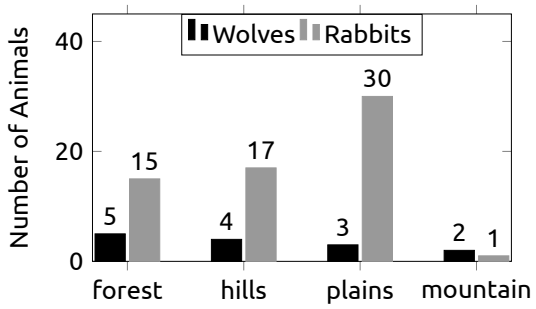
Section C

C1
How many more rabbits are there than wolves in the forest and plains combined?



Solution. In the forest and plains combined, there are 8 wolves and 45 rabbits. So, there are 37 more rabbits than wolves.

Answer to C1: 37

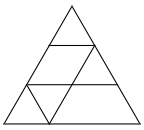
C2
What is the smallest 4 digit positive whole number whose 4 digits are all different?

Solution. The smallest four digit positive whole number which all different digits can be determined as follows:

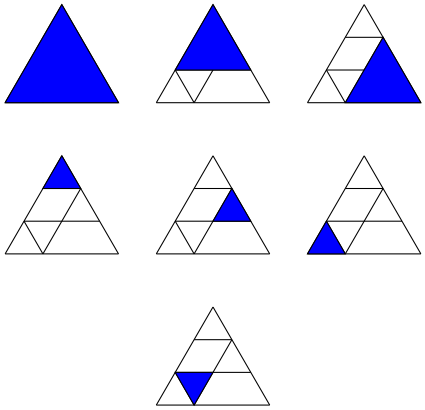
1. Determine the smallest possible first digit, which is 1. The first digit cannot be 0 since a number in the hundreds would be a three digit number.
2. Since each digit must be unique, the next three digits must be in order from the remaining digits from smallest to largest, which are: 0, 2 and 3.
3. Therefore, the smallest four digit number with all different digits is 1023

Answer to C2: 1023

C3
How many triangles are in this picture? Some triangles might be bigger than others. They also might point in different directions. Only count a triangle if all three sides are drawn.



Solution. All the triangles are highlighted in blue. There are 7.



Answer to C3: 7

C4
How many positive common factors do 24 and 60 have?

Solution. To determine the number of positive common factors 24 and 60 have can be determined by listing the positive factors of the lower number and then determining which factors also divide 60:

$$24 : 1, 2, 3, 4, 6, 8, 12, 24$$

From these positive factors, 60 is also divisible by the following: 1, 2, 3, 4, 6 and 12

Therefore, 24 and 60 have six positive common factors.

Answer to C4: 6

C5
The sum of two positive whole numbers is the same as their product. What are the two numbers? (Write your answer as __, __, filling in the blanks with the correct numbers.)

Solution. This can be solved by guess and check, for example:

$$1 : 1 + 1 = 2, 1 \times 1 = 1$$
$$2 : 2 + 2 = 4, 2 \times 2 = 4$$

Thus, the positive whole number is 2.

Answer to C5: $2, 2$

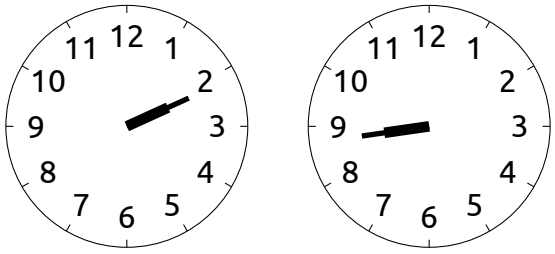
C6
Alona will do one math problem today, and increase the number of problems she does by one every day. (For example, tomorrow she'll do two and the next day she'll do three.) If today is Saturday, how many problems will she have done by the end of next Saturday?

Solution. From the start of this Saturday to the end of next Saturday, there are 8 days. (Remember, we are including both Saturdays!) She does 1 problem the first day, 2 problems the second day, …, 8 problems the last day, for a total of $1 + 2 + 3 + \cdots + 8 = 36$ problems.

Answer to C6: 36

C7

The drawing below shows analog clocks at around 2:11 and 8:44. At these times, the hour and minute hands overlap. Between 1:00 AM and 11:59 AM on any day, how many times do hour and minute hands overlap?



Solution. It might be easier to consider the period of time between 0:00 and 12:00 (in both cases, the clock hands overlap and point to the top). During this time, the hour hand moves 1 cycle, but the minute hand moves 12 cycles. So the minute hand must catch up to the hour hand 11 times. Each of these times is past 1:00, but the last one is at 12:00 which is after 11:59, so we need to exclude it. That leaves us with 10 times that the hour and minute hand overlap.

Answer to C7: 10

C8

I have \$5. For \$2 I can buy a pack of 3 toys, and for \$1 I can buy a single toy. What is the maximum number of toys I can buy?

Solution. For \$2 you can buy a bundle of three toys or two \$1 toys. Therefore, it is more efficient to buy the \$2 bundle (i.e. cheaper than \$1 per toy).

With \$5, you should buy two \$2 bundles and one of the \$1 single toy for a total of 7 toys (2×3 toys $+ 1 \times 1$ toys $= 7$ toys for cost of $2 \times \$2 + 1 \times \$1 = \$5$.

Answer to C8: 7