Homework #5 Answers

23. Blood.

Since all of the events are disjoint (a person cannot have more than one blood type!), use the addition rule where applicable.

a) $P(\text{Type AB}) = 1 - P(\text{not Type AB}) = 1 - P(\text{Type O or Type A or Type B})$
$= 1 - (0.44 + 0.42 + 0.10) = 0.04$

33. The train.

Assuming the arrival time is independent from one day to the next, the multiplication rule may be used.

a) $P(\text{gets stopped Monday and gets stopped Tuesday}) = (0.15)(0.15) = 0.0225$

b) $P(\text{gets stopped for the first time on Thursday}) = (0.85)(0.85)(0.85)(0.15) \approx 0.092$

c) $P(\text{gets stopped every day}) = (0.15)^5 \approx 0.00008$

d) $P(\text{gets stopped at least once}) = 1 - P(\text{never gets stopped}) = 1 - (0.85)^5 \approx 0.556$

34. Voters.

Since you are calling at random, one person's political affiliation is independent of another's. The multiplication rule may be used.

a) $P(\text{all Republicans}) = (0.29)(0.29)(0.29) \approx 0.024$

b) $P(\text{no Democrats}) = (1 - 0.37)(1 - 0.37)(1 - 0.37) \approx 0.25$

c) $P(\text{at least one Ind.}) = 1 - P(\text{no Independents}) = 1 - (0.77)(0.77)(0.77) \approx 0.543$

35. Religion.

Since you are calling at random, one person's religion is independent of another's. The multiplication rule may be used.

a) $P(\text{all Christian}) = (0.62)(0.62)(0.62)(0.62) \approx 0.148$

b) $P(\text{no Jews}) = (1 - 0.12)(1 - 0.12)(1 - 0.12)(1 - 0.12) \approx 0.600$

c) $P(\text{at least one person who is nonreligious}) = 1 - P(\text{no nonreligious people})$
$= 1 - (0.90)(0.90)(0.90)(0.90) = 0.3439$

37. Pepsi.

Assume that the winning caps are distributed randomly, so that the events can be considered independent. The multiplication rule may be used.

$P(\text{you win something}) = 1 - P(\text{you win nothing}) = 1 - (0.90)^6 \approx 0.469$

Multiple Choice Question Bank – Chapter 13

1. According to the U.S. Census Bureau, 74.4% of U.S. households had Internet access in 2013. What is the probability that four randomly selected U.S. households all had Internet access in 2013?

   A) 25.6% B) 30.6% C) 74.4% D) 99.6%

   I
   P(I and I and I and I)
   .744 x .744 x .744 x .744
   $(.744)^4$
   .3064

2. Your friend tells you that when drawing a card from a standard deck, *P*(Jack or King) = *P*(Jack) + *P*(King). Your friend is…

   P(A or B) = P(A) + P(B) − P(Both)
   no Both

   A) Correct, since drawing a Jack and drawing a King are independent events.
   B) Correct, since drawing a Jack and drawing a King are disjoint events.
   C) Incorrect, since drawing a Jack and drawing a King are not independent events.
   D) Incorrect, since drawing a Jack and drawing a King are not disjoint events.

3. Your friend tells you that when rolling two dice, *P*(2 sixes) = *P*(six) × *P*(six). Your friend is…

   A) Correct, since die rolls are independent events.
   B) Correct, since die rolls are disjoint events.
   C) Incorrect, since die rolls are not independent events.
   D) Incorrect, since die rolls are not disjoint events.

   one die does not affect the other

4. Your friend tells you that when drawing a card from a standard deck, *P*(Jack or Heart) = *P*(Jack) + *P*(Heart). Your friend is…

   can be Jack and Heart ← not disjoint

   A) Correct, since drawing a Jack and drawing a Heart are independent events.
   B) Correct, since drawing a Jack and drawing a Heart are disjoint events.
   C) Incorrect, since drawing a Jack and drawing a Heart are not independent events.
   D) Incorrect, since drawing a Jack and drawing a Heart are not disjoint events.

   need to subtract JH (counted 2X's)

5. Your friend tells you that when drawing two cards from a standard deck without replacement, *P*(2 queens) = *P*(Queen) × *P*(Queen). Your friend is…

   4/52 x 4/52 ← NO!

   A) Correct, since card draws are independent events.
   B) Correct, since card draws are disjoint events.
   C) Incorrect, since card draws are not independent events.
   D) Incorrect, since card draws are not disjoint events.

6. According to the U.S. Census Bureau, 42.8% of U.S. households connected to the Internet using a cable modem in 2013. If households are called at random, what is the probability that the first house with a cable modem will be contacted on the third call?

   A) 7.8% B) 14.0% C) 42.8% D) 57.2%

   P(No CM) = 1 − .428 = .572
   P(No CM and No CM and CM) = .572 x .572 x .428 = .140

7. A probability model is simply a list of outcomes and the probability of each outcome. Which of the following probability models is NOT a legitimate probability model?

A)

Outcome	1	2	3	4
Probability	0.2	0.2	0.2	0.2

$0.2 + 0.2 + 0.2 + 0.2 = .8 \neq 1$

B)

Outcome	1	2	3	4
Probability	0.25	0.25	0.25	0.25

$= 1$

C)

Outcome	1	2	3	4
Probability	0.7	0.2	0.1	0

$= 1$

D)

Outcome	1	2	3	4
Probability	1	0	0	0

$= 1$

8. A probability model is simply a list of outcomes and the probability of each outcome. Which of the following probability models is a legitimate probability model?

A)

Outcome	1	2	3	4
Probability	0.3	0.25	0.25	0.25

$0.3 + 0.25 + 0.25 + 0.25 = 1.05 \neq 1$

B)

Outcome	1	2	3	4
Probability	0.01	0.02	0.03	0.04

$0.01 + 0.02 + 0.03 + 0.04 = .1 \neq 1$

C)

Outcome	1	2	3	4
Probability	0.2	0.3	0.6	−0.1

D)

Outcome	1	2	3	4
Probability	0.2	0.25	0.35	0.2

$0.2 + 0.25 + 0.35 + 0.2 = 1$

Multiple Choice Question Bank – Chapter 13 – Key

1) B
2) B
3) A
4) D
5) C
7) A
8) D

3. A survey showed that 35% of households in a town have a dog and 12% of households have a cat.

   a. Explain what it would mean if having a dog and a cat were disjoint events.

   No both - can't have a cat and a dog.

   b. Explain what it would mean if having a dog and a cat were independent events.

   Having a cat or dog would not affect the probability of having the other.

   c. Can having a dog or a cat be both independent and disjoint? _____ Explain.

   d. Is it reasonable to use the Addition Rule to predict that 35% + 12% = 47% of the town's household have a dog or cat? No Why or why not?
   Bc some families have both - counted twice.

4. A friend claims that he is so sure that he will be accepted into the college of his choice that the probability is 110%. Comment on his claim.

   He can't be more than 100% certain.

Name_____ *Statistics Chapter 13: Review*

P(Right) = 1/4 = .25 P(Wrong) = 3/4 = .75

1. Five multiple choice questions, each with four possible answers, appear on your history exam. What is the probability that if you just guess, you
   a. get none of the questions correct?
   P(W and W and W and W and W) = .75 x .75 x .75 x .75 x .75 = $(.75)^5$ = .237
   b. get all of the questions correct?
   P(R and R and R and R and R) = .25 x .25 x .25 x .25 x .25 = $(.25)^5$ = .00097656 ~ .001
   c. get at least one of the questions wrong?
   1 − P(5R) = 1 − .001 = .999 (Part b)
   d. get your first incorrect answer on the ~~fourth~~ fifth question?
   P(R, R, R, R, W) = .25 x .25 x .25 x .25 x .75 = .003

2. Mars, Inc. manufactures bags of Peanut Butter M&M's. They report that they make 10% each brown and red candies, and 20% each yellow, blue, and orange candies. The rest of the candies are green.

   Brown 10
   Red 10
   Yellow 20
   Blue 20
   Orange 20
   Green 20
   } 80

   a. If you pick a Peanut Butter M&M at random, what is the probability that
      1. it is green? 20%
      2. it is a primary color (red, yellow, or blue)? 10 + 20 + 20 = 50%
      3. it is not orange? 1 − P(orange) = 1 − .20 = .80 = 80%

   b. What is the probability of choosing five of these candies from a large vat and getting all blue candies (show your work)?
   P(Blue, Blue, Blue, Blue, Blue) = .2 x .2 x .2 x .2 x .2 = .00032 = $.2^5$