2024 Team Up Challenge

Team Paper


💡 **Tips to Get Started**

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- The questions in this paper increase in difficulty as you move through the paper. The last few questions require some careful thought.

- Each team member doesn't need to do every question. You can split the questions up, work together, or do a combination of both. Come up with a strategy that works for your team.

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1. If $a + b = 6$, and $a = b$, then what is the value of $a \times b$?

2. A group of librarians were asked to choose between a mystery or a fantasy book. The results are shown in the circle graph. If 12 people chose mystery, how many people chose fantasy?
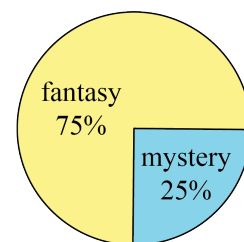

3. A large square is divided into nine identical smaller squares. Five of the smaller squares are shaded, as shown. If the total area of the shaded squares is 20 m², what is the area, in m², of the large square?
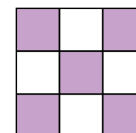
4. Antonio, Britt, and Caitlin are swimming laps in the pool. For every lap Antonio swims, Britt swims two laps. For every lap Britt swims, Caitlin swims three laps. If Antonio swam 5 laps, what is the total number of laps swum by all three people?

5. A function machine does the four operations shown, in order.

Input → Divide by 3 → Subtract 10 → Divide by 3 → Subtract 10 → Output
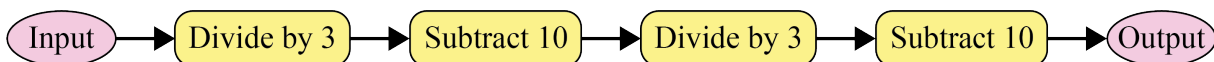
If the output is 8, what was the input?

6. Three inhabitants of planet Magu named Alpha, Beta, and Gamma, met in a crater and counted each others eyes. Alpha saw exactly 9 eyes, Beta saw exactly 11 eyes, and Gamma saw exactly 8 eyes. No one could see their own eyes. How many eyes does Alpha have?

7. In the product shown, A, B and C are digits. What is the value of $A + B + C$?

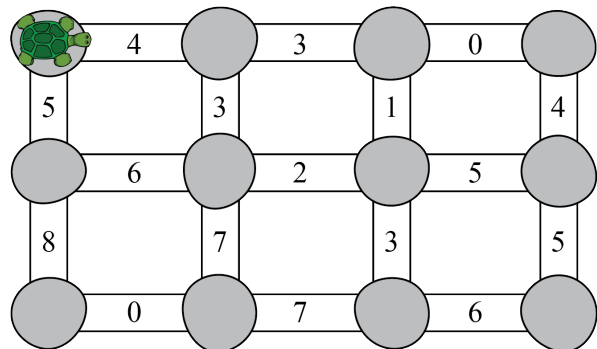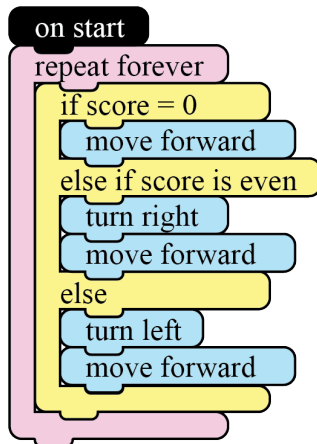$$\begin{array}{r} 6\,A \\ \times \quad B \\ \hline 3\,C\,4 \end{array}$$

8. A frog and a square are placed on a grid as shown. The frog is then translated 5 units up and x units to the right so that it lands completely inside the square. If x is an integer, how many different values of x are possible?
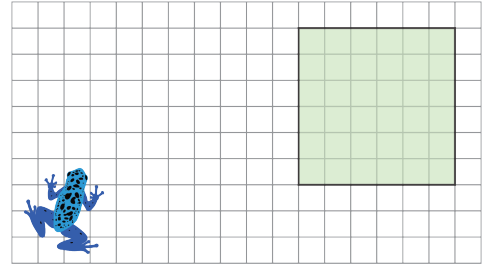
9. Ahmed created a program to move a turtle along paths that connect 12 large rocks. Each path contains a number, which represents the number of points that are added to your score when you use that path. The turtle starts on the rock in the top-left corner of the diagram, facing to the right, with a score of zero points. The following three blocks are used to move the turtle.

Block	Description
move forward	moves the turtle forward to the next rock
turn right	rotates the turtle a quarter turn clockwise
turn left	rotates the turtle a quarter turn counterclockwise

If the turtle is directed to move forward when there is no path in front of it, the program will crash. Ahmed's program and the diagram are shown.

```
on start
repeat forever
    if score = 0
        move forward
    else if score is even
        turn right
        move forward
    else
        turn left
        move forward
```

Ahmed ran his program and it crashed. What was Ahmed's score right before his program crashed?

10. What is the largest number of blocks with dimensions $1 \times 1 \times 2$ that can fit inside a box with dimensions $3 \times 3 \times 3$?

11. Rectangle $ABCD$ has integer side lengths and is divided into four rectangles, as shown. The largest of these four rectangles is shaded and has a perimeter of 28 cm. The smallest rectangle is striped and has a perimeter of 12 cm. What is the perimeter, in cm, of rectangle $ABCD$?
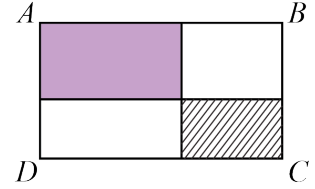
12. Keoni writes the positive integers, in order, starting from 1. He writes the integers in rows, each with 9 integers. Keoni writes the first row from left to right, but once he reaches the end of a row, he writes the next row in the opposite direction, placing each integer directly below an integer in the previous row, as shown.

$$
\begin{array}{ccccccccc}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\
18 & 17 & 16 & 15 & 14 & 13 & 12 & 11 & 10 \\
19 & 20 & \cdots
\end{array}
$$

If Keoni continues writing positive integers in this way, which integer will be directly above 2024?

13. When 857 is divided by a positive integer n, the remainder is 17. When 908 is divided by the same positive integer n, the remainder is 26. What is the largest possible value of the integer n?

14. Four points W, X, Y, and Z are placed along a number line such that WX is two-thirds of XZ and WY is twice YZ.

If $WX = 12$, what is the value of XY?

15. A robot is placed at the entrance on the left side of the following maze.
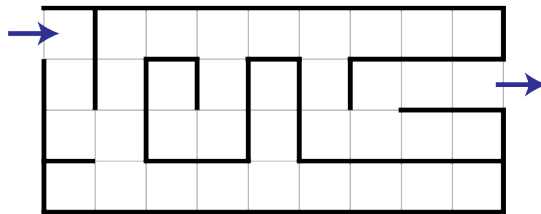
The robot moves through the maze one square at a time. Before it moves, the robot looks left, forward, and right; each time seeing either an opening or a wall. At each square, it is possible for the robot to see a total of 0, 1, or 2 openings.

- If the robot sees 0 openings, that is, it sees three walls, it stops moving.
- If the robot sees 1 opening, it moves through it to the next square.
- If the robot sees 2 openings, the probability of it moving through either of the openings is equal.

What is the probability that the robot will reach the exit on the right side of the maze?

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Team Paper Answer Sheet

Team: _____

Question	Answer
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