wizPROF 2009

calculator not allowed

you may use 75 minutes

scrap paper is allowed

results and awards at school mid-May

24th March the answers will be on the website

24th March the explanations will be on the website

wizPROF
3, 4, 5 & 6 havo/vwo

3 points

wizPROF 2009

1. Which of the following numbers is a multiple of 3?

A. 2 + 0 + 0 + 9 **B.** (2 + 0) • (0 + 9) **C.** 200 – 9 **D.** 2^9 **E.** 2009

2. 2009 People joined a running contest. Gerard was one of the participants. The number of runners that finished behind Gerard was three times as big as the number of runners that finished ahead of Gerard.
At what place did Gerard finish?

A. 501 **B.** 502 **C.** 503 **D.** 1506 **E.** 1507

3. Lynda has written down a sequence of numbers. Each number in the sequence is the sum of the two previous numbers in that sequence, except the first and the second one. The fourth number in the sequence is 6, the sixth number is 15.
What is the seventh number in the sequence?

A. 9 **B.** 16 **C.** 21 **D.** 22 **E.** 24

4. How much is $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{6}{7}$ of $\frac{7}{8}$ of $\frac{8}{9}$ of $\frac{9}{10}$ of 1000 ?

A. 50 **B.** 100 **C.** 150 **D.** 200 **E.** 250

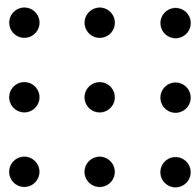
5. Harold wrote 2009 times the number 2009 down, one directly after the other.
Now he adds all odd digits that are directly followed by an even digit.
Which outcome does he get then?

A. 4018 **B.** 18072 **C.** 18081 **D.** 22088 **E.** 22099

6. In a game one can score 0, 1, 2, 3, 4 or 5 points. After four plays May has scored an average of exactly four points.
Which of the following statements cannot be correct?

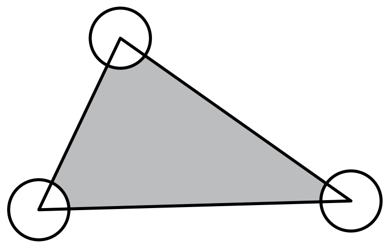
A. May has scored 1 point exactly once.
B. May has scored 3 points exactly two times.
C. May has scored 3 points exactly three times.
D. May has scored 4 points exactly two times.
E. May has scored 4 points every time.

7. Ian wants to remove some of the 9 dots shown.
Of the remaining dots, no 3 are allowed to lie on one straight line.
How many dots should Ian remove at least?



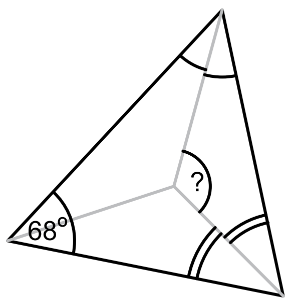
A. 1 **B.** 2 **C.** 3 **D.** 4 **E.** 7

8. The area of the triangle is 80 m².
The three circles around the vertices all have radius 2 m.
How many m² is the area of the grey region?



A. 2π **B.** $40 - 2\pi$ **C.** $80 - 4\pi$ **D.** $80 - 3\pi$ **E.** $80 - 2\pi$

9. A triangle has an angle of 68 degrees. In the triangle the three bisectors are drawn.
How many degrees is the angle with the question mark?



A. 124 **B.** 128 **C.** 132 **D.** 136 **E.** 140

10. How many whole numbers are there, for which the square root differs from 10 by less than 1?

A. 36 **B.** 37 **C.** 38 **D.** 39 **E.** 40

4 points

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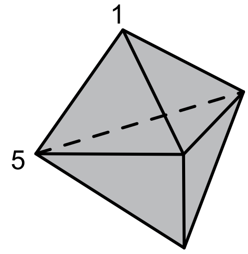
11. A solid has six triangular faces. With every vertex goes a number.
You can see two of these numbers. If we add the numbers at the three vertices of each face, we will get six times the same result. We add up all five numbers associated to the vertices.
What is the outcome?



A. 17 **B.** 18 **C.** 24 **D.** 48 **E.** 66

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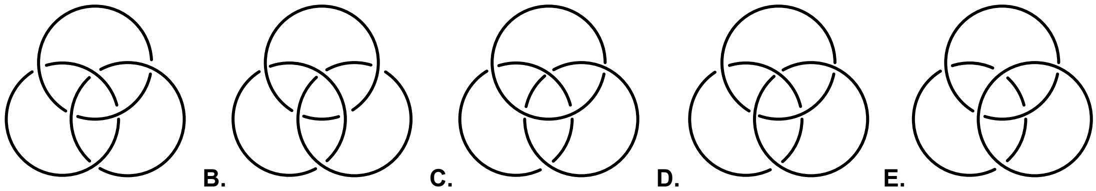
12. The Borromean rings have the curious property that you cannot detach the three rings without cutting at least one. But as soon as one ring is detached -- it does not matter which one -- the other two will be detached as well.
In which of the following figures do you see the Borromean rings?



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

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13. In a row of 25 men everybody (except the one in front) says that the man in front of him lies.
The man in front says that every man behind him lies.
How many men in this row are lying?

A. 0 **B.** 1 **C.** 12 **D.** 13 **E.** 24

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14. There are positive whole numbers of which the square and the cube have the same number of digits.
How many of such numbers are there?

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

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15. If we put one zero behind the point and in front of the 1 in 1.1, we will get the number 1.01.
How many noughts do we have to put there to get a number that is in between $\frac{20009}{20008}$ and $\frac{2009}{2008}$?

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

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16. Mona has written down a sequence of different positive whole numbers smaller than 11. Max nodded approvingly when he discovered that for each pair of neighbouring numbers one of the numbers was divisible by the other one.
How many whole numbers could Mona have written down at most?

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

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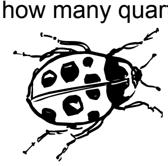
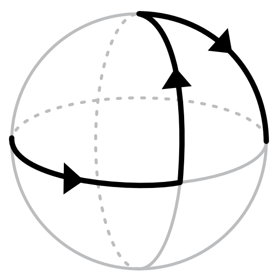
17. Three circular hoops are glued together. They intersect each other at right angles.
A ladybird flies to an intersection point. There it begins a walk.
It walks a quarter hoop and then takes a left turn to another hoop.
The ladybird walks a quarter hoop again and then takes a right turn.
And so it continues, alternating between left turns and right turns.
After how many quarter hoops does the ladybird return to the starting point?





A. 6 **B.** 9 **C.** 12 **D.** 15 **E.** 18

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18. We say that a ♥ b means: $ab + a + b$. For example: 5 ♥ 8 = 5 • 8 + 5 + 8 = 53 .
There is a number x for which 3 ♥ 5 = 2 ♥ x.
What is x?

A. 3 **B.** 6 **C.** 7 **D.** 10 **E.** 12

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19. Pete writes down ten-digit numbers that consist only of digits 1, 2, and 3.
He also wants neighbouring digits to differ by exactly 1.
How many numbers could Pete write down at most?

A. 16 **B.** 32 **C.** 40. **D.** 64 **E.** 80

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20. At a party the number of people that wear glasses divided by the number of people that do not wear glasses is exactly equal to 0.24 .
What is the smallest number of people that could be present at the party?

A. 25 **B.** 31 **C.** 36 **D.** 48 **E.** 76

5 points

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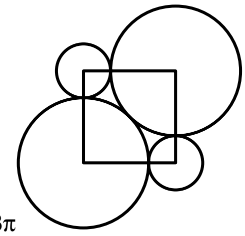
21. The vertices of the square are the centres of the circles.
The big circles touch each other as well as both of the small circles.
The radius of the small circles is equal to 1.
What is the radius of the big circles?

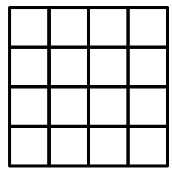


A. $\frac{22}{9}$ **B.** $\sqrt{5}$ **C.** $1 + \sqrt{2}$ **D.** 2,5 **E.** $0{,}8\pi$

22. Susan has made a cuboid out of exactly 2009 equal little cubes. She also has 2009 little stickers. On the outside of the cuboid she sticks such a little sticker exactly in the middle of each little square. Susan still has stickers left.
How many?

A. 0 **B.** 49 **C.** 287 **D.** 476 **E.** 763

23. Carolyn has put checkers pieces in the boxes of this square. In some of the boxes there are several pieces on top of each other, but not in every box there is a piece. If she adds the number of pieces for each row and each column, the eight answers she gets will all be different.
What is the least number of pieces Carolyn could have put down?



A. 12 **B.** 14 **C.** 15 **D.** 24 **E.** 30

24. A number of tangerines, pears, apples and bananas are put in a row.
Each type of fruit lies at least once next to every other type of fruit. So an apple lies at least once next to a banana, a pear at least once next to a tangerine, etc.
How many pieces of fruit are needed at least to make such a row?

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

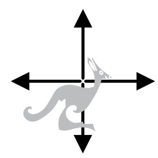
25. There are numbers n such that $(2^2 - 1) \cdot (3^2 - 1) \cdot (4^2 - 1) \cdot \ldots\ldots \cdot (n^2 - 1)$ is a square.
What is the smallest number that n can be?

A. 6 **B.** 8 **C.** 9 **D.** 16 **E.** 27

26. All divisors of a positive whole number are put in a row in increasing order.
The divisors 1 and the number itself are deleted from the row.
Of the remaining row the last number is 45 times as big as the first number.
For how many positive whole numbers is this the case?

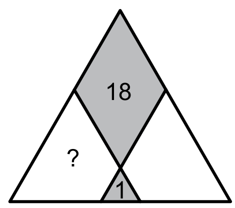
A. 0 **B.** 1 **C.** 2 **D.** 3 **E.** more than 3

27. Kangaroo Skippy is in a meadow and will make ten jumps.
With each jump it goes 1 metre north, or 1 metre east or 1 metre south or 1 metre west.
How many places are there where Skippy could be after ten jumps?



A. 100 **B.** 121 **C.** 225 **D.** 400 **E.** 441

28. An equilateral triangle is divided into a rhombus, a little equilateral triangle and two trapezia.
The rhombus has area 18, the little equilateral triangle has area 1.
What is the area of one of the trapezia?

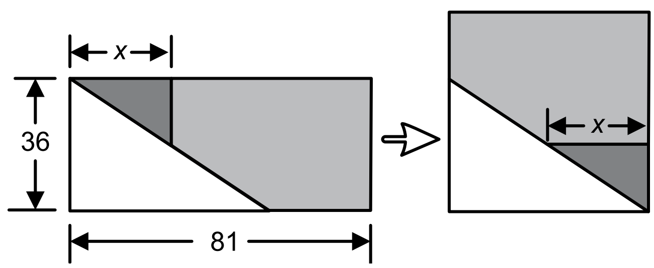


A. 10 **B.** 12,5 **C.** 15 **D.** 16 **E.** 18

29. Thomas has 15 cards, numbered from 1 to 15. He removes a number of cards.
If he takes two of the remaining cards, the sum of their numbers is never a square.
How many cards did Thomas take away at least?

A. 7 **B.** 8 **C.** 9 **D.** 10 **E.** 11

30. A rectangle of 36 x 81 is cut into three pieces.
We can make a square of the three pieces.
How long is x?



A. 23 **B.** 24 **C.** 25 **D.** 26 **E.** 27