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

1. Johnnie is asked to solve the following problem:

$$100(106)^0 - 2\left(\frac{7^2+2}{\sqrt{9}}\right)$$

He incorrectly states that the answer is 103. How far was Johnnie from the correct answer (the positive difference between Johnnie's answer and the correct answer)?

(A) 66 (B) 39 (C) 65 (D) 38 (E) NOTA

2. Charlie's family is going on a road trip. They embark on their journey, maintaining a constant speed of 90 mph. They travel at this speed for 4 hours. They then slow down to a speed of 60 mph. They travel at this speed for 2 hours. What is the sum of the average speed and total distance that Charlie's family travels?

(A) 555 (B) 400 (C) 405 (D) 560 (E) NOTA

3. Given that $(a,b)\$(c,d) = \dfrac{9a-7c}{11b-3d}$, evaluate the following expression:

$$(11,2)\$(8,7)$$

(A) 155 (B) 0 (C) 43 (D) $\dfrac{85}{67}$ (E) NOTA

4. After failing a math test, Johnnie wants to buy something to make himself feel better. He goes to Walmart to buy a \$600 toy set. Johnnie lives in a crazy state where the sales tax is 16.5%. If his total, after sales tax is added, is greater than \$700, he is able to use a 50% off coupon. If he is unable to use the 50% off coupon, he can use a \$10 off coupon he found on the ground. What is the total amount Johnnie pays for this toy set, including sales tax and applicable discounts?

(A) \$49.50 (B) \$689.00 (C) \$699.00 (D) \$349.50 (E) NOTA

5. Charlie's family is nearly halfway done with their road trip. They begin Day 16 of their journey at Johnnie's family's old farm. They are trying to get to Billy's family's convenience store, and have a map that tells them how to get from the farm to the store. The map reads as follows:

- Travel east at a speed of 60 mph for 5 minutes
- Travel 10 miles south
- Travel west at a speed of 75 mph for 8 minutes
- Travel north at a speed of 10 mph for 2 hour
- Travel 14 miles west
- You have reached your final destination

How far from the farm is the store, in miles?

(A) 461 (B) 59 (C) $\sqrt{1741}$ (D) $\sqrt{461}$ (E) NOTA

6. Billy's dog, Chase, is tied to a tree with a 20 foot rope. Chase loves running around while tied to the tree. What is the area, in square feet, of the space Chase can run around in (the area of the tree is negligible)?

(A) 40π (B) 400π (C) 400 (D) 100π (E) NOTA

Use the following information for questions 7 and 8:

Charlie's dog, Duke, loves to be petted. Charlie records the number of people that pet Duke each day for 2 weeks. The results are displayed in the table below:

Table 1: Stem Plot of times petted, Key: $1|1 = 11$

Stem	Leaf
1	1 4 4 7 9
2	0
3	0 5 7
4	1 2 3 7 8

7. Charlie is trying to find the average number of people that pet Duke each day. However, Charlie is bad at math and gets an answer that is 84 times the true answer. What is Charlie's answer, expressed as an exact value?

(A) 2508.0 (B) 398.0 (C) $\frac{199}{7}$ (D) 2268.0 (E) NOTA

8. Duke is sad on the days he is petted less than the median of the data set. What is the total number of times Duke is petted on the days he is sad?

(A) 110 (B) 140 (C) 95 (D) 25 (E) NOTA

9. Johnnie gave up on playing with his toy set and instead developed an addiction to Fortnite. He starts out the game with full health, which is numerically represented by 100 "health points". As per the rules of the game, his health can never exceed 100, even when using a healing item. Johnnie isn't great at Fortnite, but he plays many matches. During one of these matches, his health points are affected as follows:

- Begins match with full health
- Loses 45% of his health points
- Increases his remaining health points by 20%
- Increases his remaining health points by 50%
- Loses $\frac{2}{3}$ of his remaining health points
- Increases his remaining health points by 30%
- End of match

How many health points does Johnnie have at the end of the match, expressed as a decimal rounded to the nearest tenth?

(A) 35.1 (B) 42.9 (C) 70.2 (D) 100.0 (E) NOTA

10. Duke and Chase are incredibly intelligent dogs that love treats. Their favorite treats are Scooby Snax, carrots, Pup-Peronis, Schmackos, and blueberries. The dogs are very smart and trade their treats, using a doggy conversion factors. 1 carrot is worth 5 blueberries. 3 blueberries is worth 1 Schmacko. 7 Schmackos is worth 5 Pup-Peronis. 9 Pup-Peronis are worth 2 Scooby Snax. Chase is a very good boy and has saved up many blueberries and is trying to buy 3 Scooby Snax from Duke. How many blueberries must Chase pay Duke to receive 3 Scooby Snax (Note: Chase cannot pay in portions of a blueberry. As such, he must round up and give Duke a whole number of blueberries)?

(A) 56.7 (B) 57 (C) 19 (D) 11 (E) NOTA

11. Solve the following equation for x:

$$2x - 5 = 4a + 3$$

(A) $x = 4a + 3$ (B) $x = 4a + 8$ (C) $x = 2a + 4$ (D) $x = 6$ (E) NOTA

12. If Rohan is very rich and has 2 dollars, how many 17 cent pieces of candy can he buy?

(A) 0 (B) 10 (C) 11 (D) 12 (E) NOTA

13. Billy has a very long last name: WOLFESCHLEELSGTENHAIUSENBERGERDORFF. His teacher asks him to find how many different permutations there are of his last name. Billy does not want to do this, so instead he finds out how many different permutations there are of the last 8 letters of his last name. How many different permutations are there of the last 8 letters of his last name?

(A) 64 (B) 10080 (C) 40320 (D) 23535820 (E) NOTA

14. Billy got caught for the shortcut he took in problem 13. His teacher is incredibly angry and gives Billy the following problem to solve:
Simplify the following expression:

$$\frac{(5x^3y^{-2}z^{2019})^3}{(2xyz^{2018})^2}$$

What is the correct answer to the problem the teacher assigned to Billy?

(A) $\frac{125}{4}x^7y^{-8}z^{2023}$ (B) $\frac{125x^7z^{2023}}{4y^{-8}}$ (C) $\frac{5x^2z}{2y^3}$ (D) $10x^4y^{-1}z^{4037}$ (E) NOTA

15. Billy wants to get better at math, so he hires his dog Chase as a mentor. Chase gives Billy the following, asking him to order them from greatest to least:

$$\sqrt{680},\ \frac{164}{6},\ 243^{\frac{3}{5}},\ 27\tfrac{2}{7},\ 27.5$$

(A) $27.5,\ 27\frac{2}{7},\ \frac{164}{6},\ 243^{\frac{3}{5}},\ \sqrt{680}$
(B) $\sqrt{680},\ 243^{\frac{3}{5}},\ 27\frac{2}{7},\ \frac{164}{6},\ 27.5$
(C) $27.5,\ \frac{164}{6},\ 27\frac{2}{7},\ 243\frac{3}{5},\ \sqrt{680}$
(D) $27.5,\ \frac{164}{6},\ 27\frac{2}{7},\ 243^{\frac{3}{5}},\ \sqrt{680}$
(E) NOTA

16. Billy, Charlie, and Johnnie spent a lot of money over the past few days and have to get jobs as a result. They decide to sell luxury lemonade at 3 different sizes: small, medium, and large. It takes them 30 seconds to prepare the small size, 2.5 minutes to prepare the medium size, and 6.5 minutes to prepare the large size. There are 112 people in line to buy lemonade. Among the people in the line, $\frac{5}{16}$ of them want the small size, $\frac{1}{8}$ of them want the medium size, and the rest want the large size. How long, in minutes, will it take them to prepare the lemonade for the people in the line?

(A) 63 (B) 52.5 (C) 462 (D) 409.5 (E) NOTA

17. What is 5% of 2% of 50, expressed as a fraction?

(A) $\frac{7}{50}$ (B) $\frac{1}{10}$ (C) $\frac{1}{5}$ (D) $\frac{1}{20}$ (E) NOTA

18. Find the area of a circle with radius 4, rounded to the nearest thousandth.

(A) 50.264 (B) 50.265 (C) 50.26 (D) 50.27 (E) NOTA

19. While his owner is away selling lemonade, Chase decides to steal treats from a bowl of assorted dog treats. In the bowl are 5 Pup-Peronis, 7 Scooby Snax, and 12 blueberries. Chase selects 3 treats at random from the bowl without replacement. What is the probability he selects 3 blueberries?

(A) $\frac{1}{8}$ (B) $\frac{5}{46}$ (C) $\frac{35}{1152}$ (D) $\frac{1}{2}$ (E) NOTA

20. Johnnie gives up selling lemonade and decides to sell his \$600 toy set to make money. His cousin wants the toy set and says he will pay Johnnie if he solves the following problem:

If a sequence of 8 consecutive integers has a sum of 564, what is the sum of the first and last numbers of the data set?

What should Johnnie answer to sell the toy set to his cousin?

(A) 67 (B) 141 (C) 139 (D) 70.5 (E) NOTA

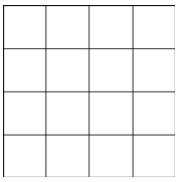
21. Billy and Charlie are still busy selling lemonade, but decide to have a bit of fun by asking the 200 people in their lemonade stand line what ice cream flavor they like. To simplify the survey, Billy and Charlie limit the flavors to chocolate, vanilla, and strawberry (everyone chose at least one of these options). 56 answered that they like only vanilla, 28 answered that they like only strawberry, 40 answered that they only like chocolate, and 10 answered that they like all three flavors. If x is the number of people that answered that they like only chocolate and vanilla, y is the number of people that answered that they like only strawberry and chocolate, and z is the number of people that answered that they like only strawberry and vanilla, what is the sum of x, y, and z?

(A) 66 (B) 134 (C) 6272 (D) 8736 (E) NOTA

22. Charlie's older sister, Delilah, works for a small company as a video game designer. She is currently helping the company make a 650 km^2 map for a video game. Her coworker, Dominic, is helping her make the map. It takes Delilah 3 hours to develop 7 km^2 and it takes Dominic 9 hours to develop 5 km^2. How long, in hours, will it take the two to create the whole map if they are working together?

(A) 650 (B) 225 (C) $\frac{16900}{9}$ (D) $\frac{9}{26}$ (E) NOTA

23. Dominic is struggling with his math test. In order to help him, find the number of *unique* squares in the figure below:



(A) 1 (B) 16 (C) 25 (D) 30 (E) NOTA

24. Dominic is not great at making video games. His boss informs him that he will be fired if he does not answer a math question correctly. Dominic answers the question incorrectly and gets fired. What answer does he not say (the correct answer) if the question is as follows:
Find the product of the greatest prime number and least composite number from the following data set:

$$\{1, 227, 113, 56, 43, 89, 55, 54, 90, 212, 45, 142, 114, 556, 2, 12, 6\}$$

(A) 1362 (B) 227 (C) 56 (D) 556 (E) NOTA

25. Delilah had an annual salary of \$72,000 a year with a \$1,000 monthly bonus. After Dominic's termination, her annual salary was increased by $\frac{4}{9}$ but she lost her monthly bonus. Does Delilah make more money working for 5 years on her old salary (lets call this salary A) or 4 years on her new salary (lets call this salary B)? How much more does she make?

(A) Salary A; $\$8,000$ (B) Salary A; $\$4,000$ (C) Salary B; $\$8,000$ (D) Salary B; $\$24,000$ (E) NOTA

26. Tanvi has become tired of spending the majority of her summer sleeping, and she decides to do something adventurous. As she is extremely confident in her hiking abilities, she decides to trek up Mount Everest (9000 m). Tanvi can climb 400 m in the daytime, but due to her inexpertise, she slips 250 m down the mountain every night. How many days does it take for Tanvi to reach the peak, given she begins climbing the mountain from its bottom at the start of a day?

(A) 58 (B) 59 (C) 60 (D) 61 (E) NOTA

27. Dominic decides to give up his dream of being a video game developer and before he starts looking for more jobs, he needs to drive to his parent's house from Alaska using his 6-wheeled truck. His parents live near Rickards High School in Tallahassee, Florida. The trip is a total of 4500 miles, from Anchorage, Alaska to Tallahassee, Florida. Dominic decides to use the 2 spare tires that came with the truck such that all wheels have a equal amount of usage. How many miles of usage should each tire have at the end of his trip?

(A) 750 (B) 562.5 (C) 652.5 (D) 3375 (E) NOTA

28. Delilah does not know what flavor of ice cream to get. She has narrowed the flavors down to 2 choices: coconut and mint chocolate chip. She decides to flip a standard, fair coin, with one side as heads and the other as tails, 3 times to choose a flavor. On her first flip, she gets heads. On her second flip, she gets tails. On her third flip she also gets heads. If a is the probability of this situation occurring (heads, tails, heads) and b is the probability that Delilah flips a heads if she flips the coin one more time, evaluate the expression $\frac{a}{b}$.

(A) $\frac{1}{16}$ (B) $\frac{1}{2}$ (C) 4 (D) $\frac{1}{4}$ (E) NOTA

29. Billy, Charlie, Chase, Delilah, Duke, and Johnnie are told to stand (sit in the cases of Chase and Duke) in a straight line for a picture. Chase and Duke will not stay still if they sit next to each other, so they are not allowed to be next to each other. How many distinct arrangements can they stand in a line so that Chase and Duke are not next to each other?

(A) 360 (B) 15 (C) 480 (D) 21 (E) NOTA

30. Congratulations! You have reached the final question of the 2018 Elementary Individual!
To celebrate, you should closely read the following speech before selecting an answer to this question.

"The Decision to Go to the Moon" by John F. Kennedy

"There is no strife, no prejudice, no national conflict in outer space as yet. Its hazards are hostile to us all. Its conquest deserves the best of all mankind, and its opportunity for peaceful cooperation may never come again. But why, some say, the moon? ... We choose to go to the moon. [And you, young mathlete, should choose answer choice D to get this question correct]. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too."

(A) I don't like reading.
(B) I do not understand.
(C) I like the moon.
(D) I understand completely.
(E) NOTA