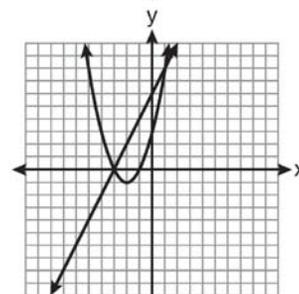## 0111ia

1 Given: $X = \{1, 2, 3, 4\}$
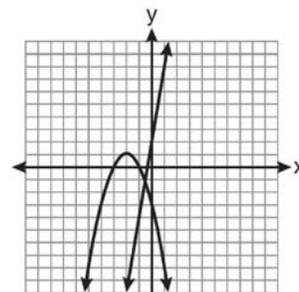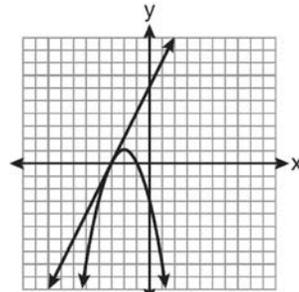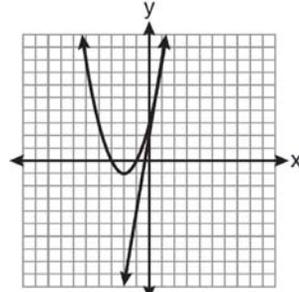
$Y = \{2, 3, 4, 5\}$

$Z = \{3, 4, 5, 6\}$
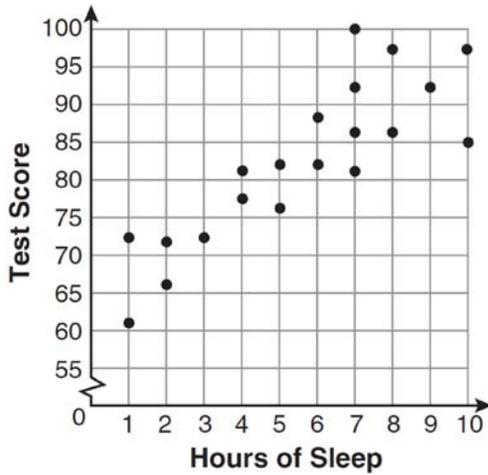
What is the intersection of sets X, Y, and Z?
1) $\{3, 4\}$
2) $\{2, 3, 4\}$
3) $\{3, 4, 5\}$
4) $\{1, 2, 3, 4, 5, 6\}$

2 Which graph could be used to find the solution of the system of equations $y = 2x + 6$ and $y = x^2 + 4x + 3$?

1)

2)

3)

4)

1

3 What is the relationship between the independent and dependent variables in the scatter plot shown below?

1) undefined correlation
2) negative correlation
3) positive correlation
4) no correlation

4 Tim ate four more cookies than Alice. Bob ate twice as many cookies as Tim. If x represents the number of cookies Alice ate, which expression represents the number of cookies Bob ate?
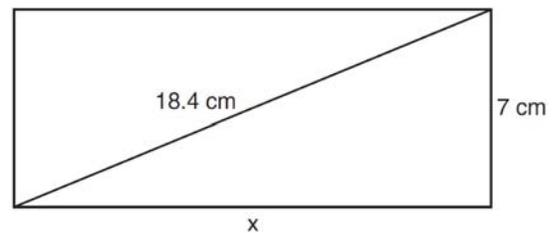1) $2 + (x + 4)$
2) $2x + 4$
3) $2(x + 4)$
4) $4(x + 2)$

5 Which relation is a function?
1) $\left\{ \left(\frac{3}{4}, 0 \right), (0, 1), \left(\frac{3}{4}, 2 \right) \right\}$
2) $\left\{ (-2, 2), \left(-\frac{1}{2}, 1 \right), (-2, 4) \right\}$
3) $\{ (-1, 4), (0, 5), (0, 4) \}$
4) $\{ (2, 1), (4, 3), (6, 5) \}$

6 What is the value of x in the equation $2(x - 4) = 4(2x + 1)$?
1) -2
2) 2
3) $-\frac{1}{2}$
4) $\frac{1}{2}$

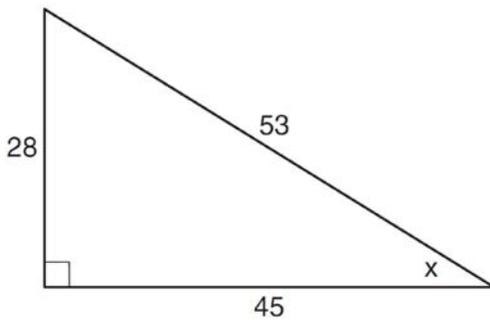7 The rectangle shown below has a diagonal of 18.4 cm and a width of 7 cm.

To the *nearest centimeter*, what is the length, x, of the rectangle?
1) 11
2) 17
3) 20
4) 25

2

8 When $a^3 - 4a$ is factored completely, the result is
   1) $(a-2)(a+2)$
   2) $a(a-2)(a+2)$
   3) $a^2(a-4)$
   4) $a(a-2)^2$

9 Which ratio represents $\sin x$ in the right triangle shown below?

   1) $\dfrac{28}{53}$
   2) $\dfrac{28}{45}$
   3) $\dfrac{45}{53}$
   4) $\dfrac{53}{28}$

10 What is the value of the expression $(a^3 + b^0)^2$ when $a = -2$ and $b = 4$?
   1) 64
   2) 49
   3) -49
   4) -64

11 A student correctly graphed the parabola shown below to solve a given quadratic equation.
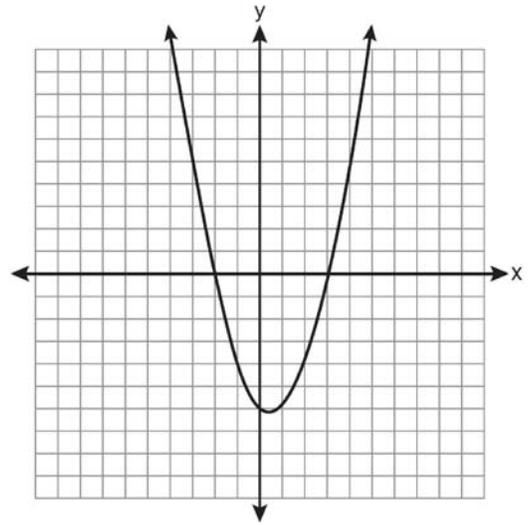
   What are the roots of the quadratic equation associated with this graph?
   1) −6 and 3
   2) −6 and 0
   3) −3 and 2
   4) −2 and 3

12 Which value of x is the solution of the equation $\dfrac{2}{3}x + \dfrac{1}{2} = \dfrac{5}{6}$?
   1) $\dfrac{1}{2}$
   2) 2
   3) $\dfrac{2}{3}$
   4) $\dfrac{3}{2}$

3

13 What is the range of the data represented in the box-and-whisker plot shown below?
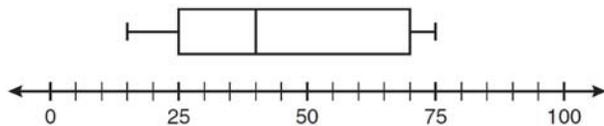

1) 40
2) 45
3) 60
4) 100

14 Which equation illustrates the associative property?
1) $x + y + z = x + y + z$
2) $x(y + z) = xy + xz$
3) $x + y + z = z + y + x$
4) $(x + y) + z = x + (y + z)$

15 Josh and Mae work at a concession stand. They each earn $8 per hour. Josh worked three hours more than Mae. If Josh and Mae earned a total of $120, how many hours did Josh work?
1) 6
2) 9
3) 12
4) 15

16 Which data set describes a situation that could be classified as quantitative?
1) the phone numbers in a telephone book
2) the addresses for students at Hopkins High School
3) the zip codes of residents in the city of Buffalo, New York
4) the time it takes each of Mr. Harper's students to complete a test

17 Which is the graph of $y = |x| + 2$?
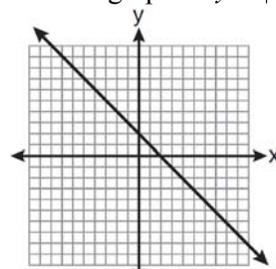
1)
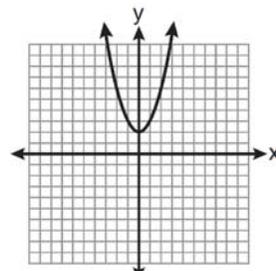
2)
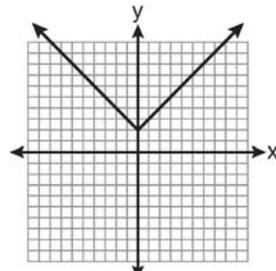
3)
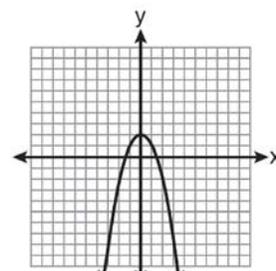
4)

18 Sam's grades on eleven chemistry tests were 90, 85, 76, 63, 94, 89, 81, 76, 78, 69, and 97. Which statement is true about the measures of central tendency?
1) mean > mode
2) mean < median
3) mode > median
4) median = mean

19 Which interval notation represents the set of all real numbers greater than 2 and less than or equal to 20?
1) $(2, 20)$
2) $(2, 20]$
3) $[2, 20)$
4) $[2, 20]$

20 What is the sum of $\frac{3}{2x}$ and $\frac{7}{4x}$?
1) $\frac{21}{8x^2}$
2) $\frac{13}{4x}$
3) $\frac{10}{6x}$
4) $\frac{13}{8x}$

21 What is $3\sqrt{2} + \sqrt{8}$ expressed in simplest radical form?
1) $3\sqrt{10}$
2) $3\sqrt{16}$
3) $5\sqrt{2}$
4) $7\sqrt{2}$

22 What is the slope of the line whose equation is $3x - 7y = 9$?
1) $-\frac{3}{7}$
2) $\frac{3}{7}$
3) $-\frac{7}{3}$
4) $\frac{7}{3}$

23 The figure shown below is composed of two rectangles and a quarter circle.
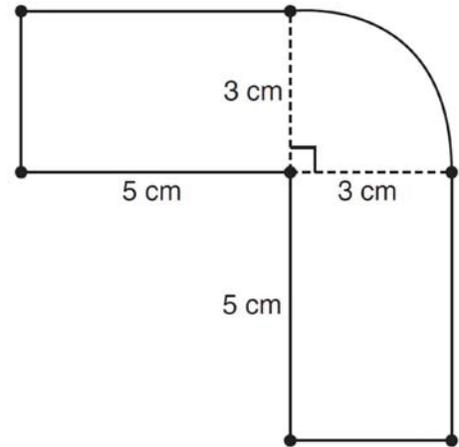
What is the area of this figure, to the *nearest square centimeter?*
1) 33
2) 37
3) 44
4) 58

24 The expression $\frac{(10w^3)^2}{5w}$ is equivalent to
1) $2w^5$
2) $2w^8$
3) $20w^5$
4) $20w^8$

5

25 If $\dfrac{ey}{n} + k = t$, what is y in terms of e, n, k, and t?

1) $y = \dfrac{tn + k}{e}$

2) $y = \dfrac{tn - k}{e}$

3) $y = \dfrac{n(t + k)}{e}$

4) $y = \dfrac{n(t - k)}{e}$

26 What is the result when $2x^2 + 3xy - 6$ is subtracted from $x^2 - 7xy + 2$?

1) $-x^2 - 10xy + 8$

2) $x^2 + 10xy - 8$

3) $-x^2 - 4xy - 4$

4) $x^2 - 4xy - 4$

27 What is an equation of the axis of symmetry of the parabola represented by $y = -x^2 + 6x - 4$?

1) $x = 3$

2) $y = 3$

3) $x = 6$

4) $y = 6$

28 Which equation has roots of -3 and 5?

1) $x^2 + 2x - 15 = 0$

2) $x^2 - 2x - 15 = 0$

3) $x^2 + 2x + 15 = 0$

4) $x^2 - 2x + 15 = 0$

29 A spinner that is equally divided into eight numbered sectors is spun 20 times. The table below shows the number of times the arrow landed in each numbered sector.

Spinner Sector	Number of Times
1	2
2	3
3	2
4	3
5	4
6	2
7	3
8	1

Based on the table, what is the empirical probability that the spinner will land on a prime number on the next spin?

1) $\dfrac{9}{20}$

2) $\dfrac{11}{20}$

3) $\dfrac{12}{20}$

4) $\dfrac{14}{20}$

30 Which expression represents $\dfrac{x^2 - x - 6}{x^2 - 5x + 6}$ in simplest form?

1) $\dfrac{x + 2}{x - 2}$

2) $\dfrac{-x - 6}{-5x + 6}$

3) $\dfrac{1}{5}$

4) -1

6

31 Roberta needs ribbon for a craft project. The ribbon sells for $3.75 per yard. Find the cost, in dollars, for 48 inches of the ribbon.

32 The square dart board shown below has a side that measures 40 inches. The shaded portion in the center is a square whose side is 15 inches. A dart thrown at the board is equally likely to land on any point on the dartboard.
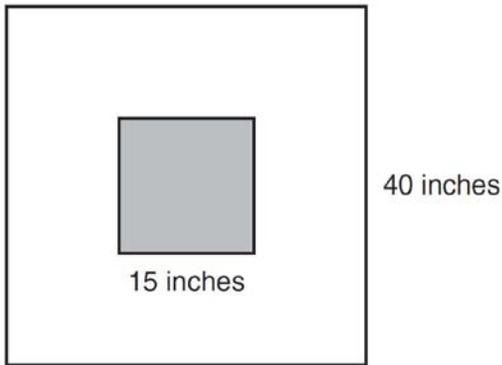
Find the probability that a dart hitting the board will *not* land in the shaded area.

33 As shown in the diagram below, a ladder 5 feet long leans against a wall and makes an angle of 65° with the ground. Find, to the *nearest tenth of a foot*, the distance from the wall to the base of the ladder.
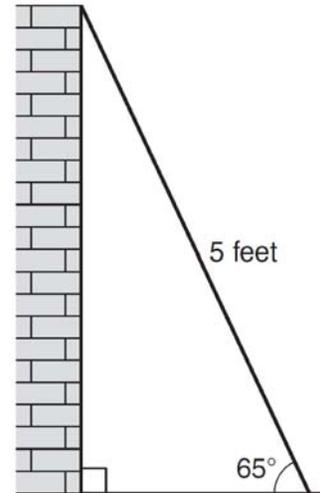
34 A line having a slope of $\frac{3}{4}$ passes through the point $(-8, 4)$. Write the equation of this line in slope-intercept form.

7

35 The test scores for 18 students in Ms. Mosher's class are listed below:

86, 81, 79, 71, 58, 87, 52, 71, 87,
87, 93, 64, 94, 81, 76, 98, 94, 68

Complete the frequency table below.

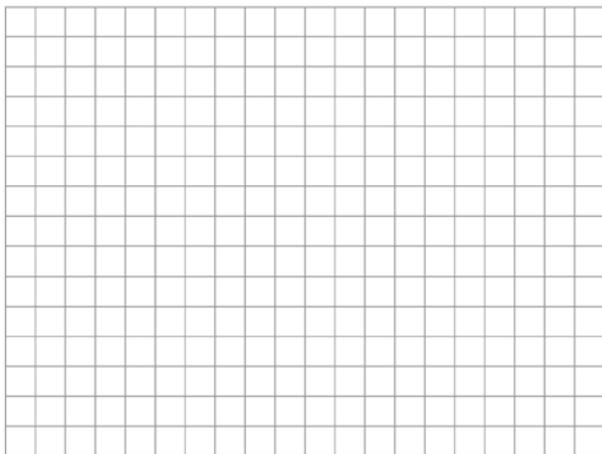| Interval	Tally	Frequency
51–60		
61–70		
71–80		
81–90		
91–100		

Draw and label a frequency histogram on the grid below.

36 Solve algebraically for x: $\dfrac{x+2}{6} = \dfrac{3}{x-1}$

37 An oil company distributes oil in a metal can shaped like a cylinder that has an actual radius of 5.1 cm and a height of 15.1 cm. A worker incorrectly measured the radius as 5 cm and the height as 15 cm. Determine the relative error in calculating the surface area, to the *nearest thousandth*.

38 The Booster Club raised $30,000 for a sports fund. No more money will be placed into the fund. Each year the fund will decrease by 5%. Determine the amount of money, to the *nearest cent*, that will be left in the sports fund after 4 years.

39 Graph the following systems of inequalities on the set of axes shown below and label the solution set S:

$$y > -x + 2$$

$$y \le \frac{2}{3}x + 5$$

8
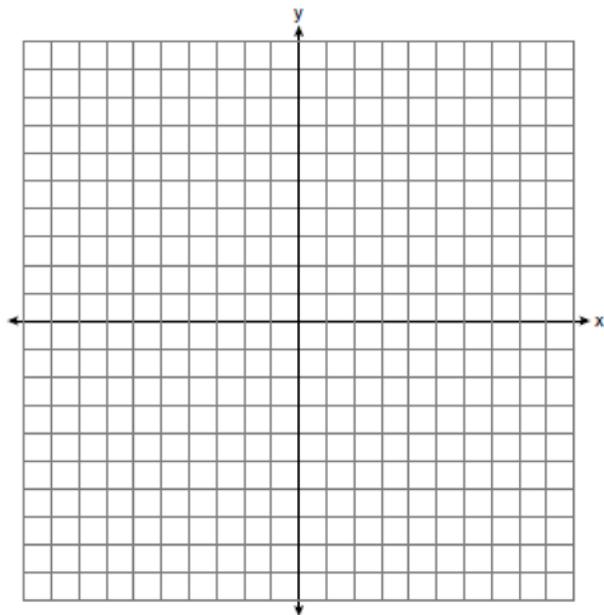
0111ia
Answer Section

1 ANS: 1   REF: 011101ia   STA: A.A.31   TOP: Set Theory
2 ANS: 4   REF: 011102ia   STA: A.G.9   TOP: Quadratic-Linear Systems
3 ANS: 3   REF: 011103ia   STA: A.S.12   TOP: Scatter Plots
4 ANS: 3   REF: 011104ia   STA: A.A.1   TOP: Expressions
5 ANS: 4

In (4), each element in the domain corresponds to a unique element in the range.

   REF: 011105ia   STA: A.G.3   TOP: Defining Functions
6 ANS: 1

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

$2x - 8 = 8x + 4$

$-12 = 6x$

$-2 = x$

   REF: 011106ia   STA: A.A.22   TOP: Solving Equations
7 ANS: 2

$\sqrt{18.4^2 - 7^2} \approx 17$

   REF: 011107ia   STA: A.A.45   TOP: Pythagorean Theorem
8 ANS: 2

$a^3 - 4a = a(a^2 - 4) = a(a - 2)(a + 2)$

   REF: 011108ia   STA: A.A.19   TOP: Factoring the Difference of Perfect Squares
9 ANS: 1

$\sin x = \dfrac{\text{opposite}}{\text{hypotenuse}} = \dfrac{28}{53}$

   REF: 011109ia   STA: A.A.42   TOP: Trigonometric Ratios
10 ANS: 2   REF: 011110ia   STA: A.N.6   TOP: Evaluating Expressions
11 ANS: 4   REF: 011111ia   STA: A.G.8   TOP: Solving Quadratics by Graphing
12 ANS: 1

$\dfrac{2x}{3} + \dfrac{1}{2} = \dfrac{5}{6}$

$\dfrac{2x}{3} = \dfrac{1}{3}$

$6x = 3$

$x = \dfrac{1}{2}$

   REF: 011112ia   STA: A.A.25   TOP: Solving Equations with Fractional Expressions

13 ANS: 3
$75 - 15 = 60$

REF: 011113ia   STA: A.S.6   TOP: Box-and-Whisker Plots
14 ANS: 4   REF: 011114ia   STA: A.N.1   TOP: Properties of Reals
15 ANS: 2
$J - M = 3$

$8J + 8M = 120$

$8J - 8M = 24$

$16J = 144$

$J = 9$

REF: 011115ia   STA: A.A.7   TOP: Writing Linear Systems
16 ANS: 4   REF: 011116ia   STA: A.S.1   TOP: Analysis of Data
17 ANS: 3   REF: 011117ia   STA: A.G.4   TOP: Graphing Absolute Value Functions
18 ANS: 1
mean $= 81\frac{7}{11}$, median $= 81$ and mode $= 76$

REF: 011118ia   STA: A.S.4   TOP: Central Tendency
19 ANS: 2   REF: 011119ia   STA: A.A.29   TOP: Set Theory
20 ANS: 2
$\dfrac{3}{2x} + \dfrac{7}{4x} = \dfrac{12x + 14x}{8x^2} = \dfrac{26x}{8x^2} = \dfrac{13}{4x}$

REF: 011120ia   STA: A.A.17   TOP: Addition and Subtraction of Rationals
21 ANS: 3
$3\sqrt{2} + \sqrt{8} = 3\sqrt{2} + \sqrt{4}\sqrt{2} = 3\sqrt{2} + 2\sqrt{2} = 5\sqrt{2}$

REF: 011121ia   STA: A.N.3   TOP: Operations with Radicals
KEY: addition
22 ANS: 2
$m = \dfrac{-A}{B} = \dfrac{-3}{-7} = \dfrac{3}{7}$

REF: 011122ia   STA: A.A.37   TOP: Slope
23 ANS: 2
$A = lw + lw + \dfrac{\pi r^2}{4} = 5 \cdot 3 + 5 \cdot 3 + \dfrac{\pi \cdot 3^2}{4} \approx 37$

REF: 011123ia   STA: A.G.1   TOP: Compositions of Polygons and Circles
KEY: area

24 ANS: 3

$$\frac{(10w^3)^2}{5w} = \frac{100w^6}{5w} = 20w^5$$

REF: 011124ia   STA: A.A.12   TOP: Powers of Powers

25 ANS: 4

$$\frac{ey}{n} + k = t$$

$$\frac{ey}{n} = t - k$$

$$y = \frac{n(t - k)}{e}$$

REF: 011125ia   STA: A.A.23   TOP: Transforming Formulas

26 ANS: 1   REF: 011126ia   STA: A.A.13   TOP: Addition and Subtraction of Polynomials
KEY: subtraction

27 ANS: 1

$$x = \frac{-b}{2a} = \frac{-6}{2(-1)} = 3.$$

REF: 011127ia   STA: A.A.41   TOP: Identifying the Vertex of a Quadratic Given Equation

28 ANS: 2

$$x^2 - 2x - 15 = 0$$

$$(x - 5)(x + 3) = 0$$

$$x = 5 \quad x = -3$$

REF: 011128ia   STA: A.A.28   TOP: Roots of Quadratics

29 ANS: 3

$$\frac{3 + 2 + 4 + 3}{20} = \frac{12}{20}$$

REF: 011129ia   STA: A.S.21   TOP: Experimental Probability

30 ANS: 1

$$\frac{x^2 - x - 6}{x^2 - 5x + 6} = \frac{(x - 3)(x + 2)}{(x - 3)(x + 2)} = \frac{x + 2}{x - 2}$$

REF: 011130ia   STA: A.A.16   TOP: Rational Expressions
KEY: $a > 0$

31 ANS:

$$5. \ 48 \text{ inches} \times \frac{1 \text{ yard}}{36 \text{ inches}} = \frac{4}{3} \text{ yards} \times \$3.75 = \$5.00$$

REF: 011131ia   STA: A.M.2   TOP: Conversions

32 ANS:

$$\frac{1375}{1600} \cdot \frac{40^2 - 15^2}{40^2} = \frac{1375}{1600}$$

REF: 011132ia   STA: A.S.20   TOP: Theoretical Probability

33 ANS:

2.1. $\cos 65 = \dfrac{x}{5}$

$\qquad x \approx 2.1$

REF: 011133ia   STA: A.A.44   TOP: Using Trigonometry to Find a Side

34 ANS:

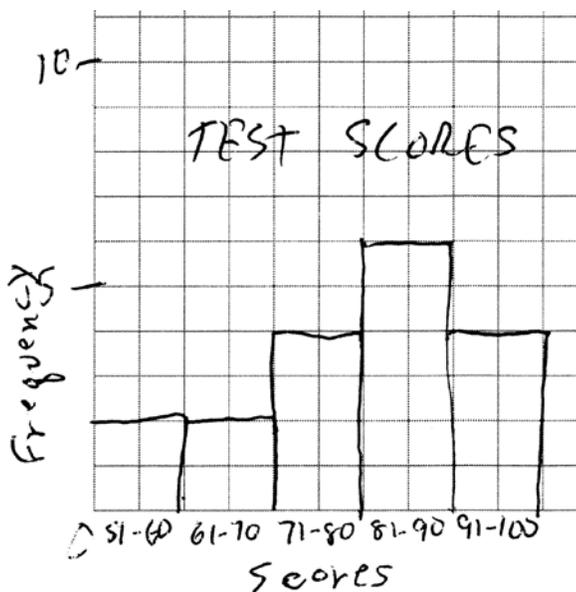$y = \dfrac{3}{4}x + 10.$ $y = mx + b$

$\qquad\qquad 4 = \dfrac{3}{4}(-8) + b$

$\qquad\qquad 4 = -6 + b$

$\qquad\qquad 10 = b$

REF: 011134ia   STA: A.A.34   TOP: Writing Linear Equations

35 ANS:

Interval	Tally	Frequency
51–60	||	2
61–70	||	2
71–80	||||	4
81–90	⊬⊦|	6
91–100	||||	4

REF: 011135ia   STA: A.S.5   TOP: Frequency Histograms, Bar Graphs and Tables

36 ANS:

$4, -5.$ $\dfrac{x+2}{6} = \dfrac{3}{x-1}$

$\qquad (x+2)(x-1) = 18$

$\qquad x^2 - x + 2x - 2 = 18$

$\qquad x^2 + x - 20 = 0$

$\qquad (x+5)(x-4) = 0$

$\qquad x = -5 \text{ or } 4$

REF: 011136ia   STA: A.A.26   TOP: Solving Rationals

37 ANS:

$0.029.$ $\dfrac{[2\pi(5.1)^2 + 2\pi(5.1)(15.1)] - [2\pi(5)^2 + 2\pi(5)(15)]}{2\pi(5.1)^2 + 2\pi(5.1)(15.1)} \approx \dfrac{647.294 - 628.319}{647.294} \approx 0.029$
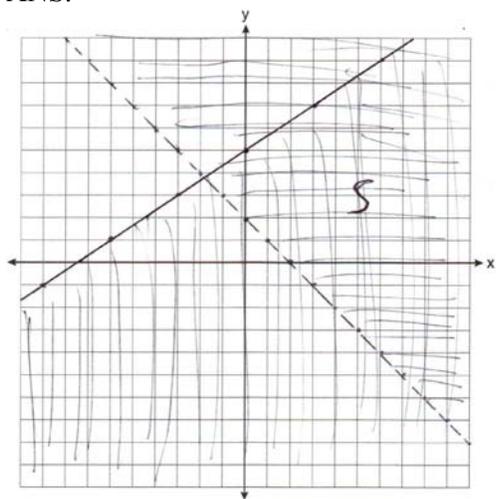
REF: 011137ia   STA: A.M.3   TOP: Error   KEY: volume and surface area

38 ANS:

$24{,}435.19.$ $30000(.95)^4 \approx 24435.19$

REF: 011138ia   STA: A.A.9   TOP: Exponential Functions

39 ANS:

REF: 011139ia   STA: A.G.7   TOP: Systems of Linear Inequalities