1. Determine the value of $(b+c)$ so that the following two polynomials are identical:
$x^3+(5b-7)x^2+17+3c+5x$ and $163x^2+x^3+5x+50$.

2. Given the set of 5 **distinct** integers: $\{2,4,6,8,k\}$. One number is selected at random from the given set and the probability that the number selected is the square of an integer is 0.2. If k represents a positive integer greater than 10, find the smallest possible value of k.

3. Find the **sum** of all distinct members of the **union** $A\cup B$ of the two sets $A=\{1,2,4,5,7\}$ and $B=\{3,4,6,7,8\}$.

4. If $f(x)-x\left(f(-x)\right)=x^2$, find $f(5)$. Express your answer as an improper fraction reduced to lowest terms.

5. Find the value of $(x+y)$ for the ordered pairs as shown: $(x-2y,3x+4y)=(3,29)$.

6. If $x^4+3x^3-x^2+11x-4$ is divided by $x+4$, the quotient is x^3+kx^2+wx+p. Find the value of $(k+w+p)$.

7. Find the smallest positive integer that has exactly 32 distinct positive integral divisors, but has only 3 distinct prime positive factors.

8. Find the **sum** of all negative integers that are members of the solution set for x of: $|x| < 5$.

9. Claire gave a test consisting of 5 problems: A, B, C, D, and E. Claire noticed that the percentage of students who had problem A correct was 65%; B, 75%; C, 60%; D, 55%; and E, 45%. Pairwise, the percentage correct was A,B, 50%; A,C, 40%; A,D, 30%; A,E, 30%; B,C, 40%; B,D, 45%; B,E, 40%; C,E, 30%; and D,E, 30%. Three at a time, the percentage correct was A,B,C, 25%; A,B,D, 25%; A,B,E,25%; A,C,D, 15%; A,C,E, 20%; A,D,E, 20%; B,C,D, 25%; B,C,E, 25%; B,D,E, 30%; and C,D,E, 20%. By fours, A,B,C,D, 10%; A,B,C,E, 15%; A,B,D,E, 20%; A,C,D,E, 10%; and B,C,D,E, 20%. Finally, the percentage having all five correct A,B,C,D,E was 10%. Five per cent of the students missed every problem. There were $k\%$ of the students who had C and D correct. Find the value of k. Do **not** attach % to your answer. **Hint:** the value of k is an integer.

10. Let $5+\sqrt[3]{7}$ be a root for x of a polynomial equation in terms of x of the smallest possible degree in which all coefficients are integers. If the coefficient of the term of the highest degree is 1, find the sum of the numerical coefficient of the x^2 term and the numerical coefficient of the x term.

11. Let $i=\sqrt{-1}$. If $x+2i=y$, find the value of $|x-y|+|y-x|$.

12. Find the length of the minor axis of an ellipse whose equation is $27x^2+144y^2=3888$.

13. The reciprocal of each root of $36x^3+228x^2+73x+6=0$ is also a root for x for the cubic equation $x^3+kx^2+wx+6=0$. Find the value of $(k+w)$. Express your answer as a proper or improper fraction as appropriate, reduced to lowest terms.

14. If n is a positive integer, find the value of n such that

$$\frac{1(2)+3(4)+5(6)+\cdots+(2n-1)(2n)}{1(2)(3)+2(3)(4)+3(4)(5)+\cdots+n(n+1)(n+2)}=\frac{29}{150}.$$

15. Find the degree of the following polynomial: $\left(3x^2\right)\left(x^3\right)+2x\left(x\right)^3-13x^2+5x-6$.

16. Find the remainder when 11^{27^6} is divided by 7.

17. The terms of an arithmetic sequence are: $50, 75, 100, \cdots$. The terms of the triangular sequence whose n^{th} term is $\frac{n^2+n}{2}$ are: $1, 3, 6, 10, \cdots$. Find the value of the first term of the triangular sequence that is greater than the corresponding term of the arithmetic sequence.

18. If Lee selects 1 coin at random from k coins, the probability the coin will be a nickel is $\frac{1}{3}$. If Cindy selects 2 coins without replacement at random from the same k coins, the probability both coins will be nickels is $\frac{1}{12}$. Find the least value of k.

19. If $\log_a 6 = 4$ and $\frac{1}{\log_a\left(r\right)} = 3$, find the value of $\log_a\left(\sqrt{6r^3}\right)$. Express your answer as a **decimal**.

20. Two friends have agreed to meet for lunch this Saturday. They have agreed that each will arrive at a random time between 11:00 A. M. and 12:00 noon and that each will wait for the other for 8 minutes or until 12:00 noon. Otherwise, the first to arrive will leave. Find the probability the two will actually have lunch together this Saturday. Express your answer as a common fraction reduced to lowest terms.

2009 RAA
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. 45

2. 11

3. 36

4. $\frac{75}{13}$ **(Must be this reduced improper fraction.)**

5. 9

6. 1

7. 1080

8. –10

9. 35

10. 60

11. 4

12. $6\sqrt{3}$ **(Must be this exact answer.)**

13. $\frac{301}{6}$ **(Must be his reduced improper fraction.)**

14. 22

15. 5

16. 1

17. 1326

18. 9

19. 2.5 **(Must be decimal answer.)**

20. $\frac{56}{225}$ **(Must be this reduced common fraction.)**