Mathematica Centrum

Together, let's shape the mathematicians of the future

BYRON-GERMAIN PREPARATORY TEST 2012
DETAILED SOLUTIONS

1. The number of edges of a cube (12) multiplied by the number of faces of a cube (6) is equal to 72.

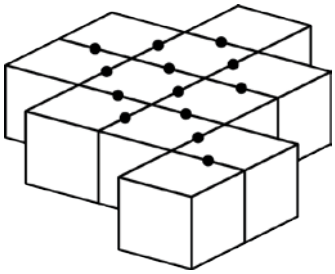
2. The factors of 6 are (1, 2, 3, and 6), those of 15 are (1, 3, 5, and 15). These 2 numbers have 2 factors in common.

3. The largest 4-digit even number that can be written with the digits 1, 8, 6, and 4 is 8 614.

4. The average of 0, 2, 4, 6, and 8 is ((0 + 2 + 4 + 6 + 8) ÷ 5) 4. In this case, it's the central term because the 5 numbers are evenly distributed.

5. The missing number in the sequence: 3 500, 3 250, ?, 2 750, 2 500 is (3 250 - 250) 3 000.

6. Each dot in the diagram accounts for 2 glued faces. There are (13 x 2) 26 glued faces. The number of faces that have no glue on them is (66 - 26) 40.

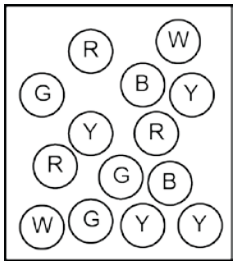


7. 16 quarters = 400¢ = 40 dimes

8. Write the following 5 numbers: 3 782, 2 863, 1 935, 2 926, 3 931 in increasing order (from the smallest to the largest). The fourth number written is 3 782.

9. The number that is 10 times smaller than 10 is 1. The number that is 10 more than 1 is 11.

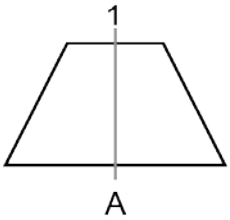
10. 11 hundreds - 280 + 14 tens = 1 100 - 280 + 140 = 960.

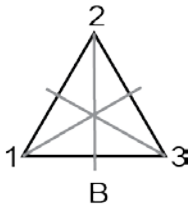


11. The base of a prism has 7 sides. The sum of the number of edges (7 + 7 + 7) plus the number of vertices (7 + 7) is 35.

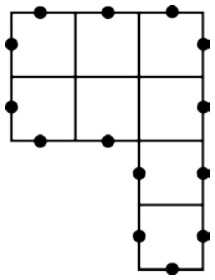
12. Without looking, Mathew picks one marble from the box. In this box there are 3 red, 3 green, 4 yellow, 2 black and 2 white marbles. Because there are 4 yellow marbles, the most prevalent colour in the box, Mathew is more likely to choose a marble of this colour.

13. The sum of the number of lines of symmetry of figure A (1) and of figure B (3) is equal to 4.





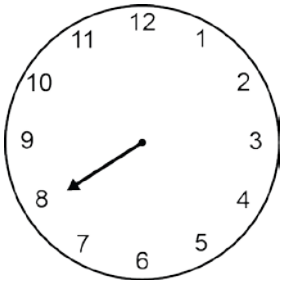
14. Since the digit 0 cannot be written first, we can only form (102, 120, 201, 210) four 3-digit numbers.



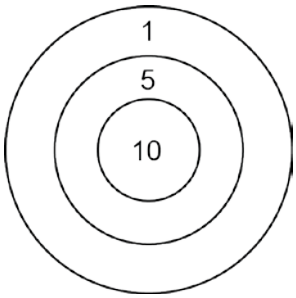
15. The perimeter of this figure is 14 cm.

16. Since Mathusalem hit the target 8 times and scored 38 points, we conclude that he hit the 1-point area 3 times. The only way to score the other 35 points is to hit the 10-point area twice and the 5-point area 3 times.

17. The clock shown in the diagram has lost its minute hand at approximately 7:55.



18. Instead of trying to answer this question right away, first let us analyse a simpler form of the same problem. How many odd numbers are there between 2 and 4? Evidently, there is only one, the 3. How many odd numbers are there between 2 and 10? There are (3, 5, 7, 9) 4. How many odd numbers are there between 8 and 18? There are (9, 11,13, 15, 17) 5. You notice that the number of odd numbers between 2 even numbers is always equal to half the difference between the even numbers. We can apply this rule to the original question. The number of odd numbers between 80 and 180 is ((180 - 80) ÷ 2) 50. Many great scientific and mathematical discoveries were made this way, by transforming the original problem into simpler models. From these we can more readily draw the mathematical law that can be used to solve all problems of the same type.



19. The purchase of III is better than that of I because he has bought double the amount of soap that I bought, but at a price which is (2 x $4.50 = $9.00) 10¢ less than double the price. The purchase of II is better than that of I because he has bought triple the amount of soap, but at a price that is (3 x $4.50 = $13.50) $1.15 less than triple the price. We can thus conclude that the best buy was made by II only.

20. Any number whose digits add up to a sum which is divisible by 3 is a multiple of 3. The numbers 102 and 120 are thus multiples of 3. There are (105, 108, … 117) 5 multiples of 3 between 102 and 120. We can find this result by subtracting 1 from one third the difference between 120 and 102 (120 - 102 = 18, 18 ÷ 3 = 6 and 6 - 1 = 5).