

## WereldWijde WiskundeWedstrijd

[WWW.W4KANGOEROE.NL](http://WWW.W4KANGOEROE.NL)



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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 29<sup>th</sup>



solutions will be posted on the website about April 20<sup>th</sup>

wizPROF  
havo 4 & 5  
vwo 3, 4, 5 & 6

zwijse n

Breng leren tot leven  
[www.zwijsen.nl](http://www.zwijsen.nl)



[www.e-nemo.nl](http://www.e-nemo.nl)



[www.education.ti.com](http://www.education.ti.com)



[www.smart.be](http://www.smart.be)



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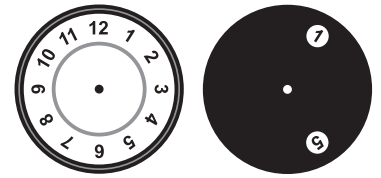
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1. A black circle containing two holes is put on top of a clock as shown. The circle is turned around until the number 10 can be seen in one of the holes.

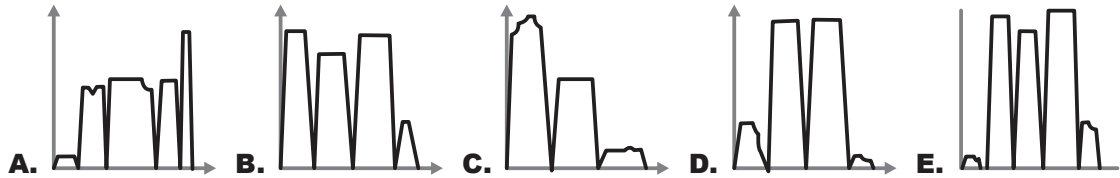


What is the number you can see in the other hole?

- A. 1 or 9      B. 2 or 6      C. 2 or 7      D. 3 or 6      E. 3 or 7

2. *Meike* had to run to catch the bus. When the bus stopped for the second time after she had boarded, *Meike* got off to continue walking to school.

Which of the following graphs would best represent her speed?

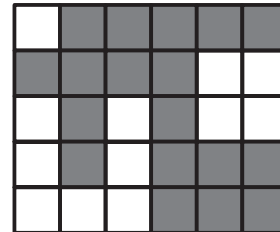


3.  $m$  and  $n$  are two odd numbers.

Which of the following numbers is also odd?

- A.  $mn + 2$       B.  $m + n$       C.  $m + n + 2$       D.  $m(n + 1)$       E.  $(m + 1)(n + 1)$

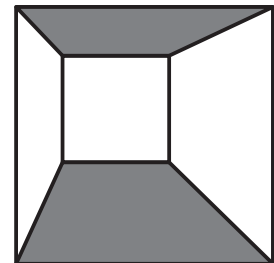
4. The rectangle on the right is divided into 30 equal squares. The perimeter of the grey area is 240.



What is the area of the rectangle?

- A. 480      B. 750      C. 1080      D. 1920      E. 2430

5. In a square with a side of 10 cm, a smaller square with a side of 4 cm. The sides of both squares are parallel.



What percentage of the figure is colored grey?

- A. 25%      B. 30%      C. 40%      D. 42%      E. 45%

6. Today is Thursday.

What day will it be 2023 days from now?

- A. Tuesday      B. Wednesday      C. Thursday      D. Friday      E. Saturday

7. A father, a mother and their three children are 80 years old together. The two youngest children are 6 and 8 years old.

How old were the parents and children together 7 years ago?

- A. 35      B. 36      C. 45      D. 46      E. 66

8. A wooden fence consists of a number of vertical beams in a row. Each pair of vertical beams next to each other is connected by four horizontal beams. The fence begins and ends with a vertical beam.

Which of the following can be the number of the beams in the fence?

- A. 95      B. 96      C. 97      D. 98      E. 99

9. The equation  $\frac{a}{5} = \frac{7}{b}$  must be made correct by filling in positive integers for  $a$  and  $b$ .

How many different combinations of  $a$  and  $b$  are possible?

- A. 0                      B. 1                      C. 2                      D. 3                      E. 4

10. *Olivier* has played 200 games of chess and won 49% of them.

How many more games of chess does he need to play at least to increase his winning percentage to exactly 50%?

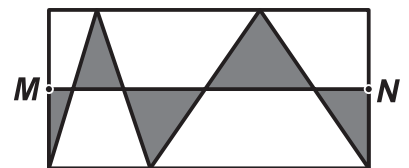
- A. 0                      B. 1                      C. 2                      D. 3                      E. 4

11. *Noure* is trying to save water. She reduced the duration of her shower by one quarter. At the same time, she lowered the water pressure to reduce the water flow by one quarter.

By how much did *Noure* reduce the total amount of water for showering?

- A.  $\frac{1}{16}$                       B.  $\frac{1}{4}$                       C.  $\frac{3}{8}$                       D.  $\frac{7}{16}$                       E.  $\frac{1}{2}$

12. In the rectangle below, points  $M$  and  $N$  are the midpoints of two sides.



What part of the area of the rectangle is grey?

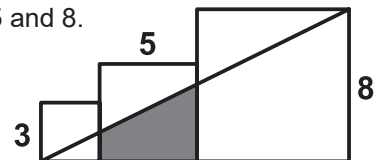
- A.  $\frac{1}{6}$                       B.  $\frac{1}{5}$                       C.  $\frac{1}{4}$                       D.  $\frac{1}{3}$                       E.  $\frac{1}{2}$

13. A wire of length 95 meter is cut into three pieces, such that the length of each resulting piece is equal to that of the immediately preceding one, but increased by a factor of a half.

What is the length of the largest piece?

- A. 36                      B. 42                      C. 45                      D. 46                      E. 48

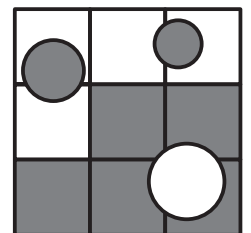
14. In the diagram you see three squares of side-length 3, 5 and 8.



What is the area of the grey trapezium?

- A. 13                      B.  $\frac{55}{4}$                       C.  $\frac{61}{4}$                       D.  $\frac{65}{4}$                       E.  $\frac{69}{4}$

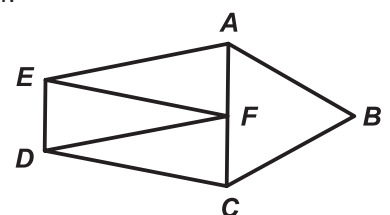
15. A square with a side of 30 is divided into nine equal smaller squares. The three circles have radii of 5 (the bottom one), of 4 (top left), and of 3 (top right).



What is the area of the grey area?

- A. 400                      B.  $500 - 25\pi$                       C. 500                      D.  $400 + 50\pi$                       E.  $500 + 25\pi$

16. Pentagon  $ABCDE$  is divided into four triangles all with the same perimeter. Triangle  $ABC$  is equilateral and  $AEF$ ,  $DFE$ , and  $CDF$  are three identical isosceles triangles.



How many times larger is the perimeter of pentagon  $ABCDE$  than the perimeter of triangle  $ABC$ ?

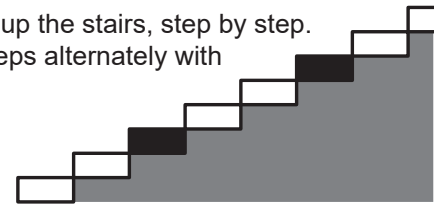
- A.  $\frac{4}{3}$                       B.  $\frac{3}{2}$                       C.  $\frac{5}{3}$                       D. 2                      E.  $\frac{5}{2}$

17. On a table there is a tower of blocks, numbered from 1 to 90. *Diewertje* is building a new tower. She takes three blocks from the top of the old tower and puts them, without turning them, on top of the new tower.

90	3
89	2
88	1
4	85
3	90
2	89
1	88

How many blocks will there be in the new tower between blocks 39 and 40?

- A. 0                      B. 1                      C. 2                      D. 3                      E. 4
18. Every third step of a staircase of 2023 steps is painted black. The first steps of the stairs are shown alongside. *Xander* is walking up the stairs, step by step. You don't know which leg he starts with, but you do know that he steps alternately with his left and his right leg on a step.

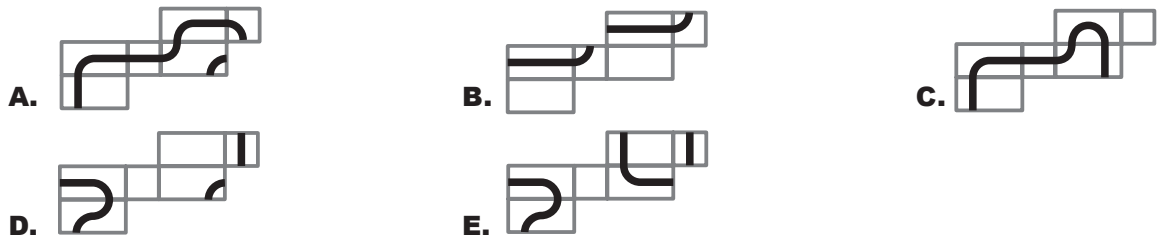


How many times does he step on a black step with his right leg?

- A. 0                      B. 333                      C. 336                      D. 337                      E. 674

19. *Nassim* has drawn a closed squiggle line on a beam.

Which result can **not** be from this beam?



20. We call a two-digit number **powerless** if none of its digits can be written as the power of an integer with an exponent greater than 1. For example, the number 53 is powerless, but the number 54 is not because  $4 = 2^2$ .

Which of the following numbers is a common divisor of the smallest and largest powerless number?

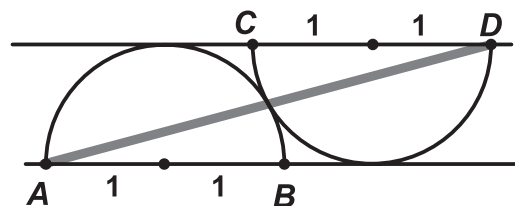
- A. 3                      B. 5                      C. 7                      D. 11                      E. 13

21. We calculate the average of five different prime numbers. The answer turns out to be an integer.

What is the smallest possible answer?

- A. 2                      B. 5                      C. 6                      D. 12                      E. 30

22. Two equal semicircles of radius 1 touch each other. The centerlines *AB* and *CD* are parallel and touch the other circle, see the figure.



How big is  $AD^2$ ?

- A.  $5 + 2\sqrt{3}$                       B. 9                      C. 12                      D.  $8 + 4\sqrt{3}$                       E. 16

23. We make a sequence of non-negative integers. We start with 2, 0, 2, 3. Each subsequent number is the smallest integer unequal to the previous four numbers in the sequence.

Which number is the 2023<sup>rd</sup> in this sequence?

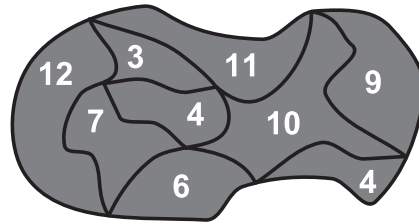
- A. 0                      B. 1                      C. 2                      D. 3                      E. 4

24. From the rectangle with vertices (0, 0), (100, 0), (100, 50), and (0, 50), the circle with center (75, 30) and radius 10 is cut. After that a line is drawn through (75, 30) which divides evenly the remaining area of the rectangle.

What is the slope of this line?

- A.  $\frac{1}{5}$       B.  $\frac{1}{3}$       C.  $\frac{2}{5}$       D.  $\frac{1}{2}$       E.  $\frac{2}{3}$

25. On the right you see the map of a park. The park is divided into a number of regions. Inside each region the perimeter of that region is written.



What is the perimeter of the park?

- A. 22      B. 28      C. 32      D. 36      E. something else

26. Anouk wants to write the integers 1 to 9 in the nine boxes below.

	1		6					
--	---	--	---	--	--	--	--	--

For each triplet of boxes next to each other, the sum of the numbers must be a multiple of 3. She has already written the numbers 1 and 6.

In how many ways can Anouk write the other seven integers?

- A. 9      B. 12      C. 15      D. 18      E. 24

27. If Sila only makes calls, it will take 32 hours before her fully charged cell phone runs out. If she only uses the Internet, it takes 20 hours. If she doesn't use the phone, it takes 80 hours before it runs out. This morning Sila boarded the train with her phone half-charged. While on the train, the time she is on the internet by phone, the time she speaks and the time she does not take any action are the same. When she got off the train, the battery of her phone just died.

How many hours did Sila spend on the train?

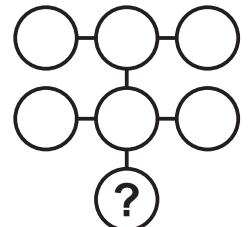
- A. 12      B. 15      C. 16      D. 18      E. 22

28. From a three-digit number, the sum of the digits is subtracted. The result is a number of three equal digits.

For how many three-digit numbers can this be done?

- A. 2      B. 10      C. 20      D. 30      E. 40

29. In each circle there is a one-digit number. The numbers are all different. The products of the three numbers in the circles in a straight line is the same for all three lines.



Which number is in the circle with the question mark?

- A. 2      B. 3      C. 4      D. 6      E. 8

30. You may move from any cell to any neighboring cell (left, right, up or down) in this table. You may reuse cells multiple times.

B	A	N
A	N	A
N	A	N

In how many ways can you make the word BANANA?

- A. 14      B. 28      C. 56      D. 84      E. something else