1) Let's start off easy, evaluate $5 + 3(2 + 1)$.

A) 12 B) 14 C) 15 D) 24 E) NOTA

2) Jeffrey is thinking of his favorite number. Being the math-lover that he is, he starts to manipulate his number in the following order: he first multiplies his number by 2, then subtracts 1 from his result, then divides that difference by 5, and finally adds 6 to that quotient to obtain 11. What is Jeffrey's favorite number?

A) 13 B) 26 C) 28 D) 43 E) NOTA

3) A giant ice cream cone has 204 gallons of ice cream in it initially. A dispenser starts inputting 12 gallons of ice cream per hour into the cone. Three hours after the dispenser first starts, ice cream starts melting out of the bottom of the cone at a rate of 24 gallons per hour. How many hours after the dispenser starts working will the cone have no ice cream left in it?

A) 10 B) 15 C) 20 D) 25 E) NOTA

4) Simplify the following expression, where $abc \neq 0$, with only positive exponents and find the sum of the exponents: $\frac{a^{-2}bc^3(ab^2)^4(a^2b^{-3}c^1)^2}{abc}$. For example, if the simplified form is a^2b^3 or $\frac{a^2}{b^3}$, your answer would be 5 because $2 + 3 = 5$.

A) 10 B) 12 C) 14 D) 16 E) NOTA

5) Alex and William each think of a number. One of their numbers is three times the other, and the sum of their numbers is eight more than twice the smaller number. What is the least possible number William could have picked?

A) 1 B) 3 C) 4 D) 12 E) NOTA

6) A number that is a palindrome is a number that reads the same backward as forward. For example, 121 and 444 are both palindromes. ABA is a three-digit palindrome (where A and B represent digits) for which the sum of the digits is 16. If $ABA - AAB = 36$, what is $ABA + AAB$?

A) 932 B) 934 C) 1119 D) 1121 E) NOTA

7) How many of the following statements are always true?

I: If $a > b$, then $a \cdot c > b \cdot c$ for all values of c.
II: If you multiply together 4 different numbers, the product is always positive or zero.
III: $(a + b)c = ca + cb$
IV: If $a > b$, then $a + c > b + c$ for all values of c.

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

8) What is the largest integer solution to the inequality $-13 < 9x - 1 \leq 5$?

A) -1 B) 0 C) $\frac{2}{3}$ D) 1 E) NOTA

9) What is the value of $\sqrt{6 + \sqrt{6 + \sqrt{6 + \cdots}}}$?

A) -2 B) 2 C) 3 D) 6 E) NOTA

10) Buffy lives 5 miles from the trampoline park, and Bryan lives 4 miles from the same trampoline park. If x is the distance in miles between Buffy and Bryan's houses, which of the following inequalities completely describes all possible values of x?

A) $1 \leq x \leq 9$ B) $0 \leq x \leq 8$ C) $1 \leq x \leq \sqrt{41}$ D) $\sqrt{41} \leq x \leq 9$ E) NOTA

11) In honor of the new year, prime factorize 2022. How many distinct prime factors does it have?

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

12) Find the value of $x + y$ if the following system of equations is true:

$$\begin{cases} 10x + 9y = 14 \\ 2x - 5y = 30 \end{cases}$$

A) 1 B) -1 C) 9 D) 8 E) NOTA

13) Helena owns a boba shop called HelenaT and sells boba tea. Kira is a regular customer of HelenaT and so on Monday, Kira buys 1 boba tea with 10 pearls and it cost her $3.00. On Tuesday, Kira bought 2 boba teas with 8 total pearls (4 pearls per tea) and it cost her $5.40. On Wednesday (Kira's addicted to boba) Kira buys 3 boba teas with 18 total pearls (6 pearls per tea). How much money did Kira spend on Wednesday?

A) $7.80 B) $5.90 C) $2.40 D) $8.40 E) NOTA

14) Alice is reading *Alice in Wonderland* when she notices that she is on page 111. Assuming that Alice started reading on page 1, how many times did Alice see the digit 1? (Assume numbers only appear in the page numbering and make sure to count the 111^{th} page)

A) 32 B) 33 C) 35 D) 36 E) NOTA

15) Define a "closed operation on integers" as an operation that always results in an integer when performed on two integers. (For example, addition is a closed operation on integers because whenever you add two integers, you always get an integer as your answer.) How many of the following operations are closed operations on integers?
I. Subtraction II. Multiplication III. Division IV. Exponentiation

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

16) What is the product of the greatest common divisor of 18 and 60 and the least common multiple of 18 and 60?

A) 216 B) 2160 C) 1080 D) 540 E) NOTA

17) Jack is playing Brawl Stars. He is pushing his 0 trophy Crow in Solo Showdown. Because he is a Crow god, he gains on average 10 trophies per minute. If Jack plays with Crow for 2 hours, how many trophies will his Crow be expected to be at?

A) 12 B) 20 C) 1200 D) 2000 E) NOTA

18) Slik Rik is buying games for his Nintendo Switch. There are games that cost $14.00, $15.00, and $16.00. Because he is slik, he must buy at least one game of each cost. If Rik doesn't want to spend more than $100 on games, what is the maximum number of games that he can buy?

A) 8 B) 7 C) 6 D) 5 E) NOTA

19) What is the product of the solutions of the equation $(5x + 4)^2 - (2x - 7)^2 = 0$?

A) $\frac{11}{7}$ B) $-\frac{11}{3}$ C) $-\frac{11}{7}$ D) $-\frac{3}{7}$ E) NOTA

20) Zach is coming up with some new outfits. He has 3 different shirts, 4 different pairs of pants, and 4 different briefcases. Each outfit consists of exactly one shirt, one pair of pants, and one briefcase. How many different outfits can he wear?

A) 6 B) 12 C) 24 D) 48 E) NOTA

21) Slik Rik is back and this time he is buying popcorn and a drink. The regular sized popcorn is $5.00, and the regular sized drink is $1.50. But Rik can't settle for regular stuff. He, of course, needs the slik stuff. The slik-sized popcorn has a 35% markup on the regular popcorn price and the slik sized drink has a 20% markup on the regular drink price. If Rik buys 2 slik-sized popcorns and one slik sized drink, how much money does he spend in total?

A) $11.50 B) $11.80 C) $15.00 D) $15.30 E) NOTA

22) Factor the following as completely as possible over reals: $x^4 - 1$.

A) $(x^2 - 1)(x^2 + 1)$ B) $(x^2 + 1)(x + 1)(x - 1)$

C) $(x^2 - 1)(x^2 - 1)$ D) $(x^2 - 1)(x + 1)(x - 1)$ E) NOTA

23) Amy is mixing some pink paint. Her current 2-liter mixture is 20% red paint and 80% white paint. She thinks that's too light, so she tries to add red paint until her mixture is 50% red and 50% white. How many liters of red paint will she need to add to accomplish her goal?

A) 1.2 B) 0.6 C) 3.2 D) 1.6 E) NOTA

24) Andrew is standing on a 10-foot-tall cliff and throws a ball. The object's height h at time t is described by the equation $h(t) = -16t^2 + 36t + 10$, where h is in feet. What is the maximum height of the ball (with respect to ground level)?

A) 10 B) 31 C) $\frac{81}{4}$ D) $\frac{121}{4}$ E) NOTA

25) Anna has an urn containing black and white marbles. The number of black marbles can be represented as $2x^2 - 5x - 12$ for some x. Similarly, the number of white marbles can be represented as $x - 4$. The ratio of black to white marbles is $15 : 1$. How many black marbles are there?

A) 22 B) 30 C) 11 D) 13 E) NOTA

26) Eddie the bee is buzzing around. However, he finds himself in a dire situation! He is between two cars that are on a collision course! One car is driving east at 5 mph, while the other car is driving west at 12 mph. Eddie starts in the dead center of the two cars flying eastward at 30 mph when the cars are still 85 miles apart. Because Eddie is afraid of cars, whenever Eddie meets a car, he instantly turns around and flies in the opposite direction. If everything moves at constant speeds throughout, how many miles does Eddie fly before the cars collide?

A) 150 B) 170 C) 200 D) 850 E) NOTA

27) Which of the following answer choices is equivalent to the following expression:

$$(5^{-3})\left(\frac{1}{7}\right)^{-4}(3)(7^{-3})\left(\frac{1}{5}\right)^{-3}$$

A) 3 B) 15 C) 20 D) 105 E) NOTA

28) The area of a rectangle is equivalent to the length of the rectangle multiplied by the width of the rectangle. Consider the region on the Cartesian plane enclosed by the lines $x = 2, x = -3, y = 4,$ and $y = -3$. What is the area of that region?

A) 49 B) 35 C) 20 D) 175 E) NOTA

29) Bailey is training to lower his 5k time. He is running along the curve $y = 3x^2 + 7x - 6$. He starts at the point (-5, 34) and runs in the positive x-direction. Bailey notices that he crosses the x-axis twice during his run. How far apart (in units) are the two points where Bailey crosses the x-axis?

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

30) How many real solutions does $\left|x + \left|x + 2|x|\right|\right| = 1$ have?

A) 1 B) 2 C) 4 D) 8 E) NOTA