



Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

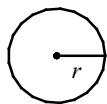
DIRECTIONS

For questions **1-15**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 16-20**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

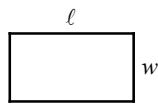
- The use of calculator **is not permitted**.
- All variables and expressions used represent real numbers unless otherwise indicated.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures lie in a plane unless otherwise indicated.
- Unless otherwise indicated, the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

REFERENCE

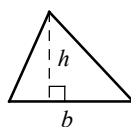


$$A = \pi r^2$$

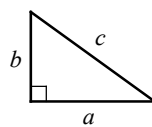
$$C = 2\pi r$$



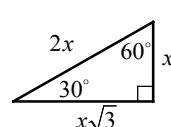
$$A = \ell w$$



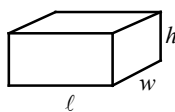
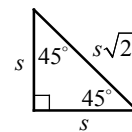
$$A = \frac{1}{2}bh$$



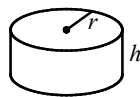
$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = \ell wh$$



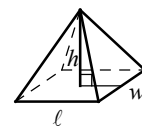
$$V = \pi r^2 h$$



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



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



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

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

If $f(x) = \frac{1}{2}x - 1$, what is $f(-2x + 1)$ equal to?

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

2

If $x = 1 - \frac{a}{b}$, which of the following is equivalent to $\frac{1}{x}$?

- A) $\frac{b}{1+a}$
- B) $\frac{b}{1-a}$
- C) $\frac{b-1}{a}$
- D) $\frac{b}{b-a}$

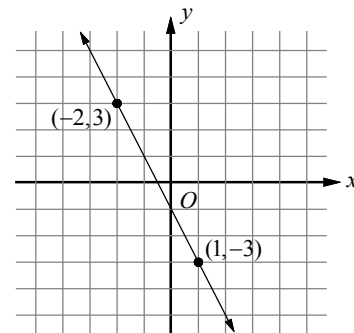
3

$$\frac{1}{2}(16 - 4x) = nx + 8 + 3x$$

If the linear equation above is an identity, what is the value of n ?

- A) -5
- B) -3
- C) -1
- D) 3

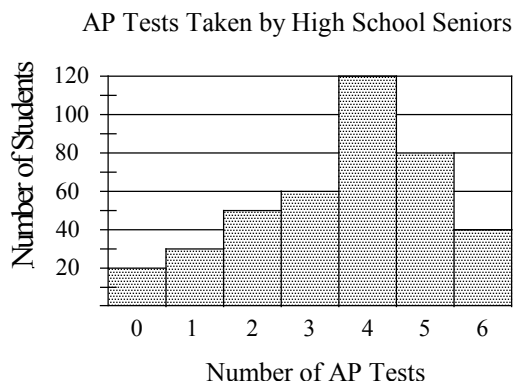
4



Which of the following equations represents a line that is parallel to the line shown above and contains the point $(\frac{1}{2}, 3)$?

- A) $y = x + \frac{5}{2}$
- B) $y = -x + \frac{7}{2}$
- C) $y = -2x + 4$
- D) $y = -2x + 6$

Questions 5 and 6 refer to the following information.



The graph above depicts a survey of 400 senior students in a high school who took the AP tests last May. The number of AP tests taken by each student ranges from zero to six.

5

Which of the following is NOT true of the survey results?

- A) The mode of the number of AP tests taken by each student was 4.
- B) The average (arithmetic mean) number of AP tests taken by the senior students was greater than the median number of AP tests taken by the senior students.
- C) The average (arithmetic mean) number of AP tests taken by the senior students was equal to the median number of AP tests taken by the senior students.
- D) The average (arithmetic mean) number of AP tests taken by the senior students was less than the median number of AP tests taken by the senior students.

6

By what percent is the number of senior students who took 4 AP tests greater than the number of senior students who took 3 AP tests?

- A) 50%
- B) 75%
- C) 100%
- D) 200%

7

$$x + y < a$$

$$x - y > b$$

In the xy -plane, if $(0,1)$ is the solution to the system of inequalities above, which of the following relationships between a and b must be true?

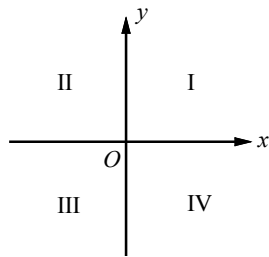
- A) $|a| < |b|$
- B) $|a| > |b|$
- C) $a - b < 2$
- D) $a - b > 2$

8

Which of the following complex numbers is equivalent to $\frac{(1+i)^2}{1-i}$? (Note: $i = \sqrt{-1}$)

- A) $-1 - i$
- B) $-1 + i$
- C) $1 - i$
- D) $1 + i$

9



If the system of inequalities $2 - y < 2x$ and $-x \leq 4 - y$ is graphed in the xy -plane above, which quadrant contains no solutions to the system?

- A) Quadrant II
- B) Quadrant III
- C) Quadrant IV
- D) There are solutions in all four quadrants.

10

A certain company produces d diskettes every m minutes. Which of the following is the number of diskettes produced in h hours, in terms of d , m , and h ?

- A) $\frac{60dh}{m}$
- B) $\frac{60dm}{h}$
- C) $\frac{60mh}{d}$
- D) $\frac{dh}{60m}$

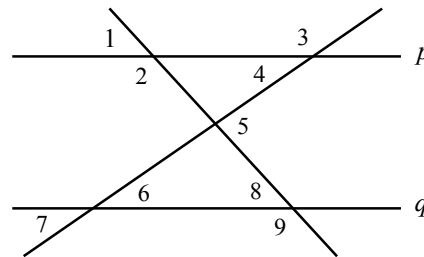
11

$$y = 2x^2 - 11x - 6$$

The equation above represents a parabola in the xy -plane. Which of the following equivalent forms of the equation displays the x -intercepts of the parabola as constants or coefficients?

- A) $y = (2x - 3)(x + 2)$
- B) $y = (2x + 1)(x - 6)$
- C) $y = 2\left(x - \frac{11}{4}\right)^2 - \frac{169}{8}$
- D) $y = 2\left(x - \frac{11}{2}\right)^2 - \frac{133}{4}$

12



In the figure above, line p is parallel to line q . Which of the following must be true?

- I. $m\angle 2 = m\angle 9$
- II. $m\angle 2 + m\angle 4 = 180$
- III. $m\angle 4 + m\angle 8 = m\angle 5$

- A) I only
- B) I and II only
- C) I and III only
- D) I, II, and III

13

At a coffee shop, a customer bought 10 bags of Arabian Mocha and Kona coffee. A bag of Arabian Mocha costs \$18 and a bag of Kona coffee costs \$28. If x is the number of bags of Arabian Mocha and the customer paid d dollars for the Arabian Mocha and Kona coffee, which of the following represents x in terms of d ?

- A) $x = 28 - 0.1d$
- B) $x = 28 + 0.1d$
- C) $x = 18 - 0.1d$
- D) $x = 18 + 0.1d$

14

If p , q , r , and s are four different positive numbers such that $p = \frac{r}{s-r}$ and $q = \frac{r}{s}$, what is q in terms of s ?

- A) $1 + \frac{1}{p}$
- B) $1 - \frac{1}{p}$
- C) $\frac{1}{1+p}$
- D) $\frac{p}{1+p}$

15

The population of a certain town doubles every 24 years. If the population of the town was 140,000 at the beginning of 2016, which of the following equations represents the population, P , t years after 2016?

- A) $P = 140,000 + 24t$
- B) $P = 140,000 + (24)^t$
- C) $P = 140,000(2)^{\frac{t}{24}}$
- D) $P = 140,000 \cdot \frac{(2)^t}{24}$


DIRECTIONS

For questions 16-20, solve the problem and enter your answer in the grid as described below, on the answer sheet.

- 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.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.

- Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or $7/2$. (If $\begin{array}{|c|c|c|c|} \hline 3 & 1 & / & 2 \\ \hline \circ & \circ & \bullet & \circ \\ \hline \end{array}$ is entered into the grid, it will be interpreted as $\frac{31}{2}$ not $3\frac{1}{2}$.)

- 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
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
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
1	1	1
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.

16

$$-7 + a = 3$$

Given the above equation, what is the value of $10 - [(a - 3) - 7]$?

17

Three is subtracted from two thirds of the number k and the difference is doubled. If the result is ten more than one third of the number, what is the value of k ?

18

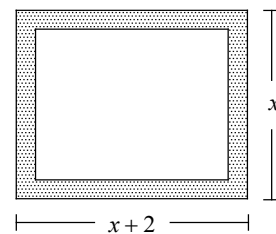
$$\begin{aligned} 6x + ky &= 3 \\ y &= 1 - 2x \end{aligned}$$

For what value of k will the system of equations above have infinitely many solutions?

19

If $\frac{-2x^2 + 5x + 10}{-x + 4} = 2x + 3 - \frac{A}{-x + 4}$, what is the value of A ?

20



A rectangular picture, represented by the unshaded region in the figure above, is mounted in a rectangular frame, represented by the shaded region. The frame is 1 inch wide on all sides. For what value of x , in inches, is the area of the picture twice the area of the frame?

No Test Material On This Page



Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

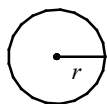
DIRECTIONS

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NOTES

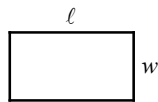
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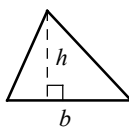


$$A = \pi r^2$$

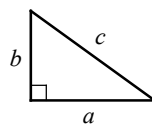
$$C = 2\pi r$$



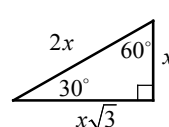
$$A = \ell w$$



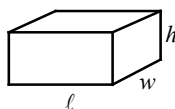
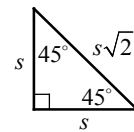
$$A = \frac{1}{2}bh$$



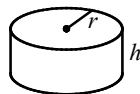
$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = \ell wh$$



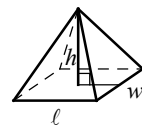
$$V = \pi r^2 h$$



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



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



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

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

One number is 4 times the value of another number. If their sum is -15 , what is the value of the smaller of the two numbers?

- A) -12
- B) -9
- C) -6
- D) -3

2

Year	Profits
2010	108,000
2011	320,000
2012	415,000
2013	576,000
2014	842,000
2015	1,160,000

The profits of an electronic company during the six years of its operation are given in the table above. Which of the following best approximates the average rate of change of the profits from 2010 to 2015?

- A) \$180,000 per year
- B) \$210,000 per year
- C) \$250,000 per year
- D) \$280,000 per year

3

If $f(x) = \sqrt{x} + 2$ and $g(x) = (x-1)^2$, which of the following is equivalent to $g(f(a)) - 2f(a)$?

- A) $\sqrt{a} + 2$
- B) $\sqrt{a} - 1$
- C) $a + 4$
- D) $a - 3$

4

Which of the following systems of equations has no solution?

- A) $\frac{1}{5}x + \frac{1}{3}y = 1$
 $3x - 5y = 15$
- B) $4x + 3y = 12$
 $3x - 4y = 6$
- C) $-3x + 2y = 7$
 $\frac{1}{2}x - \frac{1}{3}y = 3$
- D) $-x + 2y = 1$
 $2x - 4y = -2$

5

A line in the xy -plane passes through the origin and has a slope of $-\frac{3}{4}$. Which of the following points does NOT lie on the line?

- A) $(2, -\frac{3}{2})$
- B) $(-4, 3)$
- C) $(8, -3)$
- D) $(0, 0)$

6

	Distance to Finish Line (meters)
Mike	$-12t + 1500$
Maria	$-10.5t + 1500$

Mike and Maria race on a 1500-meter course with their bikes. The expressions in the table above show the distance to the finish line t seconds after they started the race. How many meters will Maria have left to bike when Mike completes the course?

- A) 165
- B) 187.5
- C) 210
- D) 232.5

7

x	$f(x)$
-4	-10.5
-2	2.5
1	-8
2	7.5

The function f is defined by a polynomial. Some values of x and $f(x)$ are shown in the table above. What is the remainder when $f(x)$ is divided by $x + 2$?

- A) -10.5
- B) -8
- C) 2.5
- D) 7.5

8

A thermos holds 2 quarts of liquid. If $\frac{1}{2}$ tablespoon of ground coffee makes 4 cups of coffee, how many thermoses can be filled with the coffee made from 3 tablespoons of ground coffee?
(1 quart = 4 cups)

- A) 8
- B) 6
- C) 4
- D) 3

Questions 9 and 10 refer to the following information.

The manufacturer of a cable company sells cable for \$30 per foot. The cost, C , of producing x feet of cable is $C = 12.5x + 210$. The company makes a profit when the amount of money received from selling the cable is greater than the cost of producing the cable.

9

Which of the following inequalities gives all possible values of x for which the company will make a profit?

- A) $x > 12$
- B) $x > 14.4$
- C) $x > 16$
- D) $x > 18.6$

10

What is the profit that the company could earn from the sale of 50 feet of cable?

- A) \$620.00
 - B) \$635.00
 - C) \$650.00
 - D) \$665.00
-

11

Alice and Bernie both own orchards that grow only apple trees and peach trees. Alice has twice as many apple trees as Bernie has. Bernie has 1.5 times as many peach trees as Alice has. Alice's orchard has 110 more trees than Bernie's orchard, and the total number of trees in both orchards are 1,050. Let x be the number of apple trees in Bernie's orchard and y be the number of peach trees in Alice's orchard. Which of the following systems of equations can be used to find the values of the variables x and y ?

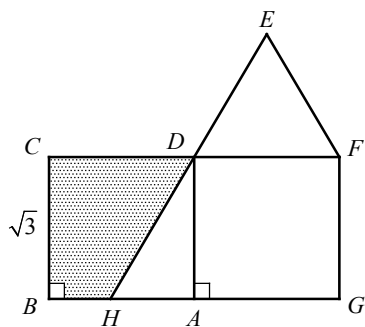
- A) $x + 2y = 1.5x + y + 110$
 $x + 2y + 1.5x + y = 1,050$
- B) $1.5x + y = x + 2y + 110$
 $1.5x + y + x + 2y = 1,050$
- C) $2x + y = x + 1.5y + 110$
 $2x + y + x + 1.5y = 1,050$
- D) $2x + 1.5y = x + y + 110$
 $2x + 1.5y + x + y = 1,050$

12

The average gas mileage of Roy's car is 36 miles per gallon of gas for highway driving and 24 miles per gallon of gas for city driving. If Roy used 10 gallons of gas for driving 340 miles on both highways and cities, how many miles did he drive on highways?

- A) 240
- B) 260
- C) 280
- D) 300

13



In the figure above, $ABCD$ and $ADFG$ are squares each with an area of 3 and DEF is an equilateral triangle. Line segments \overline{AD} , \overline{CF} , and \overline{EH} intersect at point D . Which of the following represents the area of the shaded region?

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

14

The line of a graph in the xy -plane contains the point $(-2, 4)$ and is parallel to a line with the equation $x + 2y = 10$. The graph of a second line passes through the points $(6, 2)$ and $(-2, -2)$. If the two lines intersect at the point (r, s) , what is the value of $r + s$?

- A) 5
 B) 7
 C) 9
 D) 11

Questions 15 and 16 refer to the following information.

Revenue of the commercial banks in country X in 1995. Revenue of the commercial banks in country X in 2005.

Banks	Percent
Bank A	40%
Bank B	29%
Bank C	15%
Bank D	8%
Other Banks	8%

100% = 10 billion dollars

Banks	Percent
Bank A	36%
Bank B	21%
Bank C	18%
Bank D	10%
Other Banks	15%

100% = 14 billion dollars

The tables above show the percentage of revenue of the commercial banks in country X. Total revenue of the commercial banks in 1995 was 10 billion dollars and total revenue of the commercial banks in 2005 was 14 billion dollars.

15

According to the tables above, which commercial bank had amounts of revenue that were nearly equal in 1995 and 2005?

- A) Bank A
 B) Bank B
 C) Bank C
 D) Bank D

16

According to the tables above, what is the percent increase of the revenue of Bank D from 1995 to 2005?

- A) 2%
 B) 20%
 C) 43%
 D) 75%

17

If p is 20 percent less than r , r is 20 percent less than s , and s is 20 percent less than t , which of the following is equal to p ?

- A) $0.4t$
- B) $0.4096t$
- C) $0.512t$
- D) $0.64t$

18

A large container can be filled with four times as much water as a medium-sized container, or nine times as much as a small-sized container. If x small containers and x large containers are needed to fill a water tank that could be filled with 120 medium-sized containers, what is the value of x ?

- A) 21
- B) 25
- C) 27
- D) 32

19

	Engineering	Humanities
Female		
Male		
Total	56	52

The incomplete table above summarizes the number of faculty members in engineering and humanities departments at a certain college. The ratio of female faculty members in engineering to male faculty members in engineering is 3 to 11, and the ratio of female faculty members in humanities to male faculty members in humanities is 9 to 4. There are a total of 56 faculty members in engineering and 52 faculty members in humanities. If one female faculty member is randomly selected, what is the probability that she will be in humanities?

- A) $\frac{5}{8}$
- B) $\frac{11}{16}$
- C) $\frac{20}{27}$
- D) $\frac{3}{4}$

20

A parabola with the equation $f(x) = a(x+1)(x-3)$ has a minimum value at $x = 1$ in the xy -plane. If $f(p) = f(-3)$, which of the following could be the value of p ?

- A) 4
- B) 5
- C) 6
- D) 7

21

$$x^2 - x + y^2 + 2y - \frac{19}{4} = 0$$

The equation of a circle in the xy -plane is shown above. What is the area of the circle?

- A) 6π
- B) $\frac{13}{2}\pi$
- C) 7π
- D) $\frac{15}{2}\pi$

22

$$g(x) = -(x^2 - 6x + 5) - 4(x - c)$$

In the polynomial $g(x)$ defined above, c is a constant. If $g(x)$ is divisible by $x+1$, what is the value of c ?

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

23

If A_0 is the initial amount deposited in a savings that earns at a fixed rate of r percent per year, and if a constant amount of c is added to the account each year, then the amount A_n of the savings, n years after the initial deposit is made, is given by the equation $A_n = (1 + \frac{r}{100}) \cdot A_{n-1} + c$.

If Alan made an initial deposit of \$10,000 that earns at a fixed rate of 4 percent per year, and he adds a constant amount of \$3,000 to his account each year, what is A_3 , the amount he has in the savings three years after he made his initial deposit?

- A) \$19,816.00
- B) \$20,248.64
- C) \$20,613.44
- D) \$20,623.23

24

What are the solutions to $(x+3)(x-3) = 4x$?

- A) $4 \pm \sqrt{5}$
- B) $4 \pm \sqrt{13}$
- C) $2 \pm \sqrt{5}$
- D) $2 \pm \sqrt{13}$

25

If $x \neq \pm 1$, which of the following is equivalent

to $\frac{\frac{1}{x+1}-1}{\frac{1}{x^2-1}+1}$?

- A) $\frac{1+x}{x}$
- B) $\frac{1-x}{x}$
- C) $\frac{x}{1+x}$
- D) $\frac{x}{1-x}$

26

The average (arithmetic mean) test score for all the students in a class is 79.6. If the average score of 16 boys in the class was 81, while that of n girls was 78, what is the value of n ?

- A) 14
- B) 15
- C) 16
- D) 17

27

The mean price of a gallon of gas in a certain state is \$2.95 with a standard deviation of 12 cents. Which of the following prices is not within 2 standard deviations of the mean price?

- A) \$2.69
- B) \$2.72
- C) \$3.05
- D) \$3.18

28

A cylindrical shape container 40 cm high inside with an internal diameter of 20 centimeters (cm) is 80 percent filled with fruit punch. If Kara pours 12 fluid ounces of fruit punch to each plastic cup, what is the largest number of plastic cups with 12 fluid ounces of fruit punch, that she can pour from the container?

(1 fluid ounce = 29.6 cubic centimeters)

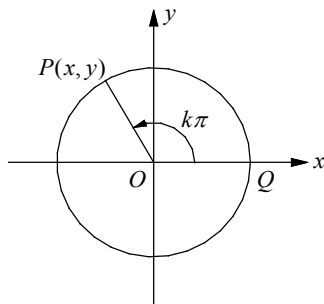
- A) 22
- B) 25
- C) 28
- D) 31

29

Which of the following is NOT a factor of the polynomial $p(x) = 2x^3 - 5x^2 - 4x + 3$?

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

30



In the xy -plane above, O is the center of the unit circle, and the measure of $\angle POQ$ is $k\pi$ radians. If $\sin(k\pi) = a$, which of the following could be $\sin(k\pi + \pi)$?

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

31

Real numbers a and b are positive, and the ratio of a to b is 2.25 times the ratio of b to a .

What is the value of $\frac{a}{b}$?

32

$$\frac{2}{5}x - \frac{1}{5}y = 98$$

$$\frac{2}{7}x + \frac{1}{14}y = 55$$

If the ordered pair (x, y) satisfies the system of equations shown above, what is the value of x ?

33

$$p(x) = \frac{2x-1}{(x-4)^2 - 6(x-4) + 9}$$

For what value of x is the function above undefined?

34

When Jay was on vacation in China, the exchange rate for Chinese yuan to US dollars was 6.14 yuan per dollar. On her vacation in China, Jay bought two one-day Beijing tour tickets for 320 yuan each. To the nearest dollar, how many dollars did the two tickets cost?

(Disregard the \$ sign when gridding your answer.)

35

If $x^4 \cdot x^9 = x^n \cdot x^n$, what is the value of n ?

36

In the xy -plane, a parabola with the equation $y = -(x+3)^2 + 9$ intersects a line with the equation $y = -7$ at two points, P and Q . What is the length of \overline{PQ} ?

37

$$y = a(x+3)(x-5)$$

In the quadratic equation above, a is a nonzero constant. The graph of the equation in the xy -plane has the vertex (h, k) . If the value of k is -8 , what is the value of a ?

38

If $(x+2)$ is a factor of $f(x) = x^3 + x^2 + x + c$, and $(-1, p)$ lies on the graph of f , what is the value of p ?

Answer Key**SAT Practice Test 1 – No Calculator**

1. A 2. D 3. A 4. C 5. B
 6. C 7. D 8. B 9. C 10. A
 11. B 12. C 13. A 14. D 15. C
 16. 10 17. 16 18. 3 19. 2 20. 10

SAT Practice Test 1 – Calculator

1. A 2. B 3. D 4. C 5. C
 6. B 7. C 8. D 9. A 10. D
 11. C 12. D 13. B 14. A 15. B
 16. D 17. C 18. C 19. D 20. B
 21. A 22. B 23. C 24. D 25. B
 26. A 27. A 28. C 29. D 30. C
 31. 1.5 32. 210 33. 7 34. 104 35. 6.5
 36. 8 37. $\frac{1}{2}$ or 0.5 38. 5

Answers and Explanations**SAT Practice Test 1 – No Calculator**

1. A

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

$$f(-2x+1) = \frac{1}{2}(-2x+1) - 1 \quad \text{Replace } -2x+1 \text{ for } x.$$

$$f(-2x+1) = -x + \frac{1}{2} - 1 \quad \text{Simplify.}$$

$$f(-2x+1) = -x - \frac{1}{2}$$

2. D

$$x = 1 - \frac{a}{b}$$

$$x = 1 \cdot \frac{b}{b} - \frac{a}{b} \quad b \text{ is the LCD.}$$

$$x = \frac{b-a}{b} \quad \text{Subtract the numerator.}$$

$$\frac{1}{x} = \frac{b}{b-a}$$

3. A

$$\frac{1}{2}(16-4x) = nx + 8 + 3x$$

$$8 - 2x = 8 + (n+3)x \quad \text{Simplify.}$$

If each side of the equation is the same, the equation is an identity.

Therefore, in the simplified equation above, if $-2 = n + 3$, the equation is an identity.

Solving for n yields $n = -5$.

4. C

The slope of the line shown on the graph is

$$\frac{3 - (-3)}{-2 - 1} = -2. \quad \text{Therefore, the equation of the line}$$

that is parallel to the line shown on the graph, in slope-intercept form, is $y = -2x + b$.

Since the line contains $(\frac{1}{2}, 3)$, substitute $x = \frac{1}{2}$

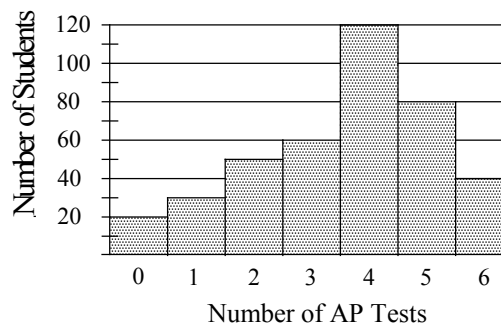
and $y = 3$ in the equation.

$$3 = -2(\frac{1}{2}) + b \Rightarrow b = 4$$

Therefore, the equation of the line is $y = -2x + 4$.

5. B

AP Tests Taken by High School Seniors



The mode of a set of data is the number that appears most frequently. Therefore, the mode of the number of AP tests taken by each student was 4.

The statement in choice A is true.

When the distribution is skewed to the left, the data set will usually have a greater median than the mean.

The statement in choice B is NOT true.

So, choice B is the correct answer.

The following shows the calculation of the mean, which you don't necessarily need to do in a real SAT test situation.

There are 160 students who took 3 or less AP tests and there are 120 students who took 5 or more AP tests. Since the median number is the average of the 200th and 201th number, the median is 4.

The mean number of AP tests taken by the senior students was

$$\frac{0 \cdot 20 + 1 \cdot 30 + 2 \cdot 50 + 3 \cdot 60 + 4 \cdot 120 + 5 \cdot 80 + 6 \cdot 40}{400} = 3.575$$

Therefore, the average number of AP tests taken by the senior students is less than the median number of AP tests taken by the senior students.

6. C

There are 120 senior students who took 4 AP tests and there are 60 students who took 3 AP tests.

The following equation represents “120 is what percent greater than 60”.

$$120 = 60 \left(1 + \underbrace{\frac{n}{100}}_{n\% \text{ more than } 60} \right)$$

$$120 = 60 + 60 \times \frac{n}{100} \quad \text{Distributive Property}$$

$$60 = 60 \times \frac{n}{100} \quad \text{Subtract 60 from each side.}$$

$$1 = \frac{n}{100} \quad \text{Divide each side by 60.}$$

$$n = 100$$

Therefore, the number of senior students who took 4 AP tests is 100% greater than the number of senior students who took 3 AP tests.

7. D

$$x + y < a$$

$$x - y > b$$

Substitute $x = 0$ and $y = 1$ in the inequalities.

$$0 + 1 < a \text{ or } 1 < a \quad \text{First inequality}$$

$$0 - 1 > b \text{ or } -1 > b \quad \text{Second inequality}$$

$$1 < a$$

$$1 < -b \quad \text{Multiply each side of second inequality by } -1 \text{ and change } > \text{ to } <.$$

$$1 < a$$

$$+ \quad | \quad 1 < -b \quad \text{Add the two inequalities.}$$

$$2 < a + (-b)$$

Choice D is correct.

8. B

$$\frac{(1+i)^2}{1-i}$$

$$= \frac{1+2i+i^2}{1-i} \quad \text{FOIL}$$

$$= \frac{1+2i-1}{1-i} \quad i^2 = -1$$

$$= \frac{2i}{1-i} \quad \text{Simplify.}$$

$$= \frac{2i(1+i)}{(1-i)(1+i)} \quad \text{Rationalize the denominator.}$$

$$= \frac{2i+2i^2}{1-i^2} \quad \text{Distributive Property}$$

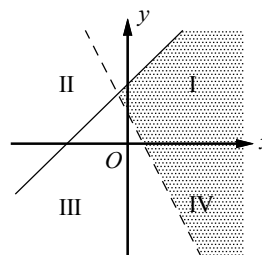
$$= \frac{2i-2}{1-(-1)} \quad i^2 = -1$$

$$= \frac{2(i-1)}{2} \quad \text{Factor.}$$

$$= i-1 \text{ or } -1+i \quad \text{Simplify.}$$

9. C

To determine which quadrant does not contain any solution to the system of inequalities, graph the inequalities. Graph the inequality $2 - y < 2x$ by drawing a dashed line through $(0, 2)$ and $(1, 0)$. Graph the inequality $-x \leq 4 - y$ by drawing a solid line through $(0, 4)$ and $(-4, 0)$.



The solution to the system of inequalities is the shaded region shown above. It can be seen that the solutions only include points in quadrants I, II, and IV and do not include any points in quadrant III.

Choice C is correct.

10. A

Let x = the number of diskettes produced in h hours.

Set up a proportion for the following:

d diskettes produced in m minutes is x diskettes produced in h hours.

$$\frac{d \text{ diskettes}}{m \text{ minutes}} = \frac{x \text{ diskettes}}{h \text{ hours}}$$

$$\frac{d \text{ diskettes}}{m \text{ minutes}} = \frac{x \text{ diskettes}}{60h \text{ minutes}} \quad h \text{ hours} = 60h \text{ minutes}$$

$$60dh = mx \quad \text{Cross Products}$$

$$\frac{60dh}{m} = x$$

11. B

The factored form of a quadratic function written as $y = a(x-b)(x-c)$ has x -intercepts $(b, 0)$ and $(c, 0)$. So, you need to factored the given equation.

$$y = 2x^2 - 11x - 6$$

Find two numbers with a sum of -11 and a product of $2 \cdot -6$ or -12 . The two numbers are 1 and -12 .

$$2x^2 - 11x - 6$$

$$= 2x^2 + x - 12x - 6 \quad \text{Write } -11x \text{ as } x - 12x.$$

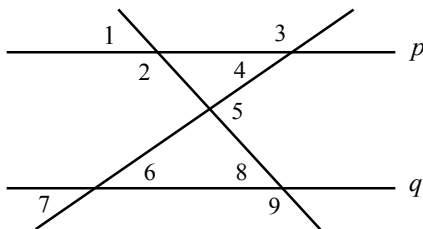
$$= (2x^2 + x) - (12x + 6) \quad \text{Group terms with common factor.}$$

$$= x(2x + 1) - 6(2x + 1) \quad \text{Factor each group.}$$

$$= (2x + 1)(x - 6) \quad \text{Distributive Property}$$

Therefore, $y = (2x + 1)(x - 6)$ is the equivalent form of the equation that displays the x -intercepts of the parabola as constants or coefficients.

12. C



In the figure above, line p is parallel to line q .

I. If line p is parallel to line q , corresponding angles are equal in measure. Therefore, $m\angle 2 = m\angle 9$.

Statement I is true.

II. $\angle 2$ and $\angle 4$ do not have any relation. We do not know if the two angles are supplementary.

Statement II is not true.

III. $m\angle 4 = m\angle 6$ Alternate interior $\angle s$ are \cong .

$$m\angle 6 + m\angle 8 = m\angle 5 \quad \text{Exterior Angle Theorem}$$

$$m\angle 4 + m\angle 8 = m\angle 5 \quad \text{Substitute } m\angle 4 \text{ for } m\angle 6.$$

Statement III is true.

13. A

If x is the number of bags of Arabian Mocha, then $10 - x$ is the number of bags of Kona. The cost of Arabian Mocha is $18x$ and the cost of Kona is $28(10 - x)$. The total cost is d dollars, so $18x + 28(10 - x) = d$.

$$18x + 280 - 28x = d \quad \text{Distributive Property}$$

$$-10x + 280 = d \quad \text{Simplify.}$$

$$280 - d = 10x \quad \text{Simplify.}$$

$$\frac{280 - d}{10} = x \quad \text{Divide each side by 10.}$$

$$28 - 0.1d = x \quad \text{Simplify.}$$

14. D

First you need to solve the equation $p = \frac{r}{s-r}$ for r .

$$p(s-r) = \frac{r}{s-r}(s-r) \quad \text{Multiply by } s-r.$$

$$ps - pr = r \quad \text{Distributive Property}$$

$$ps = r + pr \quad \text{Add } pr \text{ to each side.}$$

$$ps = r(1+p) \quad \text{Factor.}$$

$$\frac{ps}{1+p} = r \quad \text{Divide by } 1+p.$$

$$q = \frac{r}{s} = r \cdot \frac{1}{s}$$

$$q = \frac{p}{1+p} \cdot \frac{1}{s} \quad r = \frac{ps}{1+p}$$

$$q = \frac{p}{1+p} \quad \text{Cancel out } s.$$

15. C

A population that doubles in size over equal time periods is increasing at an exponential rate. The exponential growth model can be written in the

form $y = a(2)^{\frac{t}{b}}$, in which a is the population at time $t = 0$ and b is the doubling time. If the population of the town was 140,000 at the beginning of 2016 and the population doubles

every 24 years, $P = 140,000(2)^{\frac{t}{24}}$ represents the population t years after 2016.

$$\text{If } t = 24, (2)^{\frac{24}{24}} = (2)^{24} = (2)^1.$$

So the population will double 24 years after 2016.

If $t = 48$, $(2)^{\frac{48}{24}} = (2)^2$. So the population will quadruple 48 years after 2016, and so on.

16. 10

$$\begin{aligned} -7 + a &= 3 \\ -7 + a + 7 &= 3 + 7 && \text{Add 7 to each side.} \\ a &= 10 && \text{Simplify.} \end{aligned}$$

Hence, $10 - [(a - 3) - 7] = 10 - [(10 - 3) - 7] = 10$.

17. 16

$$\begin{aligned} \frac{2}{3}k - 3 &&& \text{Three is subtracted from} \\ &&& \text{two thirds of } k. \\ 2\left(\frac{2}{3}k - 3\right) &&& \text{The difference is doubled.} \\ 2\left(\frac{2}{3}k - 3\right) = \frac{1}{3}k + 10 &&& \text{The result is ten more than} \\ &&& \text{one third of the number.} \\ \frac{4}{3}k - 6 = \frac{1}{3}k + 10 &&& \text{Simplify.} \\ 3\left(\frac{4}{3}k - 6\right) = 3\left(\frac{1}{3}k + 10\right) &&& \text{Multiply each side by 3.} \\ 4k - 18 = k + 30 &&& \text{Distributive Property} \\ 4k - 18 - k = k + 30 - k &&& \text{Subtract } k \text{ from each side.} \\ 3k - 18 = 30 &&& \text{Simplify.} \\ 3k = 48 &&& \text{Add 18 to each side.} \\ k = 16 &&& \text{Divide each side by 3.} \end{aligned}$$

18. 3

In order for a system of two linear equations to have infinitely many solutions, the two equations must be equivalent. The equation $6x + ky = 3$

can be rewritten as $y = \frac{-6}{k}x + \frac{3}{k}$. If the two

equations are equivalent, $-\frac{6}{k} = -2$ and $\frac{3}{k} = 1$.

Solving for k yields $k = 3$.

19. 2

$$\frac{-2x^2 + 5x + 10}{-x + 4} = 2x + 3 - \frac{A}{-x + 4}$$

Multiply each side of the equation by $-x + 4$.

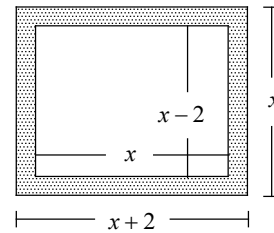
$$\begin{aligned} (-x + 4) \frac{-2x^2 + 5x + 10}{-x + 4} \\ = (-x + 4) \left[2x + 3 - \frac{A}{-x + 4} \right] \end{aligned}$$

$$\Rightarrow -2x^2 + 5x + 10 = (-x + 4)(2x + 3) - A$$

$$\Rightarrow -2x^2 + 5x + 10 = -2x^2 + 5x + 12 - A$$

Since the constant terms have to be equal on both sides of the equation, $10 = 12 - A$, or $A = 2$.

20. 10



Since the width of the frame is 1 inch, it follows that the length and width of the rectangular picture, represented by the unshaded region, is x and $x - 2$ respectively. Thus the area of the rectangular picture is $x(x - 2)$ square inches. The area of the outer rectangle is $x(x + 2)$ square inches.

Since the area of the frame is the area of the outer rectangle minus the area of the inner rectangle, the area of the frame is $x(x + 2) - x(x - 2)$.

Set the expression for the area of the picture as twice the area of the frame.

$$\begin{aligned} x(x - 2) &= 2[x(x + 2) - x(x - 2)] \\ x^2 - 2x &= 2[x^2 + 2x - x^2 + 2x] \\ x^2 - 2x &= 8x \\ x^2 - 10x &= 0 \\ x(x - 10) &= 0 \\ x = 0 &\text{ or } x = 10 \end{aligned}$$

Since x represents the length of the picture, discard the solution $x = 0$. Therefore, when $x = 10$, the area of the picture is twice the area of the frame.

SAT Practice Test 1 – Calculator

1. A

Let $4n$ and n be the two numbers.

$$4n + n = -15 \quad \text{Their sum is } -15.$$

$$5n = -15 \quad \text{Simplify.}$$

$$n = -3$$

$$4n = -12$$

Since -12 is the smaller of two numbers, choice A is correct.

2. B

Average rate of change in profit

$$= \frac{\text{change in profit}}{\text{change in years}} = \frac{1,160,000 - 108,000}{2015 - 2010}$$

$$= \frac{1,052,000}{5} = 210,400$$

3. D

If $f(x) = \sqrt{x} + 2$ and $g(x) = (x-1)^2$,

$$f(a) = \sqrt{a} + 2.$$

$$g(f(a)) - 2f(a)$$

$$= g(\sqrt{a} + 2) - 2(\sqrt{a} + 2)$$

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

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

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

$$= a - 3$$

4. C

A system of two equations has no solution if the equations have the same slope but different y -intercepts. Change each equation in each answer choice into slope-intercept form.

$$\text{A) } \frac{1}{5}x + \frac{1}{3}y = 1 \Rightarrow y = -\frac{3}{5}x + 3$$

$$3x - 5y = 15 \Rightarrow y = \frac{3}{5}x - 3$$

Their slopes are different, so they must have one solution.

$$\text{B) } 4x + 3y = 12 \Rightarrow y = -\frac{4}{3}x + 4$$

$$3x - 4y = 6 \Rightarrow y = \frac{3}{4}x - \frac{3}{2}$$

Their slopes are different, so they must have one solution.

$$\text{C) } -3x + 2y = 7 \Rightarrow y = \frac{3}{2}x + \frac{7}{2}$$

$$\frac{1}{2}x - \frac{1}{3}y = 3 \Rightarrow y = \frac{3}{2}x - 9$$

The slopes are the same, but their y -intercepts are different. Therefore, the system has no solution.

5. C

If a line in the xy -plane passes through the origin and has a slope of $-\frac{3}{4}$, the equation of the line

$$\text{is } y = -\frac{3}{4}x.$$

Check each answer choice with the equation

$$y = -\frac{3}{4}x.$$

$$\text{A) Substitute } x = 2 \text{ and } y = -\frac{3}{2} \text{ in } y = -\frac{3}{4}x.$$

$$-\frac{3}{2} = -\frac{3}{4}(2) \text{ is true.}$$

$$\text{B) Substitute } x = -4 \text{ and } y = 3 \text{ in } y = -\frac{3}{4}x.$$

$$3 = -\frac{3}{4}(-4) \text{ is true.}$$

$$\text{C) Substitute } x = 8 \text{ and } y = -3 \text{ in } y = -\frac{3}{4}x.$$

$$-3 = -\frac{3}{4}(8) \text{ is not true.}$$

Therefore, choice C is correct.

6. B

To find out the time it took for Mike to reach the finish line, solve the equation $-12t + 1,500 = 0$ for t . Solving the equation for t gives $t = 125$. Substitute 125 for t in the expression $-10.5t + 1,500$.

$$-10.5(125) + 1,500 = 187.5$$

Therefore, Maria has 187.5 meters to finish when Mike is on the finish line.

7. C

If the polynomial $f(x)$ is divided by $x + 2$, the remainder is $f(-2)$. Based on the table, $f(-2) = 2.5$. Therefore, when $f(x)$ is divided by $x + 2$, the remainder is 2.5.

8. D

Set up a proportion for the following.

If $\frac{1}{2}$ tablespoon of ground coffee makes 4 cups of coffee, 3 tablespoons of ground coffee makes c cups of coffee.

$$\frac{\frac{1}{2} \text{ table spoon of ground coffee}}{4 \text{ cups of coffee}} = \frac{3 \text{ table spoons of ground coffee}}{c \text{ cups of coffee}}$$

$$\frac{1}{2}c = 3 \cdot 4 \quad \text{Cross Product}$$

$$c = 24 \text{ cups} \quad \text{Simplify.}$$

Since a thermos holds 2 quarts of liquid, which is 8 cups, 24 cups of coffee can be filled $24 \div 8$, or 3 thermoses.

9. A

If the company sells x feet of cable, the selling price is $30x$ and the cost of producing x feet of cable is $C = 12.5x + 210$. Therefore,

$$\begin{aligned} \text{profit} &= \text{selling price} - \text{cost} \\ &= 30x - (12.5x + 210) \\ &= 17.5x - 210 \end{aligned}$$

To make a profit, $17.5x - 210 > 0$.
Solving the inequality gives $x > 12$.

10. D

If the company sells 50 feet of cable, the profit is $17.5(50) - 210$, or 665 dollars.

11. C

If x is the number of apple trees in Bernie's orchards, $2x$ is the number of apple trees in Alice's orchards, because Alice has twice as many apple trees as Bernie has. If y is the number of peach trees in Alice's orchards, $1.5y$ is the number of peach trees in Bernie's orchards, because Bernie has 1.5 times as many peach trees as Alice. Therefore, the number of trees in Alice's orchards is $2x + y$ and the number of trees in Bernie's orchards is $x + 1.5y$. Since Alice's orchard has 110 more trees than Bernie's orchard, the expression $2x + y = x + 1.5y + 110$ is true. Since the total number of trees in both orchards is 1,050, the expression $2x + y + x + 1.5y + 110 = 1,050$ is true.

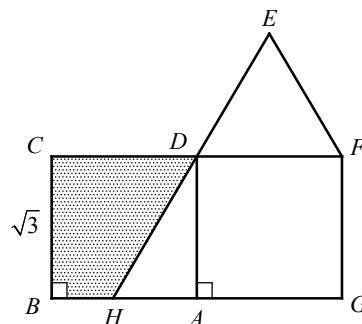
Choice C is correct.

12. D

Let x = the number of miles he drove on the highway. Let $340 - x$ = the number of miles he drove in the city. The number of gallons of gas used is the number of miles drove divided by the gas mileage. Therefore, $\frac{x}{36} + \frac{340 - x}{24} = 10$.

$$\begin{aligned} 72\left(\frac{x}{36} + \frac{340 - x}{24}\right) &= 72(10) && \text{LCD is 72.} \\ 2x + 3(340 - x) &= 720 && \text{Distributive Property} \\ 2x + 1,020 - 3x &= 720 && \text{Distributive Property} \\ -x &= -300 \\ x &= 300 \end{aligned}$$

13. B



$$\begin{aligned} m\angle EDF &= 60 && \text{Each } \angle \text{ of equilateral } \Delta \text{ is } 60^\circ. \\ m\angle DHA &= m\angle EDF && \text{Corresponding angles are } \cong. \\ m\angle DHA &= 60 && \text{Substitution} \end{aligned}$$

Therefore, $\triangle DHA$ is a 30° - 60° - 90° triangle.

$$\begin{aligned} HA \cdot \sqrt{3} &= DA && \text{In a } 30^\circ\text{-}60^\circ\text{-}90^\circ \Delta, \text{ the longer} \\ &&& \text{leg is } \sqrt{3} \text{ times the shorter leg.} \end{aligned}$$

$$\begin{aligned} HA \cdot \sqrt{3} &= \sqrt{3} && DA = CB = \sqrt{3} \\ HA &= 1 && \text{Divide each side by } \sqrt{3}. \end{aligned}$$

$$\text{Area of } \triangle DHA = \frac{1}{2} HA \cdot DA = \frac{1}{2} (1)(\sqrt{3}) = \frac{\sqrt{3}}{2}$$

Area of shaded region is area of square $ABCD$ minus area of triangle DHA . Therefore,

$$\text{area of shaded region} = 3 - \frac{\sqrt{3}}{2}.$$

14. A

Rewrite the equation $x + 2y = 10$ as $y = -\frac{1}{2}x + 5$.

The slope of the line is $-\frac{1}{2}$. Any line parallel to

the line can be written as $y = -\frac{1}{2}x + b$. If the line

contains the point $(-2, 4)$, substitute $x = -2$ and $y = 4$ in the equation. $4 = -\frac{1}{2}(-2) + b \Rightarrow b = 3$

Therefore, $y = -\frac{1}{2}x + 3$ is parallel to $x + 2y = 10$ and contains the point $(-2, 4)$.

The slope of the second line which passes through the points $(6, 2)$ and $(-2, -2)$ is $\frac{2 - (-2)}{6 - (-2)}$ or $\frac{1}{2}$.

The point-slope form of the second line is

$$y - 2 = \frac{1}{2}(x - 6), \text{ which can be rewritten as}$$

$$y = \frac{1}{2}x - 1. \text{ Substitute } -\frac{1}{2}x + 3 \text{ for } y \text{ in the}$$

equation to find the point of intersection.

$$\frac{1}{2}x - 1 = -\frac{1}{2}x + 3 \quad \text{Substitution}$$

$$\frac{1}{2}x - 1 + \frac{1}{2}x = -\frac{1}{2}x + 3 + \frac{1}{2}x \quad \text{Add } \frac{1}{2}x.$$

$$x - 1 = 3 \quad \text{Simplify.}$$

$$x = 4$$

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

Therefore, the point of intersection $(r, s) = (4, 1)$.

$$r + s = 4 + 1 = 5$$

15. B

Actual earnings in 1995

$$\text{Bank A} = 10 \times 0.4 = 4 \text{ billion}$$

$$\text{Bank B} = 10 \times 0.29 = 2.9 \text{ billion}$$

$$\text{Bank C} = 10 \times 0.15 = 1.5 \text{ billion}$$

$$\text{Bank D} = 10 \times 0.08 = 0.8 \text{ billion}$$

Actual earnings in 2005

$$\text{Bank A} = 14 \times 0.36 = 5.04 \text{ billion}$$

$$\text{Bank B} = 14 \times 0.21 = 2.94 \text{ billion}$$

$$\text{Bank C} = 14 \times 0.18 = 2.52 \text{ billion}$$

$$\text{Bank D} = 14 \times 0.1 = 1.4 \text{ billion}$$

Bank B had actual amounts of earnings that were nearly equal in 1995 and 2005.

16. D

The actual earnings of Bank D rose from 0.8 billion in 1995 to 1.4 billion in 2005.

The percent increase is

$$\frac{\text{amount of increase}}{\text{amount in 1995}} = \frac{1.4 - 0.8}{0.8} = 0.75.$$

The percent increase of the actual earnings of Bank D from 1995 to 2005 is 75 percent.

17. C

$$p = r - 0.2r \quad p \text{ is 20\% less than } r.$$

$$p = 0.8r \quad \text{Simplify.}$$

$$r = s - 0.2s \quad r \text{ is 20\% less than } s.$$

$$r = 0.8s \quad \text{Simplify.}$$

$$s = t - 0.2t \quad s \text{ is 20\% less than } t.$$

$$s = 0.8t \quad \text{Simplify.}$$

$$p = 0.8r = 0.8(0.8s) = 0.8(0.8(0.8t)) = 0.512t$$

18. C

Let m = the capacity of the medium container, then $4m$ = the capacity of the large container,

and $\frac{4m}{9}$ = the capacity of the small container.

If x small containers and x large containers are needed to fill a water tank that could be filled with 120 medium size containers, then the equation

$$x\left(\frac{4m}{9}\right) + x(4m) = 120m \quad \text{can be used to solve the}$$

value of x .

$$m\left(\frac{4}{9}x + 4x\right) = 120m \quad \text{Factor.}$$

$$\left(\frac{4}{9}x + 4x\right) = 120 \quad \text{Divide each side by } m.$$

$$\frac{40}{9}x = 120 \quad \text{Simplify.}$$

$$\frac{9}{40} \cdot \frac{40}{9}x = \frac{9}{40} \cdot 120 \quad \text{Multiply each side by } \frac{9}{40}.$$

$$x = 27$$

19. D

Let the number of female faculty members in engineering be $3x$ and let the number of male faculty members in engineering be $11x$. Then $3x + 11x = 56$.

$$14x = 56 \quad \text{Simplify.}$$

$$x = 4 \quad \text{Divide each side by 14.}$$

So, there are 12 female and 44 male faculty members in engineering.

Let the number of female faculty members in humanities be $9y$ and let the number of male faculty members in humanities be $4y$. Then $9y + 4y = 52$.

$$13x = 52 \quad \text{Simplify.}$$

$$y = 4 \quad \text{Divide each side by 13.}$$

So, there are 36 female and 16 male faculty members in humanities.

Now you are able to fill in the table.

	Engineering	Humanities
Female	12	36
Male	44	16
Total	56	52

There are altogether 48 female faculty members. If one female faculty member is randomly selected, the probability that she will be in humanities is

$$\frac{36}{48} = \frac{3}{4}.$$

20. B

If the parabola has a minimum value at $x = 1$, $x = 1$ is the axis of symmetry. If $f(p) = f(-3)$, the distance from p to $x = 1$ is the same as the distance from -3 to $x = 1$. Thus, $1 - (-3) = p - 1$.

$$\begin{aligned} 4 &= p - 1 && \text{Simplify.} \\ 5 &= p \end{aligned}$$

21. A

$$x^2 - x + y^2 + 2y - \frac{19}{4} = 0$$

Add $\frac{19}{4}$ to each side.

$$x^2 - x + y^2 + 2y = \frac{19}{4}$$

Add $(-1 \times \frac{1}{2})^2$ and $(2 \times \frac{1}{2})^2$ to complete the square for each variable.

$$x^2 - x + \frac{1}{4} + y^2 + 2y + 1 = \frac{19}{4} + \frac{1}{4} + 1$$

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

The standard equation of a circle with center (h, k) and radius r unit is $(x - h)^2 + (y - k)^2 = r^2$.

Therefore, the radius of the circle is $\sqrt{6}$ and the area of the circle is $\pi(\sqrt{6})^2 = 6\pi$.

22. B

$$g(x) = -(x^2 - 6x + 5) - 4(x - c)$$

If $g(x)$ is divisible by $x + 1$, $g(-1) = 0$.

$$\begin{aligned} g(-1) &= -((-1)^2 - 6(-1) + 5) - 4(-1 - c) \\ &= -(1 + 6 + 5) + 4 + 4c \\ &= -12 + 4 + 4c \\ &= -8 + 4c \end{aligned}$$

Therefore, if $g(-1) = 0$, $-8 + 4c = 0$ or $c = 2$.

23. C

$$A_n = (1 + \frac{r}{100}) \cdot A_{n-1} + c$$

If Alan made an initial deposit of \$10,000 that earns at a fixed rate of 4 percent per year, and he adds a constant amount of \$3,000 to his account each year, then $A_0 = 10,000$, $r = 4$ and $c = 3,000$.

$$A_1 = (1 + \frac{4}{100}) \cdot 10,000 + 3,000 \quad n = 1$$

$$= 13,400$$

$$A_2 = (1 + \frac{4}{100}) \cdot A_1 + 3,000 \quad n = 2$$

$$\begin{aligned} &= (1 + \frac{4}{100}) \cdot 13,400 + 3,000 \quad A_1 = 13,400 \\ &= 16,936 \end{aligned}$$

$$A_3 = (1 + \frac{4}{100}) \cdot A_2 + 3,000 \quad n = 3$$

$$\begin{aligned} &= (1 + \frac{4}{100}) \cdot 16,936 + 3,000 \quad A_2 = 16,936 \\ &= 20,613.44 \end{aligned}$$

24. D

$$(x + 3)(x - 3) = 4x$$

$$x^2 - 9 = 4x$$

$$x^2 - 4x - 9 = 0$$

Use the quadratic formula to solve the equation.

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-9)}}{2(1)} \\ &= \frac{4 \pm \sqrt{16 + 36}}{2} = \frac{4 \pm \sqrt{52}}{2} \\ &= \frac{4 \pm \sqrt{52}}{2} = \frac{4 \pm 2\sqrt{13}}{2} \\ &= 2 \pm \sqrt{13} \end{aligned}$$

25. B

Since $(x^2 - 1) = (x + 1)(x - 1)$, $(x + 1)(x - 1)$ is the LCD of the numerator and the denominator.

$$\begin{aligned} \frac{\frac{1}{x+1} - 1}{x^2 - 1} + 1 &= \frac{(\frac{1}{x+1} - 1)(x+1)(x-1)}{(\frac{1}{x^2-1} + 1)(x+1)(x-1)} \\ &= \frac{(x-1) - (x+1)(x-1)}{1 + (x+1)(x-1)} \\ &= \frac{x-1-x^2+1}{1+x^2-1} \\ &= \frac{x-x^2}{x^2} \\ &= \frac{x(1-x)}{x^2} \\ &= \frac{1-x}{x} \end{aligned}$$

26. A

The weighted average of two groups is the sum of the values of group 1 plus the sum of the values of group 2 divided by the total number of the values. In this question, the weighted average of two groups is 79.6, the sum of the values of boys is 81×16 , the sum of the values of girls is $78n$, and the total number of values is $16 + n$. Use the weighted average formula.

$$79.6 = \frac{81 \times 16 + 78n}{16 + n}$$

Multiply each side of the equation by $16 + n$.

$$79.6(16 + n) = 1296 + 78n$$

$$1273.6 + 79.6n = 1296 + 78n$$

$$1.6n = 22.4$$

$$n = \frac{22.4}{1.6} \\ = 14$$

27. A

$2.95 + 0.12 = 3.07$	Price within one SD
$2.95 + 2 \times 0.12 = 3.19$	Price within two SD
$2.95 - 0.12 = 2.83$	Price within one SD
$2.95 - 2 \times 0.12 = 2.71$	Price within two SD

The prices between \$2.71 and \$3.19 are within two standard deviations. Thus, \$2.69 is not within two standard deviations.

28. C

Volume of the cylindrical shape container
 $= \pi r^2 h = \pi (10 \text{ cm})^2 (40 \text{ cm}) = 4,000\pi \text{ cm}^3$.

The container is 80 percent filled with punch, so the amount of punch in the container is
 $4,000\pi \text{ cm}^3 \times 0.8 = 3,200\pi \text{ cm}^3$.

Since 1 fluid ounce = 29.6 cm^3 , dividing the amount of cubic centimeters by 29.6 will give the number of fluid ounces.

$$(3,200\pi \text{ cm}^3) \div 29.6 \text{ cm}^3 \approx 339.63 \text{ fluid ounces}$$

To find out the number of cups, divide 339.63 by 12. $339.63 \div 12 \approx 28.3$

Therefore, the largest number of 12 ounce cups that she can pour from the container is 28.

29. D

$$p(x) = 2x^3 - 5x^2 - 4x + 3$$

Check each answer choice.

A) If $2x - 1$ is a factor of $p(x)$, $p(\frac{1}{2}) = 0$.

$$p(\frac{1}{2}) = 2(\frac{1}{2})^3 - 5(\frac{1}{2})^2 - 4(\frac{1}{2}) + 3 = 0$$

Therefore, $2x - 1$ is a factor of $p(x)$.

B) If $x + 1$ is a factor of $p(x)$, $p(-1) = 0$.

$$p(-1) = 2(-1)^3 - 5(-1)^2 - 4(-1) + 3 = 0$$

Therefore, $x + 1$ is a factor of $p(x)$.

C) If $x - 3$ is a factor of $p(x)$, $p(3) = 0$.

$$p(3) = 2(3)^3 - 5(3)^2 - 4(3) + 3 = 0$$

Therefore, $x - 3$ is a factor of $p(x)$.

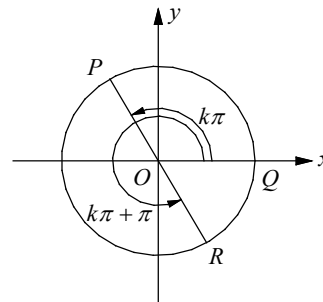
D) If $x - 1$ is a factor of $p(x)$, $p(1) = 0$.

$$p(1) = 2(1)^3 - 5(1)^2 - 4(1) + 3 = -4 \neq 0$$

Therefore, $x - 1$ is NOT a factor of $p(x)$.

Choice D is correct.

30. C



In the xy -plane above, the terminal side of $k\pi$ intersects the unit circle in quadrant II. In the

unit circle, $\sin \theta = \frac{y}{1} = y$. If $\sin(k\pi) = a$, the

y -coordinate of P is a , for which $a > 0$. If

the terminal side of $k\pi$ is in quadrant II, the terminal side of $k\pi + \pi$ intersects the unit circle in quadrant IV. The y -coordinate in quadrant II is positive but the y -coordinate in quadrant IV is negative. Therefore,

$$\sin(k\pi + \pi) = \frac{y}{1} = y = -a.$$

31. 1.5

The ratio of a to b is 2.25 times the ratio of b

to a . This can be written as $\frac{a}{b} = 2.25 \times \frac{b}{a}$.

$$\frac{a}{b} \cdot \frac{a}{b} = 2.25 \times \frac{b}{a} \cdot \frac{a}{b} \quad \text{Multiply each side by } \frac{a}{b}.$$

$$\frac{a^2}{b^2} = 2.25 \quad \text{Simplify.}$$

$$\frac{a}{b} = \pm\sqrt{2.25} = \pm 1.5 \quad \text{Square root each side.}$$

Since a and b are positive, $\frac{a}{b} = 1.5$

32. 210

$$\frac{2}{5}x - \frac{1}{5}y = 98 \quad \text{First equation}$$

$$\frac{2}{7}x + \frac{1}{14}y = 55 \quad \text{Second equation}$$

$$5\left(\frac{2}{5}x - \frac{1}{5}y\right) = 5(98) \quad \text{Multiply each side by 5.}$$

$$14\left(\frac{2}{7}x + \frac{1}{14}y\right) = 14(55) \quad \text{Multiply each side by 14.}$$

$$2x - y = 490 \quad \text{Simplify.}$$

$$4x + y = 770 \quad \text{Simplify.}$$

Add the two equations to get $6x = 1260$.

$$x = \frac{1260}{6} = 210$$

33. 7

The expression $p(x) = \frac{2x-1}{(x-4)^2 - 6(x-4) + 9}$ is undefined when the denominator of $p(x)$ is zero. Therefore, if $(x-4)^2 - 6(x-4) + 9$ is equal to 0, $p(x)$ is undefined.

$$(x-4)^2 - 6(x-4) + 9 = 0$$

The expression $(x-4)^2 - 6(x-4) + 9 = 0$ is a perfect square, which can be rewritten as $((x-4)-3)^2 = 0$.

The expression $((x-4)-3)^2$ is equal to zero if $(x-4)-3 = 0$. Solving for x gives $x = 7$.

34. 104

Jay bought two one-day Beijing tour tickets for 320 yuan each, so she paid 640 yuan for the two tickets. Set up a proportion.

$$\frac{1 \text{ dollar}}{6.14 \text{ yuans}} = \frac{x \text{ dollar}}{640 \text{ yuans}}$$

$$6.14x = 640 \quad \text{Cross Products}$$

$$x = \frac{640}{6.14} \approx 104.234$$

She paid \$104 dollars for the two tickets, to the nearest dollar.

35. 6.5

$$x^4 \cdot x^9 = x^n \cdot x^n$$

$$x^{4+9} = x^{n+n}$$

$$x^{13} = x^{2n}$$

$$13 = 2n$$

$$6.5 = n$$

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

Simplify.

36. 8

To find the point of intersection, substitute -7 for y in the equation $y = -(x+3)^2 + 9$.

$$-7 = -(x+3)^2 + 9 \quad \text{Substitute } -7 \text{ for } y.$$

$$-7 = -x^2 - 6x - 9 + 9 \quad \text{FOIL}$$

$$-7 = -x^2 - 6x \quad \text{Simplify.}$$

$$x^2 + 6x - 7 = 0 \quad \text{Make one side 0.}$$

$$(x+7)(x-1) = 0 \quad \text{Factor.}$$

$$x = -7 \text{ or } x = 1$$

Since \overline{PQ} is on a horizontal line, $y = -7$,

$$PQ = 1 - (-7) = 8.$$

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

The x -coordinate of the vertex of a parabola is the average of the two x -intercepts. Therefore, if the coordinates of the vertex of $y = a(x+3)(x-5)$

is (h, k) , $h = \frac{-3+5}{2} = 1$. Since the value of k is

given as -8 , $(h, k) = (1, -8)$. Substitute 1 for x and -8 for y in the equation of the quadratic function.

$$-8 = a(1+3)(1-5)$$

$$-8 = a(-16)$$

$$\frac{1}{2} = a$$

38. 5

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

$$f(-2) = (-2)^3 + (-2)^2 + (-2) + c = 0$$

$$\Rightarrow -8 + 4 - 2 + c = 0 \Rightarrow c = 6$$

$$\text{So, } f(x) = x^3 + x^2 + x + 6.$$

Since, $(-1, p)$ lies on the graph of f , $f(-1) = p$.

$$f(-1) = (-1)^3 + (-1)^2 + (-1) + 6 = p \Rightarrow p = 5$$