

WERELDWIJDE WISKUNDEWEDSTRIJD

W4KANGOEROE



WWW.W4KANGOEROE.NL

COMPETITION PERIOD
MARCH 20 TO 31

GOOD LUCK AND MOST OF ALL HAVE FUN!

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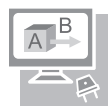
calculators are not allowed



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 April 4th

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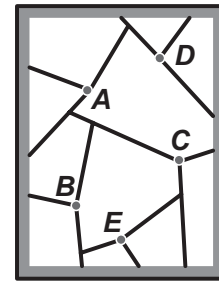
www.museumboerhaave.nl

1. This year's number is the square of an integer: $2025 = 45^2$.

In how many years will the year be a square again?

- A. 25 B. 91 C. 121 D. 500 E. 2025

2. *Bart* threw five stones, one after the other, hitting a window at points *A*, *B*, *C*, *D* and *E*. Each impact created cracks that extended from the point of contact either to a previous crack or to the edge of the window.



In which order were the points hit?

- A. *ABCDE* B. *BCDAE* C. *BDACE* D. *DACBE* E. *DCABE*

3. A vase contains 20 balls, which are either yellow, red, blue or black. Exactly 17 of them are not red, 15 are not black and 12 are not yellow.

How many blue balls are in the vase?

- A. 3 B. 4 C. 6 D. 7 E. 8

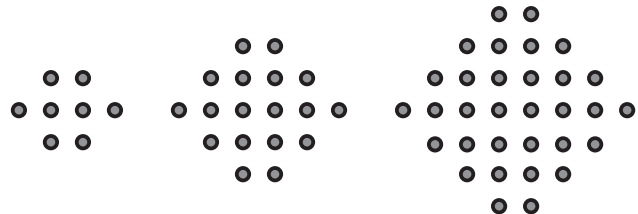
4. Between which two numbers does the value of 88×888 lie?

- A. 8 and 88 B. 88 and 888 C. 888 and 8888 D. 8888 and 88888 E. 88888 and 888888

5. $\sqrt{16^{16}} =$

- A. 4^4 B. 4^8 C. 4^{16} D. 8^8 E. 16^4

6. Below, you can see the first three figures in a sequence of dot patterns.



How many dots are in the fifth figure?

- A. 72 B. 74 C. 76 D. 78 E. 80

7. *Markus* divides $\sqrt{11}$ by the number 3.

Between which two whole numbers does the result lie?

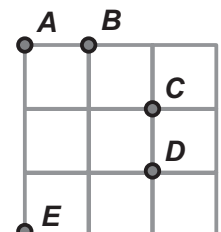
- A. 0 and 1 B. 1 and 2 C. 2 and 3 D. 3 and 4 E. 4 and 5

8. *Laura's* favorite chocolate bars used to be sold in packs of five. Since this week, they are sold in packs of four, but the price per pack remains the same.

By what percentage has the price of each bar increased?

- A. 10% B. 20% C. 25% D. 30% E. 50%

9. One of the points *A*, *B*, *C*, *D* or *E* is removed. As a result, all distances between the four remaining points become different.

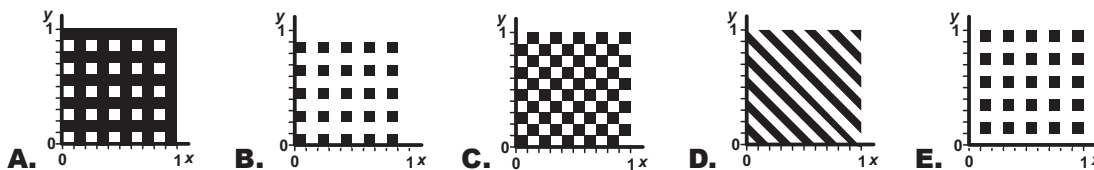


Which point should be removed?

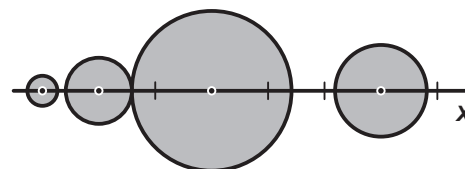
- A. *A* B. *B* C. *C* D. *D* E. *E*

10. In the xy -plane, within the square defined by $0 \leq x \leq 1$ and $0 \leq y \leq 1$, all points are painted black if the first decimal digit of both x and y is odd.

What does the resulting square look like?



11. Four circular discs with centers at $(0, 0)$, $(1, 0)$, $(3, 0)$ and $(6, 0)$ have positive radii r_1, r_2, r_3 and r_4 . The discs may touch but not overlap.



What is the largest possible value of $r_1 + r_2 + r_3 + r_4$?

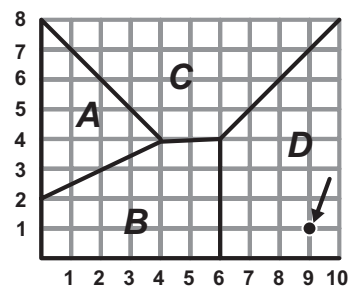
- A. 3 B. 4 C. 5 D. 6 E. there is no upper limit

12. Given ten different positive integers, with M being the largest. Exactly five of the numbers are divisible by 5 and exactly seven are divisible by 7.

What is the smallest possible value of M ?

- A. 63 B. 75 C. 77 D. 105 E. another value

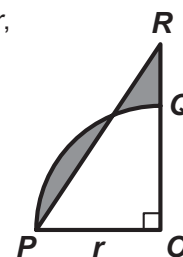
13. The map shows a small town with four schools. Each student must attend the nearest school. The map shows the four regions A, B, C and D of all points nearest, respectively, to each school. The school in region D is located at point $(9, 1)$.



What are the coordinates of the school in region A ?

- A. $(0, 4)$ B. $(1, 4)$ C. $(1, 5)$ D. $(1, 6)$ E. $(2, 4)$

14. The triangle POR is intersected by the quarter-circle with center O and radius $OP = r$, as shown in the figure. The two shaded regions have the same area.



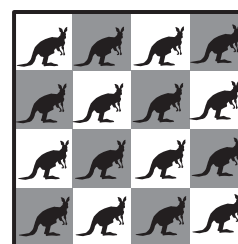
What is the length of OR ?

- A. $\frac{\pi r}{2}$ B. $\frac{r}{2}$ C. πr D. $\frac{2}{\pi}$ E. $\frac{\pi}{2r}$

15. What is the smallest positive integer N such that $\sqrt{2\sqrt{3\sqrt{N}}}$ is an integer?

- A. $2^4 \cdot 3^2$ B. $2^{12} \cdot 3^6$ C. $2^4 \cdot 3^{14}$ D. $2^4 \cdot 3^6 \cdot 5^8$ E. another value

16. On a chessboard, there are 16 kangaroos, one on each square. On each whistle, each kangaroo jumps to a neighboring square (up, down, left, or right, but not diagonally). All kangaroos stay on the board. There can be several kangaroos on any square.



After 100 whistles, what is the largest possible number of empty squares?

- A. 8 B. 10 C. 12 D. 14 E. 15

17. The five-digit number $N18NN$ is divisible by 18.

For how many different digits N is this true?

- A. 0 B. 1 C. 2 D. 3 E. more than 3

18. The equation $ax^4 + bx^3 + cx^2 + dx + e = 0$ has solutions $x = 1, x = 2, x = 3$ and $x = 4$.

The smallest solution of $ex^4 + dx^3 + cx^2 + bx + a = 0$ is then:

- A. $x = -4$ B. $x = -1$ C. $x = \frac{1}{4}$ D. $x = 1$ E. not to be determined

19. The area of the black semicircle is 12.



What is the area of the large quarter circle?

- A. 25 B. 30 C. 32 D. 36 E. 42

20. When grandma started knitting socks, she had a ball of yarn with a diameter of 30 cm. After knitting 70 socks, the diameter had shrunk to 15 cm.



How many more socks can grandma knit with the yarn that is left?

- A. 10 B. 20 C. 30 D. 50 E. 70

21. Mila writes down the numbers 3 and 5.

Then, she replaces these two numbers with their positive difference and their sum. She repeats this process with the two new numbers. She is doing this 50 times in total.

What are the two numbers Mila will end up with?

- A. $3 \cdot 2^{25}$ and $5 \cdot 2^{25}$ B. 3^{25} and 5^{25} C. $2 \cdot 3^{25}$ and $2 \cdot 5^{25}$
 D. 3^{50} and 5^{50} E. none of the above

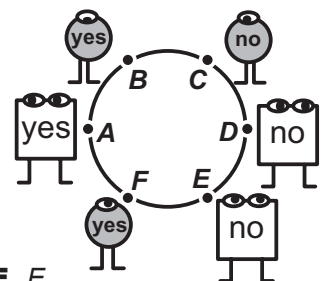
22. Hamid wrote an arbitrary two-digit integer on a blackboard.

Then, he erased the last digit of the number. As a result, the number decreased by $p\%$.

Which of the following is closest to the largest possible value of p ?

- A. 10 B. 50 C. 90 D. 95 E. 99

23. A group of three square men from Mars and three circular men from Jupiter are sitting around a table. One of them has the key to their flying saucer. All members of one group always tell the truth, while all members of the other group always lie. They were all asked, 'Does one of your neighbors have the key?'. Their answers are shown in the figure.



Who has the key?

- A. A B. B C. C D. D E. E

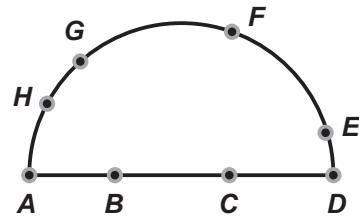
24. Julia and her little sister Paula go for a bike ride.

Both ride at a constant speed along the same path: Julia at 18 km/h and Paula at 12 km/h. After 20 minutes, Julia gets tired, turns around and rides back. When they meet, Paula also turns around and heads back home. They both continue at their own speed, with Paula arriving later.

How many minutes later than Julia will Paula arrive home?

- A. 4 B. 6 C. 8 D. 10 E. 15

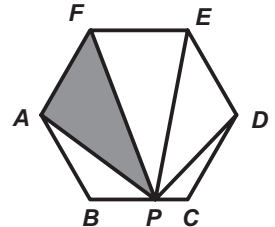
25. A semicircle has diameter AD . Points B and C lie on the AD , and points $E, F, G,$ and H lie on the arc.



How many triangles can be formed using three of these eight points as vertices?

- A. 15 B. 50 C. 51 D. 52 E. 54

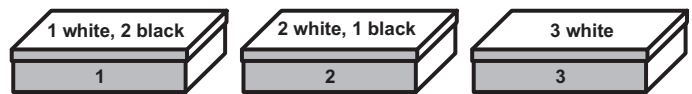
26. The diagram shows a regular hexagon $ABCDEF$. Point P lies on BC such that the area of $\triangle PEF$ is 64 and the area of $\triangle PDE$ is 42.



What is the area of $\triangle APF$?

- A. 53 B. 54 C. 56 D. 60 E. 64

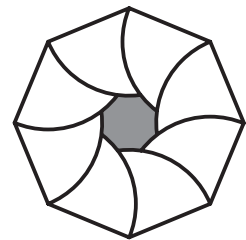
27. Three boxes each contain three balls. The labels on the lids indicate the contents of the boxes, but each lid is placed on the wrong box.



How many balls must we remove, at a minimum, from one or more boxes to determine which lid belonged to which box?

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

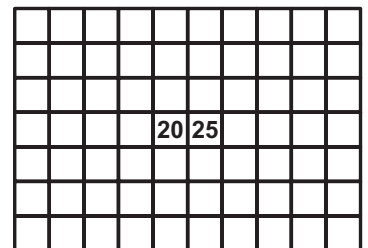
28. The figure shows a regular octagon with sides of 1 cm. An arc of radius 1 cm is drawn at each vertex, as shown. This creates the grey area.



What is the perimeter of this grey area?

- A. $\frac{2\pi}{3}$ cm B. $\frac{3\pi}{4}$ cm C. $\frac{4\pi}{5}$ cm D. $\frac{8\pi}{9}$ cm E. π cm

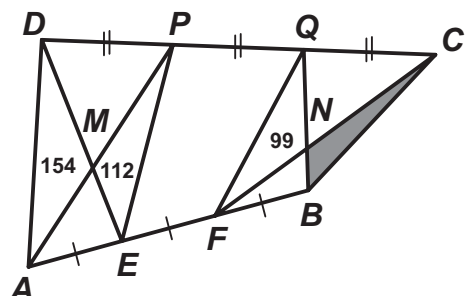
29. In a table with seven rows and ten columns, each cell contains a number. The sum of the numbers in each 3×4 or 4×3 rectangle is 0. We see the numbers in two of the cells.



What is the sum of all the numbers in the table?

- A. -5 B. -20 C. -25 D. -45 E. It cannot be determined

30. The opposite sides AB and CD of the convex quadrilateral $ABCD$, AB and CD , are each divided into three equal parts such that $AE = EF = FB$ and $DP = PQ = QC$. The diagonals of $AEPD$ and $FBCQ$ intersect at points M and N , respectively. The areas of triangles $\triangle AMD$, $\triangle EMP$ and $\triangle FNQ$ are 154, 112, and 99, respectively.



What is the area of triangle $\triangle BCN$?

- A. 57 B. 70 C. 72 D. 86 E. 141