Date	1	1
Page N	o.	

_			
Sur managel	· Probability	of Carriel	ament c.
THE STATE OF THE	- COULDING	CONIPC	644111
· · · · · · · · · · · · · · · · · · ·			

Key Concepts

· The complement od an Event A (denoted X) consists of all outcomes not in A

Probability Rule P(AC) = 1 - P(A)

- This rule is especially wedy) when calculation P(A)
directly is difficult

Example: CoinToss (At least one Hoads in 5 tasser) · Total possible octtones in 5 tosses: 25= 32

· Only 7 oct+ core has all tails = TITIT

· P (Al) Tails) = 1 so

P(A+ Leas+ One Heads) = 1-1 = 37 5 97%

Surrary: Intersection and Mutually Exclusive Events 3 Intersection of Events (ANB)

De intersection of the events A and B, denoted A DB consists of all outcomer that belong to both A and B.

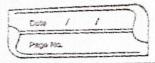
Example Rolling a Die

Let E = "xalling an even number of the thank two" +7=63,45%

Let T = "xalling a number growther thank two" +7=63,45%

Jet section: Ent = 64,68 (numbers that are both our

and greater than 2)



Events A and B are mutually exclusive if they can't occurs together, reaning their intersection is empty P (ANB)=0 Key point: A and its complement to as always mutuall Example: Mutually Exclusive Events offolling a Diod

Let $\overline{t} = 80$ | an over number S = 62, y for

To find mutually exclusive events pick on Earth

tent slaves no outcomes with E A = 61,3,53 (odd number complement of E) Plese choice work because they do not contain any numbers soon E, making A D Et o and Plan E) = 0 Surrary: Union of Events and Additive Ryle of Probability

1) Union of Events (AUB) (encists at all out cones that belong to either, AB, Example: Two child family

Sumple Space S = 6 bb, bg, g b, gg? (first letter = dirst born,

sc cond latter = se cond bor Events: - B = at least one boy -> B dbb, bg, gb3

- D = different genoors -> D = d bg, gb3

· M = same genoor -) M = d bb, gg3

Date			
-			
Secretary Second	-	-	
			•
Page N	h		

BUD = B = dibb/bg/gbd (all ready Encluded in B)
BUM = 5 (entire tample space)

2) Additive Rule of Probability

PAUB) = P(A) + P(B) - P(A)B)

Example Tutosing coovice Gien Probabilitios:

· Need Meth telp P(M) = 0.63 Now English Help PLE) = 6.34 Need both PIMMED=077

Find Probability of reading either nath or English les

P(My E) = P(M) + P(E) - P(M N E) = 0.63 + 0.34 - 0.77 = 0.70

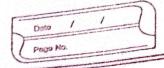
why stibtes ct? without it hald overcount students reading telp in both subjects

Surrery Conditional Probability & Independence of Frent

Conditional Probability

The conditional Probability of an Avent A given that event B has occurred is denoted as PCAIB)

P(AIB) = P(ANB) PIB)



Eample (Rolling a Die)

a) Probability of Rolling a 5 given that the number is all

Given 0 = 27,3,53 lodd numbers) F = 653 $P(F10) - P(F00) = \frac{1}{3/6} = \frac{1}{3}$ $P(0) = \frac{3}{3}$ b) Probability that the number is add given that it is ab

Since Polling a 5 garantees an Odd number, Plaint Example (Marsiage age and Gendox Analysis)

A description table provides data on 902 individuals

who lose narried before age 40, categorized by goods

and age at First massiage. M. rale E WH Total F: female 293 714 450 F a teorage & when direct namice F 82 299 71 452 w : in one 15 thenties when first marrie Total 125 592 185 902 H: in one ! thisties when first marrie Probability that a randomly related porson was a tenagor at first maxied

P(E) = 125/go2 × 0.139 or (14%) Probability that a nale was a terrage of disst movied since it is known, that the person selected is nale, all the famales may be served from consideration From the male only data PLEIM) = 43/450 = 0.096



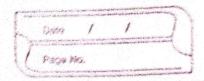
Example (Overneight and Hypertension) A contingency table surresizes the population distributions based on overneight status and hypertension H D The person selected subsers Hyan H 0.09 0.11 HC 0.02 0.78 Dente lity that a person has hypertension given Heyare ournego P(H10) = P(H00) = 0.09 - 0.8182 P(0) 0.09+0.08 (b) Probability that a presson has hyportentian given they are not come p (H100) = B.11 = 0.186 P.(HIOC) = 0.1236, owneight individuals are

Disina p(H10) = 0.8182 is over six times larger than significantly was likely to have hyportonsion.

Independence ad Elents I Definition of Independence Two eunts A and B are independent if PCANBO = P(A).P(B)

Id this condition closes not told, A and B are deposled -

2 Practical Wesk of Endependence Clecking independence. If you can compute PCD, P(B) and P(AnB):



"Id P(ANB) = P(A). P(B), Then A and B are independent
"Id P(ANB) = P(A). P(B), then A and B are not independent

Calculating Joint Probability. It A and B one independent Calculate P(ANB) or P(B). P(B)

Example Ralling a dais die with A=d3) and B=d1,3,58 $P(A) = \frac{1}{6}$, $P(B) = \frac{1}{12}$, $P(AnB) = \frac{1}{6}$ Since P(AnB) = 1 and $P(A) \cdot P(B) = 1$ A and $P(A) \cdot P(B) = 1$.

not independent

Eample Analyzing nexital status and gender anong adults
under 40:

P(F) = 452/goz, P(E) = 125/goz, P(F) = 18/goz
P(F) = 452/goz, P(E) the events F and the eve