

Homework 1 - ISYE 3770

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PART 1 - Textbook Questions

Q2.1.13

- a) $3 + 5 + 6 + 8$
- b) $1 + 2$
- c) $1 + 2 + 3 + 4 + 5$
- d) $7 + 8$
- e) $3 + 4 + 5$

Q2.1.21

- a) $A' = \{x \mid x \geq 72.5\}$
- b) $B' = \{x \mid 0 < x \leq 52.5\}$
- c) $A \cap B = \{x \mid 52.5 < x < 72.5\}$
- d) $A \cup B = \{x \mid x > 0\}$

Note: Sample space is positive real numbers.

Q2.2.13

$$C_4^5 \times C_6^{45} + C_5^5 \times C_5^{45}$$

```
choose(5, 4) * choose(45, 5) + choose(5, 5) * choose(45, 5)
```

```
## [1] 7330554
```

Q2.3.1

- a) $P(A) = 0.1 + 0.1 + 0.2 = 0.4$
- b) $P(B) = 0.2 + 0.4 + 0.2 = 0.8$
- c) $P(A') = 0.4 + 0.2 = 0.6$
- d) $P(A \cup B) = 0.1 + 0.1 + 0.2 + 0.4 + 0.2 = 1$
- e) $P(A \cap B) = 0.2$

Q2.3.17

- a) $A = \frac{52^8}{62^8}$
- b) $B = \frac{10^8}{62^8}$
- c) $62^8 - 52^8$

d) $\frac{10!}{2!} \cdot 52^6$

- a) $A = \frac{52^8}{62^8}$
 b) $B = \frac{10^8}{62^8}$
 c) $62^8 - 52^8$
 d) $10^2 \cdot 52^6$

Q2.4.7

a) $\frac{C_1^5 \times 36^5}{36^6}$

```
choose(5, 1) * (36**5) / 36**6
```

```
## [1] 0.1388889
```

b) $\frac{36^5 \times C_1^5}{36^6}$

```
(36**5) * choose(5, 1) / 36**6
```

```
## [1] 0.1388889
```

c) $\frac{C_1^5 \times 36^4 \times C_1^5}{36^6}$

```
choose(5, 1) * (36**4) * choose(5, 1) / 36**6
```

```
## [1] 0.01929012
```

d) $\frac{2 \times C_1^5 \times 36^5 - C_1^5 \times 36^4 \times C_1^5}{36^6}$

```
(2 * choose(5, 1) * 36**5 - choose(5, 1) * 36**4 * choose(5, 1)) / 36**6
```

```
## [1] 0.2584877
```

PART 2

Find the numbers of combinations for the following 5-card Poker hand.

a) Three of a Kind It contains three cards of the same number(rank), plus two cards which are not of this number nor the same as each other. For example: AAA83, KKK72, . . .

Solution: $C_1^{13} \times C_3^4 \times C_1^{48} \times C_1^{47}$

```
choose(13, 1) * choose(4, 3) * choose(48, 1) * choose(47, 1)
```

```
## [1] 117312
```

PART 3

Four Candidates: A, B, C, and D run for the president of GT Elementary School. Suppose we have 100 voters (students) and everyone needs to vote for exactly one candidate from A, B, C, and D and the votes are anonymous. How many different voting results (combinations) can we have here? [5 pts]

Solution: $C_4^{100+4-1}$

```
choose(100+4-1, 4)
```

```
## [1] 4421275
```