

## Level 1

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MC: +12 for the correct answer, -3 for a wrong answer, 0 for unanswered  
T/F: +3 for each correct answer, -3 for each wrong answer, 0 for unanswered  
NUM: +12 for the correct answer, 0 for wrong or unanswered

### Question 1 (MC):

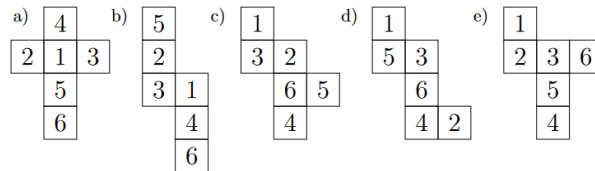
Which of the following computations gives the largest result?

- A:  $12 \cdot 34$
- B:  $1 + 23 \cdot 4$
- C:  $123 \cdot 4$
- D:  $1 + 2 \cdot 34$
- E:  $12 \cdot 3 + 4$

### Question 2 (MC):

Which of the following nets can be folded into a cube where the labels on opposite sides add up to 7?

- A: a)
- B: b)
- C: c)
- D: d)
- E: e)



### Question 3 (MC):

Tanish has 73 bananas. He wants to give each of his 5 monkeys an equal number of bananas, while keeping the leftovers for himself. How many bananas could Tanish possibly have left over?

- A: 16
- B: 17
- C: 18
- D: 19
- E: 20

### Question 4 (MC):

Tan the rabbit has arranged 100 baskets in a circle, each containing a single carrot. How many carrots can Tan eat at most such that any three baskets in a row still have at least one carrot among them?

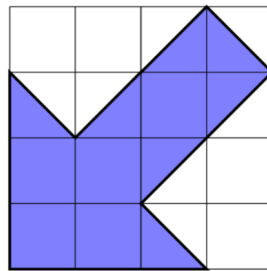
- A: 33
- B: 34
- C: 50
- D: 66
- E: 67

### Question 5 (NUM):

Ricardo took 5 pairs of pants and 7 Hawaiian shirts with him on his summer holiday. If he does not want to wear the same outfit combination on two different days, how many days can his holiday last at most?

### Question 6 (NUM):

If the side length of the large square is 24, what is the area of the blue arrow?

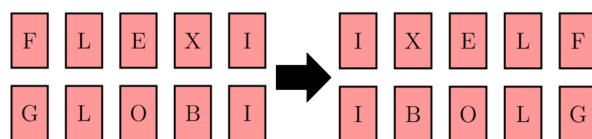


### Question 7 (NUM):

In a class of 30 students, 20 students like pizza and 15 students like burgers. If 10 students like both pizza and burgers, how many students like neither pizza nor burgers?

### Question 8 (NUM):

Samuel is playing a game. He has two rows of cards with letters on them, as shown on the left. Each move, he chooses one letter from the top row as well as one letter from the bottom row, and he switches these two cards. After some moves, he reaches the following reverse configuration as shown on the right. At least how many moves did he make?



### Question 9 (T/F):

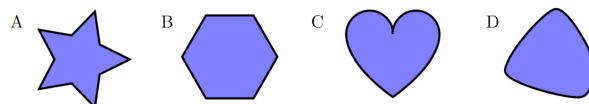
Which of these integers can be written as the product of two even integers?

- A: -4
- B: 50
- C: 51
- D: 52

### Question 10 (T/F):

Julia has a small garden. She can walk between any two points in her garden in a straight line without leaving the garden. Which of the following shapes could the garden have?

- A: A
- B: B
- C: C
- D: D



## Junior 2

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MC:	+16 for the correct answer,	-4 for a wrong answer,	0 for unanswered
T/F:	+4 for each correct answer,	-4 for each wrong answer,	0 for unanswered
NUM:	+16 for the correct answer,	0 for wrong or unanswered	

### Question 11 (MC):

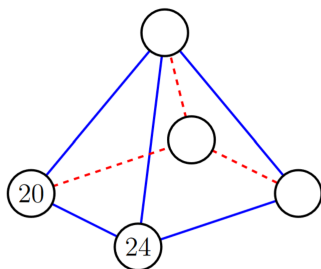
How many positive two-digit integers are there such that the product of both digits is a positive square number?

- A: 9
- B: 13
- C: 15
- D: 17
- E: 18

### Question 12 (MC):

On each corner of the pyramid below, Emily writes a positive integer such that the sum of numbers touching each of the five faces is the same. She already wrote 20 and 24 on two neighbouring corners as shown below. What will the sum of all numbers be when she is done?

- A: 101
- B: 132
- C: 145
- D: 146
- E: More information required



### Question 13 (MC):

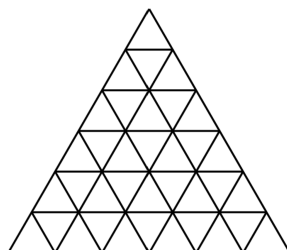
Two parents, aged 50 and 46 respectively, have three kids, aged 12, 13 and 15. What age will the oldest child be when the sum of the ages of the parents is twice the sum of the ages of the children?

- A: 17
- B: 19
- C: 20
- D: 21
- E: 24

### Question 14 (MC):

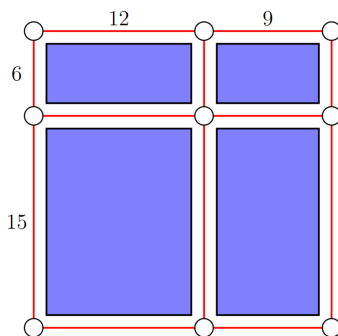
In the following diagram, at least how many triangles would we need to colour red so that each uncoloured triangle shares an edge with a red triangle?

- A: 9
- B: 10
- C: 12
- D: 15
- E: 21



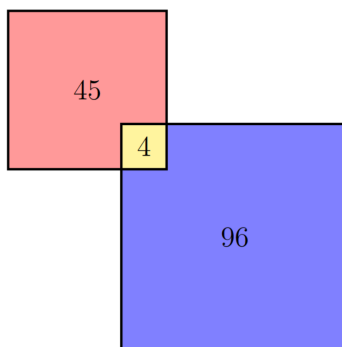
### Question 15 (NUM):

The MO-Headquarters consist of four rectangular buildings as illustrated below in blue. There is a street food vendor at each corner marked with a circle. Jana wants to visit them all in a single trip. She can start and end where she wants and walk along the red lines. How far does she have to walk at least?



### Question 16 (NUM):

Ruhi has a garden formed by two overlapping squares, as shown in the picture below. She grows red flowers in the red region of area 45, yellow flowers in the yellow region of area 4 and blue flowers in the blue region of area 96. If the yellow region is a square, what is the perimeter of Ruhi's garden?



### Question 17 (NUM):

Mathys has 20 different flavours of candy in his jar and each flavour occurs 20 times. One by one, he will randomly take out a piece of candy and eat it. At least how many pieces of candy does Mathys need to eat in order to be certain that he either ate 20 candies of the same flavour or tasted each flavour at least once?

### Question 18 (NUM):

What is the largest number such that any pair of consecutive digits within it form a two-digit square number?

### Question 19 (T/F):

Two positive integers  $a, b$  are called friends if either  $a = 3b + 2$  or  $b = 3a + 2$ . Which of these propositions are true?

- A: An odd and an even number can be friends.
- B: There is a number that is friends with two numbers.
- C: Two prime numbers can be friends.
- D: There are two numbers that are friends and both divisible by 5.

### Question 20 (T/F):

A mailman wants to deliver the mail on a circular road with 42 houses. For this he starts at a house and then moves clockwise, always skipping exactly  $n$  houses before stopping at the next house. For which values of  $n$  does he visit every house?

- A: 23
- B: 24
- C: 25
- D: 26

### Junior 3

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MC:	+20 for the correct answer,	-5 for a wrong answer,	0 for unanswered
T/F:	+5 for each correct answer,	-5 for each wrong answer,	0 for unanswered
NUM:	+20 for the correct answer,	0 for wrong or unanswered	

### Question 21 (MC):

Five people all make a statement about how many of them are liars:

- Elisabeth: "Two of us are liars!"
- Guy: "Three of us are liars!"
- Karin: "Four of us are liars!"
- Ignazio: "Three of us are liars!"
- Viola: "All of us are liars!"

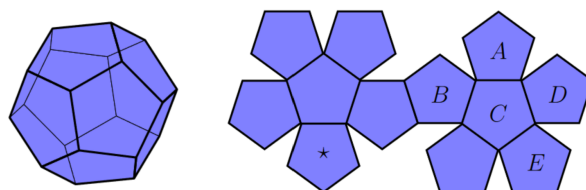
How many of them are liars?

- A: 2
- B: 3
- C: 4
- D: 5
- E: More information required

### Question 22 (MC):

A dodecahedron is a solid with 12 pentagonal faces, as shown on the left. If the shape on the right is folded into a dodecahedron, what face will end up directly opposite the face marked with a star?

- A: A
- B: B
- C: C
- D: D
- E: E



**Question 23 (MC):**

Let  $x > 0$  be a real number with  $x + \frac{1}{x} = 3$ . What is the value of  $x^4 + \frac{1}{x^4}$ ?

- A: 47
- B: 52
- C: 77
- D: 81
- E: More information required

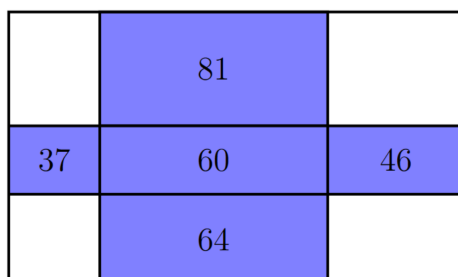
**Question 24 (MC):**

Paul has written down finitely many different rational numbers on the blackboard. He notices that the product of any two different numbers on the board is also on the board. At most how many numbers could be on the board?

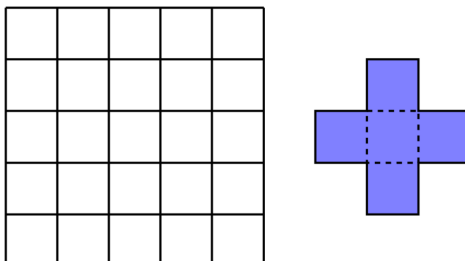
- A: 2
- B: 3
- C: 4
- D: 5
- E: More than 5

**Question 25 (NUM):**

Each of the small blue rectangles below is labelled with its perimeter. What is the perimeter of the large outer rectangle?

**Question 26 (NUM):**

A Swiss cross is the shape made out of 5 squares illustrated below. At most how many squares of the  $5 \times 5$  grid below can you colour red, such that any Swiss cross formed by the grid lines contains at most 1 red square?

**Question 27 (NUM):**

Bora and Jonah together with their 4 other friends, want to sit around a round table with 6 different chairs. If Bora and Jonah do not want to sit next to each other, how many possible seating plans are there?

**Question 28 (NUM):**

What is the smallest positive integer that has different remainders when divided by each of 1, 2, 3, 4, 5?

**Question 29 (T/F):**

Viviane has an 8-minute and an 11-minute hourglass. If the sand in both hourglasses is currently settled, which of the following numbers of minutes can Viviane measure exactly, starting from now?

- A: 12
- B: 14
- C: 16
- D: 21

**Question 30 (T/F):**

Which statements are true about the infinite sequence  $7, 77, 777, \dots$ ?

- A: The sequence contains a number divisible by 9.
- B: The sequence contains two numbers whose difference is divisible by 101.
- C: The sequence contains a square number.
- D: The sequence contains exactly one prime number.