wizBRAIN 2023

WereldWijde WiskundeWedstrijd

WWW.W4KANGOEROE.NL

W4Kangoeroe

Good luck and most of all have fun !

calculators are not allowed

you may use 75 minutes

only a pencil, an eraser and scribbling paper are allowed

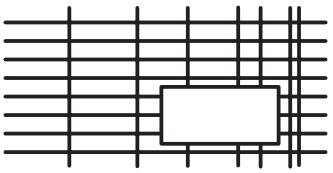
results and prizes will arrive at school at the end of May

answers will be posted on the website about March 29th

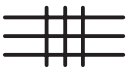
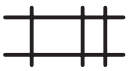
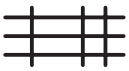
solutions will be posted on the website about April 20th

wizBRAIN
havo 1, 2 & 3
vwo 1 & 2
vmbo 3 & 4 m.u.v. basisberoepsgerichte leerweg.

1. The diagram shows a set of horizontal and vertical lines from which a part has been left out.



Which of the following pieces is the missing part?

A.  **B.**  **C.**  **D.**  **E.** 

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2. *Jonte* glues the grey piece and the two white pieces of paper onto the black circle.

Which result can he **not** obtain?

A.  **B.**  **C.**  **D.**  **E.** 

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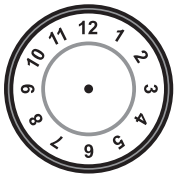
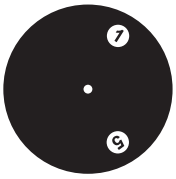
3. A black circle with two holes is placed on top of a clock, as shown. The black circle is rotated around its center so that in one hole the number 8 appears.





Which two numbers can be seen in the other hole?

A. 1 and 4 **B.** 1 and 5 **C.** 4 and 12 **D.** 5 and 12 **E.** 7 and 11

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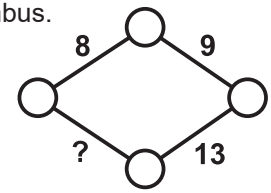
4. *Werner* wants to write a number at each vertex and along each edge of the rhombus. He wants the sum (addition) of the numbers at the two vertices at the ends of each edge to be equal to the number written on the edge.



What number will he write instead of the question mark?

A. 11 **B.** 12 **C.** 13 **D.** 14 **E.** 15

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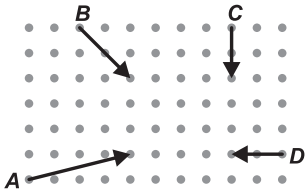
5. The diagram shows the initial position, the direction of travel and the distance that four bumper cars travel in five seconds.



Which two cars will collide after ten seconds?

A. *A* and *B* **B.** *A* and *C* **C.** *A* and *D* **D.** *B* and *C* **E.** *C* and *D*

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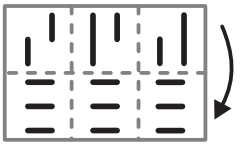
6. *Kristina* has a piece of transparent paper on which some lines have been drawn. She folds it along the dashed line.



What can she now see?

A.  **B.**  **C.**  **D.**  **E.** 

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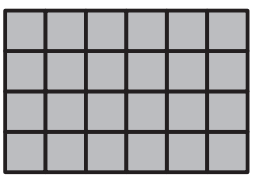
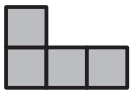
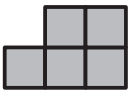
7. A tiler wants to tile a floor of dimensions 4 m × 6 m using identical tiles. There should be no overlaps or gaps.



Which of the following tiles could **not** be used?

A.  **B.**  **C.**  **D.**  **E.** 

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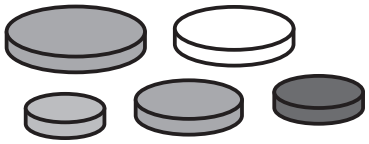
8. *John* has 150 coins. When he throws them on the table, 40% show heads and 60% show tails.

How many coins should he flip so that there is an equal amount of heads and tails on the table?

A. 10 **B.** 15 **C.** 20 **D.** 25 **E.** 30

9. *Anna* has five circular disks, each of a different size.
She decides to build a tower with three of her disks, so that each disk in her tower is smaller than the disk directly below it.



How many different towers can *Anna* build?

A. 5 **B.** 6 **C.** 8 **D.** 10 **E.** 15

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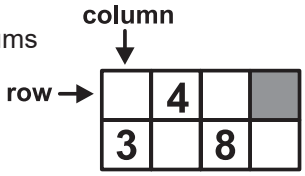
10. *Evita* wants to write the numbers 1 to 8 in the boxes of the grid shown, so that the sums of the numbers in the boxes in each row are equal and the sums of the numbers in the boxes in each column are equal.
She has already written down the numbers 3, 4 and 8.



Which number will she write in the grey box?

A. 1 **B.** 2 **C.** 5 **D.** 6 **E.** 7

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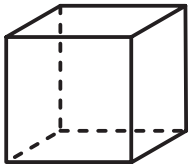
11. Some edges of a cube should be coloured red, so that every face of the cube has at least one red edge.



What is the smallest possible number of edges that could be coloured red?

A. 2 **B.** 3 **C.** 4 **D.** 5 **E.** 6

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12. *Thea* wrote down three consecutive whole numbers from small to large, but instead of digits she used symbols.

She wrote 

What would she write next?

A.  **B.**  **C.**  **D.**  **E.** 

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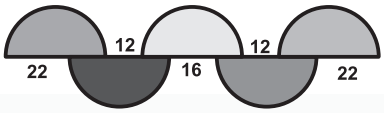
13. The diagram shows five equally sized semicircles and a number of line segments.
The lengths of these line segments are written next to them.



What is the radius of the semicircles?

A. 12 **B.** 16 **C.** 18 **D.** 22 **E.** 36

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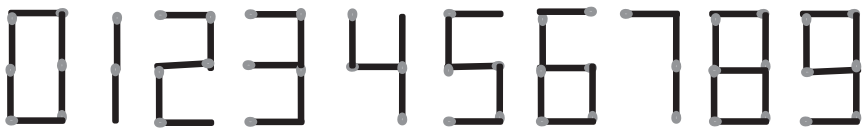
14. With matchsticks you can write numbers, as shown below.



How many different positive integers can be written using exactly six matchsticks in this way?

A. 2 **B.** 4 **C.** 6 **D.** 8 **E.** 9

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15. *Peter* has drawn a square with edges of 1 cm.

How many points can he draw that are exactly 1 cm away from two of the vertices of this square?

A. 4 **B.** 6 **C.** 8 **D.** 10 **E.** 12

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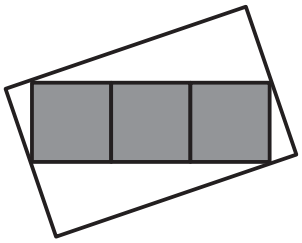
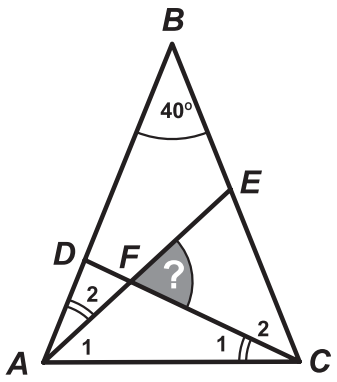
16. The diagram shows a rectangle consisting of three grey squares, each of area 25 cm², inside a larger white rectangle.
Two of the vertices of the grey rectangle touch the mid-points of the shorter sides of the white rectangle and the other two vertices of the grey rectangle touch the other two sides of the white rectangle.



What is the area, in cm², of the white rectangle?

A. 125 **B.** 136 **C.** 149 **D.** 150 **E.** 172

17. Triangle ABC is isosceles with $AB = BC$ and $\angle B = 40^\circ$.
The two marked angles $\angle A_2$ and $\angle C_1$ are equal.



What is the size of the angle with the question mark?

A. 55° **B.** 60° **C.** 65° **D.** 70° **E.** 75°

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18. *Tom, John,* and *Lily* each shot six arrows at a target.
Arrows hitting anywhere within the same ring score the same number of points.
Tom scored 46 points and John scored 34 points.

How many points did *Lily* score?

A. 37 **B.** 38 **C.** 39 **D.** 40 **E.** 41

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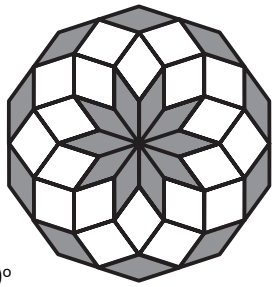
19. The "rose", as shown, is formed by two kinds of diamonds, of which the small ones are dark grey and the large ones are white.



What is the largest angle of a white diamond?

A. 106° **B.** 108° **C.** 110° **D.** 112° **E.** 120°

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20. Some beavers and some kangaroos are standing in a circle.
There are three beavers in total. A beaver may not stand next to another beaver.
There are exactly three kangaroos standing next to another kangaroo.

What is the largest possible amount of kangaroos in the circle?

A. 4 **B.** 5 **C.** 6 **D.** 7 **E.** 8

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21. The sum of 2023 consecutive integers is 2023.

What is the sum of the digits of the largest of these integers?

A. 4 **B.** 5 **C.** 6 **D.** 7 **E.** 8

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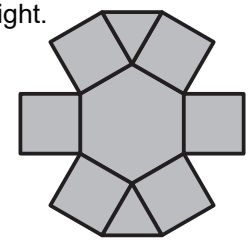
22. *Elizabet* wants to write the numbers 1 to 9 in the regions of the shape shown on the right.
The product (multiplication) of the numbers in two adjacent regions is not more than 15.
Two regions are adjacent if they have a common edge.



In how many ways can she do this?

A. 8 **B.** 12 **C.** 16 **D.** 24 **E.** 32

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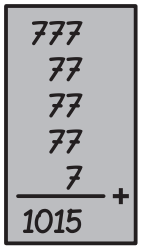
23. *Bart* wrote the number 1015 as a sum of numbers with only the digit 7.
He used a 7 a total of ten times, as shown.
Now he wants to write the number 2023 as a sum of numbers with only the digit 7, using a 7 a total of 19 times.



How many times will he use the number 77?

A. 2 **B.** 3 **C.** 4 **D.** 5 **E.** 6

24. *Snow White* organised during several days a chess competition for the seven dwarfs, in which each dwarf played one game against every other dwarf.
On Monday, *Grumpy* played 1 game, *Sneezy* played 2, *Sleepy* 3, *Bashful* 4, *Happy* 5 and *Doc* 6 games.

How many games did *Dopey* play on Monday?

A. 1 **B.** 2 **C.** 3 **D.** 4 **E.** 5

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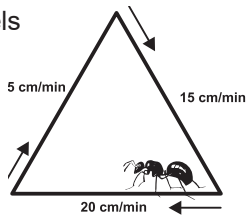
25. An ant walks along the sides of an equilateral triangle. The speeds at which it travels along the three sides are 5 cm/min, 15 cm/min and 20 cm/min as shown.



What is the average speed, in cm/min at which the ant travels the whole perimeter of the triangle?

A. 10 **B.** $\frac{80}{11}$ **C.** $\frac{180}{19}$ **D.** 15 **E.** $\frac{40}{3}$

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26. *Martin* is standing in a queue. The number of people in the queue is a multiple of 3.
He notices that there are as many people in front of him as behind him.
He sees two friends, both standing behind him in line, one in the 19th place and the other in the 28th place.

In which position in the queue is *Martin* standing?

A. 14 **B.** 15 **C.** 16 **D.** 17 **E.** 18

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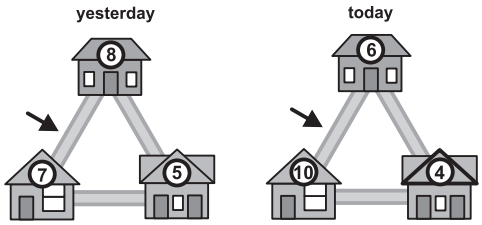
27. Twenty mice live in three houses.
Last night, each mouse left its house and went to one of the other two houses, always taking the shortest route.
The numbers in the diagram show the number of mice per house, yesterday and today.



How many mice used the path by the arrow?

A. 9 **B.** 11 **C.** 12 **D.** 16 **E.** 19

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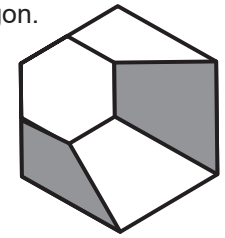
28. A big regular hexagon is divided into four quadrilaterals and one smaller regular hexagon.
The area of the grey region and the area of the smaller hexagon are in the ratio $\frac{4}{3}$.



What is the ratio $\frac{\text{area small hexagon}}{\text{area big hexagon}}$?

A. $\frac{3}{11}$ **B.** $\frac{1}{3}$ **C.** $\frac{2}{3}$ **D.** $\frac{3}{4}$ **E.** $\frac{3}{5}$

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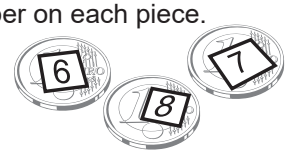
29. *Jake* wrote six consecutive numbers onto six white pieces of paper, one number on each piece.
He stuck these pieces of paper to the top and bottom of three coins.



Then he tossed these three coins three times. On the first toss, he saw the numbers 6, 7 and 8, as shown, and coloured them red.
On the second toss, the sum of the numbers he saw was 23, and on the third toss, the sum was 17.

What was the sum of the numbers on the remaining three white pieces of paper?

A. 18 **B.** 19 **C.** 23 **D.** 24 **E.** 30

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30. A rugby team scored 24 points, 17 points and 25 points in the seventh, eighth and ninth game of the 2022 season.
Their average points-per-game was higher after nine games than it was after their first six games. Their average after ten games was more than 22.

What is the smallest number of points they could have scored in their tenth game?

A. 22 **B.** 23 **C.** 24 **D.** 25 **E.** 26