MATH DAY 2024

Exercises

1. In ancient Egypt, a rich person had many ushabtis (small statues representing immortal servants). They had "normal ushabtis", one for every day of the year, plus they had one "leader ushabti" for every full group of 10 normal ushabtis. What was the total amount of ushabtis?
   Comment: By year we mean 52 weeks and 1 day.

   A: 400

   B: 401

   C: 410

   D: 411

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2. If six 3D printers print six mugs in six minutes, how many 3D printers are required to print twelve mugs in twelve minutes?
   Comment: The printers are all alike, the mugs are all alike.

   A: 24

   B: 12

   C: 6

   D: 3

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3. A clown is alternatingly telling one true fact and one lie. The clown says, in order, the following sentences:
   – I like mushrooms.
   – I don't like mushrooms.
   – I don't like mushrooms and I don't like onions.
   – I like either mushrooms or onions.
   Which of the following assertions is correct?

   A: The clown likes onions and mushrooms.

   B: The clown likes onions but not mushrooms.

   C: The clown likes mushrooms but not onions.

   D: The clown likes neither onions nor mushrooms.

4. Consider a regular hexagon and a rhombus with the same side-length, and such that two angles in the rhombus are the same as the hexagon's angles. What is the ratio between the area of the hexagon and the area of the rhombus?

    A: 1

    B: 2

    C: 3

    D: 4

5. Four friends Amy, Ben, Chi, Dan have chosen cups in four distinct colors, namely red, green, blue, yellow. You have the following information:

    • The two cups of Amy and Chi are yellow and green.

    • The two cups of Amy and Dan are red and green.

    What is the color of Ben's cup?

    A: Red

    B: Green

    C: Blue

    D: Yellow

6. Consider a code of the form $ABBA$, knowing that A and B are distinct numbers from 0 to 9 that satisfy: $A + B = B$ and $A + B = B \times B$. How many possibilities are there for this code?

    A: 1

    B: 2

    C: 3

    D: 4

7. Elisa and Nicole have some candies. Elisa gives 1/3 of her candies to Nicole and, at the same time, Nicole gives 1/3 of her candies to Elisa. In the end, the number of candies that they have differs by 6. By how much did the number of candies differ before the exchange?

A: 0

B: 6

C: 12

D: 18

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8. Your grandparents' cake recipe for 10 people uses 6 eggs and 600 grams of flour. To be faithful to the recipe, it is important to preserve the ratio between eggs and flour. You need to use an integer amount of eggs. How many grams of flour do you use for making a cake that suffices for 8 people?

   A: 400

   B: 450

   C: 480

   D: 500

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9. We call a number *supereven* if all of its digits are even numbers. What is the number of supereven numbers from 0 to 1000?

   A: 100

   B: 125

   C: 250

   D: 500

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10. Consider a square. Connect one square vertex to the two middle points of the two non adjacent sides. This subdivides the square into a quadrilateral and two triangles. What is the area of the quadrilateral, computed in percentage with respect to the area of the whole square?
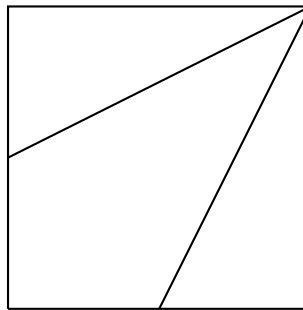
A: 60%

B: 55%

C: 54%

D: 50%

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11. Consider the 16 fields of a 4×4 square board. At most how many fields can be chosen so that no four midpoints of the chosen fields form the vertices of a rectangle with sides parallel to the square board?

   A: 7

   B: 8

   C: 9

   D: 10

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12. Five teenagers at a dinner share one round table. The designated places are, in clockwise order: Amy, Ben, Cheng, Dan, Ed. However, they totally dislike this arrangement. Each teenager does not want to have as neighbor any of the two foreseen neighbours. Moreover, Amy wishes to keep her designated seat. In how many ways can they rearrange themselves so that their wishes are all fulfilled?

   A: 0

   B: 1

   C: 2

   D: 3

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13. We have some red and blue balls in an urn. The probability of drawing a red ball is 1/3. If we draw a red ball (and we don't put this ball back in the urn), then the probability of drawing another red ball is 1/4. If we draw two red balls, what is the probability of drawing a third red ball?

   A: 1/5

   B: 1/6

   C: 1/7

   D: 1/8

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14. Hannah and Trevor are playing a game of luck. They toss a fair coin multiple times. Hannah wins as soon as HEADS has come out 4 times, while Trevor wins as soon as TAILS has come out 4 times.
They have now tossed the coin 5 times: HEADS has come out 3 times and TAILS has come out 2 times. What is the probability for Hannah to win the game?

   A: 25%

   B: 50%

   C: 75%

   D: 100%

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15. Charles is taking part in a 10 km marathon with the aim of achieving an average speed of 12 kilometers per hour. However, after having run for 5 kilometers, he checks his watch and finds out that his average speed so far has only been 10 kilometers per hour. What average speed, in kilometers per hour, must Charles have in the second half of the marathon to meet his goal?

   A: 14

   B: 15

   C: 16

   D: 17

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16. In a rectangle $ABCD$, we have $\overline{AB} = 4\overline{AD}$. The vertices E and F of a parallelogram $ABEF$ are on the line CD and the angle $\widehat{FAB}$ is 30°. What is the ratio of the perimeters of the parallelogram and the rectangle?

   A: 1,2

   B: 1,5

   C: 1,8

   D: 2