Name_____
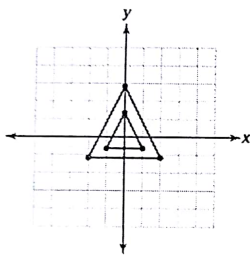
Date _____ Period _____

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**① The smaller triangle is transformed to create the larger triangle. Which of these is the scale factor of the dilation centered at the point (0, 0)?**
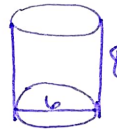


A. 4
B. 2
C. 1
D. $\frac{1}{2}$

---

**② A sandcastle mold is in the shape of a cylinder with a diameter of 6 inches and a height of 8 inches.**

**To the nearest cubic inch, how much sand will fit in the sandcastle mold? Explain how you determined your answer. In your explanation, use the word pi instead of the symbol π. Write your answer on the lines provided.**

$$V = \pi r^2 h$$
$$= \pi (3)^2 (8)$$
$$= 72 \pi \, in^3$$

**③ Line segment CD is 5 inches long. If line segment CD is dilated to form line segment C'D' with a scale factor of 0.6, what is the length of line segment C'D'?**

$$5(.6) = 3 in$$

---

**④ Part A: A graph of a quadratic function contains the points (–2, 0), (0, –12), and (3, 0). Alisa made a mistake when writing the explicit formula of the equation of the quadratic function. Her work is shown below:**

I used points (–2, 0) and (3, 0) to show that (x – 2) and (x + 3) are factors of the function, giving y = a(x – 2)(x + 3).      +    –

I used the point (0, –12) to find a.

–12 = a(0 – 2)(0 + 3)
      +    –
–12 = –6a

2 = a ✓

So, the equation of the quadratic function is y = 2(x – 2)(x + 3) or y = 2x² + 2x – 12.
                                                  +        –

**Describe the mistake that Alisa made. Then explain how you could correct the equation of the quadratic function. Write your answer on the lines provided.**

---

**⑤ Part B: An object is launched and follows the path expressed by the function h(t) = –16t² + 16t + 32 where h is the height at t seconds. Find the height, in feet, of the object at 1 second after launch. Explain how you determined your answer. Write your answer on the lines provided.**
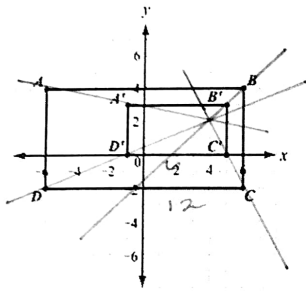
$$h(1) = -16(1)^2 + 16(1) + 32$$
$$= -16 + 16 + 32$$
$$= 32 ft$$

**6**

Figure A'B'C'D' is a dilation of figure ABCD.



a. Determine the center of dilation. (4,2)
b. Determine the scale factor of the dilation. 6/12 = 1/2
c. What is the relationship between the sides of the pre-image and the corresponding sides of the image? they are 1/2 the length.

**7**

**Which transformation results in a figure that is similar to the original figure but has a greater area?**

A. a dilation of $\triangle QRS$ by a scale factor of 0.25
B. a dilation of $\triangle QRS$ by a scale factor of 0.5
C. a dilation of $\triangle QRS$ by a scale factor of 1
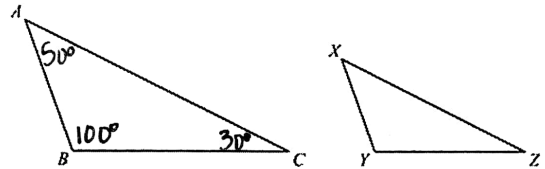D. a dilation of $\triangle QRS$ by a scale factor of 2

**8**

In the coordinate plane, segment $\overline{PQ}$ is the result of a dilation of segment $\overline{XY}$ by a scale factor of $\frac{1}{2}$.
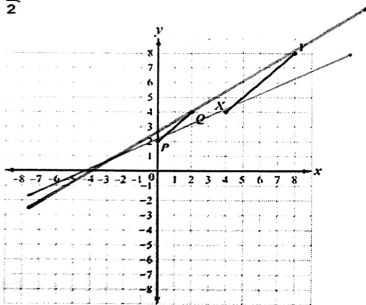


**Which point is the center of dilation?**

A. (−4, 0)
B. (0, −4)
C. (0, 4)
D. (4, 0)

**9**

In the triangles shown, $\triangle ABC$ is dilated by a factor of $\frac{2}{3}$ to form $\triangle XYZ$.



Given that $m\angle A = 50°$ and $m\angle B = 100°$, what is $m\angle Z$?

A. 15°
B. 25°
C. 30°
D. 50°

**10** Parallelogram *FGHJ* was translated 3 units down to form parallelogram *F′G′H′J′*. Parallelogram *F′G′H′J′* was then rotated 90° counterclockwise about point *G′* to obtain parallelogram *F″G″H″J″*.



Which statement is true about parallelogram *FGHJ* and parallelogram *F″G″H″J″*?

A. The figures are both similar and congruent.
B. The figures are neither similar nor congruent.
C. The figures are similar but not congruent.
D. The figures are congruent but not similar.

**11** Consider the triangles shown.



Which can be used to prove the triangles are congruent?

A. SSS
B. ASA
C. SAS
D. AAS

**12** In this diagram, $\overline{DE} \cong \overline{JI}$ and $\angle D \cong \angle J$.



Which additional information is sufficient to prove that △*DEF* is congruent to △*JIH*?

A. $\overline{ED} \cong \overline{IH}$
B. $\overline{DH} \cong \overline{JF}$
C. $\overline{HG} \cong \overline{GI}$
D. $\overline{HF} \cong \overline{JF}$

**13** In this diagram, $\overline{CD}$ is the perpendicular bisector of $\overline{AB}$. The two-column proof shows that $\overline{AC}$ is congruent to $\overline{BC}$.



| Step | Statement | Justification |
|---|---|---|
| 1 | $\overline{CD}$ is the perpendicular bisector of $\overline{AB}$. | Given |
| 2 | $\overline{AD} \cong \overline{BD}$ | Definition of bisector |
| 3 | $\overline{CD} \cong \overline{CD}$ | Reflexive Property of Congruence |
| 4 | $\angle ADC$ and $\angle BDC$ are right angles. | Definition of perpendicular lines |
| 5 | $\angle ADC \cong \angle BDC$ | All right angles are congruent. |
| 6 | △*ADC* ≅ △*BDC* | ? |
| 7 | $\overline{AC} \cong \overline{BC}$ | CPCTC |

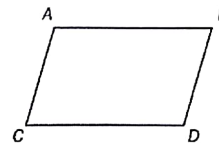Which of the following would justify Step 6?

A. AAS
B. ASA
C. SAS
D. SSS

**14.** Which information is needed to show that a parallelogram is a rectangle?

A. The diagonals bisect each other.

B. The diagonals are congruent.

C. The diagonals are congruent and perpendicular.

D. The diagonals bisect each other and are perpendicular.

**15.** Look at quadrilateral *ABCD*.



Which information is needed to show that quadrilateral *ABCD* is a parallelogram?

A. Use the distance formula to show that diagonals *AD* and *BC* have the same length.

B. Use the slope formula to show that segments *AB* and *CD* are perpendicular and segments *AC* and *BD* are perpendicular.

C. Use the slope formula to show that segments *AB* and *CD* have the same slope and segments *AC* and *BD* have the same slope.

D. Use the distance formula to show that segments *AB* and *AC* have the same length and segments *CD* and *BD* have the same lengths.

**16.** Consider the construction of the angle bisector shown.
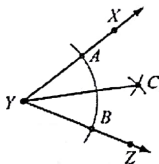


Which could have been the first step in creating this construction?

A. Place the compass point on point *A* and draw an arc inside ∠*Y*.

B. Place the compass point on point *B* and draw an arc inside ∠*Y*.

C. Place the compass point on vertex *Y* and draw an arc that intersects $\overline{YX}$ and $\overline{YZ}$.

D. Place the compass point on vertex *Y* and draw an arc that intersects point *C*.

**17.** Consider the beginning of a construction of a square inscribed in circle *Q*.

Step 1: Label point *R* on circle *Q*.

Step 2: Draw a diameter through *R* and *Q*.

Step 3: Label the intersection on the circle point *T*.
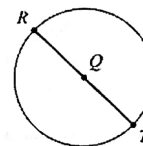


What is the next step in this construction?

A. Draw radius $\overline{SQ}$.

B. Label point *S* on circle *Q*.

C. Construct a line segment parallel to $\overline{RT}$.

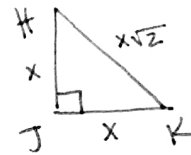D. Construct the perpendicular bisector of $\overline{RT}$.

**18** In right triangle $ABC$, angle $A$ and angle $B$ are complementary angles. The value of $\cos A$ is $\dfrac{5}{13}$. What is the value of $\sin B$?
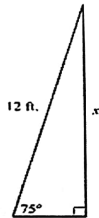
A. $\dfrac{5}{13}$

B. $\dfrac{12}{13}$

C. $\dfrac{13}{12}$

D. $\dfrac{13}{5}$

**19** In right triangle $HJK$, $\angle J$ is a right angle and $\tan \angle H = 1$. Which statement about triangle $HJK$ must be true?

A. $\sin \angle H = \dfrac{1}{2}$

B. $\sin \angle H = 1$

C. $\sin \angle H = \cos \angle H$

D. $\sin \angle H = \dfrac{1}{\cos \angle H}$



**20** A 12-foot ladder is leaning against a building at a 75° angle with the ground.



12 ft.    $x$

75°

**Which equation can be used to find how high the ladder reaches up the side of the building?**

A. $\sin 75° = \dfrac{12}{x}$

B. $\tan 75° = \dfrac{12}{x}$

C. $\cos 75° = \dfrac{x}{12}$

D. $\sin 75° = \dfrac{x}{12}$

**21** A hot air balloon is 1,200 feet above the ground. The angle of depression from the basket of the hot air balloon to the base of a monument is 54°.



54°

1,200 ft.    $d$

54°
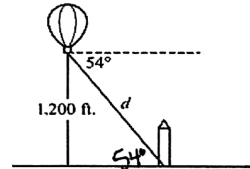
**Which equation can be used to find the distance, $d$, in feet, from the basket of the hot air balloon to the base of the monument?**

A. $\sin 54° = \dfrac{d}{1200}$

B. $\sin 54° = \dfrac{1200}{d}$

C. $\cos 54° = \dfrac{d}{1200}$

D. $\cos 54° = \dfrac{1200}{d}$

**22.** In circle $P$ below, $\overline{AB}$ is a diameter.



If $m\angle APC = 100°$, find the following:

a. $m\angle BPC$   $80°$

b. $m\angle BAC$   $40°$
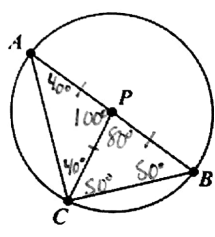
c. $m\overset{\frown}{BC}$   $80°$

d. $m\overset{\frown}{AC}$   $100°$

---

**23.** $\angle PNQ$ is inscribed in circle $O$ and $m\overset{\frown}{PQ} = 70°$.
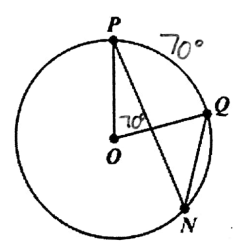


a. What is the measure of $\angle POQ$?   $70°$

b. What is the relationship between $\angle POQ$ and $\angle PNQ$?   $\angle POQ = 2\angle PNQ$

c. What is the measure of $\angle PNQ$?

$35°$

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**24.** In circle $P$ below, $\overline{DG}$ is a tangent. $AF = 8$, $EF = 6$, $BF = 4$, and $EG = 8$.
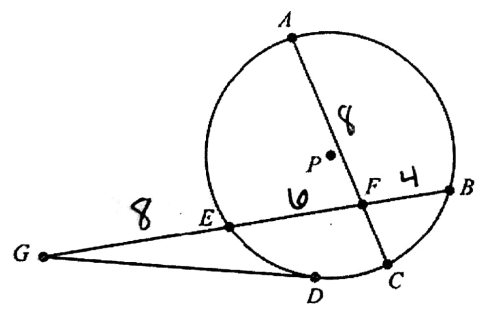


Find $CF$ and $DG$.

$CF$:   $8(CF) = 6(4)$

       $8(CF) = 24$

$DG$:   $DG^2 = 8(18)$

       $DG^2 = 144$

---

**25.** In this circle, $\overline{AB}$ is tangent to the circle at point $B$, $\overline{AC}$ is tangent to the circle at point $C$, and point $D$ lies on the circle. What is $m\angle BAC$?
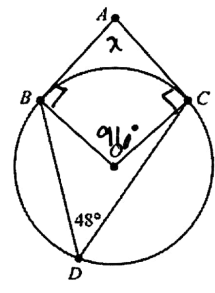


$x + 96 + 90 + 90 = 360$

$x + 96 = 180$

$x = 84°$

H

---

**26** Circle A is shown.



8 m

$A$  $\theta$  .r°  50°
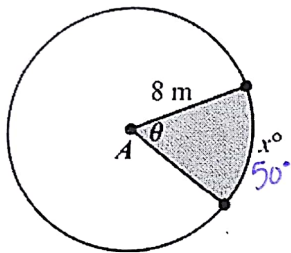
If $x = 50$, what is the area of the shaded sector of circle A?

$A = \pi r^2 \left(\frac{m}{360}\right)$

$= \pi (8)^2 \left(\frac{50}{360}\right) = \frac{80}{9}\pi \, m^2$

**27** What is the volume of the cone shown below?



15  17 cm  h  16 cm  8
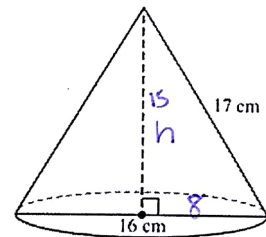
$V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi (8)^2 (15)$

$= 320\pi \, cm^3$

$64 + h^2 = 289$

$h^2 = 225$

$h = 15$

**28** A sphere has a radius of 3 feet. What is the volume of the sphere?

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

$= \frac{4}{3}\pi (3)^3$

$= 36\pi \, ft^3$

**29** A cylinder has a radius of 10 cm and a height of 9 cm. A cone has a radius of 10 cm and a height of 9 cm. Show that the volume of the cylinder is three times the volume of the cone.

Cylinder

$V = \pi r^2 h$

$= \pi (10)^2 (9)$

$= 900\pi \, cm^3$

Cone

$V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi (10)^2 (9)$

$= 300\pi \, cm^3$

$900\pi = 3(300\pi)$

Cylinder $= 3$ (cone)

7

**(30)** Jason constructed two cylinders using solid metal washers. The cylinders have the same height, but one of the cylinders is slanted as shown.



Which statement is true about Jason's cylinders?

A. The cylinders have different volumes because they have different radii.
B. The cylinders have different volumes because they have different surface areas.
C. The cylinders have the same volume because each of the washers has the same height.
D. The cylinders have the same volume because they have the same cross-sectional area at every plane parallel to the bases.

**(31)** Rewrite $\sqrt{2}\left(\sqrt{12} - \sqrt{3}\right)$.

$$\sqrt{24} - \sqrt{6}$$
$$4 \quad 6$$
$$\sqrt{2}$$
$$2\sqrt{6} - \sqrt{6} = \boxed{\sqrt{6}}$$

**(32)** Write $\sqrt{\dfrac{18}{25}}$ in an equivalent form where no radical has a perfect square factor and there is no radical in the denominator.

$$\frac{\sqrt{18} < \frac{9}{2} \left(\frac{3}{3}\right)}{\sqrt{25}} = \frac{3\sqrt{2}}{5}$$

**(33)** Write $\sqrt{\left(4p^2\right)^3}$ in an equivalent form without a square root. Assume that $p$ is non-negative.

$$\sqrt{64p^6} = \boxed{8p^3}$$

**(34)** Look at the expression below.

$$\left(5 + \sqrt{2}\right) + 2\sqrt{2} = 5 + 3\sqrt{2}$$

Is the value of the expression rational or irrational? Explain.

IRRATIONAL → Non-perfect Square.

**(35)** Explain why the product $\pi \bullet 5$ is irrational.

The product of a rational & irrational # is irrational.

**(36)** Is the value of the expression $\sqrt{8}\left(5\sqrt{8} + \sqrt{2}\right)$ rational or irrational? Explain how you found your answer.

$$5\sqrt{64} + \sqrt{16}$$
$$5 \cdot 8 + 4$$
$$44$$

Rational

**(37)** Which expression is equivalent to $\sqrt{32} - \sqrt{8}$?

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

$16 \cdot 2 \quad 4 \cdot 2$
$4 \cdot 4 \quad 2 \cdot 2$

$4\sqrt{2} - 2\sqrt{2} = 2\sqrt{2}$

**(38)** Which expression is equivalent to $\sqrt{\frac{27}{16}}$?

A. $\frac{3}{4\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{3}}{12} = \sqrt{3}/4$

B. $\frac{3}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{3}}{6} = \frac{\sqrt{3}}{2}$

$\frac{\sqrt{27}}{\sqrt{16}} = \boxed{\frac{3\sqrt{3}}{4}}$

C. $\frac{4}{3\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{9}$

D. $\frac{9}{4\sqrt{3}} \cdot \frac{9\sqrt{3}}{8\sqrt{3}} = \frac{9\sqrt{3}}{4\sqrt{9}} = \frac{9\sqrt{3}}{12} = \frac{3\sqrt{3}}{4}$

**(39)** Which expression has a value that is a rational number?

A. $\sqrt{10} + 16$
B. $2(\sqrt{5} + \sqrt{7})$
C. $\sqrt{9} + \sqrt{4} = 3 + 2 = 5$
D. $\sqrt{3} + 0$

**(40)** Which statement is true about the value of $(\sqrt{8} + 4) \cdot 4$?

A. It is rational because the product of two rational numbers is rational.
B. It is rational because the product of a rational number and an irrational number is rational.
C. It is irrational because the product of two irrational numbers is irrational.
D. It is irrational because the product of an irrational number and a rational number is irrational.

**(41)** The dimensions of a rectangle are shown.

$5x + 2$

$3x + 8$ [rectangle] $3x + 8$

$5x + 2$
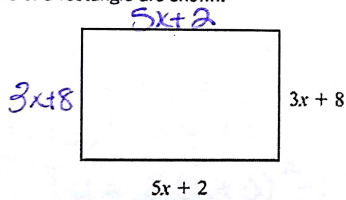
What is the perimeter of the rectangle if the perimeter of a rectangle is equal to the sum of the lengths of its sides?

$2(5x + 2) + 2(3x + 8)$

$10x + 4 + 6x + 16$

$\boxed{16x + 20}$

**(42)** Rewrite the expression $(x^3 + 2x^2 - x) - (-x^3 + 2x^2 + 6)$.

$2x^3 - x - 6$

**(43)** The dimensions of a patio, in feet, are shown below.

[rectangle] $2x - 3$

$4x + 1$

What is the area of the patio, in square feet?

$(4x + 1)(2x - 3)$

$(8x^2 - 10x - 3) ft^2$

**44)** Consider the expression $3n^2 + n + 2$.

a. What is the coefficient of $n$?  **1**

b. What terms are being added in the expression?

**45)** Factor the expression $16a^2 - 81$.

$$(4a+9)(4a-9)$$

**46)** Factor the expression $12x^2 + 14x - 6$.

~~$(12x^2 \cdot ... )$~~

$+9 \times -2 \quad 7$

$$2(6x^2 + 7x - 3)$$
$$(6x^2 + 9x)(-2x - 3)$$
$$3x(2x+3) - 1(2x+3)$$
$$\boxed{2(3x-1)(2x+3)}$$

**47)** In which expression is the coefficient of the $n$ term $-1$?

A. $3n^2 + 4n - 1$
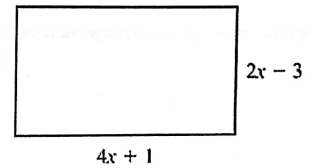B. $-n^2 + 5n + 4$
C. $-2n^2 - n + 5$   ☑
D. $4n^2 + n - 5$

**48)** The expression $s^2$ is used to calculate the area of a square, where $s$ is the side length of the square. What does the expression $(8x)^2$ represent?

A. the area of a square with a side length of 8
B. the area of a square with a side length of 16
C. the area of a square with a side length of $4x$
D. the area of a square with a side length of $8x$   ☑

**49)** Write $f(x) = 2x^2 + 12x + 1$ in vertex form.

$$2x^2 + 12x + \_ = y - 1 + \_$$
$$2(x^2 + 6x + 9) = y - 1 + 18$$
$$2(x+3)^2 = y + 17$$
$$\boxed{y = 2(x+3)^2 - 17}$$

**50)** The function $h(t) = -t^2 + 8t + 2$ represents the height, in feet, of a stream of water being squirted out of a fountain after $t$ seconds. What is the maximum height of the water?

Vertex: $-\dfrac{8}{2(-1)} = 4$    $(4, 18)$

$-(4)^2 + 8(4) + 2$    Max height=

$-16 + 32 + 2$    $\boxed{18\,ft}$

$18$

**51)** What are the zeros of the function represented by the quadratic expression $x^2 + 6x - 27$?

$$(x+9)(x-3)$$
$$\boxed{(-9,0) \ (3,0)}$$

**52)** What are the zeros of the function represented by the quadratic expression $2x^2 - 5x - 3$?

$-6 \times 1 \quad -5$

$(2x^2 - 6x) + (1x - 3)$
$2x(x-3) \ 1(x-3)$
$(2x+1)(x-3)$
$x = -\frac{1}{2}, 3$

$$\boxed{(-\tfrac{1}{2}, 0)}$$
$$\boxed{(3, 0)}$$

**53.**

Which of these is the result of completing the square for the expression $x^2 + 8x - 30$?

A. $(x + 4)^2 - 30$
B. $(x + 4)^2 - 46$
C. $(x + 8)^2 - 30$
D. $(x + 8)^2 - 94$

$X^2 + 8x + \underline{16} = 30 + \underline{16}$

$(x+4)^2 = 46$

$(x+4)^2 - 46$

**54.**

The product of two consecutive positive integers is 132.

a. Write an equation to model the situation.   $X(X+1) = 132$
b. What are the two consecutive integers?

$X^2 + 1X - 132 = 0$   $\boxed{11, 12}$
$(x + 12)(x - 11) = 0$
$X = -12, 11$

**55.**

The formula for the volume of a cylinder is $V = \pi r^2 h$.

a. Solve the formula for $r$.
b. If the volume of a cylinder is $200\pi$ cubic inches and the height of the cylinder is 8 inches, what is the radius of the cylinder?

$V/\pi h = \sqrt{r^2}$   $r = \sqrt{\frac{V}{\pi h}}$

$r = \sqrt{\frac{200\pi}{\pi(8)}} = \sqrt{25}$
$= \boxed{5 in}$

**56.**

The formula for the area of a circle is $A = \pi r^2$. Which equation shows the formula in terms of $r$?

A. $r = \frac{2A}{\pi}$
B. $r = \frac{\sqrt{A}}{\pi}$
C. $r = \sqrt{\frac{A}{\pi}}$
D. $r = \frac{A}{2\pi}$

$\frac{A}{\pi} = r^2$

$r = \sqrt{\frac{A}{\pi}}$

**57.**

Solve the equation $x^2 - 100 = 0$ by using square roots.

$X^2 = 100$

$\boxed{X = \pm 10}$

**58.**

What are the solutions to the equation $x^2 - 5x = 14$?

A. $x = -7, x = -2$
B. $x = -14, x = -1$
C. $x = -2, x = 7$
D. $x = -1, x = 14$

$x^2 - 5x - 14 = 0$

$(x - 7)(x + 2)$

$X = 7, -2$

**59.**

An object is thrown in the air with an initial velocity of 5 m/s from a height of 9 m. The equation $h(t) = -4.9t^2 + 5t + 9$ models the height of the object in meters after $t$ seconds.

About how many seconds does it take for the object to hit the ground? Round your answer to the nearest tenth of a second.

A. 0.90 second
B. 1.50 seconds
C. 2.00 seconds
D. 9.00 seconds

$-4.9t^2 + 5t + 9 = 0$

$\frac{-5 \pm \sqrt{25 - 4(-4.9)(9)}}{2(-4.9)} = 2.00 \text{ sec.}$

**(60)** A ball is thrown into the air from a height of 4 feet at time $t = 0$. The function that models this situation is $h(t) = -16t^2 + 63t + 4$, where $t$ is measured in seconds and $h$ is the height in feet.

  a. What is the height of the ball after 2 seconds?
  b. When will the ball reach a height of 50 feet?
  c. What is the maximum height of the ball?
  d. When will the ball hit the ground?
  e. What domain makes sense for the function?

a) $-16(2)^2 + 63(2) + 4 = \boxed{66\,ft}$

b) $-16t^2 + 63t + 4 = 50$
  $-16t^2 + 63t - 46 = 0$
  $\dfrac{-63 \pm \sqrt{3969 - 4(-16)(-46)}}{2(-16)} \approx \boxed{.97,\ 2.97}$

c) $\dfrac{-63}{2(-16)} = 1.97$
  $-16(1.97)^2 + 63(1.97) + 4 = \boxed{66\,ft} \leftarrow max$

d) $-16t^2 + 63t + 4 = 0$
  $\dfrac{-63 \pm \sqrt{3969 - 4(-16)(4)}}{-32} = \boxed{4\ sec}$

e) $0 \leq t \leq 4$

---

**(61)** This table shows a company's profit, $p$, in thousands of dollars over time, $t$, in months.

| Time, $t$ (months) | Profit, $p$ (thousands of dollars) |
|---|---|
| 3 | 18 |
| 7 | 66 |
| 10 | 123 |
| 15 | 258 |
| 24 | 627 |

  a. Describe the average rate of change in terms of the given context.
  b. What is the average rate of change of the profit between 3 and 7 months?
  c. What is the average rate of change of the profit between 3 and 24 months?

*rate at which company earns profit*

b) $\dfrac{66 - 18}{7 - 3} = \dfrac{48}{4} = 12$

c) $\dfrac{627 - 18}{24 - 3} = \dfrac{609}{21} = 29$

---

**(62)** A flying disk is thrown into the air from a height of 25 feet at time $t = 0$. The function that models this situation is $h(t) = -16t^2 + 75t + 25$, where $t$ is measured in seconds and $h$ is the height in feet. What values of $t$ best describe the times when the disk is flying in the air?

  A. $0 < t < 5$
  B. $0 < t < 25$
  C. all real numbers
  D. all positive integers

$-16t^2 + 75t + 25 = 0$

$\dfrac{-75 \pm \sqrt{5625 - 4(-16)(25)}}{2(-16)}$

$= 5$

---

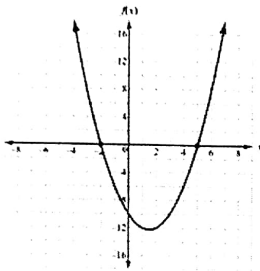**(63)** What is the end behavior of the graph of $f(x) = -0.25x^2 - 2x + 1$?

  A. As $x$ increases, $f(x)$ increases.
    As $x$ decreases, $f(x)$ decreases.

  B. As $x$ increases, $f(x)$ decreases.
    As $x$ decreases, $f(x)$ decreases.

  C. As $x$ increases, $f(x)$ increases.
    As $x$ decreases, $f(x)$ increases.

  D. As $x$ increases, $f(x)$ decreases.
    As $x$ decreases, $f(x)$ increases.

20

**(64)** Use this graph to answer the question.



Which function is shown in the graph?

- **A.** $f(x) = x^2 - 3x - 10$
- **B.** $f(x) = x^2 + 3x - 10$
- **C.** $f(x) = x^2 + x - 12$
- **D.** $f(x) = x^2 - 5x - 8$

*(handwritten)* $(x+2)(x-5)$

$x^2 - 3x - 10$

---

**(65)** The function $f(t) = -16t^2 + 64t + 5$ models the height of a ball that was hit into the air, where $t$ is measured in seconds and $h$ is the height in feet.

This table represents the height, $g(t)$, of a second ball that was thrown into the air.

| Time, $t$ (in seconds) | Height, $g(t)$ (in feet) |
|---|---|
| 0 | 4 |
| 1 | 36 |
| 2 | 36 |
| 3 | 4 |

*(handwritten)* $-16t^2 + 64t + 5 = 0$

$\dfrac{-64 \pm \sqrt{64^2 - 4(-16)(5)}}{-32}$

$\approx 4.1\,\text{sec}.$

Which statement BEST compares the length of time each ball is in the air?

- **A.** The ball represented by $f(t)$ is in the air for about 5 seconds, and the ball represented by $g(t)$ is in the air for about 3 seconds.
- **B.** The ball represented by $f(t)$ is in the air for about 3 seconds, and the ball represented by $g(t)$ is in the air for about 5 seconds.
- **C.** The ball represented by $f(t)$ is in the air for about 3 seconds, and the ball represented by $g(t)$ is in the air for about 4 seconds.
- **D.** The ball represented by $f(t)$ is in the air for about 4 seconds, and the ball represented by $g(t)$ is in the air for about 3 seconds.

---

**(66)** What explicit expression can be used to find the next term in this sequence?

$$2, 8, 18, 32, 50, \ldots$$

- **A.** $2n$
- **B.** $2n + 6$
- **C.** $2n^2$
- **D.** $2n^2 + 1$

*(handwritten)*
$2(1) = 2 \quad 2(2) = 4 \; X$
$2(1) + 6 = 8 \; X$
$2(1)^2 = 2 \quad (2)(2)^2 = 8 \quad 2(3)^2 = 18$

---

**(67)** The function $s(t) = vt + h - 0.5at^2$ represents the height of an object, $s$, from the ground after time, $t$, when the object is thrown with an initial velocity of $v$, at an initial height of $h$, and where $a$ is the acceleration due to gravity (32 feet per second squared).

A baseball player hits a baseball 4 feet above the ground with an initial velocity of 80 feet per second. About how long will it take the baseball to hit the ground?

- **A.** 2 seconds
- **B.** 3 seconds
- **C.** 4 seconds
- **D.** 5 seconds

*(handwritten)*
$s(t) = 80t + 4 - .5(32)t^2$
$-16t^2 + 80t + 4 = 0$
$\dfrac{-80 \pm \sqrt{80^2 - 4(-16)(4)}}{-32} = 5.05$

---

**(68)** A café's annual income depends on $x$, the number of customers. The function $I(x) = 4x^2 - 20x$ describes the café's total annual income. The function $C(x) = 2x^2 + 5$ describes the total amount the café spends in a year. The café's annual profit, $P(x)$, is the difference between the annual income and the amount spent in a year.

Which function describes $P(x)$?

- **A.** $P(x) = 2x^2 - 20x - 5$
- **B.** $P(x) = 4x^3 - 20x^2$
- **C.** $P(x) = 6x^2 - 20x + 5$
- **D.** $P(x) = 8x^4 - 40x^3 - 20x^2 - 100x$

*(handwritten)*
$(4x^2 - 20x) - (2x^2 + 5)$
$2x^2 - 20x - 5$

*(handwritten sideways)* 21

**(69)** Compare the graphs of the following functions to $f(x)$.

a. $\dfrac{1}{2} f(x)$    V. Shrink by $\frac{1}{2}$

b. $f(x) - 5$    down 5

c. $f(x-2) + 1$    right 2, up 1

**(70)** Is $f(x) = 2x^3 + 6x$ even, ~~odd,~~ or neither? Explain how you know.
0    0

**(71)** How does the graph of $f(x)$ compare to the graph of $f\left(\dfrac{1}{2}x\right)$?

h. stretch by 2

---

**(72)** Which of these is an even function?

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

B. $f(x) = 3x^3 + x$

C. $f(x) = 6x^2 - 8$

D. $f(x) = 4x^3 + 2x^2$

**(73)** Which statement BEST describes how the graph of $g(x) = -3x^2$ compares to the graph of $f(x) = x^2$?

A. The graph of $g(x)$ is a vertical stretch of $f(x)$ by a factor of 3.

B. The graph of $g(x)$ is a reflection of $f(x)$ across the x-axis.

C. The graph of $g(x)$ is a vertical shrink of $f(x)$ by a factor of $\dfrac{1}{3}$ and a reflection across the x-axis.

D. The graph of $g(x)$ is a vertical stretch of $f(x)$ by a factor of 3 and a reflection across the x-axis.

---

**(74)** Which statement is true about the graphs of exponential functions?

A. The graphs of exponential functions never exceed the graphs of linear and quadratic functions.

B. The graphs of exponential functions always exceed the graphs of linear and quadratic functions.

C. The graphs of exponential functions eventually exceed the graphs of linear and quadratic functions.

D. The graphs of exponential functions eventually exceed the graphs of linear functions but not quadratic functions.

---

**(75)** A table of values is shown for $f(x)$ and $g(x)$.

| x | f(x) |
|---|------|
| 0 | 0 |
| 1 | 1 |
| 2 | 4 |
| 3 | 9 |
| 4 | 16 |
| 5 | 25 |

| x | g(x) |
|---|------|
| 0 | -2 |
| 1 | -1 |
| 2 | 1 |
| 3 | 5 |
| 4 | 13 |
| 5 | 29 |

Which statement compares the graphs of $f(x)$ and $g(x)$ over the interval [0, 5]?

A. The graph of $f(x)$ always exceeds the graph of $g(x)$ over the interval [0, 5].

B. The graph of $g(x)$ always exceeds the graph of $f(x)$ over the interval [0, 5].

C. The graph of $g(x)$ exceeds the graph of $f(x)$ over the interval [0, 4], the graphs intersect at a point between 4 and 5, and then the graph of $f(x)$ exceeds the graph of $g(x)$.

D. The graph of $f(x)$ exceeds the graph of $g(x)$ over the interval [0, 4], the graphs intersect at a point between 4 and 5, and then the graph of $g(x)$ exceeds the graph of $f(x)$.

**1.** This scatter plot shows the height, in feet, of a ball launched in the air from an initial height of 3 feet and the time the ball traveled in seconds.

**(96)**
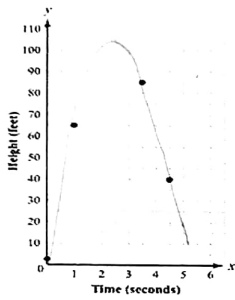


Based on an estimated quadratic regression curve, which is the BEST estimate for the maximum height of the ball?

A.  75 feet
B.  85 feet
C.  100 feet
D.  120 feet

---

The quadratic function $f(x) = -45x^2 + 350x + 1{,}590$ models the population of a city, where $x$ is the number of years after 2005 and $f(x)$ is the population of the city in thousands of people. What is the estimated population of the city in 2015?

**(97)**

A.  45,000
B.  77,000
C.  590,000
D.  670,000

$-45(10)^2 + 350(10) + 1590$

$= 590,000$

What is the equation of the circle with a center at (4, 5) and a radius of 2?

**(98)**

$(x-4)^2 + (y-5)^2 = 4$

---

What is the center and radius of the circle given by $8x^2 + 8y^2 - 16x - 32y + 24 = 0$?

**(99)**

$C: (+1, 2)$

$r = \sqrt{2}$

$x^2 + y^2 - 2x - 4y + 3 = 0$

$x^2 - 2x + 1 + y^2 - 4y + 4 = -3 + 1 + 4$

$(x-1)^2 + (y-2)^2 = 2$

Which is an equation for the circle with a center at (–2, 3) and a radius of 3?

**(100)**

A.  $x^2 + y^2 + 4x - 6y + 22 = 0$
B.  $2x^2 + 2y^2 + 3x - 3y + 4 = 0$
C.  $x^2 + y^2 + 4x - 6y + 4 = 0$
D.  $3x^2 + 3y^2 + 4x - 6y + 4 = 0$

$(x+2)^2 + (y-3)^2 = 9$

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

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

---

Which point is on a circle with a center of (3, –9) and a radius of 5?

**(8)**

A.  (–6, 5)
B.  (–1, 6)
C.  (1, 6)
D.  (6, –5)

$(x-3)^2 + (y+9)^2 = 25$

$(6-3)^2 + (-5+9)^2 = 25$

$9 + 16 = 25 ✓$

23

**82.** Which two points can form the diameter of a circle with a center at the origin and a radius of 6?

A. (3, −5) and (−3, 5)
B. (−1, 0) and (4, 0)
C. (0, 6) and (0, −5)
D. (0, 0) and (5, 0)

*Handwritten work:*

Diameter = 12

$\sqrt{(3-3)^2+(-5-5)^2}$

$\sqrt{36+100} = \sqrt{136}$ ✗

$\sqrt{(-1-4)^2+(0-0)^2} = \sqrt{25}$ ✗

$\sqrt{(0-0)^2+(6--5)^2} = \sqrt{121}$ ✗

$\sqrt{(0-5)^2+(0-0)^2} = \sqrt{25}$

---

**83.** Joe counts 250 peach trees on 25% of the land he owns. He determined that there are 10 trees for every 1,000 square feet of land. About how many acres of land does Joe own?

| 1 acre = 43,560 square feet |
| --- |

A. 2.3 acres
B. 10 acres
C. 43.56 acres
D. 2,500 acres

*Handwritten work:*

$\dfrac{10 \text{ trees}}{1000 \text{ ft}^2} = \dfrac{250 \text{ trees}}{x \text{ ft}^2}$
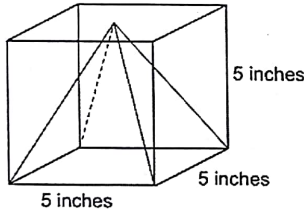
$10x = 250,000$

$x = 25,000 \text{ ft}^2 \times 4$

$\boxed{100,000 \text{ ft}^2}$

$\dfrac{1 \text{ ac}}{43,560 \text{ ft}^2} = \dfrac{x \text{ ac}}{100000}$

$100,000 = 43,500x$

$2.3 = x$

---

**84.** A square pyramid is packaged inside a box.

5 inches
5 inches
5 inches

The space inside the box around the pyramid is then filled with protective foam. About how many cubic inches of foam is needed to fill the space around the pyramid?

A. 8 cubic inches
B. 41 cubic inches
C. 83 cubic inches
D. 125 cubic inches

*Handwritten work:*

cube = 5 × 5 × 5 = 125 in³

Pyramid = $\frac{1}{3}(5)(5)(5)$ = 41.7 in³

125 − 41.7 = $\boxed{83 \text{ in}^3}$

---

**85.**

| Bicycle and Skateboard Ownership | | | |
| --- | --- | --- | --- |
| Owns a Bicycle | Owns a Skateboard | Owns a Bicycle AND Skateboard | Does NOT Own a Bicycle OR Skateboard |
| Ryan | Brett | Joe | Amy |
| Sarah | Juan | Mike | Gabe |
| Mariko | Tobi | Linda | Abi |
| Nina | | Rose | |
| Dion | | | |

Let set *A* be the names of students who own bicycles, and let set *B* be the names of students who own skateboards.

a. Find *A* and *B*. What does the set represent?
b. Find *A* or *B*. What does the set represent?
c. Find (*A* and *B*)'. What does the set represent?

*Handwritten work:*

a. Joe, Mike, Linda, Rose → owns both

b. Ryan, Sarah, Mariko, Nina, Dion, Brett, Juan, Tobi, Joe, Mike, Linda, Rose → owns both or just bike or just skateboard

c. Amy, Gabe, Abi, Ryan, Sarah, Mariko, Nina, Dion, Brett Juan Tobi — Does not own both.

**86.** A random survey was conducted to gather information about age and employment status. This table shows the data that were collected.

**Employment Survey Results**

| Employment Status | Age (in Years) | | Total |
| --- | --- | --- | --- |
| | Less than 18 | 18 or greater | |
| Has Job | 20 | 587 | 607 |
| Does Not Have Job | 245 | 92 | 337 |
| Total | 265 | 679 | 944 |

a. What is the probability that a randomly selected person surveyed has a job, given that the person is less than 18 years old?

$\frac{20}{265} = \boxed{4/53}$

b. What is the probability that a randomly selected person surveyed has a job, given that the person is greater than or equal to 18 years old?

$\boxed{\frac{587}{679}}$

c. Are having a job (A) and being 18 or greater (B) independent events? Explain.

- $P(A)$ = has a job
- $P(A')$ = does not have a job
- $P(B)$ = 18 years old or greater
- $P(B')$ = less than 18 years old

NO

$P(A|B) \neq P(A)$

$\frac{587}{679} \neq \frac{607}{944}$

---

**87.** For which set of probabilities would events A and B be independent?
A. $P(A) = 0.25$; $P(B) = 0.25$; $P(A \text{ and } B) = 0.5$
B. $P(A) = 0.08$; $P(B) = 0.4$; $P(A \text{ and } B) = 0.12$
C. $P(A) = 0.16$; $P(B) = 0.24$; $P(A \text{ and } B) = 0.32$
D. $P(A) = 0.3$; $P(B) = 0.15$; $P(A \text{ and } B) = 0.045$ ✓

**88.** Assume that the following events are independent:

- The probability that a high school senior will go to college is 0.72. $\quad P(A)$
- The probability that a high school senior will go to college and live on campus is 0.46. $\quad P(A \text{ and } B) = P(A) \cdot P(B)$

What is the probability that a high school senior will live on campus, given that the person will go to college?

A. 0.26
B. 0.33
C. 0.57
D. 0.64 ✓

$A$ = go to college
$B$ = live on campus.

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

$P(B|A) = P(B) = \frac{P(A)}{} = .46/.72$

---

**89.** In Mr. Mabry's class, there are 12 boys and 16 girls. On Monday, 4 boys and 5 girls were wearing white shirts.

a. If a student is chosen at random from Mr. Mabry's class, what is the probability of choosing a boy or a student wearing a white shirt? $12/28 + 9/28 - 4/28 = \boxed{17/28}$

b. If a student is chosen at random from Mr. Mabry's class, what is the probability of choosing a girl or a student not wearing a white shirt?

$\frac{16}{28} + \frac{19}{28} - \frac{11}{28} = 24/28 = \boxed{6/7}$

**90.** Terry has a number cube with sides labeled 1 through 6. He rolls the number cube twice.

a. What is the probability that the sum of the two rolls is a prime number, given that at least one of the rolls is a 3? $\boxed{\frac{4}{11}}$

b. What is the probability that the sum of the two rolls is a prime number or at least one of the rolls is a 3?

$\frac{11}{36} + \frac{15}{36} - \frac{4}{36}$

$= \frac{22}{36} = \boxed{11/18}$

| | 1 | 2 | 3 | 4 | 5 | 6 |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |

---

**91.** Mrs. Klein surveyed 240 men and 285 women about their vehicles. Of those surveyed, 155 men and 70 women said they own a red vehicle. If a person is chosen at random from those surveyed, what is the probability of choosing a woman or a person who does NOT own a red vehicle?

A. $\frac{14}{57}$
B. $\frac{71}{105}$
C. $\frac{74}{105}$ ✓
D. $\frac{88}{105}$

| | men | women | |
| --- | --- | --- | --- |
| own | 155 | 70 | 225 |
| Don't own | 85 | 215 | 300 |
| | 240 | 285 | 525 |

$\frac{285}{525} + \frac{300}{525} - \frac{215}{525} = \frac{370}{525} = \frac{74}{105}$

**q2** Bianca spins two spinners that have four equal sections numbered 1 through 4. If she spins a 4 on at least one spin, what is the probability that the sum of her two spins is an odd number?

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

B. $\frac{7}{16}$

C. $\frac{4}{7}$

D. $\frac{11}{16}$

$\frac{4}{7}$

$\rightarrow$

|   | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 2 | 3 | 4 | 5 | 6 |
| 3 | 4 | 5 | 6 | 7 |
| 4 | 5 | 6 | 7 | 8 |

**q3** Each letter of the alphabet is written on separate cards in red ink. The cards are placed in a container. Each letter of the alphabet is also written on separate cards in black ink. The cards are placed in the same container. What is the probability that a card randomly selected from the container has a letter written in black ink and the letter is A or Z?

OR

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

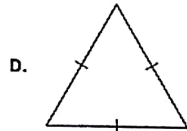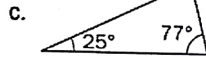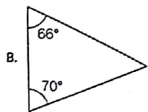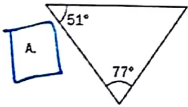B. $\frac{7}{13}$

C. $\frac{15}{26}$

D. $\frac{8}{13}$

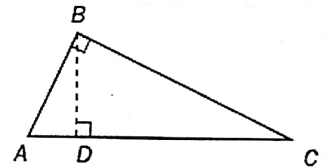$$\frac{26}{52} + \frac{4}{52} - \frac{2}{52} = \frac{28}{52} = \frac{7}{13}$$

**q4** Look at the triangle.

77°
52°   51
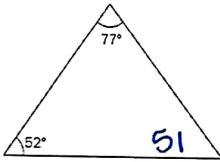
Which triangle is similar to the given triangle?

C. 25°  77°

A. 51° 77°

D.

B. 66° 70°

**q5** Right $\triangle ABC$ with altitude $BD$.

Prove $\triangle ABC$ is similar to $\triangle BDC$.

$\angle ABC \cong \angle BDC$
$\angle C \cong \angle C$
$\triangle ABC \sim \triangle BDC$ by AA~

**96** Which equation is true?

A. sin40° = tan50°
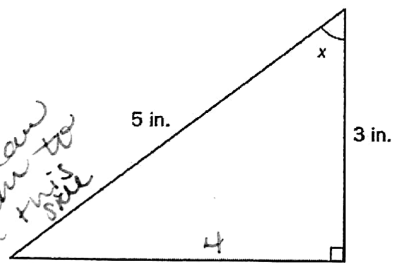B. cos40° = cos50°
C. sin40° = sin50°
D. cos40° = sin50°

**97** Which point is on a circle with a center of (0, 0) and a radius of 10?

A. (0, 5)
B. (10, 0)
C. (0, −10)
D. (−8, 6)

**98** Study the triangle.



5 in.
3 in.
x
4
Pythagorean theorem to find this side

Explain how you can determine the value of sin x. Use the word theta in your explanation instead of the symbol. Write your answer on the lines provided.

Sinx = 4/5

**99** Explain why the formula for the area of a sector is $A = \frac{\pi r^2 \theta}{360}$, where $r$ is the radius of the circle and $\theta$ is the measure in degrees of the central angle of the sector. Use the word pi in your explanation instead of the symbol $\pi$. Write your answer on the lines provided.

area of circle = πr²
sector is a portion cut
of 360° of the circle.

**100**

Points *A*, *B*, *C*, *D*, and *E* are located on the circle O, as shown in this figure
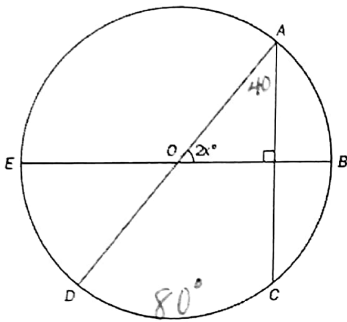


The measure of $\overset{\frown}{CD}$ is 80°. What is the value of *x* ?

A. 50
B. 40
C. 35
D. 25

$2x = 50°$

$x = 25°$

---

**101**

A pyramid and a rectangular prism have congruent bases and equal heights. Write a statement comparing the volume of the figures, and explain your reasoning. Write your answer on the lines provided.

Pyramid will be ⅓ the volume of the prism

---

**102**

Which expression is equivalent to $-4\sqrt{28x} \cdot \sqrt{7x^3}$ ?

A. $-56x^2$
B. $4x^2\sqrt{7}$
C. $-4x\sqrt{196}$
D. $-28x$

$-4\sqrt{196x^4}$

$-4(14x^2)$

$-56x^2$

---

Which value is an irrational number?

A. $4 + \sqrt{7}$

B. $\sqrt{2}\sqrt{8}$

C. $\dfrac{\sqrt{3}\sqrt{12}}{5}$

D. $\sqrt{3} - \sqrt{3}$

---

**104**

Part A: Explain how you could rewrite the expression $3x + 2(x^2 - 4x + 1) + 5x - 2$ to write it with the fewest number of terms. Write your answer on the lines provided.

$3x + 2x^2 - 8x + 2 + 5x - 2$

$2x^2$

Part B: How many non-zero terms does the expression from Part A rewritten with the fewest number of terms contain?

1

28

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**105** A professional weather balloon is 10 yards in diameter. It is in the shape of a sphere. What is the volume of the weather balloon to the nearest cubic yard?

A. 59 cubic yards
B. 105 cubic yards
C. 294 cubic yards
D. 523 cubic yards

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

$= \frac{4}{3}\pi (5)^3$

$= 523 \, yd^3$

---

**106** The table defines a quadratic function.

| x | y |
|----|----|
| −1 | 5 |
| 0 | 1 |
| 1 | −1 |
| 3 | 1 |

Which is the average rate of change between $x = -1$ and $x = 1$?

A. undefined
B. $-\frac{1}{3}$
C. −3
D. −4

$\frac{-1-5}{1--1} = \frac{-6}{2} = -3$

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**107** A student draws a card from a standard deck and then draws another card without replacing the first card. Explain why the probability of picking an ace on the first draw and the probability of picking a 7 on the second draw are NOT independent events. Write your answer on the lines provided.

you did NOT replace the card so there are less cards to choose from on the second draw

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**108** When rolling a fair, six-sided number cube, what is the probability of rolling an even number or a number less than 3?

A. $\frac{5}{6}$
B. $\frac{2}{3}$
C. $\frac{1}{2}$
D. $\frac{1}{3}$

$\frac{3}{6} + \frac{2}{6} - \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$

**(109)** What is the probability of rolling a 5 on a fair, six-sided number cube **if you know that you rolled an odd number?**

A. $\frac{1}{6}$

B. $\frac{1}{3}$

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

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

given

$\frac{1}{3}$

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**(110)** How many zeros does this quadratic function have? Explain how you determined your answer. Write your answer on the lines provided.

$$f(x) = x^2 + 15x + 56$$

$(x+8)(x+7)$

$x = -8, -7$

$\boxed{2}$

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**(111)** One bag of lawn fertilizer can cover approximately 5,000 square feet. Mike's lawn is about 500 square feet. Mike fertilizes his lawn an average of 4 times per year. About how many full years will he be able to fertilize his lawn with one bag of fertilizer?

A. 2 years

B. 3 years

C. 9 years

D. 10 years

$1 \text{ yr} = 2000 \text{ sq. ft.}$

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WE ARE SO PROUD OF YOUR HARD WORK THIS SEMESTER. STUDY HARD AND Y'ALL WILL DO AWESOME ON THE MILESTONE FRIDAY ☺