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①

10-12

Danielle's tutoring hours:

Monday 11:30-12:30,

Neuberger Hall 3rd floor atrium

p.90 #33

	I	$\bar{I}$	
D	34	78	112
$\bar{D}$	85	49	134
	119	127	246

a) $P(I) = \frac{119}{246} = .48$

b) $P(D) = \frac{112}{246} = .46$

c) $P(I \cap D) = \frac{34}{246} = .14$

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d) $P(\bar{D} \cap \bar{I}) = \frac{49}{246} = .20$

e) $P(D \mid I) = \frac{n(D \cap I)}{n(I)} = \frac{34}{119} = .29$

f) $P(I \mid \bar{D}) = \frac{85}{134} = .63$

g) $P(I \cup D) = P(I) + P(D) - P(I \cap D)$

$= .48 + .46 - .14$

$= .80$

3

p.95 #41 B: bonus plan

$P(B) = .93$

C: cafeteria style

$P(C) = .55$

H: home-based

$P(H) = .70$

$$P(B \cup C \cup H) = 1 - P(\bar{B})P(\bar{C})P(\bar{H})$$

$$= 1 - P(\overline{B \cup C \cup H})$$

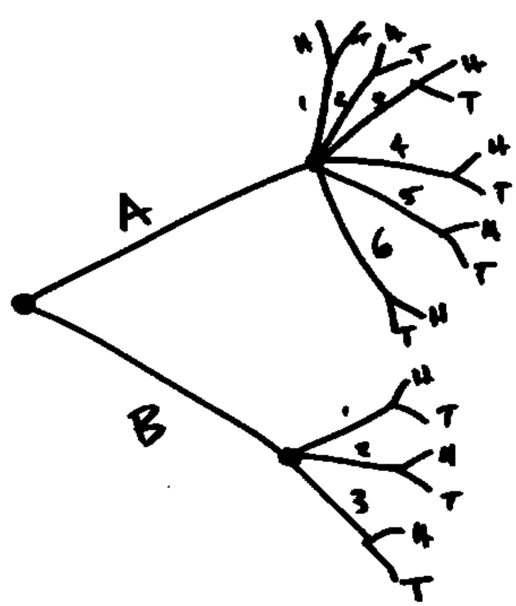
$$= 1 - P(\bar{B} \cap \bar{C} \cap \bar{H})$$

$$= 1 - (.07)(.45)(.30)$$

$$= .99$$

4

#43 $\boxed{\text{6 dimes}}$ A $\boxed{\text{3 nickels}}$ B



E1: box A

E2: coin is dime

E3: heads

i) $P(E1) = \frac{1}{2} = .5$

$P(E2) = P(E1) = .5$

$P(E3) = .5$

ii) Are E1 and E2 independent?

[Defn: A & B are indp. if $P(A|B) = P(A)$]

Is it true that $P(E2|E1) = P(E2)$?

$1 \neq .5$

E1 and E2 are dependent

iii) Are E1 and E3 independent? Yes

Test: $P(E3|E1) = P(E3)$?

$.5 = .5$

(iv) Yes

Sec 2-6 Counting Rules

(1) Multiplication Rule

If a process can be broken down into a sequence of operations, then the total number of outcomes is the product of the number of outcomes at each stage.

Example: Randomly construct a license plate consisting of 3 letters, then 3 digits. How many possible outcomes? $\underline{26} \times \underline{26} \times \underline{26} \times \underline{10} \times \underline{10} \times \underline{10}$

$= 17{,}576{,}000$

2 Factorial Rule

The number of ways of ordering or ranking n objects is $n!$

Example: Rank 5 types of cereal.
How many different outcomes are possible?

$$\underline{5} \times \underline{4} \times \underline{3} \times \underline{2} \times \underline{1}$$

$$= 5! = 120$$

3 Permutation Rule

Start with n items. Rank r of them.

The number of possible outcomes is

$$_nP_r = \frac{n!}{(n-r)!}$$

Example: Start with 5 boxes of cereal.
Rank the top 3. How many diff. outcomes?

$$\underline{5} \times \underline{4} \times \underline{3} = 60$$

(9)

$$5 \cdot 4 \cdot 3 = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1} = \frac{5!}{2!}$$

Example: 20 people enter a contest, with
1st, 2nd, & 3rd prizes.
How many different outcomes are possible?

$$_{20}P_3 = \frac{20!}{17!} = 6840$$

OR: $\underline{20} \times \underline{19} \times \underline{18} = 6840$

(10)

④ Combination Rule

Start with n objects. Select r of them, unranked or unordered

The number of outcomes is

$$_nC_r = \frac{_nP_r}{r!} = \frac{n!}{r!(n-r)!}$$

Example: 5 cereals. Select your favorite 3, without ranking

ABCDE

ABC	ACE	BDE
ABD	ADE	CDE
ABE	BCD	
ACD	BCE	

10 outcomes

If we use the multiplication rule, we get

$$\underline{5} \times \underline{4} \times \underline{3} = 60$$

But in combinations, ABC = ACB = BAC =
BCA = CAB = CBA

$$\frac{60}{6} = 10$$

$$_5C_3 = \frac{_5P_3}{3!} = \frac{60}{6} = 10$$

Example: 52 cards
Deal 5 cards
How many different outcomes are possible?
(order is not important)

$$_{52}C_5 = \binom{52}{5} = \text{"52 choose 5"}$$

$$= \frac{_{52}P_5}{5!} = \frac{52!}{5!\,47!} = 2{,}598{,}960$$

$$P(\text{royal flush}) = \frac{4}{2598960}$$

$$= .0000015$$

Hw p.989 all odd problems

Quiz 2 next Thursday