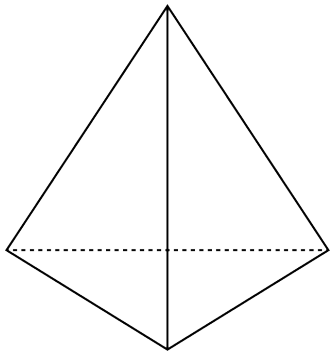
Mathematica Centrum

Together, let's shape the mathematicians of the future

BYRON-GERMAIN PREPARATORY TEST 2013
DETAILED SOLUTIONS

1. The number of faces of a triangular pyramid is 4.



2. 3 x 2 x 3 x 2 = 36.

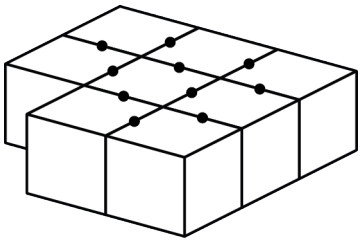
3. The number which is a multiple of 4 is (4 x 6) 24.

4. The value of ? in the equation 11 x 3 = ? + 3 is 30.

5. The value of ? in the equation 10 x 2 ÷ 5 x 2 = 4 x ? is 2.

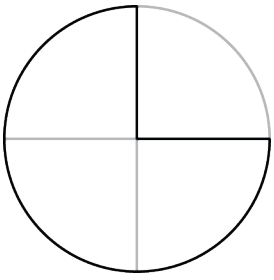
6. The number of sides of a square (4) + the number of vertices of a square (4) + the number of lines of symmetry in a square (4) is equal to 12.

7. The product of 50 x 10 x 2 is (500 x 2) 1 000.



8. Eight blocks have been glued together as shown in the diagram. These 8 blocks have a total of (8 x 6) 48 faces, 20 (10 x 2) of which are covered with glue (each dot in the diagram accounts for 2 glued faces). The number of faces of these blocks that have no glue on them is (48 -20) 28.

9. Mathilda has bought 2¢ and 3¢ stamps for a total of 40¢. The total being even, the number of 3¢ stamps bought must absolutely be even, otherwise the total would be odd. The number of 3¢ stamps cannot be 16 because 16 x 3¢ is equal to 48¢. The number of 3¢ stamps that she has bought could be 12.



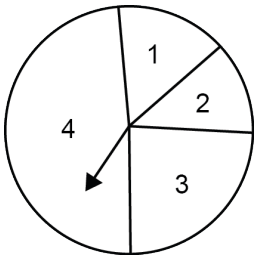
10. The result of 3 x 8 - 11 x 2 is (24 - 22) 2.

11. The fraction of the pie that has been eaten is 1/4.

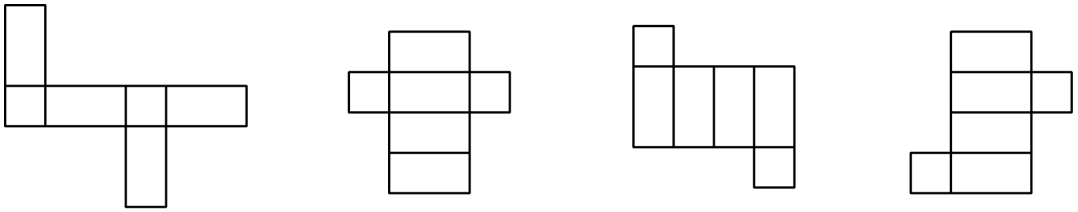
12. The divisors of 10 are {1, 2, 5, 10}, those of 12 are {1, 2, 3, 4, 6, 12}. Of these 5 numbers: 1, 2, 3, 4, and 5, only 2 (1 and 2) are common divisors of 10 and 12.

13. The value of 10 mm (1 cm) + 10 cm + 10 dm (100 cm) is 111 cm.

14. The circular sector 3 represents about a quarter of the spinner (a bit less than 90º). Mathew could expect to get a 3 approximately (1/4 of 1 000) 250 times.



15. Each one of the 4 nets below can form a rectangular prism because the 3 pairs of opposite faces are identical and disjoint (they have no common edges).



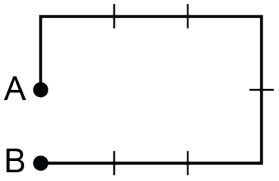
I II III IV

16. Together, they pour a total of (45 ml + 40 ml) 85 ml of water. Andrea will be able to pour the 40 ml of water at least 11 times (85 ml x 11 = 935 ml) whether she pours the water before or after Melissa. When Melissa will pour the 45 ml for the 12th time, she will pour them first because she is the one that pours first at each even term of the sequence: A-M, M-A, A-M, M-A … . The beaker will then contain a total of (935 ml + 45 ml) 980 ml of water. Andrea will not be able to pour the 40 ml of water completely in the 1 000 ml beaker a 12th time without the water overflowing.

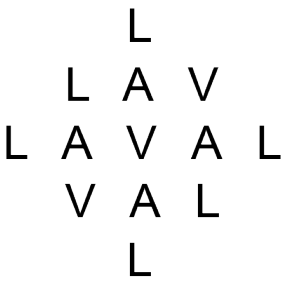
17. Of the five natural numbers given, the only one that yields an odd remainder when divided by 6 (53 ÷ 6 = 8 R 5) is 53. The number that we are seeking could be 53.

18. The second circle has twice the dots of the first circle. The 3rd circle has one dot more than the second. The fourth circle has twice the dots of the 3rd. The 5th has one dot more than the 4th. The mathematical rule of this sequence is x 2 + 1. To continue the sequence, the next circle must have (7 x 2) 14 dots.

19. Mathilda leaves from A and ends her journey at B. She ended her journey1 km (south) of her house (see diagram).



20. Using the L of the first line, we can read the word LAVAL in 6 different ways. Indeed, if you start from this L and stop at the first A, then read from left to right and from top to bottom, you will be able to read the word LAVAL in 2 different ways. If you start again from this same L and move down vertically to the first V, then read from left to right and from top to bottom, you will be able to read the word LAVAL in two other ways. If you move down vertically to the second A, you will be able to read the word LAVAL in two more ways. Going through the same process, but using the first L of the third line, you will be able to read the word LAVAL in another 6 ways. Using the L of the 2nd line, you can read the word LAVAL in 12 other ways, because if you use the A just to its right, you can read the word LAVAL in the same 6 ways you would be reading it if you were using the L of the first line (except the L itself). If you use the A right below it, you can read the word LAVAL in the same 6 ways you would be reading it if you were using the L from the third line (except the L itself). In all, you can read the word LAVAL in 24 different ways.



21. If Andrea takes 36 minutes to wax the car, Mathew takes 12 minutes. In 36 minutes, Mathew can wax 3 identical cars. Together, in 36 minutes, they can wax 4 cars. Together, they can wax the same car in (36 ÷ 4) 9 minutes.

22. The ones digit of the following product:13 x 12 x 11 x 10 x 9 x 8 x 7 is 0.

IMPORTANT CORRECTION

Attention: Contest supervisor for grades 3, 4, 5, and 6

Please note:

Number 29 ‘’D’’ of the 2013 Contest should be ‘’10’’ instead of ‘’8’’