# STAT2110 PASS Worksheet 1

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## 1 Key Formulas

- Sample mean:

$$\bar{x} = \sum_{i=1}^{n} \frac{x_i}{n}$$

- Sample variance:

$$s^2 = \sum_{i=1}^{n} \frac{(x_i - \bar{x})^2}{n-1}$$

- Numbers of permutations of $n$ distinct objects taken $r$ at a time:

$${}_nP_r = \frac{n!}{(n-r)!}$$

- Number of combinations of $n$ distinct objects taken $r$ at a time:

$$\binom{n}{r} = \frac{n!}{r!(n-r)!}$$

- If A and B are two events, then

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

- The conditional probability of B given A is defined by

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

## 2 Questions

1. A coin is to be flipped three times. List the possible outcomes in the form (result on toss 1, result on toss 2, result on toss 3).
2. A confectionery company report that their product is composed of 15% yellow, 10% red, 20% orange, 25% blue, 15% green, and 15% brown. Suppose you randomly select a product, what is the probability of the following?
   (a) It is brown.
   (b) It is red or green.
   (c) It is not blue.
   (d) It is both red and brown.
3. (a) How many possible outcomes are there from rolling a six-sided dice 5 times?
   (b) How many possible outcomes are there from rolling a pair of six-sided dice 7 times?
   (c) How many possible outcomes are there from rolling an eight-sided dice 10 times then tossing a coin 10 times?
4. How many ways are there to select 5 candidates from 9 equally qualified recent graduates for openings in an accounting firm? **(2.47)**
5. In a high school graduating class of 100 students, 54 studied mathematics, 69 studied history, and 35 studied both mathematics and history. If one of these students is selected at random, find the probability that **(2.61)**
   (a) the student took mathematics or history;
   (b) the student did not take either of these subjects;
   (c) the student took history but not mathematics.

6. In a poker hand consisting of 5 cards, find the probability of holding **(2.59)**

   (a) 3 aces;

   (b) 4 hearts and 1 club.

7. A random sample of 200 adults are classified below by sex and their level of education attained. **(2.75)**

| **Education** | **Male** | **Female** |
|---|---|---|
| Elementary | 38 | 45 |
| Secondary | 28 | 50 |
| College | 22 | 17 |

   If a person is picked at random from this group, find the probability that:

   (a) the person is a male, given that the person has a secondary education;

   (b) the person does not have a college degree, given that the person is a female.

# 3 Challenge Questions

9. The sample mean and sample variance of five data values are, respectively, $\bar{x} = 49.4$ and $s^2 = 16.8$. If three data values are 50, 48 and 48, what are the other two data values?

10. A group of 5 boys and 10 girls is lined up in random order - that is, each of the 15! permutations is assumed to be equally likely.

    (a) What is the probability that the person in the 4th position is a boy?

    (b) What is the probability that the person in the 12th position is a boy?

    (c) What is the probability that a particular boy is in the 3rd position?