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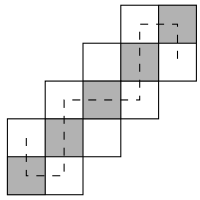
Dutch Mathematical Olympiad

19 January – 30 January 2026

Solutions

A1. D) 11 Colour the squares of the figure alternately white and black like on a chess board, see the figure on the right. The mouse has to move alternately from a white square to a black square and vice versa. There are a total of 5 black squares and 8 white squares. The mouse visits as many white as black squares, except if the mouse visits an odd number of squares: then there is one more of one of the two colours. So the best possible result for the mouse is 11 squares: 5 black and 6 white. This can be achieved, for example, by following the path in the figure on the right.



A2. B) 2-3 In the row of seven dominoes, each number must occur an even number of times, except possibly the two numbers at the ends of the row. Looking at the eight dominoes drawn by Emre, we see that the numbers 1, 2, 3 and 6 occur an odd number of times and the numbers 0, 4 and 5 occur an even number of times. Since only two numbers can occur an odd number of times, the domino Emre does not use must therefore contain two of the numbers 1, 2, 3 and 6. The only domino that meets this requirement is 2-3. We see that the remaining seven stones can indeed be laid in a row, for example as follows:

1-0, 0-4, 4-2, 2-2, 2-5, 5-4, 4-6.

A3. B) 3 If n students always tell the truth, then the answer "n" must occur at least n times in the students' answers. It may be that the answer occurs more often because there are students who sometimes tell the truth. Of the five different answers "two", "three", "four", "five" and "six", there is only one that meets this requirement. That is the answer "three", which was given a total of four times. So there are three students who always tell the truth.

A4. E) chair E Person B sits in chair A or chair C. We try both possibilities.

If person B sits in chair A, then chairs A and D are occupied. Persons C, D and E should therefore sit in chairs B, C and E, but then person E fails to get between person C and D.

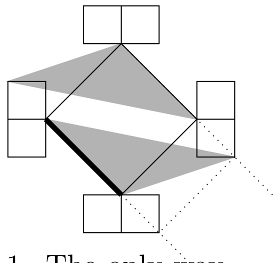
So person B sits on chair C. Then person C should sit on chair B. Since person E must sit next to person C, person E must now sit on chair A and immediately next to it on chair E sits person D. All in all we find the following seating arrangement:

chair	A	B	C	D	E
person	E	C	B	A	D

A5. D) 70 Suppose the bin has R red, W white and B blue balls. So then we know that $W + B = 4R$ and $R + B = 6W$. Subtracting the second equation from the first, we find that $W - R = 4R - 6W$, or $W = \frac{5}{7}R$. Plugging this into the first equation, we then find that $B = 4R - \frac{5}{7}R = \frac{23}{7}R$.

We now see that R must be divisible by 7. Moreover, R must also be even, so R is a multiple of 14, say $R = 14n$ for a positive integer n. Then we get that $W = 10n$ and $B = 46n$. The total number of balls, $R + B + W = 70n$ is positive and less than 100, so n must be equal to 1. So there are 70 balls in total.

A6. E) it is constant Look at the bottom red triangle. Take the lower left side as the base. That base does not depend on how big the small squares are. Since the diagonals of the small squares are parallel to the sides of the big square, the height of the red triangle is also always the same. So the area does not depend on the dimensions of the small squares.



A7. B) 2 On either side of the number 3 there can only be the number 1. The only way to make a sequence without using more 1s than 3s is to start with 3131 . . . 31 and/or end with 1313 . . . 13, using all 1s and 3s in the process. Similarly, there can only be a 4 next to a 2. The only way to make a sequence without using more 2s than 4s is to start with 2424 . . . 24 and/or end with 4242 . . . 42, using all 2s and 4s in the process. So there are two possible sequences:

$$3131\ldots314242\ldots42 \qquad \text{and} \qquad 2424\ldots241313\ldots13.$$

A8. C) 5 Dana starts with an odd number and after each step, regardless of whether she gets heads or tails, the number is still odd. We investigate how the final digits 1, 3, 5, 7 and 9 change after each coin toss:

	1	3	5	7	9
heads	3	7	1	5	9
tails	3	7	1	5	9

We see that for the final digit, it does not matter whether Dana tosses heads or tails. The final digit 9 always remains a 9 and the other four digits always return after four increments: $1 \to 3 \to 7 \to 5 \to 1 \to \ldots$. Since 2024 is divisible by 4, the final digit after 2026 coin tosses is the same as after 2 coin tosses. So to end with a number ending in a 3, Dana must have started with a number ending in a 5.

B1. 333 Note that each of the numbers has two digits. A number with any one of the digits 0, 3, 6 or 9 is divisible by 3 only if the other digit is also a 0, 3, 6 or 9. We cannot combine 9 with a 0, because then the number is divisible by 9. For the same reason, we cannot combine 6 and 3. It is easy to verify that of the remaining combinations, the largest sum is $93 + 60 = 153$.

Of the remaining six digits, we can also find out which other digit they can be combined with:

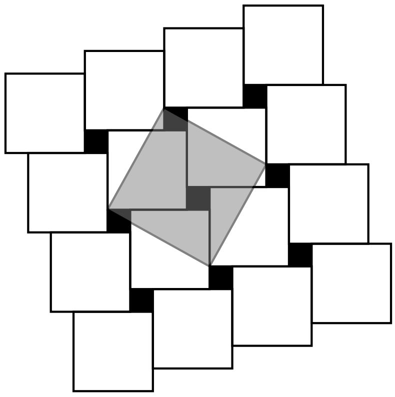
$$8 - 4 - 2 - 1 - 5 - 7 - 8,$$

where there is a line between two digits if they can occur together. There are two ways to make pairs. To get the largest possible sum, we put the largest digit in front:

$$84 + 21 + 75 = 180 \qquad \text{or} \qquad 42 + 51 + 87 = 180.$$

In both cases, the total outcome equals $153 + 180 = 333$.

B2. 198 We look at what happens when we make the grey tile transparent. We see that the white piece on the bottom right (under the transparant tile) fits exactly on the white piece on the top left, and together these pieces form a white square. Similarly, the white piece on the top right can be made complete by adding the tiny triangle on the left top and the piece on the bottom left to it. Finally, the black pieces on the top and left form exactly a black square. So the total area of the grey square is twice the area of a white square plus twice that of a black square: that is $2 \cdot 92 + 2 \cdot 7 = 198$.



Alternative solution: instead of "cutting and pasting", we can also approach this problem algebraically. We denote the side length of the black squares by x and that of the white squares by y. Then it is given that $x^2 = 7$ and $y^2 = 92$. The side z of the small tile is the hypothenuse of the right triangle with legs $x+y$ and $y-x$. The Pythagorean theorem then gives us that $z = \sqrt{(x+y)^2 + (y-x)^2} = \sqrt{(x^2 + 2xy + y^2) + (y^2 - 2xy + x^2)} = \sqrt{2x^2 + 2y^2}$, from which we deduce that the area of the grey tile equals $z^2 = 2x^2 + 2y^2 = 2 \cdot 7 + 2 \cdot 92 = 198$.

B3. 168 A time always starts with the hours that must be between 00 and 23, but because the first digit cannot be a 0, only 10 to 23 are possible; that's 14 possibilities. Since every month has at least 28 days, those starting digits are also always possible for a date. Those starting digits are also possible for a year.

The last two digits must form a month. For that, there are only the 12 possibilities 01 to 12, all of which are also valid possibilities for a time or year. So in total, there are $14 \cdot 12 = 168$ four-digit numbers, not starting with a zero, that simultaneously indicate a time, date and year.

B4. 5 The divisions that the numbers have to satisfy can also be written as multiplications. For example, we see that $B = C \cdot F$, $C = G \cdot D$, and $F = G \cdot I$. If we substitute these equations in each other, starting from the last one going to the first one, we find that $B = G \cdot G \cdot D \cdot I$. From this, it follows that $B = 150$ is divisble by G^2. The only squares which are a divisor of 150 are $1^2 = 1$ and $5^2 = 25$, but $G = 1$ is not allowed. Therefore, G can only be equal to 5.

From $150 = 5 \cdot 5 \cdot D \cdot I$ it follows that there are two possibilities: either $D = 2$ and $I = 3$, or $D = 3$ and $I = 2$. We can find a solution for both these possibilities, as you can see in the pyramids below.

$$\begin{array}{ccccccc} 6750 & : & 150 & : & 10 & : & 2 \\ & 45 & : & 15 & : & 5 & \\ & & 3 & : & 3 & & \\ & & & 1 & & & \end{array} \qquad \begin{array}{ccccccc} 3000 & : & 150 & : & 15 & : & 3 \\ & 20 & : & 10 & : & 5 & \\ & & 2 & : & 2 & & \\ & & & 1 & & & \end{array}$$