Instructions: Calculators are not allowed during this exam. Fill in the circle on the bubble sheet corresponding to the letter of the correct answer. If the answer is not listed, fill in the bubble marked e) None of these.

1. List all of the rational numbers in the set \(\left\{51, 0, 8.5, -3, 0.756, \frac{5}{2}, \sqrt{7}\right\}\).
   a) 51, 0  
   b) 51, 0, −3  
   c) 51, 0, 8.5, −3, 0.756, \(\frac{5}{2}\)  
   d) 51, 0, 8.5, −3, \(\frac{5}{2}\)  
   e) None of these

2. Which property is demonstrated by 5(7 + 3) = (7 + 3) 5?
   a) Associative  
   b) Commutative  
   c) Distributive  
   d) Identity  
   e) None of these

3. Which of these points is on the graph of \(f(x) = 3 - 2x^2\)?
   a) (-1,5)  
   b) (0,4)  
   c) (-1,-2)  
   d) (-2,-5)  
   e) None of these

4. Which number is \(\frac{2}{3}\) of the way from −6 to 8 on a number line?
   a) \(\frac{4}{3}\)  
   b) 4  
   c) \(\frac{10}{3}\)  
   d) \(\frac{28}{3}\)  
   e) None of these

5. Solve for \(c\): \(a (b + c) + b (a + c) = d\).
   a) \(\frac{d}{ab} - 2\)  
   b) \(\frac{a + b}{d - 2ab}\)  
   c) \(\frac{d - 2ab}{2}\)  
   d) \(\frac{d - 2ab}{a + b}\)  
   e) None of these

6. If \(x \neq 0\), which of the following is equivalent to \(\frac{x^3 + x^{-5}}{x^{-2}}\)?
   a) \(x^6 + x^{-10}\)  
   b) \(x^5 + x^{-3}\)  
   c) \(x + x^{-7}\)  
   d) 1  
   e) None of these
7. If Bob drives at a rate of 70 km/hr for three hours, how fast will he have to drive for the next four hours to average 100 km/hr for the entire trip?
   a) 137.5 km/hr   b) 130 km/hr   c) 125 km/hr   d) 122.5 km/hr   e) None of these

8. Factor out the greatest common factor. \(24x^3y^2z^3 - 16x^2y^3z^2 + 40xy^3z^3 - 8xy^2z^2\)
   a) \(8xy^2z^2(3x^2z - 2xy + 5yz)\)   b) \(3x^2z - 2xy + 5yz\)   c) \(4x^3y^3z^3\)
   d) \(2xyz(12x^2yz - 8xy^2z - 4yz + 20y^2z^2)\)   e) None of these

9. Find the equation of line containing the point \((1, -2)\) that is parallel to the vertical line passing through \((-1, 4)\)
   a) \(y = 3x - 2\)   b) \(y = 3x - 5\)   c) \(y = -2\)   d) \(x = 1\)   e) None of these

10. Find the exact value of \(\sqrt{17 + \sqrt{5}} - \frac{59}{8 - \sqrt{5}}\).
    a) 7   b) 5   c) 3   d) 1   e) None of these

11. Find the absolute value of the difference of the solutions to the equation \(|3x - 5| - 3 = 16\).
    a) 0   b) 8   c) 3 \(\frac{1}{3}\)   d) 12 \(\frac{2}{3}\)   e) None of these

12. Maria invested some of her money for one year at 3.5% and $450 less at 2%. If the total interest she earned was $46, how much did she have in total at the end of the year?
    a) 1000   b) 1046   c) 1550   d) 1596   e) None of these

13. If \(a, b \neq 0\), find the slope of the line perpendicular to \(ax - by = 16\).
    a) \(\frac{b}{a}\)   b) \(-\frac{16}{b}\)   c) \(\frac{a}{b}\)   d) \(-\frac{a}{b}\)   e) None of these

14. Simplify the following product of 50 factors:
    \[ \left(1 - \frac{2}{3}\right) \cdot \left(1 + \frac{2}{3}\right) \cdot \left(1 - \frac{2}{7}\right) \cdot \left(1 + \frac{2}{7}\right) \cdot \left(1 - \frac{2}{11}\right) \cdot \left(1 + \frac{2}{11}\right) \cdot \ldots \cdot \left(1 - \frac{2}{99}\right) \cdot \left(1 + \frac{2}{99}\right). \]
    a) \(\frac{3}{101}\)   b) \(\frac{1}{101}\)   c) \(\frac{1}{99}\)   d) \(\frac{1}{50}\)   e) None of these
15. Suppose $M, A, T$ and $H$ are non-zero numbers. Solve for $M$: \[ A = \frac{H}{M} \div \frac{T}{A}. \]

a) $\frac{A^2}{TH}$  

b) $\frac{TH}{A^2}$  

c) $\frac{H}{T}$  

d) $\frac{T}{H}$  

e) None of these

16. Simplify. $x - 1 \{x - 2 \{x - 3(x - 4)\}\}$.

a) $4x + 8$  

b) $-4x + 24$  

c) $-5x - 10$  

d) $-4x - 24$  

e) None of these

17. What is the range of the function $\{(1, -4), (-3, 7), (10, 2), (-8, -3), (-5, 9)\}$?

a) $\{-5, 10, -3, -4, 1, 7, 9, -8, 2\}$  

b) $\{-5, -3, 10, 1, -8\}$  

c) $\{2, -3, 7, -4, 9\}$  

d) $\{-1/4, -3/7, 5, 8/3, -5/9\}$  

e) None of these

18. How many solutions are there to the system of equations $2x - 3y = 8$ ?

\[-2x + 3y = 5\]

a) 0  

b) 1  

c) 2  

d) infinitely many  

e) None of these

19. Solve for $x$. \[ \frac{1}{1 + \frac{2}{1+x}} = \frac{2}{3}. \]

a) $x = 3$  

b) $x = 2$  

c) $x = 1$  

d) $x = -1$  

e) None of these

20. A recipe calls for $11/8$ cups of sugar per serving. Sugar can be purchased in 5 cup packages. If a baker plans to make 12 servings, how many packages of sugar does he need to purchase?

a) 2  

b) 3  

c) 4  

d) 5  

e) None of these

21. If $x^3 + 2x - 1$ is divided by $x + 2$, what is the remainder?

a) $-11$  

b) $-13$  

c) $-1$  

d) 11  

e) None of these

22. Solve and write your answer in interval notation. $6(5 - w) \geq -3(w - 7) - w$.

a) \((-\infty, \frac{9}{2}]\)  

b) \(\left[\frac{9}{2}, \infty\right)\)  

c) \(\left(\frac{3}{2}, \infty\right]\)  

d) \((-\infty, \frac{51}{2}]\)  

e) None of these
23. A kayak takes $1\frac{1}{2}$ hours to go 24 miles downstream and 4 hours to return. Find the quotient of twice the speed of the current and the speed of the kayak in still water.

a) $\frac{3}{4}$  b) $\frac{5}{6}$  c) $\frac{8}{9}$  d) $\frac{10}{11}$  e) None of these

24. A line has a slope of $-\frac{4}{7}$. The line contains the points (3, 1) and (x, -5). Find x.

a) $13\frac{1}{2}$  b) $6\frac{3}{7}$  c) 7  d) $2\frac{6}{7}$  e) None of these

25. If $a \ominus b = \frac{a - b + |a + b|}{2}$, find $[2 \ominus (-3)] \ominus 6$

a) 0  b) 3  c) 6  d) -1  e) None of these

26. Find the value of $(5^{-1} + 6^{-1})^{-1}$.

a) $-\frac{11}{30}$  b) $\frac{30}{11}$  c) $\frac{1}{11}$  d) 11  e) None of these

27. Will can make a Thanksgiving dinner in 9 hours. Betty can make the same dinner in 6 hours. They decided to work together to make the dinner this year. After working together to make the dinner for 3 hours, Will had to leave. How long did it take for Betty to finish making the Thanksgiving dinner?

a) 36 minutes  b) 45 minutes  c) 1 hour  d) 3 hours  e) None of these

28. Which quadrant does not contain any points on the line $3x + 4y = 5$?

a) I  b) II  c) III  d) IV  e) None of these

29. Which of the following is equivalent to $\frac{x^2 - 1}{x - x^2}$?

a) $\frac{1}{x}$  b) $-\frac{1}{x}$  c) $-1 + \frac{1}{x}$  d) $-1 - \frac{1}{x}$  e) None of these

30. The length of the hypotenuse of a right triangle is 3 meters more than twice the length of the shorter leg. The longer leg is 7 meters longer than the shorter leg. If the perimeter of the triangle is 30 meters, what is the area of the triangle?

a) 60  b) 12  c) 5  d) 30  e) None of these