Spirit of Math®

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IN COLLABORATION WITH

smile

Developed by

Stanford University

GRADE 6

Spirit of Math International Contest 2021

In collaboration with SMILE developed by Stanford University

INSTRUCTIONS

1. You have **60 minutes** to write the contest.
2. The contest is multiple-choice with four choices for each question.
3. Write the CAPITAL letter of the answer you choose on the line to the right of each question and fill in the corresponding circle on the SoM Answer Sheet.
4. Each question answered correctly is worth one mark, and the sum of the correct answers is the score.
5. Marks are not taken off for wrong answers.
6. No calculators or other counting tools are allowed.

Student Name: _____ **Score:** /40

1) $-7 \times 3 + 24 - 5 = ?$

A) –3 B) –2 C) 3 D) 40 ____

2) If Mary Mu can eat one cookie in 3 seconds, how many cookies can she eat in one minute?

A) 20 B) 30 C) 45 D) 60 ____

3) Which of the following numbers is **not** a prime number?

A) 24 B) 37 C) 41 D) 47 ____

4) Tyler always drinks 25% of the lemonade he makes. Today he made 40 L of lemonade. How much did he drink?

A) 5 L B) 10 L C) 20 L D) 25 L ____

5) What is the next term in the sequence? 1, 3, 9, 27, ___

A) 54 B) 63 C) 81 D) 99 ____

6) Which of the following ratios is equivalent to 12 : 8?

A) 3 : 4 B) 2 : 3 C) 8 : 4 D) 3 : 2 ____

7) You are on Earth and your best friend is on the planet Mars, 225 million kilometers away. If you travel 15 000 000 km in your spaceship directly toward your best friend, and your best friend travels 78 000 000 km directly toward you, how far apart are the two of you?

A) 93 000 000 km B) 132 000 000 km C) 147 500 000 km D) 175 000 000 km ____

8) It is estimated that three wind turbines can produce enough energy to power 996 houses each year. How many houses can five wind turbines power each year?

A) 1495 B) 1525 C) 1585 D) 1660 ____

9) Hiba's mom was 38 when Hiba was 8 years old. Hiba's mom is now 45 years old. How many times older is Hiba's mom than Hiba now?

A) 2 B) 2.5 C) 3 D) 4 ____

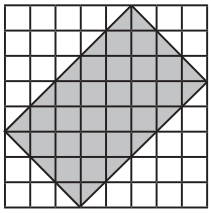
Space for rough work

10) The Hailstone Sequence is a sequence of integers generated by following this rule:
- If the number is even, divide by 2 to get the next term in the sequence.
- If the number is odd, multiply by 3 and add 1 to get the next term in the sequence.

The sequence ends when it reaches the number 1. For example, 20, 10, 5, 16, 8, 4, 2, 1 is a Hailstone Sequence with 8 terms. How many terms are in a Hailstone Sequence that starts with 12?

A) 9 B) 10 C) 11 D) 12 ____

11) What is the area, in unit squares, of a rectangle that has an area three times as large as the area of the shaded rectangle in the unit grid to the right?



A) 45 units^2 B) 60 units^2 C) 75 units^2 D) 90 units^2 ____

12) How many different ways can you arrange the letters in the word RIGHT, including the way that spells "RIGHT"?

A) 24 B) 100 C) 120 D) 720 ____

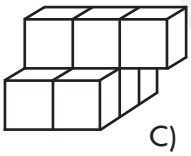
13) A box contains 2 red, 3 yellow, 6 green, and 8 blue marbles. You randomly take one marble from the box without looking. What is the probability that it is **not** yellow?

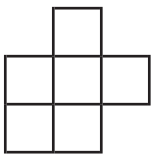
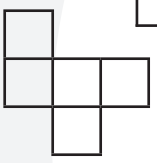
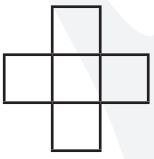
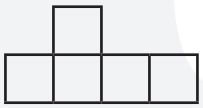
A) $\frac{3}{19}$ B) $\frac{5}{19}$ C) $\frac{16}{19}$ D) $\frac{17}{19}$ ____

14) In an aquarium with many fish, 0.125 of the fish are blue. What is the fewest possible number of fish in the aquarium?

A) 4 B) 8 C) 9 D) 12 ____

15) Seven small cubes are glued together as shown in the diagram below. How would the figure appear when viewed from the top?



A)  B)  C)  D)  ____

Space for rough work

16) The sum of two natural numbers is 25 and their product is 144. What is the positive difference between these two numbers?

A) 7 B) 8 C) 9 D) 10 ____

17) The Caesar cipher, sometimes known as the Caesar shift, is an encryption technique named after Julius Caesar who used it to send private messages. In this method, each letter is shifted by a fixed number of positions down the alphabet. Julius encodes the message "NORTH" to send to his friend Marcus Crassus. It reads, "PQTVJ". Marcus, using the same Caesar shift, responds with the encoded message, "GCING". Julius decodes the message to find that Marcus said:

A) EVADE B) EAGER C) ELITE D) EAGLE ____

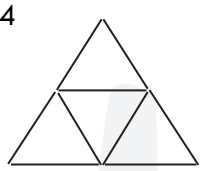
18) Marco finds a $20.00 polo shirt at the store. Once the cashier applies 5% tax, what is the final price of Marco's polo?

A) $20.50 B) $21.00 C) $21.50 D) $22.00 ____

19) On the given line segment, all points are evenly spaced. What is the distance between points P_1 and P_3?

A) $\frac{3}{10}$ B) $\frac{1}{3}$ C) $\frac{1}{2}$ D) $\frac{3}{4}$ ____

20) The diagram to the right is made up of nine identical matchsticks. What is the fewest number of matchstick(s) that need to be removed so that exactly two triangles remain? (The final diagram must be a closed figure).



A) 1 B) 2 C) 3 D) 4 ____

21) Thirty-five students went to summer camps. Eighteen went to an art camp and 15 went to a chess camp. Four students went to both an art camp and a chess camp. How many students went to neither an art camp nor a chess camp?

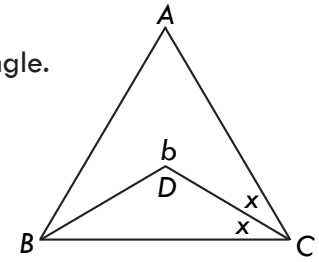
A) 2 B) 4 C) 5 D) 6 ____

Space for rough work

22) An ant can walk around the base of a square-based prism in eight minutes. The height of the prism is three times its base side length. Only walking along the edges, how long will it take for the ant to walk the shortest path from one corner to the prism's opposite corner if it walks at the same rate?

A) 8 minutes B) 10 minutes C) 12 minutes D) 18 minutes ____

23) *ABC* is an equilateral triangle and *BCD* is an isosceles triangle. What is the measure of reflex angle *b*?



A) 120° B) 220° C) 240° D) 300° ____

24) How many three-digit numbers are divisible by 5?

A) 90 B) 100 C) 180 D) 200 ____

25) Mana is trying hard to improve her average. After scoring 73% on three tests, she decided to try to raise her average. What mark should she get on the next test in order for her to achieve an average of exactly 79%?

A) 93% B) 94% C) 95% D) 97% ____

26) A new operation # is defined this way: a#b = a! + b!. What is the value of $(2\#3)^2 - (3\#4)^2$?

A) –836 B) –572 C) –108 D) –24 ____

27) When inserting only addition signs among some or all of the digits below, which three-digit answer **cannot** be obtained?

1 2 3 4 5 6

A) 102 B) 174 C) 299 D) 579 ____

Space for rough work

28) The odometer of a car shows the palindrome 152251 km. After the car has traveled for 10 hours at a constant rate, the odometer showed the next palindromic number. How fast was the car traveling?

A) 100 km/h B) 110 km/h C) 1001 km/h D) 1100 km/h ____

29) Each car of a train is 10 m long and each car is separated from the next by a distance of 2 m. If the total distance from the front of the first car to the back of the last car is 82 m, how many cars does the train have?

A) 5 B) 6 C) 7 D) 8 ____

30) If 5 workers can paint 10 rooms in 6 hours, how long it will take 10 workers to paint 60 rooms?

A) 18 hours B) 24 hours C) 30 hours D) 36 hours ____

31) Mr. Manich and his class of 31 students are taking a 250 km trip to Niagara Falls. They can either travel by minibus with 8 people in each minibus, or take one bus for all 32 people. Gasoline consumption is 40L/100 km for a bus and 8L/100 km for a minibus. If gas costs $1.10 per litre, which method of transportation to get to Niagara Falls will cost less and by how much?

A) The cost is the same B) Minibus costs $20 less C) Minibus costs $22 less D) Bus costs $20 less ____

32) What is the units digit when $1234123^{47} + 1234567^{49}$ is evaluated?

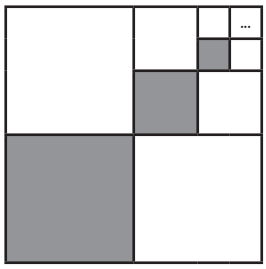
A) 1 B) 4 C) 7 D) 9 ____

33) Silvia, Andrew, Melanie, and Eric sit in a row beside each other at school. Silvia and Melanie like to talk a lot, so their teacher does not want them to sit next to each other. In how many ways can the teacher seat these four students such that Silvia and Melanie are not next to each other?

A) 8 B) 12 C) 22 D) 24 ____

Space for rough work

34) Using the image to the right, what is the sum of $\frac{1}{4}+\frac{1}{16}+\frac{1}{64}+\frac{1}{256}+\ldots$?

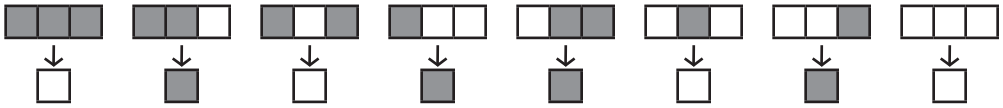


A) $\frac{1}{2}$ C) $\frac{3}{10}$

B) $\frac{1}{3}$ D) $\frac{2}{3}$

____

35) Elementary cellular automata evolve according to a set of rules. Each new cell depends only on itself and its nearest neighbours. There are two possible states for each cell: white or grey. The diagram below shows the rule for how the next generation of cells will be created based on the cells in the current generation.



This rule is applied to every set of three adjacent cells in Generation 0 to create Generation 1 below.

Generation 0: 

Generation 1: 

Assuming every cell to the left and right of the given diagram for Generation 0 is white, which of the following represents Generation 3?

A)  B)  C)  D) 

____

36) In the triangular pattern presented below, what is the last term in the 16th row?

1

2 3 4

5 6 7 8

9 10 11 12 13

14 15 16 17 18 19

...

A) 134 B) 136 C) 151 D) 153

____

Space for rough work

37) If Hanna visits her friend Arjun, she will not have time to study. If Hanna does not study, she will not do well on her math test. Based on this information, which statement is true?

A) If Hanna studies, she will do well on her math test.

B) If Hanna does not visit her friend Arjun, she will do well on her math test.

C) If Hanna does not visit her friend Arjun, she will study.

D) If Hanna does well on her math test, then she did not visit her friend Arjun. ____

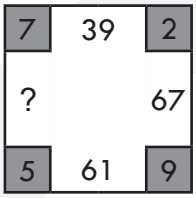
38) Ben forgot to complete his math homework, so he decided to finish it between 7 a.m. and 8 a.m. before going to school. When he started the homework, it was exactly 7 a.m. When Ben finished his homework, the clock hands were overlapping. To the nearest minute, how long did it take Ben to finish his homework?

A) 36 minutes B) 37 minutes C) 38 minutes D) 40 minutes ____

39) Lily has a pile of 11 sticks each with an integer length. She noticed that no three sticks can form a triangle. If the smallest two sticks are 1 cm long, what is the smallest possible length of the largest stick?

A) 55 cm B) 89 cm C) 144 cm D) 256 cm ____

40) The numbers in the square below follow a certain pattern. What is the missing number?



A) 39 B) 41 C) 46 D) 51 ____

Space for rough work