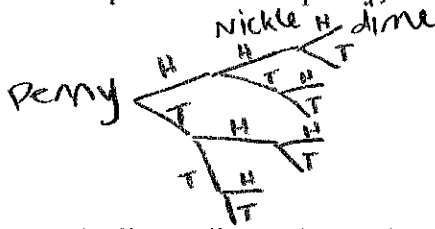## Sec. 14.1
Sample Space and Simple Probability

State the sample space for each of the following events. Remember the sample space is a list of all possible outcomes for the event. Please try and use either an area model or a tree diagram to help construct the sample space. Please explain why you chose the method used.

① Event: Flip three coins a penny, a nickel, and a dime

② Event: Roll two dice and record their sum.

③ Event: Shooting One – and – One Free Throws

H = Hit the shot
M = miss the shot
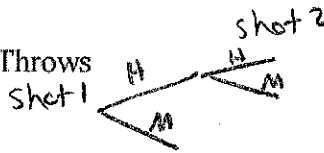
④ Use question #1 to answer the following, find the probability of each of the following events occurring. Be sure to show your thinking clearly:

3 H
2 H 1T
2T 1 H
3 T

a) Three heads $\dfrac{1}{8}$

b) At least two heads $\dfrac{4}{8} = \dfrac{1}{2}$

c) One head and two tails $\dfrac{3}{8}$

d) At least one tail $\dfrac{7}{8}$

e) Exactly two tails $\dfrac{3}{8}$

f) At least one head and one tail $\dfrac{6}{8} = \dfrac{3}{4}$

g) Which is more likely, flipping at least 2 heads or a least 2 tails? Explain

2 heads = $\dfrac{4}{8}$ 2 tails = $\dfrac{4}{8}$

they are the same

f) Did you choose the best method to represent this sample space? Explain

Both work well

5. Use question #2 to answer the following.
   a) In a standard casino dice game the roller wins on the first roll if he rolls a sum of 7 or 11. What is the probability of winning on the first roll?

   $$\frac{8}{36} = \frac{2}{9}$$

   b) The player loses on the first roll if he rolls a sum of 2, 3, or 12. What is the probability of losing on the first roll?

   $$\frac{4}{36} = \frac{1}{9}$$

   c) If the player rolls any other sum, he continues to roll the dice until the first sum he rolled comes up again or until he rolls a 7, whichever happens first. What is the probability that the game continues after the first roll?

   Prob. of not $\frac{12}{36}$ or $\frac{24}{36} = \boxed{\frac{2}{3}}$

   $1 - \frac{12}{36}$

6. Still using question #2, in a different game of dice, you win if you roll a sum of six, lose if you roll a sum of seven. If anything else happens you ignore the results and roll again.
   a) How many ways are there to get a sum of six?

   5

   b) How many ways are there to get a sum of seven?

   6

   c) How many possible outcomes are important in this problem?

   11, the outcomes where you win or lose

⑦ Rimshot McGee has a 70% free throw average. The opposing team is ahead by one point. Rimshot is at the foul line in a one-and-one situation with just seconds left in the game. (A one-and-one situation means that the player shoots a free throw. (If he makes the shot, he is allowed to shoot another. If he misses the shot, he gets no second shot. Each shot made is worth one point.)

a) Take a guess. What do you think is the most likely outcome for Rimshot (use the sample space from question #3 to help if necessary)?
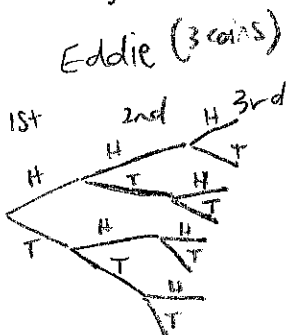
He will most likely make both shots

b) Jeremy is working on the problem with Jenna and he remembers that area models are sometimes useful for solving problems related to probability. They set up the following area modes. Which part of the model represents Rimshot getting one point? How can you use the model to help you calculate the probability that Rimshot will get exactly one point?

2nd shot

|	makes (0.7)	misses (0.3)
1st shot makes (0.7)	.49	.21
misses (0.3)	.3	

c) Use a model to find the probability of each outcome (0 points, 1 point, 2 points). What is the most likely of the three outcomes?

0 points   .3 or 30%

1 points   .21 or 21%

2 points   .49 or 49%

⑧ Eddie told Alfred, *"I'll bet if I flip three coins I can get exactly two heads."* Alfred replied, *"I'll bet I can get exactly two heads if I flip four coins!"* Eddie scoffed. *"Well, so what? That's easier."* Alfred argues, *"No, it's not. It's harder."* Who is correct? Show all of your work and be prepared to defend your conclusion.

Eddie (3 coins)

1st 2nd 3rd

8 outcomes

Eachly 2 heads
HHT, HTH, THH

$\frac{3}{8}$

They are the same

Alfred: H T
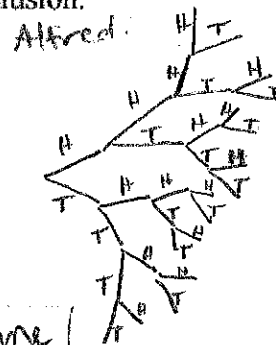
$2 \cdot 2 \cdot 2 \cdot 2 = 16$ outcomes

Exactly 2 Heads
HTHT, HTTH, THHT
THTH, TTHH, HHTT

$\frac{6}{16} = \frac{3}{8}$

9) Harold sorted his jellybeans into two jars. He likes purple ones best and the black ones next best, so these are both in one jar. His next favorites are yellow, orange, and white, and these are in another jar. He throws all the rest in the garbage. Harold allows himself to eat only one jellybean from each jar per day. He wears a blindfold when he selects his jellybeans so he cannot choose his favorite first. What is the probability that Harold gets one black jellybean and one orange jellybean, if the first jar has 60% black and 40% purple jellybeans and the second jar has 30% yellow, 50% orange, and 20% white jellybeans?

B   P   Y   O   W
60% 40%   30% 50% 20%

$(.6)(.5) = .30$

10) What is the probability that $x^2 + 7x + k$ is factorable if $0 \le k \le 20$ and k is an integer?

21 outcomes   factorable if $k = 0, 6, 10, 12$

k
$1 \cdot 6 = 6$
$6 \cdot 1 = 6$
$2 \cdot 5 = 10$
$5 \cdot 2 = 10$
$3 \cdot 4 = 12$
$4 \cdot 3 = 12$

$\boxed{\dfrac{4}{21}}$

11. A coin is flipped. Find the probability of heads (P(H) *means the probability of a Head is*)?

$\boxed{\dfrac{1}{2}}$

12. A die is rolled. What is P(2)? What is the probability of an odd number? P(Prime)?

$P(2) = \dfrac{1}{6}$ $P(odd) = \dfrac{1}{2}$ $P(Prime) = \dfrac{1}{2}$

13. A card is drawn from a standard deck of playing cards. (4 suits – black clubs, black spades, red diamonds, red hearts; 13 of each suit, Ace (A), numbers 2 thru 10, Face Cards – Jack (J), Queen (Q), King (K); 52 cards in all). Find the following probabilities.

a) P(2)

$\dfrac{4}{52} = \dfrac{1}{13}$

b) P(red)

$\dfrac{1}{2}$

c) P(K)

$\dfrac{4}{52} = \dfrac{1}{13}$

d) P(club)

$\dfrac{13}{52} = \dfrac{1}{4}$

d) P(face card)

$\dfrac{12}{52} = \dfrac{3}{13}$

e) P(black face card)

$\dfrac{6}{52} = \dfrac{3}{26}$