

MATHEMATICS ENRICHMENT CLUB.
Problem Sheet 5, May 26, 2015¹

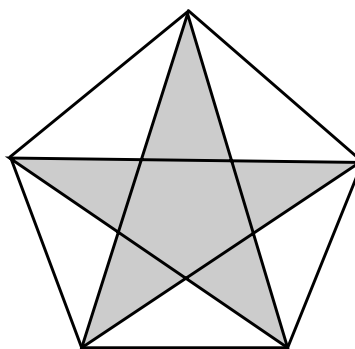
1. (a) What is the remainder when $2^{2015526}$ is divided by 7?
 (b) Find the last digit of 2^{2015} .
2. Geralt rolls 5 dices simultaneously, each dice has six faces labeled with the numbers 1;2;3;4;5 and 6. What is the probability of getting 5 consecutive numbers as the outcome of the dice roll?

3. If $y = 2$ and

$$\begin{array}{ccccccc} s & \text{---} & r & \text{---} & q & \text{---} & p & \text{---} & \text{---} & \text{---} \\ & & & & & & & & & \\ x + & & y + & & x + & & y + & & \dots & = 7; \end{array}$$

solve for x .

4. In a regular pentagon the diagonals are joined to form a star. What fraction of the pentagon does the star occupy?



5. Divide the numbers 24;38;39;44;45;46;48 into two sets in such a way that the sum of the numbers in each set is prime. Show that this can only be done in one way.
6. Find a positive integer x , such that if x is increased by 10%, then we get another positive integer with the sum of digits decreased by 10%.

¹Some problems from UNSW's publication *Parabola*, and the *Tournament of Towns in Toronto*

Senior Questions

1. Consider the points of intersection of the graphs $y = \cos x$ and $x = 100 \cos(100y)$ for