wizPROF 2015

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calculators are not allowed

you may use 75 minutes

scribbling paper is allowed

results and prizes will arrive at school in May

answers will be posted on the website March 28th

solutions will be posted on the website April 19th

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

1. Some sports club owns 5 identical grass mowers.
One playground can be mowed in 10 hours by 2 of these mowers.
In how many hours can the playground be mowed if all mowers are used?

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

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2. Mother did the laundry and has hung T-shirts on a clothes line.
Her son *Tom* is going to hang washed socks on the line. He puts a single sock between every pair of T-shirts. When *Tom* is finished, there are 29 clothes on the clothes line.

How many T-shirts are on the line then?

A. 10 **B.** 11 **C.** 13 **D.** 14 **E.** 15

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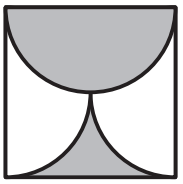
3. The shaded area is bounded by a semicircle and 2 quarter circle arcs.



Which fraction of the square is shaded?

A. $\frac{1}{4}$ **B.** $\frac{\pi}{8}$ **C.** $\frac{1}{2}$ **D.** $\frac{\pi}{4}$ **E.** $\frac{\pi}{2}$

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4. *Ann*, *Beth* en *Cindy* have bought a bag with 30 sweets. *Ann* paid 80 cents, *Betty* 50 cents, and *Cindy* 20 cents. Each girl gets 10 sweets. If the girls would have divided the sweets proportionally to what they paid, *Ann* would have received more sweets.

How many more?

A. 6 **B.** 7 **C.** 8 **D.** 9 **E.** 10

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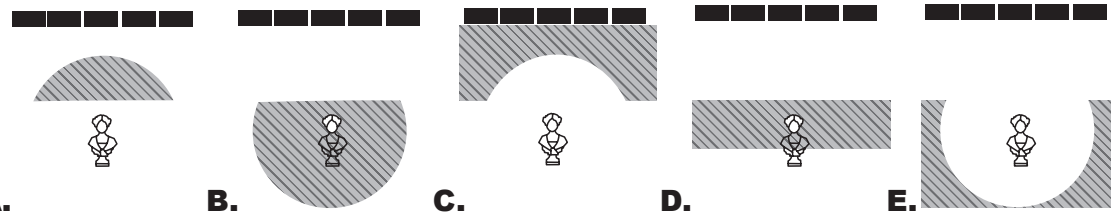
5. On a captured ship, pirate *Jack* found a note with directions for finding a treasure:
"the treasure is located at least 5 meters away from the wall, but less than 5 meters away from the statue".
Which of the following figures shows the region where *Jack* should look for the treasure?



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

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6. What is the last digit of the number $2015^2 + 2015^0 + 2015^1 + 2015^5$?

A. 1 **B.** 5 **C.** 6 **D.** 7 **E.** 9

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7. Every pupil in a class of 33 takes biology and/or computer science.
3 of the pupils take both subjects. The number of pupils taking only computer science is twice the number of pupils taking only biology.
How many pupils take computer science?

A. 15 **B.** 18 **C.** 20 **D.** 22 **E.** 23

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8. Which of the following numbers is neither a square nor a cube number?

A. 2^9 **B.** 3^{10} **C.** 4^{11} **D.** 5^{12} **E.** 6^{13}

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9. *Marcus* lights a new candle every night. Out of the stumps of 7 burnt candles he always makes 1 new candle. This morning he has bought 100 new candles.
How many days at most can he now light a new candle?

A. 112 **B.** 114 **C.** 115 **D.** 116 **E.** 117

10. We consider the number of right angles in a pentagon having only angles of less than 180°.
What are all possibilities for that number?

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

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11. The picture shows a dice in in different positions.

What is the probability of rolling `YES' with this dice?

A. $\frac{1}{3}$ **B.** $\frac{1}{2}$ **C.** $\frac{5}{9}$ **D.** $\frac{2}{3}$ **E.** $\frac{5}{6}$

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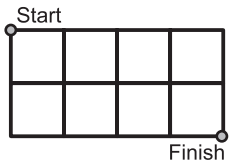
12. The picture shows 8 squares of side length 1.



You have to walk from “Start” to “Finish”.
You can only walk along the sides and the diagonals of the squares.
What is the minimum distance you could walk?

A. $\sqrt{10}+\sqrt{2}$ **B.** $2+2\sqrt{2}$ **C.** $4\sqrt{2}$ **D.** 6 **E.** $2\sqrt{5}$

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13. Planet Galamar is inhabited by strange creatures. They all have at least 2 ears.
Inhabitants *Imi*, *Dimi* and *Trimi* meet each other in a crater.
Imi says: “I see 8 ears.” *Dimi*: “I see 7 ears.” *Trimi*: “That is strange. I see only 5 ears.”
Of course no one can see its own ears.

How many ears does *Trimi* have?

A. 2 **B.** 4 **C.** 5 **D.** 6 **E.** 7

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14. A glass container forms a rectangular prism.
The base is a square with sides of length 10 cm. The container is partially filled with water.
A heavy, solid cube with sides of length 2 cm is put in it.
The water now reaches exactly up to the upper edge of the cube.

To what height in cm did the water reach in the container before the cube was put into it?

A. 1,90 **B.** 1,91 **C.** 1,92 **D.** 1,93 **E.** 1,94

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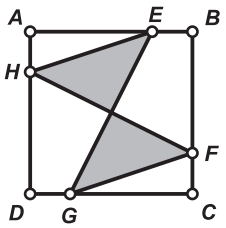
15. Square *ABCD* has area 80, $AE = BF = CG = DH$ en $AE = 3EB$.
What is the area of the shaded part?



A. 20 **B.** 25 **C.** 30 **D.** 35 **E.** 40

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16. *Senna* adds 2 prime numbers and gets 85 as a result.
Nassim multiplies the same prime numbers and adds up the digits of the outcome.
What sum will *Nassim* get?

A. 12 **B.** 13 **C.** 14 **D.** 15 **E.** 21

17. *Flora* has 3 different dictionaries and 2 different novels.
She wants to put these books on her bookshelf.
The dictionaries should go side by side, and so should the novels.

In how many different ways can *Flora* arrange the books?

A. 12 **B.** 24 **C.** 30 **D.** 60 **E.** 120

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18. The number 258 has these 2 properties: it consists of 3 digits, and each pair of adjacent digits differs by 3.
How many numbers have both of these properties?

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

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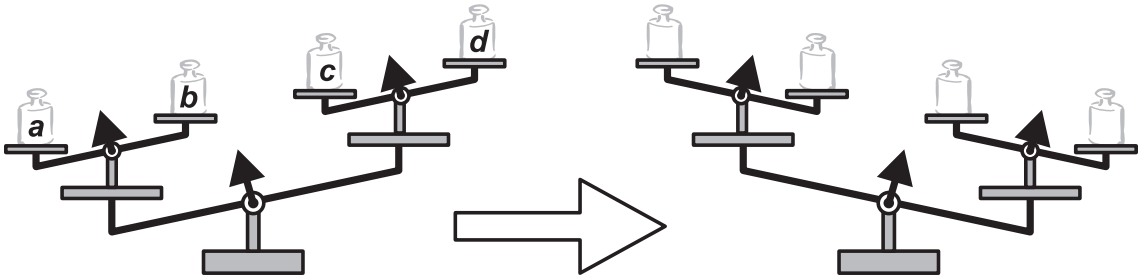
19. 4 weights *a*, *b*, *c* and *d* are placed on special scales, see figure.



Then 2 of the weights are interchanged.
After this interchange the situation is as shown in the figure on the right.
Which 2 weights were interchanged?

A. *a* and *b* **B.** *a* and *c* **C.** *a* and *d* **D.** *b* and *c* **E.** *b* and *d*

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20. If you multiply the ages of a father and his son today, the result is 2015.
How many years do they differ in age?

A. 26 **B.** 29 **C.** 31 **D.** 34 **E.** 36

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21. "If n is a prime number, then exactly 1 of the numbers n − 2 and n + 2 is also a prime number."
Which of the following n is a counter-example to this statement?

A. n = 11 **B.** n = 19 **C.** n = 21 **D.** n = 29 **E.** n = 37

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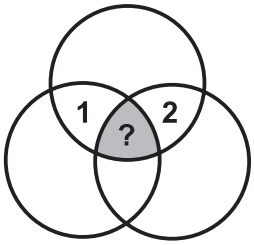
22. *Roland* wants to write a number in each of the 7 regions of the figure.
The number in a region should be the sum of the numbers in all neighbouring regions (the region with the question mark has 3 neighbouring regions). *Roland* already wrote a number in 2 regions.



Which number will be written in the region with the question mark?

A. -6 **B.** -3 **C.** 0 **D.** 3 **E.** 6

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23. How many different 2-digit numbers are the sum of 6 different powers of 2?
($2^0 = 1$ is also a power of 2)

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

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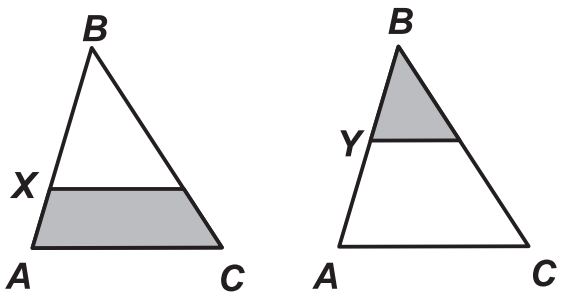
24. In a right-angled triangle, the angle bisector of an acute angle divides the opposite side in 2 segments. One of those has length 1, the other has length 2.
What is the length of the bisector?

A. $\sqrt{2}$ **B.** $\sqrt{3}$ **C.** 2 **D.** $\sqrt{5}$ **E.** $\sqrt{6}$

25. In triangle *ABC* two lines parallel to side *AC* are drawn, one through point *X* and one through point *Y*.

This way the shaded regions in the figure below are created.



The shaded regions have equal areas.
The ratio *BX*:*XA* = 4:1.
What is the ratio *BY*:*YA*?

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

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26. Different letters represent different digits, equal letters represent equal digits.
For example: if A = 2 and B = 5 then AB represents the number 25. A is not equal to 0.
In how many different ways can A, B and C be chosen such that AB < BC < CA ?

A. 84 **B.** 96 **C.** 125 **D.** 201 **E.** 502

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27. Out of the numbers 1, 2, 3, …, n − 1, n one number has been removed.
The mean of the remaining numbers is 4,75.
Which number was removed?

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

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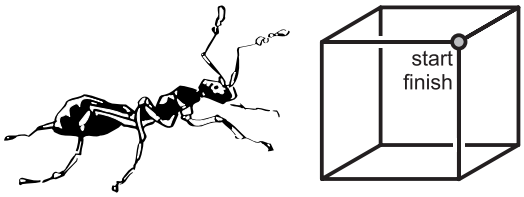
28. Miss *Ant* would like to walk along every edge of a cube with edges of length 1.
She starts in a vertex and wants to finish there too.



What is the minimum length of Miss *Ant's* walk?

A. 12 **B.** 13 **C.** 15 **D.** 16 **E.** 20

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29. *Timon* wrote down 10 different numbers on a piece of paper.
He underlines each number that equals the product of the other 9.
How many numbers can *Timon* underline at most?

A. 1 **B.** 2 **C.** 3 **D.** 9 **E.** 10

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30. Several points on a line are coloured red. One red point is called A, another one B.
For point A all line segments joining a red point to the left of A and a red point to the right of A, are counted. There are 80 such segments.
The segments joining a red point to the left of point B and a red point to the right of B are also counted. There turn out to be 90 of them.

How many points are coloured red?

A. 20 **B.** 21 **C.** 22 **D.** 80 **E.** 90