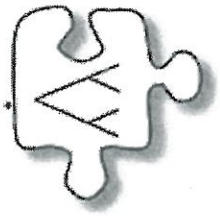
Name: Notes Period: _____ Date: _____

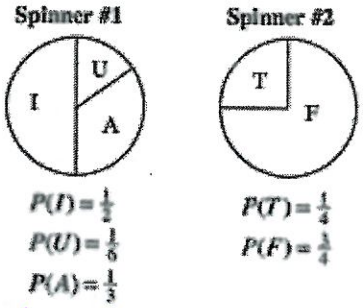
4.2.2 How can I represent it?

Using a Tree Diagram



In Lesson 4.2.1, you used a probability area model to represent probability situations where some outcomes were more likely than others. Today you will consider how to represent these types of situations using tree diagrams.

4-64. Your teacher challenges you to a spinner game. You spin the two spinners with the probabilities listed at right. The first letter comes from Spinner #1 and the second letter from Spinner #2. If the letters can form a two-letter English word, you win. Otherwise, your teacher wins. Test your ideas with the *4-64 Student eTool* (CPM) spinner game.



a. Are the outcomes for spinner #2 independent of the outcomes for spinner #1?

Yes, they are independent because the outcome of #1 has no affect the outcome of #2

b. Make a probability area model of the sample space, and find the probability that you will win this game.

Spinner 1

Spinner 2	I $(\frac{1}{2})$	U $(\frac{1}{6})$	A $(\frac{1}{3})$
T $(\frac{1}{4})$	$(\frac{1}{2})(\frac{1}{4})$ $\frac{1}{8}$		$\frac{1}{12}$
F $(\frac{3}{4})$	$\frac{3}{8}$		

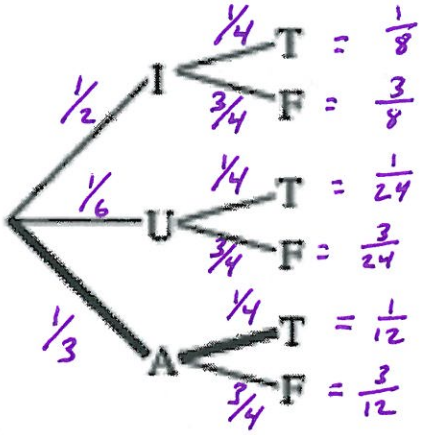
$\frac{1}{8} + \frac{1}{12} + \frac{3}{8} =$

$\frac{7}{12} = .58\overline{3}$

c. Is this game fair? If you played the game 100 times, who do you think would win more often, you or your teacher? Can you be sure this will happen?

No, more likely the teacher will lose.

4-65. Sinclair wonders how to model the spinner game in problem 4-64 using a tree diagram. He draws the tree diagram below.



a. Sabrina says, *"That can't be right. This diagram makes it look like all the words are equally likely."* What is Sabrina talking about? Why is this tree diagram misleading?

Because it doesn't show which are more likely to occur

b. To make the tree diagram reflect the true probabilities in this game, Sabrina writes numbers on each branch showing the probability that the letter will occur. So she writes a "$\frac{1}{3}$" on the branch for "A," a "$\frac{1}{4}$" on the branch for each "T," etc. Following Sabrina's method, label the tree diagram with probabilities on each branch.

c. According to the probability area model that you made in problem 4-64, what is the probability that you will spin the word "AT"? Now examine the bolded branch on the tree diagram shown above. How could the numbers you have written on the tree diagram be used to find the probability of spinning "AT"?

We need to multiply the branches together.

d. Does this method work for the other combinations of letters? Similarly calculate the probabilities for each of the paths of the tree diagram. At the end of each branch, write its probability. (For example, write "$\frac{1}{12}$" at the end of the "AT" branch.) Do your answers match those from problem 4-64?

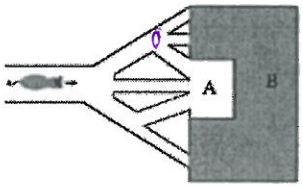
Yes, they match

e. Find all the branches with letter combinations that make words. Use the numbers written at the end of each branch to compute the total probability that you will spin a word. Does this probability match the probability you found with your area model?

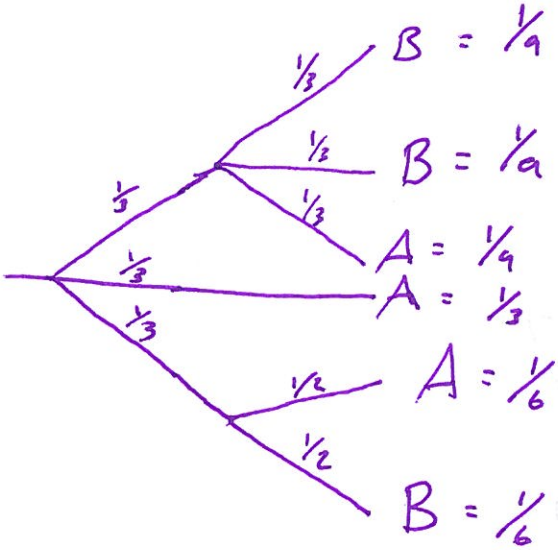
4-66. THE RAT RACE

Ryan has a pet rat Romeo that he boasts is the smartest rat in the county. Sammy overheard Ryan at the county fair claiming that Romeo could learn to run a particular maze and find the cheese at the end.
"I don't think Romeo is that smart!" Sammy declares, *"I think the rat just chooses a random path through the maze."*

Ryan has built a maze with the floor plan shown below. In addition, he has placed some cheese in an airtight container (so Romeo can't smell the cheese!) in room A.



a. Suppose that every time Romeo reaches a split in the maze, he is equally likely to choose any of the paths in front of him. Choose a method and calculate the probability that Romeo will end up in each room. In a sentence or two, explain why you chose the method you did.

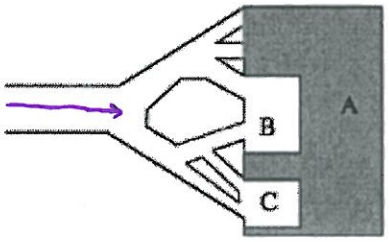


b. If the rat moves through the maze randomly, how many out of 100 attempts would you expect Romeo to end up in room A? How many times would you expect him to end up in room B? Explain.

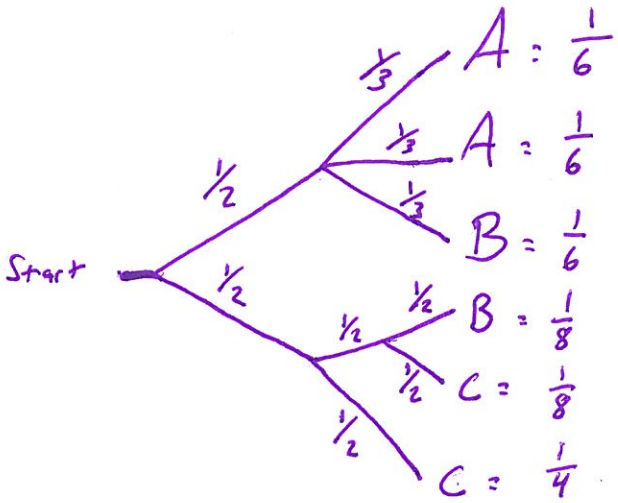
$P(A) = \frac{1}{9} + \frac{1}{3} + \frac{1}{6} = \boxed{\frac{11}{18}}$ $P(B) = \frac{1}{9} + \frac{1}{9} + \frac{1}{6} = \boxed{\frac{7}{18}}$

c. After 100 attempts, and Romeo finds the cheese 66 times. *"See how smart Romeo is?"* Ryan asks, *"He clearly learned something and got better at the maze as he went along."* Sammy isn't so sure.
Do you think Romeo learned and improved his ability to return to the same room over time? Or could he just have been moving randomly? Discuss this question with your team. Then, write an argument that would convince Ryan or Sammy.

4-67. Always skeptical, Sammy says, "*If Romeo really can learn, he ought to be able to figure out how to run this new maze I've designed.*" Examine Sammy's maze below.



a. To give Romeo the best chance of finding the cheese, in which room should the cheese be placed? Choose a method, show all steps in your solution process, and justify your answer.



b. If the cheese is in room C and Romeo finds the cheese 6 times out of every 10 tries, does he seem to be learning? Explain your conclusion.

$P(A) = \frac{1}{6} + \frac{1}{6} = \boxed{\frac{1}{3}}$

$P(B) = \frac{1}{6} + \frac{1}{8} = \boxed{\frac{7}{24}}$

$P(C) = \frac{1}{8} + \frac{1}{4} = \boxed{\frac{3}{8}}$

4-68. LEARNING LOG

Make an entry in your Learning Log describing the various ways of representing complete sample spaces. For each method, indicate how you compute probabilities using the method. Which method seems easiest to use so far? Label this entry "Creating Sample Spaces" and include today's date. Set this Learning Log aside in a safe place. You will need it in the next lesson.