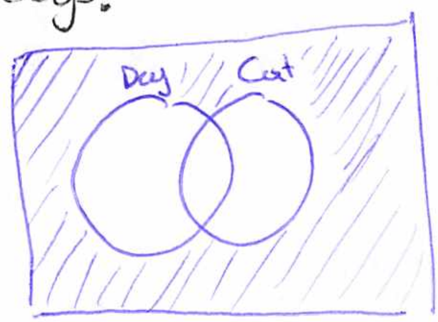
Warmup

46% of surveyed adults had a dog
35% of surveyed adults had a cat

12% had both a dog and a cat.

What percent of surveyed adults have ~~neither~~ no cat nor dogs?



re the region

$(D \cup C)'$

our question is: $P((D \cup C)')$

$$= \cancel{P}\,1 - \underline{P(D \cup C)}$$

$$P(D \cup C) = P(D) + P(C) - P(D \cap C)$$

$$.46 + .35 - .12$$

$$= 0.69$$

$$P((D \cup C)') = 1 - 0.69 = 0.31$$

31% of surveyed have neither cat nor dog

3 A pr

Exam next Wednesday

- sections 6.1, 6.2, 6.3, 6.4
  7.1, 7.2, 7.3, 7.4

↳ topics include:

★ counting
- decision algorithm
- permutations and combinations
- w/ repetition vs w/o repetition

★ probability
- relative frequency
- experimental probability vs theoretical probability
- finding probability through counting

★ high amount of overlap between all sections ★

- usual review materials and schedule
  ↳ practice questions available on ~~Monday~~ friday

- Webassigns for 7.2, 7.3, 7.4 are due Sunday after exam
  <u>DO THEM BEFORE</u>

Some survey of apple / android users found

	Iphone	Android	
freshman	128	77	205
Sophomore	114	89	203
Junior	120	80	200
Senior	99	81	180
	461	327	788

but we lost some information.

but we remember early results that

37% of freshman used Android
44% " " sophomore "
40% juniors
45% seniors

① Recover missing data for each class

$$P(\text{android}) = \frac{\#\text{ androids users}}{\#\text{ iphone} + \#\text{android}}$$

for Juniors:

$$0.40 = \frac{X}{120 + X} \Rightarrow 0.4(120+X) = X$$

$$48 + .4X = X$$

$$48 = 0.6X$$

$$X = 80$$

for Seniors:

$$0.45 = \frac{81}{X + 81} \Rightarrow X + 81 = \frac{81}{0.45}$$

$$x + 81 = 180$$

$$x = 99$$

② What's probability of surveyed students having an iphone?

$$P(\text{Iphone}) = \frac{\#\text{iphone}}{\#\text{ student}} = \frac{461}{788} \approx 0.59$$

③ What percent of surveyed students were android users or seniors?

$$= \frac{327 + 180 - 81}{788} = \frac{99 + 81 + 80 + 89 + 77}{788} \approx 0.54$$

54%

7.4

Recall that if outcomes are equally likely, the modelled probability of an event E is

$$P(E) = \frac{n(E)}{n(S)} = \frac{\#\text{ of favorable outcomes}}{\#\text{ of total outcomes}}$$

7.4 is just "let's use our counting techniques from chapter 6 to calculate probability"

In the game craps, the first roll of dice can instantly determine outcome of the game.

If the sum is 7 or 11, immediate win

If the sum is 2, 3, or 12, immediate loss

What's probability of a win on first roll?

$$= \frac{\text{number of rolls with sum 7 or 11}}{\text{number of rolls possible}} = \frac{8}{36} = 0.\overline{22}$$

sum of 7: (1,6), (2,5), (3,4), (4,3), (5,2), (6,1)

Sum of 11: (6,5), (5,6)

8

Probability of a loss on first roll?

$$= \frac{\text{number of sums of 2,3, or 12}}{\text{number of rolls possible}} = \frac{4}{36} = \frac{1}{12} \approx 0.08\overline{33}$$

Sum of 2: (1,1) ~~c(1,1)?~~

Sum of 3: (1,2), (2,1)

Sum of 12: (6,6)

1,1	12	13	14	15	16
21	22	23	24	25	26
31	32	33	...		
41	42	.			
51	52	:			
61	62				

What's the probability of being dealt 5 cards and have exactly 1 pair?

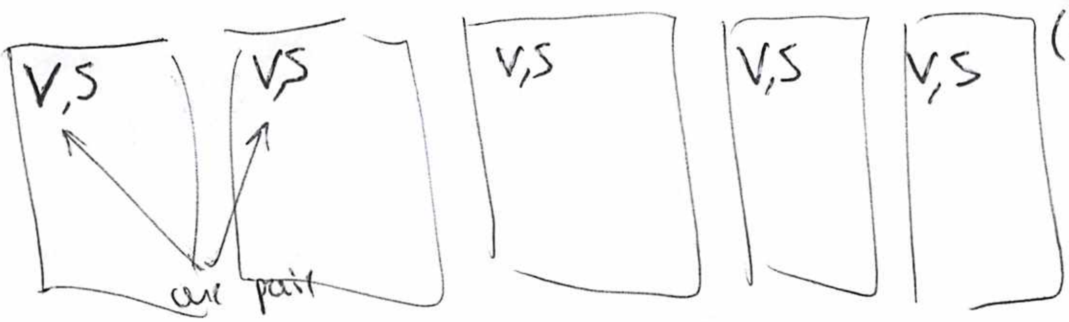
- each card has a value (13 values)
- " " a suit (4 suits)
- total of 52 cards

$$P(\text{exactly 1 pair}) = \frac{\#\text{ hands w/ 1 pair}}{\#\text{ hands}}$$

$$\#\text{ hands of 5 cards} = C(52,5) = \frac{P(52,5)}{5!}$$

Combinations

$$= \frac{52!}{(52-5)!\,5!}$$



Step 1: What value is our pair? 13 options $(= C(13,1))$

Step 2: What suits are our pair? $C(4,2) = \frac{4\cdot 3}{2} = 6$

Step 3: What are values of other cards? $C(12,3)$

Step 4: What are other suits? $4\cdot 4\cdot 4 = 4^3$

$$13\cdot C(4,2)\cdot C(12,3)\cdot 4^3 = 13\cdot \frac{4!}{2!\,2!}\cdot \frac{12!}{9!\,3!}\cdot 4^3$$

$$\frac{13\cdot 6\cdot \left(12!/9!\,3!\right)4^3}{\left(52!/(52-5)!\,5!\right)}$$

Suppose a seller has

3 yellow marbles
5 silver
4 cat's eyes
2 snow balls
1 green

$\Big\}$ 15

You can buy 4 chosen randomly.

① Probability of getting exactly 1 cat's eyes

$$= \frac{\#\text{ sets of 4 w/ exactly 1 cat's eye}}{\text{total sets of 4 marbles}} = \frac{4 \cdot C(11,3)}{C(15,4)}$$

Step1: Cat's eye : 4

Step2: Choose the remaining: $C(11,3)$

(set of 3, with none being cat's eyes)

$$= \frac{4\left(11!/8!\cdot 3!\right)}{15!/11!\ 4!} = \frac{4\cdot 11!\cdot 11!\cdot 4!}{15!\quad 8!\quad 3!}$$

$$= \frac{4 \cdot 11\cdot 10\cdot 9\cdot 4}{15\cdot 14\cdot 13\cdot 12} = 0.483$$

③ $P(\geq 1 \text{ cat's eye})$

$= P(\text{exactly } 1) + P(\text{exactly } 2) + P(\text{exactly } 3) + P(\text{exactly } 4)$

$= P((\text{no cat's eyes})')$

$= 1 - P(0 \text{ cat's eyes})$

$$= 1 - \frac{\#\text{ sets of 4 w/o cat's eye}}{\text{total sets of 4}}$$

$$= 1 - \frac{C(11,4)}{C(15,4)}$$

$$= 1 - \frac{11!/4!\,7!}{15!/4!\,11!}$$ ← suitable final answer

$$= 1 - \frac{11! \cdot \cancel{4!} \cdot 11!}{15!\ \cancel{4!}\ \ 7!} = 1 - \frac{11 \cdot 10 \cdot 9 \cdot 8}{15 \cdot 14 \cdot 13 \cdot 12} = 0.76$$