

CONDITIONAL PROBABILITY

TEXT:

LAST NAME	FIRST NAME	DATE
-----------	------------	------

1 (6 points). Suppose that a sample of young galaxies yields the following contingency table.

	Spiral	Elliptical	Lenticular	Total
Active	9	1	0	
Inactive	3	1	6	
Total				

The experiment is to choose one of these galaxies at random. For each of the following events, write it down formally, and compute its probability.

(a) The chosen galaxy is active, given it is a spiral.

(b) The chosen galaxy is elliptical, given it is **not** an active spiral.

(c) Are the events Active and Elliptical mutually exclusive?

Yes / No

(d) Are the events Active and Elliptical independent? Explain.

Yes / No

(e) Are the events Active and Lenticular mutually exclusive?

Yes / No

(f) Are the events Active and Lenticular independent? Explain.

Yes / No

2 (1 point). Toss a fair six-sided die 5 times (alternatively, toss 5 different dice once). What are the chances that all 5 rolls come up as 6? *Yahtzee!*

3 (2 points). A basket contains 7 yellow apples and 4 red apples. Margo picks two apples without looking.

(a) What is the probability she picks 2 yellow apples?

(b) What is the probability she gets both colors?

4 (1 point). Every job applicant at Acme Corp marketing division must pass 2 job interviews, and the only way to advance to the 2nd interview is to pass the first one. The records show that 2.4% of all applicants pass both interviews and get hired. The records also show that applicants who pass the 1st interview have a 14% chance of passing the 2nd interview. What are the chances of passing the 1st interview?

5 (4 points). Roll a fair 12-sided die with numbers 1 through 12, assume all outcomes are equally likely.

- (a) How likely is the number to be prime?
- (b) How likely is the number to be even?
- (c) How likely is the number to be prime, given it's even?
- (d) How likely is the number to be even, given it's prime?
- (e) Are the events *prime* and *even* independent?
- (f) Are the events *prime* and *even* mutually exclusive?

6 (6 points). The game of Texas Holdem starts with every player receiving 2 random cards from the standard deck of 52 cards. Alice is impatient, so she opens her cards one by one, which results in a sample space with 52×51 outcomes. Use the conditional probability multiplication rule to find the chances for the following events. State your answers in decimal notation.

- (a) both cards are red
- (b) both cards are hearts
- (c) both cards are Queens
- (d) the cards are of the same suit
- (e) the cards are of different suits
- (f) the cards are suited Ace and King

	Kind												
Suit													
													
													
													

7. In a game of Five Card Draw, a player gets 5 random cards out of the standard 52-card deck.
- (a) Find the probability of drawing a flush: 5 cards of the same suit.

- (b) Find the probability of drawing four of a kind, where 4 out of 5 drawn cards are of the same kind. *Hint: since we don't know which one of the 5 cards will be of a different kind, start by writing this event as a union of 5 mutually exclusive events.*