

2020 UAB Middle School Math Tournament

8th Grade Division

Written Test

1. Evaluate $6! - 4!$
A) 30
B) $5!$
C) 724
D) 696
E) NOTA
2. Fill in the missing number $\{-3, 2, -5/6, 1/4, -7/120, \underline{\hspace{2cm}}\}$
A) $3/1080$
B) $1/16$
C) $3/1024$
D) $3/2048$
E) NOTA
3. How many different combinations of letters can be made by rearranging the letters in the word MATHEMATICS?
A) 3,687,457
B) 4,989,600
C) 11
D) 312
E) NOTA
4. Find the correct value for x
 $5x + 27 - 2x + (11x * 2) - 2 = 0$
A) 3
B) 5
C) 1
D) 4
E) NOTA
5. Write $f(x) = |x - 3|$ as a piecewise function.
A) $f(x) = \{ (x - 3), \text{ if } x - 3 \geq 0$
 $- (x - 3), \text{ if } x - 3 < 0 \}$

- B) $f(x) = \begin{cases} (x - 3), & \text{if } x - 3 \geq 0 \\ (x - 3), & \text{if } x - 3 < 0 \end{cases}$
- C) $f(x) = \begin{cases} (x + 3), & \text{if } x - 3 \geq 0 \\ -(x + 3), & \text{if } x - 3 < 0 \end{cases}$
- D) $f(x) = \begin{cases} (x - 3), & \text{if } x - 3 \geq 0 \\ -(x + 3), & \text{if } x - 3 < 0 \end{cases}$
- E) NOTA

6. Evaluate $27x^3$ when $x = 2$
- A) 84
B) 91
C) 132
D) 216
E) NOTA
7. Sailor Moon is in a strange dimension in which everything is plotted on a coordinate system. She is currently standing on point (0,0) and the enemy, Queen Nehelania is located at point (10,6). If Sailor Moon flies along the line $y = \frac{1}{2}x^2$ in a northeastward direction and Queen Nehelania flies along the line $y = 2x - 2$ in a southwestward direction, at which coordinate will their ultimate battle commence? Assume that Sailor Moon and Queen Nehelania are destined to battle and neither will miss the rendezvous point due to speed of flight.
- A) (2,2)
B) (2,1)
C) (0,1)
D) (0,0)
E) NOTA
8. The President of Ticonderoga wants to increase the taxes in the nation so the President can live in a nicer house. The President determines that the dream house will cost \$11,348,395. There is already a 3.6% income tax in place on the citizens of the nation. The nation's finances indicate that the taxable income of the nation is \$312,2057,908.82. If the President wants to accumulate funds for the mansion in one year, how much does the income tax need to be increased?
- A) 17.1%
B) 196.8%
C) 25.7%
D) 2.4%
E) NOTA
9. What number does the binary code: 10010110 convert to in decimal form?
- A) 64
B) 100

- C) 4
- D) 150
- E) NOTA

10. Simplify $\sqrt[3]{125x^8}$

- A) $5x^2\sqrt[3]{x^2}$
- B) $5\sqrt[3]{5x^2}$
- C) $125x^2$
- D) $\sqrt[3]{125x^2}$
- E) NOTA

11. Sebastien is a butler on planet Zed. He is waiting for the young master in the middle of Kipper Park. Due to the two suns in the solar system, he has two shadows and both currently have the length of 89 inches. Beginning at the time Sebastien arrives at the park, the first shadow will elongate 7 inches per hour for 5 hours, then shorten 2 inches per hour for the next 10 hours. The second shadow will shorten 9 inches per hour for 6 hours and elongate 3 inches per hour for the next 5 hours. If it takes 7 hours for the young master to reach Sebastien, what is the product of the lengths of the two shadows?

- A) 5260
- B) 4200
- C) 4900
- D) 5300
- E) NOTA

12. What is the sum of all the prime numbers between 30 and 60?

- A) 30
- B) 311
- C) 257
- D) 143
- E) NOTA

13. Ron Swanson decides to be nice to his employees, so he buys steaks for all 131 members of the Parks & Rec department. Each package contains 3 steaks. How many packages does he have to buy?

- A) 43
- B) 15
- C) 44
- D) 16
- E) NOTA

14. In a bag containing red and green marbles, the ratio of the red marbles to the green marbles is 2:5. The bag contains 230 red marbles. How many green marbles are there in the bag?
- A) 92
 - B) 460
 - C) 575
 - D) 288
 - E) NOTA

15. Rumor has it that Steve Jobs struggled to get an A in his math class. On his tests, he got a 79, 62, 84, and 98. Tests account for 25% of his grade. Luckily, he has a 98% homework average which accounts for 45% of his grade. What grade does he need to get on his final exam to get a 90 in the class if his final exam is worth 30% of his overall grade? Round answer to two decimal places.
- A) 85.72
 - B) 85.71
 - C) 93.71
 - D) 93.72
 - E) NOTA

16. A company sells a total of \$120,000 of medical devices to hospitals around the world. This is a 34% increase from the sales from the year before. What was the value of sales from the year before.
- A) \$40,800
 - B) \$160,800
 - C) \$408,000
 - D) \$79,200
 - E) NOTA

17. Solve the below equation for x.

$$|3x - 6| = 15$$

- A) -3 and 7
 - B) 3 and 7
 - C) only 7
 - D) only 3
 - E) NOTA
18. Shaggy is building a fence around his backyard for Scooby-Doo. He needs 100 yards of fence to surround his yard completely, but he only has \$179. The nicer oak wood costs \$2.73 per yard and the cheaper pine wood costs \$1.27 per yard. Assuming he will spend as much as he can on the nicer oak and will fill the rest of the fence with the cheaper pine wood, how many yards of his fence are oak, and how many are pine?

- A) 70, 30
- B) 63, 37
- C) 84, 16
- D) 59, 41
- E) NOTA

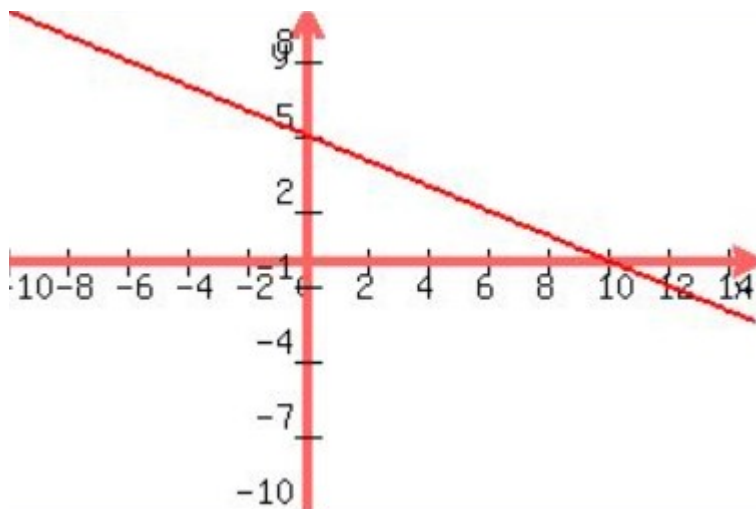
19. If $3x - 30 - (-45x - 10) - 19 = 5x + 47$ then what is the value of the expression $5x + 21$?

- A) 31
- B) 36
- C) 26
- D) 41
- E) NOTA

20. If $a^2 + b^2 = c^2$, $a = 5$, $c = 12$, what is b ?

- A) $\sqrt{17}$
- B) $\sqrt{119}$
- C) 17
- D) 119
- E) NOTA

21. If $f(x) = -0.5x + 5$, what is the area created by the shape formed by the x and y axes and the line.



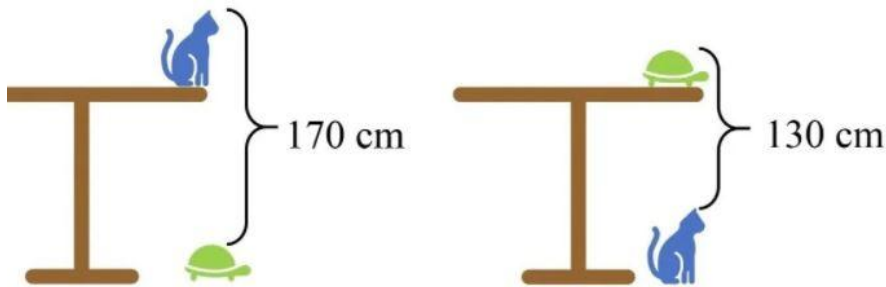
- A) 25
- B) 75
- C) 12.5
- D) 50
- E) NOTA

22. Factor $5x^3 + 11x^2 + 2x = 0$ in order to find values for x

- A) 0, 2, $\frac{3}{5}$

- B) 1, 2, 3
- C) 1, 2, 3/5
- D) 0, -2, -3/5
- E) NOTA

23. How tall is the table?



- A) 140 cm
- B) 40 cm
- C) 150 cm
- D) 170 cm
- E) NOTA

24. If the positive square root of x is between 4 and 12, what inequality represents all possible values of x ?

- A) $4 < x < 12$
- B) $12 < x < 16$
- C) $4 < x < 144$
- D) $16 < x < 144$
- E) NOTA

25. Amanda loves math. Rumor has it, she has a real calculator in her brain. Her friend Andrew thinks that she is wrong when she says $7^{x+1} - (2^7 - 11^2) = 42$ for all values of x . Is she wrong? Are there any values of x that make this statement true?

- A) 0
- B) 1
- C) All values of x except 0 and 1
- D) Amanda is right
- E) NOTA

TB1. What is the tangent of 45 degrees?

TB2. What integer is in the ten-thousandths spot when $\sqrt{2}$ is converted to a decimal?

TB3. Simplify $(6x^2 + 7x - 20) / (2x + 5)$.