

Practice Exam II

March 8, 2012

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You must record here your answers to the multiple choice problems.

Place an \times through your answer to each problem.

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Multiple Choice

1. (5 pts.) Which of the following **could** be the probability distribution of an experiment?

(a)

Outcome	Probability
s_1	0.50
s_1	0.25
s_1	0.10
s_1	0.15

↑ Note all s_1 's

(b)

Outcome	Probability
s_1	0.50
s_2	0.25
s_3	0.10
s_4	0.10

(c)

Outcome	Probability
s_1	0.50
s_2	0.25
s_3	0.10
s_4	0.15

(d)

Outcome	Probability
s_1	0.50
s_2	0.25
s_3	0.25
s_4	0.10

(e)

Outcome	Probability
s_1	0.50
s_2	0.25
s_3	0.35
s_4	-0.10

2. (5 pts.) Suppose I roll a die twice and record the sum of the numbers that come up. What is the probability that this sum is 3?

(a) $\frac{1}{9}$

(b) $\frac{1}{18}$

(c) $\frac{1}{36}$

(d) $\frac{1}{6}$

(e) $\frac{1}{12}$

3. (5 pts.) An urn contains some balls. Each of the balls has a number on it, and each is colored. Consider the events

E = “The ball has a 3 on it”

F = “The ball is green”

Someone asks you “What is the probability that the ball is green and has a 3 on it?” Which of the following probabilities are they asking for?

(a) $Pr(E|F)$

(b) $Pr(F|E)$

(c) $Pr(E \cup F)$

(d) $Pr(E) + Pr(F)$

(e) $Pr(E \cap F)$

4. (5 pts.) It is determined that the odds AGAINST Stewball winning his next race are 3-2. What is the probability that Stewball DOES win the race? (Notice the “against” and the “does.”) *If necessary*, round to the nearest percent.

(a) 40%

(b) 30%

(c) 60%

(d) 67%

(e) 33%

5. (5 pts.) Three students (strangers) meet in line at the dining hall and start chatting. What is the probability that **at least** two were born on the same day of the week?

(a) $\frac{1}{7}$

(b) $\frac{1}{49}$

(c) $\frac{133}{343}$

(d) $\frac{152}{343}$

(e) $\frac{241}{343}$

6. (5 pts.) An urn contains balls with the following distribution of colors and numbers:

- 9 red balls: 3 labelled "A," 3 labelled "B" and 3 labelled "C"
- 10 blue balls: 2 labelled "A," 4 labelled "B" and 4 labelled "C"
- 12 green balls: 4 labelled "A," 5 labelled "B" and 3 labelled "C"

A ball is chosen at random and found to be labelled "B." What is the probability that it is blue?

(a) $\frac{2}{5}$

(b) $\frac{10}{31}$

(c) $\frac{12}{31}$

(d) $\frac{1}{3}$

(e) $\frac{5}{6}$

7. (5 pts.) In a football game, a coin is tossed before the game starts to determine who receives the ball first. Suppose that the local team plays 13 games this season. What is the probability that they will win exactly seven of the coin tosses? (**Careful: a lot of these answers look similar. Make sure which one you're picking.**)

(a) $\frac{\binom{13}{7}}{2^7}$

(b) $\frac{\binom{13}{7}}{2^{13}}$

(c) $\frac{P(13, 7)}{2^{13}}$

(d) $\frac{7}{13}$

(e) $\frac{\binom{13}{7}}{P(13, 7)}$

8. (5 pts.) A (not very high quality) company manufactures stereo equipment. Experience shows that defects in manufacturing are independent of one another. Quality control studies reveal that

- 10% of their CD players are defective;
- 20% of their amplifiers are defective;
- 50% of their speakers are defective.

A system consists of a CD players, an amplifier, and **TWO** speakers. What is the probability that the entire system is NOT defective?

(a) 0.5%

(b) 18%

(c) 82%

(d) 97%

(e) 99.5%

9. (5 pts.) A certain “loaded” die has the following probability distribution:

Outcome	Probability
1	0.30
2	0.05
3	0.15
4	0.10
5	0.25
6	0.15

Let E be the event that an odd number is rolled. Find $Pr(E)$.

- (a) 0.30 (b) 0.45 (c) 0.50
(d) 0.70 (e) 1.00

10. (5 pts.) Let E and F be **MUTUALLY EXCLUSIVE** events. Assume that $Pr(E) = 0.20$ and $Pr(F) = 0.30$. Find $Pr(E \cup F)$.

- (a) 0.20 (b) 0.30 (c) 0.44
(d) 0.50 (e) There is not enough information.

Partial Credit

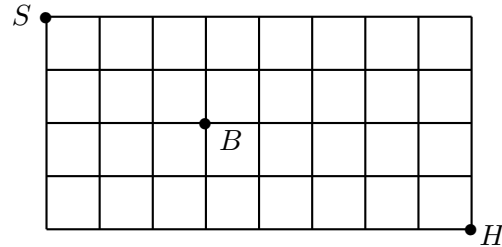
You must show all of your work on the partial credit problems to receive credit! Make sure that your answer is clearly indicated. You're more likely to get partial credit for a wrong answer if you explain your reasoning.

11. (10 pts.) The Census Bureau has determined that among all families with four children (no multiple births), all 16 possible orders of boys and girls (e.g. BGBB) are equally likely to occur.

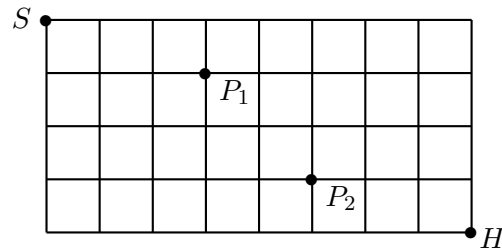
(a) If a family is chosen at random from the Bureau's list of families with four children, what is the probability that exactly two are boys?

(b) Suppose that a family is chosen at random, and it is noticed that they have at least two boys. What is the probability that they have exactly two boys?

12. (10 pts.) For this problem, you may leave your answer in terms of mixtures of combinations and permutations (i.e. $C(n, r)$ and $P(n, r)$ for appropriate n and r) if you like.

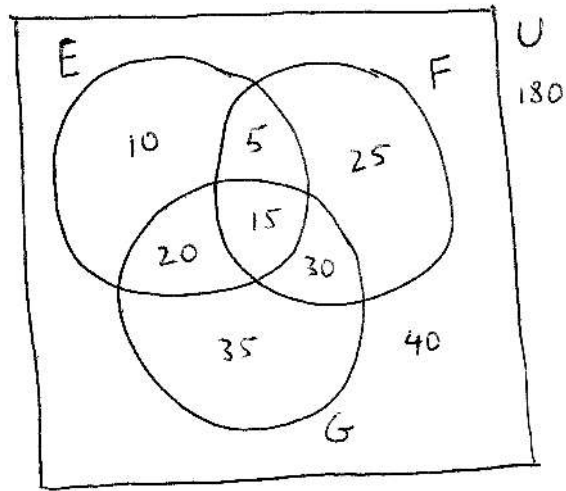


(a) Refer to the above city map. Sam starts at school (marked S) and needs to go home (marked H). He chooses a random path traveling only east and south. A bully is lurking in the spot marked B . What is the probability that Sam goes by the bully? (Hint: How many paths all together go from S to H ? How many paths go through B ?)



(b) Sam starts at school (marked S) and needs to go home (marked H). He randomly chooses a route traveling only east and south. A leprechaun has left two pots of gold at the points marked P_1 and P_2 . What is the probability that he passes by **both** of the pots?

13. (10 pts.) Consider the following Venn diagram:



Note that there are 180 outcomes all together. If an outcome is selected at random from U , find the following probabilities:

(a) $Pr(E) =$

(b) $Pr(E|F) =$

(c) $Pr(E \cap G') =$

(d) $Pr(F \cup G) =$

14. (10 pts.) Jack plays the following game. First he rolls a die and observes the number that comes up; then he draws a card from a standard deck and observes the suit. (**The number on the card is irrelevant; only the suit matters. Remember that there are four suits, all equally likely to be drawn.**) Here's how the game works:

If the die shows a 1 or a 2, then he needs a “club” to win.

If the die shows a 3,4,5 or 6, then he needs a “diamond” or a “heart” to win.

(a) Draw a tree diagram for this game, with all the probabilities labelled and indicating which endpoints correspond to winning the game.

(b) What is the probability of winning the game?

(c) If Jack won the game, what is the probability that he rolled a 3 in the first part?

15. (10 pts.) In our house, for supper, we have pasta 60% of the time, rice 30% of the time, and turkeyburgers 10% of the time. When we have pasta, 80% of the time we put red sauce on it and 20% of the time we put white sauce on it. When we have rice, 30% of the time we put red sauce on it and 70% of the time we put white sauce on it. When we have turkeyburgers, 40% of the time we put red sauce on them and 60% of the time we put white sauce on them.¹

(a) Draw a tree diagram representing the given information.

(b) What percentage of the time do we have red sauce in our house?

(c) President Obama chooses a random night to come unannounced for dinner. He is delighted to see that we're having red sauce. With this additional information, what is the probability that we're having turkeyburgers?

¹My 12-year-old daughter wanted me to stress that this problem is entirely fictional. In particular, we do **not** put either red or white sauce on our turkeyburgers.

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