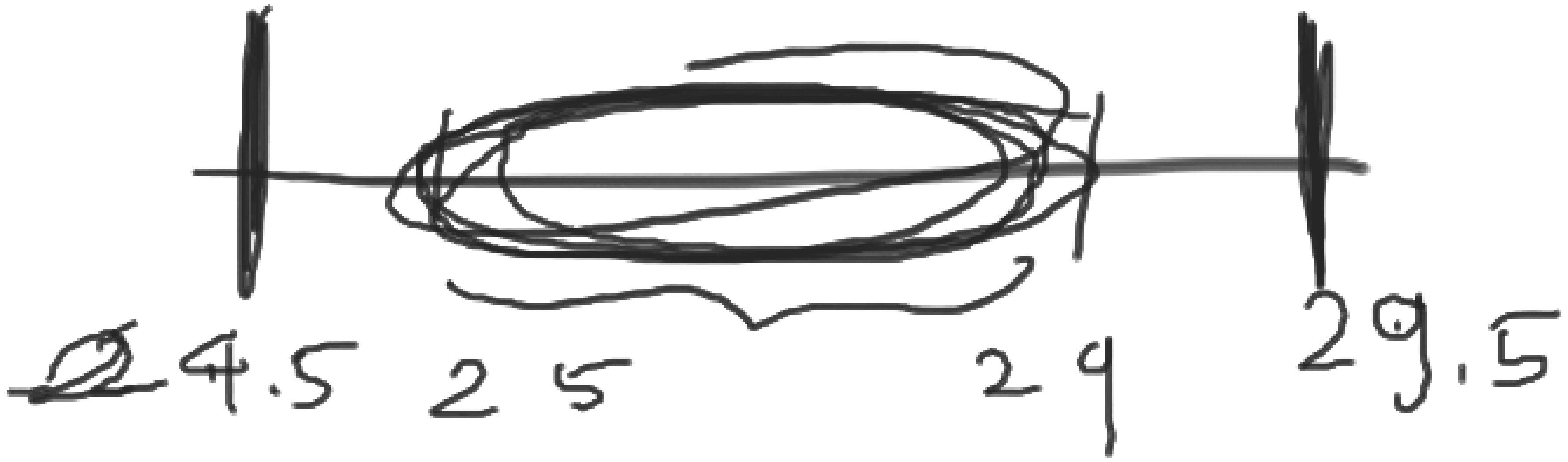
4

	freq	
25-29	5	24.5-29.5
30-34	10	29.5-34.5
35-39	12	34.5-39.5
40-44	7	39.5-44.5

-0.5 0.5



$0 \leq p \leq 1$.

$\Sigma p_i = 1$.

p - prob. of success

q - prob. of failure

$p + q = 1$.

$p = 1 - q$

$q = 1 - p$.

$p = \frac{1}{6}$

$p = \frac{1}{6} \times 4$

$= \frac{2}{3}$.

getting 3 on one die

a.

5 - blacks
6 - blue
7 - red

$\frac{6}{18} \leftarrow \frac{1}{3}$

single blue pen

1] prob. of getting single blue pen

$= \frac{6}{18}$.

2] Prob. either red or blue pen

$$= \frac{7}{18} + \frac{6}{18} = \frac{13}{18} \neq 1$$

3] Prob of getn black and blue pen

$$= \frac{5}{18} \times \frac{6}{18}$$

4] Prob eith blue/black/red $= \frac{6}{18} + \frac{5}{18} + \frac{7}{18}$

$= 1$

20 - men

33 - women

a) $\text{Prob}(\text{man}) = \frac{20}{20+33}$

b) $\text{Prob}(\text{women}) = \frac{33}{20+33}$

$\frac{20}{53}$, $\frac{33}{53}$

$= 0.3774$ $= 0.6226$.

$0 \leq p \leq 1$ $0 \leq p \leq 1$

$\frac{20}{53} + \frac{33}{53} = 1$

$p_1 + p_2 = 1$

Throwing dice

4 upward in 3 throws.

$$= \frac{1}{6} \times 3$$

---

10 horses $\longrightarrow \frac{1}{10} = 0.1$

$$\frac{1}{10} \times \frac{1}{10} = \frac{1}{100} = 0.01$$

$\cancel{A}$ $U = \{1, 2, \ldots 10\}$

$A = \{2, 4, 6, \ldots 10\}$

$\overline{A} = \{1, 3, 5, \ldots 9\}$

$N = 40$

Defective $\rightarrow A$
(5)

$P(A) = \frac{5}{40} = \frac{1}{8}$

$P(\bar{A}) = \frac{35}{40} = \frac{7}{8}$

Non defective $\rightarrow \bar{A}$
(35)

5 - defective $\longrightarrow$ 35 - Non-defective

$\frac{35}{40}$ $\downarrow$ 1 drawn of 40

$\frac{34}{39}$ 34 - Non-defective
$\downarrow$ 1 drawn of 39.

S - sample space.

A - event

$P(A) = p$.

$P(\phi) = 0$

$P(A) \leq 1$

$P(A^c) = 1 - P(A)$

$P(S) = 1$.

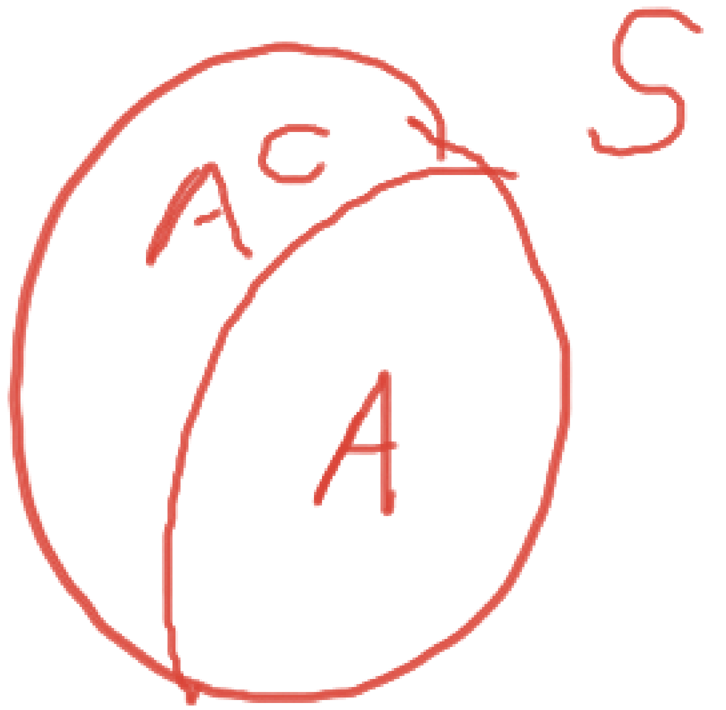
1] Prove $P(A^c) = 1 - P(A)$.

We know that $S = A \cup A^c$.

$\Rightarrow P(S) = P(A \cup A^c)$

$\Rightarrow 1 = P(A) + P(A^c)$

$\Rightarrow 1 - P(A^c) = P(A)$



A & A^c - disjoint

Prove $P(A) \leq 1$.

Sol^n Since, $P(A^c) \geq 0$.

$\Rightarrow 1 - P(A) \geq 0$

$\Rightarrow 1 \geq P(A)$

$\Rightarrow P(A) \leq 1$.

same

3] Prove $P(S) = 1$.

Since, $S = S \cup \phi$

$$P(S) = P(S \cup \phi)$$

$$= P(S) + P(\phi)$$

$$P(S) = 1 + 0$$

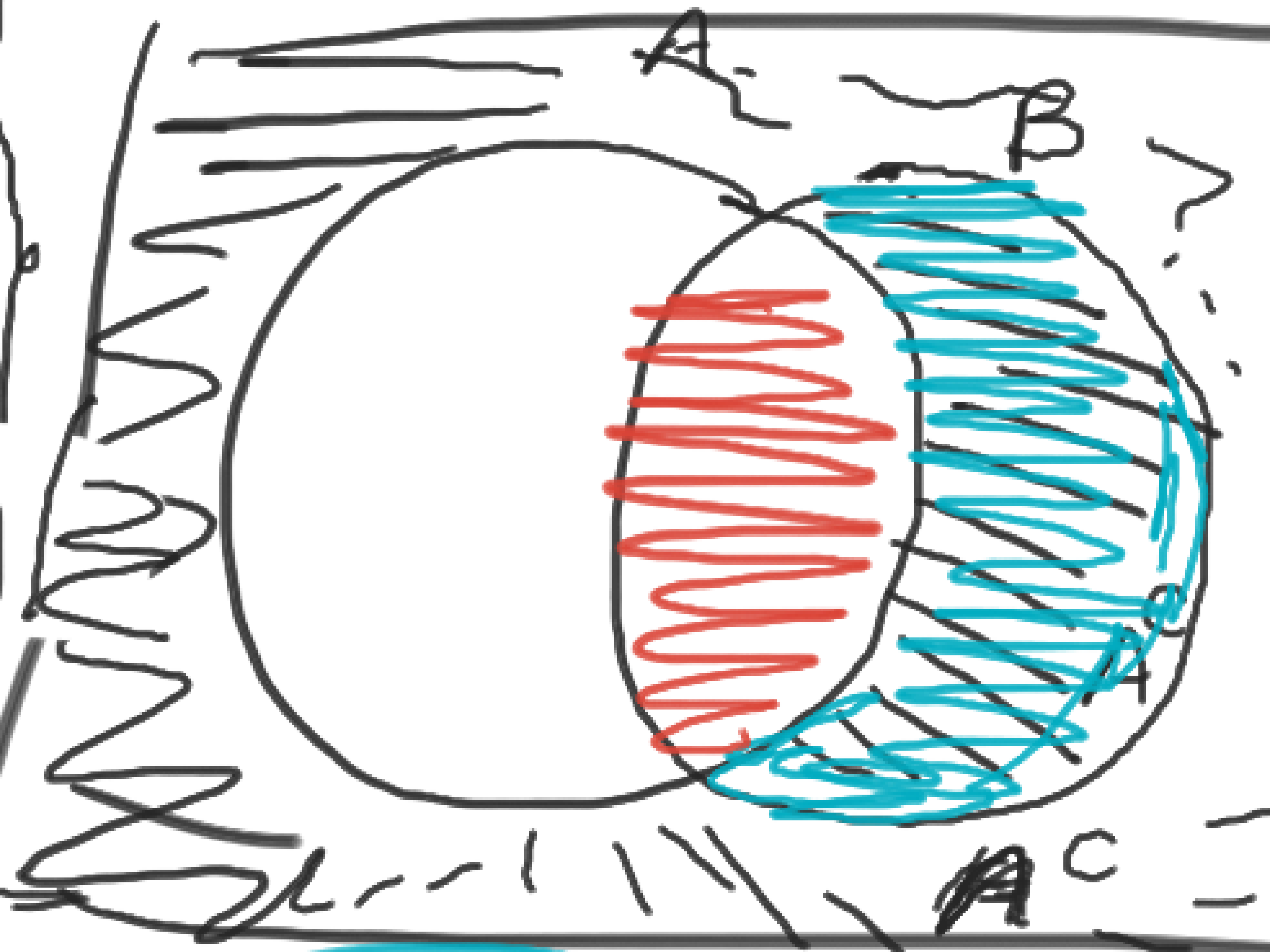
$$\boxed{P(S) = 1}$$

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

Sol^n :

$$B = B \cap S$$
$$= B \cap (A \cup A^c)$$
$$B = (B \cap A) \cup (B \cap A^c)$$
$$P(B) = P(A \cap B) + P(B \cap A^c)$$
$$P(B \cap A^c) = \underline{P(B)} - P(A \cap B)$$

$$A \cup B$$
$$= A \cup (B \cap A^c).$$



$B \cap A^c = B - (A \cap B)$

$$A \cup B = A \cup (B \cap A^c)$$

$$P(A \cup B) = P(A) + P(B \cap A^c)$$

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

$$A \subseteq B$$

$$P(A) \leq P(B)$$

$A_1, A_2, \ldots\ldots, A_n \xrightarrow{\text{mutually}}$ disjoint

$P(A_1) = p_1 \quad , \quad P(A_2) = p_2 \quad , \ldots \ldots \quad P(A_n) = p_n$

$$P\left(\bigcup_{i=1}^{n} A_i\right) = \sum_{i=1}^{n} P(A_i)$$

$$P(A_1 \cup A_2 \cup \ldots \cup A_n) = P(A_1) + P(A_2) + \ldots + P(A_n)$$

$$P(A \cup B) = P(A) + P(B) - P(\underbrace{A \cap B}_{= \emptyset})$$

A & B are disjoint

$$\boxed{P(A \cup B) = P(A) + P(B)}$$

$$P(\cup A_i) = \sum P(A_i)$$

Random Variable

$\therefore \rightarrow 2^3 = 8.$

Toss a coin thrice.

$S = \{HHH, HHT, HTH, THH, TTH, THT, HTT, TTT\}$

X = No. of heads.

S	HHH	HHT	HTH	THH	TTH	THT	HTT	TTT
X	3	2	2	2	1	1	1	0
$P(X=x)$	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8

$P(\cancel{X}=x)$

$X = \{0, 1, 2, 3\} \rightarrow$ countable

Discrete Random Variable

$P(X=x) = P(X=0) = \frac{1}{8}$

$P(X=1) = 3/8$

$= P\{TTH, THT, HTT\}$

$P(X=2) = 3/8$

X	0	1	2	3
$P(X=x)$	$1/8$	$3/8$	$3/8$	$1/8$

$P(1 \leq X \leq 3)$

$= \frac{3}{8} + \frac{3}{8} + \frac{1}{8}$

$= \frac{7}{8}$

Probability distributⁿ of X = no. of heads.

$P(X < 2) = P\{X = 0, 1\}$

$= P\{X = 0\} + P(X = 1)$

$\frac{1}{8} + \frac{3}{8} = \frac{4}{8}$

$\mathbb{N} = \{1, 2, \ldots\}$ — countable.

$\mathbb{R} = (-\infty, \infty)$ —

$[0, 1] \neq \{0, 1\}$

Uncountable　　　　Countable.

$$X : \Omega \longrightarrow \mathbb{R}.$$

$$\{HH, \dots, TT\} \longrightarrow \{0, 1, 2, 3\} \subseteq \mathbb{R}$$

Random variable.

$P(X = x)$ table

Probability mass function (p.m.f)