. Julia was asked to find the quotient of $\frac{6-5i}{2-4i}$.

A. Her work is shown below.

$$\frac{6-5i}{2-4i}$$

$$\frac{6-5i}{2-4i} \cdot \frac{2-4i}{2-4i}$$

$$\frac{12-10i+24i+20i^2}{4-8i-8i+16i^2}$$

$$\frac{-8+14i}{-12-16i}$$

Julia decides this expression cannot be simplified further because she was unable to find a real-number denominator.

What error did Julia make? Explain why and how a real-number denominator could be determined for this expression.

_____

_____

_____

B. Demonstrate how Julia could have found the quotient in the space below. Give the answer in standard form. Show all of your work.

$$\frac{6-5i}{2-4i}$$

Go On ▶

20. Consider rectangle *ABCD* and square *BDEF* shown below. The rectangle has an irrational length and a rational width.
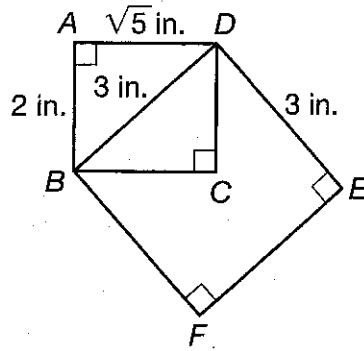
A. Use the formula $P = l + w + l + w$ to find the perimeter, P_{rect}, of rectangle *ABCD*.

$P_{rect} =$ _____

Is the sum rational or irrational? Will this be true for the sum of any rational and irrational number?

_____

_____

B. Use the formula $A = lw$ to find the area, A_{rect}, of rectangle *ABCD*. Show all of your work.

$A_{rect} =$ _____

Is the product rational or irrational? Will this be true for the product of any rational and irrational number?

_____

_____

Go On ▶

C. The diagonal of the rectangle, $\overline{BD}$, is equal to one side of square *BDEF*. Its length is rational.

Determine the perimeter, P_{sq}, and the area, A_{sq}, of square *BDEF*. Show all of your work.

$P_{sq} =$ _____

$A_{sq} =$ _____

Is the perimeter rational or irrational? What about the area? Will this be true of the sum or product of any rational numbers?

_____

_____

_____

_____

Unit 4

STOP

Unit 5 Assessment • Quadratic Functions

1. The quadratic function $g(x)$ is graphed below.
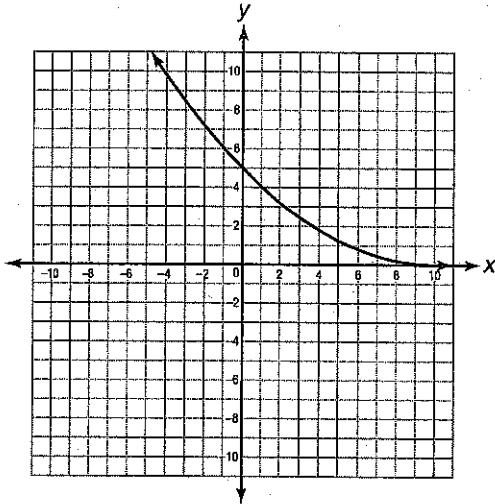
Which of these statements about $g(x)$ is true?

A. The vertex at $(10, 0)$ is a maximum.

B. The vertex at $(10, 0)$ is a minimum.

C. The vertex at $(0, 5)$ is a maximum.

D. The vertex at $(0, 5)$ is a minimum.

2. A small museum models the number of visitors present x hours after it opens by the function $V(x) = -(x - 8)^2 + 64$. For which values of x does the function make sense?

A. $(0, 8)$

B. $(0, 16)$

C. $(0, 64)$

D. $(0, 128)$

3. The distance that a rocket travels from starting velocity v and acceleration a in t seconds is given by the formula $d = \frac{1}{2}at^2 + vt$.

Which of the following expresses this relationship in terms of the acceleration?

A. $a = \frac{2d - v}{t}$

B. $a = \frac{2(d - v)}{t}$

C. $a = \frac{2(d - vt)}{t^2}$

D. $a = \frac{2d - vt}{t^2}$

4. The product of two consecutive odd integers is 143. Which of the following quadratic equations can be written to express this information?

A. $x^2 + 2x + 143 = 0$

B. $x^2 + 2x - 143 = 0$

C. $4x^2 + 4x + 143 = 0$

D. $4x^2 + 4x - 143 = 0$

5. Which of the following is the solution set for the equation $x^2 = 81$?

A. $\{-3, 3\}$

B. $\{3\}$

C. $\{-9, 9\}$

D. $\{9\}$

Go On ▶

6. Which of these statements correctly describes the function $h(x) = 4x^2 - 4$?

   A. The function $h(x)$ is even.

   B. The function $h(x)$ is odd.

   C. The function $h(x)$ is both even and odd.

   D. The function $h(x)$ is neither even nor odd.

7. Which of the following is true of the solutions for this equation?

$$x^2 - 8x = -65$$

   A. The equation has infinitely many real solutions.

   B. The equation has two real solutions.

   C. The equation has only one real solution.

   D. The equation has no real solutions, but two complex solutions.

8. Which of the following shows a quadratic expression and its factored form?

   A. $4x^2 - 3x^2 + 1; 4(x - 3)(x + 1)$

   B. $5x^2 - 10x - 15; 5(x - 1)(x + 3)$

   C. $-3x^2 - 2x - 8; -3(x - 4)(x + 2)$

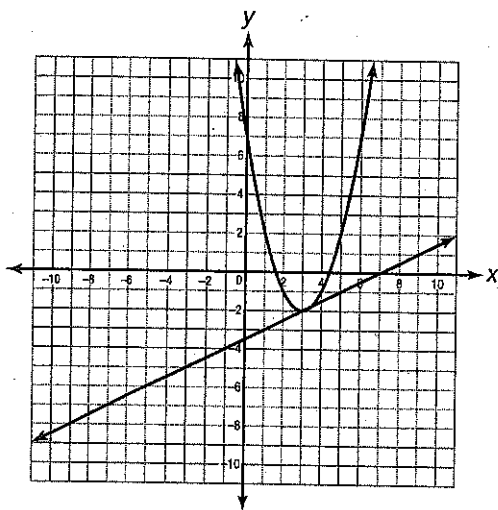   **D.** $-2x^2 + 18; -2(x - 3)(x + 3)$

9. Which of the following is the coefficient of the cubic term of this polynomial?

$$-3x^6 + x^5 - 2x^4 - 6x^3$$
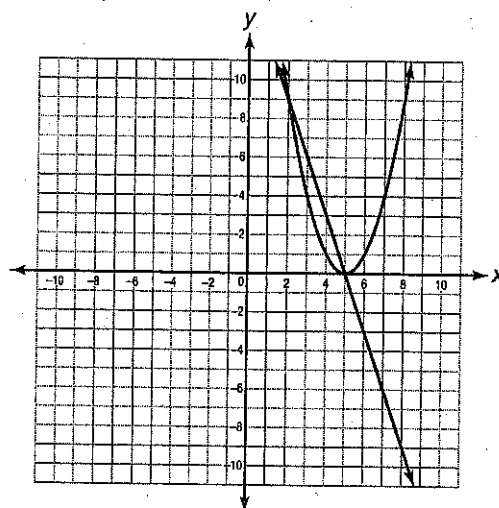
   A. 4

   B. 3

   C. -2

   D. -6

Go On ▶

Unit 5

10. Which of these graphs shows a system of functions that has exactly one solution?

A.

C.

B.
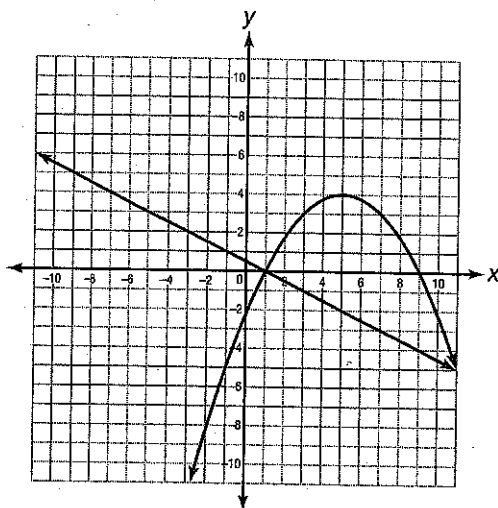
D.
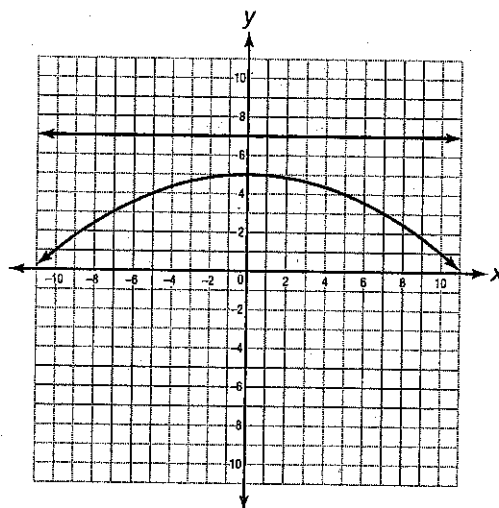
Go On ▶

11. Which of the following functions has a graph that shows a parabola that opens downward?

A. $f(x) = -5(x - 2)$

B. $h(x) = (x + 6)^2 - 7$

C. $m(x) = \frac{1}{2}(x - 1)^2 + \frac{1}{4}$

D. $p(x) = -2(x + 3)^2 + 5$

12. Which of the following are all of the x- and y-intercepts of the functions $f(x) = -\frac{1}{4}(x + 8)^2$?

A. $(0, 8)$, $(-16, 0)$, and $(16, 0)$

B. $(0, -16)$, $(0, 16)$, and $(8, 0)$

C. $(0, -16)$ and $(-8, 0)$

D. $(0, 2)$ and $(0, -2)$

13. Which of the following is the solution set to the equation $5x^2 + 5x = -1$?

A. $x = 0, 2$

B. $x = -\frac{1}{2} + \frac{\sqrt{5}}{10}, -\frac{1}{2} - \frac{\sqrt{5}}{10}$

C. $x = \frac{1}{5}, -\frac{1}{5}$

D. $x = -1 + \sqrt{5}, -1 - \sqrt{5}$

14. Which of the following represents a factored form of $x^4 - 16$?

A. $(x^2 - 4)(x^2 - 4)$

B. $(x - 2)^2(x + 2)^2$

C. $(x - 2)^2(x^2 + 2)$

D. $(x - 2)(x + 2)(x^2 + 4)$

15. The function $f(x)$ is defined as $f(x) = -4(x + 2)^2 - 4$. Which of the following statements correctly describes the intervals of the domain?

A. The function is increasing on the interval $(-\infty, \infty)$ and is negative on the interval $(-\infty, \infty)$.

B. The function is increasing on the interval $(-\infty, -4)$ and decreasing on the interval $(-4, \infty)$; it is positive on the interval $(-\infty, 2)$ and negative on the interval $(2, \infty)$.

C. The function is increasing on the interval $(\infty, 2)$ and decreasing on the interval $(2, \infty)$; it is positive on the interval $(-\infty, -4)$ and negative on the interval $(-4, \infty)$.

D. The function is increasing on the interval $(\infty, -2)$ and decreasing on the interval $(-2, \infty)$; it is negative on the interval $(-\infty, \infty)$.

Go On ▶

Unit 5

16. Tatiana wants to use a quadratic function that is increasing from $(-\infty, 5)$ and decreasing from $(5, \infty)$ to model a situation. Which of these graphs shows a quadratic function that has these features?

A.
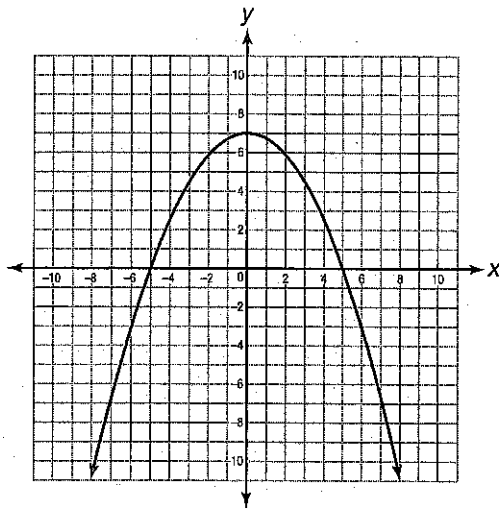
C.
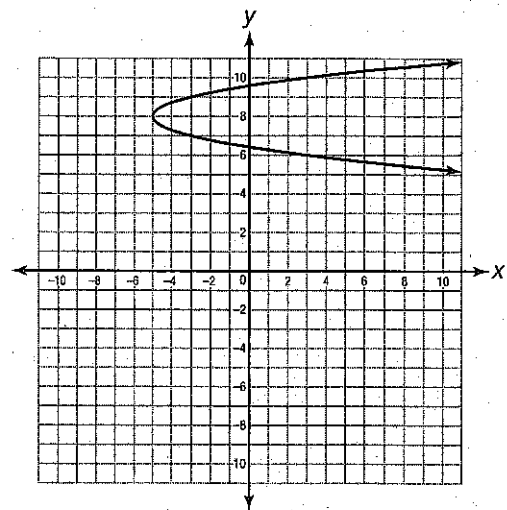
B.
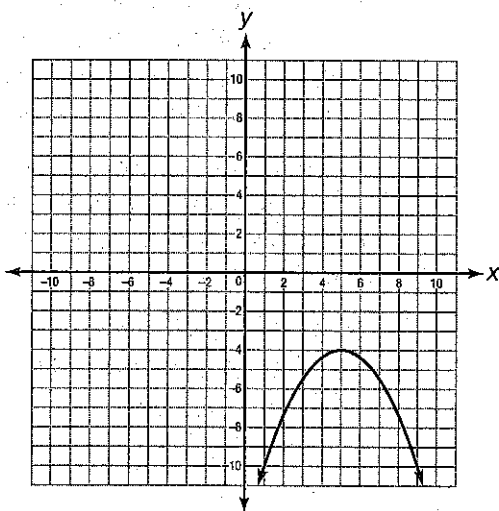
D.
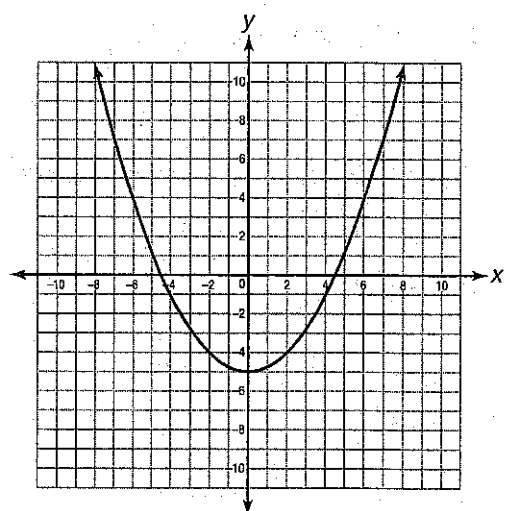
17. The total daily cost of making cell phones at a factory is a function of several factors: the product of the number of employees working each day, $15x$, and the number of cell phones each employee makes per day, $20x + 5$. Added to this is the daily cost for the factory space, $5,000. Which of these gives the total daily cost, $C(x)$, for the factory?

A. $C(x) = 35x^2 + 5,005$

B. $C(x) = 300x^2 + 75x + 5,000$

C. $C(x) = 300x^2 + 5,005$

D. $C(x) = 375x + 5,000$

18. Which of the following are the solutions to $x^2 + 12x = 9$, as found by completing the square?

A. $3\sqrt{5} + 6, 3\sqrt{5} - 6$

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

C. $-6 - 3\sqrt{5}, -6 + 3\sqrt{5}$

D. $\sqrt{39}, -\sqrt{39}$

19. The graphs below show $f(x)$ and $g(x)$.
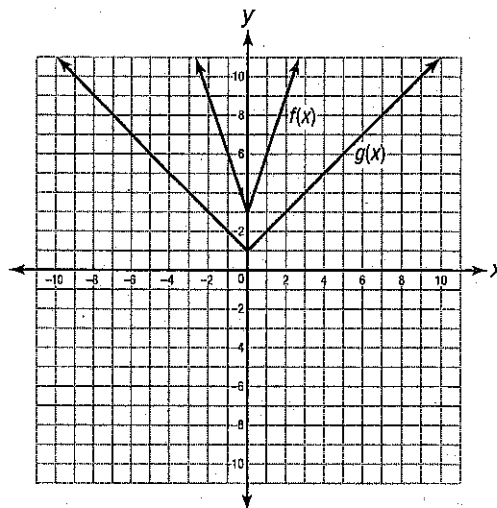
Which of the following describes the relationship between $f(x)$ and $g(x)$?

A. $g(x) = 3f(x)$

B. $g(x) = f(3x)$

C. $g(x) = \frac{1}{3}f(x)$

D. $g(x) = f\left(\frac{1}{3}x\right)$

20. Yolanda tries to find the zeros of the quadratic function $a(x) = 5x^2 - 4x + 8$. She decides that $a(x)$ has no real zeros. Which of the following could be her reason for correctly knowing this?

A. because $(-4)^2 - (4)(5)(8) < 0$

B. because $\frac{-(-4)}{(2)(5)} < 1$

C. because $\sqrt{(-4)^2} > 0$

D. because $(-4)^2 > (5)(8)$

Go On ▶

21. The graph below shows the function g(x).
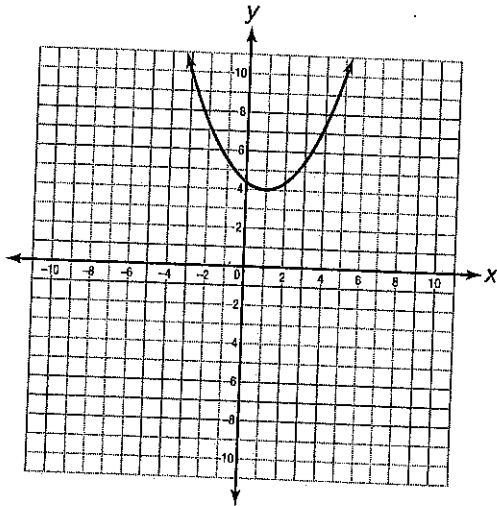
Which of the following describes how the graph of g(2x) compares to the graph of g(x)?

A. The axis of symmetry moves to the left $\frac{1}{2}$ unit, and the parabola is narrower.

B. The axis of symmetry moves to the right $\frac{1}{2}$ unit, and the parabola is wider.

C. The parabola is the same shape, but the axis of symmetry is moved to the left two units.

D. The parabola is the same shape, but the axis of symmetry is moved to the right two units.

22. The graph below shows the function a(x).
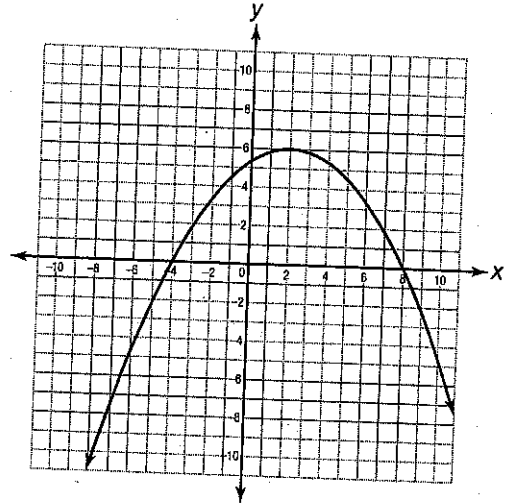
Over which interval are both the function increasing and the value of the function positive?

A. $(-\infty, 2)$

B. $(0, 2)$

C. $(2, 8)$

D. $(-4, 2)$

Go On ▶

23. Which of these tables represents a function with a constant rate of change?

A.

x	y
0	−1
1	−2
4	−3
9	−4
16	−5

B.

x	y
−4	9
−5	11
−6	13
−7	15
−8	17

C.

x	y
−2	4
−1	1
0	0
1	1
2	4

D.

x	y
−4	4
−2	2
0	0
2	2
4	4

24. The height, h, in feet of a ball after it is kicked from the ground with an initial speed of 64 feet per second is modeled by the equation $h = -16t^2 + 64t$. How many seconds will it take for the ball to reach a height of 70 feet?

A. It will take 1.5 seconds.

B. It will take 2 seconds.

C. It will take 4 seconds.

D. The ball will never reach a height of 70 feet.

25. The number of tablet computers sold at one store over x weeks can be modeled by the function $s(x) = 14x + 2$. Over that time, the number of these computers that are returned because they are defective is given by the function $r(x) = 3x - 2$. Which of the following functions gives the number of computers that are sold and not returned by this store over x weeks?

A. $17x$, because $s(x) + r(x) = 17x$

B. $11x + 4$, because $s(x) - r(x) = 11x + 4$

C. $42x^2 - 22x - 4$, because $s(x) \cdot r(x) = 42x^2 - 22x - 4$

D. $\frac{14x + 2}{3x - 2}$, because $s(x) \div r(x) = \frac{14x + 2}{3x - 2}$

Go On ▶

Unit 5

26. A farmer wants to fence in a rectangular portion of land along one side of her barn. She uses the side of the barn as one side of the rectangle and makes the other three sides from a total of 60 feet of fencing. Find the side lengths that give the maximum area she can fence in, as well as the maximum area. Show all of your work.
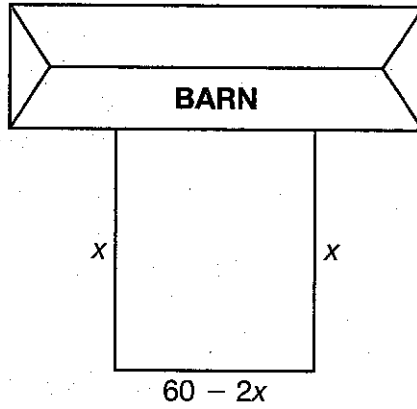
27. Find the vertex of the quadratic function $y = x^2 - 8x - 5$ by completing the square. Show all of your work.

Go On ▶

28. The function $g(x)$ is given below.

$$g(x) = 2x^2 + 15x - 8$$

A.   Factor the function to find its zeros.

B.   What does it mean for a value to be a 'zero' of a function? Explain how the factored form of a quadratic lets you find its zeros.

_____

_____

_____

C.   If two quadratic functions have the same zeros, must they be the same function? Explain with examples.

_____

_____

Go On ▶

29. The function $b(x)$ is given below.

$$b(x) \geq \tfrac{1}{4}x^2 + x - 8$$

A. Graph the inequality on the coordinate axes below.
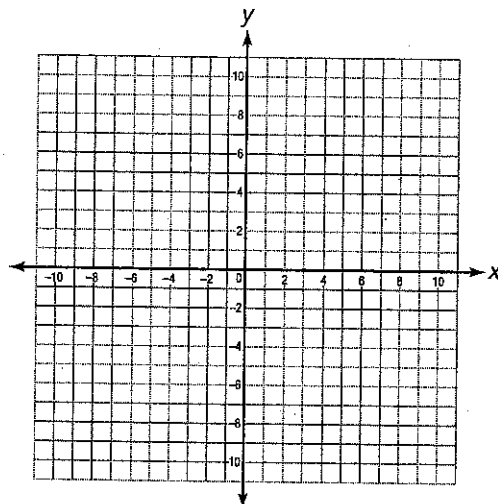
B. Explain how to decide which part of your graph to shade.

_____

_____

_____

_____

C. How do you know if the boundary is included in the solution set?

_____

_____

_____

_____

Go On ▶

30. Kiesha sets off a model rocket from the ground. At that moment, a helium balloon her brother released a few minutes earlier is at a height of 512 feet. The balloon has been rising at a constant rate of 3 feet per second, so its height at time t is given by the function $b(t) = 3t + 512$. The height of the rocket at time t is given by the function $r(t) = -16t^2 + 195t$.

A. Which values of the domain make sense for the rocket function? Explain.

_____

_____

_____

B. Solve the system of equations using the substitution method.

C. At what time(s) t will the balloon and the rocket be at the same height? What will be the height at each time?

_____

_____

_____

Unit 5

STOP

1. The general form for the equation of a circular conic section is $Ax^2 + By^2 + Cx + Dy + E = 0$. Which of the following must also be true if the equation describes a circle?

A. $A = B$

B. $A = 0$

C. $B = 0$

D. $A = C$ and $B = D$

2. Each point on a parabola is equidistant from a fixed point and a fixed line. Which terms are used to name that point and that line?

A. The point is the vertex and the line is the axis of symmetry.

B. The point is the vertex and the line is the directrix.

C. The point is the focus and the line is the axis of symmetry.

D. The point is the focus and the line is the directrix.

3. Which of the following nonlinear systems has only one solution?

A. $\begin{cases} x^2 + (y-1)^2 = 2 \\ x + y = 1 \end{cases}$

B. $\begin{cases} x^2 + (y-1)^2 = 2 \\ x + y = 2 \end{cases}$

C. $\begin{cases} x^2 + (y-1)^2 = 2 \\ x + y = 3 \end{cases}$

D. $\begin{cases} x^2 + (y-1)^2 = 2 \\ x + y = 4 \end{cases}$

4. Circle A with several radii drawn is shown.
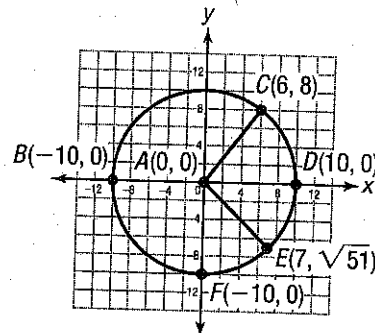
Which information is **not** accurate and would **not** help you show that all the radii of this circle have the same length?

A. $BD = 10$ because the grid shows 10 horizontal units between points B and D.

B. $CA = \sqrt{(6-0)^2 + (8-0)^2}$
$= \sqrt{36 + 64} = 10$

C. $EA = \sqrt{(7-0)^2 + (\sqrt{51}-0)^2}$
$= \sqrt{49 + 51} = 10$

D. $FA = |0 - (-10)| = 10$

Go On ▶

5. The focus of a parabola is $(3, 7)$ and its directrix is $x = -5$. Which of the following describes the graph of the parabola?

    A. Its vertex is at $(-1, 7)$ and it opens to the left.

    B. Its vertex is at $(-1, 7)$ and it opens to the right.

    C. Its vertex is at $(-3, 7)$ and it opens to the left.

    D. Its vertex is at $(-3, 7)$ and it opens to the right.

6. Which shows the correct center and radius for the circle with this equation?

$$(x - 3)^2 + \left(y + \frac{1}{2}\right)^2 = \frac{9}{16}$$

    A. center: $\left(3, -\frac{1}{2}\right)$; radius: $\frac{3}{4}$

    B. center: $\left(3, -\frac{1}{2}\right)$; radius: $\frac{9}{16}$

    C. center: $\left(-3, \frac{1}{2}\right)$; radius: $\frac{3}{4}$

    D. center: $\left(-3, \frac{1}{2}\right)$; radius: $\frac{9}{16}$

7. Which best describes the solution(s) for the following system of equations?

$$\begin{cases} (x + 1)^2 + (y + 1)^2 = 25 \\ x + y = 3 \end{cases}$$

    A. $(-1, 4)$ only

    B. $(-1, 4)$ and $(4, -1)$

    C. $(0, 3)$ and $(3, 0)$

    D. no real solutions

8. What is the focus of the parabola graphed below?

    A. $(4, 2)$

    B. $(4, 2.25)$

    C. $(4, 2.5)$

    D. $(4, 3)$

Go On ▶
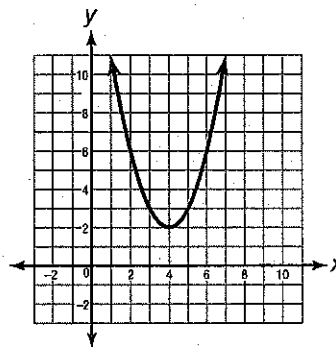
9. Which shows the graph of the circle with this equation?

$$(x + 3)^2 + (y + 1)^2 = 4$$

A.
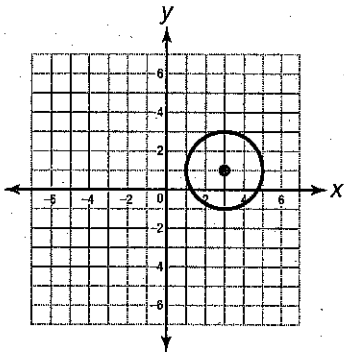
B.
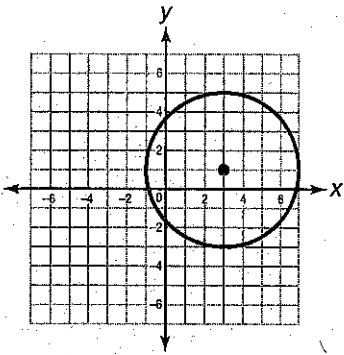
C.
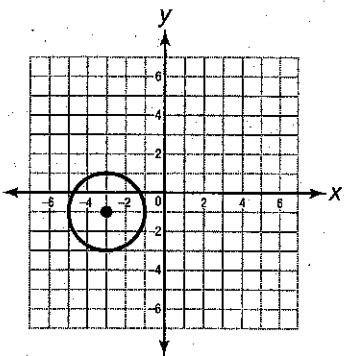
D.
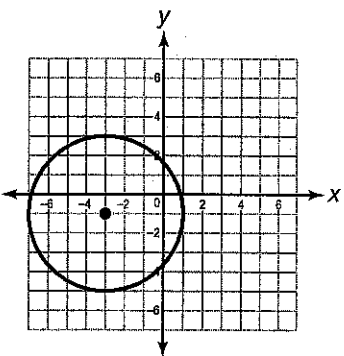
10. Cameron wants to prove or disprove that the point $(3, \sqrt{7})$ lies on the circle centered at the origin that includes the point $(4, 0)$. Which of the following is **not** accurate and would **not** help him prove this?

A. The distance from $(0, 0)$ to $(4, 0)$ is a radius of the circle.

B. The distance from $(3, \sqrt{7})$ to $(4, 0)$ is a radius of the circle.

C. The distance from $(0, 0)$ to $(4, 0)$ is: $|4 - 0| = 4$.

D. The distance from $(0, 0)$ to $(3, \sqrt{7})$ is: $\sqrt{(\sqrt{7} - 0)^2 + (3 - 0)^2} = 4$.

11. Solve the nonlinear system algebraically.

$$\begin{cases} (x - 4)^2 + (y - 1)^2 = 9 \\ y = 2x \end{cases}$$

Which best describes the solution(s) to this system?

A. $(0.8, 1.6)$ only

B. $(0.8, 1.6), (1.6, 3.2)$

C. $(-4, -2), (-1, 1)$

D. no real solutions

Go On ▶

12. Point (3, 8) is on a circle with center (6, 4). What is the equation of the circle?

- **A.** $(x - 3)^2 + (y - 8)^2 = 5$
- **B.** $(x - 3)^2 + (y - 8)^2 = 25$
- **C.** $(x - 6)^2 + (y - 4)^2 = 5$
- **D.** $(x - 6)^2 + (y - 4)^2 = 25$

13. Given: $\overleftrightarrow{AC}$ is tangent to circle O.
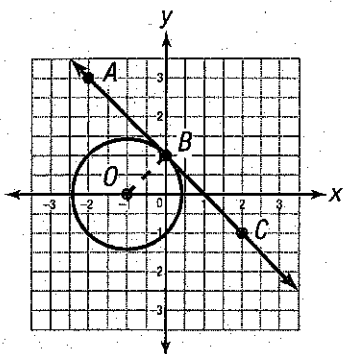
Which information would **not** be helpful in proving that the point of tangency of a tangent line is perpendicular to the radius drawn to the point of tangency?

- **A.** Line AC has a slope of −1.
- **B.** Line OB has a slope of 1.
- **C.** The distance from point O to point B is: $\sqrt{(-1 - 0)^2 + (0 - 1)^2} = \sqrt{2}$.
- **D.** The product of opposite reciprocals is −1.

14. What is the directrix of this parabola?
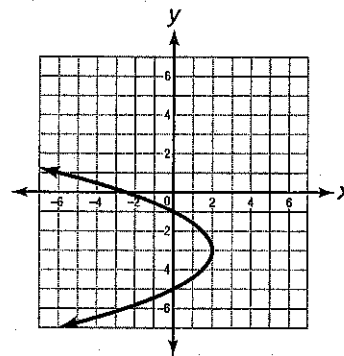
- **A.** $x = 1.5$
- **B.** $x = 1.875$
- **C.** $x = 2.125$
- **D.** $x = 2.5$

15. What is the equation for the circle graphed below in standard form?
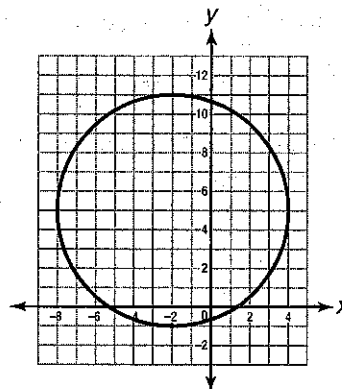
- **A.** $(x + 2)^2 + (y - 5)^2 = 12$
- **B.** $(x + 2)^2 + (y - 5)^2 = 36$
- **C.** $(x + 3)^2 + (y - 5)^2 = 12$
- **D.** $(x + 3^2) + (y - 5)^2 = 36$

Go On ▶

Unit 6

16. The mirrored reflector in a flashlight is shaped like a parabola. The reflector is 8 inches across and 4 inches deep. The lightbulb of the flashlight is located at the focus of the parabola.
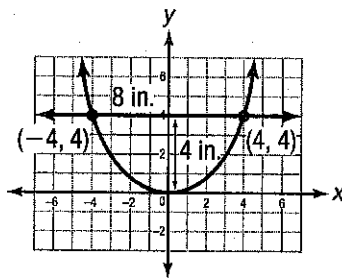
Identify and label the location of the lightbulb on the diagram. How far from the vertex is the lightbulb positioned? Show all of your work.

17. The equation of a circle in general form is given below.

$$x^2 + y^2 - 4x + 6y + 9 = 0$$

Convert this equation to standard form by completing the square. Identify its center and radius. Show all of your work.

standard form: _____

center: (_____, _____)

radius: _____

Go On ▶

18. A fenced-in square exhibit at a botanic garden is 40 feet on each side. The entrance to the exhibit is in the center of the west edge of the fence. At the center of the exhibit is a circular fish pond with a diameter of 20 feet. Tasha is standing at the entrance.

A. The grid below shows the exhibit. Use a compass to draw and label a representation of the pond. Then draw and label a point to show Tasha's location.
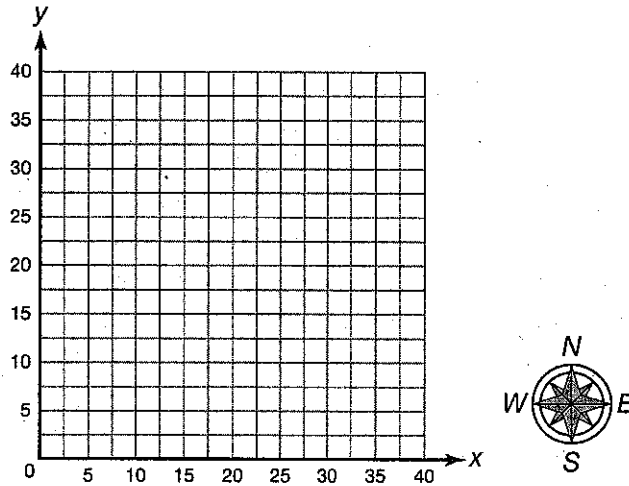
B. Tasha is meeting Pedro in the exhibit. Pedro is 15 feet south and 25 feet east of the entrance. Assuming the pond is the only potential obstacle, can Tasha walk a straight-line path to where Pedro is standing? Draw a segment to represent the straight-line path she would need to take. Explain why she can or cannot walk a straight-line path to meet Pedro.

_____

_____

_____

Go On ▶

19. In circle O, $\angle MNP$ is an inscribed angle that intercepts arc MQP. Use circle O to prove that a 90° inscribed angle intercepts a semicircle.
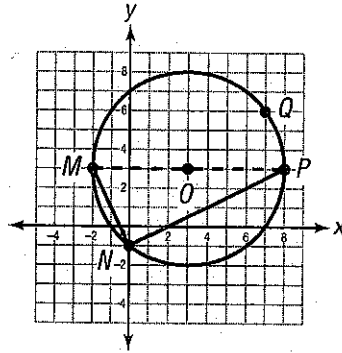
A. Calculate the slopes of $\overline{MN}$ and $\overline{NP}$. Use those slopes to prove that the inscribed angle, $\angle MNP$, measures 90°. Explain and show all of your work.

slope of $\overline{MN}$ = _____

slope of $\overline{NP}$ = _____

_____

_____

B. Provide a reason to show why $\overline{MP}$ is a diameter of circle O.

_____

_____

C. Explain how you know that arc MQP is a semicircle. What does this indicate about the arc that a 90° inscribed angle intercepts?

_____

_____

_____

20. In circle O, chords KL and MN intersect at point P. Prove the intersecting chords theorem by showing that $(KP)(PL) = (MP)(PN)$.
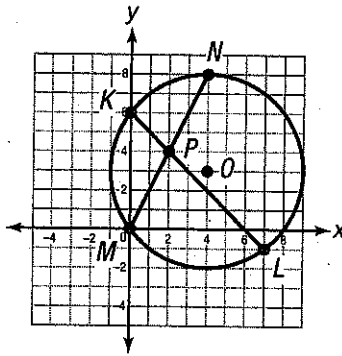
A. Write equations for the lines containing the chords.

$\overleftrightarrow{KL}$: _____

$\overleftrightarrow{MN}$: _____

B. Use algebra to determine the coordinates of the point of intersection, P. Show all of your work.

P: (_____, _____)

C. Use the distance formula to find the lengths of the chords.

$\overline{KP} =$ _____

$\overline{LP} =$ _____

$\overline{MP} =$ _____

$\overline{NP} =$ _____

Show that $(\overline{KP})(\overline{LP}) = (\overline{MP})(\overline{NP})$.

What does this indicate about the segments formed by intersecting chords?

_____

Unit 6

STOP

Unit 7 Assessment • **Applications of Probability**

1. Consider the universal set, U, and its subsets, A and B.

$$U = \{1, 2, 4, 6, 7, 10\}$$
$$A = \{2, 4, 6, 10\}$$
$$B = \{2, 6, 7\}$$

Which set represents $A \cap B$?

A. $\{2\}$

B. $\{2, 6\}$

C. $\{7, 10\}$

D. $\{2, 4, 6, 7, 10\}$

2. If two events A and B are independent, then which statement is completely true of events A and B?

A. The outcome of event A does not affect the outcome of event B, so $P(A \cap B) = P(A)P(B)$.

B. The outcome of event A affects the outcome of event B, so $P(A \cap B) = P(A)P(B)$.

C. The outcome of event A does not affect the outcome of event B, so $P(A \cup B) = P(A) + P(B)$.

D. The outcome of event A affects the outcome of event B, so $P(A \cup B) = P(A) + P(B)$.

3. Eight tiles are in a bag as shown.
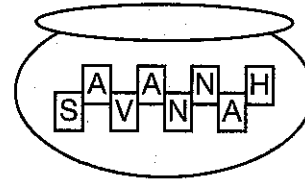
Jack will reach into the bag and select a tile without looking. What is the probability that he will select a tile with an N on it?

A. $\frac{1}{8}$

B. $\frac{1}{4}$

C. $\frac{3}{8}$

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

4. Students responding to a poll were asked whether they were for or against a proposal to change the school mascot.

	For (F)	Against (A)
Boys (B)	15	40
Girls (G)	18	27

What is the probability that a randomly selected student at the school would be for the proposal given that the student was a girl?

A. 18%

B. 33%

C. 40%

D. 54%

Go On ▶

5. The union of two overlapping events A and B is equal to which of the following?

A. $P(A) + P(B)$

B. $P(A) + P(B) - P(A \text{ and } B)$

C. $P(A)P(B)$

D. $\dfrac{P(A \text{ and } B)}{P(B)}$

6. A large bag holds marbles of the following colors: black (B), green (G), red (R), and yellow (Y). A small bag holds marbles of the following colors: green (G), white (W), and yellow (Y). Which shows the union of the sets of colors in the two bags?

A. {G, R}

B. {G, Y}

C. {B, G, R, Y}

D. {B, G, R, W, Y}

7. The Venn diagram below shows the probabilities for event C and the intersection of events C and D. The probabilities for event D and the complement of the union of events C and D are not shown.
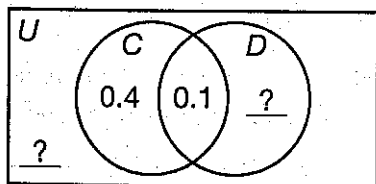
If events C and D are independent events, what is P(D)?

A. 0.03

B. 0.2

C. 0.3

D. 0.5

8. The director of a chorus puts the names of male soloists in one hat and the names of female soloists in another hat. He will select one name from each hat to perform a duet at the spring concert. The tree diagram shows the possible combinations for the duet.
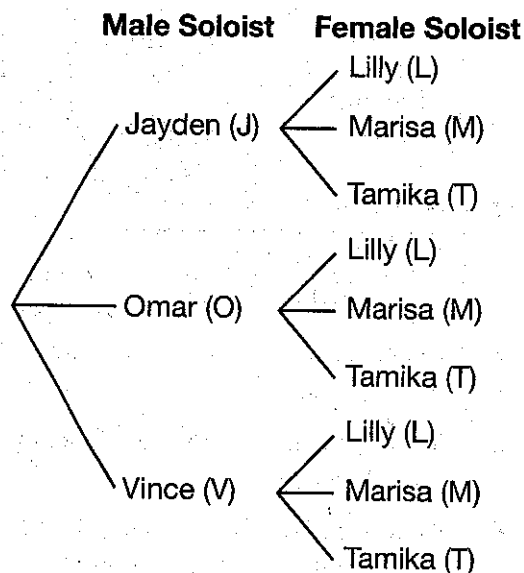
What is the probability that Jayden and Tamika will be selected to perform the duet?

A. $\dfrac{1}{3}$

B. $\dfrac{1}{6}$

C. $\dfrac{1}{9}$

D. $\dfrac{1}{12}$

Go On ▶

9. The Venn diagram shows which world languages members of a boys' basketball team are studying this year in school: French (F) or Spanish (S). Let the entire diagram represent U, the universal set.
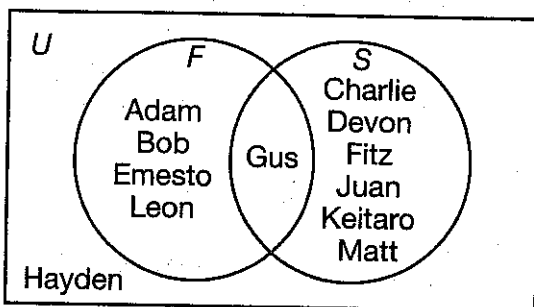
Which best describes $F \cap \overline{S}$?

A. It consists of players who take French, but not Spanish.

B. It consists of players who take Spanish, but not French.

C. It consists of players who take either French or Spanish, but not both.

D. It consists of players who take neither French nor Spanish.

10. Event A is independent of event B if which of the following is true?

A. $P(A \mid B) = P(A) + P(B)$

B. $P(A \mid B) = P(A)(P(B)$

C. $P(A \mid B) = P(A \cap B)$

D. $P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$

11. The universal set shown by the Venn diagram is the set of all possible outcomes of tossing a number cube with faces numbered 1 to 6. Subset O is the set of outcomes that are odd. Subset M is the set of outcomes that are multiples of 3.
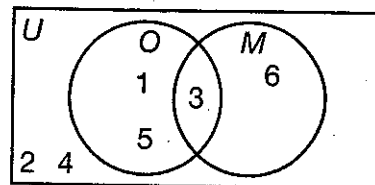
Which shows $\{\overline{O \cap M}\}$?

A. $\{3\}$

B. $\{2, 4\}$

C. $\{1, 5, 6\}$

D. $\{1, 2, 4, 5, 6\}$

12. The physical education teachers surveyed ninth-grade students to find out which field trip they were most interested in taking.

	Golf (G)	Swimming (S)
Boys (B)	72	24
Girls (G)	46	50

If you chose a ninth-grade boy from the school at random, which of the following would you expect to be true?

A. He would be about 3 times as likely to prefer a golf trip to a swimming trip.

B. He would be about 3 times as likely to prefer a swimming trip to a golf trip.

C. He would be about 7 times as likely to prefer a golf trip to a swimming trip.

D. He would be just as likely to prefer a golf trip as a swimming trip.

Go On ▶

13. Tenth-grade students will have to sign up for a health elective. A survey of a group of tenth-grade students asked which elective they would most like to take.

	First Aid (F)	Nutrition (N)
Boys (B)	20	5
Girls (G)	15	10

What is $P(B \cup N)$?

A. 10%

B. 35%

C. 70%

D. 80%

14. A white number cube, a red number cube, and a green number cube, each with faces numbered 1 to 6, are tossed at the same time. What is the probability of all three cubes landing on odd numbers given that the white cube landed on 3?

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

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. $\frac{1}{36}$

15. The two-way frequency table shows the midterm exam scores for students in the same U.S. history class and whether or not they played computer games the night before the exam.

	Score ≥ 85	Score < 85
Played Computer Games	1	7
Did Not Play Computer Games	10	6

What is the probability that a randomly selected student from the class had a score greater than or equal to 85 given that the student did **not** play computer games the night before the exam?

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

B. $\frac{5}{8}$

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

D. $\frac{10}{11}$

Go On ▶

16. The Venn diagram shows the intersection of two sets. Set A shows the number of ninth-grade students surveyed and set B shows the number of students in the school band.
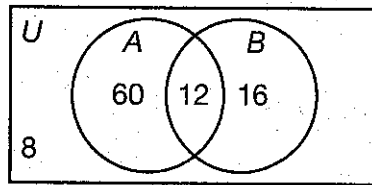
What is $P(B \mid A)$ for this Venn diagram? What does this probability represent? Show all of your work.

_____

_____

_____

17. The two-way frequency table shows the results of a survey of eleventh- and twelfth-grade students at Fairlawn High School. Students were asked whether or not they have their own car.

	Have Car (C)	No Car (N)
Eleventh Grade (E)	8	32
Twelfth Grade (T)	22	18

Suppose a student's name is chosen from a list of eleventh- and twelfth-grade students at the high school. What is the probability that the student chosen will have a car, be in twelfth grade, or both? Use probability and set notation to show or explain how you determined the answer.

_____

_____

_____

Go On ▶

18. Abby, Brian, and Chelle are spinning a spinner with 9 equal-size sections numbered 1 to 9.

- If the spinner lands on a prime number, Abby gets a point.

- If the spinner lands on an even number, Brian gets a point.

- If the spinner lands on a number greater than 5, Chelle gets a point.

A. List the elements in each set.

The universal set:

$U =$ _____

The winning outcomes for Abby:

$A =$ _____

The winning outcomes for Brian:

$B =$ _____

The winning outcomes for Chelle:

$C =$ _____

B. Use the rectangle below to create a Venn diagram to show the universal set, U.

Use intersecting circles to show how sets A, B, and C intersect and overlap.
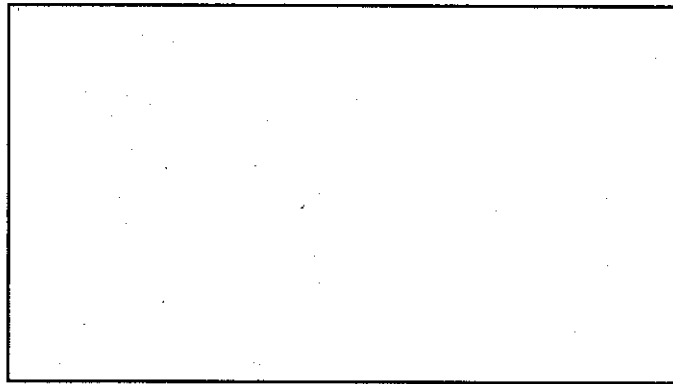
Shade the part of the diagram that shows $\overline{A \cup B \cup C}$. What outcomes are included and what does that region represent?

_____

C. Are there any empty regions in the diagram? Describe what any empty regions show about the game.

_____

_____

Go On ▶

19. Eighty tenth-grade students at Milton High School were asked which school lunch they like best. Twenty-five boys chose pizza, four boys chose chicken, and 11 boys chose tacos. Seven girls chose pizza, 20 girls chose chicken, and 13 girls chose tacos.

A. Use the grid below to create a two-way frequency table for these data.

				Total
Boys				
Girls				
Total				

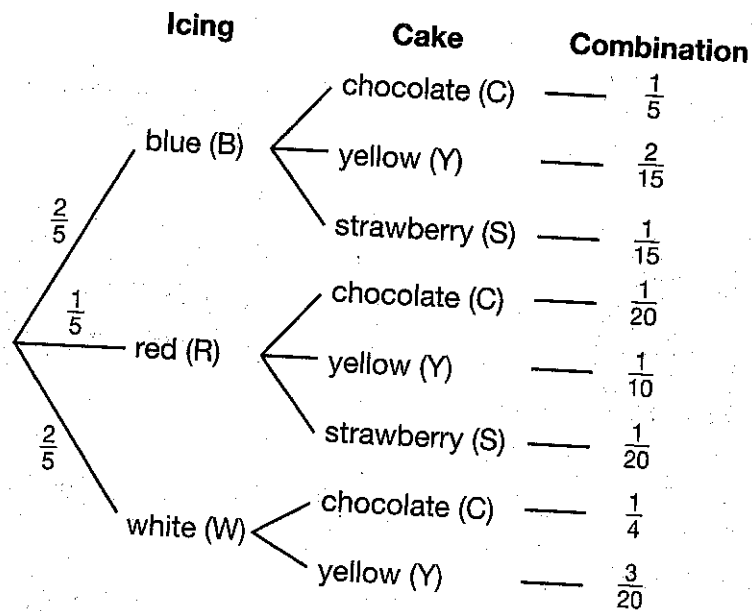B. What is the probability that a tenth-grade student at the school chosen at random likes pizza best? Explain how you determined your answer.

_____

_____

_____

C. What is the probability that a tenth-grade boy chosen at random likes pizza best? Explain how you determined your answer.

_____

_____

_____

Go On ▶

20. Sixty cupcakes were prepared for a celebration. Each cupcake has blue, red, or white icing. The cake is either chocolate cake, yellow cake, or strawberry cake.

Icing	Cake	Combination
	chocolate (C)	$\frac{1}{5}$
blue (B)	yellow (Y)	$\frac{2}{15}$
	strawberry (S)	$\frac{1}{15}$
	chocolate (C)	$\frac{1}{20}$
red (R)	yellow (Y)	$\frac{1}{10}$
	strawberry (S)	$\frac{1}{20}$
white (W)	chocolate (C)	$\frac{1}{4}$
	yellow (Y)	$\frac{3}{20}$

blue (B): $\frac{2}{5}$
red (R): $\frac{1}{5}$
white (W): $\frac{2}{5}$

A. Katie is the first to select a cupcake. Given that she chose a cupcake with blue icing, what is the probability that she chose each of the following?

a chocolate cupcake _____
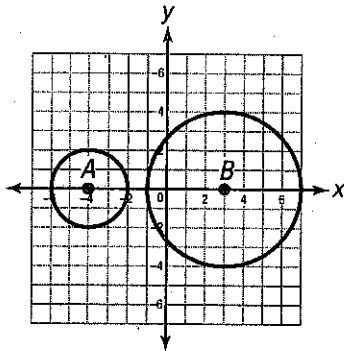
a yellow cupcake _____

a strawberry cupcake _____

B. Assuming Katie had chosen randomly (without choosing an icing color first), which two cupcake combinations had the same probability of being chosen? What does this indicate about the probabilities that are **not** labeled on the tree diagram?

_____

_____

_____

STOP

Summative Assessment

1. Circles A and B are shown below.

Which of the following is true?

A. All circles, including circles A and B, are similar.

B. All circles, including circles A and B, are congruent.

C. Circles A and B are similar, but not all circles are similar.

D. Circles A and B are congruent, but not all circles are congruent.

2. Which of the following statements is true?

A. Similar figures have corresponding sides that are equal in length.

B. Similar figures have corresponding angles that are equal in measure.

C. Dilating a triangle by a scale factor less than 1 results in a similar triangle with longer sides.

D. Dilating a triangle by a scale factor greater than 1 results in a similar triangle with greater angle measures.

3. Which of the following is equivalent to $3\sqrt{20} + 2\sqrt{72}$?

A. $18\sqrt{7}$

B. $6\sqrt{2} + 2\sqrt{5}$

C. $6\sqrt{5} + 12\sqrt{2}$

D. $12\sqrt{5} + 72\sqrt{2}$

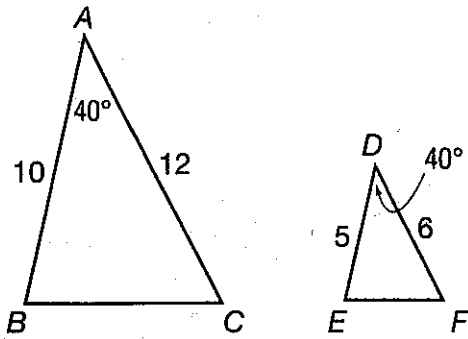**4.** If $\sin 36.9° \approx \frac{21}{35}$ and $\cos 36.9° \approx \frac{28}{35}$, which is true?

A. $\tan 36.9° \approx \frac{21}{28}$

B. $\tan 36.9° \approx \frac{28}{21}$

C. $\tan 36.9° \approx \frac{21}{35}$

D. $\tan 36.9° \approx \frac{28}{35}$

5. Which of the following polynomials is written in standard form?

A. $-14x + x^2 + 7x^3$

B. $3x^3 - 90x + 2x^5$

C. $\frac{1}{2}x^4 + \frac{3}{8}x^3 + 10$

D. $3x^2 + 7x - 8 - 2x^2 + 11$

Go On ▶

6. Which of the following can be used to show that $\triangle ABC$ is similar to $\triangle DEF$ using the information given?
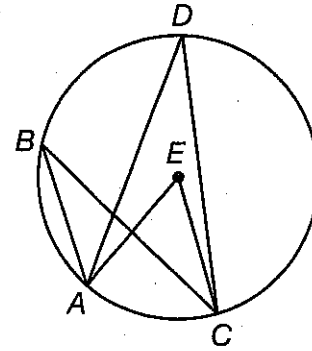

- **A.** AA~ postulate
- **B.** triangle similarity theorem
- **C.** SAS~ theorem
- **D.** SSS~ theorem

7. Which statement is **not** true of this quadratic expression?

$$x^2 - 7x - 10$$

- **A.** -7 and 10 are coefficients.
- **B.** x^2 is the leading term.
- **C.** $-7x$ is the linear term.
- **D.** 10 is the constant term.

8. In circle E, $\angle ABC$ measures $28°$.

Which of the following must also be true?

- **A.** $m\angle ADC = 28°$ and $m\angle AEC = 14°$
- **B.** $m\angle ADC = 28°$ and $m\angle AEC = 28°$
- **C.** $m\angle ADC = 28°$ and $m\angle AEC = 56°$
- **D.** $m\angle ADC = 56°$ and $m\angle AEC = 112°$

9. Given that $(3^{\frac{1}{2}})^2 = 3$, what must be the value of $3^{\frac{1}{2}}$?

- **A.** $\frac{3}{2}$
- **B.** $(\sqrt{3})^2$
- **C.** $\sqrt[3]{2}$
- **D.** $\sqrt{3}$

10. Which shows the correct center and radius for the circle with this equation?

$$(x - 7)^2 + (y + 1.75)^2 = 12.25$$

- **A.** center: $(7, -1.75)$; radius: 3.5
- **B.** center: $(7, -1.75)$; radius: 12.25
- **C.** center: $(-7, 1.75)$; radius: $\frac{3}{4}$
- **D.** center: $(-7, 1.75)$; radius: $\frac{9}{16}$

Go On ▶

Summative Assessment

11. Consider the universal set, U, and its subsets, A and B.

$$U = \{1, 3, 5, 6, 7, 8, 9, 12\}$$
$$A = \{1, 3, 7, 9\}$$
$$B = \{3, 6, 9, 12\}$$

Which set represents $\bar{B}$?

A. $\{1, 7\}$

B. $\{3, 9\}$

C. $\{1, 5, 7, 8,\}$

D. $\{1, 3, 6, 7, 9, 12\}$

12. What is the value of i^{14}?

A. i

B. $-i$

C. 1

D. -1

13. The focus of a parabola is $(5, -2)$ and its directrix is $y = 6$. What is the equation of the parabola?
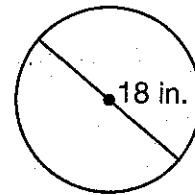
A. $y - 2 = -\frac{1}{16}(y - 5)^2$

B. $y - 2 = -\frac{1}{16}(x + 5)^2$

C. $y - 2 = -\frac{1}{4}(y - 5)^2$

D. $y - 2 = -\frac{1}{4}(x + 5)^2$

14. What is the area of the circle shown below?

18 in.

A. 18π square inches

B. 36π square inches

C. 81π square inches

**D.** 324π square inches

Go On ▶

15. The table shows the number of freshmen and sophomores at Vanderbilt High School who participate in afterschool clubs and who do not.

	Participate in Clubs (P)	No Clubs (N)	Total
Freshman (F)	45	60	105
Sophomore (S)	99	36	135
Total	144	96	240

Which is the best estimate of the probability that a randomly selected freshman or sophomore from the school does **not** participate in clubs?

A. 9.6%   C. 40%

B. 36%   D. 60%

16. How could quadrilateral *ABCD* be transformed to show that it is congruent to quadrilateral *A'B'C'D'*?
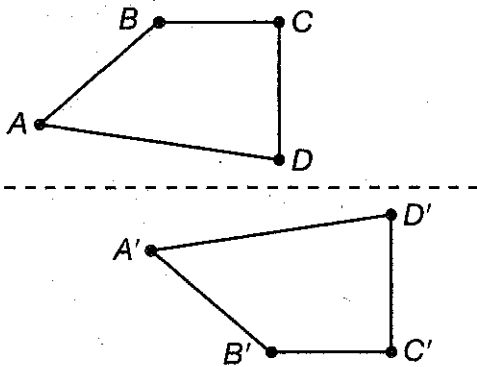
A. translation of quadrilateral *ABCD* down

B. translation of quadrilateral *ABCD* down and to the right

C. reflection of quadrilateral *ABCD* across the dashed line followed by a translation down

D. reflection of quadrilateral *ABCD* across the dashed line followed by a translation to the right

17. Which figure is being constructed below?
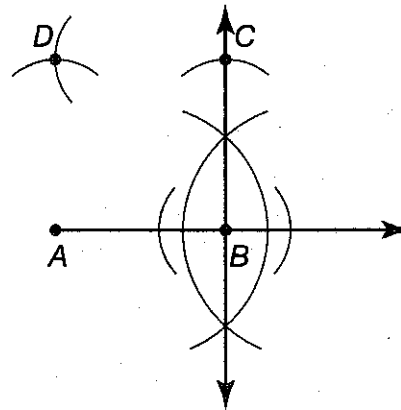
A. an equilateral triangle

B. a rectangle that is not a square
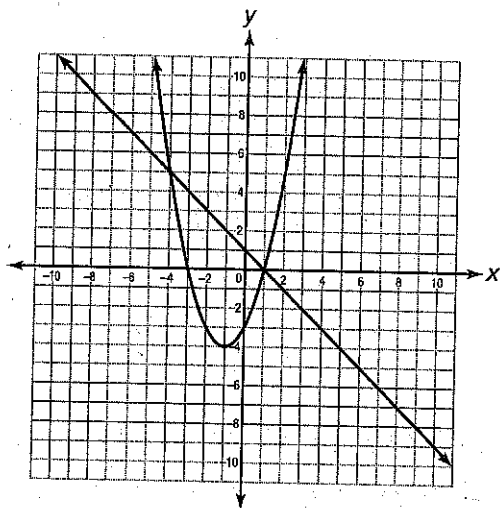
C. a square

D. a regular polygon inscribed in a circle

18. Event C is independent of event D if which of the following is true?

A. $P(C \mid D) = P(C)$

B. $P(C \mid D) = P(C)P(D)$

C. $P(C \mid D) = P(C) + P(D)$

D. $P(C \mid D) = \dfrac{P(C \cap D)}{P(D)}$

19. The following system of equations is graphed below.
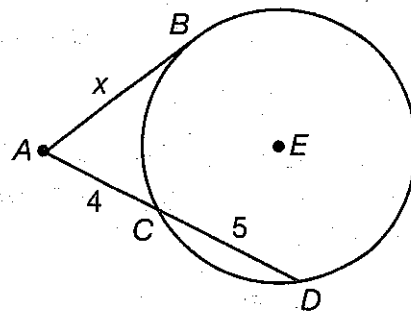
$$y = x^2 + 2x - 3$$

$$y = 1 - x$$

What is the solution set for this system of equations?

A. $(-5, 4)$

B. $(1, 0)$

C. $(-5, 4)$ and $(0, 1)$

D. $(-4, 5)$ and $(1, 0)$

20. Which expression is equivalent to $(a^2 b)^{\frac{7}{2}} + c^{\frac{2}{3}}$?

A. $a^3 b^3 \sqrt{ab} + c\sqrt{c}$

B. $a^3 b^7 + \sqrt[3]{c^2}$

C. $a^7 b^3 \sqrt{b} + c\sqrt{c}$

D. $a^7 b^3 \sqrt{b} + \sqrt[3]{c^2}$

21. What is the length of the segment represented by x in circle E?

A. 4.5 units

B. 6 units

C. 6.7 units

D. 12 units

22. Let x be the measure of an acute angle in a right triangle. For $0° < x < 90°$, which of the following statements is true?

A. As x increases, the values of the sine of x and the tangent of x both decrease.

B. As x increases, the values of the cosine of x and the tangent of x both increase.

C. As x increases, the values of the sine of x increases and the cosine of x decreases.

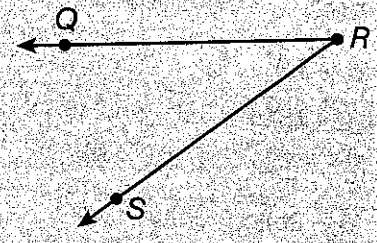**D.** As x increases, the values of the sine of x decreases and the cosine of x increases.

23. The Venn diagram below shows the probabilities for event M and the intersection of events L and M. The probabilities for event L and the complement of the union of events L and M are not shown.
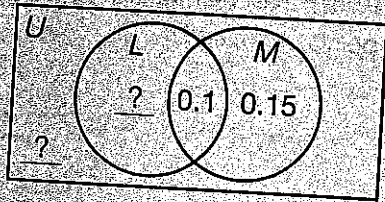
If events L and M are independent events, what is $P(L)$?

A. 0.15

B. 0.2

C. 0.3

D. 0.4

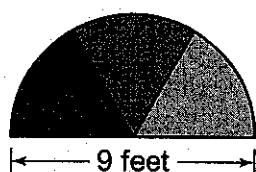**24.** Angle QRS is shown below.

Which of the following shows the construction of the line that bisects $\angle QRS$?

A.

B.

C.

D.

25. Which shows the fully factored form of $a^4 - 81b^4$?

A. $(a - 3b)^4$

B. $(a - 3b)(a + 3b)^3$

C. $(a - 3b)(a + 3b)(a^2 - 9b^2)$

D. $(a - 3b)(a + 3b)(a^2 + 9b^2)$

26. A semicircular window has a diameter of 9 feet. The window contains three stained glass panes of equal size as shown.

|← 9 feet →|

What is the approximate area of one of the colored glass sections?

A. 10.6 square feet

B. 21.2 square feet

C. 31.8 square feet

D. 42.4 square feet

27. Which statement is **not** true of the function $f(x) = (x + 1)^2 - 9$?

A. Its y-intercept is at $(0, -9)$.

B. It has two x-intercepts, at $(-4, 0)$ and $(2, 0)$.

C. Its minimum value is -9.

D. It has no maximum.

28. Line PM is the perpendicular bisector of $\overline{AB}$.
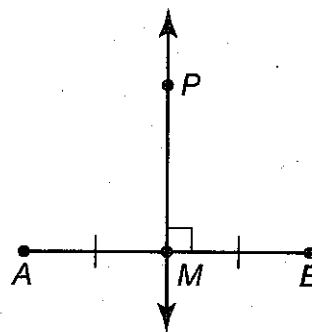
Which of the following must also be true?

A. Point P must be equidistant from points A and M.

B. Point P must be equidistant from points A and B.

C. Point P must be equidistant from points M and B.

D. Point P must be equidistant from three points, A, M, and B.

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29. The fine arts teachers surveyed twelfth-grade students to find out which arts elective they were most interested in taking.

	Cartooning (C)	Sculpture (S)
Boys (B)	64	32
Girls (G)	20	60

If you chose a twelfth-grade boy from the school at random, which of the following would you expect to be true?

A. He would be about twice as likely to prefer cartooning to sculpture.

B. He would be about twice as likely to prefer sculpture to cartooning.

C. He would be about 3 times as likely to prefer cartooning to sculpture.

D. He would be about 3 times as likely to prefer sculpture to cartooning.

30. What is the value of this expression?

$$(9 - 8i) - (7 - 2i)$$

A. $2 + 6i$

B. $2 - 6i$

C. $2 - 10i$

D. $-6i$

31. The table shows the temperatures predicted by a meteorologist for Macon, Georgia, for a day in August.
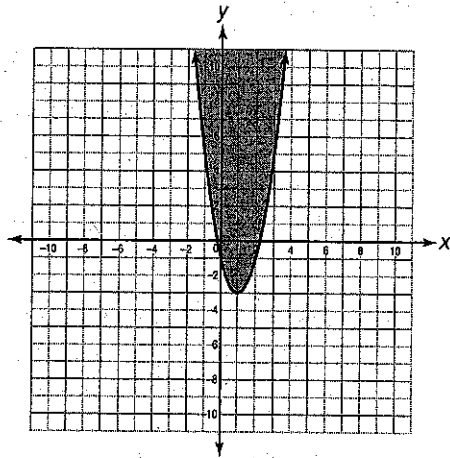
Hours Since Midnight x	Predicted Temperature in °F f(x)
6 (6:00 A.M.)	75
8 (8:00 A.M.)	79
10 (10:00 A.M.)	82
12 (12:00 P.M.)	84
14 (2:00 P.M.)	87
16 (4:00 P.M.)	85
18 (6:00 P.M.)	82
20 (8:00 P.M.)	77

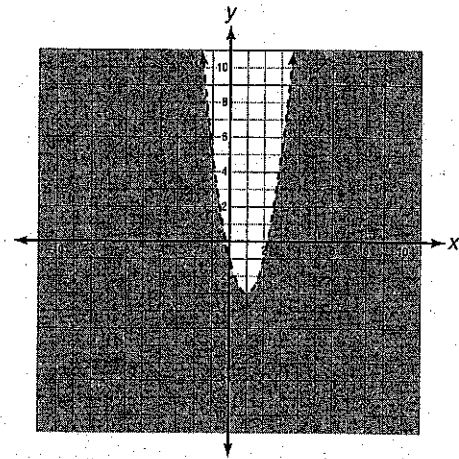Which of the following is the best quadratic model for these data?

A. $f(x) = -0.19x^2 + 5.31x + 49.35$

B. $f(x) = -0.19x^2 + 49.35x + 5.31$

C. $f(x) = 0.24x^2 + 78.2x$

D. $f(x) = 0.24x^2 + 78.2$

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32. Which of the following is the graph of $y \leq 2x^2 - 4x - 1$?
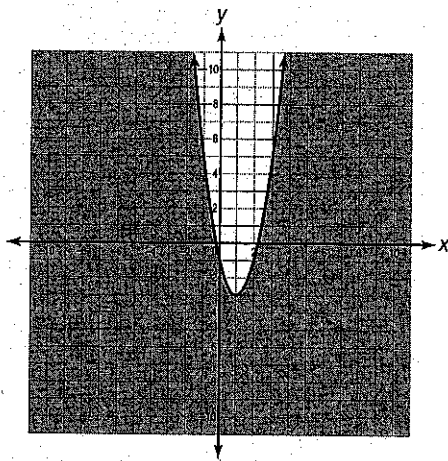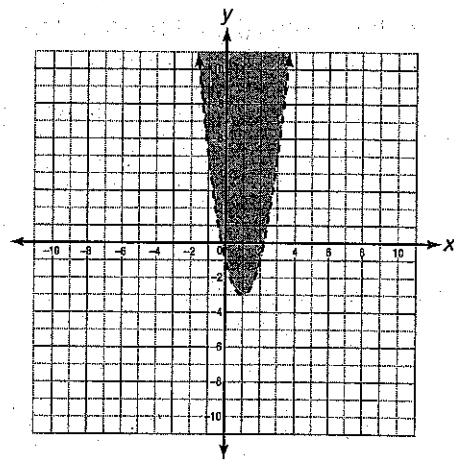
A.

C.

B.

D.

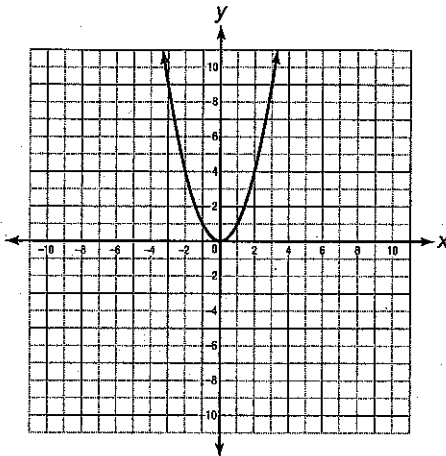**33.** Solve the nonlinear system algebraically.

$$\begin{cases} (x - 3)^2 + y^2 = 100 \\ x + y = 5 \end{cases}$$

Which best describes the solution(s) to this system?

A. $(-3, 11)$ only

B. $(-3, 8), (11, -6)$

C. $(3, 2), (-11, 16)$
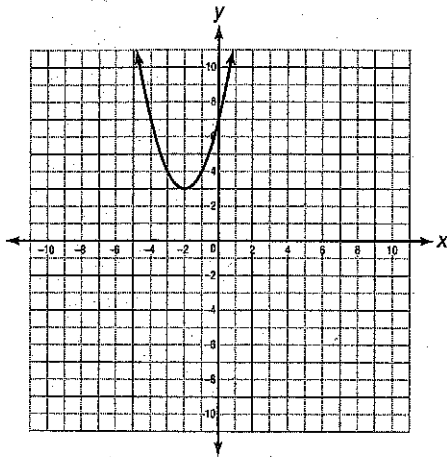
D. no real solutions

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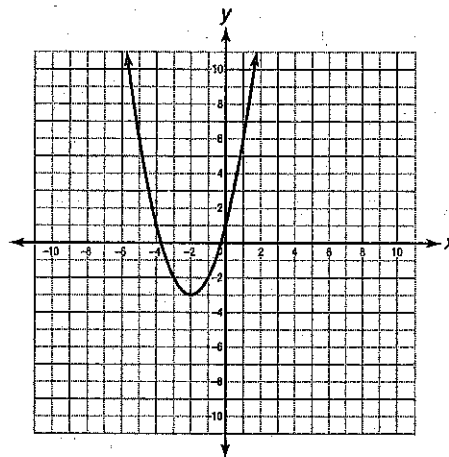**34.** The parent function for quadratic functions, $f(x) = x^2$, is graphed below.

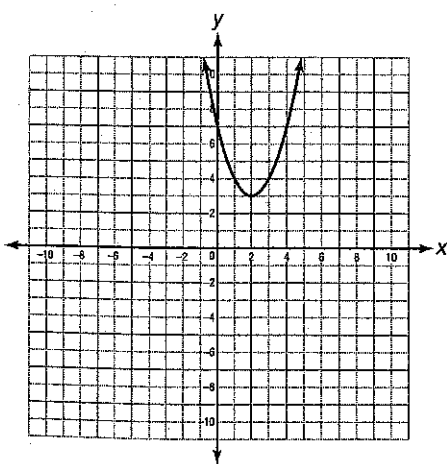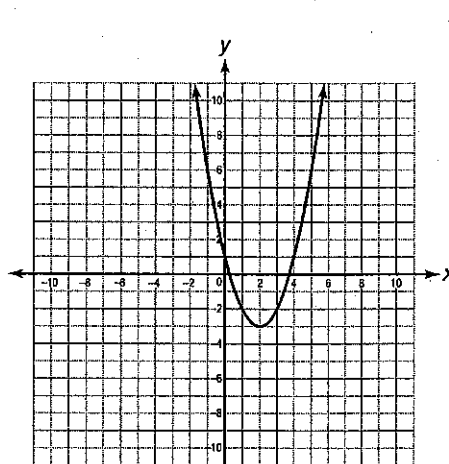Which of the following is the graph of $g(x) = (x - 2)^2 + 3$?

A.

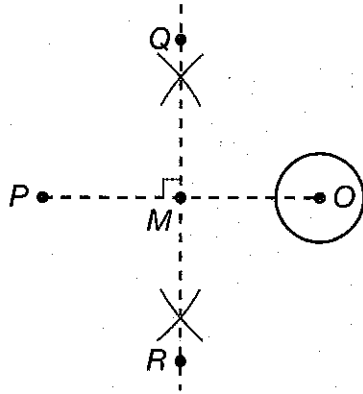**C.**

B.

D.

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35. Valentina drew point P outside circle O. She then constructed line QR, which is shown below.

Suppose Valentina uses a compass to construct a circle with center M and radius $\overline{OM}$. What will her construction produce?

A. a circle that is inscribed in a triangle

B. a circle that is circumscribed about a triangle

C. the points of tangency for two lines that can be drawn from point P to the circle

D. the points of tangency for two lines that can be drawn from point M to the circle

36. Which of the following shows the equation $x^2 - 8 = 4x$ after applying the method of completing the square and the equation's solution set?

A. $(x - 2)^2 = 8; x = 2 \pm 2\sqrt{2}$

B. $(x - 4)^2 = 8; x = 4 \pm 2\sqrt{2}$

C. $(x - 2)^2 = 12; x = 2 \pm 2\sqrt{3}$

D. $(x - 4)^2 = 12; x = 4 \pm 2\sqrt{3}$

37. The graph below represents function f. A second function, g, is represented by the equation $g(x) = -2x^2 + 2$.
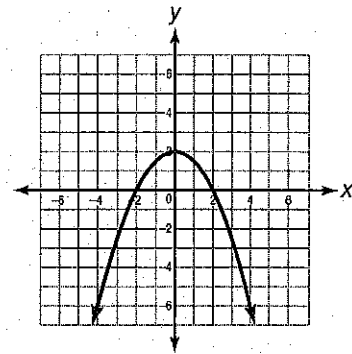
Which is **not** an accurate comparison of the key features of the functions?

A. Both functions have the same y-intercept $(0, 2)$.

B. Both functions have two x-intercepts.

C. Regarding end behavior, the ends of the graph of f point down and so do the ends of the graph of g.

D. On the portions of the graph where both functions are decreasing, f is decreasing at a faster rate.

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38. Given: triangle *JKL* is an isosceles triangle.

$JK \cong KL$

$\overline{KM}$ is a median drawn from vertex *K* to $\overline{JL}$.
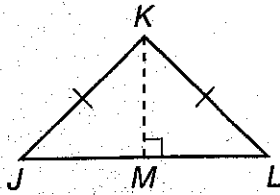
Which of the following statements is **not** accurate and would **not** help prove that the base angles of an isosceles triangle are congruent?

A. $\overline{JM} \cong \overline{LM}$ because $\overline{KM}$ is a median and therefore, *M* is the midpoint of $\overline{JL}$.

B. $\angle JKL \cong \angle LMK$ because all right angles measure 90°.

C. $\overline{KM} \cong \overline{KM}$ by the reflexive property.

D. $\triangle JKM \cong \triangle LKM$ by the SSS postulate.

39. A projectile is launched from a platform that is 16 feet above the ground with an initial speed of 64 feet per second. The height of the projectile, in feet, is modeled by the equation $h = -16t^2 + 64t + 16$. How many seconds will it take for the ball to reach a height of 90 feet?

A. It will take 0.5 second.

B. It will take 2 seconds.

C. It will take 4 seconds.

D. The ball will never reach a height of 90 feet.

40. A group of juniors and seniors at Lafayette High School were surveyed to find out if they plan to attend the school's formal dance this year.

|	Yes, Attending (Y)	No, Not Attending (N)
Junior (J)	14	11
Senior (S)	21	4

What is $P(S \cup Y)$ and what does it represent?

A. There is a 21% chance that a senior selected at random will attend the formal.

B. There is a 42% chance that a senior selected at random will attend the formal.

C. There is a 78% chance that a student selected at random from a list of juniors and seniors will be either a senior or someone who plans to attend the formal (or both).

D. There is a 74% chance that a student selected at random from a list of juniors and seniors will be either a senior or someone who plans to attend the formal (or both).

41. What is the quotient?

$$\frac{5 - 3i}{1 + 2i}$$

A. $-0.2 - 2.6i$

B. $-0.2 + 2.6i$

C. $-1 - 13i$

D. $11 - 13i$

Go On ▶

42. Complete the square for this equation and write the resulting equation.

$$3x^2 + 12x = 6$$

What is the solution set?

A. $\{-2, 2\}$

B. $\{-2 + \sqrt{6}, 2 + \sqrt{6}\}$

C. $\{-2 + \sqrt{6}, -2 - \sqrt{6}\}$

D. $\{2 + \sqrt{6}, 2 - \sqrt{6}\}$

43. A scoop of ice cream is a sphere with diameter 8 centimeters. It fits exactly into a cone with a base diameter of 8 centimeters.
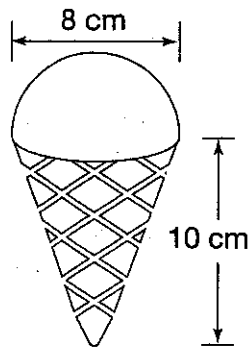
Suppose the ice cream melts and the cone does not absorb any of it. Will the cone hold all of the melted ice cream if its height is 10 centimeters? If not, what is the minimum height the cone would have to be to hold the melted ice cream?

A. A cone with a height of 10 centimeters will hold all of the ice cream.

B. A cone with a height of 12 centimeters is needed to hold all of the ice cream.

C. A cone with a height of 16 centimeters is needed to hold all of the ice cream.

D. A cone with a height of 20 centimeters is needed to hold all of the ice cream.

44. The following graph shows the reflection of $\triangle TUV$ across the line $x = 1$.
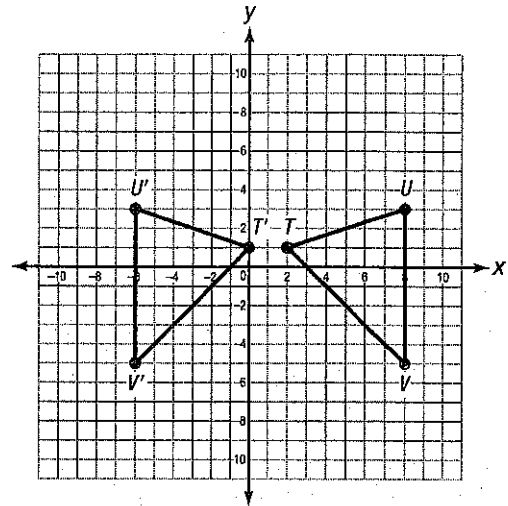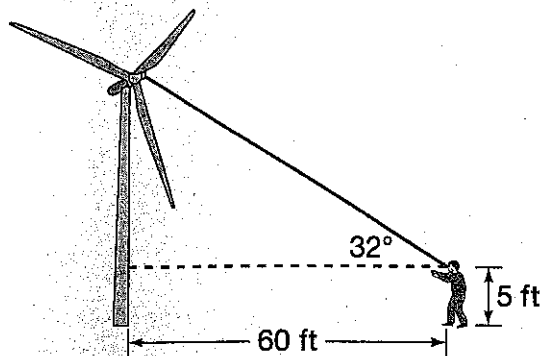

Which of the following proves that $\triangle TUV$ is congruent to $\triangle T'U'V'$?

A. $\angle T \cong \angle T'$, $\angle U \cong \angle U'$, $\angle V \cong \angle V'$

B. $\overline{UV} \cong \overline{U'V'}$, $\overline{UT} \cong \overline{U'T'}$, $\angle V \cong \angle V'$

C. $\angle V \cong \angle V'$, $\overline{UV} \cong \overline{U'V'}$, $\angle U \cong \angle U'$

D. $\overline{UT} \cong \overline{U'T'}$, $\angle U \cong \angle U'$, $\overline{TV} \cong \overline{T'V'}$

Go On ▶

45. Malik is standing 60 feet from a wind turbine. The angle of elevation from Malik's eyes to the rotor of the turbine is 32°. Malik's eye level is 5 feet above the ground.

What is the approximate height of the turbine from the ground to the rotor?

A.   31.8 feet

B.   36.8 feet

C.   37.5 feet

D.   42.5 feet

46. Given: parallelogram FGHJ is a rectangle. It has diagonals $\overline{FH}$ and $\overline{GJ}$, which intersect at point K.
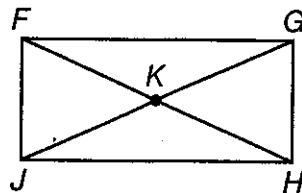
Which of the following would **not** help you prove that the diagonals of a rectangle are congruent?

A. $\overline{FG} = \overline{JH}$ and $\overline{FJ} = \overline{GH}$ because opposite sides of a parallelogram are congruent.

B. $\angle FGH \cong \angle HJF$ because all angles in a rectangle measure 90°.

C. $\triangle FGH \sim \triangle HJF$ by the SAS~ theorem.

D. $\triangle FGH \cong \triangle HJF$ by the SAS postulate.

Summative Assessment

47. The diagram shows plans for a triangular park with entrances at A, B, and C. There are three straight paths connecting the entrances as shown. The planning committee wants to post a map of the park at a point that is equidistant from each of the walking paths.
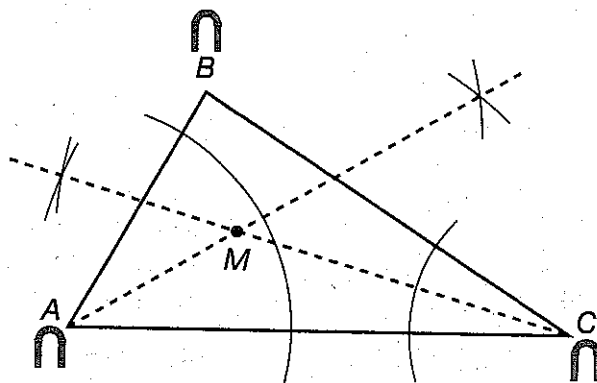
One planner constructed point M and said it shows the point where the map should be placed. Which statement accurately explains if the planner is correct or not?

A. The planner is correct because point M is the center of the circle that can be inscribed in △ABC.

B. The planner is correct because point M is the center of the circle that can be circumscribed about △ABC.

C. The planner is incorrect because point M is the incenter of the triangle and the planner should have drawn the circumcenter.

D. The planner is incorrect because point M is the circumcenter of the triangle and the planner should have drawn the incenter.

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48. Triangle *ABC* has side lengths shown. It was dilated by a scale factor of $\frac{3}{4}$ with point *A* as the point of dilation, to form $\triangle APQ$, shown below.
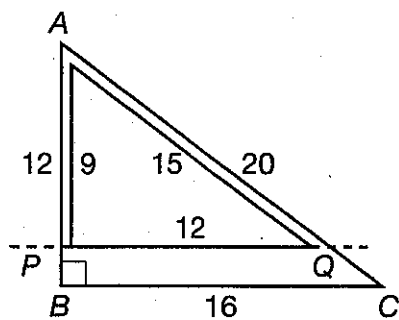
These triangles can be used to prove the triangle similarity theorem. Which statement is **not** accurate and does **not** help prove that if a line parallel to one side of a triangle intersects its other two sides, it divides those sides proportionally?

A. A dilation of the line containing $\overline{BC}$ results in a line parallel to $\overleftrightarrow{BC}$, so $\overleftrightarrow{PQ}$ || $\overleftrightarrow{BC}$.

B. $\triangle ABC \cong \triangle APQ$ by the SSS postulate.

C. $\triangle ABC \sim \triangle APQ$ because dilations result in similar figures.

D. Similar figures have proportional side lengths, so $\frac{AB}{AP} = \frac{AC}{AQ}$.

Summative Assessment

49. There are 54 wrap sandwiches prepared for the judges of an art contest. Each wrap is made with either a multigrain or white flour tortilla and contains either tuna, grilled chicken, or egg salad.

Tortilla	Protein	Outcome
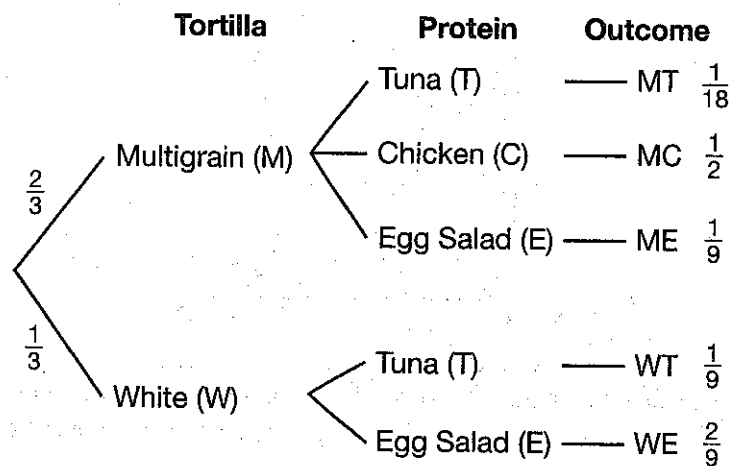
If the first judge to take a wrap chooses a wrap with a multigrain tortilla, but does not pay attention to what protein is inside, which of the following is true?

A. The probability that the judge selected a tuna wrap is $\frac{1}{12}$.

B. The probability that the judge selected a chicken wrap is $\frac{1}{2}$.

C. The probability that the judge selected an egg salad wrap is $\frac{1}{3}$.

D. It is equally likely that the judge selected a wrap with egg salad as a wrap with tuna.

Go On ▶

50. Given: $\overline{AB}$ and $\overline{CD}$ are chords of circle O that intersect at point F.
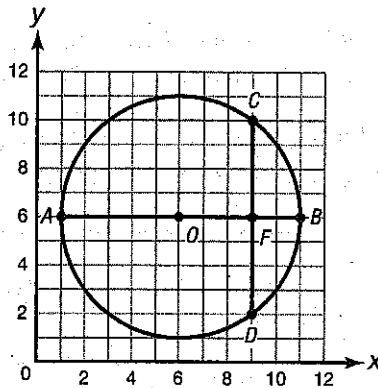
Which reason below is **not** accurate and would therefore **not** help prove that if a diameter intersects a chord and is perpendicular to the chord, it bisects the chord?

A. $\overline{AB}$ is a diameter of circle O because it passes through point O.

B. $\overline{AB} \perp \overline{CD}$ because the slopes of the lines containing them are opposite reciprocals.

C. $\overline{CF} = |10 - 6| = 4$ and $\overline{DF} = |6 - 2| = 4$.

D. By definition, if $\overline{AB}$ divides $\overline{CD}$ into two congruent segments, $\overline{AB}$ bisects $\overline{CD}$.

STOP

Formula Sheet

Analytic Geometry Formula Sheet

Below are the formulas you may find useful as you work the problems. However, some of the formulas may not be used. You may refer to this page as you take the test.

Area

Rectangle/Parallelogram $A = bh$

Triangle $A = \frac{1}{2}bh$

Circle $A = \pi r^2$

Circumference

$C = \pi d$ $\pi \approx 3.14$

$C = 2\pi r$

Volume

Rectangular Prism/Cylinder $V = Bh$

Pyramid/Cone $V = \frac{1}{3}Bh$

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

Surface Area

Rectangular Prism $SA = 2lw + 2wh + 2lh$

Cylinder $SA = 2\pi r^2 + 2\pi rh$

Sphere $SA = 4\pi r^2$

Trigonometric Relationships

$\sin(\theta) = \dfrac{\text{opp}}{\text{hyp}}$; $\cos(\theta) = \dfrac{\text{adj}}{\text{hyp}}$; $\tan(\theta) = \dfrac{\text{opp}}{\text{adj}}$

Quadratic Equations

Standard Form: $y = ax^2 + bx + c$

Vertex Form: $y = a(x - h)^2 + k$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Conic Sections

Parabola: $y - k = \dfrac{1}{4p}(x - h)^2$

$x - h = \dfrac{1}{4p}(y - k)^2$

Circle: $(x - h)^2 + (y - k)^2 = r^2$

Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Conditional Probability

$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$$