1. From the set $\{1,2,3,4\}$, one member is selected at random as a value for k. Find the probability that the solution for x of the equation $kx=8$ is an integer. Express your answer as a **decimal**.

2. **(Multiple Choice)** For your answer write the **capital letter** which corresponds to the correct choice.

   What are all the real values for which $|-2x| = -x-x$?

   A) all $x \le 0$ B) all $x \ge 0$ C) all $x < 0$ D) all $x > 0$ E) $x = 0$

3. Find the smallest possible **positive** value for x such that $2x^2+9x \ge 5$.

4. Find the integral value of x such that $\log_2\left(\log_3\left(\log_5\left(x^9\right)\right)\right) = 2$.

5. If $x-3$ is a factor of $x^2-11x+k$, find the value of k.

6. Find the focus of the parabola whose equation is $x^2+6x+12y-3=0$. Express your answer as an **ordered pair** of the form (x, y).

7. A machine contains 9 balls numbered consecutively from 1 through 9. Balls numbered 1, 4, 5, 6, 7, 8 and 9 are equally likely to drop out. Ball number 2 is four times as likely to drop out as any of these and three times as likely as ball number 3. The machine is rotated, and a ball drops out. The ball is replaced, the machine is rotated again, and a ball drops out. Find the probability that one 2 ball and one 3 ball dropped out. Express your answer as a **decimal rounded to the nearest hundred-thousandth**.

8. Let w be a positive integer that is a root for x of the cubic equation $x^3 + ax^2 + bx - \frac{1}{2} = 0$. The reciprocal of w is also a root of the given cubic equation. If $b < 50$, find the largest possible value of w.

9. At the end of each month, Ernesto invests \$125.02 in an annuity that pays an annual percentage rate of 6.8% and is compounded monthly. After Ernesto has made his 24th monthly investment of \$125.02, find the number of dollars in the value of Ernesto's annuity. Round your answer to the nearest dollar, and express your answer as that whole number.

10. Let $n < 57$ and let $x < n$ where both x and n are positive integers. Find the value of the largest possible value of x if the sum of the consecutive positive integers from $(x+1)$ through n is 186 more than the sum of the consecutive positive integers from 1 through $(x-1)$.

11. The foci of a hyperbola are $(0,3)$ and $(0,-3)$, and the vertices of this hyperbola are $(0, \frac{\sqrt{11}}{2})$ and $(0, -\frac{\sqrt{11}}{2})$. This hyperbola can be expressed in the form $\frac{y^2}{k} - \frac{x^2}{w} = 1$. Find the value of $(5k + 9w)$.

12. Find the sum of the arithmetic series $2 + 5 + 8 + 11 + \cdots + 302$.

13. A six digit number of the form $bcdefa$, where b is the hundred thousands digit, c is the ten thousands digit, etc., is 3.5 times the six digit number of the form $abcdef$, where a is the hundred thousands digit, etc. Find the original six digit number $bcdefa$.

14. Let $a_1 = 125$. For every integer n such that $n \geq 1$, $a_{(n+1)} = a_n +$ the square of the sum of the digits of a_n. Find the value of a_6.

15. If $3xy - 39x = 12y + 9$, then the range for y includes all real numbers except one real number. Find the real number that is **not** a member of the range for y.

16. On 11/14/01, Michael Cameron, 20, from Canada proved that $2^{13,466,917} - 1$ is prime. How many digits did that prime number contain?

17. An ordered pair (b, c) of integers, each of which has absolute value less than or equal to nine, is chosen at random, with each such ordered pair having an equal likelihood of being chosen. The individual members of the ordered pair chosen are substituted for b and c respectively in the equation $x^2 + bx + 2c = 0$. Find the probability that the two roots for x are unequal. Express your answer as a common fraction reduced to lowest terms.

18. If $x \neq 5$, then $\dfrac{x^3 - 2x + 20}{x - 5} = x^2 + 5x + 23 + \dfrac{k}{x-5}$. Find the value of k.

19. If $x > 1$ and if $(\log_x 128)(\log_{128} 16) = y$, then $\log_{(2x)} 256 = \dfrac{ky}{wy + p}$ where k, w, and p are positive integers. Find the smallest possible value of $(k + w + p)$.

20. Let x, y, and z be positive integers such that $\dfrac{1}{x^2} + \dfrac{1}{y^2} = \dfrac{1}{z^2}$. If x and y are each integral multiples of P, a prime integer greater than 6, find the smallest possible value of $(x + y + z)$.

2010 SAA

Algebra II

Name ANSWERS

School ____________________

(Use full school name – no abbreviations)

_______ Correct X 2 pts. ea. = [ ]

Note: All answers must be written legibly in simplest form, according to the specifications stated in the Contest Manual. Exact answers are to be given unless otherwise specified in the question. No units of measurement are required.

1. 0.75 OR .75 (Must be this decimal.)
2. A (Must be this capital letter.)
3. 0.5 OR .5 OR $\frac{1}{2}$
4. 1953125
5. 24
6. $(-3,-2)$ (Must be this ordered pair.)
7. 0.07012 OR .07012 (Must be this decimal.)
8. 97
9. 3204 ($ optional.)
10. 33
11. 70
12. 15352
13. 538461
14. 1242
15. 13
16. 4053946
17. $\frac{356}{361}$ (Must be this reduced common fraction.)
18. 135
19. 5
20. 281

ITEM ANALYSIS
165 Papers
% correct
3AA Algebra II

1.	87%	11.	25%
2.	83%	12.	66%
3.	91%	13.	4%
4.	64%	14.	57%
5.	94%	15.	45%
6.	25%	16.	4%
7.	14%	17.	3%
8.	7%	18.	73%
9.	10%	19.	3%
10.	11%	20.	0%

151 Papers
% correct
4AA Algebra II

1.	96%	11.	42%
2.	89%	12.	75%
3.	92%	13.	9%
4.	79%	14.	60%
5.	97%	15.	58%
6.	39%	16.	7%
7.	30%	17.	8%
8.	23%	18.	79%
9.	13%	19.	2%
10.	13%	20.	1%