

Agenda

* Basic Definitions

✓ Sample space

✓ Event

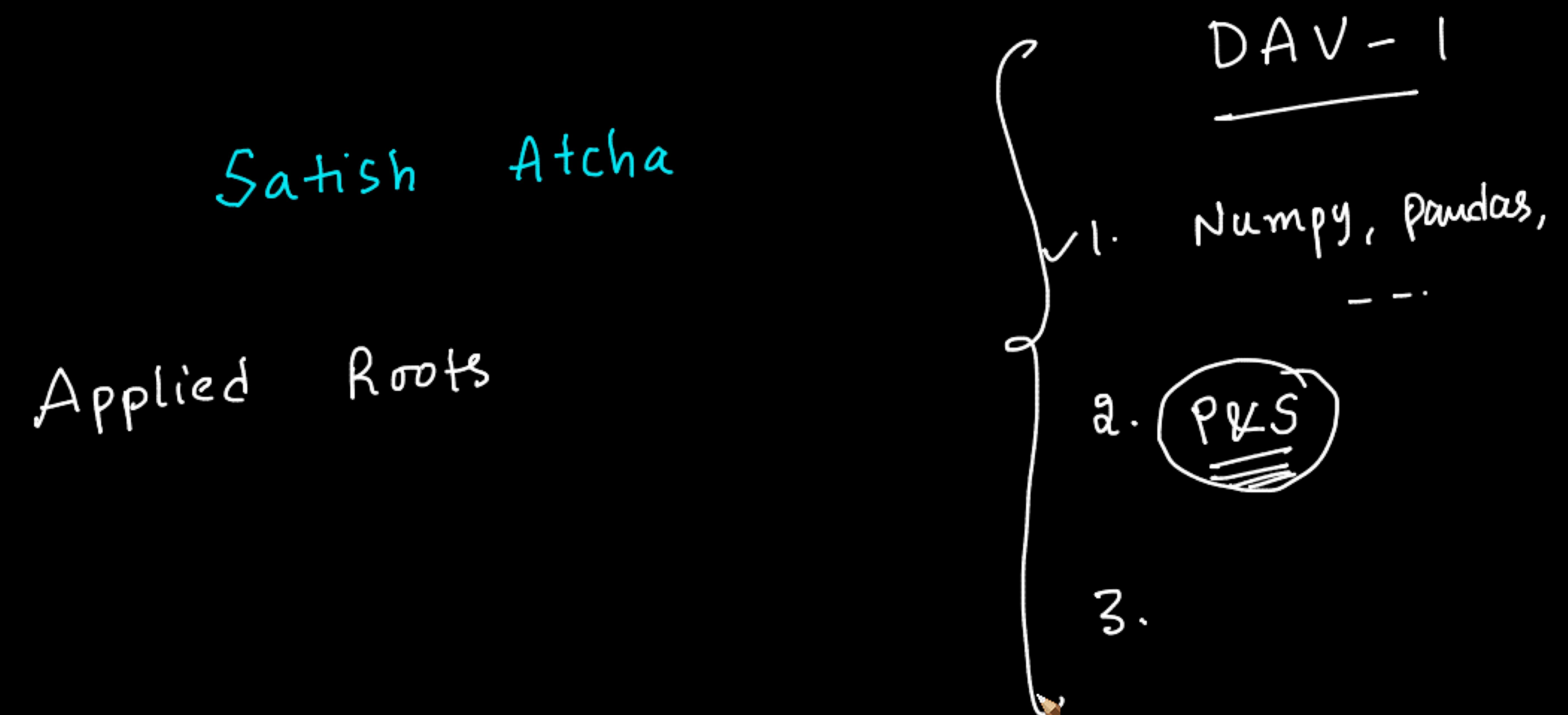
Set operations

✓ Union, Intersection, complement

Assignments

Probability

Mutually Exclusive Events



=> When was the last time you saw probability?



=> Where you see probability?

Sample Space: It is a collection of all possible outcomes of a experiment.

Ex: Throwing a Dice

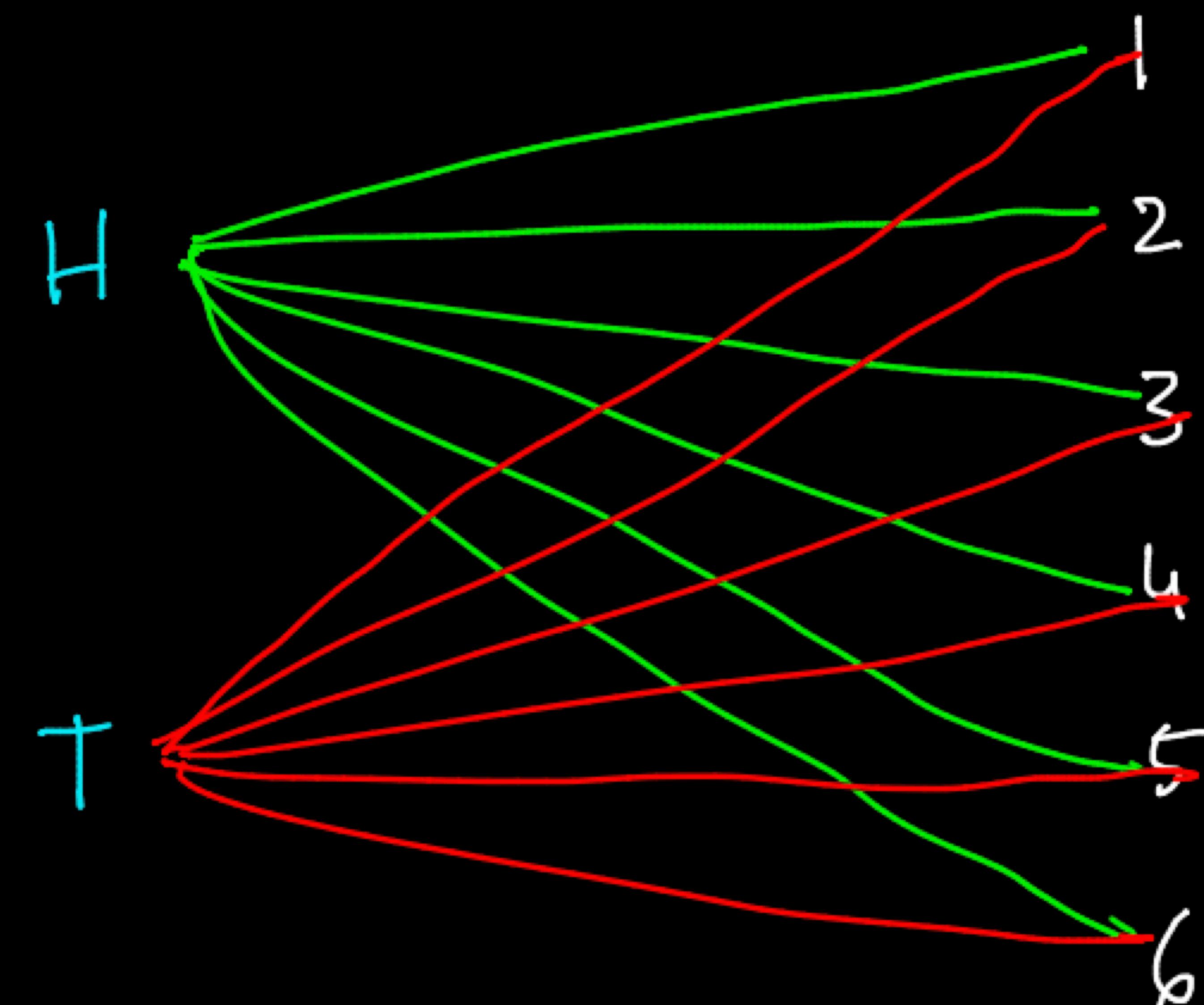
$$S = \{1, 2, 3, 4, 5, 6\}$$

Ex: Tossing a coin

$$S = \{H, T\}$$

Quiz
=✓ What will be the size of sample space if we roll a die and toss a coin simultaneously?

Toss a coin Roll a die



$$S = \{ (H, 1), (H, 2), \dots, (H, 6), (T, 1), (T, 2), \dots, (T, 6) \}$$

Event : Any subset of the sample space (Ω)
Any collection of an outcome.

{ all }
any }

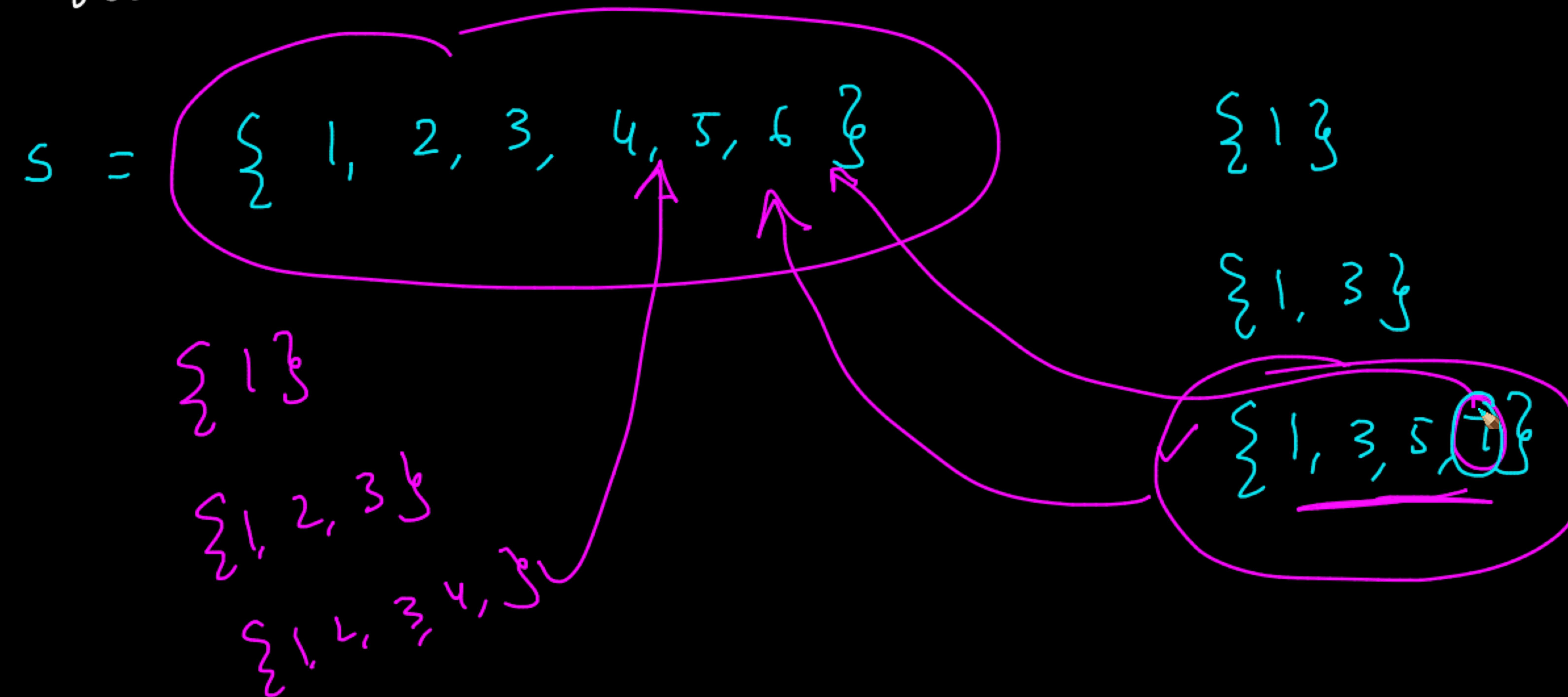
Ex: Dice $S = \{1, 2, 3, 4, 5, 6\}$

Odd number $= \{1, 3, 5\}$

Even no $= \{2, 4, 6\}$
 $\{1, 3\}$

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Q4iz
which of the following is not an event if we
roll a die?



Set operations

Dice

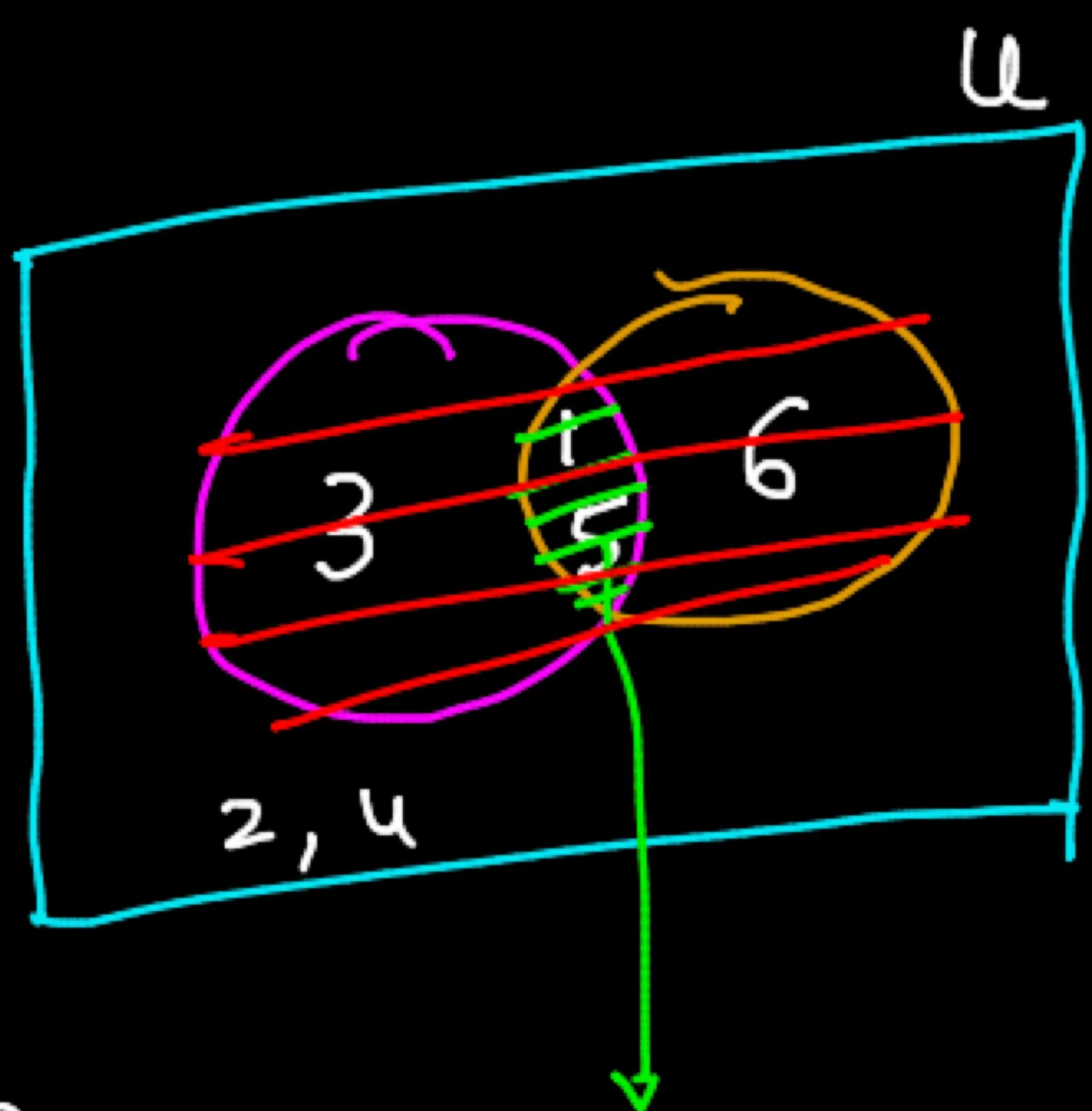
$$S = \{1, 2, 3, 4, 5, 6\}$$

$$A = \{1, 3, 5\}$$

$$B = \{1, 5, 6\}$$

(1) when will both A & B will win?

$$A \cap B = \{1, 5\}$$

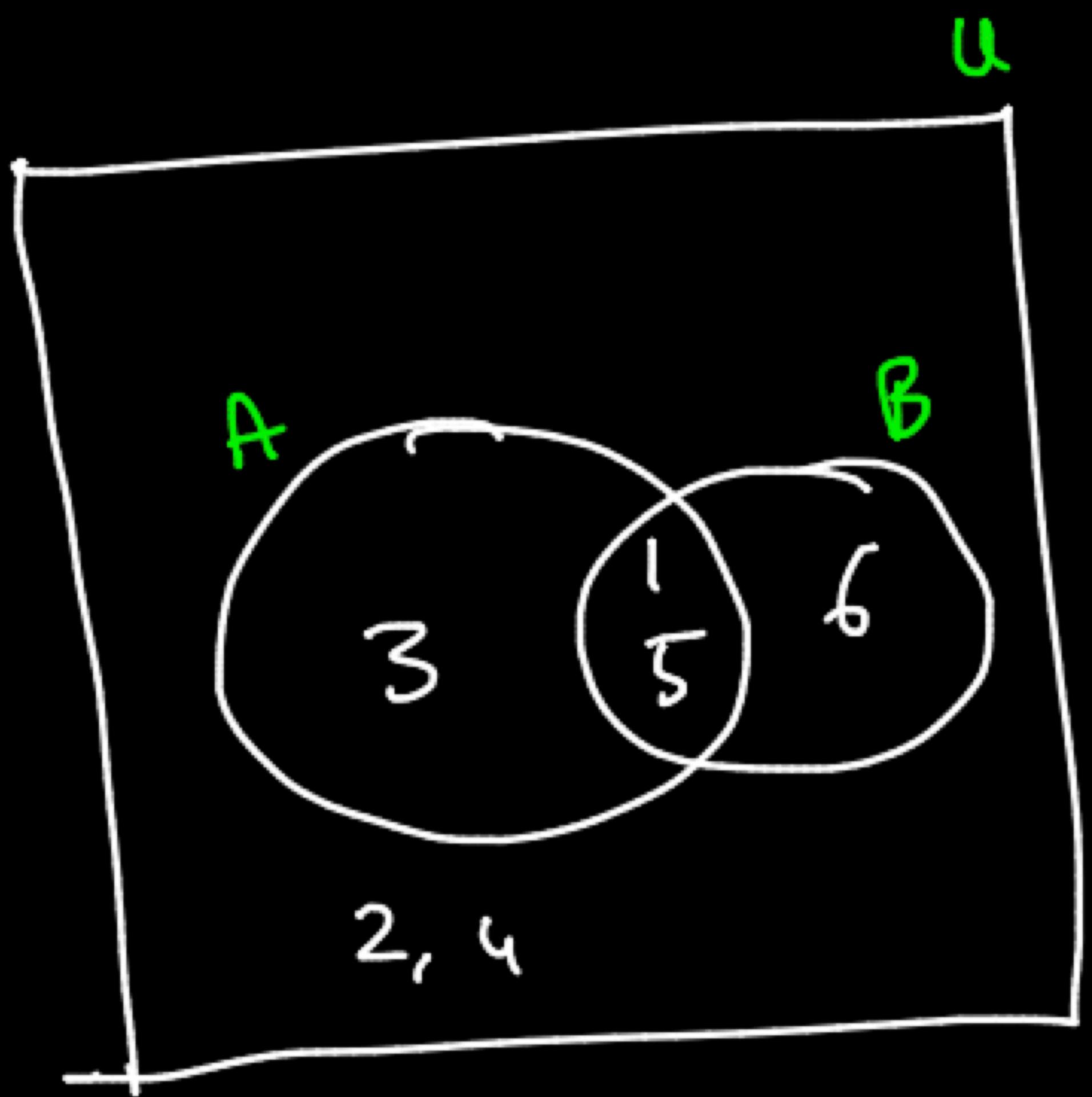


⇒ when will A or B win?

$$A \cup B = \{1, 3, 5, 6\}$$

⇒ when will A loose?

$$A^c = \{2, 4, 6\}$$



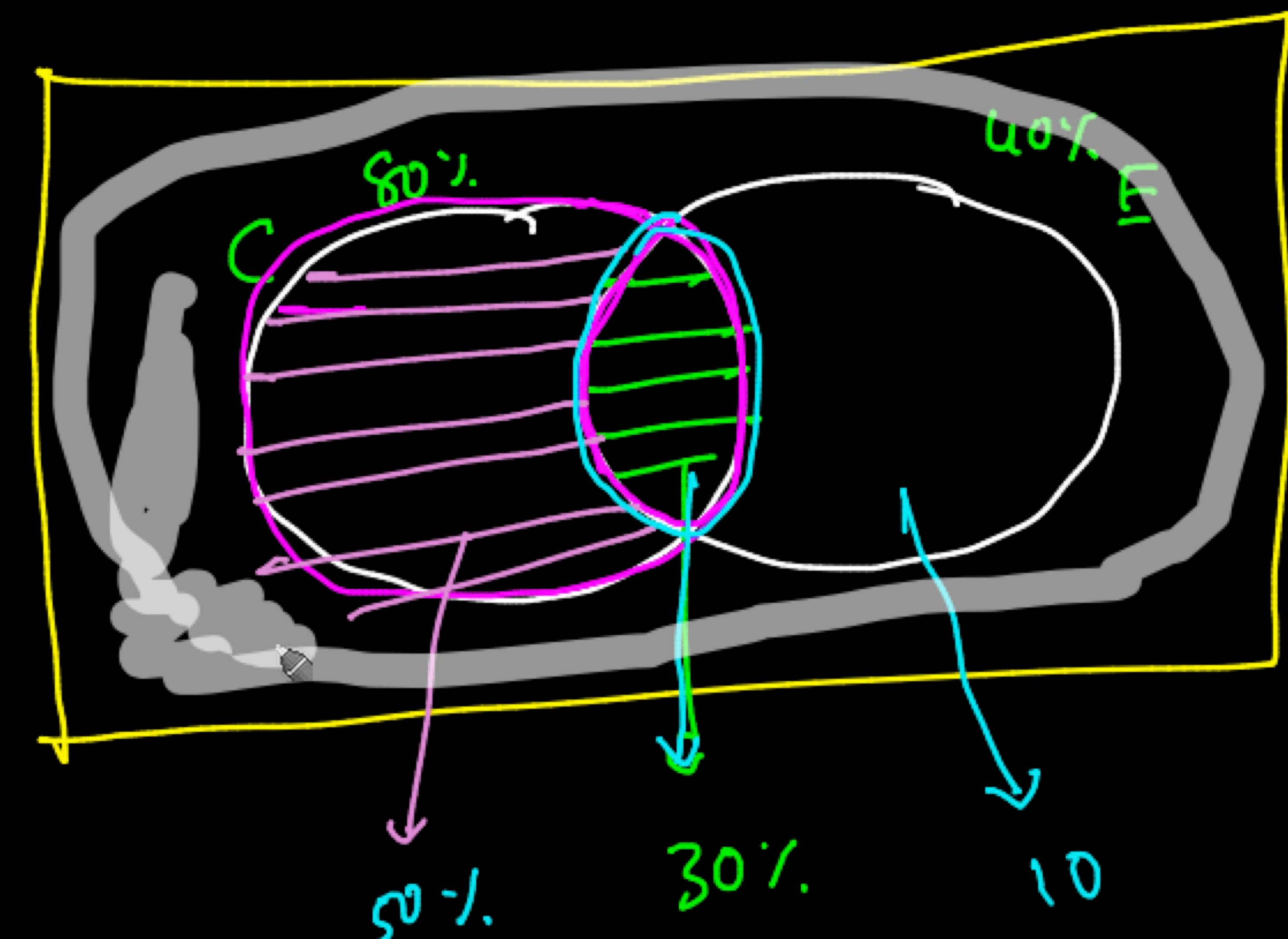
Quiz

80% people like cappuccino

40% "

30% both

what % of the people like cappuccino, but do not like espresso?



$$80 - 30 = 50\%$$

⇒ what % of people like espresso, but do not like cappuccino?

$$100 - 30 = \textcircled{10}$$

⇒ what % of neither like espresso nor cappuccino?

$$100 - (\underline{\underline{50 + 30 + 10}}) = \textcircled{10 \%}$$

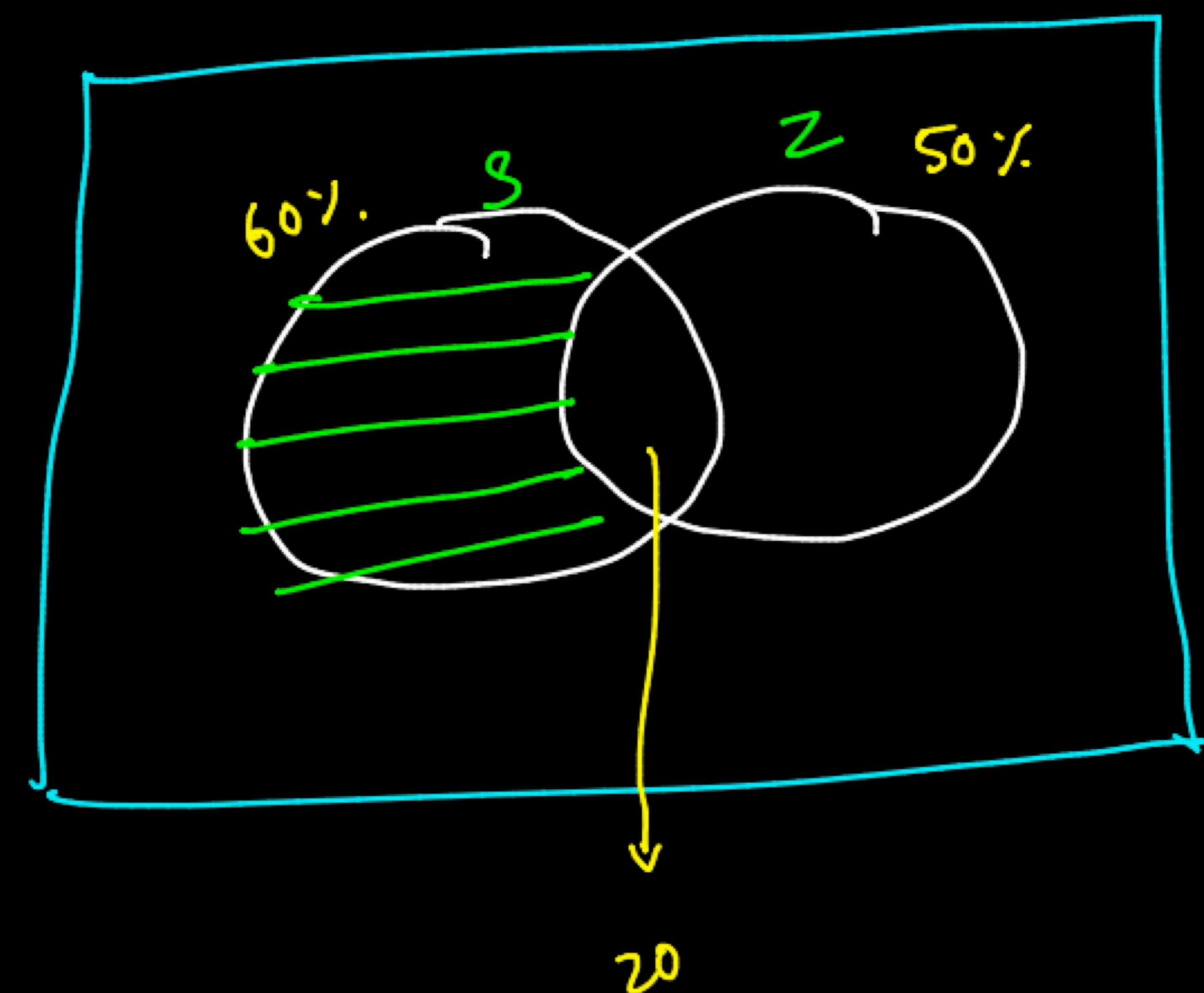
Quiz
≡

60% people use Swiggy,

50% " " zomato

20% " " Bolt

what % of people use swiggy but do not use zomato?

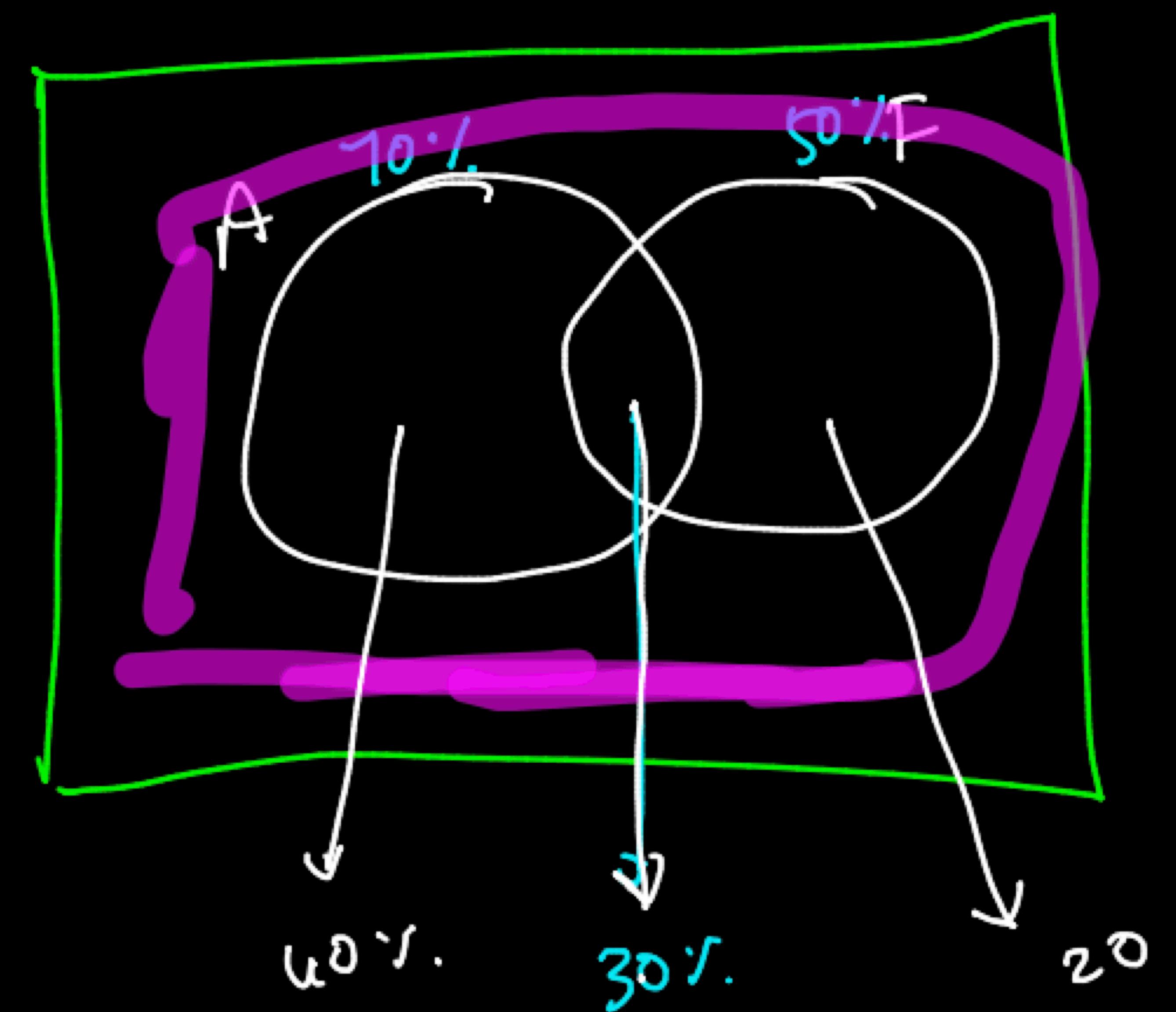


$$60 - 20 = \underline{\underline{40\%}}$$

Quiz

70% use Amazon
50% use Flipkart
30% use Both

what % of people use neither Amazon nor flipkart?



$$100 - 30 = 40$$

$$100 - 90 = 10$$



Probability

=> How likely that event is to occur.

Ex:



$$S = \{ H, T \}$$

$$P(H) = \frac{1}{2} = 0.5$$

$$P(T) = \frac{1}{2} = 0.5$$

Dice
≡

$$S = \{1, 2, 3, 4, 5, 6\}$$

$$P(\{\cdot_1\}) = \frac{1}{6} =$$

$$P(\{\cdot_2\}) = \frac{1}{6}$$

$$\{\cdot_3\} \quad \frac{1}{6}$$

⋮

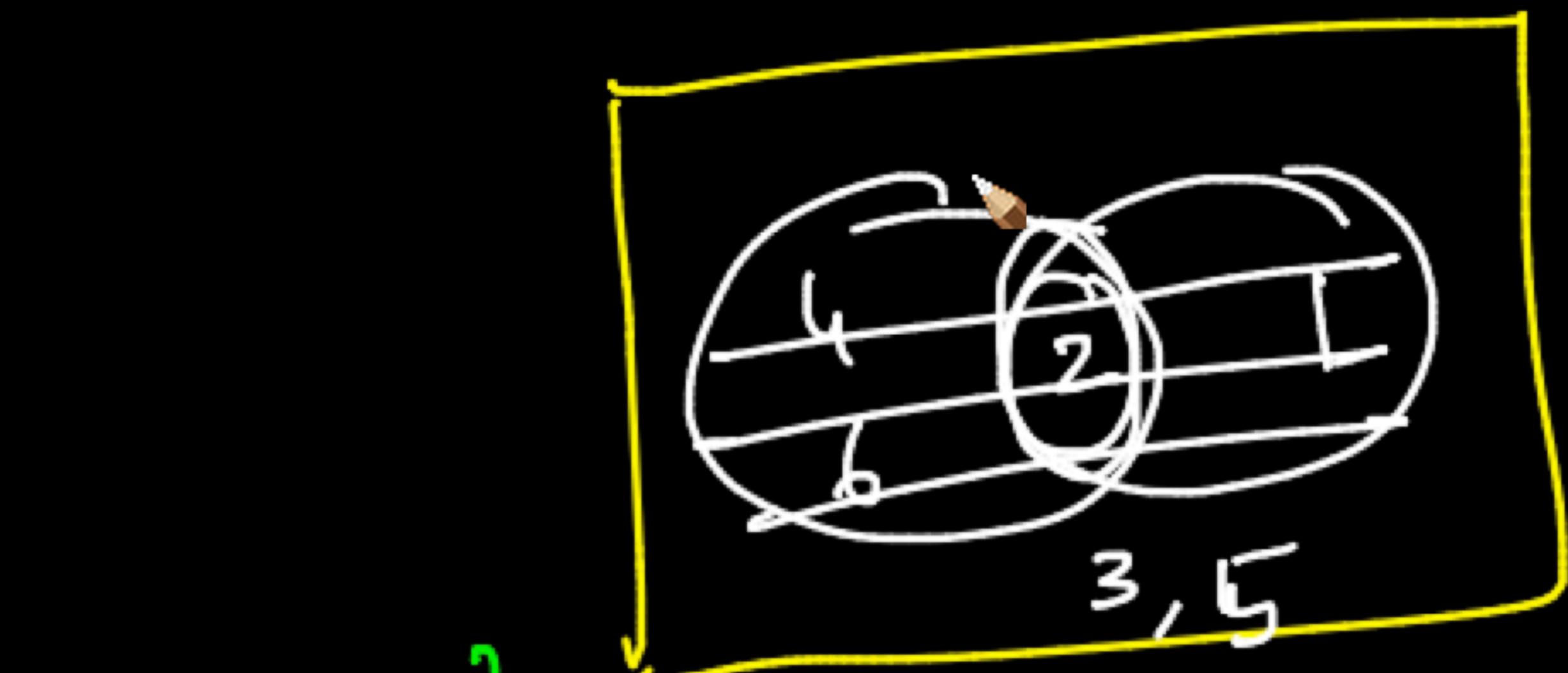
$$S = \{1, 2, 3, 4, 5, 6\}$$

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

$$B = \{1, 2\}$$

iii) $P(A) = \frac{3}{6} = \frac{1}{2}$

ii) $P(B) = \frac{2}{6} = \frac{1}{3}$



$$\{1, 3, 5\}$$

$$P(A^c) = \frac{3}{6} = \frac{1}{2}$$

$$\{3, 4, 5, 6\}$$

$$P(B^c) = \frac{4}{6} = \frac{2}{3}$$

\equiv

$$(5) \quad P(A \cap B) = \frac{1}{6} = \{2\}$$

$$(6) \quad P(A \cup B) = P(A) + P(B) - P(A \cap B) = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$$

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

Mutually Exclusive \Leftrightarrow Disjoint sets

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

$$B = \{1, 2\}$$

$$C = \{1, 3, 5\}$$

\Rightarrow which of the following represent mutually exclusive sets?

$$A \cap C = \{\} \Leftrightarrow \emptyset$$

$P(A \cap C) = 0$

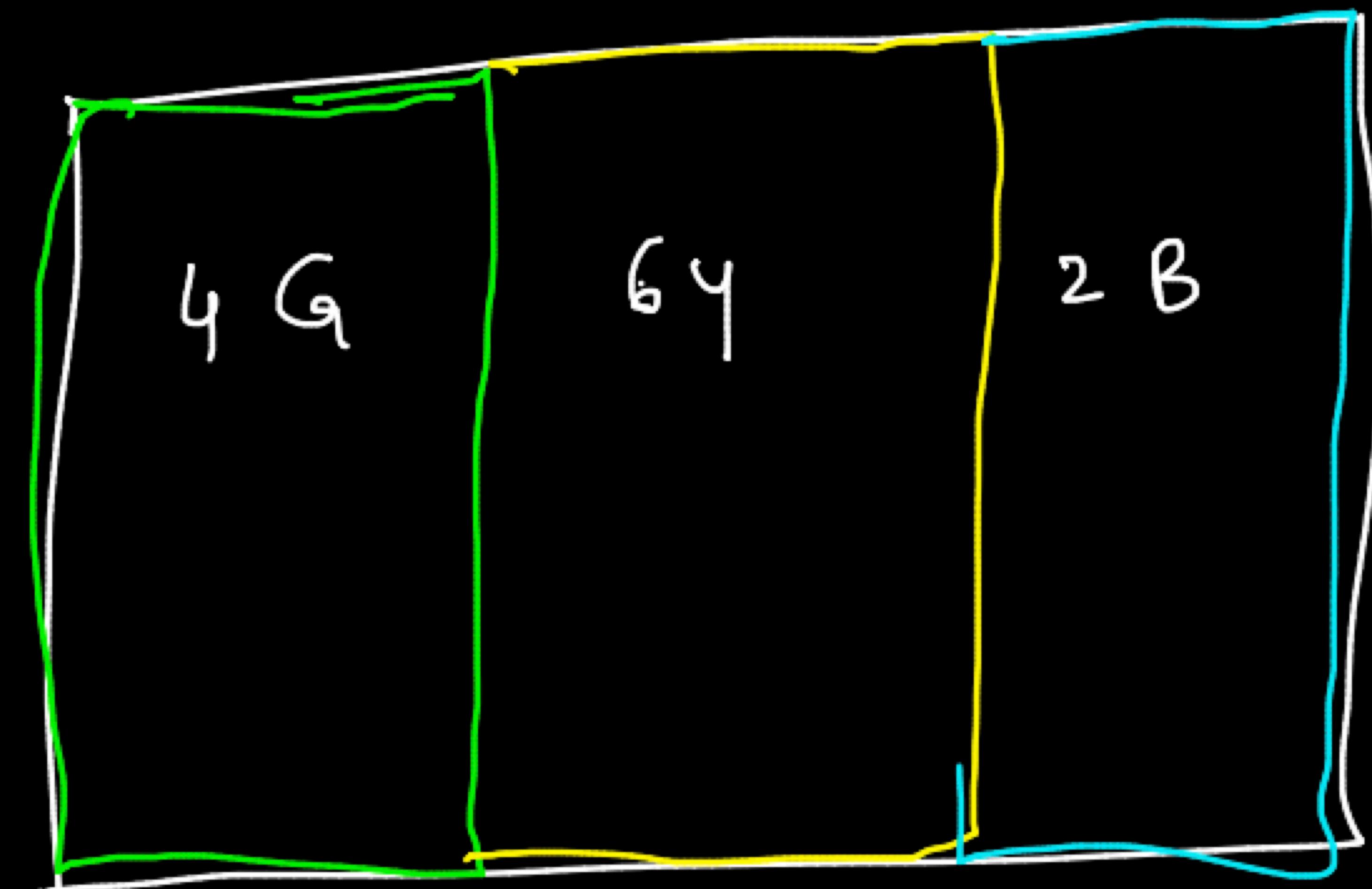
Youtube prem vs Non prem

~~coffee~~ cappacino vs Espresso

Swiggy Zomato

Amazon Flipkart

⇒ There are 4 green balls, 6 yellow balls, and 2 blue balls in a bag. A random ball is chosen. Find the probability that a yellow or blue ball is chosen.



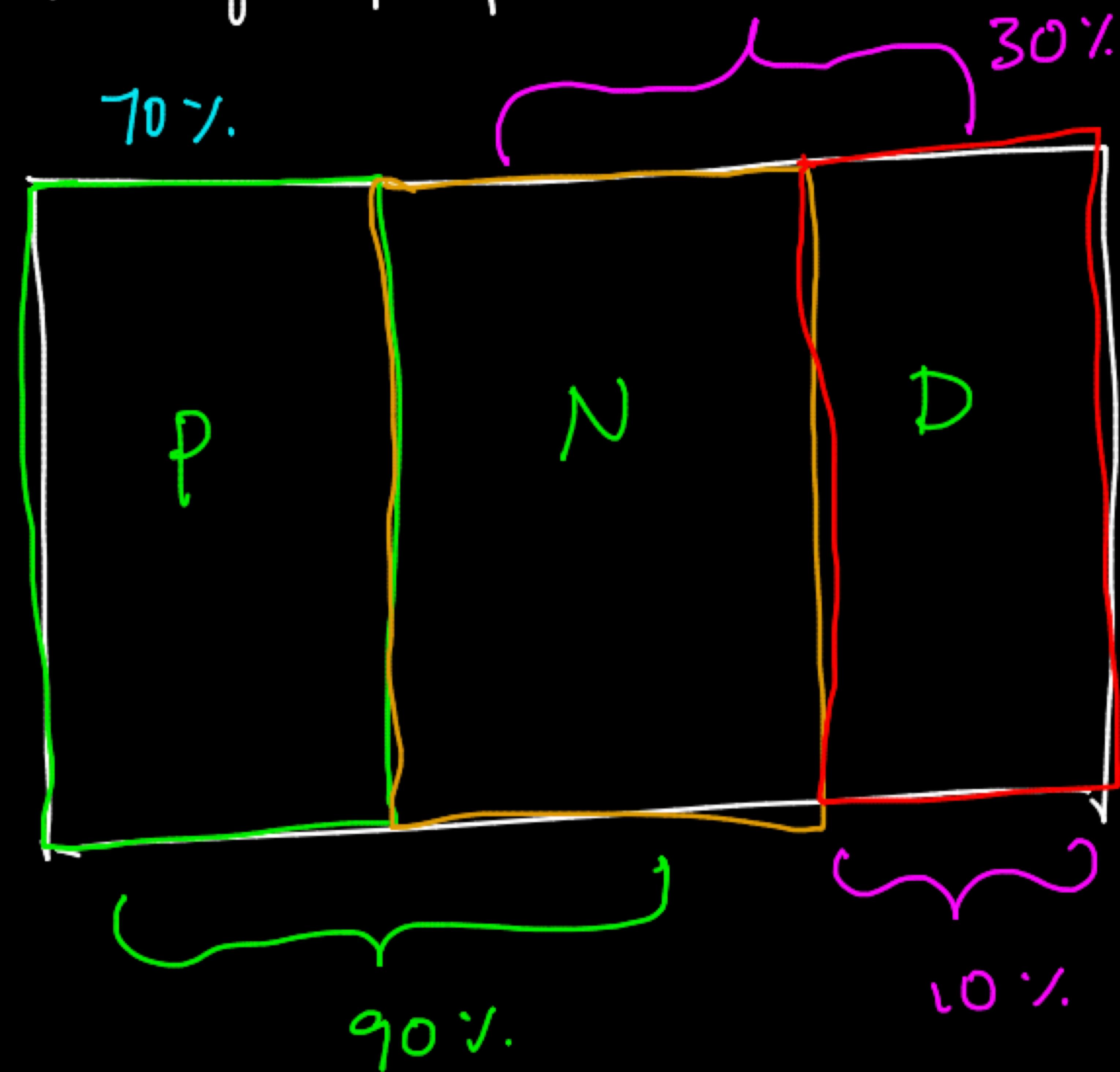
$$P(Y) = \frac{6}{12} = \boxed{\frac{1}{2}}$$

$$P(B) = \frac{2}{12} = \boxed{\frac{1}{6}}$$

$$P(Y \cup B) = P(Y) + P(B) - \cancel{P(Y \cap B)}$$
$$\frac{6}{12} + \frac{2}{12} = \boxed{\frac{8}{12}}$$

Quiz In an NPS survey, It is seen that 90% are either promoters or neutral. 30% are neutral or detractors.

What % of people are neutral?



P → 70 %

D → 10%



Maths

$$\checkmark (1) \quad P(P_r \cup N) = \underline{\underline{0.9}}$$

$$(2) \quad P(N \cup D) = 0.3$$

$$\Leftrightarrow P(P_r \cup N \cup D) = 1 \quad \longrightarrow \textcircled{1}$$

$$P(P_r \cap N) = 0$$

$$P(N \cap D) = 0$$

$$P(P_r \cap D) = 0$$

$$P(P_\tau \cup N) = 0.9$$



$$P(P_\tau) + P(N) - \boxed{P(P_\tau \cap N)} = 0.9$$

$$P(P_\tau) + P(N) = 0.9 \longrightarrow \textcircled{2}$$

$$P(N \cup D) = 0.3$$

$$P(N) + \underline{P(D)} = 0.3 \longrightarrow \textcircled{3}$$

$$P(P_\sigma \cup N \cup D) = 1$$

$$\underline{P(P_\sigma) + P(N) + P(D)} = 1$$

$$0.9 + P(D) = 1$$

$$P(D) = 1 - 0.9 = 0.1$$

$$P(N) + P(D) = 0.3$$

$$P(N) = 0.3 - 0.1 = 0.2$$

Dhoni and Deonatty

1 Ball

possible outcomes of dhoni

hit a six = $\{S, F\}$

"

"

"

2 Balls

$= \{SS, SF, FS, FF\}$

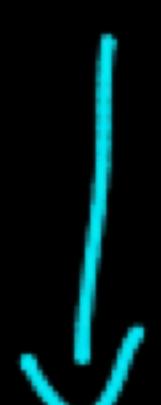
"

"

3 Balls

2^3

$= \{SSS, SSF, SFS, FSS, FFS, SFF, FSF, FFF\}$



n Balls

$= 2^n$ ✓

satish.atcha @ scalar.com