Secondary Math II Blitz 2019

Directions: 1. Select the most correct answer for each questions and mark it on you answer form.

2. No calculator of any sort are allowed.

3. Note that N.O.T. means "None of these."

1. Let $f(x) = \sqrt{-2x}$, where x is a real number. Find $f(-2)$.

a) 2 b) $2i$ c) 16 d) ± 2 e) N.O.T.

2. Multiply and simplify: $(a-3)(2a+3)$.

a) $2a^2 - 3y - 9$ b) $2a^2$ c) $4a^2 - 9$ d) -9 e) N.O.T.

3. What is the last digit of π?

a) 3 b) 1 c) 4 d) 6 e) N.O.T.

4. The system $\begin{cases} x^2 + y^2 = 1 \\ x - y = 1 \end{cases}$ has

a) 4 solutions b) 3 solutions c) 2 solutions d) No solutions e) N.O.T.

5. Simplify the expression $8 + \frac{1}{\sqrt{3}-2} - \frac{1}{\sqrt{3}+2}$.

a) 4 b) 8 c) 1 d) -2 e) N.O.T.

6. Solve: $5^x = \frac{1}{\sqrt{5}}$.

a) $x = \frac{1}{2}$ b) $x = -1$ c) $x = \frac{1}{5}$ d) $x = -\frac{1}{2}$ e) N.O.T.

7. Given the graph of a function $y = f(x)$, how is the graph of $y = 12 \cdot f(x)$ constructed?

a) Vertical stretch by a factor of 12

b) Vertical compression by a factor of 12

c) Horizontal stretch by a factor of 12

d) Horizontal compression by a factor of 12

e) N.O.T.

8. Simplify $\frac{x}{2}+\frac{x}{3}+\frac{x}{4}+\frac{x}{5}$.

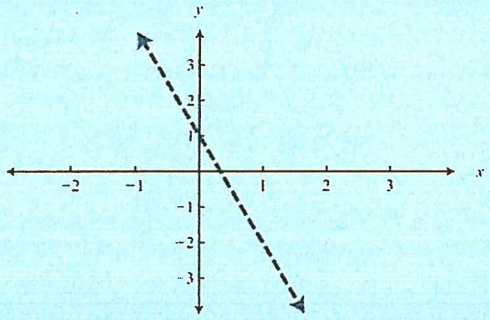
a) $\frac{x}{120}$ b) $\frac{5x}{4}$ c) $\frac{70x}{60}$ d) $\frac{77x}{60}$ e) N.O.T.

9. Factor completely: $x^2 - 4x + 4$.

a) $x = 2$, multiplicity 2 b) $(x-2)^2$

c) $(x+2)^2$ d) $x^2 + y^2$ e) N.O.T.

10. Which inequality is shown in the graph below?



a) $x - y > 3$ b) $y \leq -2x + 5$ c) $y > -3x + 1$ d) $y > -3x$ e) N.O.T.

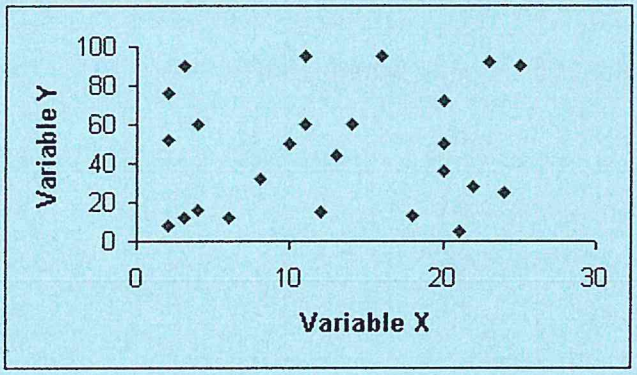
11. The distance between the points $(5, -1)$ and $(-4, 6)$ is

a) $\sqrt{26}$ b) $\sqrt{10}$ c) $\sqrt{32}$ d) $\sqrt{130}$ e) N.O.T.

12. Find $f(0)$ if $f(x) = \begin{cases} x, & if\ x < 0 \\ 2x + 1, & if\ x \geq 0 \end{cases}$.

a) 0 b) -1 c) 1 d) 3 e) N.O.T.

13. Which statement is true about the data shown in the scatter plot below?



a) There is no correlation between the two sets of data.

b) There is a positive correlation between the two sets of data.

c) There is a negative correlation between the two sets of data.

d) The correlation between the data is both positive and negative.

e) N.O.T.

14. Tom has grades of 90, 84, and 77 on three math tests. What grade must he obtain on the next test to have an average of exactly 85 for the four tests?

a) 92 b) 89 c) 100 d) 77 e) N.O.T.

15. Simplify: $\sqrt{x}\sqrt{1+\frac{1}{x}}$.

a) $x + 1$ b) $\sqrt{x+1}$ c) $\sqrt{x} + 1$ d) $x\sqrt{x+1}$ e) N.O.T.

16. Find the y-intercept of $-y - (x+2)^2 = 7$.

a) $(0, 11)$ b) $(-7, 0)$ c) $(0, -7)$ d) $(11, 0)$ e) N.O.T.

17. Simplify $1+\dfrac{1}{1+\dfrac{1}{1+\frac{1}{2}}}$.

a) $\frac{5}{4}$ b) $\frac{8}{5}$ c) $\frac{3}{2}$ d) $\frac{8}{3}$ e) N.O.T.

18. If two perpendicular lines are graphed, then which of the following must be true?

a) The equations of the lines will have a common solution of $(-1,-1)$.

b) The lines will have slopes which are negative reciprocals.

c) The lines will have slopes which are negative.

d) The equations of the lines will have an infinite number of common solutions.

e) N.O.T.

19. Factor completely: t^4-1

a) $(t-1)(t+1)$ b) $t^2(t-1)(t+1)$

c) $t=\pm 1$ d) $(t-1)^2(t+1)$ e) N.O.T.

20. The value of the determinant of $\begin{bmatrix} 2 & -2 & 2 \\ 3 & -3 & 3 \\ 4 & -4 & 4 \end{bmatrix}$ is:

a) 9 b) -9 c) 3 d) 0 e) N.O.T.

21. The absolute value of a complex number $a+bi$ is its distance from the origin. Using the distance formula we have $|a+bi|=\sqrt{a^2+b^2}$. Find the absolute value of $-3+i$.

a) -3 b) 10 c) $\sqrt{3}$ d) $\sqrt{10}$ e) N.O.T.

22. A circle has a diameter of 2π. Find the circumference.

a) $2\pi^2$ b) 16π c) 32π d) 2π e) N.O.T.

23. The graph of $\frac{x^2}{25} - \frac{y^2}{9} = 1$ is a

a) parabola b) chord c) ellipse d) hyperbola e) N.O.T.

24. What is the radius of the circle given by $x^2 - 8x + y^2 + 4y = 0$?

a) 2 b) 4 c) $2 \cdot 5^{\frac{1}{2}}$ d) 8 e) N.O.T.

25. Simplify: $\left(\left((x^{16})^{\frac{1}{4}}\right)^2\right)^{\frac{1}{2}}$.

a) x b) x^8 c) x^{16} d) x^4 e) N.O.T.

26. The vertices of ΔABC are $(-15, 0)$, $(1, 12)$, and $(10, 0)$. Find the perimeter.

a) 50 b) 60 c) 100 d) 132 e) N.O.T.

27. An expression equivalent to $\frac{a}{b} - \frac{1}{a} = \frac{c}{b}$ is:

a) $ac - bc = ac$ b) $a^2 + b^2 = ac$

c) $a = c - 1$ d) $b = a^2 - ac$ e) N.O.T.

28. Find the mode of the following data:

23, 24, 27, 18, 19, 27

a) 23 b) 19 c) 23.5 d) 27 e) N.O.T.

29. Suppose ΔABC is an isosceles triangle with $AC \cong AB$. If the measure of $\angle A$ is twice the measure of $\angle C$, then what is the measure of $\angle B$?

a) 45° b) 40° c) 35° d) 30° e) N.O.T.

30. The area of a rectangle is represented by $x^2 + 2x - 99$. If the width is represented by $x + 11$, the length must be

a) $x + 9$ b) $x - 9$ c) $x - 13$ d) $x + 13$ e) N.O.T.

31. $401^2 - 399^2 =$

a) $(401-399)^2$ b) 64000 c) 1600 d) 12999 e) N.O.T.

32. Which equation represents a line that is parallel to the line given by $y = \pi x - \sqrt{2}$?

a) $y = \frac{1}{\pi}x + \sqrt{2}$ b) $y = \sqrt{2}x + \pi$ c) $y = \pi x + \sqrt{2}$ d) $y = -\frac{1}{\pi}x + \sqrt{2}$ e) N.O.T.

33. The solution to the logarithmic equation $\ln(\ln(x)) = 0$ is:

a) e b) 0 c) e^{-1} d) $e^{\ln(x)}$ e) N.O.T.

34. For $x > 0$, $e^{16\ln(x)}$ is:

a) e^{16} b) $\ln(x)$ c) x^{16} d) $16x$ e) N.O.T.

35. Find the degree of the following polynomial: $4^8x^2y^3(wz)^2$.

a) 17 b) 15 c) 7 d) 9 e) N.O.T.

36. The vertices of ΔABC are $(-15, 0)$, $(1, 12)$, and $(10, 0)$. Find the area.

a) 50 b) 60 c) 100 d) 132 e) N.O.T.

37. If the operation ♥ is defined for all integers x and y as $x \heartsuit y = x^2 + y - 2$, then which of the following is equal to $4 \heartsuit -3$?

a) 21 b) 17 c) 15 d) 11 e) N.O.T.

38. A triangle has sides with lengths 4, 7, and x. Which of the following could be the perimeter of the triangle?

a) 11 b) 16 c) 24 d) 28 e) N.O.T.

39. A freight train leaves Danville Union Station and travels north at 75 km/h. Two hours later, an express train leaves the same station on parallel tracks and travels north at 125km/h. How far will the freight train have traveled when the express train catches up to it?

a) 225 km b) 325 km c) 357 km d) 375 km e) N.O.T.

40. Find the midpoint of the segment with endpoints at $\left(\frac{-4}{5}, \frac{-2}{3}\right)$ and $\left(\frac{1}{8}, \frac{3}{4}\right)$.

a) $\left(\frac{27}{80}, \frac{25}{7}\right)$ b) $\left(\frac{-27}{80}, \frac{1}{24}\right)$ c) $\left(\frac{-80}{27}, \frac{1}{24}\right)$ d) $\left(\frac{1}{24}, \frac{-27}{80}\right)$ e) N.O.T.

41. A bag contains three red marbles, one blue marble, and two yellow marbles. A marble is selected from the bag at random, and it is not replaced. A second marble is then randomly selected. What is the probability that the first marble was red and the second marble was yellow?

a) $\frac{1}{6}$ b) $\frac{1}{12}$ c) $\frac{5}{12}$ d) $\frac{1}{5}$ e) N.O.T.

42. If $0 \leq x \leq 10$ and $-10 \leq y \leq -1$, then what is the range for $x - y$?

a) $-10 \leq x - y \leq 9$ b) $-9 \leq x - y \leq 11$

c) $10 \leq x - y \leq 11$ d) $1 \leq x - y \leq 20$ e) N.O.T.

43. The simplified form of $\frac{x^{-1}}{y^{-1}} - \frac{y^{-1}}{x^{-1}}$ is:

a) $\frac{y^2 - x^2}{xy}$ b) $\frac{x^2 + y^2}{xy}$ c) $\frac{xy}{x^2 - y^2}$ d) $x^2 - y^2$ e) N.O.T.

44. Solve: $\ln(x) + \ln(2) = \ln(4)$.

a) $\frac{e^2}{4}$ b) $\frac{e^4}{2}$ c) $e^x = 4$ d) 2 e) N.O.T.

45. If $C(n,r) = \frac{n!}{r!(n-r)!} = \binom{n}{r}$, then $\binom{6}{2} =$

a) 30 b) 16 c) 45 d) 54 e) N.O.T.