

MAT 223, Discussion Questions 10.12

1. What does it mean for two events to be independent?

formally $P(A) = P(A|B)$
 $\vee P(A \cap B) = P(A) \cdot P(B)$

if I know B happened, then the probability of A remains the same.

2. Suppose you flip a fair coin and a fair six-sided die together. What is the probability of getting a head on the coin and a 6 on the die?

$\frac{1}{2} \cdot \frac{1}{6} = \frac{1}{12}$ since these events are independent

3. Give five examples of dependent events. Give two examples that are independent.

answers will vary

- dep: ① level of education, party one votes for
 ② gender and pet ownership
 ③ race & socioeconomic status
 ④ population density and crime rates
 ⑤ race and skin cancer risk

- independent
 ① coin flips
 ② rolling dice

4. What is conditional probability?

$P(A|B)$ = given info about event B, what is the probability A also occurs

5. A department store sells shirts in three sizes and in three patterns (small, medium and large; plaid, print and stripes). The table below gives the number of shirts of each type sold on a particular, typical day.

Size	Plaid	Print	Stripes	
Small	3	2	3	8
Medium	10	5	7	22
Large	4	2	8	14
	17	9	18	44

- a. If you choose a sales receipt at random from that day, what is the probability that the shirt on that receipt is a print shirt?

$$\frac{9}{44}$$

- b. If the shirt is a print shirt, what is the conditional probability that the shirt is a size medium?

$$\frac{5}{9}$$

6. Consider a state license plate with six characters total, with three capital letters (not including O), followed by three numbers (i.e. ABC 123). How many different plates are possible?

$$25 \cdot 25 \cdot 25 \cdot 10 \cdot 10 \cdot 10 = 25^3 \cdot 10^3 = 15,625,000$$

7. How many of the plates above contain only vowels and even numbers? What is the probability that a randomly chosen plate in this state contains only vowels and even numbers?

$$5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 = 5^6 = 15,625$$

$$\frac{15,625}{15,625,000} = .001$$

8. Suppose that a wardrobe has three pairs of pants, five shirts, two belts, six pairs of socks, three blazers, and two pairs of shoes. How many different outfits are possible if you need to choose one of each?

$$3 \cdot 5 \cdot 2 \cdot 6 \cdot 3 \cdot 2 = 1080$$

9. How many ways can you arrange a deck of cards? <http://ed.ted.com/lessons/how-many-ways-can-you-arrange-a-deck-of-cards-yannay-khaikin#review>