Week 04/05
Term 1
2024

HAWKER COLLEGE
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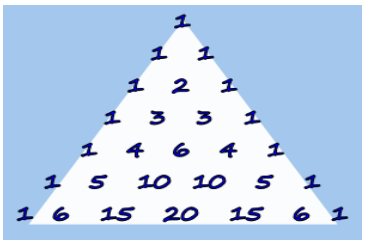
Learning Brief
SMM1: Counting and Probability

Goals



By the end of this week, you should be able to:

- Use combinations to count selections of objects where order is not important; use the ${}^{n}C_{r}$ notations to represent selections where order is not important; use CAS to compute ${}^{n}C_{r}$ for a given n and a given r
- Investigate patterns in Pascal's triangle and the relationship to combinations, establish counting principles and use them to solve simple problems involving numerical values for *n* and *r*.
- Understand the fundamentals of probability (review)
- Define experiment, outcome, event, probability and equally likely.
- Recognize the difference between outcomes that are equally likely and not equally likely to occur.
- Examine the sample space, using tree and lattice diagrams, and probabilities for experiments

Theoretical Components

You will require Chapter 12 of Maths Quest 11 Mathematical Methods 11
Read through Section 12G on Combinations.
Study and make notes on Examples 22 -25.
Read through Section 12H on Applications to Probability (pdf Google Drive). Study and make notes on Examples 26 -29.

How can you use Pascal's Triangle to find combinations or how can you use combinations to find a value in Pascal's Triangle?

http://www.mathsisfun.com/data/binomial-distribution.html

Review of the fundamentals of probability:

- review probability as a measure of 'the likelihood of occurrence' of an event
- review the probability scale: $0 \leq P(A) \leq 1$ for each event A, with $P(A) = 0$ if A is an impossibility and $P(A) = 1$ if A is a certainty
- review the rules: $P(A') = 1 - P(A)$ and $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Watch these videos:
https://www.khanacademy.org/math/probability/probability-and-combinatorics-topic/probability_combinatorics/v/events-and-outcomes-3

https://www.khanacademy.org/math/probability/probability-and-combinatorics-topic/probability_combinatorics/v/getting-exactly-two-heads-combinatorics

https://www.khanacademy.org/math/probability/probability-and-combinatorics-topic/probability_combinatorics/v/probability-using-combinations

Practical Components

Do the following questions:

- EX 12G: ALL the odd numbered questions
- EX 12H: Questions 1-19

Write the nth row of Pascal's Triangle using ${}^{n}C_{r}$ notation. Expand:

- $(x + y)^n$
- $(2x - 3y)^n$

Investigation

1. How many 10-card hands containing exactly 7 hearts and 3 spades are possible from a standard 52-card deck?
2. A basketball squad of 10 must be chosen from a group of 8 women and 6 men. How many squads are possible:
   - without restriction?
   - if the squad contains 6 women and 4 men?
   - if the squad must contain at least 6 women?
   - if the squad contains all of the men?
3. Ten people randomly seat themselves about a circular table. What is the probability that 4 particular people will be sitting next to each other?
4. In the expansion of $(2 + 3x)^n$ the coefficients of x^3 and x^4 are in the ratio 8: 15. Find *n.*
5. What is the probability of getting exactly 50 heads on 100 flips of a coin?

QFO

In **Week 6** you are to sit an **In-Class Task** worth 15%. It is an open book task given under test conditions. You will be allowed to bring in any of your notes and worked exercises from Week 1 to 5 briefs inclusive and, of course, your calculator. More information to come.