**4.1 Counting Principles**

**By the end of the lesson you will be able to:**

1. Determine the Fundamental Counting Principle and use it to solve problems
2. Identify and solve counting problems when the FCP does not apply

**Example 1**

Hannah plays on her school soccer team. The uniform has:

* Three different jerseys: maroon, grey and black
* Three different shorts: white, black and grey

How many different variations of the uniform can the coach choose for each game?

**Method #1: Use a Tree Diagram**

**Method #2: Use the Fundamental Counting Principle**

*Fundamental Counting Principle:*

When there are **\_\_\_** ways to do one thing and **\_\_\_\_** ways to do another, then there are **\_\_\_\_\_\_\_\_\_\_** ways of doing **\_\_\_\_\_\_\_\_\_**.

Note: This principle only applies when things are linked by the word \_\_\_\_\_\_\_\_\_\_.

**Example 2 – Extending the Fundamental Counting Principle past 2 tasks**

 A lock opens with a correct three-number code.

1. How many different three-number codes are possible?

1. Suppose each number can only be used once in a code. How many different codes are possible when repetition is not allowed?

**Example 3 – When the Fundamental Counting Principle does not apply**

The Fundamental Counting Principle does not always apply, specifically when tasks are linked by the word \_\_\_\_\_\_\_.

* If task/things are mutually exclusive, they involve \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_, A and B: then $n\left(A∪B\right)=n\left(A\right)+n(B)$

* If the tasks are not mutually exclusive, they involve two sets that are not disjoint, C and D: then $n\left(C∪D\right)=n\left(C\right)+n\left(D\right)-n(C∩D)$

* + We use the Principle of Inclusion and Exclusion must be used to avoid counting elements in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of two sets more than once.



a) What is the probability of drawing a single card and getting a club or a red card?

b) What is the probability of drawing a single card and getting a heart or a 2?

**Assignment**: P. 235 #1-3, 5-7, 9, 12, 14, 15

