

Math 153 - Quiz 5

March 13, 2104

Name key

Score _____

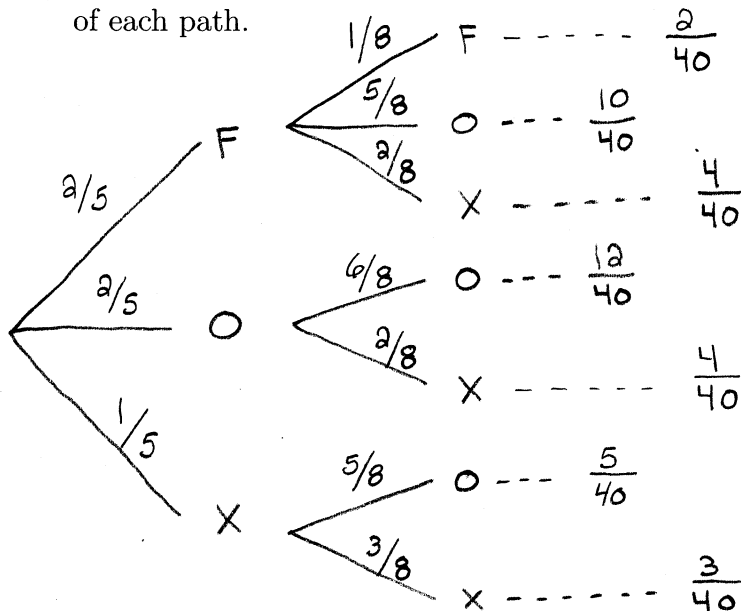
Show all work to receive full credit. Supply explanations when necessary.

1. (2.5 points) A letter is selected at random from the first box and placed into the second box. Then a letter is selected at random from the second box.

F F O O X

O O O O O X X

- (a) Sketch the complete tree diagram for this experiment. Include the probabilities of each path.



- (b) Let A be the event of drawing the letter O from the second box. What is \bar{A} ?

$$\bar{A} = \{ (F,F), (F,X), (O,X), (X,X) \}$$

$$P(A) = \frac{10}{40} + \frac{12}{40} + \frac{5}{40} = \frac{27}{40} \Rightarrow P(\bar{A}) = \frac{13}{40}$$

- (c) What are the odds in favor of A ?

$$\frac{27/40}{13/40} = \frac{27}{13}$$

- (d) What are the odds against A ?

$$\frac{13}{27}$$

2. (1.5 points) Suppose A and B are events such that $P(A) = 0.64$, $P(B) = 0.45$, and $P(A|B) = 0.4$.

(a) Determine $P(A \cap B)$.

$$\begin{aligned} P(A \cap B) &= P(A|B) \cdot P(B) \\ &= (0.40)(0.45) = \boxed{0.18} \end{aligned}$$

(b) Determine $P(B|A)$.

$$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{0.18}{0.64} = \boxed{0.28125}$$

(c) Find the odds in favor of A .

$$P(A) = \frac{64}{100} \Rightarrow \text{ODDS IN FAVOR ARE}$$
$$\frac{64}{36} \text{ OR } \boxed{\frac{16}{9}}$$

3. (2 points) A test has two true/false problems, two multiple-choice problems with 4 answer choices, and one multiple-choice problem with 5 answer choices. If you randomly choose an answer for each of the problems, what is the probability that you will answer at least one problem correctly?

AT LEAST ONE CORRECT MEANS SAME AS NOT ALL WRONG.

$$\begin{array}{ccccccc} \frac{1}{2} \text{ Wrong} & \frac{1}{2} \text{ Wrong} & \frac{3}{4} \text{ Wrong} & \frac{3}{4} \text{ Wrong} & \frac{4}{5} \text{ Wrong} \\ \diagdown & \diagdown & \diagdown & \diagdown & \diagdown \\ & \text{Wrong} & & \text{Wrong} & \\ \text{Prob of All Wrong} & = & \frac{1}{2} \times \frac{1}{2} \times \frac{3}{4} \times \frac{3}{4} \times \frac{4}{5} & = & \frac{36}{320} \\ \text{Prob of AT LEAST ONE CORRECT} & = & 1 - \frac{36}{320} & = & \boxed{\frac{284}{320}} \end{array}$$

4. (3 points) In studying the effectiveness of a test preparation course, the following data were collected.

	Passed Test	Failed Test
Took Test-Prep Class	137	43
Did not take Test-Prep Class	213	105

$$137 + 43 + 213 + 105 = 498$$

A person from this sample is selected at random.

- (a) What is the probability that the person passed the test?

$$\frac{137 + 213}{498} = \frac{350}{498}$$

- (b) What is the probability that the person took the test preparation class and passed the test?

$$\frac{137}{498}$$

- (c) What is the probability that the person passed the test given that he/she took the test preparation class?

$$\frac{137}{137 + 43} = \frac{137}{180}$$

- (d) What is the probability that the person took the test preparation class given that he/she failed the test?

$$\frac{43}{43 + 105} = \frac{43}{148}$$

- (e) Are $\overbrace{\text{taking the test preparation class}}^{\text{EVENT A}}$ and $\overbrace{\text{passing the test}}^{\text{EVENT B}}$ independent events? Give support for your answer!

$$\underbrace{P(B|A) = \frac{137}{180} \approx 0.76}_{\text{PART (c)}} \neq \underbrace{P(B) = \frac{350}{498} \approx 0.70}_{\text{PART (a)}}$$

NOT INDEPENDENT!