COSM Chapter-4

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Probability

(1) Steps Outcomes
1 3
2 2
3 4

How many experimental outcomes exists for the entire experiment?

→ Total experimental outcomes = 3 * 2 * 4
= 24 outcomes.

(2) How many ways can three items be selected from a group of six items?

→ $^6C_3 = \frac{6!}{3!(6-3)!} = \frac{6 \times 5 \times 4}{3 \times 2} = 20$

There are 20 ways to select 3 items from a group of 6 items.

Given A, B, C, D, E and F are 6 items.

Combinations: { (ABC), (ACD), (ADE), (AEF)
(ABD), (ABE), (ABF), ~~(ACD)~~
(ACE), (ACF), ~~(ADE)~~, (ADF)
~~(AEF)~~, (BCD), (BDE), (BEF)
(BCE), (BCF), (BDF), (CDE)
(CDF), (DEF) (CEF) }

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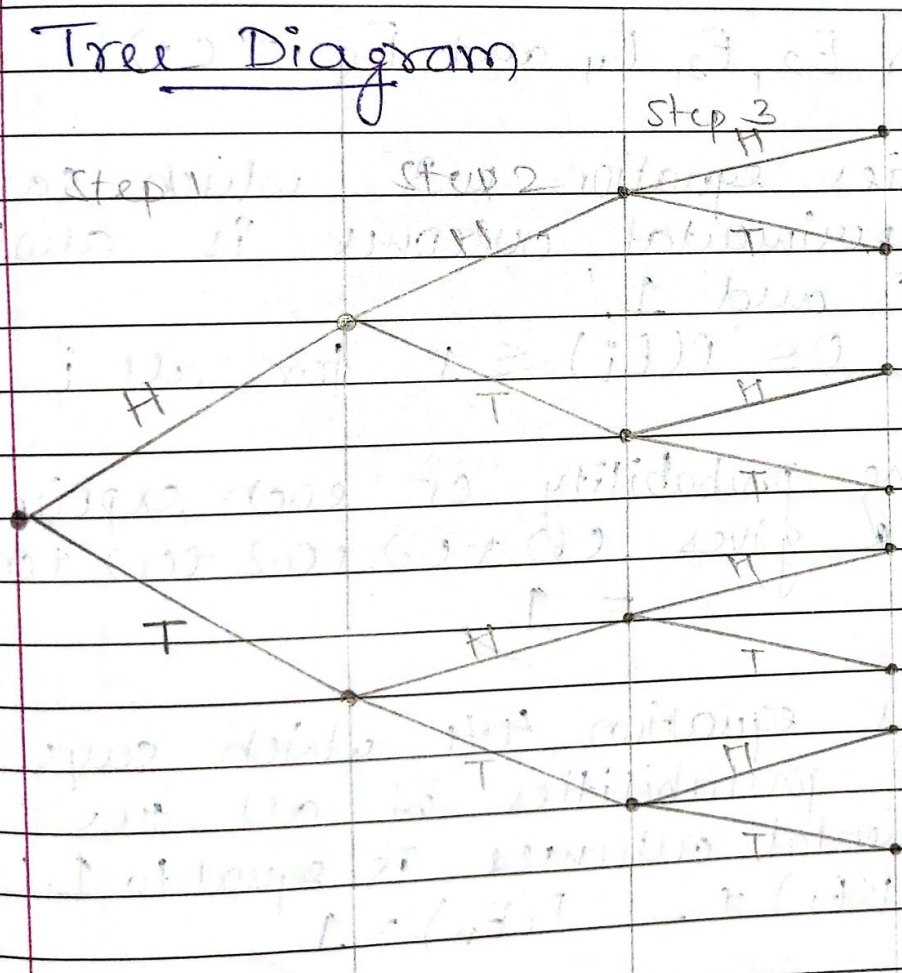
(3) How many permutations of 3 items can be selected from a group of 6.

→ $${}^{6}P_{3} = \frac{6!}{(6-3)!} = 6 \times 5 \times 4 = 120$$

There are 120 permutations to select 3 items from a group of 6 items.

(4) Tree Diagram



(b) Experimental outcomes:

{ (HHH), (HHT), (HTH), (HTT), (THH), (THT), (TTH), (TTT) }

(c) Probability for each experiment outcome is 1/8.

(5) outcomes: E_1, E_2, E_3, E_4, E_5.

Assigning Probabilities:

Probability for E_1 to occur = $1/5 = 0.2$

Similarly for E_2, E_3, E_4 and $E_5 = 0.2$

That satisfies equation 4.3 which says 'each experimental outcome is always between 0 and 1.'

ie. $0 \leq P(E_i) \leq 1$ for all i

Also, adding probability of each experiment outcome gives $0.2 + 0.2 + 0.2 + 0.2 + 0.2 = 1$

That satisfies equation 4.4 which says 'sum of probabilities of all the experimental outcomes is equal to 1.0'

ie. $P(E_1) + P(E_2) + \ldots P(E_n) = 1$

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(6) Experiment — Outcomes

E_1	20
E_2	13
E_3	17
	50

Assigning Probabilities:

$E_1 = 20/50 = 0.4$
$E_2 = 13/50 = 0.26$
$E_3 = 17/50 = 0.34$

Here, 'relative frequency method' is used as the data are available to the estimate the proportion of occurence.

(7) Given subjectively assigned probability.

$P(E_1) = 0.10$ $P(E_2) = 0.15$

$P(E_3) = 0.40$ $P(E_4) = 0.20$

The subjectively assigned probabilities are not valid because it must satisfy two basic requirement of equations (4.3) and (4.4).

$P(E_1) + P(E_2) + P(E_3) + P(E_4) = 0.85$

As the sum of all the probabilities for the experimental outcomes is not 1, it is not valid.