NCCTM 2014 Math Contest

Level 1 Exam
Appalachian State University

Do not turn this page until you are instructed to do so.

- Time = 1 hour
- Calculators are **NOT** allowed
- 25 multiple-choice questions
- Each question has only 1 correct answer
- Each correct answer is worth 1 point
- Answers must be marked on the answer sheet to receive credit
- You may write on the test and take it home with you
- You may keep your *math* pencil
- Do your best and *good luck!*
- *Remember to silence your cell phones!*

1. Simplify: $-2-\{-2-[-3+(-2+3(-2))]-6\}$

A. -15
B. -5
C. 1
D. 18
E. None of these

2. Amanda has 8 more nickels than quarters. The total value of her nickels and quarters together is \$10.00. How many nickels does she have?

A. 32
B. 20
C. 40
D. 28
E. None of these

3. The average of five numbers is 7. Which of the following must be true?

A. The middle number is 7.
B. Each number is 7.
C. The difference between the smallest number and the largest number is 7.
D. The sum of the numbers is 35.
E. The product of the numbers is 35.

4. If x represents an odd number and y an even number, which of the following is always even?

A. x^2+y^2
B. $x+y$
C. $x+2y$
D. $xy+1$
E. $2x+y$

5. If $0 < x < 1$, which one of the following statements is true?

A. $x > \frac{1}{x}$
B. $x = \frac{1}{x}$
C. $x < \frac{1}{x}$
D. There is no way to determine the relationship between x and $\frac{1}{x}$

6. How many multiples of 5 are greater than 0 and less than 50?

A. 9
B. 10
C. 11
D. 20
E. None of these

7. A salesperson earns a salary of $650 per month and 25% of sales. Which of the following equations could be useful for determining the minimum amount of sales needed for the salesperson to earn at least $2250 per month?

A. $2250 = (650 + 25) S$
B. $2250 = 650 S + 25 S$
C. $2250 = 650 + 0.25 S$
D. $2250 = 0.25(650 + S)$
E. None of these

8. Which of the following statements best describes the number of y intercepts a linear function can have?

A. A linear function can have any whole number of y-intercepts.
B. A linear function cannot have zero y-intercepts.
C. A linear function can have zero, one, or infinitely many y-intercepts.
D. A linear function must have one or more y-intercepts.

9. The function $h(t) = -16t^2 + 35t + 6$ provides the height h in feet of a tennis ball t seconds after it is shot straight up into the air from a pitching machine. Which of the following is true about what $h(2.5)$ represents?

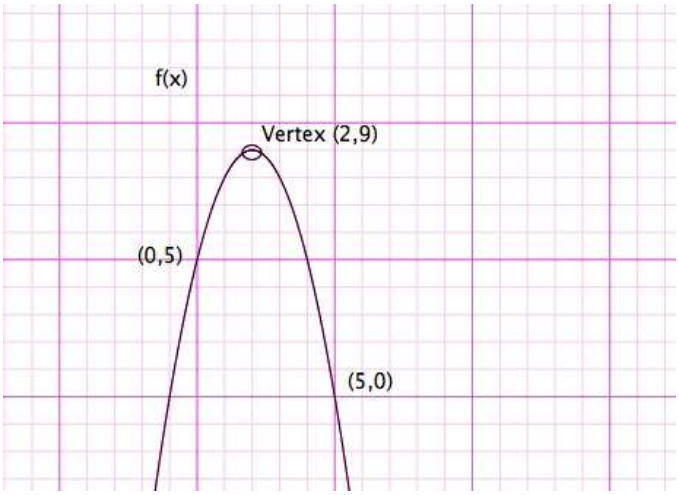
A. $h(2.5)$ represents that the ball is at a height of 2.5 feet.
B. $h(2.5)$ represents the height of the ball after 2.5 seconds.
C. $h(2.5)$ represents the time that has passed when the ball is at a height of 2.5 feet.
D. $h(2.5)$ represents the y-intercept of the graph.
E. None of these

10. The square of the larger of two consecutive odd integers is 56 more than the square of the smaller integer. Find the larger integer.

A. 13
B. 15
C. 5
D. 3
E. None of these

Questions 11 – 13 refer to the following:

A portion of the graph of a quadratic function $f(x)$ is shown below. Selected values of a linear function $g(x)$ are shown in the table. For questions 11 – 13, select a symbol that correctly indicates the relationship between the first and second quantities shown in the item.



x	$g(x)$
-4	7
-1	1
2	-5
5	-11

11. The y coordinate of the y-intercept of $f(x)$ _____ The y-coordinate of the y-intercept of $g(x)$

A. >
B. <
C. =
D. There is not enough information to determine the relationship.

12. $f(3)$ _____ $g(3)$

A. >
B. <
C. =
D. There is not enough information to determine the relationship.

13. Maximum value of $f(x)$ on the interval $-5 \le x \le 5$ _____ Maximum value of $g(x)$ on the interval $-5 \le x \le 5$

A. >
B. <
C. =
D. There is not enough information to determine the relationship.

14. Simplify: $\left\{\left(-2x^3\right)^3 \div \left(-2x\right)^{-3}\right\}^4$

A. x^{24}
B. x^{12}
C. $2^{24}x^{48}$
D. $\frac{1}{256}x^{24}$
E. $\frac{-1}{2^9 x^3}$

15. A teacher's salary is reduced by 20%. By what percent must her salary be raised next year to return to her original salary?

A. 20%
B. 25%
C. 30%
D. 40%
E. None of these

16. A person who is 6 foot tall casts a 4 foot shadow at the same time that a building casts a 20 foot shadow. How tall is the building?

A. 24 feet
B. 45 feet
C. $13\frac{1}{3}$ feet
D. 30 feet
E. None of these

17. Which point does not belong to the solution set of the system: $\begin{cases} x^3 - 3 \\ y \le x + 2 \end{cases}$

A. (0, 0)
B. (2, 1)
C. (– 2, 1)
D. (– 1, 1)
E. All of these belong to the solution set

18. Three numbers are in proportions 2:3:5 and sum to 40. What is the second largest of these numbers?

A. 8
B. 9
C. 10
D. 11
E. None of these

19. Which of the following are factors of $x^5 - 16x$?

I. x II. $(x - 2)$ III. $(x + 2)$ IV. $\left(x^2 + 4\right)$

A. I only
B. I, II, and III only
C. II, III, and IV only
D. II and IV only
E. I, II, III, and IV

20. Write an equation of the line which passes through the point (2, 3) and has a slope of – 1.

A. $x + y = 5$
B. $x - y = -1$
C. $x - y = 5$
D. $x + y = 1$

21. The points (0, 1), (1, 3), (2, y) lie on a straight line provided y equals:

A. 1
B. – 2
C. 5
D. 3
E. None of these

22. The graphs of $3x - 2y = 3$ and $2x + ky = 5$ will be parallel lines provided k is equal to:

A. – 3
B. 3
C. $\frac{3}{4}$
D. $-\frac{4}{3}$
E. None of these

23. A rectangle of width $2x + 3y$ inches has an area of $6x^2 + 5xy - 6y^2$ square inches. Find the perimeter of the rectangle.

A. $3x - 2y$ inches
B. $5x + y$ inches
C. $10x + 2y$ inches
D. $6x - 4y$ inches
E. None of these

24. Which rule defines the relation $\left\{(1, \frac{1}{2}), (2, \frac{1}{4}), (3, \frac{1}{6}), (4, \frac{1}{8})\right\}$?

A. $y = \frac{1}{2}x$
B. $y = 2x$
C. $y = \frac{1}{x^2}$
D. $y = \frac{1}{2x}$
E. None of these

25. Evaluate $\frac{x}{y}$ if $\frac{x - 2y}{y} = 17$

A. 14
B. 19
C. – 15
D. $\frac{1}{19}$
E. None of these

*When you complete the test, double check that you have marked your answers clearly on the scantron answer form and have completely erased any extra marks. Please sit quietly and wait for further instructions once the testing time is over. Thank you.