



Math Test – No Calculator

25 MINUTES, 17 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

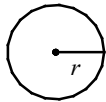
DIRECTIONS

For questions 1-13, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 14-17, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 14 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

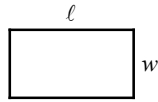
- The use of calculator is **not permitted**.
- All variables and expressions used represent real numbers unless otherwise indicated.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures lie in a plane unless otherwise indicated.
- Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

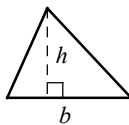


$$A = \pi r^2$$

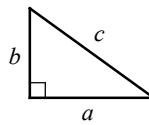
$$C = 2\pi r$$



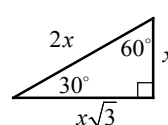
$$A = \ell w$$



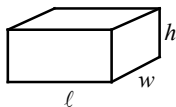
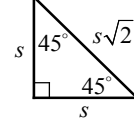
$$A = \frac{1}{2}bh$$



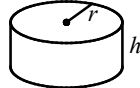
$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = \ell wh$$



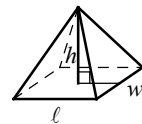
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}\ell wh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

Number a is increased by the product of b and c . The result is divided by c and then decreased by b . Finally, that result is multiplied by c . Which of the following is the final result?

- A) a
- B) $a + bc - b$
- C) $\frac{a}{c} + b - c$
- D) $\frac{a}{c} + b - bc$

2

Jenny had m magazines to sell for her soccer team fundraiser. She sold j magazines on her own and her sister sold nine less than twice the amount Jenny sold. How many magazines remained unsold in terms of m and j ?

- A) $3j - 9 - m$
- B) $3j + 9 - m$
- C) $m - 3j - 9$
- D) $m - 3j + 9$

3

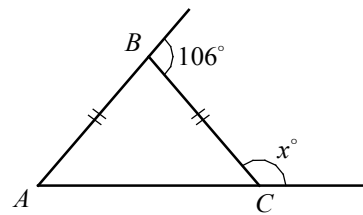
$$\frac{y}{x} = 0.5$$

$$2(x - 3) = y$$

If (x, y) is the solution to the system of the equations above, what is the value of $x + y$?

- A) 2
- B) 4
- C) 6
- D) 8

4



In the figure above, $AB = BC$. What is the value of x ?

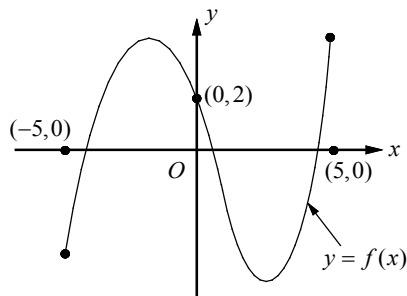
- A) 113
- B) 118
- C) 123
- D) 127

5

Which of the following is equivalent to $(x^2y - 2xy^2 + 3xy) - 2(xy - xy^2 + x^2y)$?

- A) $2x^2y + xy$
- B) $-x^2y + xy$
- C) $-x^2y + 4xy^2 + xy$
- D) $2x^2y + 4xy^2 + xy$

6



The graph of $f(x)$ is shown above for $-5 \leq x \leq 5$. How many real solutions does $f(x) = 2$ have?

- A) None
- B) 1
- C) 2
- D) 3

7

$$3x^2 + 10x - 8 = 0$$

If r and s are two solutions of the equation above, which of the following is the value of $r + s$?

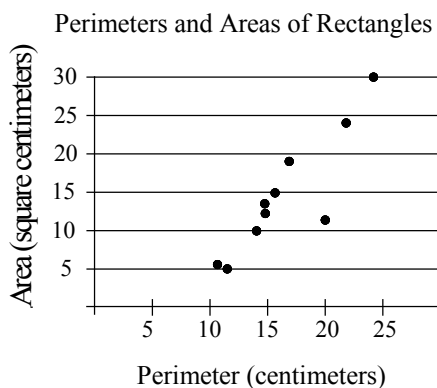
- A) $-\frac{10}{3}$
- B) $-\frac{8}{3}$
- C) $-\frac{5}{3}$
- D) $-\frac{4}{3}$

8

The price of a backpack is b dollars, to which t percent of sales tax is added at the counter. What is the price of the backpack after tax in terms of b and t ?

- A) $b(1 + 0.01t)$ dollars
- B) $b(1 + t)$ dollars
- C) $(b + 0.01t)$ dollars
- D) $(b + t)$ dollars

9



The scatter plot above shows the perimeters and areas of 10 rectangles. What is the perimeter, in centimeters, of the rectangle represented by the data point that is farthest from the line of best fit (not shown)?

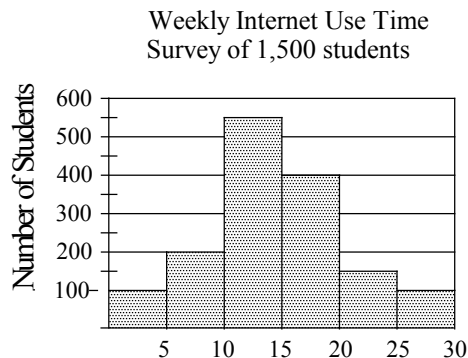
- A) 12
- B) 17
- C) 20
- D) 23

10

If $(2x - 3)(x - p) = 2x^2 - qx + 12$ for all values of x , what is the value of $p + q$?

- A) 13
- B) 15
- C) 17
- D) 19

Questions 11 and 12 refer to the following information.



Number of Hours of Internet Use Each Week

A survey was taken to find the number of hours of internet use per week among 1,500 students.

11

Which of the following could be the median number of internet use time per week?

- A) 9
- B) 14
- C) 16
- D) 18

12

According to the histogram above, which of the following is the closest approximation of the percentage of students who use internet more than 15 hours each week?

- A) 34%
- B) 39%
- C) 43%
- D) 48%

13

Which of the following tables shows a relationship in which y is directly proportional to x ?

A)

x	2	4	6
y	1	0	-1

B)

x	2	4	6
y	0	2	4

C)

x	2	4	6
y	6	9	12

D)


x	2	4	6
y	3	6	9



DIRECTIONS

For questions 14-17, solve the problem and enter your answer in the grid as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.

5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or $7/2$. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$ not $3\frac{1}{2}$.)

6. **Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write answer → in boxes.

Grid in result.

Answer: $\frac{5}{12}$

5	/	1	2
○	○	○	○
○	○	○	○
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

← Fraction line

Answer: 3.25

3	.	2	5
○	○	○	○
○	○	○	○
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

← Decimal point

Acceptable ways to grid $\frac{2}{3}$ are:

	2	/	3
○	○	○	○
○	○	○	○
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7

.	6	6	6
○	○	○	○
○	○	○	○
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7

.	6	6	7
○	○	○	○
○	○	○	○
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7

Answer: 212 - either position is correct.

	2	1	2
○	○	○	○
○	○	○	○
0	0	0	0
1	1	1	1
2	2	2	2

2	1	2	
○	○	○	○
○	○	○	○
0	0	0	0
1	1	1	1
2	2	2	2

NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

14

If $a = 5$ and $b = 3$, $(ac - 6) + a(b - c) =$

15

For what value of n is $n - |n - 7|$ equal to 0?

16

If x and y are positive integers, what is the value of $\frac{3x^4(2y)^2}{(2x^2y)^2}$?

17

If $x + 3$ is a factor of $f(x) = ax^2 + bx - 15$, in which a and b are constants, what is the value of $3a - b$?

No Test Material On This Page



Math Test – Calculator

45 MINUTES, 31 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

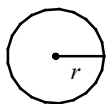
DIRECTIONS

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NOTES

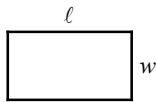
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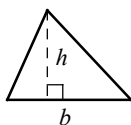


$$A = \pi r^2$$

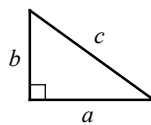
$$C = 2\pi r$$



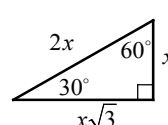
$$A = \ell w$$



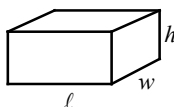
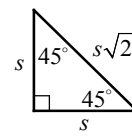
$$A = \frac{1}{2}bh$$



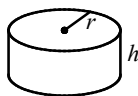
$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = \ell wh$$



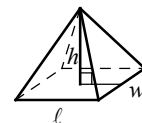
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}\ell wh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

The total profit p , in dollars, from producing and selling x units of barbecue grill is given by the function $p(x) = kx - (b + 500)$, in which k and b are constants. When 120 barbecue grills were produced and sold, the total profit was \$15,000 and when 200 barbecue grills were produced and sold, the total profit was \$27,000. What is the value of b ?

- A) 1,850
- B) 2,000
- C) 2,250
- D) 2,500

2

Arnold purchased a shirt and a pair of running shoes. The price of the shirt was s dollars and the price of the running shoes was 10 dollars less than twice the price of the shirt. He paid 8% tax for both the shoes and the shirt. If he paid 50% of the total purchase price with his debit card and paid the rest with cash, how much cash, in dollars, did he pay in terms of s ?

- A) $1.08s - 3.6$
- B) $1.62s - 5.4$
- C) $2.16s - 7.2$
- D) $2.7s - 9$

3

A car traveled at an average speed of 65 miles per hour for 4 hours and consumed fuel at a rate of 32 miles per gallon. If the price of gasoline was \$2.79 per gallon, what was the cost of gasoline, to the nearest cent, for the four hour trip?

- A) \$22.67
- B) \$24.74
- C) \$26.09
- D) \$27.32

4

x	-3	-1	1	3
$f(x)$	-1	0	1	2

The table above shows some values of the linear function f . Which of the following defines f ?

- A) $f(x) = -\frac{1}{2}x + \frac{1}{2}$
- B) $f(x) = -\frac{1}{2}x - \frac{1}{2}$
- C) $f(x) = \frac{1}{2}x + \frac{1}{2}$
- D) $f(x) = \frac{1}{2}x - \frac{1}{2}$

Questions 5 and 6 refer to the following information.

$$A = \frac{180(n-2)}{n}$$

The formula above shows the relationship between A , the measure of each angle of a regular polygon, and n , the number of sides of a regular polygon.

5

Which of the following expresses the number of sides in terms of the measure of an angle?

A) $n = \frac{A-180}{360}$

B) $n = \frac{A}{360} - 2$

C) $n = 180A - \frac{1}{2}$

D) $n = \frac{360}{180-A}$

6

For which of the following number of sides will the measure of an angle be 144 degrees?

A) 6

B) 8

C) 10

D) 12

7

If $5 - n \geq 2$, what is the greatest possible value of $n + 2$?

A) 2

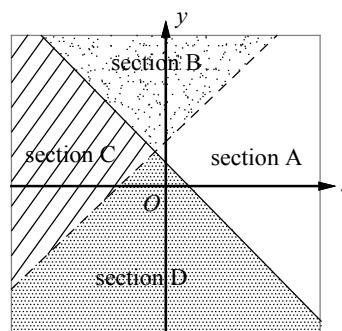
B) 3

C) 4

D) 5

8

$$\begin{cases} x - y < -2 \\ x + y \geq 1 \end{cases}$$



A graph and a system of inequalities are shown above. Which section of the graph could represent all of the solutions to the system?

A) Section A

B) Section B

C) Section C

D) Section D

9

A cubic meter of titanium weighs 4,540 kilograms. How much will 2,000 cubic centimeters of titanium weigh, in kilograms? (1 m = 100 cm)

- A) 0.908
- B) 9.08
- C) 90.8
- D) 908

10

When number n is divided by $\frac{2}{3}$, the result is the same as 6 less than $2n$. What is the value of $\frac{2}{3}n$?

- A) 12
- B) 10
- C) 8
- D) 6

Questions 11 and 12 refer to the following information.

Danny needs \$450 to buy an iPad. He has already saved \$120. He plans to earn the rest of the money by working at an office supply store. His savings can be modeled by the equation $y = 9.5x + 120$, in which x represents the number of hours he worked at the office supply store, and y represents his total savings.

11

Which of the following best describes the meaning of the number 9.5 in the equation?

- A) The number of hours Danny works for the office supply store in one day.
- B) The number of hours Danny works for the office supply store in one week.
- C) The amount Danny get paid per day from the office supply store.
- D) The amount Danny get paid per hour from the office supply store.

12

What is the minimum number of hours Danny needs to work at the office supply store to save enough money to buy an iPad?

- A) 33 hours
- B) 34 hours
- C) 35 hours
- D) 36 hours

13

If the average (arithmetic mean) of 2, a , and b is $2x$, what is the average of a and b in terms of x ?

- A) $2x - 1$
- B) $2x - 2$
- C) $3x - 1$
- D) $3x - 2$

14

If a equals 120 percent of a number, then 40 percent of that number is

- A) $\frac{1}{3}a$
- B) $0.48a$
- C) $3a$
- D) $4.8a$

15

$$h = -4.9t^2 + 40t$$

The equation above expresses the height h , in meters, of an object t seconds after it is thrown into the air from the ground with an initial speed of 40 meters per second. After approximately how many seconds will the object reach its highest point?

- A) 3
- B) 4
- C) 5
- D) 6

16

The graph of a line on the xy -plane passes through points $(-3, 1)$ and $(3, 5)$. The graph of a second line contains the point $(6, 0)$. If the two lines are parallel, what is the y -intercept of the second line?

- A) -1
- B) -2
- C) -3
- D) -4

17

The length and width of a large picture are respectively 18 inches and 12 inches. If each dimension is reduced by x inches to make the ratio of length to width 5 to 3, what is the value of x ?

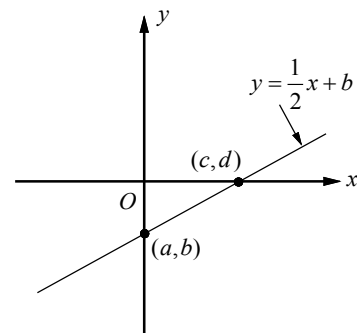
- A) 6
- B) 5
- C) 4
- D) 3

18

In a music store, 25% of the compact discs are classical. Out of these, 60% are on sale. If not more than 450 classical CDs are on sale, what could be the maximum number of CDs in the store?

- A) 2,600
- B) 2,800
- C) 3,000
- D) 3,200

19



In the graph above, line $y = \frac{1}{2}x + b$ intersects the y -axis at point (a, b) and intersects the x -axis at point (c, d) . If the value of b is equal to -3.5 , what is the value of c ?

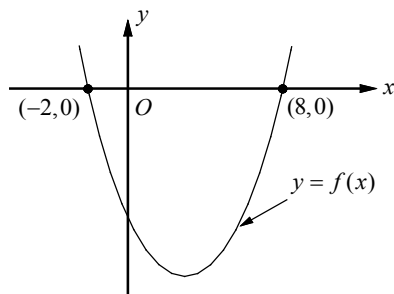
- A) 5.5
- B) 7
- C) 8.5
- D) 10

20

If $y = kx^2$, in which k is a constant, and $y = -12$ when $x = -4$, what is the value of y when $x = 2$?

- A) -6
- B) -3
- C) 3
- D) 6

21



In the xy -plane above, $(-2, 0)$ and $(8, 0)$ are the two x -intercepts of the graph of f . If the minimum value of f is $-\frac{25}{2}$, which of the following is the y -intercept of the graph of f ?

- A) $(0, -8)$
- B) $(0, -8\frac{1}{2})$
- C) $(0, -9)$
- D) $(0, -9\frac{1}{2})$

22

$$f(x) = -2(x^2 + 7x - 3) - a(x + 2) + 1$$

In the polynomial $f(x)$ defined above, a is a constant. If $f(x)$ is divisible by x , what is the value of a ?

- A) $-\frac{5}{2}$
- B) -3
- C) $\frac{7}{2}$
- D) 5

23

$$f(x) = \frac{1}{3}x - k$$

In the function above, k is a constant. If $f(-3) = k$, what is the value of $f(-\frac{3}{2})$?

- A) -1
- B) $-\frac{1}{2}$
- C) 0
- D) 1

24

The value V , in dollars, of an artist's painting t years after it was purchased is given by the function $V(t) = 5,000(4)^{\frac{t}{10}}$. What is the value, in dollars, of the painting 15 years after it was purchased?

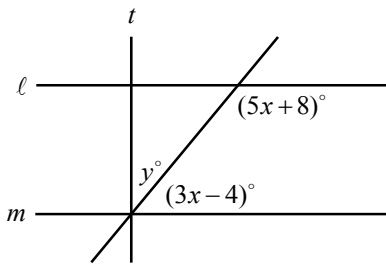
- A) \$28,000
- B) \$32,000
- C) \$36,000
- D) \$40,000

25

A water tank in the shape of a rectangular prism has a base length of 6 meters and a base width of 4 meters. In the morning, 120 cubic meters of water from the tank was used for planting. In the afternoon, 125 percent more than the amount of water used in the morning was pumped into the tank. What is the increase in the height of the water after the water was pumped into the tank, in meters?

- A) $1\frac{1}{4}$
 B) $2\frac{3}{4}$
 C) $4\frac{1}{2}$
 D) $6\frac{1}{4}$

26

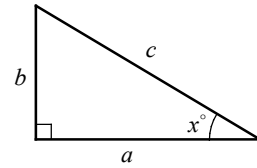


Note: Figure not drawn to scale.

In the figure above, $\ell \parallel m$ and $t \perp \ell$. What is the value of y ?

- A) 24
 B) 28
 C) 32
 D) 36

27



In the right triangle ABC above, which of the following must be true?

- I. $\sin x^\circ = \frac{b}{c}$
 II. $\cos(90 - x)^\circ = \frac{b}{c}$
 III. $\sin(90 - x)^\circ = \frac{b}{c}$
- A) I only
 B) II only
 C) I and II only
 D) I and III only

28

Derek paid \$82 for one beanie and one mitten. If the beanie cost \$8 more than the mitten, how much did Derek pay for the beanie?

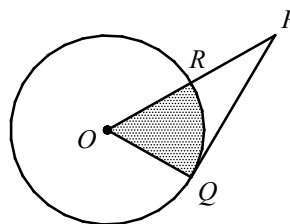
29

If the slope of a line in the xy -plane that passes through the points $(\frac{1}{2}, -1)$ and $(2, b)$ is $\frac{8}{3}$, what is the value of b ?

30

If x and y are positive integers, $x^2 - y^2 = \frac{8}{9}$, and $x^2 + 2xy + y^2 = \frac{16}{9}$, what is the value of $x - y$?

31



In the figure above, the radius of circle O is 3. The line segment \overline{PQ} is tangent to circle O and $OR = RP$. If the area of the shaded region is $k\pi$, what is the value of k ?

Answer Key**PSAT 10 Practice Test – No Calculator**

1. A 2. D 3. C 4. D 5. B
 6. D 7. A 8. A 9. C 10. B
 11. B 12. C 13. D 14. 9 15. $\frac{7}{2}$ or 3.5
 16. 3 17. 5

PSAT 10 Practice Test – Calculator

1. D 2. B 3. A 4. C 5. D
 6. C 7. D 8. B 9. B 10. A
 11. D 12. C 13. C 14. A 15. B
 16. D 17. D 18. C 19. B 20. B
 21. A 22. C 23. C 24. D 25. D
 26. B 27. C 28. 45 29. 3 30. $\frac{2}{3}$
 31. $\frac{3}{2}$

Answers and Explanations**PSAT 10 Practice Test – No Calculator**

1. A

$a + b \cdot c$ Number a is increased by the product of b and c .

$\frac{a + b \cdot c}{c}$ The result is divided by c .

$\frac{a + b \cdot c}{c} - b$ Then decreased by b .

$(\frac{a + b \cdot c}{c} - b) \cdot c$ Finally, that result is multiplied by c .

Use distributive property to simplify the equation.

$$\frac{a + b \cdot c}{c} \cdot c - b \cdot c = a + b \cdot c - b \cdot c = a$$

The final result is a .

2. D

Jenny sold j magazines on her own and her sister sold $2j - 9$ magazines. So, they sold $j + (2j - 9)$, or $3j - 9$ magazines, together.

Therefore, there were $m - (3j - 9)$, or $m - 3j + 9$ magazines, that remained unsold.

3. C

$$\frac{y}{x} = 0.5 \quad \text{First equation}$$

$$2(x - 3) = y \quad \text{Second equation}$$

Multiply each side of the first equation by x .

$$x\left(\frac{y}{x}\right) = (0.5)x \Rightarrow y = 0.5x$$

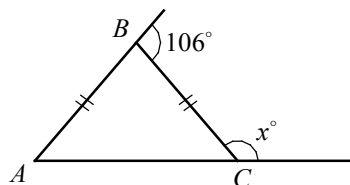
Substituting $0.5x$ for y in the second equation gives $2(x - 3) = 0.5x$.

$$2(x - 3) = 0.5x \Rightarrow 2x - 6 = 0.5x \\ \Rightarrow 1.5x = 6 \Rightarrow x = 4$$

Substituting 4 for x in the first equation

gives $\frac{y}{4} = 0.5$, or $y = 2$. Therefore, the value of $x + y$ equals $4 + 2$, or 6.

4. D



$$m\angle BCA + x = 180 \quad \text{Measure of straight } \angle \text{ equals } 180.$$

$$m\angle BCA = 180 - x \quad \text{Subtract } x.$$

$$AB = BC \quad \text{Given}$$

$$m\angle BAC = m\angle BCA \quad \text{Definition of isosceles } \Delta.$$

$$106 = m\angle BAC + m\angle BCA \quad \text{Exterior } \angle \text{ Theorem}$$

Substituting $180 - x$ for $m\angle BCA$ and $m\angle BAC$ gives $106 = (180 - x) + (180 - x)$.

$$\Rightarrow 106 = 360 - 2x \Rightarrow 2x = 254 \Rightarrow x = 127$$

5. B

$$(x^2y - 2xy^2 + 3xy) - 2(xy - xy^2 + x^2y)$$

$$= x^2y - 2xy^2 + 3xy - 2xy + 2xy^2 - 2x^2y$$

$$= -x^2y + xy$$

6. D

A real solution of a system of equations corresponds to a point of intersection of the graphs of the two equations on the xy -plane.

The graph of $y = 2$ is a horizontal line that contains the point $(0, 2)$. Since the line $y = 2$ intersects $f(x)$ three times, $f(x) = 2$ has three real solutions.

7. A

If r and s are two solutions of the quadratic equation $ax^2 + bx + c = 0$, then $r + s = -\frac{b}{a}$.

Therefore, in the equation $3x^2 + 10x - 8 = 0$, the sum of the roots is $r + s = -\frac{10}{3}$.

8. A

t percent is equal to $\frac{1}{100}t$ or $0.01t$.

The price of a backpack is b dollars. After adding t percent tax, the price will be $b + b \cdot (0.01t) = b(1 + 0.01t)$.

9. C

In the scatter plot, the first coordinate represents the perimeter of the rectangle and the second coordinate represents the area of the rectangle. Since the data point that is farthest from the line of best fit is located at $(20, 12)$, the perimeter of the rectangle is 20.

10. B

$$\begin{aligned}(2x - 3)(x - p) &= 2x^2 - 2px - 3x + 3p \\ &= 2x^2 - (2p + 3)x + 3p\end{aligned}$$

$$\text{Thus, } 2x^2 - (2p + 3)x + 3p = 2x^2 - qx + 12.$$

Since the x -terms and constant terms have to be equal on both sides of the equation, $2p + 3 = q$ and $3p = 12$. Solving for p gives $p = 4$.

$$q = 2p + 3 = 2(4) + 3 = 11$$

Therefore, $p + q = 4 + 11 = 15$.

11. B

The median of a data set is the middle value when the data are arranged in order. Since there are 1,500 students, the middle value is the average of 750th and 751st value. There are 300 students who use internet 10 hours or less per week and there are 650 students who use internet 15 hours or more per week. So the median number should be between 10 and 15 hours per week. Therefore, of the choices given, only 14 could be the median number of internet use time in a week.

12. C

There are 650 students who use internet more than 15 hours each week. Therefore, the approximate

percentage of students who use internet more than 15 hours each week is $\frac{650}{1500} = \frac{13}{30} \approx 0.43 = 43\%$.

13. D

A direct variation or a direction proportion is defined by an equation of the form $y = kx$.

Thus the graph of a direction proportion always contains the point $(0, 0)$.

Eliminate choices A and B because they do not contain the point $(0, 0)$.

Check answer choice C.

The graph contains $(2, 6)$, $(4, 9)$, and $(6, 12)$.

Substituting $x = 2$ and $y = 6$ in the equation $y = kx$ yields $6 = k(2)$ or $k = 3$. Rewrite the equation as $y = 3x$. Substitute $x = 4$ and $y = 9$ in the equation $y = 3x$. $9 = 3(4)$ is not a true equation. Therefore, choice C is not correct.

Check answer choice D.

The graph contains $(2, 3)$, $(4, 6)$, and $(6, 9)$.

Substituting $x = 2$ and $y = 3$ in the equation $y = kx$ yields $3 = k(2)$ or $k = 1.5$.

Rewrite the equation as $y = 1.5x$. Substitute $x = 4$ and $y = 6$ in the equation $y = 1.5x$. $6 = 4(1.5)$ is true.

Substitute $x = 6$ and $y = 9$ in the equation $y = 1.5x$. $9 = 6(1.5)$ is also true.

Choice D is correct.

14. 9

$$\begin{aligned}(ac - 6) + a(b - c) &= ac - 6 + ab - ac \\ &= -6 + ab\end{aligned}$$

Substitute $a = 5$ and $b = 3$.

$$-6 + ab = -6 + (5)(3) = -6 + 15 = 9$$

15. $\frac{7}{2}$

$$n - |n - 7| = 0$$

$$n = |n - 7|$$

If $n = |n - 7|$, then $n = n - 7$ or $n = -(n - 7)$.

If $n = n - 7$, the equation simplifies to $0 = -7$, which does not have a solution. If $n = -(n - 7)$,

$$n = -n + 7 \Rightarrow 2n = 7 \Rightarrow n = \frac{7}{2}$$

16. 3

$$\frac{3x^4(2y)^2}{(2x^2y)^2} = \frac{3x^4 \cdot 4y^2}{4x^4y^2} = \frac{12x^4y^2}{4x^4y^2} = 3$$

17. 5

If $x + 3$ is a factor of $f(x) = ax^2 + bx - 15$, then $f(-3) = 0$.

$$f(-3) = a(-3)^2 + b(-3) - 15 = 0$$

$$9a - 3b - 15 = 0 \quad \text{Simplify.}$$

$$9a - 3b = 15 \quad \text{Add 15 to each side.}$$

$$3(3a - b) = 15 \quad \text{Factor.}$$

$$3a - b = \frac{15}{3} = 5 \quad \text{Divide each side by 3.}$$

PSAT 10 Practice Test – Calculator

1. D

$$p(x) = kx - (b + 500)$$

$$15,000 = k(120) - (b + 500) \quad p = 15,000, x = 120$$

$$27,000 = k(200) - (b + 500) \quad p = 27,000, x = 200$$

Subtracting the first equation from the second equation, one can get $12,000 = k(80)$, which yields $150 = k$.

Substitute 150 for k in the first equation.

$$15,000 = (150)(120) - (b + 500)$$

$$15,000 = 18,000 - (b + 500)$$

$$15,000 = 17,500 - b$$

$$b = 2,500$$

2. B

If the price of the shirt was s dollars, then the price of the running shoes was $(2s - 10)$ dollars.

$$s + (2s - 10) \quad \text{Total amount before tax}$$

$$3s - 10 \quad \text{Simplify.}$$

$$3s - 10 + 0.08(3s - 10) \quad \text{Total amount after 8\% tax}$$

$$3s - 10 + 0.24s - 0.8 \quad \text{Distributive property}$$

$$3.24s - 10.8 \quad \text{Simplify.}$$

If he paid 50% of $3.24s - 10.8$ with cash, then the amount in terms of s is $1.62s - 5.4$.

3. A

The total distance he traveled in 4 hours is 65×4 , or 260 miles. The number of gasoline consumed was $260 \div 32$, or 8.125 gallons. Therefore, the cost of gasoline was $8.125 \times \$2.79$, or \$22.67 to the nearest cent.

4. C

Use two points, $(-1, 0)$ and $(1, 1)$ on the graph to find the slope of f .

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 0}{1 - (-1)} = \frac{1}{2}$$

Eliminate choices A and B because they have incorrect slopes.

Now check the other answer choices with the points $(-1, 0)$ and $(1, 1)$ on the graph.

Check the equation $f(x) = \frac{1}{2}x + \frac{1}{2}$ in choice C.

$$0 = \frac{1}{2}(-1) + \frac{1}{2} \quad x = -1 \text{ and } y = 0$$

$$1 = \frac{1}{2}(1) + \frac{1}{2} \quad x = 1 \text{ and } y = 1$$

Since both equations are true, choice C is correct.

Points $(-1, 0)$ and $(1, 1)$ are not on the graph

of $f(x) = \frac{1}{2}x - \frac{1}{2}$ in choice D,

5. D

$$A = \frac{180(n-2)}{n}$$

$$n \cdot A = n \cdot \frac{180(n-2)}{n} \quad \text{Multiply each side by } n.$$

$$nA = 180(n-2) \quad \text{Simplify.}$$

$$nA = 180n - 360 \quad \text{Distributive Property}$$

$$nA - 180n = -360 \quad \text{Subtract } 180n.$$

$$n(A - 180) = -360 \quad \text{Factor.}$$

$$n = \frac{-360}{A - 180} \quad \text{Divide each side by } A - 180.$$

$$n = \frac{(-1)(-360)}{(-1)(A - 180)} \quad \text{Multiply by } -1.$$

$$n = \frac{360}{180 - A} \quad -(A - 180) = 180 - A$$

6. C

$$n = \frac{360}{180 - A}$$

$$n = \frac{360}{180 - 144} \quad A = 144$$

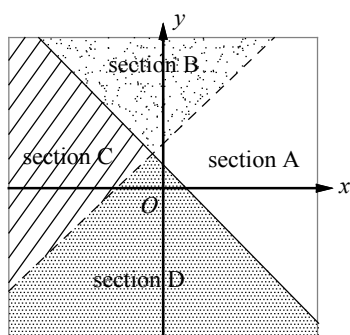
$$n = \frac{360}{36} = 10$$

7. D

$$\begin{aligned}
 5 - n &\geq 2 \\
 5 - n - 5 &\geq 2 - 5 && \text{Subtract 5 from each side.} \\
 -n &\geq -3 && \text{Simplify.} \\
 (-1)(-n) &\leq (-1)(-3) && \text{Multiply each side by } -1 \\
 &&& \text{and change } \geq \text{ to } \leq . \\
 n &\leq 3 \\
 n + 2 &\leq 3 + 2 && \text{Add 2 to each side.} \\
 n + 2 &\leq 5 \\
 \text{Thus, the greatest possible value of } n + 2 &\text{ is 5.}
 \end{aligned}$$

8. B

$$\begin{cases} x - y < -2 \\ x + y \geq 1 \end{cases}$$



The solution set of the inequality $x - y < -2$ is the union of sections B and C of the graph. The solution set of the inequality $x + y \geq 1$ is the union of sections A and B of the graph. Therefore, section B of the graph represents all of the solutions to the system.

9. B

$$\begin{aligned}
 1 \text{ m} &= 100 \text{ cm} \\
 (1 \text{ m})^3 &= (100 \text{ cm})^3 && \text{Cube each side.} \\
 1 \text{ m}^3 &= 1,000,000 \text{ cm}^3 && \text{Simplify.} \\
 \text{Let 2,000 cubic centimeters of titanium weigh } x &\text{ kilograms. Set up a proportion.} \\
 \frac{1 \text{ m}^3}{4540 \text{ kg}} &= \frac{2000 \text{ cm}^3}{x \text{ kg}} \\
 \frac{1,000,000 \text{ cm}^3}{4540 \text{ kg}} &= \frac{2000 \text{ cm}^3}{x \text{ kg}} && 1 \text{ m}^3 = 1,000,000 \text{ cm}^3 \\
 1,000,000x &= 4540 \times 2000 && \text{Cross multiply.} \\
 x &= \frac{4540 \times 2000}{1,000,000} = 9.08 \\
 \text{2,000 cubic centimeters of titanium weigh } &9.08 \text{ kilograms.}
 \end{aligned}$$

10. A

When number n is divided by $\frac{2}{3}$, the result is 6 less than $2n$.

$$\text{The equation is } n \div \frac{2}{3} = 2n - 6 .$$

$$\begin{aligned}
 n \times \frac{3}{2} &= 2n - 6 && \text{Rewrite as multiplication by the reciprocal.} \\
 2(n \times \frac{3}{2}) &= 2(2n - 6) && \text{Multiply each side by 2.} \\
 3n &= 4n - 12 && \text{Simplify.} \\
 -n &= -12 && \text{Subtract } 4n . \\
 n &= 12
 \end{aligned}$$

11. D

In the equation $y = 9.5x + 120$, x represents the number of hours Danny worked, y represents his total savings, and 120 is the amount he already saved. Each time x increases by 1, y increases by 9.5, which is the amount Danny gets paid per hour from the office supply store.

Choice D is correct.

12. C

Danny needs \$450 to buy an iPad. Therefore, the number of hours he needs to work to get enough money for one iPad can be found by solving the inequality $y = 9.5x + 120 \geq 450$.

$$\begin{aligned}
 9.5x + 120 - 120 &\geq 450 - 120 && \text{Subtract 120.} \\
 9.5x &\geq 330 && \text{Simplify.} \\
 x &\geq \frac{330}{9.5} \approx 34.7
 \end{aligned}$$

Therefore, the minimum number of hours he needs to work to save enough money for an iPad is 35 hours.

13. C

If the average of 2, a , and b is $2x$, the equation

$$2x = \frac{2 + a + b}{3} \text{ is true.}$$

$$3 \cdot 2x = 3 \cdot \frac{2 + a + b}{3} \quad \text{Multiply each side by 3.}$$

$$6x = 2 + a + b \quad \text{Simplify.}$$

$$6x - 2 = a + b \quad \text{Solve the equation for } a + b .$$

The average of a and b is $\frac{a+b}{2}$. Substituting

$$6x - 2 \text{ for } a + b \text{ yields } \frac{a+b}{2} = \frac{6x-2}{2} = 3x - 1 .$$

14. A

Let the number = n .

$$\frac{a}{a \text{ equals}} = \frac{1.2}{120\%} \times \frac{n}{\text{of } n}$$

$$a = 1.2n$$

$$\frac{a}{1.2} = n \quad \text{Solve for } n.$$

40% of n is $0.4n$. Substituting $\frac{a}{1.2}$ for n yields $0.4n = 0.4\left(\frac{a}{1.2}\right) = \frac{1}{3}a$.

15. B

The quadratic equation $y = ax^2 + bx + c$ has its maximum or minimum at $x = -\frac{b}{2a}$. Since the leading coefficient of h is negative, h has its maximum at $t = -\frac{40}{2(-4.9)} \approx 4.08$. Therefore, the object reaches its highest point about 4 seconds after it is thrown.

16. D

The slope of the first line is $\frac{5-1}{3-(-3)} = \frac{2}{3}$.

If the two lines are parallel, their slopes are equal.

Thus, the slope of the second line is $\frac{2}{3}$ and itcontains $(6, 0)$.

$$y = mx + b \quad \text{Slope-intercept form}$$

$$y = \frac{2}{3}x + b \quad m = \frac{2}{3}$$

$$0 = \frac{2}{3}(6) + b \quad \text{The line contains } (6, 0).$$

$$0 = 4 + b \quad \text{Simplify.}$$

$$-4 = b$$

Therefore the equation of the second line is

$$y = \frac{2}{3}x - 4 \text{ and the } y\text{-intercept is } -4.$$

17. D

If each dimension of the large picture is reduced by x inches, the new length will be $18-x$ and the new width will be $12-x$. Since the ratio of new

length to new width is 5 to 3, $\frac{18-x}{12-x} = \frac{5}{3}$.

$$3(18-x) = 5(12-x) \quad \text{Cross Products}$$

$$54 - 3x = 60 - 5x \quad \text{Distributive Property}$$

$$54 - 3x + 5x = 60 - 5x + 5x \quad \text{Add } 5x \text{ to each side.}$$

$$54 + 2x = 60 \quad \text{Simplify.}$$

$$2x = 6 \quad \text{Subtract } 54.$$

$$x = 3$$

18. C

Let x = the total number of CDs in the store.Then $0.25x$ = the number of classical CDs.

Since 60% of these classical CDs are on sale, $0.25x \times 0.6$ are on sale. Since that number is not more than 450, the inequality $0.25x \times 0.6 \leq 450$ must be true.

$$0.25x \times 0.6 \leq 450 \Rightarrow 0.15x \leq 450$$

$$\Rightarrow x \leq \frac{450}{0.15} \Rightarrow x \leq 3,000$$

The maximum number of CDs in the store is 3,000.

19. B

The slope of the line which passes through (a, b) and (c, d) is $\frac{d-b}{c-a}$, which is equal to $\frac{1}{2}$. On the

x -axis the value of the y -coordinate is 0 and on the y -axis the value of the x -coordinate is 0.

Therefore, $a = d = 0$. Also $b = -3.5$ is given.

Substitute these values in the slope equation.

$$\frac{d-b}{c-a} = \frac{1}{2} \Rightarrow \frac{0-(-3.5)}{c-0} = \frac{1}{2}$$

$$\Rightarrow \frac{3.5}{c} = \frac{1}{2} \Rightarrow c = 7$$

20. B

$$y = kx^2$$

$$-12 = k(-4)^2 \quad y = -12 \text{ when } x = -4$$

$$-12 = 16k$$

$$-\frac{3}{4} = k$$

$$y = -\frac{3}{4}x^2 \quad \text{Replace } k \text{ with } -\frac{3}{4}.$$

$$y = -\frac{3}{4}(2)^2 \quad x = 2$$

$$y = -3$$

21. A

Since we know the two x -intercepts of the graph of f , it is easier to start with the factored form of a quadratic function.

The two x -intercepts are $(-2, 0)$ and $(8, 0)$, so the equation of f can be written as $y = a(x+2)(x-8)$, in which a is a constant. Since the x -coordinate of the vertex is the average of the two x -intercepts, $x = \frac{-2+8}{2} = 3$ is the x -coordinate of the vertex. The y -coordinate of the vertex is the minimum value of f , which is $-\frac{25}{2}$. In the equation $y = a(x+2)(x-8)$, substitute $x = 3$ and $y = -\frac{25}{2}$ to find the value of a .

$$-\frac{25}{2} = a(3+2)(3-8) \text{ gives } a = \frac{1}{2}.$$

So the equation of f is $y = \frac{1}{2}(x+2)(x-8)$. To find the y -intercept of the graph of f , substitute 0 for x .

$$y = \frac{1}{2}(0+2)(0-8) = -8.$$

Therefore, the y -intercept is $(0, -8)$.

22. C

If a polynomial $f(x)$ is divisible by x , then x is a factor of the polynomial. However, this is true only if the constant term of f is zero.

Simplifying the equation gives

$$f(x) = -2x^2 - 14x + 6 - ax - 2a + 1$$

$$= -2x^2 - (14+a)x + 7 - 2a.$$

$$7 - 2a = 0$$

$$-2a = -7$$

$$a = \frac{7}{2}$$

23. C

$$f(x) = \frac{1}{3}x - k$$

$$f(-3) = \frac{1}{3}(-3) - k = k$$

$$\Rightarrow -1 - k = k$$

$$\Rightarrow -\frac{1}{2} = k$$

Therefore, $f(x) = \frac{1}{3}x + \frac{1}{2}$ and

$$f\left(-\frac{3}{2}\right) = \frac{1}{3}\left(-\frac{3}{2}\right) + \frac{1}{2} = 0$$

24. D

$$V(t) = 5,000(4)^{\frac{t}{10}}$$

$$V(15) = 5,000(4)^{\frac{15}{10}} = 5,000(4)^{1.5} = 40,000$$

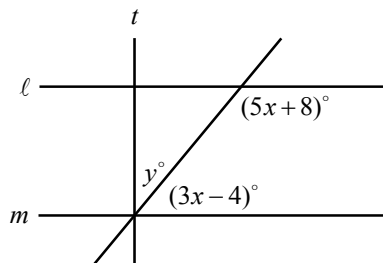
25. D

In the morning, 120 cubic meters of water from the tank was used for planting. In the afternoon, 125 percent more than the amount of water used in the morning was pumped into the tank, which is $120 + 1.25 \times 120$, or 270 cubic meters.

Let h = the increase in the height of the water, in meters, after the water was pumped into the tank.

$$6 \times 4 \times h = 270 - 120, \text{ so solving the equation for } h \text{ gives } h = 6\frac{1}{4}.$$

26. B



Note: Figure not drawn to scale.

If two lines are parallel, consecutive interior angles are supplementary.

$$(5x + 8) + (3x - 4) = 180 \quad \ell \parallel m$$

$$8x + 4 = 180 \quad \text{Simplify.}$$

$$8x = 176$$

$$x = 22$$

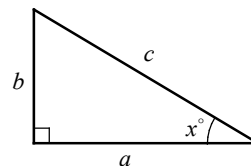
In a plane, if a line is perpendicular to one of two parallel lines, it is also perpendicular to the other. Thus, $t \perp m$ and $y + (3x - 4) = 90$.

$$y + (3 \times 22 - 4) = 90 \quad x = 22$$

$$y + 62 = 90 \quad \text{Simplify.}$$

$$y = 28$$

27. C



$$\text{I. } \sin x^\circ = \frac{\text{opposite side to angle } x}{\text{hypotenuse}} = \frac{b}{c}$$

Roman numeral I is true.

II. $(90 - x)^\circ$ is the angle between the sides c and b .

$$\begin{aligned} &\cos(90 - x)^\circ \\ &= \frac{\text{adjacent side to angle } (90 - x)}{\text{hypotenuse}} = \frac{b}{c} \end{aligned}$$

Roman numeral II is true.

$$\begin{aligned} \text{III. } &\sin(90 - x)^\circ \\ &= \frac{\text{opposite side to angle } (90 - x)}{\text{hypotenuse}} = \frac{a}{c} \end{aligned}$$

Roman numeral III is not true.

Choice C is correct.

28. 45

Let m = the price of a mitten.

Then $m + 8$ = the price of a beanie.

$$m + (m + 8) = 82 \quad \text{The cost of one beanie and one mitten is \$82.}$$

$$2m + 8 = 82 \quad \text{Simplify.}$$

$$2m = 74$$

$$m = 37$$

Thus, Derek paid $37 + 8$, or \$45, for the beanie.

29. 3

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{b - (-1)}{2 - \frac{1}{2}} = \frac{b + 1}{\frac{3}{2}} = \frac{2}{3}(b + 1)$$

$$\text{Therefore, } \frac{2}{3}(b + 1) = \frac{8}{3}.$$

$$\frac{3}{2} \cdot \frac{2}{3}(b + 1) = \frac{3}{2} \cdot \frac{8}{3} \quad \text{Multiply each side by } \frac{3}{2}.$$

$$b + 1 = 4 \quad \text{Simplify.}$$

$$b = 3$$

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

$$x^2 + 2xy + y^2 = \frac{16}{9}$$

$$(x + y)^2 = \frac{16}{9} \quad \text{Factor.}$$

$$x + y = \pm \sqrt{\frac{16}{9}} = \pm \frac{4}{3} \quad \text{Square Root Property}$$

Since x and y are positive integers, $x + y = \frac{4}{3}$.

$$x^2 - y^2 = \frac{8}{9}$$

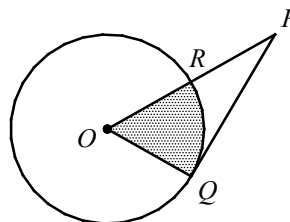
$$(x + y)(x - y) = \frac{8}{9} \quad \text{Factor.}$$

$$\frac{4}{3}(x - y) = \frac{8}{9} \quad x + y = \frac{4}{3}$$

$$\frac{3}{4} \cdot \frac{4}{3}(x - y) = \frac{3}{4} \cdot \frac{8}{9} \quad \text{Multiply each side by } \frac{3}{4}.$$

$$x - y = \frac{2}{3}$$

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



If a line is tangent to a circle, then the line is perpendicular to the radius at the point of tangency. Therefore, $\overline{PQ} \perp \overline{OQ}$ and $\triangle OPQ$ is a right triangle. If $OR = RP = 3$, then $OP = OR + RP = 3 + 3 = 6$.

If a right triangle has a hypotenuse that is twice as long as the shorter leg, then it is a 30° - 60° - 90° triangle. Thus $m\angle POQ = 60$.

$$\text{Area of sector } ROQ = \pi r^2 \times \frac{m\angle ROQ}{360}$$

$$= \pi(3)^2 \times \frac{60}{360} = 9\pi \times \frac{1}{6} = \frac{3}{2}\pi$$

If the area of the shaded region is $k\pi$, then

$$k = \frac{3}{2}.$$