wizPROF 2018

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 25th

solutions will be posted on the website about April 16th

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

1. A triangle has sides of length 2 and 5. The third side has odd integer length.

What is the length of the third side?

A. 1 **B.** 3 **C.** 5 **D.** 7 **E.** 9

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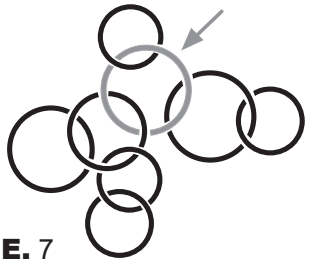
2. Some of the rings alongside form a chain.
One of the chains contains the ring with the arrow.



How many rings does the longest chain containing the ring with the arrow have?

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

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3. Within some family every child has at least two brothers and at least one sister.

What is the least number of children this family can have?

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

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4. *Maria* has picked 42 apples, 60 pears and 90 cherries.
She wants as many persons as possible to share the fruit.
Everyone should get the same.

How many persons could get a portion?

A. 3 **B.** 6 **C.** 10 **D.** 14 **E.** 42

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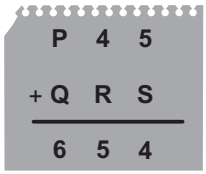
5. In the correct calculation shown alongside, some numbers have been replaced by the letters P, Q, R, and S.



How much is P + Q + R + S?

A. 14 **B.** 15 **C.** 16 **D.** 17 **E.** 24

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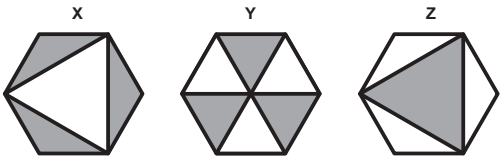
6. In a regular hexagon, a grey region is indicated in three different ways.
These regions have area X, Y, and Z.



Which is of the following statements is true?

A. X=Y=Z **B.** Y=Z≠X **C.** Z=X≠Y **D.** X=Y≠Z
E. X, Y and Z are all different

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7. We add five consecutive integers. The answer is 10^{2018}.

Which number is the middle one of these five numbers?

A. 10^{2013} **B.** 5^{2017} **C.** 10^{2017} **D.** $2 \cdot 10^{2017}$ **E.** 2^{2018}

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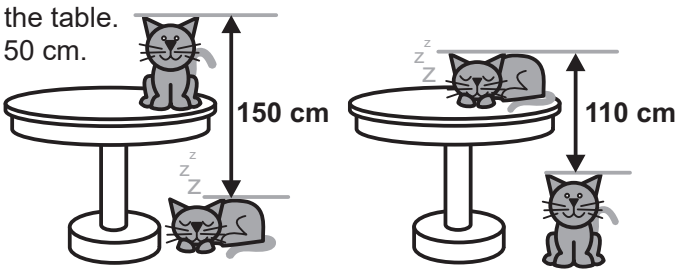
8. One cat sleeps on the floor, the second sits on the table.
The difference in height between their ears is 150 cm.
If the two cats change places, that height difference would be 110 cm.



How high is the table?

A. 110 cm **B.** 120 cm **C.** 130 cm **D.** 140 cm **E.** 150 cm

9. We add 25% of 2018 and 2018% of 25.

What will the result be?

A. 1009 **B.** 2016 **C.** 2018 **D.** 3027 **E.** 5045

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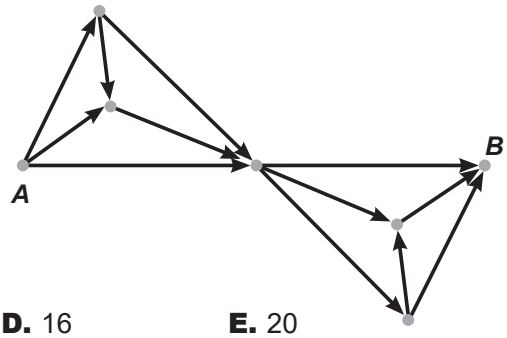
10. You want to go from A to B following the arrows.



How many different routes can you choose from?

A. 6 **B.** 9 **C.** 12 **D.** 16 **E.** 20

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11. Two dorms at the Academy Road are separated by 250 meters.
In the first dorm live 100 students, in the second dorm 150.
A bus stop needs to be planned at the Academy Road. The combined walking distance to the bus stop for all 250 students together should be as small as possible.

Where should the bus stop be located?

A. at the site of the first dorm
B. 100 meter from the first dorm
C. 100 m from the second dorm
D. at the site of the second dorm
E. the bus stop may be anywhere between both dorms

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12. We have a sequence of 105 numbers: 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5, ...
Every numbers appears as often as its value indicates (so there are seven 7's, for example).

How many of these 105 numbers are divisible by 3?

A. 4 **B.** 12 **C.** 21 **D.** 30 **E.** 45

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13. Eight half-circles are drawn inside a square with sides of length 4.
Next some regions have been coloured grey.

What is the area of the white region?

A. 2π **B.** $3\pi - 2$ **C.** 8 **D.** $6 + \pi$ **E.** 3π

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14. Yesterday, 40 trains were riding in Switzerland.
Each train connected two of the towns *Luzern*, *Zürich*, *Bern*, *Basel* and *Genève*.
10 of the trains departed from or arrived in *Luzern*, 10 of the trains departed from or arrived in *Zürich*, 10 of the trains departed from or arrived in *Bern*, and 10 of the trains departed from or arrived in *Basel*.

How many trains departed from or arrived in *Genève*?

A. 0 **B.** 10 **C.** 20 **D.** 30 **E.** 40

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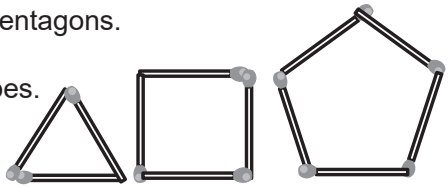
15. *Louise* makes shapes out of matches: triangles, squares and pentagons.
She has exactly 41 matches and wants to use them all.
Also, she would like to make at least one of each of these shapes.



How many shapes can *Louise* make at most?

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

16. *Peter* wants to buy a book, but has no money. His father and two brothers help out.
His father gives *Peter* half of what his brothers give together.
His elder brother gives *Peter* a third of what the others give together.
The younger brother gives 10 euro.

How much money does *Peter* get in total from his father and brothers?

A. € 24 **B.** € 26 **C.** € 28 **D.** € 30 **E.** € 32

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17. We consider three-digit numbers with the property that the number becomes 9 times as small by removing the middle digit.

How many such numbers exist?

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

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18. How many digits does the outcome of $\frac{1}{9}\cdot 10^{2018}\cdot(10^{2018}-1)$ have?

A. 2017 **B.** 2018 **C.** 4035 **D.** 4036 **E.** 4037

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19. The vertices of a regular 2018-gon are numbered consecutively 1, 2, 3, ..., 2018.
We draw a line from vertex 18 to vertex 1018.
We also draw a line from vertex 1018 to vertex 2000.
This way we created three polygons.

How many vertices do these polygons have?

A. 37, 982 and 1000 **B.** 37, 983 and 1001 **C.** 37, 983 and 1002
D. 38, 982 and 1001 **E.** 38, 983 and 1001

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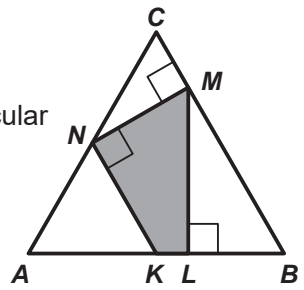
20. The equilateral triangle *ABC* has area 32.
Point *N* is the midpoint of side *AC*, point *M* is on side *BC* and points *K* and *L* are on side *AB*.
Line segment *NM* is perpendicular to side *BC*, line segment *ML* is perpendicular to side *AB* and line segment *KN* is perpendicular to line segment *NM*.



What is the area of quadrilateral *KLMN*?

A. 8 **B.** 10 **C.** 11 **D.** 12 **E.** 15

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21. Of the inhabitants of Austria, 13% live in the province of *Stiermarken* but not in *Graz* (a city in *Stiermarken*). Of the inhabitants of *Stiermarken* 35% live in *Graz*.

What percentage of the inhabitants of Austria live in the *Stiermarken* province?

A. 13 **B.** 20 **C.** 22 **D.** 48 **E.** 65

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22. *Yasmine* wrote down some integers.
One of the numbers is 2018.
The sum of all integers is also 2018. Their product is 2018 too.

Which of the following can be the number of integers *Yasmine* wrote down?

A. 2016 **B.** 2017 **C.** 2018 **D.** 2019 **E.** 2020

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23. Four numbers are given.
For each threesome we calculate the average and add this to the fourth number.
We get the following four results: 17, 21, 23 and 29.

Which is the largest of the four given numbers?

A. 12 **B.** 15 **C.** 21 **D.** 24 **E.** 29

24. Points A_0, A_1, A_2, ... are all on a straight line. Line segment A_0A_1 has length 1.
A_0 is the midpoint of line segment A_1A_2, A_1 is the midpoint of line segment A_2A_3, etcetera.

What is the length of line segment A_0A_{11}?

A. 171 **B.** 341 **C.** 512 **D.** 587 **E.** 683

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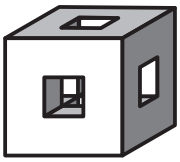
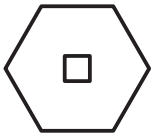
25. Three tunnels have been made through a 3x3x3 cube by removing seven little cubes. We cut this cube in half. The cutting plane is perpendicular to a body diagonal and passes through the midpoint of the cube.



What will we get to see?

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

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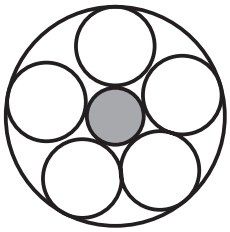
26. Two circles, of radii 1 and 9 with a common center, form a ring.
Inside this ring some other circles fit, tangent to both given circles.
The circles inside the ring do not overlap.
Alongside you see some circles in a ring with **other** radii.



How many circles will fit at most inside a ring with radii 1 and 9?

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

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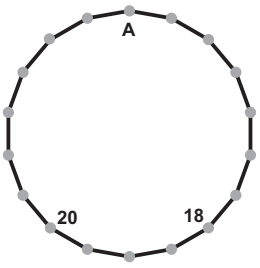
27. A number is written at each vertex of the 18-gon.
The number is the sum of the numbers at the neighbours of that vertex.
Two numbers have been given.



Which number will be at vertex A?

A. -38 **B.** -20 **C.** 18 **D.** 38 **E.** 2018

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28. *Diana* has drawn a rectangle with 12 squares.
She has made some squares black.
In the empty squares she then wrote down how many black squares share a side with that empty square. Alongside you see the result.
Now she will do the same with a rectangle of 2018 squares and she adds the numbers that will appear in it.

1		2	1
0	3		
1		2	1

What is the largest sum she could get this way?

A. 1262 **B.** 2016 **C.** 2018 **D.** 3025 **E.** 3027

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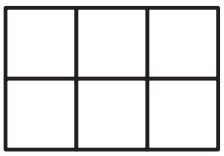
29. The numbers from 1 to 6 should be written in this table.
The sum of the numbers in each row and in each column should be divisible by 3.



In how many different ways can we achieve this?

A. 12 **B.** 36 **C.** 42 **D.** 45 **E.** 48

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30. *Joey* has made a large cube by glueing together a number of small cubes.
Then he has painted some of the faces of the large cube.
His sister dropped the large cube, and it fell apart into the small cubes again.
Of the small cubes, 45 turned out to be unpainted.

How many faces of the large cube did *Joey* paint?

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