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real sat math B1_1-10_page-0070.jpg

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real sat math B1_1-10_page-0072.jpg

real sat math B1_1-10_page-0073.jpg

real sat math B1_1-10_page-0074.jpg

real sat math B1_1-10_page-0075.jpg

real sat math B1_1-10_page-0076.jpg

real sat math B1_1-10_page-0077.jpg

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real sat math B1_1-10_page-0090.jpg

real sat math B1_1-10_page-0091.jpg

real sat math B1_1-10_page-0092.jpg

real sat math B1_1-10_page-0093.jpg

real sat math B1_1-10_page-0094.jpg

real sat math B1_1-10_page-0095.jpg

SAT® December 2016 Int.

IMPORTANT REMINDERS:

1 A No. 2 pencil is required for the test. Do not use a mechanical pencil or pen.

2 Sharing any questions with anyone is a violation of the SAT® Program's Test Security and Fairness policies and may result in your scores being canceled.

3 Requests to cancel scores must be received in writing by the Wednesday following the test date.

3 **3**

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

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5. 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.
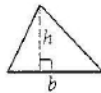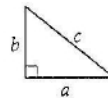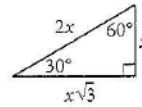
REFERENCE

$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$
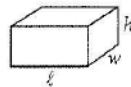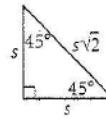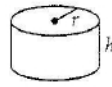
$A = \frac{1}{2} bh$
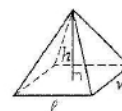
$c^2 = a^2 + b^2$

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.

1

$$x + y = 10$$
$$x - y = 8$$

If (x_1, y_1) is the solution to the system of equations above, what is the value of y_1 ?

A) 9

B) 2

C) 1

D) -1

2

A sports drink is sold in cans with capacities of 10 fluid ounces and 14 fluid ounces. A shipment of 54 cans of these sizes, totaling 636 fluid ounces of the sports drink, arrives at a store. Which of the following systems of equations could be used to determine the number of cans of each size in the shipment, where x is the number of 10-fluid-ounce cans and y is the number of 14-fluid-ounce cans?

A) $10x + 14y = 636$
$x + y = 54$

B) $10x + 14y = 54$
$x + y = 636$

C) $24xy = 636$
$x + y = 54$

D) $24xy = 54$
$x + y = 636$

3

$$y = 2(1.1)^x$$

The equation above models the number of miles, y, that Jenna plans to run on week x of an 8-week training regimen. Which of the following graphs models this situation?

A)

B)

C)

D)
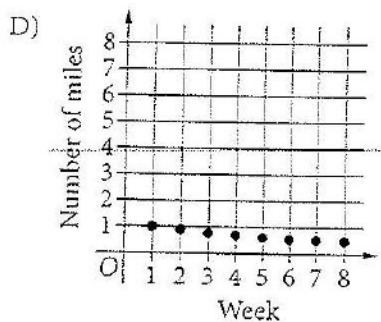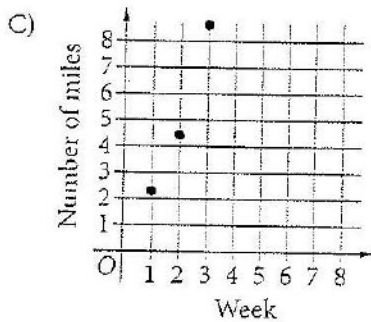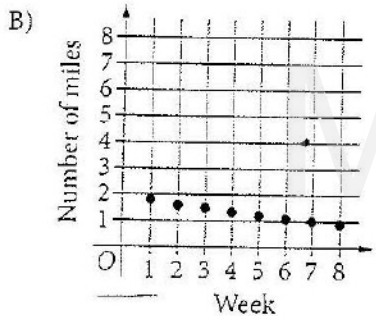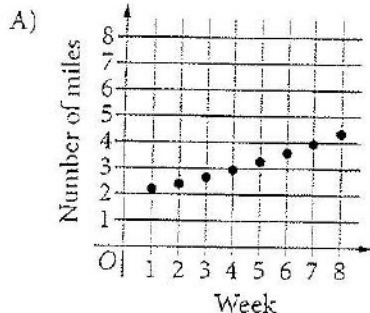
4

In the figure above, $AD = 4$, $AE = 6$, and segment DE is parallel to segment BC. What is the ratio of the length of segment BD to the length of segment CE ?

A) 2:5

B) 3:5

C) 2:3

D) 1:2

5

Claire, a metalsmith, has 500 grams (g) of sterling silver. She wants to use the sterling silver to create at least 20 rings and at least 10 bracelets. She uses 3 g of sterling silver to create each ring and 40 g of sterling silver to create each bracelet. Which of the following systems of inequalities r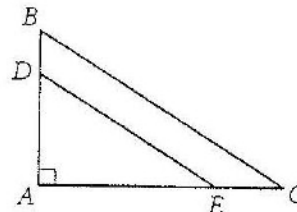epresents this situation, where r is the number of rings and b is the number of bracelets Claire can create with the sterling silver?

A) $3r + 40b \leq 500$
   $r \geq 3$
   $b \geq 40$

B) $3r + 40b \leq 500$
   $r \geq 20$
   $b \geq 10$

C) $20r + 10b \leq 500$
   $r \geq 3$
   $b \geq 40$

D) $20r + 10b \leq 500$
   $r \geq 20$
   $b \geq 10$

6

The height of an airplane, in feet, while it is in the process of landing is modeled by the equation $h(t) = 13{,}200 - 11t$, where t is the time, in seconds, since the landing process began. What is the meaning of the value 13,200 in the equation?

A) The distance the airplane travels while it is landing

B) The rate of descent of the airplane while it is landing

C) The speed of the airplane at the start of the landing process

D) The height of the airplane at the start of the landing process

7

Which of the following expressions is equivalent to $(x - 6)(x + 1) - 3(x - 2)$?

A) $x^2 - 8x$

B) $x^2 - 10x$

C) $x^2 - 8x - 12$

D) $x^2 - 10x - 12$

8

In the function f defined by $f(x) = x^2 + 5x + t$, what must t represent?

A) The maximum value of f

B) The minimum value of f

C) The x-intercept of the graph of f in the xy-plane

D) The y-intercept of the graph of f in the xy-plane

9

$$\sqrt{3-x} + 2 = x - 1$$

What is the solution of the equation above?

A) $x = 1$ only

B) $x = 2$ only

C) $x = 3$ only

D) $x = 2$ and $x = 3$

10

Sam needs to rent a truck to move furniture. Rental Truck Company A charges $29 per day plus $0.60 per mile driven. Rental Truck Company B charges $59 per day and has no charge per mile driven. Sam will rent the truck for 3 days and drive a total of x miles. The solution to which of the following inequalities is all values of x for which the total charge for renting from Company B will be less than the total charge for renting from Company A?

A) $x > 50$

B) $x > 107$

C) $x > 150$

D) $x > 440$

11

The binomial $x + 2y$ is a factor of which of the following?

A) $x^2 + 3xy + 2y^2$

B) $x^2 + 3xy + 3y^2$

C) $x^2 + 6xy + 6y^2$

D) $x^2 + 6xy + 9y^2$

12

If $N = \dfrac{x^2 + x - 6}{x^2 - x - 12} \div \dfrac{x - 2}{x - 4}$ and $N \geq 0$, which of the

following must be true?

A) $x \neq -4$

B) $x \neq -3$

C) $x \neq 1$

D) $x \neq 2$

13

> ## ENROLLMENT IS OPEN
> ## AT OUR TUTORING CENTER!
>
> <u>Tuition:</u>
> $25 per student for each tutoring session
>   Each tutoring session lasts an hour
> <u>Discounts:</u>
> • First session is free for all new students
> • Family discount: 10% off tuition if you
>   enroll more than one child
> <u>Books and Supplies:</u> $20 per student

The figure above shows an advertisement for a tutoring center. The tutoring center allows the two discounts to be used together. A family enrolls two children in the tutoring center program, each for the first time. If each child is signed up for x tutoring sessions, not including the first free session, which of the following functions represents the family's total cost $c(x)$, in dollars?

A) $c(x) = 45x + 40$

B) $c(x) = 45x - 5$

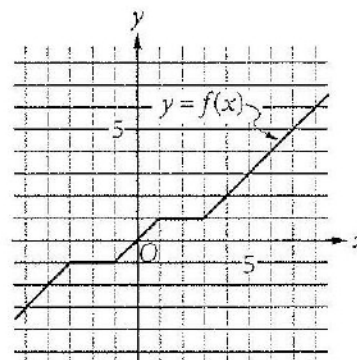C) $c(x) = 22.5x + 20$

D) $c(x) = 22.5x - 2.5$

14

If $x > 0$ and $\sqrt{x\sqrt{x}} = x^a$, what is the value of a ?

A) $\dfrac{3}{2}$

B) $\dfrac{3}{4}$

C) $\dfrac{1}{2}$

D) $\dfrac{1}{4}$

15

The complete graph of the function f is shown in the xy-plane above. What is the y-intercept of the graph of $y = f(x - 2)$?

A) -1

B) 0

C) 1

D) 2

DIRECTIONS

For **questions 16-20,** 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 3|1|/|2 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.

Answer: $\frac{7}{12}$

Write answer in boxes. → ← Fraction line

Grid in result. →

Answer: 2.5

← Decimal point

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

Answer: 201 – either position is correct

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

- 130 -

16

$$10 = 2.5(3y - 2)$$

According to the equation above, what is the value of y ?

17

The surface area, S, of a cylinder with a radius of 5 is defined by $S = 2\pi(5^2) + 2\pi(5)h$, where h is the height of the cylinder. If the equation is rewritten in the form $h = \dfrac{S}{x} - y$, where x and y are constants, what is the value of y ?

18

In the unit circle with center O, the length of arc $\overset{\frown}{PQ}$ is $\dfrac{\pi}{3}$. What is the value of the cosine of $\angle POQ$?

19

Janelle is shipping CDs to remote employees. She has two identical boxes filled with packing material that each weigh 3.2 ounces before packing them with CDs. She packed each box with the same number of CDs that each weigh 0.55 ounce. The total weight for the two boxes packed with CDs was 17.4 ounces. What is the total number of CDs that Janelle packed in the two boxes?

20

In the complex number system, what is the quotient when $\dfrac{i^4 - 16}{i^4 - 25}$ is divided by $\dfrac{i^2 - 4}{i^2 - 9}$?

(Note: $i = \sqrt{-1}$)

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

DIRECTIONS

For questions 1-30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 31-38**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

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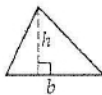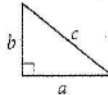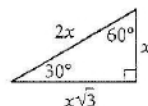
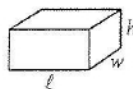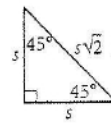**REFERENCE**

$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

$A = \frac{1}{2} bh$
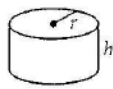
$c^2 = a^2 + b^2$

Special Right Triangles

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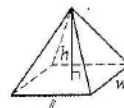
$V = \pi r^2 h$

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

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

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

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.

1

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

Which of the following expressions is equivalent to the one above?

A) $5x^3 - x + 5$

B) $6x^3 - x + 5$

C) $5x^4 + x^2 + 7x$

D) $6x^4 - 2x^2 + 10x$

2

A recipe recommends cooking a roast between 35 and 45 minutes per pound. Which of the following cooking times for a 10-pound roast follows the recommendation?

A) 100 minutes

B) 300 minutes

C) 400 minutes

D) 500 minutes

3

Fred wants to save enough money to pay for a car that costs $7,500 and 12 months of insurance that costs $110 per month. Fred has already saved $6,000 and plans to save an additional $350 per month. Which inequality can be used to determine the number of months, x, Fred could save in order to have enough money to buy the car and pay for 12 months of insurance?

A) $7,500 - 110x \le 6,000 - 250(12)$

B) $7,500 \div 110x \le 6,000 \div 250(12)$

C) $7,500 - 110(12) \le 6,000 - 350x$
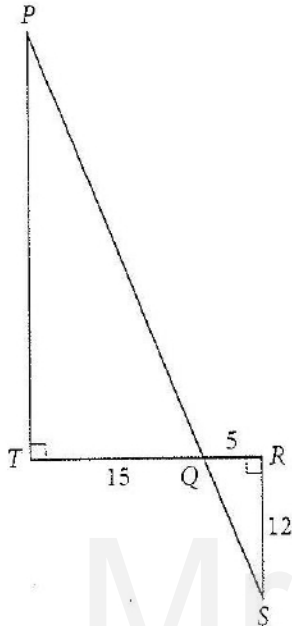
D) $7,500 \div 110(12) \le 6,000 \div 350x$

4

If $t^2 - 7t = 18$ and $t > 0$, what is the value of t ?

A) 9

B) 8

C) 5

D) 2

5

What is the length of $\overline{PQ}$ in the figure above?

A) 36

B) 39

C) $\sqrt{250}$

D) $\sqrt{369}$

Website P: $y = 0.65x + 1,000$

Website Q: $y = 0.5x + 1,450$

A company wants to place advertisements on two social media websites. The cost to place an advertisement on each site consists of an initial start-up fee plus a fee every time the advertisement is clicked. The equations above show the cost y, in dollars, to place an advertisement that receives x clicks on each site.
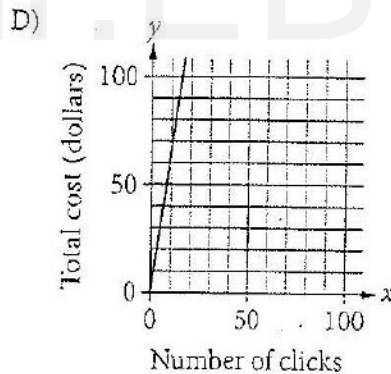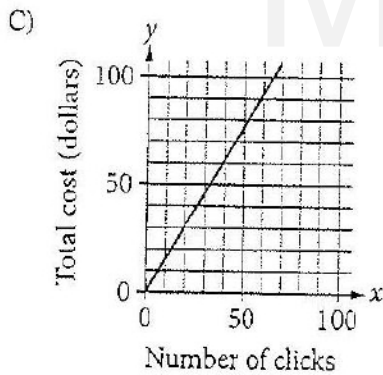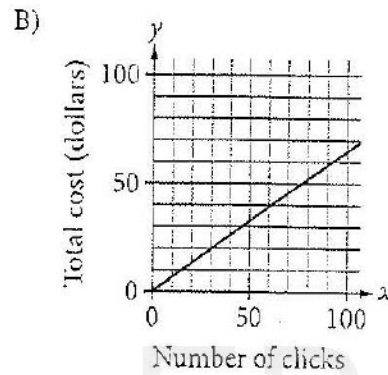
6

The company has a total budget of $5,000 to place an advertisement on Website Q. What is the maximum number of clicks the advertisement can receive on Website Q without going over budget?

A) 1,775

B) 7,100

C) 10,000

D) 12,900

7

The company is also considering placing an advertisement on Website R. Website R charges no initial fee, but charges the same amount as Website P every time the advertisement is clicked. Which of the following graphs represents the cost y, in dollars, of placing an advertisement that receives x clicks on Website R?
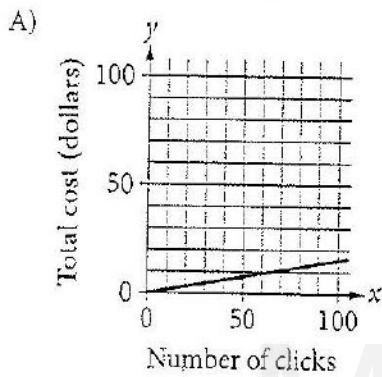
A)

Total cost (dollars) vs Number of clicks

B)

Total cost (dollars) vs Number of clicks

C)

Total cost (dollars) vs Number of clicks

D)

Total cost (dollars) vs Number of clicks

8

A sports agent, Ann, earns a commission equal to 10 percent of the salary of each athlete she represents. If her commission from an athlete she represents is $4,575.00, what is that athlete's salary?

A) $45.75

B) $457.50

C) $45,750.00

D) $457,500.00

9

Newton's second law of motion states that a force, F, acting on an object of mass m results in an acceleration, a, and can be represented using the equation $F = ma$. If mass is measured in kilograms (kg), and acceleration is measured in meters per second squared $\left(\dfrac{\text{meter}}{\text{sec}^2}\right)$, which of the following units could be used to measure force?

A) $\dfrac{\text{kg} \cdot \text{meter}}{\text{sec}^2}$

B) $\dfrac{\text{kg} \cdot \text{sec}^2}{\text{meter}}$

C) $\dfrac{\text{meter}}{\text{kg} \cdot \text{sec}^2}$

D) $\text{kg} \cdot \text{meter} \cdot \text{sec}^2$

10

Isabel began charging her phone battery when it was 40% charged. After 48 minutes, her phone battery was 80% charged. If the phone battery charges at a constant rate, how many more minutes will it take for her phone battery to be exactly 90% charged?

A) 4
B) 8
C) 10
D) 12

11

$$x + 2y = 1$$

The graph of the equation above is a line in the xy-plane. In which of the following equivalent forms of the equation does the y-intercept appear as a constant or coefficient?

A) $x + 2y - 1 = 0$

B) $y = \dfrac{1}{2} - \dfrac{1}{2}x$

C) $2y = 1 - x$

D) $x = 1 - 2y$

12

Students and teachers from Pine Brook Elementary School are going on a field trip to the zoo. Admission to the zoo will cost $7.50 for each student and $12 for each adult. It will cost a total of $681 for all 86 people on the field trip for admission to the zoo. How many students are going on the field trip?

A) 29
B) 70
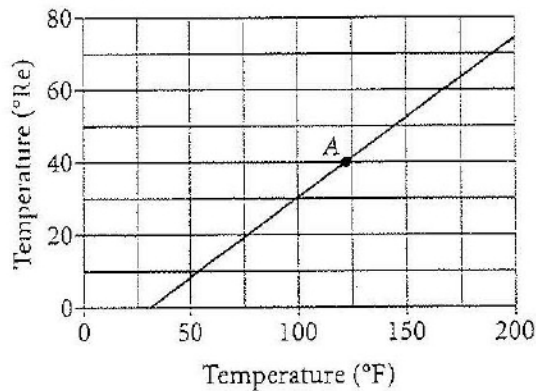C) 78
D) 91

13

137, 163, 115, 137, 179, 155, 171

A geologist recorded the heights, in feet, of a geyser's eruptions over a twelve-hour period. The heights are given in the list above. What is the median height recorded by the geologist?

A) 115
B) 137
C) 151
D) 155

14

Relationship between
Degrees Réaumur and Degrees Fahrenheit

The graph above shows the function r that relates the temperature $r(x)$, measured in degrees Réaumur, and the temperature x, measured in degrees Fahrenheit. If $A(122, 40)$ is a point on the graph of r, which of the following must be true?

A) A temperature of 122 degrees Réaumur corresponds to a temperature of 40 degrees Fahrenheit.

B) A temperature of 40 degrees Réaumur corresponds to a temperature of 122 degrees Fahrenheit.

C) For every increase of 40 degrees Fahrenheit, there is an increase of 122 degrees Réaumur.

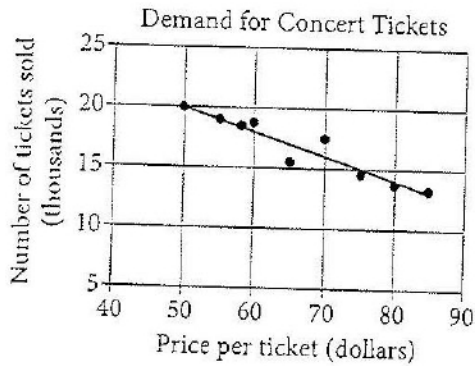D) For every increase of 40 degrees Réaumur, there is an increase of 122 degrees Fahrenheit.

15

If $a + b = 14$ and $a^2 - b^2 = 56$, what is the value of $a - b$?

A) 2

B) 4

C) 5

D) 9

Questions 16 and 17 refer to the following information.

Demand for Concert Tickets

The scatterplot above shows the relationship between the number of tickets sold and the price per ticket for 9 different concerts. The line of best fit is also shown.

16

Which of the following is closest to the mean number of tickets sold for the 9 concerts shown in the scatterplot?

A) 20,000

B) 17,000

C) 15,000

D) 13,000

17

For a concert where the ticket price was $100, the line of best fit correctly predicted the number of tickets sold. How many tickets were sold for that concert?

A) 6,000

B) 8,000

C) 10,000

D) 12,000

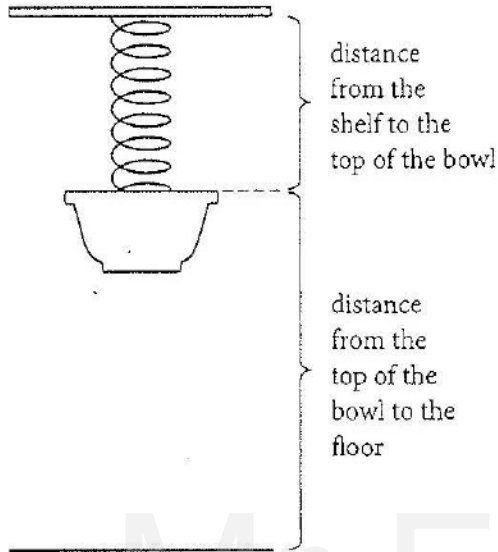**18**

If $\frac{2}{5}$ of $10x$ is 6 more than x, what is the value of x ?

A) 2

B) 3

C) 4

D) 6

Questions 19 and 20 refer to the following information.

distance from the shelf to the top of the bowl

distance from the top of the bowl to the floor

Number of weights in the bowl	Distance from the shelf to the top of the bowl (centimeters)
0	17.0
1	19.1
2	20.9
3	23.0
4	24.9
5	27.0

In the figure on the left above, a bowl is suspended by a spring from a horizontal shelf. When identical cylindrical weights are placed in the bowl, the spring extends so that the bowl becomes closer to the floor and farther from the shelf. The table on the right above gives a student's measurements of the distances from the shelf to the top of the bowl when various numbers of the weights were in the bowl.

19

Based on the table, each time one of the cylindrical weights is added to the bowl, by approximately how many centimeters does the distance from the top of the bowl to the floor decrease?

A) 0.5

B) 1.0

C) 2.0

D) 3.5

20

The function $d(n) = cn + b$, where c and b are constants, models the distance $d(n)$, in centimeters, from the shelf to the top of the bowl when n weights are in the bowl. If $g(n) = tn + w$, where t and w are constants, models the distance $g(n)$, in centimeters, from the top of the bowl to the floor when n weights are in the bowl, which of the following must be closest to c ?

A) t

B) w

C) $-t$

D) $-w$

21

	Native continent	
Class	Australia	Africa
Mammals	8	6
Reptiles	9	17
Birds	27	23

The table above shows the numbers of animals classified by class and native continent for all 90 animals at a local zoo. What fraction of the reptiles are native to Australia?

A) $\dfrac{1}{10}$

B) $\dfrac{9}{44}$

C) $\dfrac{13}{45}$

D) $\dfrac{9}{26}$

22

Ages of Participants

36	55	42
25	15	31
25	38	49
44	37	69
15	37	77
32	28	72

A journal article reported the mean age of participants in a study. The ages of the 18 participants in the study are given in the table above. Which of the following statements best describes why the mean age of participants alone may not be a useful measure of center for the distribution?

A) Outliers may cause the distribution to be skewed.

B) Repeated numbers may cause the distribution to be skewed.

C) The number of participants is too small to calculate and report the mean.

D) Sets containing an even number of data points may cause the distribution to be skewed.
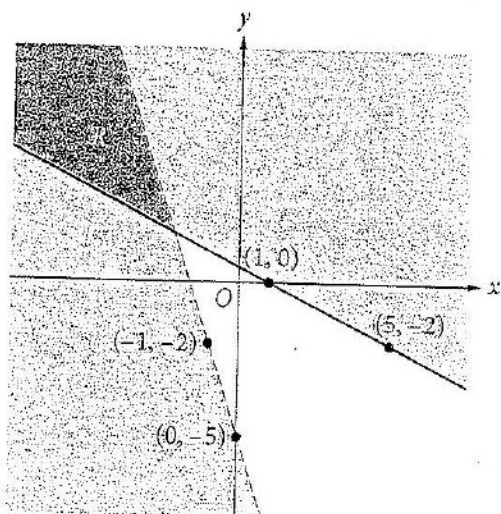
23
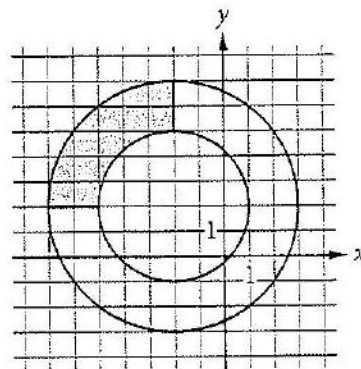
Each circle shown in the xy-plane above has center $(-2, 2)$, and their radii are 3 and 5. What is the area of the shaded region?

A) 3π

B) $\dfrac{7}{2}\pi$

C) 4π

D) $\dfrac{9}{2}\pi$

24

The shaded region R in the xy-plane above is the solution to a system of inequalities. Which of the following ordered pairs satisfies the system of inequalities?

A) $(-4, 4)$

B) $(-3, 4)$

C) $(-1, 1)$

D) $(0, -5)$

25

Texture	Mineral composition		
	Granitic	Andesitic	Basaltic
Coarse-grained	32	22	42
Fine-grained	16	16	31

The table above shows the distribution of all 159 igneous rocks in a university's earth science laboratory by mineral composition and texture. What fraction of the university's granitic rocks are coarse-grained?

A) $\dfrac{96}{159}$

B) $\dfrac{32}{159}$

C) $\dfrac{32}{96}$

D) $\dfrac{32}{48}$

26

In the xy-plane, which of the following does NOT contain any points that are part of the solution set to $3x - 4y > 12$?

A) The region where $x < 0$ and $y > 0$

B) The region where $x < 0$ and $y < 0$

C) The region where $x > 0$ and $y > 0$

D) The x-axis

27

$$f(x) = a \cdot b^x$$

The function f is defined above, where a and b are both constants greater than 1. Which of the following data sets could be modeled by the function f ?

A)

Bouncing Ball

Bounce	x	0	1	2	3	4
Maximum height (inches)	$f(x)$	32	16	8	4	2

B)

Experiment

Time (minutes)	x	0	1	2	3	4
Number of observations remaining	$f(x)$	10	8	6	4	2

C)

Bacteria Sample

Time (hours)	x	0	1	2	3	4
Population	$f(x)$	2	4	8	16	32

D)

Employee Net Pay

Time (hours)	x	1	2	3	4
Net pay (dollars)	$f(x)$	8	16	24	32

28

On a 60-mile road there are 7 rest stops placed at equal intervals, including one at each end of the road, as shown above. What is the distance, in feet, between two consecutive rest stops?
(Note: 1 mile = 5,280 feet)

A) 31,680
B) 36,960
C) 45,257
D) 52,800

29

The population of a community was 2,000 in 2013, and the population was projected to increase by 50 people each year. Under these conditions, which of the following expressions models the population of the community t years after 2013 ?

A) $2,000 + (1 + 0.05)^t$

B) $2,000(1 + 0.025)^t$

C) $2,000(1 + 0.025t)$

D) $2,000(1 + 0.05t)$

30

$$(x - p)(x - 3) > 0$$

In the inequality above, p is a constant. If the solution set for the inequality consists of the values of x such that $x < 3$ or $x > 5$, what is the value of p ?

A) -5

B) 0

C) 2

D) 5

DIRECTIONS

For questions 31-38, 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 [3 1 / 2] 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.

Answer: $\frac{7}{12}$ Answer: 2.5

Write answer in boxes. ← Fraction line

Grid in result.

← Decimal point

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

Answer: 201 — either position is correct

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

31

A dairy farm produces 5300 pounds of whole milk each day. The farm uses 21.2 pounds of whole milk to produce one pound of butter. At this rate, how many pounds of butter can the dairy farm produce each day?

33

$$5x - 2y = 8$$
$$x = 2y$$

What is the value of x in the system of equations above?

32

$$(x-1)^2 + (y-3)^2 = 16$$

The equation above forms a circle when graphed in the xy-plane. What is the radius of the circle?

34

In the xy-plane, the graph of the equation $3y - 6x = 8$ intersects the y-axis at the point $(0, a)$. What is the value of a ?

35

$$y = 8x$$
$$y = x^2 + 16$$

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

36

A cube made of osmium, the element with the highest density, measures 5 centimeters along each edge and has a mass of 2825 grams. What is the density, in grams per cubic centimeter, of the osmium from which the cube is made? (Density is mass per unit volume.)

Most Frequently Reported Prior Career Fields of the 535 Members of the 113th Congress

	Chamber	
	House of Representatives	Senate
Business	187	27
Education	77	15
Law	154	55
Public service	180	42

The table above gives the distribution, by chamber, of fields in which members of the 113th Congress of the United States most frequently reported spending a portion of their careers before being elected to Congress. There were 435 members in the House of Representatives and 100 members in the Senate at the time these data were collected. Some members reported more than one career field.

37

If x percent of members of the Senate reported education as a prior career field, what is the value of x ?

38

Of the 435 people who reported from the House of Representatives, 78 are female. Assuming that gender and prior career field are independent, how many female representatives would be expected to have reported a prior career field in public service? (Round your answer to the nearest whole number.)

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.