(1) A card is drawn at random from a 52 deck cards so that each card has an equal probability of being drawn. Find the probabikity of drawing:

(a) red card = $\frac{26}{52}$ possible

Jack = $\frac{4}{52}$ possible

} overlap = $\frac{2}{52}$

$P(\text{not Red and not Jack}) = 1 - \left(\frac{26}{52} + \frac{4}{52} - \frac{2}{52}\right)$

$= 1 - \frac{28}{52} = \frac{24}{52}$

(b) A face card or a red Card

$P(\text{Face}) = \frac{12}{52}$ (6 are red)

$P(\text{Red}) = \frac{26}{52}$ (6 are face)

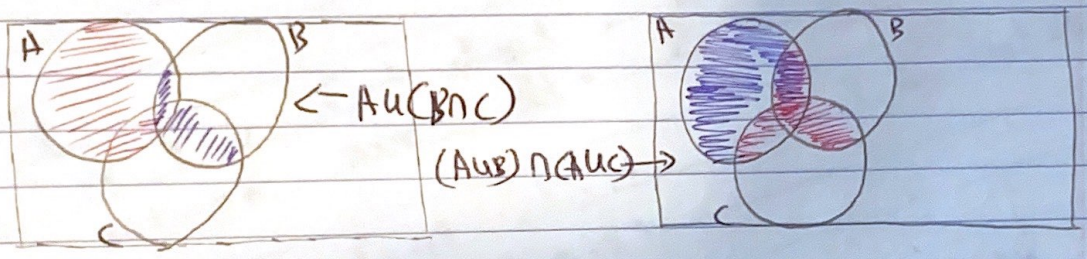
} overlap = $\frac{6}{52}$

$P(\text{Face or red}) = \left(\frac{12}{52} + \frac{26}{52} - \frac{6}{52}\right)$

$= \frac{32}{52} =$

(2) Use Venn Diagram to verify the following statement

$$\underset{\text{Red}}{A} \cup (\underset{\text{Blue}}{B} \cap C) = (\underset{\text{Blue}}{A} \cup \underset{\text{Red}}{B}) \cap (\underset{\text{Blue}}{A} \cup \underset{\text{Red}}{C})$$



$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$$

(3) 7249 less than 7000

~~even~~ odd

less than 7000 means first digit is {2} or {4}

possible outcome = 3! + 3! = 4

let x be less than 7000 and odd

P(x < 7000) → 2 or 4 will be first digit
P(x is odd) → last number can't be 2 or 4

- if 2 is first digit, possible outcome are 3! = 3x2x1 = (6)
- if 4 is first digit, possible outcome are 3! = 3x2x1 = (6)

- if 2 is first digit, and 4 is last digit, outcomes are 2! = 2x1 = (2)
- if 4 is first digit and 2 is last digit, outcomes = 2! = 2x1=2

P(being less than 700 ~~∩~~ odd number)

$= \frac{6}{4!} + \frac{6}{4!} - \frac{2}{4!} - \frac{2}{4!}$

$= \frac{6}{24} + \frac{6}{24} - \frac{2}{24} - \frac{2}{24} = \frac{8}{24}$ or $\frac{1}{3}$

(4) In how many ways can there be a first, second, and 4th place runner with 8 runners

$$\frac{8!}{4!(6)} = \frac{8\times7\times6\times5\times4!}{4!(6)} = \frac{8\times7\times4\times5}{6} = 280$$

(5) Define a sample space for following coin 6-sided die, 2-sided coin

~~P(die) =~~ die = 6 outcomes

~~H T~~ coin = 2 outcomes

Possible outcomes = 6 × 2 = (12)