Dear Sir

I have to acknowledge the receipt of your favor of May 14, in which you mention that you have finished the 6. first books of Euclid, plane trigonometry, surveying & algebra and ask whether I think a further pursuit of that branch of science would be useful to you. There are some propositions in the latter books of Euclid, & some of Archimedes, which are useful, & I have no doubt you have been made acquainted with them. Trigonometry, so far as this, is most valuable to every man, there is scarcely a day in which he will not resort to it for some of the purposes of common life. The science of calculation also is indispensible as far as the extraction of the square & cube roots; Algebra as far as the quadratic equation & the use of logarithms are often of value in ordinary cases: but all beyond these is but a luxury; a delicious luxury indeed; but not to be indulged in by one who is to have a profession to follow for his subsistence. In this light I view the conic sections, curves of the higher orders, perhaps even spherical trigonometry, Algebraical operations beyond the 2d dimension, and fluxions.

Letter from Thomas Jefferson to William G. Munford, Monticello, June 18, 1799.
Answer Section

1 ANS: 2 PTS: 2 REF: fall0701ia STA: A.S.7
TOP: Scatter Plots

2 ANS: 3 PTS: 2 REF: fall0702ia STA: A.S.23
TOP: Theoretical Probability
KEY: mutually exclusive events

3 ANS: 3
\[
\frac{(2x^3)(8x^5)}{4x^6} = \frac{16x^8}{4x^6} = 4x^2
\]

PTS: 2 REF: fall0703ia STA: A.A.12 TOP: Division of Powers

4 ANS: 4 PTS: 2 REF: fall0704ia STA: A.A.29
TOP: Set Theory

5 ANS: 3 PTS: 2 REF: fall0705ia STA: A.N.1
TOP: Identifying Properties

6 ANS: 3 PTS: 2 REF: fall0706ia STA: A.A.19
TOP: Factoring the Difference of Perfect Squares

7 ANS: 1
A rooster crows before sunrise, not because of the sun.

PTS: 2 REF: fall0707ia STA: A.S.14 TOP: Analysis of Data

8 ANS: 3
\[5x + 2y = 48\]
\[3x + 2y = 32\]
\[2x = 16\]
\[x = 8\]

PTS: 2 REF: fall0708ia STA: A.A.7 TOP: Writing Linear Systems

9 ANS: 2
The median score, 10, is the vertical line in the center of the box.

PTS: 2 REF: fall0709ia STA: A.S.5 TOP: Box-and-Whisker Plots

10 ANS: 3 PTS: 2 REF: fall0710ia STA: A.A.31
TOP: Set Theory

11 ANS: 1
\[30^2 + 40^2 = c^2.\] 30, 40, 50 is a multiple of 3, 4, 5.

\[2500 = c^2\]
\[50 = c\]

PTS: 2 REF: fall0711ia STA: A.A.45 TOP: Pythagorean Theorem
12 ANS: 4  
\[ V = \pi r^2 h = \pi \cdot 6^2 \cdot 15 \approx 1696.5 \]

PTS: 2  REF: fall0712ia  STA: A.G.2  TOP: Volume

13 ANS: 1  
\[ m = \frac{3 - 0}{0 - 2} = -\frac{3}{2} \] Using the given \( y \)-intercept \( (0, 3) \) to write the equation of the line \( y = -\frac{3}{2}x + 3 \).

PTS: 2  REF: fall0713ia  STA: A.A.35  TOP: Writing Linear Equations

14 ANS: 2  
The two values are shoe size and height.

PTS: 2  REF: fall0714ia  STA: A.S.2  TOP: Analysis of Data

15 ANS: 4  PTS: 2  REF: fall0715ia  STA: A.A.5  TOP: Modeling Inequalities

16 ANS: 3  
\[ m = \frac{4 - 10}{3 - (-6)} = \frac{2}{3} \]

PTS: 2  REF: fall0716ia  STA: A.A.33  TOP: Slope

17 ANS: 4  PTS: 2  REF: fall0717ia  STA: A.G.4  TOP: Families of Functions

18 ANS: 2  
\[ \frac{9x^4 - 27x^6}{3x^3} = \frac{9x^4(1 - 3x^2)}{3x^3} = 3x(1 - 3x^2) \]

PTS: 2  REF: fall0718ia  STA: A.A.14  TOP: Rational Expressions

19 ANS: 3  
\[ 35000(1 - 0.05)^4 \approx 28507.72 \]

PTS: 2  REF: fall0719ia  STA: A.A.9  TOP: Exponential Functions

20 ANS: 2  
The slope of the inequality is \( -\frac{1}{2} \).

PTS: 2  REF: fall0720ia  STA: A.G.6  TOP: Linear Inequalities

21 ANS: 1  
\[ \sin C = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{13}{85} \]

PTS: 2  REF: fall0721ia  STA: A.A.42  TOP: Trigonometric Ratios

22 ANS: 4  
The transformation is a reflection in the \( x \)-axis.

PTS: 2  REF: fall0722ia  STA: A.G.5  TOP: Graphing Absolute Value Functions
23 ANS: 1 PTS: 2 REF: fall0723ia STA: A.M.3
TOP: Error

24 ANS: 1
\(-2x + 5 > 17\)
\(-2x > 12\)
\(x < -6\)

PTS: 2 REF: fall0724ia STA: A.A.21 TOP: Interpreting Solutions

25 ANS: 2 PTS: 2 REF: fall0725ia STA: A.N.4
TOP: Operations with Scientific Notation

26 ANS: 4
\(w(w + 5) = 36\)
\(w^2 + 5w - 36 = 0\)

PTS: 2 REF: fall0726ia STA: A.A.5 TOP: Modeling Equations

27 ANS: 4
\(\frac{(d \times 3) + (2 \times 2d)}{2 \times 3} = \frac{3d + 4d}{6} = \frac{7d}{6}\)

PTS: 2 REF: fall0727ia STA: A.A.17 TOP: Addition and Subtraction of Rationals

28 ANS: 1 PTS: 2 REF: fall0728ia STA: A.A.15
TOP: Undefined Rationals

29 ANS: 4 PTS: 2 REF: fall0729ia STA: A.A.2
TOP: Expressions

30 ANS: 4 PTS: 2 REF: fall0730ia STA: A.G.3
TOP: Defining Functions

31 ANS:
\(30\sqrt{2}. \quad 5\sqrt{72} = 5\sqrt{36 \cdot 2} = 30\sqrt{2}\)

PTS: 2 REF: fall0731ia STA: A.N.2 TOP: Simplifying Radicals

32 ANS:

4. \(3 + 2g = 5g - 9\)
\(12 = 3g\)
\(g = 4\)

PTS: 2 REF: fall0732ia STA: A.A.22 TOP: Solving Equations
33. ANS:
Serena needs 24 \((9 + 6 + 9)\) feet of fencing to surround the rectangular portion of the garden. The length of the fencing needed for the semicircular portion of the garden is \(\frac{1}{2} \pi d = 3\pi \approx 9.4\) feet.

PTS: 2  REF: fall0733ia  STA: A.G.1  TOP: Compositions of Polygons and Circles

34. ANS:
\[
\frac{\text{distance}}{\text{time}} = \frac{60}{1.2} = 50, \quad \frac{\text{distance}}{\text{time}} = \frac{60}{40} = 1.5, \quad \text{speed} \times \text{time} = 55 \times 2 = 110. \quad 120 - 110 = 10
\]

PTS: 3  REF: fall0734ia  STA: A.M.1  TOP: Speed

35. ANS:
7. \(15x + 22 \geq 120\)
\[x \geq 6.53\]

PTS: 3  REF: fall0735ia  STA: A.A.6  TOP: Modeling Inequalities

36. ANS:
(S,S), (S,K), (S,D), (K,S), (K,K), (K,D), (D,S), (D,K), (D,D), \(\frac{4}{9}\)

PTS: 3  REF: fall0736ia  STA: A.S.19  TOP: Sample Space

37. ANS:
225000, 175000, the median better represents the value since it is closer to more values than the mean.

PTS: 4  REF: fall0737ia  STA: A.S.4  TOP: Frequency Histograms, Bar Graphs and Tables

38. ANS:

PTS: 4  REF: fall0738ia  STA: A.G.9  TOP: Quadratic-Linear Systems
39 \hspace{1cm} \text{ANS:}

\begin{align*}
6, -2, & \quad \frac{x + 1}{x} = \frac{-7}{x - 12} \\
(x + 1)(x - 12) &= -7x \\
x^2 - 11x - 12 &= -7x \\
x^2 - 4x - 12 &= 0 \\
(x - 6)(x + 2) &= 0 \\
x &= 6 \text{ or } -2
\end{align*}

PTS: 4 \hspace{1cm} \text{REF: fall0739ia} \hspace{1cm} \text{STA: A.A.26} \hspace{1cm} \text{TOP: Solving Rationals}
060801ia

Answer Section

1. ANS: 1
   PTS: 2
   REF: 060801ia
   STA: A.G.4
   TOP: Families of Functions

2. ANS: 4
   $P(G\ or\ W) = \frac{4}{8},\ P(G\ or\ B) = \frac{3}{8},\ P(Y\ or\ B) = \frac{4}{8},\ P(Y\ or\ G) = \frac{5}{8}$
   PTS: 2
   REF: 060802ia
   STA: A.S.22
   TOP: Theoretical Probability

3. ANS: 1
   To determine student interest, survey the widest range of students.
   PTS: 2
   REF: 060803ia
   STA: A.S.3
   TOP: Analysis of Data

4. ANS: 1
   PTS: 2
   REF: 060804ia
   STA: A.A.19
   TOP: Factoring the Difference of Perfect Squares

5. ANS: 4
   PTS: 2
   REF: 060805ia
   STA: A.S.12
   TOP: Scatter Plots

6. ANS: 2
   $3c + 4m = 12.50$
   $3c + 2m = 8.50$
   $2m = 4.00$
   $m = 2.00$
   PTS: 2
   REF: 060806ia
   STA: A.A.7
   TOP: Writing Linear Systems

7. ANS: 1
   PTS: 2
   REF: 060807ia
   STA: A.A.13
   TOP: Multiplication of Polynomials

8. ANS: 3
   PTS: 2
   REF: 060808ia
   STA: A.N.8
   TOP: Permutations

9. ANS: 2
   $1.5^3 = 3.375$
   PTS: 2
   REF: 060809ia
   STA: A.G.2
   TOP: Volume

10. ANS: 4
    
    $x^2 - 2 = x$  Since $y = x$, the solutions are $(2, 2)$ and $(-1, -1)$.
    $x^2 - x - 2 = 0$
    $(x - 2)(x + 1) = 0$
    $x = 2$ or $-1$
    PTS: 2
    REF: 060810ia
    STA: A.A.11
    TOP: Quadratic-Linear Systems
11 ANS: 1 PTS: 2 REF: 060811ia STA: A.G.10
TOP: Identifying the Vertex of a Quadratic Given Graph

12 ANS: 3
\[ b = 42 - r \quad r = 2b + 3 \]
\[ r = 2b + 3 \quad r = 2(42 - r) + 3 \]
\[ r = 84 - 2r + 3 \]
\[ 3r = 87 \]
\[ r = 29 \]

PTS: 2 REF: 060812ia STA: A.A.7 TOP: Writing Linear Systems

13 ANS: 4
\[ \frac{2^6}{2^3} = 2^3 \]

PTS: 2 REF: 060813ia STA: A.A.12 TOP: Division of Powers

14 ANS: 1
The slope of both is \(-4\).

PTS: 2 REF: 060814ia STA: A.A.38 TOP: Parallel and Perpendicular Lines

15 ANS: 4
\[ \frac{x^2 - 1}{x + 1} \cdot \frac{x + 3}{3x - 3} = \frac{(x + 1)(x - 1)}{x + 1} \cdot \frac{x + 3}{3(x - 1)} = \frac{x + 3}{3} \]

PTS: 2 REF: 060815ia STA: A.A.18 TOP: Multiplication and Division of Rationals

16 ANS: 2
\[ \sin A = \frac{8}{12} \]
\[ A \approx 42 \]

PTS: 2 REF: 060816ia STA: A.A.43 TOP: Using Trigonometry to Find an Angle

17 ANS: 3 PTS: 2 REF: 060817ia STA: A.A.15
TOP: Undefined Rationals

18 ANS: 2
The set of integers greater than \(-2\) and less than \(6\) is \(\{-1, 0, 1, 2, 3, 4, 5\}\). The subset of this set that is the positive factors of \(5\) is \(\{1, 5\}\). The complement of this subset is \(\{-1, 0, 2, 3, 4\}\).

PTS: 2 REF: 060818ia STA: A.A.30 TOP: Set Theory

19 ANS: 3
The other situations are quantitative.

PTS: 2 REF: 060819ia STA: A.S.1 TOP: Analysis of Data
20 \ ANS: \ 3 \\
\ m = \frac{1 - (-4)}{-6 - 4} = \frac{1}{2} \\
\ PTS: \ 2 \ \ \ \ REF: \ 060820ia \ \ STA: \ A.A.33 \ \ TOP: \ Slope

21 \ ANS: \ 2 \ \ \ \ PTS: \ 2 \ \ \ \ REF: \ 060821ia \ \ STA: \ A.A.5 \\
\ TOP: \ Modeling \ Inequalities

22 \ ANS: \ 3 \\
\ 25 - 18 = 7 \\
\ PTS: \ 2 \ \ \ \ REF: \ 060822ia \ \ STA: \ A.S.9 \\
\ TOP: \ Frequency \ Histograms, \ Bar \ Graphs \ and \ Tables

23 \ ANS: \ 4 \\
\ 25(x - 3) = 25x - 75 \\
\ PTS: \ 2 \ \ \ \ REF: \ 060823ia \ \ STA: \ A.A.1 \ \ TOP: \ Expressions

24 \ ANS: \ 2 \\
\ \frac{2x^2 - 12x}{x - 6} = \frac{2x(x - 6)}{x - 6} = 2x \\
\ PTS: \ 2 \ \ \ \ REF: \ 060824ia \ \ STA: \ A.A.14 \ \ TOP: \ Rational \ Expressions

25 \ ANS: \ 3 \ \ \ \ PTS: \ 2 \ \ \ \ REF: \ 060825ia \ \ STA: \ A.A.45 \\
\ TOP: \ Pythagorean \ Theorem

26 \ ANS: \ 4 \\
\ \frac{5}{x} = \frac{x + 13}{6} \\
\ \ x^2 + 13x = 30 \\
\ \ x^2 + 13x - 30 = 0 \\
\ (x + 15)(x - 2) = 0 \\
\ \ x = -15 \ or \ 2 \\
\ PTS: \ 2 \ \ \ \ REF: \ 060826ia \ \ STA: \ A.A.26 \ \ TOP: \ Solving \ Rationals

27 \ ANS: \ 4 \\
\ \ SA = 2lw + 2hw + 2lh = 2(3)(1.5) + 2(2)(1.5) + 2(3)(2) = 27 \\
\ PTS: \ 2 \ \ \ \ REF: \ 060827ia \ \ STA: \ A.G.2 \ \ TOP: \ Surface \ Area
28 ANS: 1
\[
\frac{\sqrt{32}}{4} = \frac{\sqrt{16 \times 2}}{4} = \sqrt{2}
\]

PTS: 2     REF: 060828ia     STA: A.N.2     TOP: Simplifying Radicals

29 ANS: 4     PTS: 2     REF: 060829ia     STA: A.G.5
TOP: Graphing Quadratic Functions

30 ANS: 2     PTS: 2     REF: 060830ia     STA: A.A.9
TOP: Exponential Functions

31 ANS:
Ann’s. \( \frac{225}{15} = 15 \text{ mpg} \) is greater than \( \frac{290}{23.2} = 12.5 \text{ mpg} \)

PTS: 2     REF: 060831ia     STA: A.M.1     TOP: Using Rate

32 ANS:
\( 36 - 9\pi \). 15.6. Area of square–area of 4 quarter circles. \( (3 + 3)^2 - 3^2 \pi = 36 - 9\pi \)

PTS: 2     REF: 060832ia     STA: A.G.1     TOP: Compositions of Polygons and Circles

33 ANS:
\( 0 \leq t \leq 40 \)

PTS: 2     REF: 060833ia     STA: A.A.31     TOP: Set Theory

34 ANS:
\( 10 + 2d \geq 75, 33. \ 10 + 2d \geq 75 \)
\[ d \geq 32.5 \]

PTS: 3     REF: 060834ia     STA: A.A.6     TOP: Modeling Inequalities

35 ANS:
\( \frac{1}{6}, 16.67\%, \$13.50. \ \frac{18 - 15}{18} = \frac{1}{6}, 18 \times 0.75 \times 13.5 \)

PTS: 3     REF: 060835ia     STA: A.N.5     TOP: Percents

36 ANS:

PTS: 3     REF: 060836ia     STA: A.G.8     TOP: Solving Quadratics by Graphing
37 ANS:
\[ w(w + 15) = 54, \ 3, \ 18. \quad w(w + 15) = 54 \]
\[ w^2 + 15w - 54 = 0 \]
\[ (w + 18)(w - 3) = 0 \]
\[ w = 3 \]

PTS: 4  REF: 060837ia  STA: A.A.8  TOP: Geometric Applications of Quadratics

38 ANS:
\[ 618.45, \ 613.44, \ 0.008. \quad 21.7 \times 28.5 = 618.45. \quad 21.6 \times 28.4 = 613.44. \quad \frac{618.45 - 613.44}{613.44} \approx 0.008. \quad \text{An error of less than 1\% would seem to be insignificant.} \]

PTS: 4  REF: 060838ia  STA: A.M.3  TOP: Error

39 ANS:
\[ 315,000, \ 180,000, \ \text{the median better represents value since it is closer to more prices than the mean.} \]

PTS: 4  REF: 060839ia  STA: A.S.4  TOP: Frequency Histograms, Bar Graphs and Tables
1. ANS: 4
   
   $5p - 1 = 2p + 20$
   
   $3p = 21$
   
   $p = 7$

   PTS: 2  
   REF: 080801ia  
   STA: A.A.22  
   TOP: Solving Equations

2. ANS: 2  
   PTS: 2  
   REF: 080802ia  
   STA: A.N.1  
   TOP: Identifying Properties

3. ANS: 1  
   PTS: 2  
   REF: 080803ia  
   STA: A.A.4  
   TOP: Modeling Inequalities

4. ANS: 3  
   mean = 6, median = 6 and mode = 7
   
   PTS: 2  
   REF: 080804ia  
   STA: A.S.4  
   TOP: Central Tendency

5. ANS: 4  
   $-4x + 2 > 10$
   
   $-4x > 8$
   
   $x < -2$

   PTS: 2  
   REF: 080805ia  
   STA: A.A.21  
   TOP: Interpreting Solutions

6. ANS: 2  
   $2x^2 + 10x - 12 = 2(x^2 + 5x - 6) = 2(x + 6)(x - 1)$

   PTS: 2  
   REF: 080806ia  
   STA: A.A.20  
   TOP: Factoring Polynomials

7. ANS: 2  
   If the car can travel 75 miles on 4 gallons, it can travel 300 miles on 16 gallons.  
   $\frac{75}{4} = \frac{x}{16}$
   
   $x = 300$

   PTS: 2  
   REF: 080807ia  
   STA: A.G.4  
   TOP: Graphing Linear Functions
8 ANS: 3

\[3ax + b = c\]

\[3ax = c - b\]

\[x = \frac{c - b}{3a}\]

PTS: 2 REF: 080808ia STA: A.A.23 TOP: Transforming Formulas

9 ANS: 4

\[16^2 + b^2 = 34^2\]

\[b^2 = 900\]

\[b = 30\]

PTS: 2 REF: 080809ia STA: A.A.45 TOP: Pythagorean Theorem

10 ANS: 2 PTS: 2 REF: 080810ia STA: A.A.36 TOP: Parallel and Perpendicular Lines

11 ANS: 2

\[s + o = 126. \, s + 2s = 126\]

\[o = 2s \quad s = 42\]

PTS: 2 REF: 080811ia STA: A.A.7 TOP: Writing Linear Systems

12 ANS: 2

\[x^2 + 5x + 6 = -x + 1. \quad y = -x + 1\]

\[x^2 + 6x + 5 = 0 = -(-5) + 1\]

\[(x + 5)(x + 1) = 0 = 6\]

\[x = -5 \text{ or } -1\]

PTS: 2 REF: 080812ia STA: A.A.11 TOP: Quadratic-Linear Systems

13 ANS: 1 PTS: 2 REF: 080813ia STA: A.G.10 TOP: Identifying the Vertex of a Quadratic Given Graph

14 ANS: 3

0.75 hours = 45 minutes. \[\frac{120}{1} = \frac{x}{45}\]

\[x = 5400\]

PTS: 2 REF: 080814ia STA: A.M.1 TOP: Using Rate

15 ANS: 2 PTS: 2 REF: 080815ia STA: A.G.1 TOP: Compositions of Polygons and Circles
16 ANS: 1
\[ 4! = 4 \times 3 \times 2 \times 1 = 24 \]

PTS: 2 REF: 080816ia STA: A.N.8 TOP: Permutations

17 ANS: 2
\[ l(l - 5) = 24 \]
\[ l^2 - 5l - 24 = 0 \]
\[ (l - 8)(l + 3) = 0 \]
\[ l = 8 \]

PTS: 2 REF: 080817ia STA: A.A.8 TOP: Geometric Applications of Quadratics

18 ANS: 3
The value of the third quartile is the last vertical line of the box.

PTS: 2 REF: 080818ia STA: A.S.6 TOP: Box-and-Whisker Plots

19 ANS: 3 PTS: 2 REF: 080819ia STA: A.A.13 TOP: Addition and Subtraction of Polynomials KEY: subtraction

20 ANS: 4
\[ \frac{2x}{5} + \frac{1}{3} = \frac{7x - 2}{15} \]
\[ \frac{(2x \times 3) + (5 \times 1)}{5 \times 3} = \frac{7x - 2}{15} \]
\[ \frac{6x + 5}{15} = \frac{7x - 2}{15} \]
\[ 6x + 5 = 7x - 2 \]
\[ x = 7 \]

PTS: 2 REF: 080820ia STA: A.A.25 TOP: Solving Equations with Fractional Expressions

21 ANS: 4
\[ \frac{25x - 125}{x^2 - 25} = \frac{25(x - 5)}{(x+5)(x-5)} = \frac{25}{x+5} \]

PTS: 2 REF: 080821ia STA: A.A.16 TOP: Rational Expressions KEY: \( a > 0 \)
22 ANS: 4

![Graph of scatter plot](image)

PTS: 2  REF: 080822ia  STA: A.S.8  TOP: Scatter Plots

23 ANS: 2  PTS: 2  REF: 080823ia  STA: A.A.32  TOP: Slope

24 ANS: 1  PTS: 2  REF: 080824ia  STA: A.A.43  TOP: Using Trigonometry to Find an Angle

25 ANS: 4  PTS: 2  REF: 080825ia  STA: A.A.40  TOP: Systems of Linear Inequalities

26 ANS: 1

\[
\frac{4x}{x - 1} \cdot \frac{x^2 - 1}{3x + 3} = \frac{4x}{x - 1} \cdot \frac{(x + 1)(x - 1)}{3(x + 1)} = \frac{4x}{3}
\]

PTS: 2  REF: 080826ia  STA: A.A.18  TOP: Multiplication and Division of Rationals


28 ANS: 1

\[
\left| \frac{289 - 282}{289} \right| \approx 0.024
\]

PTS: 2  REF: 080828ia  STA: A.M.3  TOP: Error

29 ANS: 3

\[
sinA = \frac{10}{16} \quad B = 180 - (90 = 38.7) = 51.3. \quad A \ 90^\circ \ angle \ is \ not \ acute.
\]

\[
A \approx 38.7
\]

PTS: 2  REF: 080829ia  STA: A.A.43  TOP: Using Trigonometry to Find an Angle

30 ANS: 2

The events are not mutually exclusive: P(prime) = \( \frac{3}{6} \), P(even) = \( \frac{3}{6} \), P(prime AND even) = \( \frac{1}{6} \)

\[
P(\text{prime OR even}) = \frac{3}{6} + \frac{3}{6} - \frac{1}{6} = \frac{5}{6}
\]

PTS: 2  REF: 080830ia  STA: A.S.23  TOP: Theoretical Probability

KEY: not mutually exclusive events
31 ANS: 
\[
\frac{\text{distance}}{\text{time}} = \frac{89}{0.8} = 111.25
\]
PTS: 2 REF: 080831ia STA: A.M.1 TOP: Speed

32 ANS: 
\[
\frac{3}{8} \cdot P(s_1 < 4) \times P(s_2 = \text{back}) = \frac{3}{4} \times \frac{1}{2} = \frac{3}{8}
\]
PTS: 2 REF: 080832ia STA: A.S.23 TOP: Theoretical Probability

33 ANS: 
\[
\{1,2,4,5,9,10,12\}
\]
PTS: 2 REF: 080833ia STA: A.A.30 TOP: Set Theory

34 ANS: 
\[
60 - 42\sqrt{5}.\ 3\sqrt{20}(2\sqrt{5} - 7) = 6\sqrt{100} - 21\sqrt{20} = 60 - 21\sqrt{4\sqrt{5}} = 60 - 42\sqrt{5}
\]
PTS: 3 REF: 080834ia STA: A.N.3 TOP: Operations with Radicals

35 ANS: 
. The graph will never intersect the x-axis as \(2^x > 0\) for all values of x.

36 ANS: 
\[
y = \frac{2}{5}x + 2.\ m = \frac{4 - 0}{5 - (-5)} = \frac{2}{5}.\ y = mx + b
\]
\[
4 = \frac{2}{5}(5) + b
\]
\[
b = 2
\]
PTS: 3 REF: 080836ia STA: A.G.4 TOP: Graphing Exponential Functions

37 ANS: 
\[
m = 50c,\ p = 15c.\ 3m + 2p = 1.80.\ 9m + 6p = 5.40.\ 4(.50) + 6p = 2.90
\]
\[
4m + 6p = 2.90\ 4m + 6p = 2.90\ 6p = 90
\]
\[
5m = 2.50\ p = $0.15
\]
\[
m = $0.50
\]
PTS: 3 REF: 080837ia STA: A.A.7 TOP: Writing Linear Systems
38 ANS:

<table>
<thead>
<tr>
<th>Interval</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>III</td>
<td>3</td>
</tr>
<tr>
<td>2-3</td>
<td>IIIII</td>
<td>7</td>
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<tr>
<td>4-5</td>
<td>IIIII</td>
<td>7</td>
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<tr>
<td>6-7</td>
<td>III</td>
<td>3</td>
</tr>
</tbody>
</table>

PTI: 4 REF: 080838ia STA: A.S.5
TOP: Frequency Histograms, Bar Graphs and Tables

39 ANS:

PTI: 4 REF: 080839ia STA: A.G.9 TOP: Quadratic-Linear Systems
0109ia

Answer Section

1 ANS: 3
\[ F = \frac{9}{5} C + 32 = \frac{9}{5} (15) + 32 = 59 \]
PTS: 2 REF: 010901ia STA: A.M.2 TOP: Conversions

2 ANS: 4
\[ \frac{\text{distance}}{\text{time}} = \frac{24}{6} = 4 \]
PTS: 2 REF: 010902ia STA: A.M.1 TOP: Speed

3 ANS: 4
\[ P(O) = \frac{3}{6}, P(E) = \frac{3}{6}, P(< 6) = \frac{5}{6}, P(> 4) = \frac{2}{6} \]
PTS: 2 REF: 010903ia STA: A.S.22 TOP: Theoretical Probability

4 ANS: 1
\[
0.07m + 19 \leq 29.50
\]
\[
0.07m \leq 10.50
\]
\[
m \leq 150
\]
PTS: 2 REF: 010904ia STA: A.A.6 TOP: Modeling Inequalities

5 ANS: 1
PTS: 2 REF: 010905ia STA: A.G.4 TOP: Families of Functions

6 ANS: 3
\[
\frac{k + 4}{2} = \frac{k + 9}{3}
\]
\[3(k + 4) = 2(k + 9)\]
\[3k + 12 = 2k + 18\]
\[k = 6\]
PTS: 2 REF: 010906ia STA: A.A.26 TOP: Solving Rationals

7 ANS: 4
The mean is 80.6, the median is 84.5 and the mode is 87.
PTS: 2 REF: 010907ia STA: A.S.4 TOP: Central Tendency

8 ANS: 4
PTS: 2 REF: 010908ia STA: A.A.9 TOP: Exponential Functions
9 ANS: 2  PTS: 2  REF: 010909ia  STA: A.A.19
TOP: Factoring the Difference of Perfect Squares

10 ANS: 3  PTS: 2  REF: 010910ia  STA: A.A.35
TOP: Writing Linear Equations

11 ANS: 2
\[ P = 2l + 2w \]
\[ P - 2l = 2w \]
\[ \frac{P - 2l}{2} = w \]

PTS: 2  REF: 010911ia  STA: A.A.23  TOP: Transforming Formulas

12 ANS: 3
\[ \cos 30 = \frac{x}{24} \]
\[ x \approx 21 \]

PTS: 2  REF: 010912ia  STA: A.A.44  TOP: Using Trigonometry to Find a Side

13 ANS: 2
\[ \frac{5 - 3}{2 - 7} = \frac{2}{5} \]

PTS: 2  REF: 010913ia  STA: A.A.33  TOP: Slope

14 ANS: 3
\[ x^2 - 10x + 21 = 0 \]
\[ (x - 7)(x - 3) = 0 \]
\[ x = 7 \quad x = 3 \]

PTS: 2  REF: 010914ia  STA: A.A.28  TOP: Roots of Quadratics

15 ANS: 2  PTS: 2  REF: 010915ia  STA: A.A.5
TOP: Modeling Equations

16 ANS: 2  PTS: 2  REF: 010916ia  STA: A.G.10
TOP: Identifying the Vertex of a Quadratic Given Graph

17 ANS: 3  PTS: 2  REF: 010917ia  STA: A.A.29
TOP: Set Theory

18 ANS: 1
\[ \frac{2}{x - 3} = \frac{26}{x} \]
\[ -3 = \frac{24}{x} \]
\[ x = -8 \]

PTS: 2  REF: 010918ia  STA: A.A.25  TOP: Solving Rationals
19 ANS: 2
\[
\sin U = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{15}{17}
\]
PTS: 2 REF: 010919ia STA: A.A.42 TOP: Trigonometric Ratios

20 ANS: 3
\[
\sqrt{72} = \sqrt{36 \cdot 2} = 6\sqrt{2}
\]
PTS: 2 REF: 010920ia STA: A.N.2 TOP: Simplifying Radicals

21 ANS: 2
\[
\frac{6}{5x} - \frac{2}{3x} = \frac{18x - 10x}{15x^2} = \frac{8x}{15x^2} = \frac{8}{15x}
\]
PTS: 2 REF: 010921ia STA: A.A.17 TOP: Addition and Subtraction of Rationals

22 ANS: 2
\[
x^2 - x - 20 = 3x - 15 \quad y = 3x - 15
\]
\[
x^2 - 4x - 6 = 0 = 3(-1) - 15
\]
\[
(x = 5)(x + 1) = 0 = -18
\]
\[
x = 5 \text{ or } -1
\]
PTS: 2 REF: 010922ia STA: A.A.11 TOP: Quadratic-Linear Systems

23 ANS: 1
Everyone eats, can shop in malls and wear clothes. People who work in a sporting goods store probably watch more sports television than most.

PTS: 2 REF: 010923ia STA: A.S.3 TOP: Analysis of Data

24 ANS: 4
\[
A = lw = (3w - 7)(w) = 3w^2 - 7w
\]
PTS: 2 REF: 010924ia STA: A.A.1 TOP: Expressions


26 ANS: 1
The slope of \( y = 3 - 2x \) is \(-2\). Using \( m = \frac{A}{B} \), the slope of \( 4x + 2y = 5 \) is \( \frac{4}{2} = -2 \).

PTS: 2 REF: 010926ia STA: A.A.38 TOP: Parallel and Perpendicular Lines

27 ANS: 4 PTS: 2 REF: 010927ia STA: A.N.4 TOP: Operations with Scientific Notation
28. ANS: 1
\[
\frac{1}{8} \times \frac{1}{8} = \frac{1}{64}
\]

PTS: 2  REF: 010928ia  STA: A.S.23  TOP: Theoretical Probability
KEY: independent events

29. ANS: 4  PTS: 2  REF: 010929ia  STA: A.S.6
TOP: Box-and-Whisker Plots

30. ANS: 4  PTS: 2  REF: 010930ia  STA: A.G.3
TOP: Defining Functions

31. ANS:
\[
50. 12 + 10 + 12 + \frac{1}{2} (10\pi) \approx 50
\]

PTS: 2  REF: 010931ia  STA: A.G.1  TOP: Compositions of Polygons and Circles

32. ANS:
\[
\frac{3k^2 m^6}{4}
\]

PTS: 2  REF: 010932ia  STA: A.A.12  TOP: Division of Powers

33. ANS:
\[
d = 6.25h, 250. d = 6.25(40) = 250
\]

PTS: 2  REF: 010933ia  STA: A.N.5  TOP: Direct Variation

34. ANS:
\[
1,512, 1,551.25, 0.025. \quad 36 \times 42 = 1512. \quad 36.5 \times 42.5 = 1551.25. \quad RE = \left| \frac{1512 - 1551.25}{1551.25} \right| \approx 0.025.
\]

PTS: 3  REF: 010934ia  STA: A.M.3  TOP: Error

35. ANS:
\[
\frac{3}{4x-8} \cdot \frac{3x+6}{4x+12} = \frac{x^2-4}{x+3} = \frac{3(x+2)}{4(x+3)} \cdot \frac{x+3}{(x+2)(x-2)} = \frac{3}{4(x-2)}
\]

PTS: 3  REF: 010935ia  STA: A.A.18  TOP: Multiplication and Division of Rationals

36. ANS:
\[
\frac{38}{\pi}, 2. \quad V = \pi r^2 h. \quad \frac{36}{38} \approx 2.97. \quad \text{Three cans will not fit. The maximum number is 2.}
\]
\[
342 = \pi \left( \frac{6}{2} \right)^2 h
\]
\[
\frac{342}{9\pi} = h
\]
\[
\frac{38}{\pi} = h
\]

PTS: 3  REF: 010936ia  STA: A.G.2  TOP: Volume
37 ANS:
\((-2, 5)\). \(3x + 2y = 4\) \(12x + 8y = 16\). \(3x + 2y = 4\)
\(4x + 3y = 7\) \(12x + 9y = 21\) \(3x + 2(5) = 4\)
\(y = 5\) \(3x = -6\)
\(x = -2\)

PTS: 4 REF: 010937ia STA: A.A.10 TOP: Solving Linear Systems

38 ANS:

PTS: 4 REF: 010938ia STA: A.G.7 TOP: Systems of Linear Inequalities

39 ANS:
(T,F,M), (T,F,J), (T,F,S), (T,A,M), (T,A,J), (T,A,S)\). There are 18 different kids’ meals, 12 do not include juice
and 6 include chicken nuggets.

PTS: 4 REF: 010939ia STA: A.S.19 TOP: Sample Space
0609ia
Answer Section

1 ANS: 4
\[
\frac{5}{45} = \frac{8}{x}
\]
\[5x = 360\]
\[x = 72\]

PTS: 2 REF: 060901ia STA: A.M.1 TOP: Speed

2 ANS: 4
\[x^2 - 7x + 6 = 0\]
\[(x - 6)(x - 1) = 0\]
\[x = 6 \quad x = 1\]

PTS: 2 REF: 060902ia STA: A.A.28 TOP: Roots of Quadratics

3 ANS: 1 PTS: 2 REF: 060903ia STA: A.A.12 TOP: Division of Powers

4 ANS: 2 PTS: 2 REF: 060904ia STA: A.A.1 TOP: Expressions

5 ANS: 3 The other situations are quantitative.

PTS: 2 REF: 060905ia STA: A.S.1 TOP: Analysis of Data

6 ANS: 4 PTS: 2 REF: 060906ia STA: A.A.4 TOP: Modeling Inequalities

7 ANS: 1
\[
\frac{(2x \times 6) + (3 \times x)}{3 \times 6} = 5
\]
\[\frac{12x + 3x}{18} = 5\]
\[15x = 90\]
\[x = 6\]

PTS: 2 REF: 060907ia STA: A.A.25 TOP: Solving Equations with Fractional Expressions

9 ANS: 3
\[3^2 + 5^2 = x^2\]
\[34 = x^2\]
\[\sqrt{34} = x\]

PTS: 2 REF: 060909ia STA: A.A.45 TOP: Pythagorean Theorem

10 ANS: 2
\[\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}\]

PTS: 2 REF: 060910ia STA: A.N.2 TOP: Simplifying Radicals

11 ANS: 4
\[\frac{344}{\text{sec}} \times \frac{60}{\text{sec}} \times \frac{60}{\text{min}} = 1,238,400 \frac{\text{m}}{\text{hr}}\]

PTS: 2 REF: 060911ia STA: A.M.2 TOP: Conversions

12 ANS: 2
\[L + S = 47\]
\[L - S = 15\]
\[2L = 62\]
\[L = 31\]

PTS: 2 REF: 060912ia STA: A.A.7 TOP: Writing Linear Systems

13 ANS: 3
\[a + ar = b + r\]
\[a(1 + r) = b + r\]
\[a = \frac{b + r}{1 + r}\]

PTS: 2 REF: 060913ia STA: A.A.23 TOP: Transforming Formulas

14 ANS: 1
\[\frac{4}{3}x + 5 < 17\]
\[\frac{4}{3}x < 12\]
\[4x < 36\]
\[x < 9\]

PTS: 2 REF: 060914ia STA: A.A.21 TOP: Interpreting Solutions

15 ANS: 3
The value of the upper quartile is the last vertical line of the box.

PTS: 2 REF: 060915ia STA: A.S.6 TOP: Box-and-Whisker Plots
16 ANS: 4 PTS: 2 REF: 060916ia STA: A.A.15
TOP: Undefined Rationals

17 ANS: 1
so = f + 60 j = 2f - 50 se = 3f f + (f + 60) + (2f - 50) + 3f = 1424
7f + 10 = 1424
f = 202

PTS: 2 REF: 060917ia STA: A.A.7 TOP: Writing Linear Systems

18 ANS: 1
x = \frac{-b}{2a} = \frac{(-16)}{2(1)} = 8.
\ y = (8)^2 - 16(8) + 63 = -1

PTS: 2 REF: 060918ia STA: A.A.41 TOP: Identifying the Vertex of a Quadratic Given Equation

19 ANS: 3 PTS: 2 REF: 060919ia STA: A.G.3
TOP: Defining Functions

20 ANS: 1 PTS: 2 REF: 060920ia STA: A.G.6
TOP: Linear Inequalities

21 ANS: 2
\frac{x^2 - 2x - 15}{x^2 + 3x} = \frac{(x - 5)(x + 3)}{x(x + 3)} = \frac{x - 5}{x}

PTS: 2 REF: 060921ia STA: A.A.16 TOP: Rational Expressions KEY: a > 0

22 ANS: 1
y = mx + b
-6 = (-3)(4) + b
b = 6

PTS: 2 REF: 060922ia STA: A.A.34 TOP: Writing Linear Equations

23 ANS: 2 PTS: 2 REF: 060923ia STA: A.A.13
TOP: Addition and Subtraction of Polynomials KEY: subtraction

24 ANS: 3 PTS: 2 REF: 060924ia STA: A.G.8
TOP: Solving Quadratics by Graphing

25 ANS: 2
x + 2y = 9
x - y = 3
3y = 6
y = 2

PTS: 2 REF: 060925ia STA: A.A.10 TOP: Solving Linear Systems

26 ANS: 3 PTS: 2 REF: 060926ia STA: A.N.1
TOP: Properties of Reals
27 ANS: 4 PTS: 2 REF: 060927ia STA: A.N.4
TOP: Operations with Scientific Notation

28 ANS: 2
The volume of the cube using Ezra’s measurements is $8 \times 2^3$. The actual volume is $9.261 \times 2.13$. The relative error is $\frac{9.261 - 8}{9.261} \approx 0.14$.

PTS: 2 REF: 060928ia STA: A.M.3 TOP: Error

29 ANS: 2
\[ \frac{6}{4a} - \frac{2}{3a} = \frac{18a - 8a}{12a^2} = \frac{10a}{12a^2} = \frac{5}{6a} \]

PTS: 2 REF: 060929ia STA: A.A.17 TOP: Addition and Subtraction of Rationals

30 ANS: 4 PTS: 2 REF: 060930ia STA: A.A.29
TOP: Set Theory

31 ANS: 60.
\[ \frac{1}{3} P_3 = 60 \]

PTS: 2 REF: 060931ia STA: A.N.8 TOP: Permutations

32 ANS:
\[ 4x(x + 3)(x - 3), \quad 4x^3 - 36x = 4x(x^2 - 9) = 4x(x + 3)(x - 3) \]

PTS: 2 REF: 060932ia STA: A.A.19 TOP: Factoring the Difference of Perfect Squares

33 ANS:
\[ \frac{1}{8} \]
After the English and social studies books are taken, 8 books are left and 1 is an English book.

PTS: 2 REF: 060933ia STA: A.S.18 TOP: Conditional Probability

34 ANS:
56. If the circumference of circle $O$ is 168 inches, the diameter, $\overline{AD}$, is 16 inches and the length of $\overline{BC}$ is 12 inches $\frac{3}{4} \times 16$. The area of trapezoid $ABCD$ is $\frac{1}{2} \times 4(12 + 16) = 56$.

PTS: 3 REF: 060934ia STA: A.G.1 TOP: Compositions of Polygons and Circles

35 ANS:
\[ 5,583.86. \quad A = P(1 + R)^t = 5000(1 + 0.0375)^3 \approx 5583.86 \]

PTS: 3 REF: 060935ia STA: A.A.9 TOP: Exponential Functions
36 ANS:

PTS: 3  REF: 060936ia  STA: A.S.8  TOP: Scatter Plots

37 ANS:

\[ \tan 52 = \frac{50}{x} \quad \sin 52 = \frac{50}{x} \]

\[ x \approx 39 \quad \approx 63 \]

PTS: 4  REF: 060937ia  STA: A.A.44  TOP: Using Trigonometry to Find a Side

38 ANS:

PTS: 4  REF: 060938ia  STA: A.S.5  TOP: Frequency Histograms, Bar Graphs and Tables

39 ANS:

PTS: 4  REF: 060939ia  STA: A.G.9  TOP: Quadratic-Linear Systems
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<th>ANS</th>
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<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>080901ia</td>
<td>A.A.4</td>
<td>Modeling Equations</td>
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<td>A.A.19</td>
<td>Factoring the Difference of Perfect Squares</td>
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<td>A.A.12</td>
<td>Multiplication of Powers</td>
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<td>$13.95 + 0.49x \leq 50.00$</td>
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<td>$0.49x \leq 36.05$</td>
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<td>$x \leq 73.57$</td>
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<td>A.N.7</td>
<td>Conditional Probability</td>
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<td>$(3-1) \times 2 \times 3 = 12$</td>
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<td>7</td>
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<td>2</td>
<td>080906ia</td>
<td>A.A.45</td>
<td>Pythagorean Theorem</td>
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<td>The number of correct answers on a test</td>
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<td>causes the test score.</td>
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<td>9</td>
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<td>A.S.20</td>
<td>Analysis of Data</td>
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<tr>
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<td></td>
<td>$\frac{3}{5}(x + 2) = x - 4$</td>
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<td>$3(x + 2) = 5(x - 4)$</td>
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<td>$3x + 6 = 5x - 20$</td>
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<td>$26 = 2x$</td>
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<td>$x = 13$</td>
</tr>
</tbody>
</table>
10 ANS: 4
Surveying persons leaving a football game about a sports budget contains the most bias.

PTS: 2 REF: 080910ia STA: A.S.3 TOP: Analysis of Data

11 ANS: 1 PTS: 2 REF: 080911ia STA: A.A.36
TOP: Parallel and Perpendicular Lines

12 ANS: 4
\[ A = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20\} \]

PTS: 2 REF: 080912ia STA: A.A.30 TOP: Set Theory

13 ANS: 4
\[-2(x - 5) < 4 \]
\[-2x + 10 < 4 \]
\[-2x < -6 \]
\[ x > 3 \]

PTS: 2 REF: 080913ia STA: A.A.21 TOP: Interpreting Solutions

14 ANS: 2
\[ \tan 32 = \frac{x}{25} \]
\[ x \approx 15.6 \]

PTS: 2 REF: 080914ia STA: A.A.44 TOP: Using Trigonometry to Find a Side

15 ANS: 1
\[ m = \frac{4 - (4)}{-5 - 15} = -\frac{2}{5} \]

PTS: 2 REF: 080915ia STA: A.A.33 TOP: Slope

16 ANS: 2 PTS: 2 REF: 080916ia STA: A.G.8
TOP: Solving Quadratics by Graphing

17 ANS: 2
\[ \frac{2}{3x} + \frac{4}{3x} = \frac{9x + 8x}{6x^2} = \frac{17x}{6x^2} = \frac{17}{6x} \]

PTS: 2 REF: 080917ia STA: A.A.17 TOP: Addition and Subtraction of Rationals

18 ANS: 1
\[ x^2 + 7x + 10 = 0 \]
\[ (x + 5)(x + 2) = 0 \]
\[ x = -5 \text{ or } -2 \]

PTS: 2 REF: 080918ia STA: A.A.15 TOP: Undefined Rationals
19 ANS: 3
An element of the domain, 1, is paired with two different elements of the range, 3 and 7.

PTS: 2  REF: 080919ia  STA: A.G.3  TOP: Defining Functions

20 ANS: 1
\[ x - 2y = 1 \]
\[ x + 4y = 7 \]
\[ -6y = -6 \]
\[ y = 1 \]

PTS: 2  REF: 080920ia  STA: A.A.10  TOP: Solving Linear Systems

21 ANS: 3
\[ x^2 - 6x = 0 \]
\[ x(x - 6) = 0 \]
\[ x = 0 \quad x = 6 \]

PTS: 2  REF: 080921ia  STA: A.A.27  TOP: Solving Quadratics by Factoring

22 ANS: 2
\[ 5\sqrt{20} = 5\sqrt{4 \cdot 5} = 10\sqrt{5} \]

PTS: 2  REF: 080922ia  STA: A.N.2  TOP: Simplifying Radicals

23 ANS: 3
\[ | -5(5) + 12 | = |-13 | = 13 \]

PTS: 2  REF: 080923ia  STA: A.N.6  TOP: Evaluating Expressions

24 ANS: 1  PTS: 2  REF: 080924ia  STA: A.G.1  TOP: Compositions of Polygons and Circles

25 ANS: 3  PTS: 2  REF: 080925ia  STA: A.G.4  TOP: Identifying the Equation of a Graph

26 ANS: 2
\[ \left| \frac{149.6 - 174.2}{149.6} \right| = 0.1644 \]

PTS: 2  REF: 080926ia  STA: A.M.3  TOP: Error

27 ANS: 4
\[ y = mx + b \]
\[ -1 = (2)(3) + b \]
\[ b = -7 \]

PTS: 2  REF: 080927ia  STA: A.A.34  TOP: Writing Linear Equations
Let $x =$ youngest brother and $x + 4 =$ oldest brother. $3x - (x + 4) = 48.$

$$2x - 4 = 48$$

$$x = 26$$

PTS: 2  REF: 080928ia  STA: A.A.6  TOP: Modeling Equations

ANS: 3

$500(1 + 0.06)^3 \approx 596$

PTS: 2  REF: 080929ia  STA: A.A.9  TOP: Exponential Functions

TOP: Scatter Plots

Not all of the homework problems are equations. The first problem is an expression.

PTS: 2  REF: 080931ia  STA: A.A.3  TOP: Expressions

ANS:

$5,112. \ (12 \times 30 \times 16) - (6 \times 12 \times 9) = 5112$

PTS: 2  REF: 080932ia  STA: A.G.2  TOP: Volume

ANS:

$$\frac{3}{8}. \ (H,H,H), (H,H,T), (H,T,H), (H,T,T), (T,H,H), (T,H,T), (T,T,H), (T,T,T)$$

PTS: 2  REF: 080933ia  STA: A.S.19  TOP: Sample Space

ANS:

$$x = \frac{-b}{2a} = \frac{-(-8)}{2(-2)} = -2$$

$$y = -2(-2)^2 - 8(-2) + 3 = 11$$

PTS: 3  REF: 080934ia  STA: A.A.41  TOP: Identifying the Vertex of a Quadratic Given Equation

ANS:

$30.4\%; \ no, 23.3\%. \ \frac{7.50 - 5.75}{5.75} = 30.4\%. \ \frac{7.50 - 5.75}{7.50} = 23.3\%$

PTS: 3  REF: 080935ia  STA: A.N.5  TOP: Percents

ANS:

Greg’s rate of 5.5 is faster than Dave’s rate of 5.3. $$\frac{\text{distance}}{\text{time}} = \frac{11}{2} = 5.5. \ \frac{16}{3} = 5.3$$

PTS: 3  REF: 080936ia  STA: A.M.1  TOP: Speed
37 ANS:
\[
\frac{x - 7}{3x} \cdot \frac{2x^2 - 8x - 42}{6x^2} \div \frac{x^2 - 9}{x^2 - 3x} = \frac{2(x^2 - 4x - 21)}{6x^2} \cdot \frac{x(x - 3)}{(x + 3)(x - 3)} = \frac{(x - 7)(x + 3)}{3x} \cdot \frac{1}{x + 3} = \frac{x - 7}{3x}
\]

PTS: 4  REF: 080937ia  STA: A.A.18  TOP: Multiplication and Division of Rationals

38 ANS:

PTS: 4  REF: 080938ia  STA: A.G.7  TOP: Solving Linear Systems

39 ANS:

PTS: 4  REF: 080939ia  STA: A.S.5  TOP: Box-and-Whisker Plots
0110ia

Answer Section

1. ANS: 1
   PTS: 2
   TOP: Box-and-Whisker Plots
   REF: 011001ia
   STA: A.S.6

2. ANS: 2
   PTS: 2
   TOP: Theoretical Probability
   REF: 011002ia
   STA: A.S.20

3. ANS: 1
   \[ 1P + 2C = 5 \]
   \[ 1P + 4C = 6 \]
   \[ 2C = 1 \]
   \[ C = 0.5 \]
   PTS: 2
   REF: 011003ia
   STA: A.A.7
   TOP: Writing Linear Systems

4. ANS: 1
   PTS: 2
   TOP: Set Theory
   REF: 011004ia
   STA: A.A.31

5. ANS: 2
   PTS: 2
   TOP: Modeling Inequalities
   REF: 011005ia
   STA: A.A.5

6. ANS: 2
   \[ R = 0.5^{d-1} \]
   PTS: 2
   REF: 011006ia
   STA: A.A.9
   TOP: Exponential Functions

7. ANS: 4
   \[ A(-3,4) \text{ and } B(5,8). \]
   \[ m = \frac{4-8}{-3-5} = \frac{-4}{-8} = \frac{1}{2} \]
   PTS: 2
   REF: 011007ia
   STA: A.A.33
   TOP: Slope

8. ANS: 3
   \[ \cos A = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{15}{17} \]
   PTS: 2
   REF: 011008ia
   STA: A.A.42
   TOP: Trigonometric Ratios

9. ANS: 2
   Debbie failed to distribute the 3 properly.
   PTS: 2
   REF: 011009ia
   STA: A.A.22
   TOP: Solving Equations

10. ANS: 1
    \[ -|a - b| = -|7 - (-3)| = -|-10| = -10 \]
    PTS: 2
    REF: 011010ia
    STA: A.N.6
    TOP: Evaluating Expressions

11. ANS: 3
    \[ \frac{12x^3 - 6x^2 + 2x}{2x} = \frac{2x(6x^2 - 3x + 1)}{2x} = 6x^2 - 3x + 1 \]
    PTS: 2
    REF: 011011ia
    STA: A.A.14
    TOP: Rational Expressions
12 ANS: 2  PTS: 2  REF: 011012ia  STA: A.G.9  
TOP: Quadratic-Linear Systems

13 ANS: 3
\[ m = \frac{7-3}{-3-3} = \frac{4}{-6} = \frac{2}{3} \]
\[ y = mx + b \]
\[ 3 = \frac{2}{3} (3) + b \]
\[ 3 = -2 + b \]
\[ 5 = b \]

PTS: 2  REF: 011013ia  STA: A.A.35  TOP: Writing Linear Equations

14 ANS: 3
Frequency is not a variable.

PTS: 2  REF: 011014ia  STA: A.S.2  TOP: Analysis of Data

15 ANS: 2  PTS: 2  REF: 011015ia  STA: A.G.10  
TOP: Identifying the Vertex of a Quadratic Given Graph

16 ANS: 4  PTS: 2  REF: 011016ia  STA: A.A.23  
TOP: Transforming Formulas

17 ANS: 3  PTS: 2  REF: 011017ia  STA: A.G.5  
TOP: Graphing Absolute Value Functions

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

PTS: 2  REF: 011018ia  STA: A.G.3  TOP: Defining Functions

19 ANS: 2  PTS: 2  REF: 011019ia  STA: A.S.12  
TOP: Scatter Plots

20 ANS: 4  PTS: 2  REF: 011020ia  STA: A.A.12  
TOP: Multiplication of Powers

21 ANS: 1  
\[ 4y - 2x = 0 \]
\[ 4(-1) - 2(-2) = 0 \]
\[ -4 + 4 = 0 \]

PTS: 2  REF: 011021ia  STA: A.A.39  TOP: Identifying Points on a Line

22 ANS: 2  PTS: 2  REF: 011022ia  STA: A.A.19  
TOP: Factoring the Difference of Perfect Squares

23 ANS: 2  PTS: 2  REF: 011023ia  STA: A.A.40  
TOP: Systems of Linear Inequalities

24 ANS: 4  
\[ 6\sqrt{50} + 6\sqrt{2} = 6\sqrt{25 \cdot 2} + 6\sqrt{2} = 30\sqrt{2} + 6\sqrt{2} = 36\sqrt{2} \]

PTS: 2  REF: 011024ia  STA: A.N.3  TOP: Operations with Radicals
KEY: addition
25 ANS: 4 PTS: 2 REF: 011025ia STA: A.A.17
TOP: Addition and Subtraction of Rationals

26 ANS: 1
The slope of $2x - 4y = 16$ is $\frac{-A}{B} = \frac{-2}{-4} = \frac{1}{2}$

PTS: 2 REF: 011026ia STA: A.A.38 TOP: Parallel and Perpendicular Lines

27 ANS: 2 PTS: 2 REF: 011027ia STA: A.A.3
TOP: Expressions

28 ANS: 4

\[
\frac{x + 2}{x - 2} = \frac{-3}{x}
\]

\[
x(x + 2) = -3(x - 2)
\]
\[
x^2 + 2x = -3x + 6
\]
\[
x^2 + 5x - 6 = 0
\]
\[
(x + 6)(x - 1) = 0
\]
\[
x = -6 \text{ or } 1
\]

PTS: 2 REF: 011028ia STA: A.A.26 TOP: Solving Rationals

29 ANS: 4
SA = $2hw + 2hw + 2lh = 2(2)(3) + 2(4)(3) + 2(2)(4) = 52$

PTS: 2 REF: 011029ia STA: A.G.2 TOP: Surface Area

30 ANS: 3
The age of a child does not cause the number of siblings he has, or vice versa.

PTS: 2 REF: 011030ia STA: A.S.14 TOP: Analysis of Data

31 ANS:
16. 12 feet equals 4 yards. $4 \times 4 = 16$.

PTS: 2 REF: 011031ia STA: A.M.2 TOP: Conversions

32 ANS:
53. $\sin A = \frac{16}{20}$

$A \approx 53$

PTS: 2 REF: 011032ia STA: A.A.43 TOP: Using Trigonometry to Find an Angle
33 ANS: orchestra: \[ \frac{3}{26} > \frac{4}{36} \]

PTS: 2 REF: 011033ia STA: A.S.22 TOP: Theoretical Probability

34 ANS: 
\[ -2, 3. \]
\[ x^2 - x = 6 \]
\[ x^2 - x - 6 = 0 \]
\[ (x - 3)(x + 2) = 0 \]
\[ x = 3 \text{ or } -2 \]

PTS: 3 REF: 011034ia STA: A.A.28 TOP: Roots of Quadratics

35 ANS: 
81.3, 80, both increase

PTS: 3 REF: 011035ia STA: A.S.16 TOP: Central Tendency

36 ANS: 
\[ \frac{0.102}{5.3 \times 8.2 \times 4.1} = \frac{178.16 - 160}{178.16} = 0.102 \]

PTS: 3 REF: 011036ia STA: A.M.3 TOP: Error

37 ANS: 
15,600,000, 4,368,000. \( 10 \times 10 \times 10 \times 26 \times 25 \times 24 = 15,600,000 \). \( 10 \times 9 \times 8 \times 26 \times 25 \times 24 = 11,232,000 \). \( 15,600,000 - 11,232,000 = 4,368,000 \).

PTS: 4 REF: 011037ia STA: A.N.8 TOP: Permutations

38 ANS: 
(1, -3) is in the solution set. \( 4(1) - 3(-3) > 9 \)
\[ 4 + 9 > 9 \]

PTS: 4 REF: 011038ia STA: A.G.6 TOP: Linear Inequalities
ANS:
6, 8, 10. Three consecutive even integers are $x, x+2$ and $x+4$. $(x + 2)(x + 4) = 10x + 20$

$$x^2 + 6x + 8 = 10x + 20$$
$$x^2 - 4x - 12 = 0$$
$$(x - 6)(x + 2) = 0$$
$$x = 6$$

PTS: 4     REF: 011039ia     STA: A.A.8     TOP: Writing Quadratics
0610ia
Answer Section

1 ANS: 4 PTS: 2 REF: 061001ia STA: A.A.30
TOP: Set Theory

2 ANS: 4
5 \times 2 \times 3 = 30

PTS: 2 REF: 061002ia STA: A.N.7 TOP: Multiplication Counting Principle

3 ANS: 3 PTS: 2 REF: 061003ia STA: A.A.13
TOP: Addition and Subtraction of Polynomials KEY: addition

4 ANS: 2
\[ m = \frac{5 - 2}{3 - (-2)} = \frac{3}{5} \]

PTS: 2 REF: 061004ia STA: A.A.33 TOP: Slope

5 ANS: 1 PTS: 2 REF: 061005ia STA: A.G.10
TOP: Identifying the Vertex of a Quadratic Given Graph

6 ANS: 3
\[ \frac{15}{15 + 13 + 12} = \frac{15}{40} = \frac{3}{8} \]

PTS: 2 REF: 061006ia STA: A.S.21 TOP: Experimental Probability

7 ANS: 3
2(1) + 3 = 5

PTS: 2 REF: 061007ia STA: A.A.39 TOP: Linear Equations

8 ANS: 3
\[ \sqrt{72} - 3\sqrt{2} = \sqrt{36 \cdot \sqrt{2} - 3\sqrt{2}} = 6\sqrt{2} - 3\sqrt{2} = 3\sqrt{2} \]

PTS: 2 REF: 061008ia STA: A.N.3 TOP: Operations with Radicals KEY: subtraction

9 ANS: 2
\[ \tan A = \frac{\text{opposite}}{\text{adjacent}} = \frac{14}{48} \]

PTS: 2 REF: 061009ia STA: A.A.42 TOP: Trigonometric Ratios

10 ANS: 1 PTS: 2 REF: 061010ia STA: A.A.40 TOP: Systems of Linear Inequalities

11 ANS: 3 PTS: 2 REF: 061011ia STA: A.S.2 TOP: Analysis of Data
12 ANS: 3
\[c + 3d = 8 \quad c = 4d - 6\]
\[4d - 6 + 3d = 8 \quad c = 4(2) - 6\]
\[7d = 14 \quad c = 2\]
\[d = 2\]

PTS: 2  REF: 061012ia  STA: A.A.10  TOP: Solving Linear Systems

13 ANS: 4

TOP: Defining Functions

14 ANS: 3
\[x^2 - 9 = 0\]
\[(x + 3)(x - 3) = 0\]
\[x = \pm 3\]

PTS: 2  REF: 061014ia  STA: A.A.15  TOP: Undefined Rationals

15 ANS: 2
\[y - kx = 7\] may be rewritten as \[y = kx + 7\]

PTS: 2  REF: 061015ia  STA: A.A.38  TOP: Parallel and Perpendicular Lines

16 ANS: 4

TOP: Expressions

17 ANS: 3

TOP: Quartiles and Percentiles

18 ANS: 4

TOP: Division of Powers

19 ANS: 3
\[\frac{x}{3} + \frac{x + 1}{2} = x\]
\[\frac{2x + 3(x + 1)}{6} = x\]
\[5x + 3 = 6x\]
\[3 = x\]

PTS: 2  REF: 061019ia  STA: A.A.25  TOP: Solving Equations with Fractional Expressions

20 ANS: 1
\[x^2 - 36 = 5x\]
\[x^2 - 5x - 36 = 0\]
\[(x - 9)(x + 4) = 0\]
\[x = 9\]

PTS: 2  REF: 061020ia  STA: A.A.8  TOP: Writing Quadratics
21  ANS: 1  PTS: 2  REF: 061021ia  STA: A.A.29
   TOP:  Set Theory
22  ANS: 4  PTS: 2  REF: 061022ia  STA: A.S.3
   TOP:  Analysis of Data
23  ANS: 2  PTS: 2  REF: 061023ia  STA: A.A.23
   TOP:  Transforming Formulas
24  ANS: 1  PTS: 2  REF: 061024ia  STA: A.A.17
   TOP:  Addition and Subtraction of Rationals
25  ANS: 4
   \[ s = \frac{d}{t} = \frac{150 \text{ m}}{1.5 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} = 6,000 \frac{\text{m}}{\text{hr}} \]
   PTS: 2  REF: 061025ia  STA: A.M.1  TOP: Speed
26  ANS: 4
   \[ \hat{p}_3 = 336 \]
   PTS: 2  REF: 061026ia  STA: A.N.8  TOP: Permutations
27  ANS: 2  PTS: 2  REF: 061027ia  STA: A.A.20
   TOP: Factoring Polynomials
28  ANS: 4  PTS: 2  REF: 061028ia  STA: A.G.6
   TOP: Linear Inequalities
29  ANS: 2
   \[ A = lw + \frac{\pi r^2}{2} = 6 \cdot 5 + \frac{\pi \cdot 3^2}{2} \approx 44.1 \]
   PTS: 2  REF: 061029ia  STA: A.G.1  TOP: Compositions of Polygons and Circles
30  ANS: 1
   \[ 15000(1.2)^5 = 21,600. \ 21,600 - 15,000 = 6,600 \]
   PTS: 2  REF: 061030ia  STA: A.A.9  TOP: Exponential Functions
31  ANS:
   \[ \frac{600 - 592}{592} \approx 0.014 \]
   PTS: 2  REF: 061031ia  STA: A.M.3  TOP: Relative Error
32  ANS:
   \[ -6a + 42. \ \text{distributive} \]
   PTS: 2  REF: 061032ia  STA: A.N.1  TOP: Properties of Reals
33 ANS:
\[ \sin x = \frac{30}{50} \]
\[ x = \sin^{-1} \frac{3}{5} \]
\[ x \approx 37 \]

PTS: 2 REF: 061033ia STA: A.A.43 TOP: Using Trigonometry to Find an Angle

34 ANS:
\[ -12. 3 \left( \frac{2}{3} x + 3 < -2x - 7 \right) \]
\[ x + 9 < -6x - 21 \]
\[ 7x < -30 \]
\[ x < -\frac{30}{7} \]

PTS: 3 REF: 061034ia STA: A.A.21 TOP: Interpreting Solutions

35 ANS:

Graph becomes wider as the coefficient approaches 0.

PTS: 3 REF: 061035ia STA: A.G.5 TOP: Graphing Absolute Value Functions
They will not reach their goal in 18 months.

37 ANS:
\[
\frac{x^2 + 9x + 14}{x^2 - 49} \div \frac{3x + 6}{x^2 + x - 56} = \frac{(x + 7)(x + 2)}{(x + 7)(x - 7)} \cdot \frac{(x + 8)(x - 7)}{3(x + 2)} = \frac{x + 8}{3}
\]

38 ANS:
30, 20, 71-80, 81-90 and 91-100

39 ANS:

PTS: 4    REF: 061038ia    STA: A.S.9    TOP: Frequency Histograms, Bar Graphs and Tables

PTS: 4    REF: 061039ia    STA: A.G.9    TOP: Quadratic-Linear Systems
0810ia
Answer Section

1 ANS: 3 PTS: 2 REF: 081001ia STA: A.S.7
TOP: Scatter Plots

2 ANS: 1
3(2m−1)≤4m+7
6m−3≤4m+7
2m≤10
m≤5

PTS: 2 REF: 081002ia STA: A.A.24 TOP: Solving Inequalities

3 ANS: 2 PTS: 2 REF: 081003ia STA: A.A.31
TOP: Set Theory

4 ANS: 2
\[ \sqrt{5^2+7^2} \approx 8.6 \]

PTS: 2 REF: 081004ia STA: A.A.45 TOP: Pythagorean Theorem

5 ANS: 2
\[ A(-3,8) \text{ and } B(3,6). \quad m = \frac{8-6}{-3-3} = \frac{2}{-6} = \frac{-1}{3} \]

PTS: 2 REF: 081005ia STA: A.A.33 TOP: Slope

6 ANS: 4
\[ \frac{9.2 \times 10^6}{2.3 \times 10^3} = 4 \times 10^4 \]

PTS: 2 REF: 081006ia STA: A.N.4 TOP: Operations with Scientific Notation

7 ANS: 2
Candidate B received 45%. 45% × 1860 = 837

PTS: 2 REF: 081007ia STA: A.N.5 TOP: Percents

8 ANS: 3 PTS: 2 REF: 081008ia STA: A.A.19
TOP: Factoring the Difference of Perfect Squares

9 ANS: 3 PTS: 2 REF: 081009ia STA: A.A.30
TOP: Set Theory

10 ANS: 1
2y−2x=10 \quad \text{axis of symmetry: } x = \frac{-b}{2a} = \frac{-2}{2(1)} = -1
2y=2x+10
\[ y = x + 5 \]

PTS: 2 REF: 081010ia STA: A.G.9 TOP: Quadratic-Linear Systems
11 ANS: 4   PTS: 2   REF: 081011ia   STA: A.A.5
TOP: Modeling Equations

12 ANS: 2
\[
\frac{2x - 3}{x - 4} = \frac{2}{3}
\]

\[3(2x - 3) = 2(x - 4)
\]

\[6x - 9 = 2x - 8
\]

\[4x = 1
\]

\[x = \frac{1}{4}
\]

PTS: 2   REF: 081012ia   STA: A.A.26   TOP: Solving Rationals

13 ANS: 4
\[5(x + 4) = 5x + 20
\]

PTS: 2   REF: 081013ia   STA: A.A.1   TOP: Expressions

14 ANS: 2   PTS: 2   REF: 081014ia   STA: A.A.36
TOP: Parallel and Perpendicular Lines

15 ANS: 1   PTS: 2   REF: 081015ia   STA: A.G.5
TOP: Graphing Quadratic Functions

16 ANS: 4
\[2x - 3y = 9
\]

\[2(0) - 3(-3) = 9
\]

\[0 + 9 = 9
\]

PTS: 2   REF: 081016ia   STA: A.A.39   TOP: Identifying Points on a Line

17 ANS: 3   PTS: 2   REF: 081017a   STA: A.S.14
TOP: Analysis of Data

18 ANS: 3
\[x = \frac{-b}{2a} = \frac{-10}{2(-1)} = 5.
\]

PTS: 2   REF: 081018ia   STA: A.A.41
TOP: Identifying the Vertex of a Quadratic Given Equation
19 ANS: 2
shaded = whole – unshaded
= rectangle-triangle
= lw - \frac{1}{2} bh
= 15 \times 6 - \frac{1}{2} \times 15 \times 4.6
= 90 - 34.5
= 55.5

PTS: 2 REF: 081019ia STA: A.G.1 TOP: Compositions of Polygons and Circles

20 ANS: 4
\frac{2 + 3 + 0 + 1 + 3 + 2 + 4 + 0 + 2 + 3}{10} = \frac{20}{10} = 2 \frac{x}{10} = 2 + 0.5
\quad x = 25

PTS: 2 REF: 081020ia STA: A.S.16 TOP: Average Known with Missing Data

21 ANS: 2
2(x - 3y = -3)
2x + y = 8
2x - 6y = -6
7y = 14
\quad y = 2

PTS: 2 REF: 081021ia STA: A.A.10 TOP: Solving Linear Systems

22 ANS: 4 PTS: 2 REF: 081022ia STA: A.A.29 TOP: Set Theory

23 ANS: 2
\left| \frac{55.42 - 50.27}{55.42} \right| \approx 0.093

PTS: 2 REF: 081023ia STA: A.M.3 TOP: Error

24 ANS: 3
P(S) \cdot P(M) = P(S \text{ and } M)
\frac{3}{5} \cdot P(M) = \frac{3}{10}
\quad P(M) = \frac{1}{2}

PTS: 2 REF: 081024ia STA: A.S.23 TOP: Theoretical Probability

KEY: independent events

26 ANS: 2
\[ \tan B = \frac{\text{opposite}}{\text{adjacent}} = \frac{8}{15} = 0.53 \]

PTS: 2  REF: 081026ia  STA: A.A.42  TOP: Trigonometric Ratios

27 ANS: 3
\[ \frac{2 + x - x - 2}{5x} = \frac{2 + x - x + 2}{5x} = \frac{4}{5x} \]

PTS: 2  REF: 081027ia  STA: A.A.17  TOP: Addition and Subtraction of Rationals

28 ANS: 3
\[ 6P_4 = 360 \]

PTS: 2  REF: 081028ia  STA: A.N.8  TOP: Permutations

29 ANS: 2
\[ m = \frac{5 - 3}{8 - 1} = \frac{2}{7} \]
\[ y - y_i = m(x - x_i) \]
\[ y - 5 = \frac{2}{7}(x - 8) \]

PTS: 2  REF: 081029ia  STA: A.A.35  TOP: Writing Linear Equations

30 ANS: 1  PTS: 2  REF: 081030ia  STA: A.A.3  TOP: Expressions

31 ANS:
\[ 3a^2b^2 - 6a = \frac{45a^4b^3 - 90a^3b}{15a^2b} = \frac{45a^4b^3}{15a^2b} - \frac{90a^3b}{15a^2b} = 3a^2b^2 - 6a \]

PTS: 2  REF: 081031ia  STA: A.A.14  TOP: Rational Expressions

32 ANS:
\[ \frac{1,200}{25} = \frac{x}{45} \]
\[ 25x = 54,000 \]
\[ x = 2,160 \]

PTS: 2  REF: 081032ia  STA: A.M.1  TOP: Using Rate

33 ANS:
\[ -3\sqrt{48} = -3\sqrt{16 \cdot \sqrt{3}} = -12\sqrt{3} \]

PTS: 2  REF: 081033ia  STA: A.N.2  TOP: Simplifying Radicals
34 ANS: minimum is 120, 1st quartile is 145, median is 292, 3rd quartile is 407, and maximum is 452

PTS: 3 REF: 081034ia STA: A.S.5 TOP: Box-and-Whisker Plots

35 ANS:
\[ V = lwh = 10 \cdot 2 \cdot 4 = 80 \]
\[ SA = 2hw + 2lw + 2lh = 2 \cdot 10 \cdot 2 + 2 \cdot 4 \cdot 2 + 2 \cdot 10 \cdot 4 = 136 \]

PTS: 3 REF: 081035ia STA: A.G.2 TOP: Surface Area

36 ANS:
\[ x^2 + 13x - 30 = 0 \]
\[ (x + 15)(x - 2) = 0 \]
\[ x = -15, 2 \]

PTS: 3 REF: 081036ia STA: A.A.28 TOP: Roots of Quadratics

37 ANS:

PTS: 4 REF: 081037ia STA: A.G.7 TOP: Systems of Linear Inequalities

38 ANS:
Hat A, add 1 not green to Hat A, add 11 green to Hat B, and add none to Hat C.

PTS: 4 REF: 081038ia STA: A.S.22 TOP: Theoretical Probability

39 ANS:
\[ \sin 50 = \frac{x}{110} \]
\[ \cos 50 = \frac{y}{110} \]
\[ x \approx 84 \]
\[ y \approx 71 \]

PTS: 4 REF: 081039ia STA: A.A.44 TOP: Using Trigonometry to Find a Side
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.

6 ANS: 1

\[ 2(x - 4) = 4(2x + 1) \]

\[ 2x - 8 = 8x + 4 \]

\[ -12 = 6x \]

\[ -2 = x \]

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

7 ANS: 2

\[ \sqrt{18.4^2 - 7^2} \approx 17 \]

REF: 011106ia  STA: A.A.22  TOP: Solving Equations

8 ANS: 2

\[ a^3 - 4a = a(a^2 - 4) = a(a - 2)(a + 2) \]

REF: 011107ia  STA: A.A.45  TOP: Pythagorean Theorem

9 ANS: 1

\[ \sin x = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{28}{53} \]

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

10 ANS: 2  REF: 011109ia  STA: A.A.42  TOP: Trigonometric Ratios

11 ANS: 4  REF: 011110ia  STA: A.N.6  TOP: Evaluating Expressions

12 ANS: 1

\[ \frac{2x}{3} + \frac{1}{2} = \frac{5}{6} \]

\[ \frac{2x}{3} = \frac{1}{3} \]

\[ 6x = 3 \]

\[ x = \frac{1}{2} \]

REF: 011111ia  STA: A.G.8  TOP: Solving Quadratics by Graphing

12 ANS: 1

\[ \frac{2x}{3} + \frac{1}{2} = \frac{5}{6} \]

\[ \frac{2x}{3} = \frac{1}{3} \]

\[ 6x = 3 \]

\[ x = \frac{1}{2} \]

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
\frac{3}{2x} + \frac{7}{4x} = \frac{12x + 14x}{8x^2} = \frac{26x}{8x^2} = \frac{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 \cdot 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 = \frac{-A}{B} = \frac{-3}{-7} = \frac{3}{7}

REF: 011122ia STA: A.A.37 TOP: Slope
KEY: area

23 ANS: 2
A = lw + lw + \frac{\pi r^2}{4} = 5 \cdot 3 + 5 \cdot 3 + \frac{\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
\[
\frac{e^y}{n} + k = t
\]
\[
\frac{e^y}{n} = t - k
\]
\[
y = \frac{n(t - k)}{e}
\]
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 inches × \(\frac{1\text{ yard}}{36\text{ inches}}\) = \(\frac{4}{3}\) yards × $3.75 = $5.00

REF: 011131ia STA: A.M.2 TOP: Conversions
32 ANS:
\[
\frac{1375}{1600} = \frac{40^2 - 15^2}{40^2 - 15^2} = \frac{1375}{1600}
\]

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

33 ANS:
2.1. \(\cos 65 = \frac{x}{5}\)

\[
x \approx 2.1
\]

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

34 ANS:
\[
y = \frac{3}{4}x + 10.
\]

\[
y = mx + b
\]

\[
4 = \frac{3}{4}(-8) + b
\]

\[
4 = -6 + b
\]

\[
10 = b
\]

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

35 ANS:

<table>
<thead>
<tr>
<th>Interval</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>51–60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61–70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>71–80</td>
<td></td>
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<tr>
<td>81–90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91–100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

\[
4, -5. \quad \frac{x + 2}{6} = \frac{3}{x - 1}
\]

\[
(x + 2)(x - 1) = 18
\]

\[
x^2 - x + 2x - 2 = 18
\]

\[
x^2 + x - 20 = 0
\]

\[
(x + 5)(x - 4) = 0
\]

\[
x = -5 \text{ or } 4
\]

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

37 ANS:

\[
0.029. \quad \frac{[2\pi(5.1)^2 + 2\pi(5.1)(15.1)] - [2\pi(5)^2 + 2\pi(5)(15)]}{2\pi(5.1)^2 + 2\pi(5.1)(15.1)} \approx \frac{647.294 - 628.319}{647.294} \approx 0.029
\]

REF: 011137ia STA: A.M.3 TOP: Error KEY: volume and surface area

38 ANS:

\[
24,435.19. \quad 3000(0.95)^4 \approx 24435.19
\]

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

39 ANS:

![Graph]

REF: 011139ia STA: A.G.7 TOP: Systems of Linear Inequalities
0611ia
Answer Section

1 ANS: 3 PTS: 2 REF: 061101ia STA: A.A.19
TOP: Factoring the Difference of Perfect Squares

2 ANS: 3
\[10^2 + 10^2 = c^2\]
\[c^2 = 200\]
\[c \approx 14.1\]

PTS: 2 REF: 061102ia STA: A.A.45 TOP: Pythagorean Theorem

3 ANS: 1 PTS: 2 REF: 061103ia STA: A.A.12
TOP: Division of Powers

4 ANS: 3
\[P(\text{odd}) = \frac{3}{6}, P(\text{prime}) = \frac{3}{6}, P(\text{perfect square}) = \frac{2}{6}, P(\text{even}) = \frac{3}{6}\]

PTS: 2 REF: 061104ia STA: A.S.22 TOP: Geometric Probability

5 ANS: 2 PTS: 2 REF: 061105ia STA: A.A.20
TOP: Factoring Polynomials

6 ANS: 3
\[3\sqrt{250} = 3\sqrt{25\sqrt{10}} = 15\sqrt{10}\]

PTS: 2 REF: 061106ia STA: A.N.2 TOP: Simplifying Radicals

7 ANS: 1
Asking school district employees about a school board candidate produces the most bias.

PTS: 2 REF: 061107ia STA: A.S.3 TOP: Analysis of Data

8 ANS: 2
\[\sin 57 = \frac{x}{8}\]
\[x \approx 6.7\]

PTS: 2 REF: 061108ia STA: A.A.44 TOP: Using Trigonometry to Find a Side

9 ANS: 4
\[5 \times 4 \times 3 \times 2 \times 1 = 120\]

PTS: 2 REF: 061109ia STA: A.N.8 TOP: Permutations

10 ANS: 3
\[m = \frac{6 - 4}{3 - (-2)} = \frac{2}{5}\]

PTS: 2 REF: 061110ia STA: A.A.33 TOP: Slope

11 ANS: 4 PTS: 2 REF: 061111ia STA: A.G.4
TOP: Families of Functions
12 ANS: 4 PTS: 2 REF: 061112ia STA: A.A.36
TOP: Parallel and Perpendicular Lines

13 ANS: 2 PTS: 2 REF: 061113ia STA: A.G.5
TOP: Graphing Quadratic Functions

14 ANS: 1 PTS: 2 REF: 061114ia STA: A.A.43
TOP: Using Trigonometry to Find an Angle

15 ANS: 2 PTS: 2 REF: 061115ia STA: A.S.7
TOP: Scatter Plots

16 ANS: 2
In (2), each element in the domain corresponds to a unique element in the range.

PTS: 2 REF: 061116ia STA: A.G.3 TOP: Defining Functions

17 ANS: 1
\[
\frac{12.8 + 17.2}{3 + 5} = 3.75
\]

PTS: 2 REF: 061117ia STA: A.M.1 TOP: Speed

18 ANS: 2
\[x^2 - x = x + 3\] Since \(y = x + 3\), the solutions are (3,6) and (−1,2).
\[x^2 - 2x - 3 = 0\]
\[(x - 3)(x + 1) = 0\]
\[x = 3 \text{ or } -1\]

PTS: 2 REF: 061118ia STA: A.A.11 TOP: Quadratic-Linear Systems

19 ANS: 3 PTS: 2 REF: 061119ia STA: A.A.2
TOP: Expressions

20 ANS: 3
\[
\frac{(12.3 \times 11.9) - (12.2 \times 11.8)}{12.3 \times 11.9} \approx 0.0165
\]

PTS: 2 REF: 061120ia STA: A.M.3 TOP: Error

KEY: area

21 ANS: 2 PTS: 2 REF: 061121ia STA: A.A.3
TOP: Expressions

22 ANS: 2 PTS: 2 REF: 061122ia STA: A.S.14
TOP: Analysis of Data

23 ANS: 4 PTS: 2 REF: 061123ia STA: A.A.31
TOP: Set Theory

24 ANS: 2
\[20000(0.88)^3 = 13629.44\]

PTS: 2 REF: 061124ia STA: A.A.9 TOP: Exponential Functions
25 ANS: 4
\[ x^2 - 4x - 12 = 0 \]
\[ (x - 6)(x + 2) = 0 \]
\[ x = 6 \quad x = -2 \]

PTS: 2   REF: 061125ia   STA: A.A.15   TOP: Undefined Rationals

26 ANS: 1
\[ f + m = 53 \]
\[ f - m = 25 \]
\[ 2m = 28 \]
\[ m = 14 \]

PTS: 2   REF: 061126ia   STA: A.A.7   TOP: Writing Linear Systems

27 ANS: 2
TOP: Operations with Scientific Notation

28 ANS: 2
PTS: 2   REF: 061128ia   STA: A.A.29   TOP: Set Theory

29 ANS: 4
\[ \frac{7}{6x} - \frac{y}{12x} = \frac{42x^2 - 12xy}{72x^3} = \frac{6x(7x - 2y)}{72x^3} = \frac{7x - 2y}{12x^2} \]

PTS: 2   REF: 061129ia   STA: A.A.17   TOP: Addition and Subtraction of Rationals

30 ANS: 4
PTS: 2   REF: 061130ia   STA: A.A.13   TOP: Addition and Subtraction of Polynomials

31 ANS:
\[ \frac{x^2 - 5x - 24}{x - 8} = \frac{(x - 8)(x + 3)}{x - 8} = x + 3 \]

PTS: 2   REF: 061131ia   STA: A.A.14   TOP: Division of Polynomials

32 ANS:
(1) Distributive; (2) Commutative

PTS: 2   REF: 061132ia   STA: A.N.1   TOP: Identifying Properties

33 ANS:
\[ x = 1; \quad (1, -5) \]

PTS: 2   REF: 061133ia   STA: A.G.10   TOP: Identifying the Vertex of a Quadratic Given Graph

34 ANS:
12, 7. Both the median and the mode will increase.

PTS: 3   REF: 061134ia   STA: A.S.16   TOP: Central Tendency
35 ANS:
0.65x + 35 \leq 45
0.65x \leq 10
x \leq 15

PTS: 3 REF: 061135ia STA: A.A.6 TOP: Modeling Inequalities

36 ANS:
2(x + 3)(x - 4) + 2(5)(x - 4) + 2(x + 3)(5)
2(x^2 - 4x + 3x - 12) + 10(x - 4) + 10(x + 3)
2x^2 - 2x - 24 + 10x - 40 + 10x + 30
2x^2 + 18x - 34

PTS: 3 REF: 061136ia STA: A.G.2 TOP: Surface Area

37 ANS:
\frac{9}{4}, \frac{3}{4} = \frac{-x + 11}{4x} + \frac{1}{2x}
\frac{3}{4} = \frac{-x - 11}{4x} + \frac{2}{4x}
\frac{3}{4} = \frac{-x - 9}{4x}
12x = -4x - 36
16x = -36
x = \frac{9}{4}

PTS: 4 REF: 061137ia STA: A.A.26 TOP: Solving Rationals

38 ANS:
(T,J,F), (T,J,N), (T,K,F), (T,K,N), (T,C,F), (T,C,N), (B,J,F), (B,J,N), (B,K,F), (B,K,N), (B,C,F), (B,C,N), (S,J,F),

PTS: 4 REF: 061138ia STA: A.S.19 TOP: Sample Space
39 ANS:

PTS: 4 REF: 061139ia STA: A.G.7 TOP: Systems of Linear Inequalities
0811ia

Answer Section

1 ANS: 4  
\[ \frac{150}{20} = \frac{x}{30} \]

\[ 20x = 4500 \]

\[ x = 225 \]

PTS: 2  REF: 081101ia  STA: A.N.5  TOP: Direct Variation

2 ANS: 1  PTS: 2  REF: 081102ia  STA: A.S.12  TOP: Scatter Plots

3 ANS: 3  PTS: 2  REF: 081103ia  STA: A.A.30  TOP: Set Theory

4 ANS: 2  PTS: 2  REF: 081104ia  STA: A.S.14  TOP: Analysis of Data

5 ANS: 3  
\[ V = \pi r^2 h = \pi \cdot 5^2 \cdot 2.3 \approx 180.6 \]

PTS: 2  REF: 081105ia  STA: A.G.2  TOP: Volume

6 ANS: 2  PTS: 2  REF: 081106ia  STA: A.S.6  TOP: Box-and-Whisker Plots

7 ANS: 4  PTS: 2  REF: 081107ia  STA: A.A.5  TOP: Modeling Inequalities

8 ANS: 1  
\[ y = mx + b \]

\[ 5 = (-2)(1) + b \]

\[ b = 7 \]

PTS: 2  REF: 081108ia  STA: A.A.34  TOP: Writing Linear Equations

9 ANS: 3  
\[ 2x - 5y = 11 \]
\[ 2x - 5(-1) = 11 \]

\[ -2x + 3y = -9 \]
\[ 2x = 6 \]

\[ -2y = 2 \]
\[ x = 3 \]

\[ y = -1 \]

PTS: 2  REF: 081109ia  STA: A.A.10  TOP: Solving Linear Systems

10 ANS: 1  PTS: 2  REF: 081110ia  STA: A.A.1  TOP: Expressions

11 ANS: 2  PTS: 2  REF: 081111ia  STA: A.G.10  TOP: Identifying the Vertex of a Quadratic Given Graph
12 ANS: 2
\[ \tan ABC = \frac{\text{opposite}}{\text{adjacent}} = \frac{5}{12} \]

PTS: 2 REF: 081112ia STA: A.A.42 TOP: Trigonometric Ratios

13 ANS: 1
\[-3(-4)^2(2) + 4(-4) = -96 - 16 = -112 \]

PTS: 2 REF: 081113ia STA: A.N.6 TOP: Evaluating Expressions

14 ANS: 4
\[-3x(x - 4) - 2(x(x + 3)) = -3x^2 + 12x - 2x^2 - 6x = -5x^2 + 6x \]

PTS: 2 REF: 081114ia STA: A.A.13 TOP: Addition and Subtraction of Monomials

15 ANS: 1 PTS: 2 REF: 081115ia STA: A.A.32
TOP: Slope

16 ANS: 2
\[ l(l - 3) = 40 \]
\[ l^2 - 3l - 40 = 0 \]
\[ (l - 8)(l + 5) = 0 \]
\[ l = 8 \]

PTS: 2 REF: 081116ia STA: A.A.8 TOP: Geometric Applications of Quadratics

17 ANS: 3 PTS: 2 REF: 081117ia STA: A.A.29
TOP: Set Theory

18 ANS: 3 PTS: 2 REF: 081118ia STA: A.G.4
TOP: Families of Functions

19 ANS: 1
\[ b = 2j + 4 \quad 2j + 4 = 31 - j \]
\[ b + j = 31 \quad 3j = 27 \]
\[ b = 31 - j \quad j = 9 \]

PTS: 2 REF: 081119ia STA: A.A.7 TOP: Writing Linear Systems

20 ANS: 2
\[ x^2 - 5x + 6 = 0 \]
\[ (x - 3)(x - 2) = 0 \]
\[ x = 3 \quad x = 2 \]

PTS: 2 REF: 081120ia STA: A.A.28 TOP: Roots of Quadratics
21 ANS: 4

\[-6x - 17 \geq 8x + 25\]

\[-42 \geq 14x\]

\[-3 \geq x\]

PTS: 2  REF: 081121ia  STA: A.A.24  TOP: Solving Inequalities

The other situations are quantitative.

22 ANS: 4

PTS: 2  REF: 081122ia  STA: A.S.1  TOP: Analysis of Data

23 ANS: 2

\[\frac{|13.5 - 12.8|}{13.5} \approx 0.093\]

PTS: 2  REF: 081123ia  STA: A.M.3  TOP: Error

KEY: area

24 ANS: 2

\[2000(1 + 0.04)^3 \approx 2249\]

PTS: 2  REF: 081124ia  STA: A.A.9  TOP: Exponential Functions

25 ANS: 3

\[P(O) = \frac{5}{10}, P(P) = \frac{4}{10}, P(\leq 5) = \frac{6}{10}, P(3) = \frac{4}{10}\]

PTS: 2  REF: 081125ia  STA: A.S.22  TOP: Theoretical Probability

26 ANS: 2

\[\cos 38 = \frac{10}{x}\]

\[x = \frac{10}{\cos 38} \approx 12.69\]

PTS: 2  REF: 081126ia  STA: A.A.44  TOP: Using Trigonometry to Find a Side

27 ANS: 2

PTS: 2  REF: 081127ia  STA: A.A.40  TOP: Systems of Linear Inequalities

28 ANS: 1

\[7 + 8 + 7 + \frac{12\pi}{2} = 22 + 6\pi\]

PTS: 2  REF: 081128ia  STA: A.G.1  TOP: Compositions of Polygons and Circles

KEY: perimeter

29 ANS: 2

\[36x^2 - 100y^6 = 4(9x^2 - 25y^6) = 4(3x + 5y^3)(3x - 5y^3)\]

PTS: 2  REF: 081129ia  STA: A.A.19  TOP: Factoring the Difference of Perfect Squares
30 ANS: 4

\[
\frac{x}{x+4} \div \frac{2x}{x^2-16} = \frac{x}{x+4} \cdot \frac{x^2-16}{2x} = \frac{1}{x+4} \cdot \frac{(x+4)(x-4)}{2} = \frac{x-4}{2}
\]

PTS: 2 REF: 081130ia STA: A.A.18 TOP: Multiplication and Division of Rationals

31 ANS:

\[
bc + ac = ab
\]

\[
c(b + a) = ab
\]

\[
c = \frac{ab}{b+a}
\]

PTS: 2 REF: 081131ia STA: A.A.23 TOP: Transforming Formulas

32 ANS:

\[
\begin{array}{c|c|c|c}
\text{Class} & \text{Frequency} & \text{Cumulative Frequency} \\
0.5 - 3.5 & 5 & 5 \\
3.5 - 6.5 & 3 & 8 \\
6.5 - 9.5 & 2 & 10 \\
9.5 - 12.5 & 1 & 11 \end{array}
\]

PTS: 2 REF: 081132ia STA: A.S.5 TOP: Frequency Histograms, Bar Graphs and Tables KEY: frequency histograms

33 ANS:

\[
77120 + 33500 = 110620 \text{ sq. ft.} \times \frac{1 \text{ acre}}{43560 \text{ sq. ft.}} \approx 2.54 \text{ acres}
\]

PTS: 2 REF: 081133ia STA: A.M.2 TOP: Conversions
34 ANS:

![Graph](image)

The graph becomes steeper.

PTS: 3 REF: 081134ia STA: A.G.5 TOP: Graphing Absolute Value Functions

35 ANS:

41.8. \( \sin x = \frac{8}{12} \)

\[ A \approx 41.8 \]

PTS: 3 REF: 081135ia STA: A.A.43 TOP: Using Trigonometry to Find an Angle

36 ANS:

\[-2\sqrt{3} \left( \frac{16\sqrt{21}}{2\sqrt{7}} \right) - 5\sqrt{12} = 8\sqrt{3} - 5\sqrt{4\sqrt{3}} = 8\sqrt{3} - 10\sqrt{3} = -2\sqrt{3} \]

PTS: 3 REF: 081136ia STA: A.N.3 TOP: Operations with Radicals

37 ANS:

\[ \frac{4}{12} \times \frac{2}{11} \times \frac{1}{10} = \frac{8}{1320} \]

\[ \frac{6}{12} \times \frac{5}{11} \times \frac{4}{10} + \frac{4}{12} \times \frac{3}{11} \times \frac{2}{10} = \frac{120}{1320} + \frac{24}{1320} = \frac{144}{1320} \]

PTS: 4 REF: 081137ia STA: A.S.23 TOP: Theoretical Probability

KEY: dependent events
38 ANS:

PTS: 4  REF: 081138ia  STA: A.G.9  TOP: Quadratic-Linear Systems

39 ANS:
\[
\frac{m}{5} + \frac{3(m-1)}{2} = 2(m-3) \\
\frac{2m}{10} + \frac{15(m-1)}{10} = 2m - 6 \\
\frac{17m - 15}{10} = 2m - 6 \\
17m - 15 = 20m - 60 \\
45 = 3m \\
15 = m
\]

PTS: 4  REF: 081139ia  STA: A.A.25  TOP: Solving Equations with Fractional Expressions