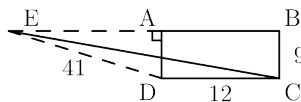


# 2022 Gauss Math Tournament Sprint Round (Div. 2)

June 11, 2022

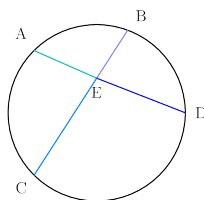
1. Calculate  $1 \times 6 + 4 - (-9)^2 - 13 + 4 \times 6 \div 3$ .
2.  $47\frac{7}{9} - 19\frac{1}{9} =$  \_\_\_\_\_.
3.  $494 =$  \_\_\_\_\_ (Roman numeral).
4. A banana is about 20 cm. How many whole bananas fit in a mile if they are lined up stem to blossom?
5. What is  $\pi^2$  rounded to the nearest tenth? Write your answer as a decimal.
6. Point  $A$  is located at  $(9, 8)$ . It is translated to the right 3 units and down 6 units to point  $A'$ . What is the sum of the coordinates of  $A'$ ?
7.  $84^2 - 16^2 =$  \_\_\_\_\_.
8. Find the sum of all values of  $x$  :  $2|x - 3| - 3 = 19$ .
9. Diego buys a pack of ramen for \$4.00, then sells it at a 5% price increase. How much profit does he make?
10. 120 is what percent of 1000?
11. Annabelle has two cubes with side length 3. What is the total surface area of the cubes?
12. Lydia wants to buy three shirts with faces of famous mathematicians on them. She wants to buy a pink Euclid shirt, a blue Gauss shirt, and a green Galois shirt. She has \$37.35 - the exact amount needed to buy all three. If all three shirts cost the same, how much does the blue Gauss shirt cost? Pretend there's no tax.
13. Cody is taking a basket-weaving class and decides to make a new design for his final exam. He has four colors - pink, blue, yellow, and asparagus green. He also has four different patterns - circles, squares, diamonds, or stars. Cody must choose one color and one pattern. He refuses to use asparagus green because it looks ugly, and he is being graded on style. How many baskets can Cody make?
14. In rectangle  $ABCD$ ,  $AB = CD = 12$  and  $AD = BC = 9$ .  $AB$  is extended to contain point  $E$ . If  $ED = 41$ , what is the area of  $\triangle EDC$ ?



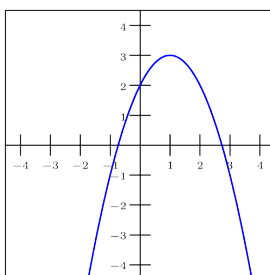
15. Andrew went to Casa Depot and bought 120 feet of rope. He tied the rope between 41 evenly spaced poles. The rope was tied as tight as possible, parallel to the ground. If we assume the Earth is flat, what is the distance between two consecutive poles in ft?

16.  $153_7 \times 12_7 = \underline{\hspace{2cm}}_{10}$ .
17. What are the odds of rolling an even number on a fair, standard, six-sided die?
- (A)  $\frac{1}{2}$                       (B)  $\frac{2}{3}$                       (C)  $\frac{3}{4}$                       (D) 1                      (E) 2
18. Let  $S(n)$  equal the sum of the digits of  $n$ . For instance,  $S(13) = 4$  and  $S(30) = 3$ . What is the smallest positive integer  $n$  such that  $S(n + 881) = 22$ ?
19. What is the degree of the sum of  $14m^3n^3 - 9m^2n$  and  $-5m^3n^3 + 12m^2n - 7m - 3$ ?
20. Nadia owns a magical fairy rabbit. On day 1, the rabbit duplicates itself, and there are now 2 magical fairy rabbits. On day 2, both rabbits duplicate themselves and there are now 4 rabbits. Nadia can only keep a maximum of 27 rabbits in her house, and then she will give the rest of them to Jenny. If the rabbits duplicate for the last time on Day 10, how many rabbits will Jenny receive?
21. If  $a \heartsuit b = \frac{a+b}{a-b}$ , what is  $5 \heartsuit (3 \heartsuit 2)$ ?
- (A) 10                      (B) -10                      (C) 7                      (D) 0                      (E) This value is undefined.
22. Tina has 35 stickers. If 40% of her stickers are green, how many stickers are not green?
23. Bob is buying a fishing pole that has been marked down \$45 during a special sale. This is a 15% decrease from the original price. How many dollars will Bob pay for the pole? Pretend tax doesn't exist.
24. What is the sum of all the values in the domain of the function whose graph contains only the points  $(11, 4)$ ,  $(7, -3)$ , and  $(-8, 12)$ ?
25.  $95^\circ F = \underline{\hspace{2cm}} \circ C$ .
26. Between these five answer choices, which of these has an odd number of positive integer factors?
- (A) 38                      (B) 72                      (C) 165                      (D) 283                      (E) 144
27.  $56_8 = \underline{\hspace{2cm}}$  (base 2).
28. What is the value of the 13th triangular number?
29. Mr. E is a magician and is buying rabbits and hats from a magic shop. Rabbits cost \$5 each and hats cost \$2 each. Mr. E buys 25 items from the store and spends \$98. How many hats does Mr. E buy?

30. Hannah and Emme are playing a guessing game. Emme will pick a positive integer less than 500 and Hannah must guess Emme's number. Emme tells her that this number leaves a remainder of 3 when divided by 5, a remainder of 5 when divided by 7, and a remainder of 11 when divided by 13. What is Emme's number?
31. A line that is parallel to  $y = 5x - 3$  that passes through  $(5, 10)$  is in the form of  $y = mx + b$ . What is  $m + b$ ?
32. In a world of gibberish, there are three different types of currency accepted: knuts, sickles, and galleons. 17 sickles = 1 galleon, and 29 knuts = 1 sickle. How many knuts are in a galleon?
33. Eric and Anthony are canoeing in a lake. They are 12 yards away from shore when their boat springs a leak. Eric starts rowing to shore at a speed of 60 yards per hour while Anthony starts scooping out water. Every minute, 8 gallons of water enters the boat, and the boat will sink if it holds more than 30 gallons of water. What is the slowest rate Anthony must scoop out water if they want to make it back to shore before the boat sinks, in gallons per minute?
34. If  $AE = 7$ ,  $BE = 6$ , and  $BC = 14$ , what is the length of  $AD$ ?



35. What is the supplement of the complement of the angle opposite the shortest side of a triangle with sides of length  $\sqrt{15}$ ,  $3\sqrt{5}$ , and  $2\sqrt{15}$ ?
36. Peter is buying red flowers. There are five types of red flowers - radiant red, rambunctious red, roaring red, rampage red, and retro red. There is an infinite amount of all types of flowers. If he needs to buy 5 red flowers, how many different ways can he do this?
37. At Gauss Middle School, there are six different math teachers - Ms. Euclid, Mrs. Stewart, Mr. Pythagoras, Mrs. Fermat, Mr. Ptolemy, and Mr. Math. They are at a mathematics awards banquet, and, because they are respectful, they will all shake hands with their coworkers. Each math teacher will shake hands once with each of their coworkers. How many handshakes are there?
38. What is the equation of the graph below?



(A)  $y = (x + 1)^2 + 2$

(B)  $y = -(x - 1)^2 + 3$

(C)  $y = -(x - 3)^2 + 4$

(D)  $y = -(x - 1)^2 - 2$

(E)  $y = (x + 1)^2$

39. If light travels  $3 \times 10^8$  meters per second, how far does light travel in one hour? Answer in scientific notation.

(A)  $1.8 \times 10^{10}$

(B)  $1.8 \times 10^{12}$

(C)  $1.08 \times 10^{10}$

(D)  $1.08 \times 10^{12}$

(E)  $1.008 \times 10^{10}$

40. Simplify  $\left(\frac{3mn^{\frac{2}{3}}}{9m^{-2}n}\right)^3$ .

(A)  $\frac{m^6}{81n^3}$

(B)  $\frac{m^6}{81n}$

(C)  $\frac{m^9}{27n}$

(D)  $\frac{m^9}{21n^3}$

(E)  $\frac{m^6}{27n}$