

Present 12.5 #11, 13, 28

9:55 Cory Cu., Kaitlin, Amber, Alyssa, Molly, Kaitlin He.

11:00 Courtney Ho., Jennifer, Taylor, Elizabeth, Kamry, Caitlyn Mc.

Homework for tonight: 12.2 #1, 3, 5, 7, 11, 13, 15, 32, 33, 35-38
Present Monday #1, 15, 33

9:55 Kaitlyn Hi., Amanda, Grace, Molly, Azjja, Katie Kl.

11:00 Gen Mc., Danielle, Steven, Emily, Jordan, Kyle Po.

Quick quiz today after presentations.

$$27) .20(\$5000) + .15(\$2000) + .65(\$0) \\ = \$2,200$$

vs.

$$1.00(2300) = \$2,300$$

After reviewing the correct solution (below), write your score on the back of your quiz.

0 = no progress at all; just rewrote problem

0.5 = false start, not based on relevant principles

1 = false start, but sustained effort with some relevant principles

1.5 = significant mistake(s), or significant misunderstanding(s)

2 = mistake near the end or could not finish; also excessive reliance on calculator or 'brute force' methods

2.5 = trivial mistake (e.g. arithmetic error), but work is mostly correct

3 = correct answer and work

Nine numbered poker chips (1, 2, ..., 9) are placed in a jar, and two chips are drawn randomly and without replacement. Find the probability that the sum of the two chips is equal to 8.

$$P(E) = \frac{n(E)}{n(S)} = \frac{6}{72} = \frac{3}{36} = \frac{1}{12} = 8.3\%$$

$$E = \{(1,7), (2,6), (3,5), (5,3), (6,2), (7,1)\}$$

So $n(E) = 6$. Also, $n(S) = P(9,2) = 9 \cdot 8 = 72$.

note: the possible sums are $\{3, 4, 5, \dots, 17\}$, but these are not equally likely outcomes so $\frac{1}{15}$ is not correct.

Insurance Company

An insurance company insures an \$8000 car for an annual premium of \$740, with a \$500 deductible. If the company spends \$20 per year to service such a policy, the probability of a total loss is 0.6%, and we assume that either a total loss or no loss will occur, what is the insurance company's expected profit on this policy?

$$8000 - 500 = 7500 \\ (7500)(0.006) + 20 = \text{expected cost} \\ = 65 = \text{total expected cost.} \\ \text{profit} = 740 - 65 = 675/\text{policy}$$

Purchase Extended Warranty?

I recently purchased a \$99 gas grill from a retail store. The store offered to sell me an Extended Service policy for \$10, meaning they will repair the grill for free if any major problem develops during the first year.

Suppose the probabilities and costs of various repairs levels are listed below. Should I have purchased the Extended Service policy?

Repair cost	Probability	Exp. Val
none	0.925	\$0.00
\$0-20	0.04	\$0.80
\$20-40	0.02	\$0.80
\$40-60	0.01	\$0.60
\$60-99	0.005	+ \$0.50
>\$99	zero	\$2.70

Analyzing Monopoly

Monopoly is a board game played using two dice. Players roll both dice to determine how many squares they move on a given turn.

If you land on someone else's property, you must pay a certain amount of rent.



Analyzing Monopoly

Calculate the expected cost of your next turn if you are...

	2 squares away from paying \$500 rent.
	3 squares away from paying \$370 rent.
	4 squares away from paying \$25 rent.
	5-9 squares away from free properties.
	10 squares away from paying \$180 rent.
	11 squares away from a free property.
	12 squares away from paying \$150 rent.

$$\frac{1}{36}(\$500) + \frac{2}{36}(\$370) + \frac{3}{36}(\$25) + \frac{3}{36}(\$180) + \frac{1}{36}(\$150) = \$55.69$$

Section 12.2

Basic Properties of Probability:

For any event E from the sample space S...

- $0 \leq P(E) \leq 1$
- $P(\emptyset) = 0$
- $P(S) = 1$
- $P(E) + P(E') = 1$ <-- the complements rule
[often written $P(E) = 1 - P(E')$]

Example: Two cards are randomly selected from a 52-card deck without replacement. Find the probability that the 2 cards are not both red.

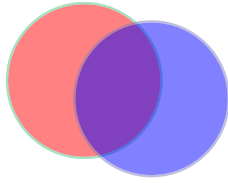
Complement's principle for probability:

$$1 - P(\text{are both red}) = 1 - \frac{C(26,2)}{C(52,2)} = 1 - \frac{26 \cdot 25 / 2}{52 \cdot 51 / 2} = 1 - \frac{25}{102} \approx .75$$

General Addition Rule for Probability

If A and B are any two events, then

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$



General Addition Rule

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

Example: A single card is drawn at random from a standard 52-card deck. Calculate the probability that:

1. The card is either a King or a Four.

$$P(K \text{ or } 4) = P(K) + P(4) \\ = \frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$$

2. The card is either a King or a Spade.

$$P(K \text{ or } \text{spade}) = \frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$$

3. The card is **neither** a King **nor** a Spade.

(hint: the complement of 'neither... nor' is 'either...or')

$$\text{Use \#2: } 1 - \frac{4}{13} = \frac{9}{13}$$

The Properties / Rules of Probability (so far...):

1. $0 \leq P(E) \leq 1$
2. $P(\emptyset) = 0$
3. $P(S) = 1$
4. $P(E) = 1 - P(E')$ <-- the Complements Rule
5. $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
(^-- the General and ^-- Special Addition Rules)

Example: In poker, find the probability that a five-card poker hand is not all clubs.

$$= 1 - P(\text{all clubs}) \\ = 1 - \frac{C(13,5)}{C(52,5)} = 99.95\%$$

Example:

Find the probability that a five-card poker hand has at least one face card.