CHAPTER

9 Practice Test 1

This practice test is a simulation of the three Math sections you will complete on the SAT. To receive the most benefit from this practice test, complete it as if it were the real SAT. So, take this practice test under test-like conditions: Isolate yourself somewhere you will not be disturbed; use a stopwatch; follow the directions; and give yourself only the amount of time allotted for each section.

When you are finished, review the answers and explanations that immediately follow the test. Make note of the kinds of errors you made and review the appropriate skills and concepts before taking another practice test.

Section 1

1.	a	b	c	d	e
2.	a	b	c	d	e
3.	a	b	c	d	e
4.	a	b	c	d	e
5.	a	b	c	d	e
6.	a	b	c	d	e
7.	a	b	c	d	e
8.	a	b	c	d	e
9.	a	b	c	d	e
10.	a	b	c	d	e
11.	a	b	c	d	e
12.	a	b	c	d	e
13.	a	b	c	d	e
14.	a	b	c	d	e
15.	a	b	c	d	e
16.	a	b	c	d	e
17.	a	b	c	d	e
18.	a	b	c	d	e
19.	a	b	c	d	e
20.	a	b	c	d	e

Section 2

1.	a	b	c	d	e
2.	a	b	c	d	e
3.	a	b	c	d	e
4.	a	b	c	d	e
5.	a	b	c	d	e
6.	a	b	c	d	e
7.	a	b	c	d	e
8.	a	b	c	d	e

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18.

Section 3

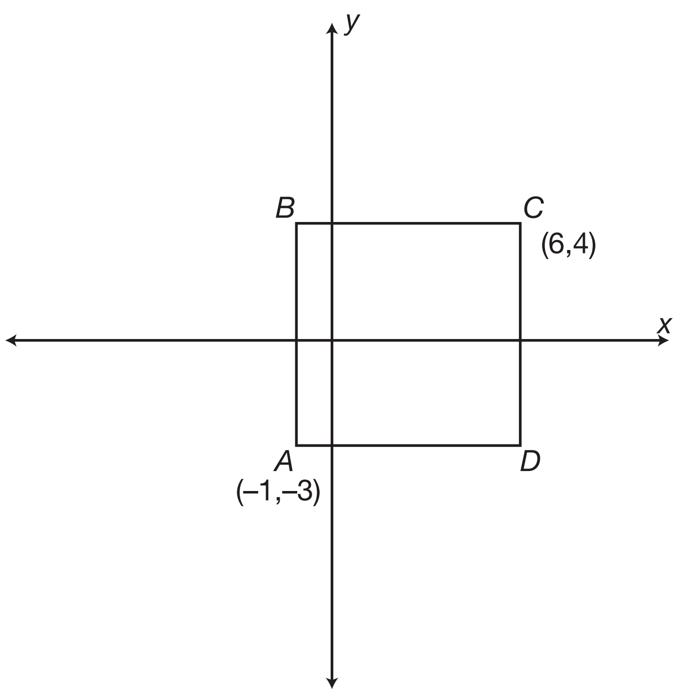
1. ⓐ ⓑ ⓒ ⓓ ⓔ	7. ⓐ ⓑ ⓒ ⓓ ⓔ	13. ⓐ ⓑ ⓒ ⓓ ⓔ
2. ⓐ ⓑ ⓒ ⓓ ⓔ	8. ⓐ ⓑ ⓒ ⓓ ⓔ	14. ⓐ ⓑ ⓒ ⓓ ⓔ
3. ⓐ ⓑ ⓒ ⓓ ⓔ	9. ⓐ ⓑ ⓒ ⓓ ⓔ	15. ⓐ ⓑ ⓒ ⓓ ⓔ
4. ⓐ ⓑ ⓒ ⓓ ⓔ	10. ⓐ ⓑ ⓒ ⓓ ⓔ	16. ⓐ ⓑ ⓒ ⓓ ⓔ
5. ⓐ ⓑ ⓒ ⓓ ⓔ	11. ⓐ ⓑ ⓒ ⓓ ⓔ	
6. ⓐ ⓑ ⓒ ⓓ ⓔ	12. ⓐ ⓑ ⓒ ⓓ ⓔ	

▶ Section 1

1. If the expression $\frac{3}{2+x} = \frac{x-5}{2x}$, then one possible value of x could be

a. –1.
b. –2.
c. –5.
d. 1.
e. 2.

2.



In the graph above, *ABCD* is a square. What are the coordinates of point *B*?

a. (–1,–4)
b. (–1,4)
c. (–1,6)
d. (–3,1)
e. (–3,4)

3. Line $y = \frac{2}{3}x - 5$ is perpendicular to line

a. $y = \frac{2}{3}x + 5$.
b. $y = 5 - \frac{2}{3}x$.
c. $y = -\frac{2}{3}x - 5$.
d. $y = \frac{3}{2}x - 5$.
e. $y = -\frac{3}{2}x + 5$.

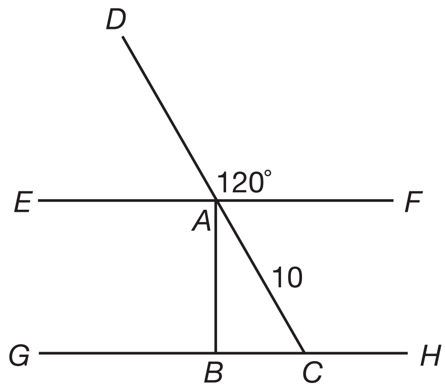
4. If 30% of r is equal to 75% of s, what is 50% of s if $r = 30$?
- **a.** 4.5
- **b.** 6
- **c.** 9
- **d.** 12
- **e.** 15

5. A dormitory now houses 30 men and allows 42 square feet of space per man. If five more men are put into this dormitory, how much less space will each man have?
- **a.** 5 square feet
- **b.** 6 square feet
- **c.** 7 square feet
- **d.** 8 square feet
- **e.** 9 square feet

6. Rob has six songs on his portable music player. How many different four-song orderings can Rob create?
- **a.** 30
- **b.** 60
- **c.** 120
- **d.** 360
- **e.** 720

7. The statement "Raphael runs every Sunday" is always true. Which of the following statements is also true?
- **a.** If Raphael does not run, then it is not Sunday.
- **b.** If Raphael runs, then it is Sunday.
- **c.** If it is not Sunday, then Raphael does not run.
- **d.** If it is Sunday, then Raphael does not run.
- **e.** If it is Sunday, it is impossible to determine if Raphael runs.

8.



In the diagram above, lines *EF* and *GH* are parallel, and line *AB* is perpendicular to lines *EF* and *GH*. What is the length of line *AB*?

a. 5
b. $5\sqrt{2}$
c. $5\sqrt{3}$
d. $10\sqrt{2}$
e. $10\sqrt{3}$

9. The expression $\frac{(x^2 + 2x - 15)}{(x^2 + 4x - 21)}$ is equivalent to

a. $\frac{5}{7}$.
b. $x + 5$.
c. $\frac{x+5}{x+7}$.
d. $\frac{-5}{2x-7}$.
e. $\frac{2x-15}{4x-21}$.

10. The point (2,1) is the midpoint of a line with endpoints at (–5,3) and

a. (–3,4).
b. (–7,2).
c. (7,1).
d. (9,–1).
e. (–10,3).

11. Lindsay grows only roses and tulips in her garden. The ratio of roses to tulips in her garden is 5:6. If there are 242 total flowers in her garden, how many of them are tulips?

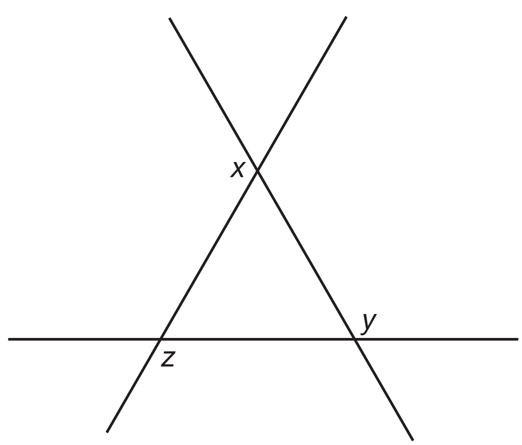
a. 22
b. 40
c. 110
d. 121
e. 132

12. It takes eight people 12 hours to clean an office. How long would it take six people to clean the office?
a. 9 hours
b. 15 hours
c. 16 hours
d. 18 hours
e. 24 hours

13. Greg has nine paintings. The Hickory Museum has enough space to display three of them. From how many different sets of three paintings does Greg have to choose?
a. 27
b. 56
c. 84
d. 168
e. 504

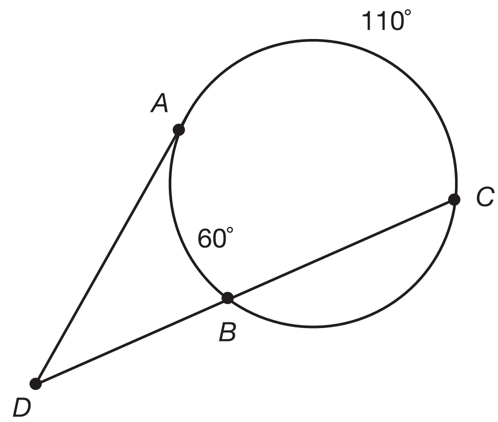
14. If the surface area of a cube is 384 cm^2, what is the volume of the cube?
a. 64 cm^3
b. 256 cm^3
c. 512 cm^3
d. 1,152 cm^3
e. 4,096 cm^3

15.



In the diagram above, what is the sum of the measures of the angles x, y, and z?
a. 180 degrees
b. 360 degrees
c. 540 degrees
d. 720 degrees
e. cannot be determined

16. Given the following figure with one tangent and one secant drawn to the circle, what is the measure of angle *ADB*?



a. 50 degrees
b. 85 degrees
c. 60 degrees
d. 110 degrees
e. 25 degrees

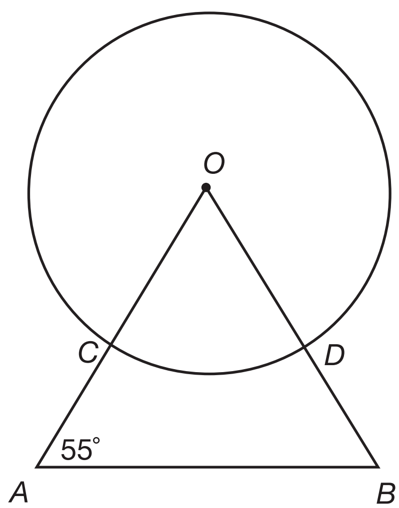
17.

COST OF BALLONS	
QUANTITY	**PRICE PER BALLOON**
1	\$1.00
10	\$0.90
100	\$0.75
1,000	\$0.60

Balloons are sold according to the chart above. If a customer buys one balloon at a time, the cost is \$1.00 per balloon. If a customer buys ten balloons at a time, the cost is \$0.90 per balloon. If Carlos wants to buy 2,000 balloons, how much money does he save by buying 1,000 balloons at a time rather than ten balloons at a time?
a. \$200
b. \$300
c. \$500
d. \$600
e. \$800

18. If $\frac{ab}{c} = d$, and a and c are doubled, what happens to the value of d?
- **a.** The value of d remains the same.
- **b.** The value of d is doubled.
- **c.** The value of d is four times greater.
- **d.** The value of d is halved.
- **e.** The value of d is four times smaller.

19.



In the diagram above, line *OA* is congruent to line *OB*. What is the measure of arc *CD*?
- **a.** 27.5 degrees
- **b.** 55 degrees
- **c.** 70 degrees
- **d.** 110 degrees
- **e.** 125 degrees

20. The expression $\frac{x\sqrt{32}}{\sqrt{4x}}$ is equivalent to
- **a.** $2\sqrt{2}$.
- **b.** $\frac{\sqrt{2}}{2}$.
- **c.** $\frac{2\sqrt{2}}{\sqrt{x}}$.
- **d.** $\frac{x\sqrt{2}}{\sqrt{x}}$.
- **e.** $\frac{2x\sqrt{2}}{\sqrt{x}}$.

► Section 2

1. What is the next number in the series below?

3 16 6 12 12 8 ______

a. 4
b. 15
c. 20
d. 24
e. 32

2. The volume of a glass of water placed in the sun decreases by 20%. If there are 240 mL of water in the glass now, what was the original volume of water in the glass?

a. 192 mL
b. 260 mL
c. 288 mL
d. 300 mL
e. 360 mL

3. What is the tenth term of the pattern below?

$\frac{2}{3}, \frac{4}{9}, \frac{8}{27}, \frac{16}{81} \ldots$

a. $\frac{20}{30}$
b. $\frac{2^{10}}{3}$
c. $\frac{2}{3^{10}}$
d. $(\frac{2}{3})^{\frac{2}{3}}$
e. $(\frac{2}{3})^{10}$

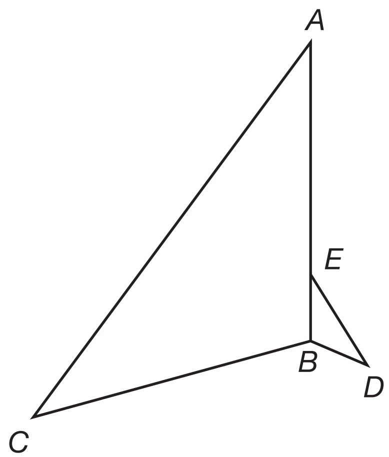
4. How does the area of a rectangle change if both the base and the height of the original rectangle are tripled?

a. The area is tripled.
b. The area is six times larger.
c. The area is nine times larger.
d. The area remains the same.
e. The area cannot be determined.

5. The equation $y = \frac{x+6}{x^2 + 7x - 18}$ is undefined when $x =$

a. –9.
b. –2.
c. –6.
d. 0.
e. 9.

6.



In the diagram above, angle A is congruent to angle BED, and angle C is congruent to angle D. If the ratio of the length of AB to the length of EB is 5:1, and the area of triangle $BED = 5a^2 + 10$, what is area of triangle ABC?

a. $5a^2 + 10$
b. $25a^2 + 50$
c. $25a^2 + 100$
d. $125a^2 + 250$
e. cannot be determined

7. The number p is greater than 0, a multiple of 6, and a factor of 180. How many possibilities are there for the value of p?

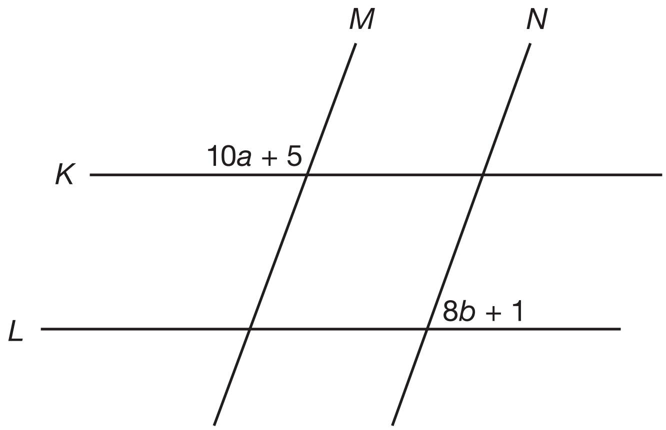
a. 7
b. 8
c. 9
d. 10
e. 11

8. If $g > 0$ and $h < 0$, which of the following is always positive?

a. gh
b. $g + h$
c. $g - h$
d. $|h| - |g|$
e. h^g

9. The length of a room is three more than twice the width of the room. The perimeter of the room is 66 feet. What is the length of the room?

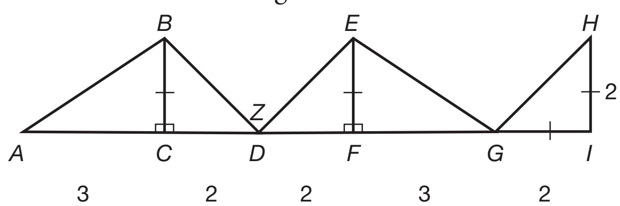
10.



In the diagram above, lines K and L are parallel, and lines M and N are parallel. If $b = 8$, then $a = ?$

11. If $6x + 9y - 15 = -6$, what is the value of $-2x - 3y + 5$?

12. Find the measure of angle Z.



13. If the distance from point $(-2,m)$ to point $(4,-1)$ is 10 units, what is the positive value of m?

14. If $z^{\frac{2}{a}} = 9$, then $a = 3$ when $z = ?$

15. The length of a rectangular prism is four times the height of the prism and one-third the width of the prism. If the volume of the prism is 384 in^3, what is the width of the prism?

16. If $2a^2 + b = 10$ and $-\frac{b}{4} + 3a = 11$, what is the positive value of a?

17. Stephanie buys almonds at the grocery store for \$1.00 per pound. If she buys 4 pounds of almonds and pays a 5% tax on her purchase, what is Stephanie's total bill?

18. The ratio of the number of linear units in the circumference of a circle to the number of square units in the area of that circle is 2:5. What is the radius of the circle?

▶ Section 3

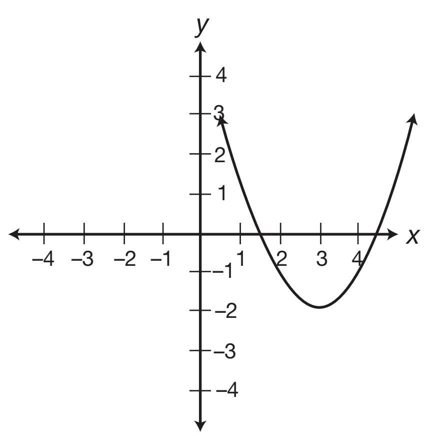
1. Which of the following number pairs is in the ratio 4:5?

a. $\frac{1}{4}, \frac{1}{5}$
b. $\frac{1}{5}, \frac{1}{4}$
c. $\frac{1}{5}, \frac{4}{5}$
d. $\frac{4}{5}, \frac{5}{4}$
e. $1, \frac{4}{5}$

2. When $x = -3$, the expression $-2x^2 + 3x - 7 =$
a. –34.
b. –27.
c. –16.
d. –10.
e. 2.

3. What is the slope of the line $-3y = 12x - 3$?
a. –4
b. –3
c. 1
d. 4
e. 12

4.



Which of the following could be the equation of the parabola shown above?
a. $y = (x + 3)^2 + 2$
b. $y = (x + 3)^2 - 2$
c. $y = (x - 3)^2 + 2$
d. $y = (x - 3)^2 - 2$
e. $y = (3x + 3)^2 - 2$

5. If $0.34 < x < 0.40$ and $\frac{5}{16} < x < \frac{9}{20}$, which of the following could be x?

a. $\frac{1}{3}$
b. $\frac{2}{5}$
c. $\frac{3}{8}$
d. $\frac{3}{7}$
e. $\frac{4}{9}$

6. A store prices a coat at $85. During a sale, the coat is sold at 20% off. After the sale, the store raises the price of the coat 10% over its sale price. What is the price of the coat now?

a. $18.70
b. $61.20
c. $68.00
d. $74.80
e. $93.50

7. The expression $4x^2 - 2x + 3$ is equal to 3 when $x = 0$ and when $x =$

a. $-\frac{1}{2}$.
b. $-\frac{1}{4}$.
c. $\frac{1}{8}$.
d. $\frac{1}{4}$.
e. $\frac{1}{2}$.

8. A spinner is divided into eight equal regions, labeled one through eight. If Jenna spins the wheel, what is the probability that she will spin a number that is less than four and greater than two?

a. $\frac{1}{8}$
b. $\frac{9}{32}$
c. $\frac{3}{8}$
d. $\frac{1}{2}$
e. $\frac{3}{4}$

9. The length of an edge of a cube is equal to half the height of a cylinder that has a volume of 160π cubic units. If the radius of the cylinder is 4 units, what is the surface area of the cube?

a. 64 square units
b. 96 square units
c. 100 square units
d. 125 square units
e. 150 square units

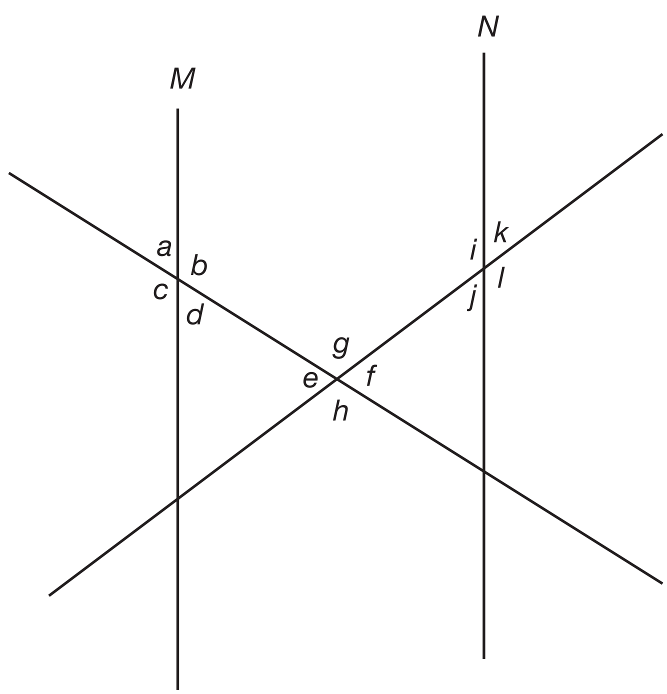
10. The function $m\#n$ is equal to $m^2 - n$. Which of the following is equivalent to $m\#(n\#m)$?

a. $-n$
b. $n^2 - m$
c. $m^2 + m - n^2$
d. $(m^2 - n)^2 - n$
e. $(n^2 - m)^2 - m$

11. Which of the following has the greatest value when $x = -\frac{1}{4}$?

a. x^{-1}
b. $-\frac{3}{8x}$
c. $4x + 3$
d. 16^x
e. $\frac{1}{81^x}$

12.



In the diagram above, lines *M* and *N* are parallel. All of the following are true EXCEPT

a. $a + b = j + l$.
b. $g = h$.
c. $c + f = f + b$.
d. $g + e + f + h = 360$.
e. $d + e = f + j$.

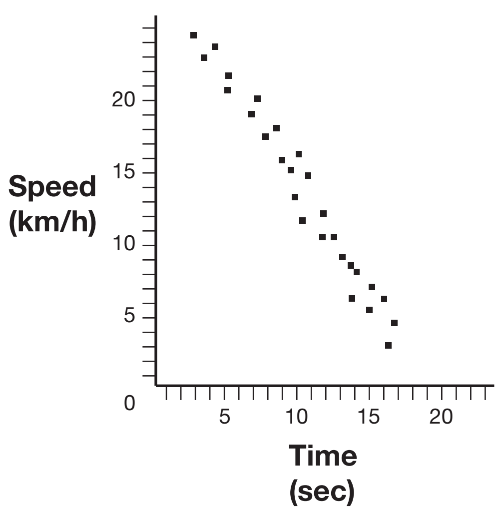
13. Melissa runs the 50-yard dash five times, with times of 5.4 seconds, 5.6 seconds, 5.4 seconds, 6.3 seconds, and 5.3 seconds. If she runs a sixth dash, which of the following would change the mean and mode of her scores, but not the median?

a. 5.3 seconds
b. 5.4 seconds
c. 5.5 seconds
d. 5.6 seconds
e. 6.3 seconds

14. If $x \neq 0$ and $y \neq 0$, $\dfrac{\frac{xy}{y} + xy}{\frac{xy}{x}} =$

a. $\frac{x}{y} + 1$.
b. $\frac{x}{y} + x$.
c. $\frac{x}{y} + y$.
d. $2xy$.
e. $y^2 + x$.

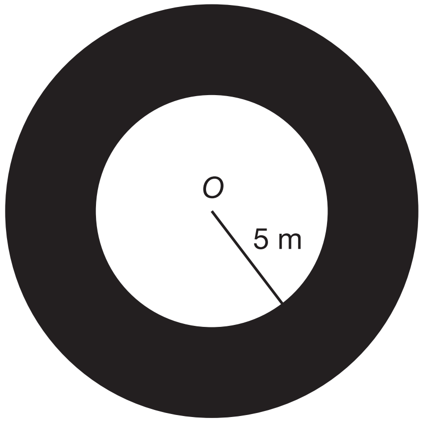
15.



The scatterplot above shows the speeds of different runners over time. Which of the following could be the equation of the line of best fit?

a. $s = -2(t - 15)$
b. $s = -t + 25$
c. $s = -\frac{1}{2}(t - 10)$
d. $s = \frac{1}{2}(t + 20)$
e. $s = 2(t + 15)$

16.



The radius of the outer circle shown above is 1.2 times greater than the radius of the inner circle. What is the area of the shaded region?

a. 6π m^2
b. 9π m^2
c. 25π m^2
d. 30π m^2
e. 36π m^2

▶ Answer Key

Section 1 Answers

1. a. Cross multiply and solve for x:

$3(2x) = (2 + x)(x - 5)$

$6x = x^2 - 3x - 10$

$x^2 - 9x - 10 = 0$

$(x - 10)(x + 1) = 0$

$x = 10, x = -1$

2. b. Point B is the same distance from the y-axis as point A, so the x-coordinate of point B is the same as the x-coordinate of point A: –1. Point B is the same distance from the x-axis as point C, so the y-coordinate of point B is the same as the y-coordinate of point C: 4. The coordinates of point B are $(-1,4)$.

3. e. Perpendicular lines have slopes that are negative reciprocals of each other. The slope of the line given is $\frac{2}{3}$. The negative reciprocal of $\frac{2}{3}$ is $-\frac{3}{2}$. Every line with a slope of $-\frac{3}{2}$ is perpendicular to the given line; $y = -\frac{3}{2}x + 5$ is perpendicular to $y = \frac{2}{3}x - 5$.

4. b. If $r = 30$, 30% of $r = (0.30)(3) = 9$. 9 is equal to 75% of s. If $0.75s = 9$, then $s = 12$. 50% of $s = (0.50)(12) = 6$.

5. b. 30 men × 42 square feet = 1,260 square feet of space; 1,260 square feet ÷ 35 men = 36 square feet; 42 – 36 = 6, so each man will have 6 less square feet of space.

6. d. The order of the four songs is important. The orderings A, B, C, D and A, C, B, D contain the same four songs, but in different orders. Both orderings must be counted. The number of six-choose-four orderings is equal to (6)(5)(4)(3) = 360.

7. a. The statement "Raphael runs every Sunday" is equivalent to "If it is Sunday, Raphael runs." The contrapositive of a true statement is also true. The contrapositive of "If it is Sunday, Raphael runs" is "If Raphael does not run, it is not Sunday."

8. c. Line AB is perpendicular to line BC, which makes triangle ABC a right triangle. Angles DAF and DCH are alternating angles—angles made by a pair of parallel lines cut by a transversal. Angle $DAF \cong$ angle DCH, therefore, angle DCH = 120 degrees. Angles DCH and ACB form a line. There are 180 degrees in a line, so the measure of angle $ACB = 180 - 120 = 60$ degrees. Triangle ABC is a 30-60-90 right triangle, which means that the length of the hypotenuse, AC, is equal to twice the length of the leg opposite the 30-degree angle, BC. Therefore, the length of BC is $\frac{10}{2}$, or 5. The length of the leg opposite the 60-degree angle, AB, is $\sqrt{3}$ times the length of the other leg, BC. Therefore, the length of AB is $5\sqrt{3}$.

9. c. Factor the numerator and denominator and cancel like factors:

$x^2 + 2x - 15 = (x + 5)(x - 3)$

$x^2 + 4x - 21 = (x + 7)(x - 3)$

Cancel the $(x - 3)$ term from the numerator and the denominator. The fraction reduces to $\frac{x+5}{x+7}$.

10. d. The midpoint of a line is equal to the average x-coordinates and the average y-coordinates of the line's endpoints:

$\frac{-5+x}{2} = 2, -5 + x = 4, x = 9$

$\frac{3+y}{2} = 1, 3 + y = 2, y = -1$

The other endpoint of this line is at $(9,-1)$.

11. e. The number of roses, $5x$, plus the number of tulips, $6x$, is equal to 242 total flowers: $5x + 6x = 242$, $11x = 242$, $x = 22$. There are $5(22) = 110$ roses and $6(22) = 132$ tulips in Lindsay's garden.

12. c. There is an inverse relationship between the number of people and the time needed to clean the office. Multiply the number of people by the hours needed to clean the office: (8)(12) = 96. Divide the total number of hours by the new number of people, 6: $\frac{96}{6} = 16$. It takes six people 16 hours to clean the office.

13. c. Be careful not to count the same set of three paintings more than once—order is not important. A nine-choose-three combination is equal to $\frac{(9)(8)(7)}{(3)(2)(1)} = \frac{504}{6} = 84$.

14. c. The surface area of a cube is equal to $6e^2$, where e is the length of one edge of the cube; $6e^2 = 384$ cm, $e^2 = 64$, $e = 8$ cm. The volume of a cube is equal to e^3; $(8\text{ cm})^3 = 512\text{ cm}^3$.

15. b. There are 180 degrees in a line: $(x + (\text{supplement of angle } x)) + (y + (\text{supplement of angle } y)) + (z + (\text{supplement of angle } z)) = 540$. The supplement of angle x, the supplement of angle y, and the supplement of angle z are the interior angles of a triangle. There are 180 degrees in a triangle, so those supplements sum to 180. Therefore, $x + y + z + 180 = 540$, and $x + y + z = 360$.

16. e. The measure of an angle in the exterior of a circle formed by a tangent and a secant is equal to half the difference of the intercepted arcs. The two intercepted arcs are $\overset{\frown}{AB}$, which is 60°, and $\overset{\frown}{AC}$, which is 110°. Find half of the difference of the two arcs; $\frac{1}{2}(110 - 60) = \frac{1}{2}(50) = 25°$.

17. d. If Carlos buys ten balloons, he will pay $(10)(\$0.90) = \$9$. In order to total 2,000 balloons, Carlos will have to make this purchase $\frac{2{,}000}{10} = 200$ times. It will cost him a total of $(200)(\$9) = \$1{,}800$. If Carlos buys 1,000 balloons, he will pay $(1{,}000)(\$0.60) = \$600$. In order to total 2,000 balloons, Carlos will have to make this purchase $\frac{2{,}000}{1{,}000} = 2$ times. It will cost him a total of $(2)(\$600) = \$1{,}200$. It will save Carlos $\$1{,}800 - \$1{,}200 = \$600$ to buy the balloons 1,000 at a time.

18. a. If a and c are doubled, the fraction on the left side of the equation becomes $\frac{2ab}{2c}$. The fraction has been multiplied by $\frac{2}{2}$, which is equal to 1. Multiplying a fraction by 1 does not change its value; $\frac{2ab}{2c} = \frac{ab}{c} = d$. The value of d remains the same.

19. c. Triangle AOB is isosceles because line OA is congruent to line OB. Angles A and B are both 55 degrees, which means that angle $O = 180 - (55 + 55) = 70$ degrees. Angle O is a central angle and arc CD is its intercepted arc. A central angle and its intercepted arc are equal in measure, so the measure of arc CD is 70 degrees.

20. e. Simplify the numerator: $x\sqrt{32} = x\sqrt{16}\,\sqrt{2} = 4x\sqrt{2}$. Simplify the denominator: $\sqrt{4x} = \sqrt{4}\,\sqrt{x} = 2\sqrt{x}$. Divide the numerator and denominator by 2: $\frac{4x\sqrt{2}}{2\sqrt{x}} = \frac{2x\sqrt{2}}{\sqrt{x}}$.

Section 2 Answers

1. d. This series actually has two alternating sets of numbers. The first number is doubled, giving the third number. The second number has 4 subtracted from it, giving it the fourth number. Therefore, the blank space will be 12 doubled, or 24.

2. d. The original volume of water, x, minus 20% of x, $0.20x$, is equal to the current volume of water, 240 mL:

$x - 0.20x = 240$ mL

$0.8x = 240$ mL

$x = 300$ mL

3. e. Each term in the pattern is equal to the fraction $\frac{2}{3}$ raised to an exponent that is equal to the position of the term in the sequence. The first term in the sequence is equal to $(\frac{2}{3})^1$, the second term is equal to $(\frac{2}{3})^2$, and so on. Therefore, the tenth term in the sequence will be equal to $(\frac{2}{3})^{10}$.

4. c. Since both dimensions are tripled, there are two additional factors of 3. Therefore, the new area is $3 \times 3 = 9$ times as large as the original. For example, use a rectangle with a base of 5 and height of 6. The area is $5 \times 6 = 30$ square units. If you multiply the each side length by 3, the new dimensions are 15 and 18. The new area is 15×18, which is 270 square units. By comparing the new area with the original area, 270 square units is nine times larger than 30 square units; $30 \times 9 = 270$.

5. a. An equation is undefined when the value of a denominator in the equation is equal to zero. Set $x^2 + 7x - 18$ equal to zero and factor the quadratic to find its roots:

$x^2 + 7x - 18 = 0$

$(x + 9)(x - 2) = 0$

$x = -9, x = 2$

6. d. Triangles ABC and BED have two pairs of congruent angles. Therefore, the third pair of angles must be congruent, which makes these triangles similar. If the area of the smaller triangle, BED, is equal to $\frac{bh}{2}$, then the area of the larger triangle, ABC, is equal to $\frac{(5b)(5h)}{2}$ or $25(\frac{bh}{2})$. The area of triangle ABC is 25 times larger than the area of triangle BED. Multiply the area of triangle BED by 25: $25(5a^2 + 10) = 125a^2 + 250$.

7. b. The positive factors of 180 (the positive numbers that divide evenly into 180) are 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, 60, 90, and 180. Of these numbers, 8 (6, 12, 18, 30, 36, 60, 90, and 180) are multiples of 6.

8. c. A positive number minus a negative number will not only always be a positive number, but will also be a positive number greater than the first operand. gh will always be negative when one multiplicand is positive and the other is negative. $g + h$ will be positive when the absolute value of g is greater than the absolute value of h, but $g + h$ will be negative when the absolute value of g is less than the absolute value of h. $|h| - |g|$ will be positive when $|h|$ is greater than g, but $|h| - |g|$ will be negative when $|h|$ is less than g. h^g will be positive when g is an even, whole number, but negative when g is an odd, whole number.

9. 23 If x is the width of the room, then $3 + 2x$ is the length of the room. The perimeter is equal to $x + x + (3 + 2x) + (3 + 2x) = 66$; $6x + 6 = 66$; $6x = 60$; $x = 10$. The length of the room is equal to $2x + 3$, $2(10) + 3 = 23$ feet.

10. 11 The labeled angle formed by lines M and K and the supplement of the labeled angle formed by lines L and N are alternating angles. Therefore, they are congruent. The angle labeled $(10a + 5)$ and its supplement, which is equal to $(8b + 1)$, total 180 degrees: $(10a + 5) + (8b + 1) = 180$. If $b = 8$, then:

$(10a + 5) + (8(8) + 1) = 180$

$10a + 70 = 180$

$10a = 110$

$a = 11$

11. 2 The first expression, $6x + 9y - 15$, is -3 times the second expression, $-2x - 3y + 5$ (multiply each term in the second expression by -3 and you'd get the first expression). Therefore, the value of the first expression, -6, is -3 times the value of the second expression. So, you can find the value of the second expression by dividing the value of the first expression by -3: $\frac{-6}{-3} = 2$. The value of $-2x - 3y + 5$ (2) is just $\frac{-1}{3}$ times the value of $6x + 9y - 15$ (-6) since $-2x - 3y + 5$ itself is $-\frac{1}{3}$ times $6x + 9y - 15$.

12. 90 Triangle DBC and triangle DEF are isosceles right triangles, which means the measures of $\angle BDC$ and $\angle EDF$ both equal 45°; $180 - (m\angle BDC + m\angle EDF) = m\angle Z$; $180 - 90 = m\angle Z$; $m\angle Z = 90°$.

13. 7 First, use the distance formula to form an equation that can be solved for m:

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

$10 = \sqrt{(4 - (-2))^2 + ((-1) - m)^2}$

$10 = \sqrt{(6)^2 + (-1 - m)^2}$

$10 = \sqrt{36 + m^2 + 2m + 1}$

$10 = \sqrt{m^2 + 2m + 37}$

$100 = m^2 + 2m + 37$

$m^2 + 2m - 63 = 0$

Now, factor $m^2 + 2m - 63$:

$(m + 9)(m - 7) = 0$

$m = 7$, $m = -9$. The positive value of m is 7.

14. 27 Substitute 3 for a: $z^{\frac{2}{3}} = 9$. To solve for z, raise both sides of the equation to the power $\frac{3}{2}$: $z^{\frac{2}{3}\frac{3}{2}} = 9^{\frac{3}{2}}$, $z = \sqrt{9^3} = 3^3 = 27$.

15. 24 If the height of the prism is h, then the length of the prism is four times that, $4h$. The length is one-third of the width, so the width is three times the length: $12h$. The volume of the prism is equal to its length multiplied by its width multiplied by its height:

$(h)(4h)(12h) = 384$

$48h^3 = 384$

$h^3 = 8$

$h = 2$

The height of the prism is 2 in, the length of the prism is (2 in)(4) = 8 in, and the width of the prism is (8 in)(3) = 24 in.

16. 3 Solve $2a^2 + b = 10$ for b: $b = 10 - 2a^2$. Substitute $(10 - 2a^2)$ for b in the second equation and solve for a:

$-\frac{10-2a^2}{4} + 3a = 11$

$-10 + 2a^2 + 12a = 44$

$2a^2 + 12a - 54 = 0$

$(2a - 6)(a + 9) = 0$

$2a - 6 = 0, a = 3$

$a + 9 = 0, a = -9$

The positive value of a is 3.

17. 4.20 If one pound of almonds costs \$1.00, then 4 pounds of almonds costs 4(\$1.00) = \$4.00. If Stephanie pays a 5% tax, then she pays (\$4.00)(0.05) = \$0.20 in tax. Her total bill is \$4.00 + \$0.20 = \$4.20.

18. 5 The circumference of a circle = $2\pi r$ and the area of a circle = πr^2. If the ratio of the number of linear units in the circumference to the number of square units in the area is 2:5, then five times the circumference is equal to twice the area:

$5(2\pi r) = 2(\pi r^2)$

$10\pi r = 2\pi r^2$

$10r = 2r^2$

$5r = r^2$

$r = 5$

The radius of the circle is equal to 5.

Section 3 Answers

1. b. Two numbers are in the ratio 4:5 if the second number is $\frac{5}{4}$ times the value of the first number; $\frac{1}{4}$ is $\frac{5}{4}$ times the value of $\frac{1}{5}$.

2. a. Substitute –3 for x:

$-2(-3)^2 + 3(-3) - 7 = -2(9) - 9 - 7 = -18 - 16 = -34$

3. a. First, convert the equation to slope-intercept form: $y = mx + b$. Divide both sides of the equation by –3:

$\frac{-3y}{-3} = \frac{12x-3}{-3}$

$y = -4x + 1$

The slope of a line written in this form is equal to the coefficient of the x term. The coefficient of the x term is –4, so the slope of the line is –4.

4. d. The equation of a parabola with its turning point c units to the right of the y-axis is written as $y = (x - c)^2$. The equation of a parabola with its turning point d units below the x-axis is written as $y = x^2 - d$. The parabola shown has its turning point three units to the right of the y-axis and two units below the x-axis, so its equation is $y = (x - 3)^2 - 2$. Alternatively, you can plug the coordinates of the vertex of the parabola, (3,–2), into each equation. The only equation that holds true is choice **d**: $y = (x - 3)^2 - 2$, $-2 = (3 - 3)^2 - 2$, $-2 = 0^2 - 2$, $-2 = -2$.

5. c. $\frac{5}{16} = 0.3125$ and $\frac{9}{20} = 0.45$; $\frac{3}{8} = 0.375$, which is between 0.34 and 0.40, and between 0.3125 and 0.45.

6. d. 20% of \$85 = (0.20)(\$85) = \$17. While on sale, the coat is sold for \$85 – \$17 = \$68; 10% of \$68 = (0.10)(\$68) = \$6.80. After the sale, the coat is sold for \$68 + \$6.80 = \$74.80.

7. e. Set the expression $4x^2 - 2x + 3$ equal to 3 and solve for x:

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

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

$4x^2 - 2x = 0$

$4x(x - \frac{1}{2}) = 0$

$x = 0, x = \frac{1}{2}$

8. a. There are three numbers on the wheel that are less than four (1, 2, 3), but only one of those numbers (3) is greater than two. The probability of Jenna spinning a number that is both less than 4 and greater than 2 is $\frac{1}{8}$.

9. e. The volume of a cylinder is equal to πr^2h. The volume of the cylinder is 160π and its radius is 4. Therefore, the height of the cylinder is equal to:
$160\pi = \pi(4)^2h$
$160 = 16h$
$h = 10$
The length of an edge of the cube is equal to half the height of the cylinder. The edge of the cube is 5 units. The surface area of a cube is equal to $6e^2$, where e is the length of an edge of the cube. The surface area of the cube $= 6(5)^2 = 6(25) =$ 150 square units.

10. c. $m\#n$ is a function definition. The problem is saying "$m\#n$" is the same as "$m^2 - n$". If $m\#n$ is $m^2 - n$, then $n\#m$ is $n^2 - m$. So, to find $m\#(n\#m)$, replace $(n\#m)$ with the value of $(n\#m)$, which is $n^2 - m$: $m\#(n^2 - m)$.

Now, use the function definition again. The function definition says "take the value before the # symbol, square it, and subtract the value after the # symbol": m squared is m^2, minus the second term, $(n^2 - m)$, is equal to $m^2 - (n^2 - m) = m^2 - n^2 + m$.

11. e. $x^{-1} = \frac{1}{x} = \frac{1}{-\frac{1}{4}} = -4$; $-\frac{3}{8x} = -\frac{3}{8(-\frac{1}{4})} = \frac{3}{2}$. $4x + 3 = 4(-\frac{1}{4}) + 3 = -1 + 3 = 2$; $16^x = 16^{-\frac{1}{4}} = \frac{1}{16^{\frac{1}{4}}} = \frac{1}{2}$; $\frac{1}{81^x} = \frac{1}{81^{-\frac{1}{4}}} = 81^{\frac{1}{4}} = 3$.

12. e. Angles e and f are vertical angles, so angle $e \cong$ angle f. However, angle d and angle j are not alternating angles. These angles are formed by different transversals. It cannot be stated that angle $d \cong$ angle j, therefore, it cannot be stated that $d + e = f + j$.

13. a. Melissa's mean time for the first five dashes is $\frac{5.4 + 5.6 + 5.4 + 6.3 + 5.3}{5} = \frac{28}{5} = 5.6$. Her times, in order from least to greatest, are: 5.3, 5.4, 5.4, 5.6, and 6.3. The middle score, or median, is 5.4. The number that appears most often, the mode, is 5.4. A score of 5.3 means that the mean will decrease and that the mode will no longer be 5.4 alone. The mode will now be 5.3 and 5.4. The median, however, will remain 5.4.

14. b. $\frac{\frac{xy}{y} + xy}{\frac{xy}{x}} = (\frac{xy}{y} + xy)(\frac{x}{xy}) = \frac{x}{y} + x$

15. a. If a straight line were drawn through as many of the plotted points as possible, it would have a negative slope. The line slopes more sharply than the line $y = -x$ (a line with a slope of -1), so the line would have a slope more negative than -1. The line would also have a y-intercept well above the x-axis. The only equation given with a slope more negative than -1 is $s = -2(t - 15)$.

16. b. The area of a circle is equal to πr^2. The radius of the inner circle is 5 m; therefore, the area of the inner circle is 25π m^2. The radius of the outer circle is $(1.2)(5) = 6$ m; therefore, the area of the outer circle is 36π. Subtract the area of the inner circle from the area of the outer circle: $36\pi - 25\pi = 9\pi$ m^2.