## MATH-3012-QHS M2.2-Quiz

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## Solutions

Here is an example sentence.

1. Find the number of permutations of all the letters in "GEOLOGICAL". Use a calculator to simplify your answer to an integer.

The number of permutations is 453,600.

- The word has 10 letters in total.
- The repeated letters are G (2 times), O (2 times), and L (2 times).
- The formula for permutations with repetitions is:

$$\frac{n!}{n_1!n_2!\dots n_k!}$$

• Calculation:

$$\frac{10!}{2! \cdot 2! \cdot 2!} = \frac{3,628,800}{8} = 453,600$$

2. How many length 5 permutations of the letters in BOTTLE are there?

The number of length 5 permutations is 360.

- The word has 6 letters, with 'T' repeated twice.
- Case 1: Permutations containing both 'T's. We choose 3 unique letters from the remaining 4 (B, O, L, E) and arrange them with the two 'T's.

$$\binom{4}{3} \cdot \frac{5!}{2!} = 4 \cdot 60 = 240$$

• Case 2: Permutations containing only one 'T'. We choose 4 unique letters from the remaining 4 and arrange them with the single 'T'.

$$\binom{4}{4} \cdot 5! = 1 \cdot 120 = 120$$

• Total permutations:

$$240 + 120 = 360$$

- 3. How many length 4 permutations of the letters in COMPUTER are there? The number of length 4 permutations is 1,680.
  - The word has 8 unique letters.

• We use the k-permutation formula:

$$P(n,k) = \frac{n!}{(n-k)!}$$

• Calculation:

$$P(8,4) = \frac{8!}{(8-4)!} = \frac{8!}{4!} = 8 \cdot 7 \cdot 6 \cdot 5 = 1,680$$

4. How many permutations of the symbols in "Elephantine" are there? Case matters! Use a calculator to simplify your answer to an integer.

The number of permutations is 9,979,200.

- $\bullet\,$  The word has 11 symbols.
- $\bullet$  The repeated symbols are 'e' (2 times) and 'n' (2 times).
- Calculation:

$$\frac{11!}{2! \cdot 2!} = \frac{39,916,800}{4} = 9,979,200$$