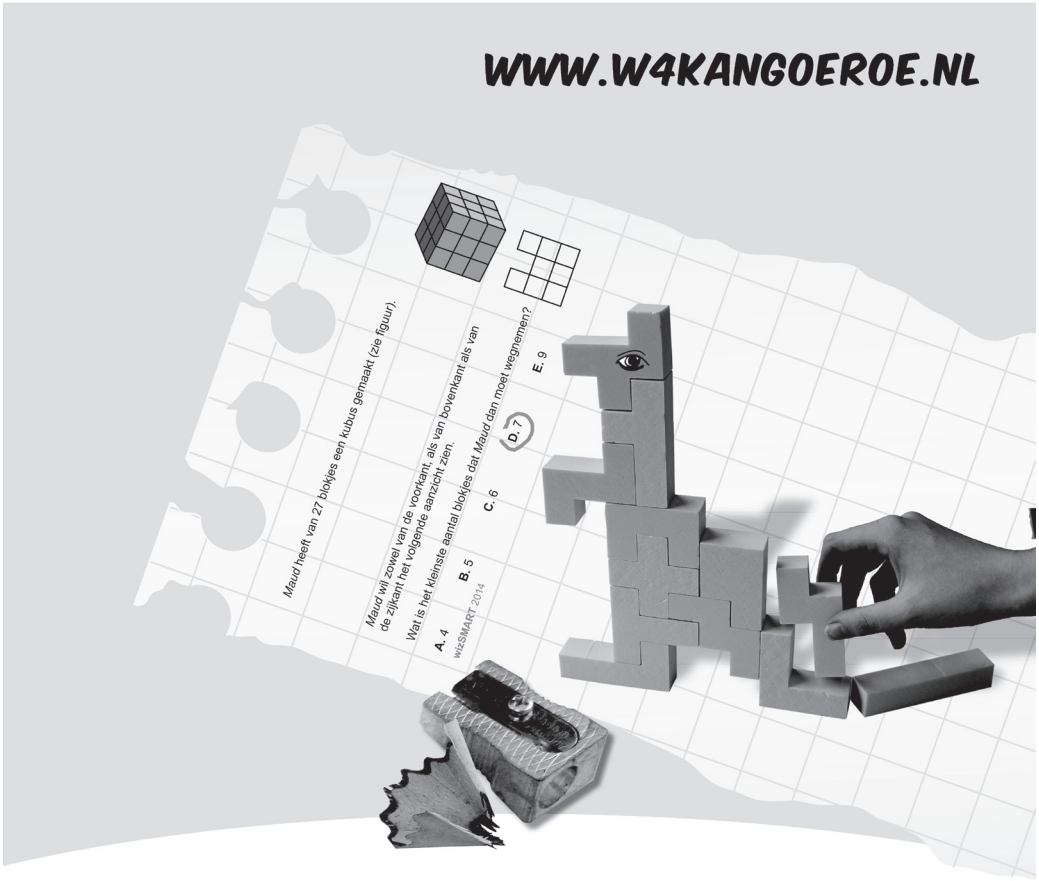
wizPROF 2016

WERELDWIJDE WISKUNDEWEDSTRIJD
W4KANGOEROE

THURSDAY MARCH 17TH 2016

WWW.W4KANGOEROE.NL



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 medio May

answers will be posted on the website March 26th

solutions will be posted on the website April 22th

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

1. Which of the following traffic signs has the largest number of lines of symmetry?

A. 

B. 
C. 
D. 
E. 

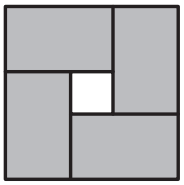
2. Little *Luke* invented negative numbers for himself by counting backwards:
… 3, 2, 1, 0, 00, 000, 0000, …
How will *Luke* write down the result of 000+0000?

A. 1 **B.** 00000 **C.** 000000 **D.** 0000000 **E.** 00000000

3. How many weeks is 2016 hours?

A. 12 **B.** 14 **C.** 16 **D.** 18 **E.** 20

4. A large square is made up from four equal grey rectangles, as pictured.
The rectangles enclose a small white square.
The area of the white square is 4 cm², and the large square is 64 cm².



What is the perimeter of one of the grey rectangles, in cm?

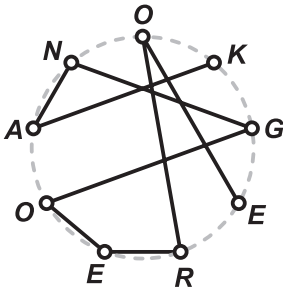
A. 8 **B.** 10 **C.** 12 **D.** 14 **E.** 16

5. The remainder of dividing the unknown number x by 6 is 3. Next we divide $3x$ by 6.

What will the remainder be?

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

6. Nine points lie on a circle. To each point one of the letters of the word KANGOEROE is attached.
We draw a path via these points from the letter K to the letter E.
Following the path we get the word KANGOEROE.
In the picture an example is shown.



In how many ways in total can we draw a path like this?

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

7. The wizPROF Kangoeroe-contest always consists of 30 questions.
Last year *Emma* took part in wizPROF.
She answered all questions and had 50% more answers right than wrong.
How many answers did she get right?

A. 10 **B.** 12 **C.** 15 **D.** 18 **E.** 20

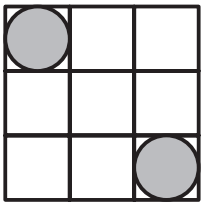
8. *Simone* has strange dice with the numbers 2, 4, 6, -1, -3 and -5 on it.
She rolls one of these dice twice, and adds the numbers she gets.
Which of the following numbers can **not** be the result of this addition?

A. 3 **B.** 4 **C.** 5 **D.** 7 **E.** 8

9. We would like to transform the word DEMO into the word MODE in a number of steps.
Each step consists of exchanging two letters that are adjacent.
We do not have to get existing words after each step.
How many steps do we need at least to go from DEMO to MODE?

A. 3 **B.** 4 **C.** 5 **D.** 6 **E.** 7

10. A square with sides of length 3 is divided into nine small squares with sides of length 1. Inside two of the small squares circles are drawn that fit exactly, see figure.



What is the distance between these two circles?

A. $2\sqrt{2}-1$ **B.** 2 **C.** $\sqrt{2}+1$ **D.** $2\sqrt{2}$ **E.** 3

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11. Of the four numbers a, b, c, and d the following is known: $a + 5 = b^2 - 1 = c^2 + 3 = d - 4$. Which is the largest of the four numbers?

A. a **B.** b **C.** c **D.** d **E.** impossible to tell

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12. Every month in *Utopia* has forty days, numbered 1 through 40. Every day with a number divisible by 6 is a holiday. Also, every day with a prime number is a holiday. How many times in one month in *Utopia* does exactly one working day occur between two holidays?

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

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13. Mr *Quelch* has written five different non-zero digits on the blackboard. *Billy* notices that if you add two of these digits you never get 10 for an answer. Which of the following digits is certainly on the blackboard?

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

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14. Eight tennis players play in a tournament. The winner of a match proceeds to the next round, the loser is eliminated. Six of the seven results are (not in the right order): *Bianca* beat *Anna*, *Cecilia* beat *Desiree*, *Greta* beat *Henriette*, *Greta* beat *Cecilia*, *Cecilia* beat *Bianca* and *Eveline* beat *Femke*.

One result is missing; which one?

A. *Greta* beat *Eveline*
B. *Cecilia* beat *Anna*
C. *Eveline* beat *Cecilia*
D. *Bianca* beat *Henriette*
E. *Greta* beat *Bianca*

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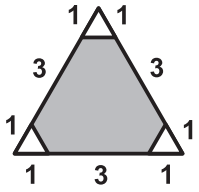
15. Which percentage of the triangle is grey?



A. 80% **B.** 85% **C.** 88% **D.** 90% **E.** impossible to tell

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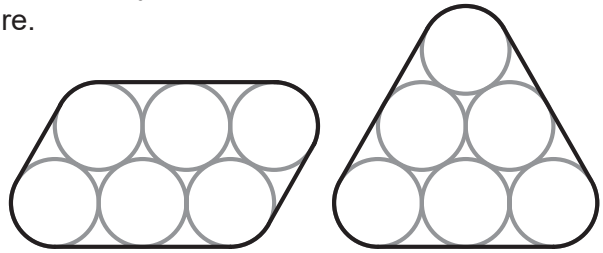
16. *Rafael* wants to keep together six pipes of 2 cm diameter by a rubber band. He has a choice of the two situations in the picture.



In which of the two is the rubber band shortest?

A. The band on the left is π cm shorter.
B. The band on the left is 4 cm shorter.
C. The band on the right is π cm shorter.
D. The band on the right is 4 cm shorter.
E. The length of the band is the same in both situations.

17. *Amal* has eight cards. Each card has exactly one of the numbers 1, 2, 4, 8, 16, 32, 64 and 128 on it; every number appears exactly once.
Amal draws a couple of cards blindly and adds their numbers.
The result is 31 more than the sum of the numbers on the cards that were not drawn.

How many cards did *Amal* draw?

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

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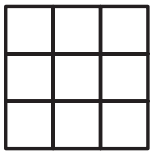
18. *Peter* is going to colour the cells in the table. The cells in each row have to get different colours. Also, the cells in each row and those on a diagonal have to get different colours.
How many colours does *Peter* need at least?



A. 3 **B.** 4 **C.** 5 **D.** 6 **E.** 7

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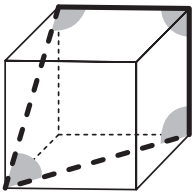
19. The figure shows a kind of quadrilateral drawn inside a cube.



What is the sum of the four angles of this quadrilateral?

A. 315° **B.** 330° **C.** 345° **D.** 360° **E.** 375°

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20. In a troop of 2016 kangaroos every animal is either black or red. At least one animal is red and also at least one is black. For each kangaroo we compute the fraction:

$$\frac{\text{number of kangaroos of the colour different from this kangaroo}}{\text{number of kangaroos of the same colour as this kangaroo}}$$

Then we add all 2016 fractions.

What will be the result of this sum?

A. 672 **B.** 1008 **C.** 1344 **D.** 2016 **E.** impossible to tell

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21. *Noureen* makes a special square with the numbers 1, 2, 4, 5, 10, 20, 25, 50, and 100. When she multiplies the numbers in a row, column or a diagonal, she should get the same product.
The figure shows how she started.

20	1	
		?

Which number should be put in place of the question mark?

A. 2 **B.** 4 **C.** 5 **D.** 10 **E.** 25

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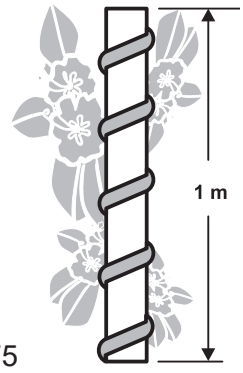
22. A plant has wound exactly five times around a pillar of 15 cm circumference and 1 meter height, see figure.
The plant grows under the same angle everywhere.



What is the length of the plant in meters?

A. 0,75 **B.** 1,0 **C.** 1,25 **D.** 1,5 **E.** 1,75

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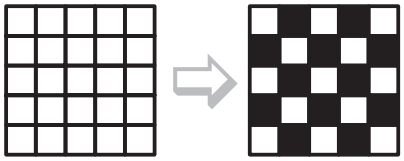
23. We take a two digit number. We divide the number by the sum of its digits.
What is the largest possible remainder we can get?

A. 13 **B.** 14 **C.** 15 **D.** 16 **E.** 17

24. In a 5 x 5 table all cells are white. *Ibrahim* wants to colour the table in a number of steps. In each step, he may change the colour of two cells next to each other or above each other. A cell will be made black if it is white. A cell will be made white if it is black.



How many steps does *Ibrahim* have to take at least to get a checkerboard pattern?

A. 6 **B.** 12 **C.** 14 **D.** 18 **E.** 24

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25. It takes 4 hours by motorboat to travel a river downstream from Appeldam to Braamdijk. It takes 6 hours to travel upstream back from Braamdijk to Appeldam.

How many hours will it take a wooden log to float unhindered from Appeldam to Braamdijk?

A. 5 **B.** 10 **C.** 12 **D.** 20 **E.** 24

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26. A square with sides of length 1 is divided into nine small squares, see figure 1.
Next, four line segments are drawn, see figure 2.

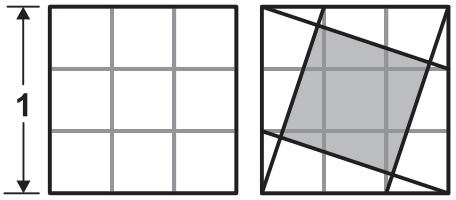

figure 1 figure 2

What is the area of the grey square?

A. $\frac{1}{3}$ **B.** $\frac{2}{5}$ **C.** $\frac{3}{10}\sqrt{2}$ **D.** $\frac{1}{9}\sqrt{10}$ **E.** $\frac{4}{9}$

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27. *Paul* has written down four consecutive positive integers.
Next, he added three of these numbers in each of the four possible ways.
The result was never a prime number.

What is the smallest number that *Paul* can have written down?

A. 3 **B.** 6 **C.** 10 **D.** 12 **E.** an other number

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28. Four athletes – a skier, a hockey player, a skater and a swimmer – had breakfast this morning at a round table. The skier sat to the left of *Anna*, the skater sat opposite from *Ben*. *Eve* and *Filip* sat next to each other.
A woman sat to the left of the hockey player.

What sports does *Eve* practice?

A. skating **B.** hockey **C.** skiing **D.** swimming **E.** impossible to know

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29. For some conference, 2016 participants have registered. The participants were numbered 1 through 2016. Participants 1 to 2015 shake as many hands as their number indicates (for example, participant 123 shook hands with 123 participants).

With how many participants did participant 2016 shake hands?

A. 1 **B.** 504 **C.** 672 **D.** 1008 **E.** 2015

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30. Dates are usually written in the form dd.mm.yyyy . For example, today is 17.03.2016 .
We call a date “special” if all digits of the date are different.

In which month will the next special date happen?

A. March **B.** June **C.** July **D.** August **E.** December