NAME _____ SCHOOL _____

2009 Middle School Math Festival **Individual Round: Algebra**

1. Simplify $-\frac{14x}{15}+\frac{x}{3}$.

A. $-\frac{13x}{45}$ B. $-\frac{3x}{5}$ C. $-x$ D. $-\frac{11x}{15}$

2. A sweater normally costs $45. As an employee, you receive a 30% discount. You must still pay the 6% sales tax on the total sales price. What is your total cost?

A. $33.39 B. $14.31 C. $ 31.50 D. $ 29.61

3. Solve the following equation for *b*: $\frac{x}{a}+\frac{y}{b}=1$

A. $b=1-\frac{ay}{x}$ C. $b=\frac{a-x}{ay}$

B. $b=1-\frac{x}{ay}$ D. $b=\frac{ay}{a-x}$

4. Peanuts sell for $7.00 per pound and cashews sell for $10.00 per pound. A vendor sold 10 pounds more peanuts than cashews and the total sales were $410. How many pounds of peanuts were sold?

A. 10 pounds B. 20 pounds C. 30 pounds D. 40 pounds

5. What is the 7th term in the following sequence: -32, 16, -8, 4 …

A. 1 B. -1 C. $-\frac{1}{2}$ D. $\frac{1}{2}$

6. Which equation shown below is equivalent to $y + 6 = -\frac{4}{7}(x + 6)$?

A. $y = \frac{4}{7}x - \frac{66}{7}$ B. $y = -\frac{4}{7}x - \frac{66}{7}$ C. $y = -\frac{4}{7}x + \frac{66}{7}$ D. $y = \frac{4}{7}x + \frac{66}{7}$

7. If $a \# b = -3a + \frac{1}{2}b$. What is the value of (4 # -2) # (-4)?

A. 37 B. -35 C. -37 D. 31

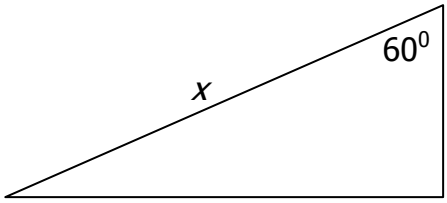
8. Two angles are supplementary. One angle is 32^0 less than the other angle. What is the measurement of the smaller angle?

A. 29^0 B. 61^0 C. 74^0 D. 106^0

9. A pole that is 15 feet tall casts a 20-foot shadow. At the same time, a nearby pole casts a 36-foot shadow. How tall is the second pole?

A. 24 feet B. 27 feet C. 30 feet D. 48 feet

10. What is exact value of *x*?



A. $12\sqrt{3}$ C. $6\sqrt{3}$

B. $3\sqrt{3}$ D. 36

11. Estimate $\sqrt{0.121}$

A. 0.011 B. 0.0605 C. 0.11 D. 0.35

12. Find the mean of the data set. $\left\{\frac{1}{2}, \frac{1}{8}, \frac{5}{6}, \frac{7}{12}\right\}$

A. $\frac{49}{96}$ B. $\frac{49}{48}$ C. $\frac{17}{48}$ D. $\frac{17}{96}$

13. Solve for *x*: $-\frac{1}{8}+\frac{3}{4}x=\frac{1}{16}$

A. $\frac{1}{12}$ B. $\frac{1}{4}$ C. $-\frac{1}{4}$ D. $-\frac{1}{12}$

14. Point *A* = (-6, 4). Point *B* = (-2, -2). Find the equation of the perpendicular bisector of $\overline{AB}$

A. $2x-3y=5$ C. $9x-6y=10$

B. $2x+3y=11$ D. $2x-3y=-11$

15. What is the exact distance between (-9, 2) and (3, -10)?

A. $2\sqrt{6}$ B. 10 C. 24 D. $12\sqrt{2}$

16. Solve for *x*: $\frac{-2}{2-x}=\frac{4}{x-5}$

A. 1 B. -1 C. -3 D. $\frac{1}{3}$

17. Solve for *x*: $|-2x-3|>5$.

A. $x > 1$ C. $-4 < x < 1$

B. $x < -1$ or $x > 1$ D. $x < -4$ or $x > 1$

18. Find the solution to the following system of equations: $\left\{\begin{array}{l} 3x+2y=7 \\ x=\frac{2}{3}y+5 \end{array}\right\}$

A. $\left(11/3, -2\right)$ B. $\left(16/3, 1/2\right)$ C. $\left(-2, 11/3\right)$ D. $\left(1/2, 16/3\right)$

19. A rectangular solid has dimensions of 2 yards by 2 feet by 2 inches. What is the volume, in cubic inches?

A. 1728 in^3 B. 864 in^3 C. 3456 in^3 D. 8 in^3

20. Simplify: $\left(\frac{-3y}{2x^{-2}}\right)^{-3}$

A. $\frac{-8}{27x^6y^3}$ B. $\frac{-8y^3}{27x^6}$ C. $\frac{8}{27x^6y^3}$ D. $\frac{-27x^6y^3}{8}$

21. Simplify $\sqrt{54} - \sqrt{384} + \sqrt{49}$

A. $7 - 5\sqrt{6}$ B. $7 + 5\sqrt{6}$ C. $7 - 61\sqrt{6}$ D. $2\sqrt{6}$

22. Simplify by rationalizing the denominator: $\frac{2-\sqrt{6}}{4+\sqrt{6}}$

A. $-7 - 3\sqrt{6}$ B. $\frac{7 - 3\sqrt{6}}{5}$ C. $\frac{7+3\sqrt{6}}{5}$ D. $-\frac{1}{2}$

23. Solve for *x*: $\frac{1}{27} = 9^{x+1}$

A. 2 B. -2 C. $\frac{1}{2}$ D. $-\frac{5}{2}$

24. Calculate $2^{-4}\left[2^6 \div 2^3 - 2^0 \times (-2)\right]$

A. $\frac{1}{4}$ B. $-\frac{5}{4}$ C. $\frac{5}{8}$ D. 1

25. What is the per cent decrease from 300 to 275?

A. $6\frac{2}{3}\%$ B. $8\frac{1}{3}\%$ C. $83\frac{1}{3}\%$ D. 25%

26. Solve for *y*: y (6y + 1) = 2

A. $\frac{2}{3}, -\frac{1}{2}$ B. $-\frac{2}{3}, \frac{1}{2}$ C. $-\frac{2}{3}, -\frac{1}{2}$ D. $0, -\frac{1}{6}$

27. Solve for *y*: $12y^2 - 13y - 25 = 10$

A. $\left\{\frac{7}{3}; -\frac{5}{4}\right\}$ B. $\left\{-\frac{7}{3}; \frac{5}{4}\right\}$ C. $\left\{-\frac{3}{7}; \frac{4}{5}\right\}$ D. $\left\{-\frac{7}{3}; -\frac{5}{4}\right\}$

28. What is the discriminant of $y + 2 = x(8x - 7)$

A. 15 B. $\sqrt{113}$ C. $7 \pm \sqrt{113}$ D. 113

29. Factor completely: $-9x^4 - 42x^3 + 72x^2$

A. $3x^2(3x-4)(x-6)$ C. $3x^2(3x+4)(x-6)$

B. $-3x^2(3x+4)(x+6)$ D. $-3x^2(3x-4)(x+6)$

30. Factor completely: $\frac{3}{4}x^2 - \frac{27}{256}$

A. $\frac{3}{4}\left(x + \frac{3}{8}\right)\left(x - \frac{3}{8}\right)$ C. $\left(\frac{3}{4}x - \frac{9}{8}\right)\left(x - \frac{3}{8}\right)$

B. $\frac{3}{4}\left(x - \frac{3}{8}\right)\left(x - \frac{3}{8}\right)$ D. $\frac{3}{4}\left(x + \frac{3}{4}\right)\left(x - \frac{3}{4}\right)$

31. What is 0.4% of 0.8?

A 0.32 B. 0.0032 C. 2 D. 200

32. What per cent of 3.1 is 20?

A. 6.45% B. 15.5% C. 60.2% D. 645%

33. 300% of what number is 51?

A. 0.17 B. 5.882 C. 17 D. 153

34. Evaluate $\frac{10!}{5!\,5!}$

A. 252 B. 120 C. 1 D. $\frac{2}{5}$

35. Write the equation, in point-slope form, of the line, $x + 5y + 14 = 0$, which passes through the point (6, -4).

A. $y + 4 = -\frac{1}{5}(x + 6)$ C. $y - 4 = -\frac{1}{5}(x + 6)$

B. $y - 4 = -\frac{1}{5}(x - 6)$ D. $y + 4 = -\frac{1}{5}(x - 6)$

36. Find the coordinates for the vertex of $y = 3x^2 - 6x - 2$.

A. (-1, 7) B. (-1, 1) C. (1, -5) D. (-1, -5)

37. Find the axis of symmetry of $y = -\frac{1}{2}x^2 + \frac{3}{5}x - \frac{1}{3}$.

A. $x = -\frac{3}{5}$ B. $x = \frac{3}{5}$ C. $y = \frac{3}{5}$ D. $x = \frac{6}{5}$

38. Factor completely: $3p^3 - 3p^2 - 12p + 12$

A. $3(p+2)(p-2)(p-1)$

B. $3(p+2)(p-2)(p+1)(p-1)$

C. $3(p-4)(p+1)(p-1)$

D. $3(p+2)(p-2)(p+1)$

39. Simplify $\dfrac{3y}{4y-8} \div \dfrac{12y^2}{20-5y^2}$

A. $\dfrac{-5(y+2)}{16y}$ B. $\dfrac{5(y+2)}{16(y-2)}$ C. $\dfrac{5(y-2)}{16y}$ D. $\dfrac{-5(y-2)}{16y}$

40. Solve for *p*: $h = \dfrac{r}{t}(p-m)$

A. $p = \dfrac{th+m}{r}$

B. $p = \dfrac{th+mr}{r}$

C. $p = \dfrac{th-mr}{r}$

D. $p = \dfrac{t(h+m)}{r}$