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Illowsky – Chapt. 3 & 4

well done

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Larson – Chapt. 3 & 4

Math 123 Exam 2

SHOW ALL WORK

Name _____

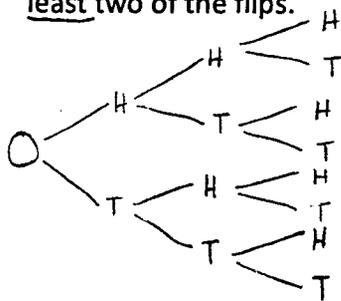
1. Suppose that of the 275 books you have read, 113 were bestsellers. What is the probability that a book you have read is a bestseller?

$$P(\text{bestseller}) = \frac{113}{275} \approx \boxed{.411}$$

2. Suppose 23% of the students at ACME college receive financial aid. What is the probability that a randomly chosen ACME college student is not on financial aid?

$$1 - .23 = \boxed{.77}$$

2. Suppose you flip 3 coins. Make a tree diagram to list all the possible outcomes in terms of heads or tails. Use your diagram to then find the probability that you will get tails on at least two of the flips.



Sample space - HHH, HHT, HTH, HHT, THH, THT, TTH, TTT

$$P(X \geq 2)$$

$$\frac{4}{8} = \boxed{\frac{1}{2}}$$

3. Of the last seven books you read, 4 were bestsellers. You choose two books at random from this list, without replacement.

- a. Find the probability that *both* books are bestsellers.

$$\frac{4}{7} \cdot \frac{3}{6} = \frac{12}{42} \approx 0.2857 \quad \frac{4C_2}{7C_2} \approx \boxed{0.2857}$$

- b. Find the probability the *neither* book ~~author~~ is a bestseller.

$$P(\text{none}) = \frac{3}{7} \cdot \frac{2}{6} = \frac{6}{42} \approx 0.143 \quad \frac{3C_2}{7C_2} \approx \boxed{0.1429}$$

- c. Find the probability that *at least one* of the books chosen is a bestseller.

$$P(\text{at least one}) = 1 - P(\text{none})$$

$$1 - 0.1429 \approx \boxed{0.8571}$$

4. Suppose that 6 out of every 10 ACME college students are male, whereas in the city of Anytown, where ACME college is located, half of all residents are male. You randomly choose a resident of Anytown (all ACME students are considered to be residents).

a. Are the events "Male" and "ACME college student" independent? Explain.

No; because the occurrence of being a male at ACME college in Anytown does not affect being a male resident of Anytown. The male could live elsewhere.

b. Are the events "male" and "ACME college student" mutually exclusive?

No; because 6 out of 10 ACME College Students are male. Venn diagram →



5. As a lover of sweets, you always have one main course, one side and three desserts for dinner. How many different meals are possible if you choose from 12 mains, 8 sides and 11 desserts?

12 mains, choose 1
8 sides, choose 1
11 desserts, choose 3

$$12 C_1 \cdot 8 C_1 \cdot 11 C_3$$

$$12 \cdot 8 \cdot 165 = \boxed{15,840}$$

6. How many distinguishable ways can you plant 5 maple trees, 6 oaks and 7 cedars in a row along a street?

$$\frac{18!}{5! \cdot 6! \cdot 7!} = \boxed{14,702,688}$$

7. What is the probability of being dealt a flush (5 cards of the same suit) in a five card poker hand, assuming the deck holds 52 cards?

5 of that suit suit

$$\frac{13 C_5 = 4 C_1}{52 C_5}$$

$$= \frac{1287 \cdot 4}{2,598,960}$$

forgot to multiply 4 C₁ in numerator

$$\approx \boxed{0.0004952}$$

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8. Classify each of the following as either a discrete or continuous random variable.

a. The number of pages in a book.

discrete random variable

b. The weight of a book in kilos.

continuous random variable

9. Suppose that 75% of AHC students have a car. You take a random sample of seven AHC students.

a. How many of the seven students would you *expect* to have a car?

$$7 \times .75 = \boxed{5.25}$$

b. In the right hand margin, make a *probability distribution*, where x = the number of students in the sample who have a car.

x	$P(x)$
0	.00006
1	.00128
2	.01154
3	.05768
4	.17303
5	.31146
6	.31146
7	.13348

c. What is the probability that *exactly 2* of the seven students have a car? *binompdf*
 $P(x=2) \approx \boxed{0.01154}$ $(7, .75, 2)$

d. What is the probability that *at most five* of the seven students have a car?

$$P(x \leq 5) \approx \boxed{0.55505} \quad \text{binomcdf}(7, .75, 5)$$

10. How many different ways are there arrange six photographs in a row on a wall?

$$6! = 720 \quad \underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1}$$

11. Suppose that the mean number of worms eaten per day by a trout is 4. If you capture a trout at random, what is the probability that it will eat 6 worms in a day?

Poisson distribution $\mu = 4$ poisson (4, 6)
 ≈ 0.1042

12. Suppose that 75% of AHC students have a car. If you keep asking random AHC students, what is the probability that you will need to ask at least three AHC students before you find one who has a car?

geometric distribution
 $P(x \geq 3) = 1 - P(x \leq 2)$
 $= 1 - 0.9375 = 0.0625$
 geometric pdf (0.75, 1) = 0.75
 geometric pdf (0.75, 2) = 0.1875
 0.9375

- 13) A fund-raising lottery sells 400 tickets at \$1.00 each. There is one \$100 prize, two \$50 prizes and four \$25 prizes. Let x = your possible winnings if you buy a single ticket. Find the expected winnings, and use this value to explain mathematically why you should or should not play this lottery.

No →

x	P(x)	x · P(x)
\$100	$\frac{1}{400} = .0025$.25
\$50	$\frac{2}{400} = .005$.25
\$25	$\frac{4}{400} = .01$.25
		$\Sigma = .75$

$\$1.00 - \$.75 = \$.25$
 The expected winnings is \$.75 per dollar. That is over 51% → so go for it. You should play this lottery.

Should Be:

x	P(x)	x · P(x)
\$99	$\frac{1}{400}$.2475
\$49	$\frac{2}{400}$.245
\$24	$\frac{4}{400}$.24
-\$1	$\frac{393}{400}$	-.9825
		$\Sigma = -.25 = \text{expected winnings}$

↳ but mathematically, it's not a good bet, right?

14. There are 5000 male and 4200 female students at ACME College. There are 3000 students graduating this year, 1400 of whom are female. You choose an ACME student at random. Find the probability that the student is either graduating this year or female.

$P(\text{Graduating or female})$
 $= P(\text{Graduating}) + P(F) - P(\text{Grad and F})$
 $= \frac{3000}{9200} + \frac{4200}{9200} - \frac{1400}{9200}$
 $= \frac{5800}{9200} \approx 0.6304$

	M	F	Total
Grad.	1,600	1,400	3,000
Non-Grad.	3,400	2,800	6,200
Total	5,000	4,200	9,200