Worksheet #4: Conditional Probability Answer Key

Name_____

1. If a single fair die is rolled, find P(3 | prime). **Prime numbers: 1, 2, 3, 5 … so … 1/4**

2. If two cards are drawn without replacement from a deck, find the probability that the second card is a diamond, given that the first card was a diamond. **(13 – 1)/(52 – 1) = 0.235**

3. If two fair dice are rolled, find the probability that the sum of the faces is 7, given that the first die rolled is odd. **Sum of 7 AND first die odd: {1, 6 3, 4 5, 2} = 3/36; First die odd = 1/2 … so … (3/36)/(1/2) = 6/36 = 1/6**

4. If three cards are drawn without replacement from a deck, find the probability that the third card is a face card, given that the first card was a king and the second card was a 9. **(12 – 1)/(52 – 2) = 0.22**

5. A six-sided die is tossed. What is the probability that it shows 2 if you know the following:

(a) It shows an even number. **Evens: 2, 4, 6 … so … 1/3**

(b) It shows a number less than 5. **Less than 5: 1, 2, 3, 4 … so … 1/4**

(c) It does not show a 6. **1/5**

(d) It shows 1 or 2. **1/2**

(e) It shows an even number less than 4. **1**

(f) It shows a number greater than 3. **0**

6. One container holds the letters D A D and a second container holds the letters A D D. One letter is chosen randomly from the first container and added to the second container, then a letter will be chosen from the second container.

(a) What is the probability that the second letter chosen is D if the first letter was A? … if the first letter was D? **1/2; 3/4**

(b) What is the probability that the second chosen letter is A if the first letter was A? … if the first letter was D? **1/2; 1/4**

7. Let A and B be events with P(A)=1/3, P(B) =1/2 , and P(A and B)=1/6. Find P(A|B), P(B|A)
P(A|B) = (1/6)/(1/2) = 1/3; P(B|A) = (1/6)/(1/3) = 1/2

8. A couple wants to have 3 or 4 children, including exactly 2 girls. Is it more likely that they will get their wish with 3 children or with 4?
There are 8 possibilities (2^3) with three children and 16 possibilities (2^4) with four children.
3 kids: GGB, GBG, BGG = 3/8
4 kids: GGBB, GBGB, GBBG, BGGB, BGBG, BBGG = 6/16 = 3/8
Equally likely!

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MULTIPLE CHOICE PRACTICE

9. Suppose that, in a certain part of the world, in any 50–year period the probability of a major plague is .39, the probability of a major famine is .52, and the probability of both a plague and a famine is .15. What is the probability of a famine given that there is a plague? **D**

(a) .240 (b) .288 (c) .370 (d) .385 (e) .760

10. The following data are from *The Commissioner's Standard Ordinary Table of Mortality:*

Age	Number Surviving
0	10,000,000
20	9,664,994
40	9,241,359
70	5,592,012

What is the probability that a 20–year–old will survive to be 70? **D**

(a) .407 (b) .421 (c) .559 (d) .579 (e) .966

Questions 11–14 refer to the following study: Five hundred people used a home test for HIV, and then all underwent more conclusive hospital testing. The accuracy of the home test was evidenced in the following table.

	HIV	Healthy	
Positive Test	35	25	60
Negative Test	5	435	440
	40	460	

11. What is the *predictive value* of the test? That is, what is the probability that a person has HIV and tests positive? **A**

(a) .070 (b) .130 (c) .538 (d) .583 (e) .875

12. What is the *false–positive rate*? That is, what is the probability of testing positive given that the person does not have HIV? **A**

(a) .054 (b) .050 (c) .130 (d) .417 (e) .875

13. What is the *sensitivity* of the test? That is, what is the probability of testing positive given that the person has HIV? **E**

(a) .070 (b) .130 (c) .538 (d) .583 (e) .875

14. What is the *specificity* of the test? That is, what is the probability of testing negative given that the person does not have HIV? **E**

(a) .125 (b) .583 (c) .870 (d) .950 (e) .946

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15. A computer technician notes that 40% of computers fail because of the hard drive, 25% because of the monitor, 20% because of a disk drive, and 15% because of the microprocessor. If the problem is not in the monitor, what is the probability that it is in the hard drive? **D**

(a) .150 (b) .400 (c) .417 (d) .533 (e) .650