



The CENTRE for EDUCATION
in MATHEMATICS and COMPUTING
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2016 Canadian Team Mathematics Contest

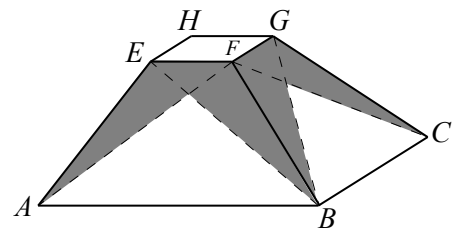
Individual Problems

1. What is the value of $2^0 + 20^0 + 201^0 + 2016^0$?
2. Zeljko travelled at 30 km/h for 20 minutes and then travelled at 20 km/h for 30 minutes. How far did he travel, in kilometres?
3. The operation \ominus is defined by $a \ominus b = a^b - b^a$. What is the value of $2 \ominus (2 \ominus 5)$?
4. Two fair six-sided dice are tossed and the numbers shown on the top face of each are added together. What is the probability that the resulting sum is less than 10?
5. A palindrome is a positive integer whose digits are the same when read forwards or backwards. For example, 25352 is a five-digit palindrome. What is the largest five-digit palindrome that is a multiple of 15?
6. On a particular street in Waterloo, there are exactly 14 houses, each numbered with an integer between 500 and 599, inclusive. The 14 house numbers form an arithmetic sequence in which 7 terms are even and 7 terms are odd. One of the houses is numbered 555 and none of the remaining 13 numbers has two equal digits. What is the smallest of the 14 house numbers?

(An *arithmetic sequence* is a sequence in which each term after the first is obtained from the previous term by adding a constant. For example, 3, 5, 7, 9 is an arithmetic sequence with four terms.)

7. Point Q has coordinates $(a + 1, 4a + 1)$ for some $a > 1$, and lies on the line with equation $y = ax + 3$. If O is the origin $(0, 0)$, determine the coordinates of the points P and R so that $OPQR$ is a square with diagonal OQ .
8. Claudine has p packages containing 19 candies each.
If Claudine divides all of her candies equally among 7 friends, there are 4 candies left over.
If Claudine divides all of her candies equally among 11 friends, there is 1 candy left over.
What is the minimum possible value of p ?

9. In the diagram, $ABCDHEFG$ is a truncated square-based pyramid. (Note that D is hidden.) In particular, $ABCD$ is a square with side length 7, $EFGH$ is a square with side length 1, and $AE = BF = CG = DH$. Each of the four trapezoidal faces is partially shaded. On each face, only the region that is below both diagonals is unshaded. If the height of the truncated pyramid is 4, what is the total shaded area?



10. Determine all pairs (x, y) of real numbers that satisfy the following system of inequalities:

$$\begin{aligned}x^4 + 8x^3y + 16x^2y^2 + 16 &\leq 8x^2 + 32xy \\y^4 + 64x^2y^2 + 10y^2 + 25 &\leq 16xy^3 + 80xy\end{aligned}$$