For all questions, answer choice (E) NOTA means that none of the given answers is correct. Good Luck!

1. Tanmay is roasting Karthik. Each roast increases the Karthik's body temperature by 5 degrees Celsius. Shubham measures Karthik's current body temperature to be about 116 degrees Fahrenheit. Before getting roasted, Karthik's body temperature was 98 degrees Fahrenheit. How many successful roasts did Tanmay make to the nearest whole number? (Hint: $F = 1.8C + 32$)

   (A) 1   (B) 2   (C) 3   (D) 4   (E) NOTA

2. How many prime numbers are less than 50?

   (A) 10   (B) 11   (C) 12   (D) 13   (E) NOTA

3. What is the prime factorization of 48?

   (A) $3 \cdot 4^2$ (B) $2^2 \cdot 12$ (C) $2^4 \cdot 3$ (D) $2 \cdot 3^4$ (E) NOTA

4. How many positive integer factors does 60 have?

   (A) 6   (B) 8   (C) 10   (D) 12   (E) NOTA

5. What is $1.6\overline{89}$ written as a rational number?

   (A) $\dfrac{168}{99}$ (B) $\dfrac{169}{99}$ (C) $\dfrac{1673}{990}$ (D) $\dfrac{1689}{990}$ (E) NOTA

6. In how many distinct ways can 5 people sit around a circular table?

   (A) 6   (B) 24   (C) 120   (D) 5040   (E) NOTA

7. Find $x + y + z$, given the following equations:

$$3x + 5y + z = 34$$
$$4x + 3y + 6z = 44$$
$$3x + 2y + 3z = 32$$

   (A) 7   (B) 8   (C) 9   (D) 10   (E) NOTA

8. Simplify:

$$(\sqrt{27})(\sqrt{39})(\sqrt{52})$$

   (A) 117   (B) 119   (C) 123   (D) 234   (E) NOTA

9. Expand:

$$(5x + 2y)(6x + 7y)$$

   (A) $30x^2 + 14y^2$ (B) $30x^2 + 12xy + 14y^2$ (C) $30x^2 + 47xy + 14y^2$ (D) $30x + 14y$ (E) NOTA

10. Pierre de Fermat proved that there exists only one number that is one more than a perfect square and one less than a perfect cube. What is the units digit of this number?

    (A) 3   (B) 4   (C) 5   (D) 6   (E) NOTA

11. What is the slope of the line passing through the points $(10, 0)$ and $(2, 6)$?

(A) $-\dfrac{3}{4}$ (B) $\dfrac{3}{4}$ (C) $-\dfrac{4}{3}$ (D) $\dfrac{4}{3}$ (E) NOTA

12. Carson loves canoeing in Crocs. Upstream, Carson and his canoe travel 3 miles per hour for 100 miles and downstream, Carson and his canoe travel 7 miles per hour for 100 miles. What is Carson's average speed?

(A) 3.6   (B) 4.2   (C) 4.8   (D) 5.4   (E) NOTA

13. Leana wants to make an A in her English class. Homework counts for 30% of her grade, tests count for 50% of her grade, and book checks count for 20% of her grade. Leana's homework grades are 99, 79, and 89. Her test grades are 89, 90, and 91. To the nearest whole number, what is the minimum average book check grade Leana must receive for her class average to be an A?

(A) 91   (B) 89   (C) 90   (D) 88   (E) NOTA

14. In the equation $PV = nRT$, with all other variables kept constant, what is the relationship between P and V?

(A) Directly proportional   (B) Jointly proportional   (C) Inversely proportional   (D) No relationship
(E) NOTA

15. Solve for y:

$$5x + 2y^2 = 49 + 3x$$

(A) $\pm\dfrac{7\sqrt{2}}{2} \mp \sqrt{x}$ (B) $\pm\dfrac{\sqrt{98 - 4x}}{2}$ (C) $\dfrac{7\sqrt{2 - 4x}}{2}$ (D) $\dfrac{\sqrt{98 - 4x}}{2}$ (E) NOTA

16. If $f(x)f(y) = f(xy)$, given $f(3) = 7$, what is $f(81)$?

(A) 7^2 (B) 7^3 (C) 7^4 (D) 7^5 (E) NOTA

17. The ocean, when plotted along the coordinate plane, constitutes the region $y \leq 1$. Grace the friendly neighborhood lobster just saved the day at point $(7, 2)$ and wants to collect the best seashell on the edge of the ocean (along $y = 1$). She then has another rescue mission to attend at point $(2, 2)$. What is the shortest distance that Grace can travel to complete her journey?

(A) 5   (B) $\sqrt{29}$ (C) $1 + \sqrt{26}$ (D) 41   (E) NOTA

18. Deekshita wants to make a mini dictionary (sorted alphabetically) that consists solely of all the different permutations of the word POLES. Each permutation gets its own page starting at page 1. What page will SLOPE be on?

(A) 103   (B) 104   (C) 105   (D) 106   (E) NOTA

19. Given that $f(x) = \dfrac{4x + 3}{2x + 2}$, calculate $f(f(2))$.

(A) $\dfrac{11}{6}$ (B) $\dfrac{15}{7}$ (C) $\dfrac{17}{8}$ (D) $\dfrac{17}{9}$ (E) NOTA

20. What is the volume of a cone with height 6 and base diameter 4?

(A) 6π (B) 8π (C) 12π (D) 16π (E) NOTA

21. What is the distance from $(0, 0)$ to $(13, 43)$?

(A) $2\sqrt{502}$ (B) $\sqrt{2018}$ (C) $2\sqrt{503}$ (D) $2\sqrt{505}$ (E) NOTA

22. What is the product of the slopes of two lines that are perpendicular to each other?

    (A) -1 (B) 0   (C) 1   (D) Cannot be determined   (E) NOTA

23. What is the product of the roots of the equation $(x+1)(x+5)(x+3) = (x+2)(x+4)(x+6)$?

    (A) -22 (B) -11 (C) 11   (D) 22   (E) NOTA

24. How many of the set $[\pi, e, i, 2.14, 3.17]$ are rational numbers?

    (A) 0   (B) 1   (C) 2   (D) 3   (E) NOTA

25. What is the sum of the first 20 whole numbers?

    (A) 210   (B) 200   (C) 195   (D) 190   (E) NOTA

26. What is the slope of a line that is perpendicular to a line with an undefined slope?

    (A) -1 (B) 0   (C) 1   (D) Cannot be determined   (E) NOTA

27. There are 11 people of different heights in a room. Each person only shakes the hand of a person shorter than them. How many handshakes take place?

    (A) 45   (B) 55   (C) 66   (D) 78   (E) NOTA

28. It takes Rayyan 30 seconds to do a math problem by himself. It takes Jason 40 seconds to do a math problem by himself. If the two work together, how long, in minutes, does it take for them to do 7 problems?

    (A) 0   (B) 2   (C) $\dfrac{2}{5}$ (D) $\dfrac{3}{5}$ (E) NOTA

29. What is $2018 \div 2(1+2)$?

    (A) 3027   (B) $\dfrac{1009}{2}$ (C) $\dfrac{1009}{3}$ (D) $\dfrac{1009}{6}$ (E) NOTA

30. You overhear a conversation between a group of 5 logicians. You know that only one is telling the truth and the rest are lying. You hear the following:

    Logician A: "Logician C is telling the truth."

    Logician B: "Either logician A or logician C is telling the truth."

    Logician C: "Either logician B or logician E is telling the truth."

    Logician D: "Logician A is lying."

    Logician E: "I am telling the truth."

    Which logician is telling the truth?

    (A) A   (B) B   (C) C   (D) D   (E) NOTA