

# 2003 STATE MATH CONTEST

## Preliminary Exam - Grades 7-9

1. The sum of the solutions to the equation  $x^2 + |2x - 16| = 19$  is

(a) -4                      (b) -2                      (c) 0                      (d) 2                      (e) 4

2. Betty has 60% as many dimes as she has nickels. The combined value of the two is \$3.85 . How many more nickels than dimes does she have?

(a) 12                      (b) 13                      (c) 14                      (d) 15                      (e) 16

3. Which value is the solution of this equation closest to?

$$\frac{1}{5} \left( 4x + \frac{25}{3} \right) - \frac{1}{3} \left( \frac{3x}{5} - 2 \right) = -\frac{2}{3}$$

(a) -6.0                      (b) -3.0                      (c) 0                      (d) 3.0                      (e) 6.0

4. Right now two clocks agree but the first clock loses 3.4 seconds every hour and the second gains 2.6 seconds every hour. How many hours will it be until the clocks again show the same time?

(a) 14,400                      (b) 12,600                      (c) 7,200                      (d) 6,300                      (e) none of these

5. If  $x^2 + 2x - 1$  is a factor of  $x^3 + Ax^2 + Bx - 1$  then  $A + B$  equals:

(a) -2                      (b) 0                      (c) 2                      (d) 4                      (e) none of these

6. What is the sum of the solutions of the following equation?

$$2 \cdot 4^{4t^2+11t+8} = 8^{4t^2+12t+9}$$

- (a)  $-7/2$       (b)  $-3/2$       (c)  $3/2$       (d)  $7/2$       (e) none of these

7.  $ABCD$  is a square. How many points  $P$  are there in the plane of the square that have the property that  $PAB$ ,  $PBC$ ,  $PCD$ ,  $PDA$  are all isosceles triangles?

- (a) 1      (b) 4      (c) 5      (d) 9      (e) infinitely many

8. If each angle of a regular  $n$ -gon (regular polygon with  $n$  sides) is  $175^\circ$ , what is the value of  $n$ ?

- (a) 6      (b) 12      (c) 24      (d) 56      (e) 72

9. An ant starts to climb a can that has the shape of a right circular cylinder with a height of 15 inches. Instead of climbing straight up the ant crawls on an angle so that it spirals up like the stripe on a barbershop pole. If the radius of the can is  $6/\pi$  inches and the ant goes around exactly 3 times until it reaches the top, how far did the ant crawl along the side of the can?

- (a) 36      (b) 39      (c) 42      (d) 45      (e) none of these

10. Line  $L_1$  passes through the intersection point of lines  $L_2$  and  $L_3$  that correspond to  $3x - 4y = -12$  and  $x + 2y = 10$ , respectively.  $L_1$  is also perpendicular to line  $L_3$ . What is the  $y$ -intercept of line  $L_1$ ?

- (a) -2      (b) -1      (c) 0      (d) 1      (e) 2

11. What is the largest difference there can be between two three digit numbers (at least 100) that have the same digits (possibly in different orders)?
- (a) 799      (b) 800      (c) 802      (d) 899      (e) none of these
12. A motorboat that goes 9 miles per hour in still water travelled downstream for 36 miles. Then it went back upstream to its starting point. If the entire trip required 9 hours, which one of the following is closest to the speed of the stream?
- (a) 2.2 mph    (b) 2.5 mph    (c) 2.8 mph    (d) 3.1 mph    (e) 3.4 mph
13. What is the sum of the digits of the smallest positive integer that is both greater than 1, and leaves a remainder of 1 when divided by either 5,6,7 or 8?
- (a) 5              (b) 9              (c) 11              (d) 13              (e) 16
14. One root of the equation  $8x^2 - 2x + c = 0$  is  $x = -1/2$ . What is the other root?
- (a)  $1/2$       (b)  $3/4$       (c)  $3/2$       (d) 2      (e) none of these
15. In a survey of 75 people about brands A, B and C, 31 liked brand A, 33 liked B, and 41 liked C. These include 8 who liked only A, 3 who liked A and B but not C, 12 who liked only B and 14 who liked only C. How many of the people surveyed did not like any of the three brands?
- (a) 6              (b) 9              (c) 11              (d) 12              (e) none of these