

# 2023 MATH FIELD DAY

## MENTAL ARITHMETIC

No Calculators

No Pencil/Paper Computations

**There are 20 questions on the test. Each one will be flashed on the screen for 25 seconds and read aloud. At the end of this time, the monitor will say, “Write down your answer.” At this time you may pick up your pencil and write your answer. Then put your pencil back down. If you fail to put your pencil down when asked, you risk not having your paper scored. The first 15 problems are multiple choice. Be sure to write A, B, C, or D, not a number. The last 5 problems require a number answer or an algebraic expression.**

1. What is the correct answer to  $36 \times 42$ ?

A. 1536

B. 1516

C. 1532

D. 1512

2. There were some people on a train. 17 people got off of the train. 12 people get on the train. Now there are 48 people on the train. How man people were on the train to begin with?

- A. 77
- B. 19
- C. 53
- D. 43

3. What is the correct answer for  $5 \times 6 \div 2 - 3 \times 4 \div 2$

A. 24

B.  $3/2$

C. 9

D. 6

**4. What is the product of the first 4 even numbers?**

**A. 0**

**B. 384**

**C. 248**

**D. 192**

5. What is the ones digit for :  $2^{21} \div 4^7$

- A. 8
- B. 2
- C. 1
- D. 4

**6. What is the sum of all of the odd numbers from 1 to 99, exclusive?**

**A. 2500**

**B. 2000**

**C. 5000**

**D. 2400**

**7. Which number is not prime?**

**A. 809**

**B. 701**

**C. 471**

**D. 937**



8. Simplify the following  $\frac{x^2 + x - 12}{x^2 - 2x - 15} \cdot \frac{x^2 + x - 6}{8 - 2x - x^2} \div \frac{3x - 9}{10 - 2x}$

- A.  $-\frac{3}{2}$
- B.  $\frac{3}{2}$
- C.  $\frac{2}{3}$
- D.  $-\frac{2}{3}$

9. You bought a shirt that was 25% off the original price of \$32. Then you paid tax at a rate of 10% on the purchase. The total cost was:

- A. \$22.70
- B. \$26.40
- C. \$24.60
- D. \$27.20

**10. Which number is evenly divisible by both 12 and 15?**

**A. 1380**

**B. 1830**

**C. 1640**

**D. 1460**

**11. Evaluate the expression when  $a = 3$  and  $b = -1$ :**

$$a - b^{a-b}$$

- A. 3**
- B. 2**
- C. 0**
- D. -2**

12. Five years ago Kate was five times as old as her son. In 5 years her age will be 8 less than three times her son's age at that time. Find their ages.

- A. 6, 30
- B. 11, 35
- C. 16, 40
- D. 21, 45

**13. Which number is the product of two square numbers?**

- A. 242**
- B. 232**
- C. 243**
- D. 202**

14. Which set of numbers is not a Pythagorean Triple?

A. 9, 12, 15

B. 12, 16, 20

C. 8, 15, 18

D. 10, 24, 26

**15. Which pair of numbers has a GCF of 9?**

**A. 72, 117**

**B. 54, 108**

**C. 52, 72**

**D. 54, 90**



**16. FIND THE NUMBER OF DEGREES IN ONE ANGLE OF AN EQUILATERAL TRIANGLE; MULTIPLY BY THE NUMBER OF BLIND MICE IN THE NURSERY RHYME, MULTIPLY BY THE NUMBER OF DIGITS IN A 1-800 TELEPHONE NUMBER; ADD THE NUMBER OF ENDS ON A PIECE OF STRING**

17. Apples normally sell for \$0.35 each. They go on sale 3 for \$0.79 each. How much money is saved if you purchase 2 dozen apples while they are on sale?

18. If the same shapes have the same values and different shapes have different values, what is the value of the hexagon in the following puzzle?

$$\begin{array}{ccccccc} & & \square & + & \triangle & + & \hexagon & = & 11 \\ \square & + & \square & + & \hexagon & + & \triangle & = & 13 \\ & & \hexagon & + & \triangle & + & \triangle & = & 14 \end{array}$$

19. I AM THINKING OF A NUMBER. IF I DIVIDE BY 11, THEN MULTIPLY BY 12, THEN SUBTRACT 20 AND FINALLY ADD 59, I END UP WITH 87. WHAT WAS MY ORIGINAL NUMBER?

20. What is the largest integer  $n$  for which  $4^n < n^4$ ?