

23. On a flat surface, my duck Fred walks due north at 1 km per hour for 1 minute, then walks due east at 0.75 km per hour for 1 minute. Fred is then how many km from his starting point?

- A)  $\frac{1}{100}$     B)  $\frac{1}{70}$     C)  $\frac{1}{48}$     D)  $\frac{1}{20}$



24.  $\sqrt{100^{100}} =$

- A)  $10^{10}$     B)  $10^{50}$     C)  $100^{10}$     D)  $100^{50}$

25. In the complete expansion of  $(x + 1)^4$ , what is the sum of the coefficients of the odd powers of  $x$ ?

- A) 4    B) 6    C) 8    D) 10

26. If  $x + 4 = y + 5$ , then  $x^2 + 8x =$

- A)  $y^2 + 10y + 9$     B)  $y^2 + 9y + 10$     C)  $y^2 + 10y$     D)  $y^2 + 9y$

27. What is the greatest positive integer  $x$  such that  $2^x$  is a divisor of  $12^{1200}$ ?

- A) 600    B) 1200    C) 2400    D) 3600

28. One hundred grandparents were shopping. If  $\frac{2}{3}$  of the grandfathers and  $\frac{1}{2}$  of the grandmothers bought coats, and the number of grandfathers who bought coats was 10 more than  $\frac{3}{2}$  the number of grandmothers who bought coats, how many grandfathers bought coats?

- A) 35    B) 40    C) 55    D) 60



29. If  $r$  is the sum of all even integers between 1 and 2011, and  $s$  is the sum of all odd integers between 0 and 2010, then  $r - s =$

- A) 1005    B) 1006    C) 2010    D) 2011

30. If  $x \neq 0$ ,  $y \neq 0$ ,  $x \neq y$ , and  $\frac{y}{x} - \frac{x}{y} + \frac{1}{x} - \frac{1}{y} = 0$ , what is the value of  $x + y$ ?

- A) -2    B) -1    C) 0    D) 1

23.

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2009-2010 Annual Algebra Course 1 Contest

Spring, 2010

Instructions

A

- **Time** Do not open this booklet until you are told by your teacher to begin. You will have only 30 minutes working time for this contest. You might be unable to finish all 30 questions in the time allowed.
- **Scores** Please remember that *this is a contest, and not a test*—there is no “passing” or “failing” score. Few students score as high as 24 points (80% correct). Students with half that, 12 points, should be commended!
- **Format and Point Value** This is a multiple-choice contest. Each answer is an A, B, C, or D. Write each answer in the *Answer Column* to the right of each question. A correct answer is worth 1 point. Unanswered questions receive no credit. You may use a calculator.



The end of the contest A

1.	What is the value of $b + e + a + r$ if $b = 1$ , $e = 2b$ , and $a = 3e$ , and $r = 4a$ ?	A) 4 B) 10 C) 24 D) 33
2.	Of the following, which has the greatest value when $x = 1$ ?	A) $x - 1$ B) $x^2 - 2$ C) $x^3 - 3$ D) $x^4 - 4$
3.	$(-4)^2(-3)^0(-2)^1(-1)^0 =$	A) -32 B) 0 C) 16 D) 32
4.	$\frac{1}{2}$ is a factor of $x^4 - 16$ .	A) $x + 4$ B) $x - 4$ C) $x + 2$ D) $x - 1$
5.	For which of the following values of $x$ is the value of $x^{-2010}$ greatest?	A) 100 B) 200 C) 300 D) 400
6.	If $300x = 450 - 300y$ , then $x + y =$	A) -3 B) 1.5 C) 15 D) 30
7.	$(2x^4 + 4x^2) + (3x^4 - 5x^2) - (4x^4 - 6x^2) =$	A) $x^4 - 7x^2$ B) $x^4 + 5x^2$ C) $x^4 - 3x^2$ D) $x^4 + x^2$
8.	If $x > 0$ , then the additive inverse of $x$ divided by the reciprocal of $x$ equals	A) the square of $x$ B) the reciprocal of the square of $x$ C) the square root of $x$ D) the additive inverse of the square of $x$
9.	$((a^4)^3)^2 =$	A) $a^9$ B) $a^{24}$ C) $a^{36}$ D) $a^{64}$
10.	One day, $c$ children ate $g$ giant ice cream cones. If $g - c = 2$ and $g^2 - c^2 = 20$ , then $g =$	A) 6 B) 8 C) 10 D) 12
11.	$x\%$ of $y\%$ of 100 000 =	A) $x + y$ B) $xy$ C) $\frac{10}{x + y}$ D) $10xy$
12.	$\sqrt{2} + \sqrt{4} + \sqrt{8} + \sqrt{16} =$	A) $\sqrt{30}$ B) $6 + 3\sqrt{2}$ C) $10\sqrt{2}$ D) $3 + 4\sqrt{2}$



13.	My teacher's blackboard is in the shape of a rectangle. I add its area to its perimeter, then subtract twice its length, then divide by its width, then subtract 2 from the quotient. The result is the rectangle's area	A) length B) width C) diagonal D) area
14.	If the equation of line $\ell$ is $39x + 54y = 101$ , then an equation of a line perpendicular to $\ell$ is	A) $54x + 39y = 16$ B) $36x + 26y = 56$ C) $54x - 39y = 1$ D) $39x - 54y = 101$
15.	If $x > 5$ , then $\frac{x-1}{x-2} \times \frac{x-2}{x-3} \times \frac{x-3}{x-4} \times \frac{x-4}{x-5} =$	A) $x^4$ B) $(x-1)^4$ C) $(x-5)^{-4}$ D) $\frac{x-1}{x-5}$
16.	If $b = \sqrt{\quad}$ , then $x^2 + bx + 4 = 0$ has two equal solutions.	A) -6 B) -2 C) 0 D) 4
17.	If $\frac{x}{y} = \frac{9}{2}$ and $\frac{y}{z} = \frac{5}{4}$ , then $\frac{z}{x} =$	A) $\frac{5}{18}$ B) $\frac{45}{8}$ C) $\frac{14}{6}$ D) $\frac{13}{7}$
18.	Which of the following is a factor of $(x^3 - 4)^2 + 8x^3 - 25$ ?	A) $x^3 + 5$ B) $x^3 + 4$ C) $x^3 + 3$ D) $x^3 + 2$
19.	If $x$ , $y$ , and $z$ are integers and the average of $x$ and $y$ is $z$ , then $x - y$ cannot equal	A) 0 B) 1 C) $y$ D) $z$
20.	If 24 workers can build a house in 10 hours, and all workers work at the same rate, then 40 workers could build the house in $\frac{1}{2}$ hours.	A) $\frac{3}{50}$ B) 6 C) 14 D) $\frac{64}{10}$
21.	If $x^2 + 8x + 16 = 5^{12}$ and $x > 0$ , then $x =$	A) $5^6 - 4$ B) $5^6$ C) $5^6 + 4$ D) $5^6 + 8$
22.	If $x$ is a prime number greater than 3, how many different positive divisors does $6x$ have?	A) 2 B) 4 C) 6 D) 8

