wizPROF 2020

WereldWijde WiskundeWedstrijd

W4Kangoeroe

Thursday
March 19th 2020

WWW.W4KANGOEROE.NL

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 March 29th
- solutions will be posted on the website about April 20th

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

1. The diagram shows a shape made from ten squares of side length 1 cm.
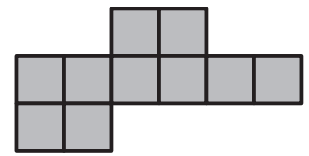
What is the length of its perimeter, in cm?

A. 14 **B.** 18 **C.** 30 **D.** 32 **E.** 40

2. Put the answers to the following calculations in order from smallest to largest.

Which answer will be in the middle?

A. 1 + 23456 **B.** 12 + 3456 **C.** 123 + 456 **D.** 1234 + 56 **E.** 12345 + 6

3. Who is the mother of the daughter of *Anna*'s mom's mom?

A. *Anna*'s sister **B.** *Anna*'s niece **C.** *Anna*'s mother
D. *Anna*'s aunt **E.** *Anna*'s grandma

4. The sum of four consecutive integers is 2.

Which integer is the smallest of these four integers?

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

5. The years 2020 and 1717 both consist of a two-digit number repeated twice.

How many years after 2020 will be the next year that has this property?

A. 20 **B.** 101 **C.** 120 **D.** 121 **E.** 202

6. When *Casper* wears his new shirt properly as shown on the left, the horizontal stripes form seven closed rings around his waist. This morning he buttoned his shirt wrongly, as shown on the right.

How many closed rings were there around *Casper*'s waist this morning?

A. 0 **B.** 2 **C.** 4 **D.** 6 **E.** 8

7. In the calculations shown, same letters stand for same digits and different letters stand for different digits. The two numbers on the left have a total of 79.

```
              A D
            + C D
   A B       + A B
 + C D       + C B
   7 9         ?
```

What number should be in the place where the question mark is?

A. 79 **B.** 158 **C.** 869 **D.** 1418 **E.** 7979

8. *Laura* has ten pieces of paper, some of which are squares, and the rest are triangles.
She cuts three squares diagonally from corner to corner.
She then counts the total number of vertices of the 13 obtained pieces of paper, which comes to 42 vertices.

How many triangles did *Laura* have before making the cuts?

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

9. *Martin* made a kite by cutting a straight wooden pole into six pieces.
He used two of them, of lengths 120 cm and 80 cm, as the diagonals.
The remaining four pieces connected the midpoints of the sides of the kite as shown in the figure.
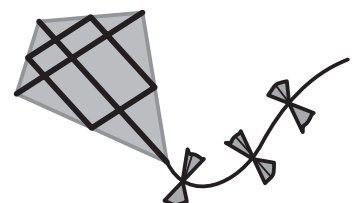
How long was the pole before it was cut?

A. 300 cm **B.** 370 cm **C.** 400 cm **D.** 410 cm **E.** 450 cm

10. The given grid is made of squares with side length 1.
Choose three of the given points to form a triangle.
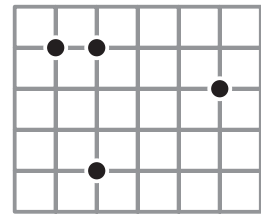
What is the smallest area of the triangle that can be obtained?

A. $\frac{1}{2}$ **B.** 1   **C.** $1\frac{1}{2}$ **D.** 2   **E.** $2\frac{1}{2}$

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11. *Myriam* wants to spend 18 consecutive days visiting her Grandma.
Her Grandma reads her fairytales only on Tuesday, Saturday and Sunday.
Myriam wants to hear fairytales as much as possible.

On which day of the week should *Myriam* start her visit?

A. Monday   **B.** Tuesday   **C.** Friday   **D.** Saturday   **E.** Sunday

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12. *a*, *b*, *c* and *d* are integers with the property that *ab* = 2*cd*

Which of the following numbers could not be the value of the product *abcd*?

A. 50   **B.** 100   **C.** 200   **D.** 450   **E.** 800

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13. The shortest path from *Atown* to *Cetown* runs through *Betown*.
Walking on this path from *Atown* to *Cetown* we would first find the signpost shown on the left.
Later we would find the signpost shown on the right.

Atown 3 km   Atown 6 km

Betown 1 km   Betown _km

Cetown 9 km   Cetown 6 km
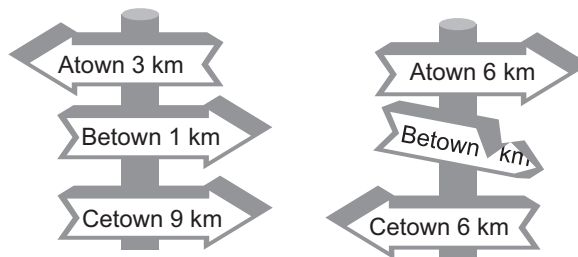
What distance was written on the broken sign?

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

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14. An isosceles triangle has a side of length 20 cm.
Of the other two side lengths, one is equal to $\frac{2}{5}$ of the other.

Which of the following values, in cm, is the perimeter of this isosceles triangle?

A. 36   **B.** 48   **C.** 60   **D.** 90   **E.** 120

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15. In each of the nine cells of the figure shown a number shall be written.
The sum of the eight numbers on the circumference must be 40.
The sum of the three numbers on each diameter must be 13.
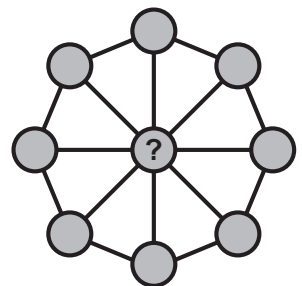
What number must be written in the central cell?

A. 3   **B.** 5   **C.** 8   **D.** 10   **E.** 12

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16. If we put a multiplication sign in the middle of the year 2005, we get as a result the product 20 • 05 = 100.
Doing the same with the year 2020, we would get 20 • 20 = 400.
Both 100 and 400 are square numbers.

How many years after 2020 and before 2100 have the property that the result is a square number?

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

17. During a festival, the price of 17 bottles of water and 51 buns is 102 euros in total.

During that same festival, what will be the price of 9 bottles of water and 27 buns in total?

A. 18 euros   **B.** 34 euros   **C.** 36 euros   **D.** 54 euros   **E.** you can't know that

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18. Two squares of different size are drawn inside an equilateral triangle.
One side of one of these squares lies on one of the sides of the triangle
as shown in the figure.
One of the sides of the other square makes an angle of 70° with another
side of the triangle.
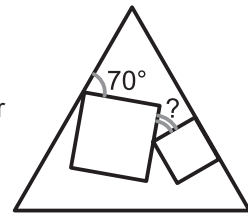
What is the size of the angle marked by the question mark?

A. 25°   **B.** 30°   **C.** 35°   **D.** 45°   **E.** 50°

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19. *Luca* began a 520 km trip by car with 14 litres of fuel in the car tank.
His car consumes 1 litre of fuel per 10 km.
After driving 55 km, he reads a road sign showing the distances from that point to five petrol stations
ahead on the road. These distances are 35 km, 45 km, 55 km, 75 km and 95 km.
The capacity of the car's fuel tank is 40 litres.
Luca wants to stop just once to fill the tank.

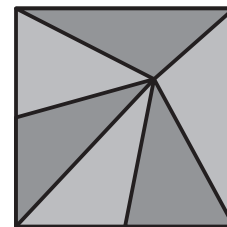How far, in km, is the petrol station that *Luca* should stop at?

A. 35   **B.** 45   **C.** 55   **D.** 75   **E.** 95

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20. The digits from 1 to 9 are randomly arranged to make a 9-digit number.

What is the probability that the resulting number is divisible by 4?

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

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21. A square shaped stained glass window of 81 dm² is made out of six triangles of equal area which meet in
one point (see figure).

How far from the bottom is that point, in dm?

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

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22. The hare *Zoef* and the tortoise *Stoffel* competed in a 5 km race along a straight line.
Zoef is five times faster than *Stoffel*.
Zoef mistakenly started perpendicular to the route.
After a while he realized his mistake, then turned and ran straight to the finish point.
He arrived at the same time as *Stoffel*.

What is the distance in km between the point where *Zoef* turned and the finish point?

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

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23. There are some squares and triangles on the table. Red and blue, large and small. We know that:
- If the shape is large, it's a square;
- If the shape is blue, it's a triangle.

Which of the following statements must be true?

A. All red shapes are squares.
B. All squares are large.
C. All small shapes are blue.
D. All triangles are blue.
E. All blue shapes are small.

24. Two identical rectangles with sides of length 3 cm and 9 cm are overlapping as in the diagram.
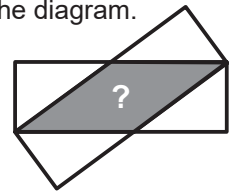
What is the area, in cm², of the overlap of the two rectangles?

**A.** 12   **B.** 13,5   **C.** 14   **D.** 15   **E.** 16

25. In each of the squares, *Amine* must write a number.
He must ensure that the sum of the four numbers in each row and in each column are the same.

1		6	3
	2	2	8
	7		4
?		7	

What number must he write into the square with the question mark?

A. 5   **B.** 6   **C.** 7   **D.** 8   **E.** 9

26. *Harry* labelled the vertices of the square-based pyramid using 1, 2, 3, 4 and 5 once each.
For each face *Harry* calculated the sum of the numbers on its vertices.
Four of these sums equalled 7, 8, 9 and 10.
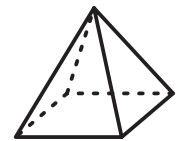
What is the sum of the fifth face?

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

27. A large cube is built using 64 smaller identical cubes.
Three of the faces of the large cube are painted.
You count the number of small cubes that have exactly one face painted.

What is the largest answer you can get?

A. 27   **B.** 28   **C.** 32   **D.** 34   **E.** 40

28. *Amanda*, *Bianca* and *Caroline* play a number of tennis matches.
In each game two girls play against each other.
After each match, the winner played the next game against the girl who had rested.
In total, *Amanda* played 10 times, *Bianca* played 15 times and *Caroline* played 17 times.

Who lost the second match?

A. *Amanda*   **B.** *Bianca*   **C.** *Caroline*
D. Either *Amanda* or *Bianca* could have lost the second match.
E. Either *Bianca* or *Caroline* could have lost the second match.

29. *AB* is the centerline of a circle. A zig-zag line starts at point *A*.
Each of the angles between the zig-zag line and the centerline *AB* is equal to α, as shown in the figure.
After four peaks, the zig-zag line ends at point *B*.
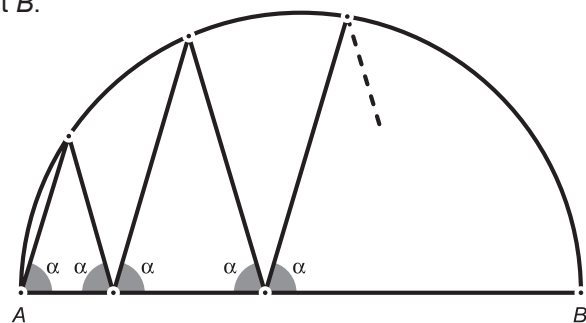
What is the size of angle α?

A. 60°   **B.** 72°   **C.** 75°   **D.** 80°   **E.** another size

30. Eight consecutive 3-digit positive integers have the following property:
each of them is divisible by its last digit.

What is the sum of the digits of the smallest of these eight integers?

A. 10   **B.** 11   **C.** 12   **D.** 13   **E.** 14