SFU

STAT 330
Tutorial 1

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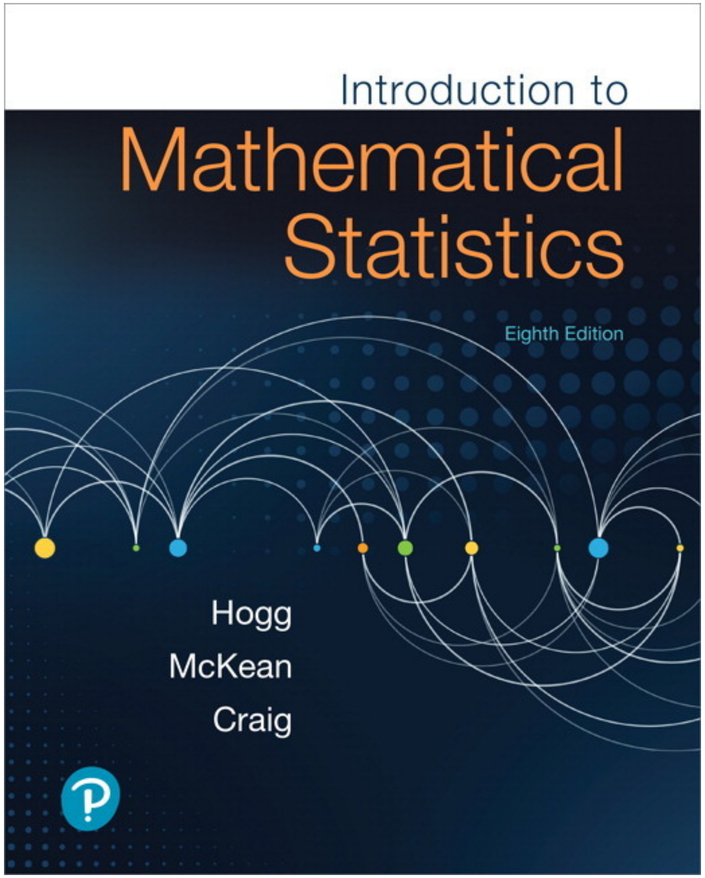
Department of Statistics & Actuarial Science

Sept 14th / Sept 16th

Textbook

Introduction of Mathematical Statistics, 8^{th} Edition



Assignments

- 1st assignment is assigned by emailing to the class list and posting in the course's canvas and web pages.

- Due on Sept 23rd by 17:30

- Submit Hwk by **CANVAS**!

Contents

R & Rstudio

R

- Go to https://mirror.rcg.sfu.ca/mirror/CRAN/

Rstudio

- Go to https://rstudio.com/products/rstudio/download/#download

R Examples

See example.r

Proof Strategy

- Direct Proof
- Proof by Contradiction
- Proof by Induction
- Proof by Contrapositive

Proof Strategy

Example:

The sum of any two consecutive numbers is odd.

Proof Strategy

Direct Proof

Assume P true
Use P to show that Q true

Proof Strategy

Direct Proof

Assume a,b are consecutive integers

so $b = a+1$

$a+b = a+(a+1) = 2a+1$

since a is an integer,

$2a$ is an even number

$2a+1$ is an odd number

Proof Strategy

Proof by Contradiction

$\text{Assume } P, \neg Q$ true

But deriving a contradiction

Proof Strategy

Proof by Contradiction

Assume a,b are consecutive integers

Also assume a+b is **not** odd

Then no integer k such that (a+b) = 2k+1

But a+b = a+(a+1) = 2a+1

There is a contradiction

So a+b is odd

Proof Strategy

Proof by Induction

Base case: Proof P, Q true for some basis case

Induction: Proof if P, Q is true for n, then they are true for n+1

Proof Strategy

Proof by Induction

Base case: 1+2 = 3 is odd

Induction case:

If x+(x+1) is odd

Then x+(x+1)+2 is also odd

x+(x+1)+2 = x+1+(x+1+1)

we can proof that if the statement is true for some x and its successor, then it is true for x+1 and its successor

Proof Strategy

Proof by Contrapositive

Proof $\neg Q \to \neg P$

Proof Strategy

Proof by Contrapositive

If $(a+b)$ is not odd, then a and b are not consecutive integers

since $(a+b)$ is not odd, there is no k exists such that $a+b = 2k+1$

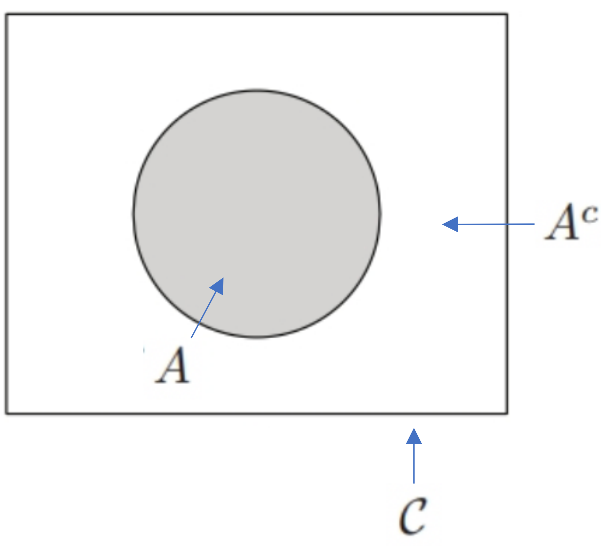
so $(a+b) = k+(k+1)$ does not hold for any integer k.

But $k+1$ is the successor of k, which implies that a and b cannot be consecutive

Review of Set Theory

Complement

Definition 1.2.1. *The* **complement** *of an event A is the set of all elements in $\mathcal{C}$ which are not in A. We denote the complement of A by A^c. That is, $A^c = \{x \in \mathcal{C} : x \notin A\}$.*

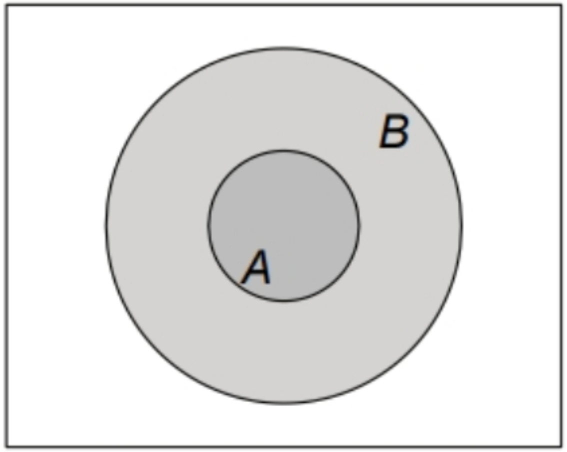


$$\mathcal{C}^c = \phi \text{ and } \phi^c = \mathcal{C}$$

Review of Set Theory

Subset

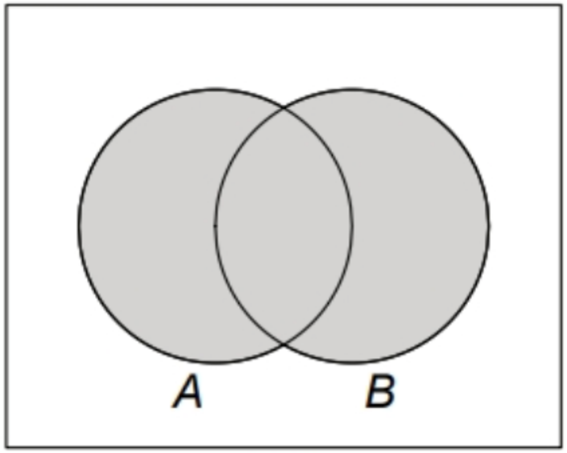
Definition 1.2.2. *If each element of a set A is also an element of set B, the set A is called a* **subset** *of the set B. This is indicated by writing $A \subset B$. If $A \subset B$ and also $B \subset A$, the two sets have the same elements, and this is indicated by writing $A = B$.*



Review of Set Theory

Union

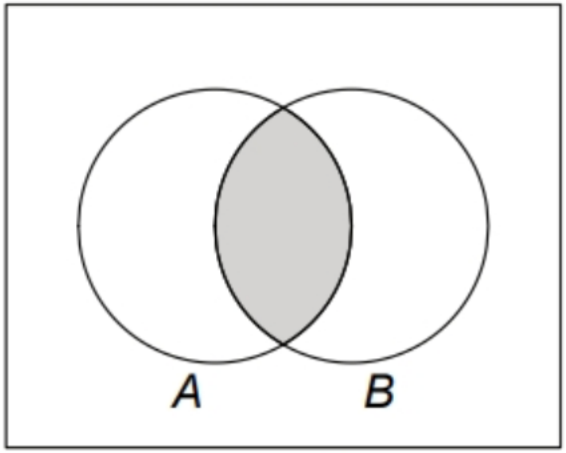
Definition 1.2.3. *Let A and B be events. Then the* **union** *of A and B is the set of all elements that are in A or in B or in both A and B. The union of A and B is denoted by $A \cup B$*



Review of Set Theory

Intersection

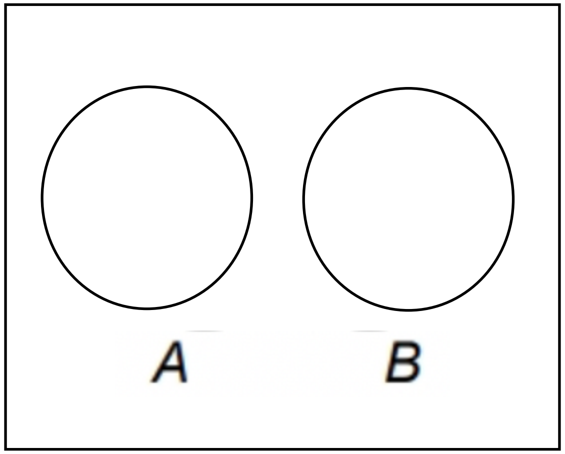
Definition 1.2.4. *Let A and B be events. Then the* **intersection** *of A and B is the set of all elements that are in both A and B. The intersection of A and B is denoted by $A \cap B$*



Review of Set Theory

Disjoint

Definition 1.2.5. *Let A and B be events. Then A and B are* **disjoint** *if* $A \cap B = \phi$



Thanks!