Age 11+ Level ★★
Worksheet 1

1. **Find from Factors**
   A certain number has exactly eight factors including 1 and itself. Two of its factors are 21 and 35. What is the number?

2. **One Short**
   A positive whole number less than 100 has remainder 2 when it is divided by 3, remainder 3 when it is divided by 4 and remainder 4 when it is divided by 5.

   What is its remainder when it is divided by 7?

3. **Grandma's Cake**
   Grandma bakes a cake for her grandchildren who are going to visit her. She has forgotten whether 3, 5 or all 6 of her grandchildren will visit.

   She wants all of the cake to be eaten by her grandchildren and would like each grandchild to get the same amount of cake.

   To prepare for all three possibilities, what is the smallest number of pieces into which she should cut the cake?

4. **Ones, Twos and Threes**
   Each digit of a positive integer is 1, 2 or 3. Each of these digits occurs at least twice in the number.

   What is the smallest such integer that is not divisible by 2 or 3?

5. **Red Card Blue Card**
   Sally has 5 red cards, numbered 1, 2, 3, 4 and 5, and 4 blue cards, numbered 3, 4, 5 and 6.

   Can you find a way in which Sally can line the cards up so that the colours alternate, and so that the number on each red card is a factor of every number next to it?

These problems are adapted from UKMT (ukmt.org.uk) and WMC (competition.ac) problems.

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Worksheet 2

1. **Smallest Abundant Number**
   An abundant number is a positive integer N such that the sum of the factors of N (not including N itself) is greater than N.

   What is the smallest abundant number?

2. **Jenny's Logic**
   Jenny and Tom have a set of cards numbered 1-7. Jenny chose three cards at random, and Tom chose two of the remaining cards.

   Jenny told Tom: "I can deduce that the sum of the numbers of your cards is even". What was the sum of the numbers on Jenny's cards?

3. **Adjacent Factors**
   Peter wrote down a list of different positive integers less than or equal to 10. For each pair of adjacent numbers, one of the numbers was divisible by the other.

   What is the longest list that Peter could have written?

4. **Back of the Queue**
   What is the remainder when the number $743\,589 \times 301\,647$ is divided by 5?

5. **Cakes and Buns**
   The Pythagoras Patisserie sells triangular cakes at 39p each and square buns at 23p each. Helen spent exactly £5.12 on an assortment of these cakes and buns.

   How many cakes and how many buns did she buy?

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