wizPROF 2011

calculator not allowed

you may use 75 minutes

scrap paper is allowed

results and awards at school mid-May

22th March the answers will be on the website

22th April the explanations will be on the website

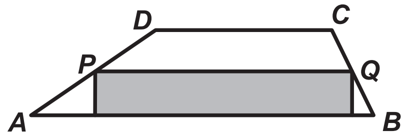
wizPROF
havo 4 & 5
vwo 3, 4, 5 & 6

1. Across some road a zebra crossing has been made of alternating white and black stripes.
The crossing starts and ends with a white stripe. All stripes are 50 cm wide.
The pedestrian crossing has 8 white stripes.
How wide is the road (in meters)?

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

---

2. Points *P* and *Q* are midpoints of the sides of trapezium *ABCD*.
The area of the grey rectangle is 13 cm^2.
How many cm^2 is the area of the trapezium?



A. 24 **B.** 25 **C.** 26 **D.** 27 **E.** 28

---

3. $a = 2 \cdot 3 + 3 \cdot 4 + 4 \cdot 5$, $b = 2^2 + 3^2 + 4^2$ en $c = 1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4$.
We put the numbers *a*, *b*, and *c* in order, from small to large.
What is the right order?

A. *a*, *c*, *b* **B.** *b*, *a*, *c* **C.** *b*, *c*, *a* **D.** *c*, *a*, *b* **E.** *c*, *b*, *a*

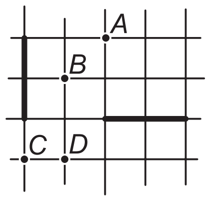
---

4. A rectangular mosaic of 360 cm^2 consists of square tiles of equal size.
The mosaic is 24 cm high and 5 tiles wide.
What is the area of one tile in cm^2?

A. 3 **B.** 4 **C.** 9 **D.** 16 **E.** 25

---

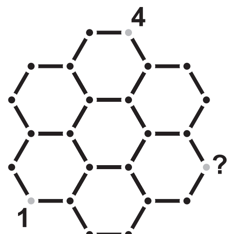
5. One of the line segments can be mapped to the other by a rotation.
Which of the points *A*, *B*, *C* or *D* could be the centre of rotation?



A. only *A* **B.** *A*, *B*, *C* and *D* **C.** *A* and *C* **D.** *A* and *D* **E.** only *D*

---

6. The picture shows part of the plan of a schoolyard.
At all vertices of the hexagons there are holes for playing marbles.
Every pair of neighbouring holes taken together contain the same number of marbles.
For two vertices the number of marbles is indicated.
How many marbles are there in the hole with a question mark?



A. 1 **B.** 3 **C.** 4 **D.** 5 **E.** can not be determined

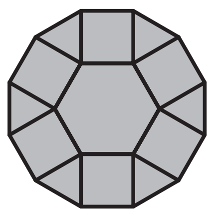
---

7. Omar has divided 2011 by a certain number. As a remainder he got 1011.
Which of the following statements is true?

A. Omar has divided by 100
B. Omar has divided by 500
C. Omar has divided by 1000
D. Omar has divided by another number
E. Omar has made a mistake

---

8. The picture shows a regular hexagon of side 1, six triangles and six squares.
What is the perimeter of the figure?



A. 9 **B.** $6 + 3\sqrt{2}$ **C.** $6(1 + \frac{1}{2}\sqrt{3})$ **D.** 12 **E.** $6(1 + \sqrt{2})$

---

9. Someone lists the four-digit numbers of which the sum of the digits is 4, from large to small.
What is the position of the number 2011?

A. 5th **B.** 6th **C.** 8th **D.** 9th **E.** 10th

---

10. A month had 5 Mondays, 5 Tuesdays, and also 5 Wednesdays.
The month before had only 4 Sundays.
What is certainly true?

A. the next month has exactly 4 Fridays
B. the next month has exactly 4 Saturdays
C. the next month has 5 Sundays
D. the next month has 5 Wednesdays
E. there is no such month

11. Immediately after the start of a race Dan is 1st, Charles 2nd, and Omar third.
During the race Dan and Charles overtake each other 9 times, Charles and Omar overtake each other 10 times, and Dan and Omar overtake each other 11 times.
In which order did they finish?

A. Dan, Charles, Omar **B.** Charles, Omar, Dan
C. Charles, Dan, Omar **D.** Omar, Charles, Dan
E. Omar, Dan, Charles

---

12. Of the number n it is known that $9^n+9^n+9^n=3^{2011}$.
What is n?

A. 1005 **B.** 1006 **C.** 2008 **D.** 2010 **E.** 2011

---

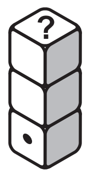
13. Emma writes a whole number in every box.
In every 2 x 2 square of boxes the sum of the numbers should be 10.
Five numbers have been filled in already.
What will be the sum of the numbers in the boxes that are still empty?

1		0
	2	
4		3

A. 9 **B.** 10 **C.** 11 **D.** 12 **E.** 13

---

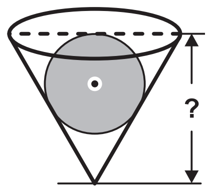
14. Opposite sides of the dice always sum to seven. Three dice are put on top of each other.
In this pile the sides that are touching sum to five, in both places.
Of the bottom die, a one is visible.
What is the number shown on the top side of the pile?



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

---

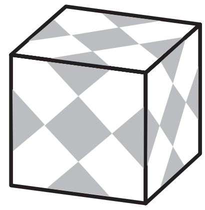
15. A marble of radius 15 rolls into a conic-shaped hole.
Viewed from aside, the hole has the shape of an equilateral triangle.
The marble fits in the hole exactly.
How deep is the hole?



A. $30\sqrt{2}$ **B.** $25\sqrt{3}$ **C.** $60(\sqrt{3}-1)$ **D.** 45 **E.** 60

---

16. Dan has a glass cube with 10 cm edges.
He glues on grey squares as shown in the picture.
The cube now looks the same from all sides.
How many cm^2 of the area of the cube are now coloured grey?



A. 75 **B.** 150 **C.** 225 **D.** 300 **E.** 375

---

17. Emma makes lists of three-digit numbers. The numbers on such a list must be consecutive, for example 204, 205, 206. Each number has at least one odd digit, so 204 is not allowed, for example.
How many numbers are on the longest list Emma can make?

A. 10 **B.** 100 **C.** 101 **D.** 110 **E.** 111

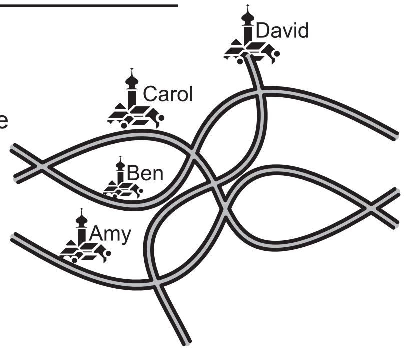
---

18. Sonia has two cube-shaped containers. The edges of the larger cube are 1 dm larger than those of the smaller one.
Both containers are filled with water. The larger container contains 217 litres more.
How many litres of water does the smaller one contain?

A. 125 **B.** 243 **C.** 512 **D.** 729 **E.** 1331

---

19. During a bus trip, Omar sketched a map of his village.
The bus ride was rather shaky, so the drawing was not very good.
Omar did succeed in drawing the four streets, their seven crossings and the homes of his friends. But in reality three streets are straight, and only one has curves in it.
Who lives along this curved street?



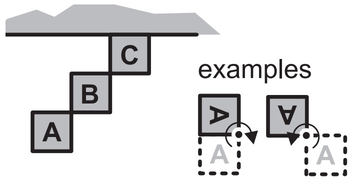
A. Amy **B.** Ben **C.** Carol **D.** David
E. can not be determined

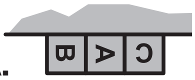
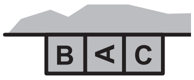
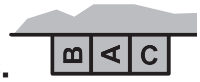
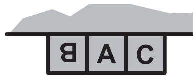
---

20. Somebody is searching for pairs of positive whole numbers x and y with $x \le y$ for which $\frac{1}{x}+\frac{1}{y}=\frac{1}{3}$ holds .
How many of those pairs are there?

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

21. A warehouse contains three large crates A, B, and C as shown in the picture (from above). The crates should be moved aside. The crates are so heavy that they can only be moved by 90 degrees rotations around a corner of the crate, see the examples.
Which of the following arrangements is possible then?



A.  **B.**  **C.**  **D.**  **E.** all of them are possible

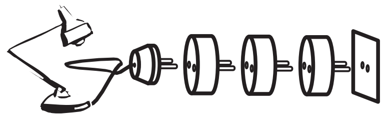
---

22. We call a number “interesting” when all its digits are different and the first digit is the sum of the other digits.
For example: 62103 is an interesting five-digit number.
How many interesting five-digit numbers are there?

A. 72 **B.** 144 **C.** 168 **D.** 216 **E.** 288

---

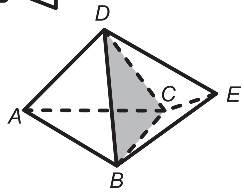
23. Emma has three time switches. Every switch that is turned on allows an electric current to flow for three hours, then it blocks the current for three hours, allows it again for three hours, blocks it again for three hours, etcetera. The clocks only run when the current is on. Emma now puts the time switches in series with a lamp, and synchronizes them, to make sure that all three start on a three hour period of allowing the current to flow.
How many hours will the lamp be burning the coming week?



A. 0 **B.** 10,5 **C.** 21 **D.** 42 **E.** 84

---

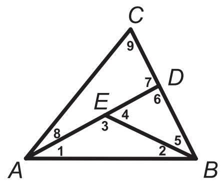
24. Two regular tetrahedra *ABCD* and *BCDE* have triangle *BCD* as a common face.
ABCD rests with face *ABC* on the ground.
Where does the line joining *D* and *E* intersect the ground face?



A. within triangle *ABC*
B. outside triangle *ABC*, but on the same side of *BC* as *A* is
C. *DE* does not intersect the ground face
D. outside triangle *ABC* and on the other side of *BC*, viewed from *A*
E. the answer depends on the lengths of the edges

---

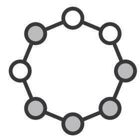
25. Somebody chooses a triangle *ABC*. On edge *BC* he chooses a point *D* and after that he chooses a point *E* on line segment *AD*. This way we obtain nine angles: 1, 2, 3, ..., 9.
He would like the least possible number of different angles.



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

---

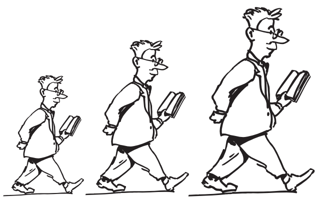
26. Emma makes a necklace with three white and five black beads. An example is shown alongside.
How many different necklaces could Emma make?



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

---

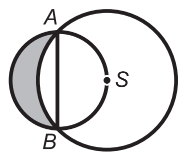
27. Mister Small, Mister Medium and Mister Large are going for a walk.
Mister Large says: “Funny, how our names are all about lengths, but each of us has a wrong name.” The smallest of the three answers: “Yes, that is true”.
What are the names of the gentlemen from smallest to largest?



A. Small, Large, Medium
B. Medium, Small, Large
C. Medium, Large, Small
D. Large, Small, Medium
E. impossible to know

---

28. *AB* is the diameter of the small circle. On this circle lies the centre *S* of the large circle.
The large circle has radius *r*.
What is the area of the grey region?



A. $\frac{1}{4}r^2$ **B.** $\frac{\sqrt{3}}{4}r^2$ **C.** $\frac{\pi\sqrt{3}}{12}r^2$ **D.** $\frac{1}{2}r^2$ **E.** $\frac{\pi}{6}r^2$

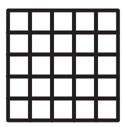
---

29. Emma would like to choose a quadruple of edges of a cube, having the property that no two of the quadruple have a vertex in common.
How many quadruples could Emma choose from?

A. 6 **B.** 8 **C.** 9 **D.** 12 **E.** 18

---

30. Somebody ticks some boxes in a 5 x 5 table. He does it in such a way that the same number of boxes is ticked in each square of 3 x 3 boxes. How many boxes can be ticked in a 3 x 3 square?
Of course that number can be 0 or 9. What other numbers (1, 2, 3, 4, 5, 6, 7, 8) are possible?



A. only 1 **B.** 1 and 2 **C.** 1, 2 and 3 **D.** 1, 2, 7 and 8 **E.** all numbers are possible