Hidden Treasure

Purpose:
Participants will determine the probability of finding the path that leads to the treasure.

Overview:
In small groups, participants will explore the path choices and identify the paths that lead to the back section of the Enchanted Forest where the castle stands. They will determine the probability of finding a path that leads to the castle using a tree diagram and an area model.

TExES Mathematics 4-8 Competencies. The beginning teacher:

IV.013.B Uses the concepts and principles of probability to describe the outcome of simple and compound events.

IV.013.D Determines probabilities by constructing sample spaces to model situations.

TEKS Mathematics Objectives. The student is expected to:

5.12.A Use fractions to describe the results of an experiment.

6.9.A Construct sample spaces using lists, tree diagrams, and combinations.

7.10.A Construct sample spaces for compound events (dependent and independent).

8.11.A Find the probabilities of compound events (dependent and independent).

8.11.B Use theoretical probabilities and experimental results to make predictions and decisions.

Terms.
Probability, deterministic vs. random experiment, sample space, finite vs. infinite sample space

Materials.
For each pair of participants:

- Transparency
- Activity Sheet for each participant

Transparencies.

- *Hidden Treasure*

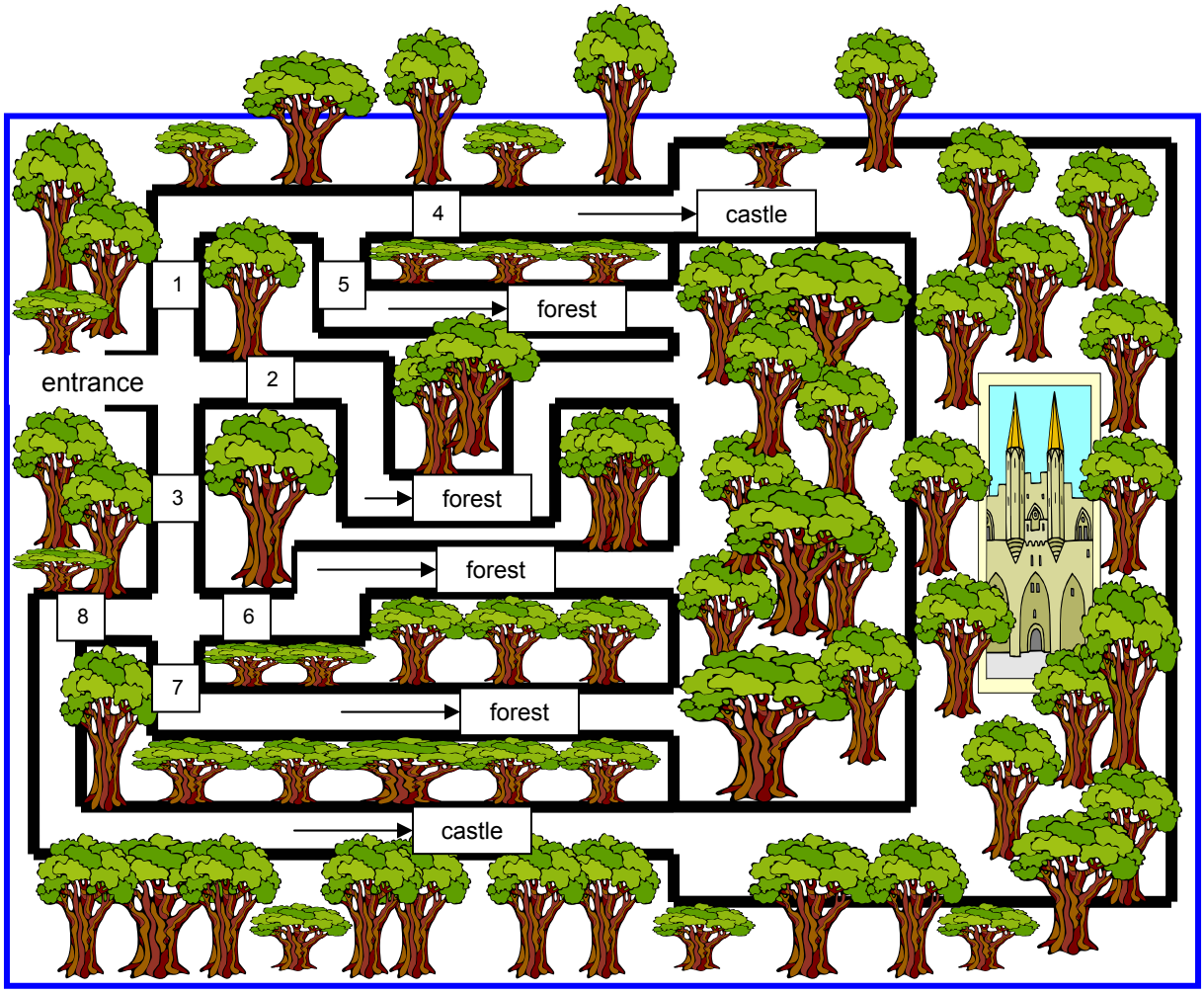
Activity Sheet(s).

- *Hidden Treasure*

Procedure:

Steps	Questions/Math Notes
1. Read aloud the Hidden Treasure Problem (Transparency #??) two times. Answer questions about the meaning of the problem. Ask participants to work in small groups to determine the probability of finding the treasure.	To stimulate their thinking, ask participants questions about what they are doing: *How many different paths are there in the Enchanted Forest? How do you know?*
2. Circulate among the groups as they work the problem. Ask participants to draw a tree diagram which indicates each time a person makes a path choice.	*In a probability tree diagram, how can you show what happens each time the path branches? Why should this approach work?* *How can you assign probabilities to path choices? Why is your approach valid? How do you know?* *Is the event "finding the path that takes you to the castle" a simple or compound event?* *Have you computed the probability of choosing each possible path?*
3. Ask participants to draw an area model to represent all the possible path choices and to determine the probability of choosing each path.	*In an area model, how can you show what happens each time the path branches? Why should this approach work?* *How can you assign probabilities to path choices? Why is your approach valid? How do you know?* *Do the computed probabilities you determined from the area model match those from the probability tree diagram?*
4. Select four small groups to present their solution: two groups share their probability tree diagrams and two groups share their area models. Try to select groups that have different solutions.	*Are you sure you have found all the possible paths that lead to the castle?* *How do you know your assigned probabilities for each path selection are correct?*

Diagram with Paths Labeled

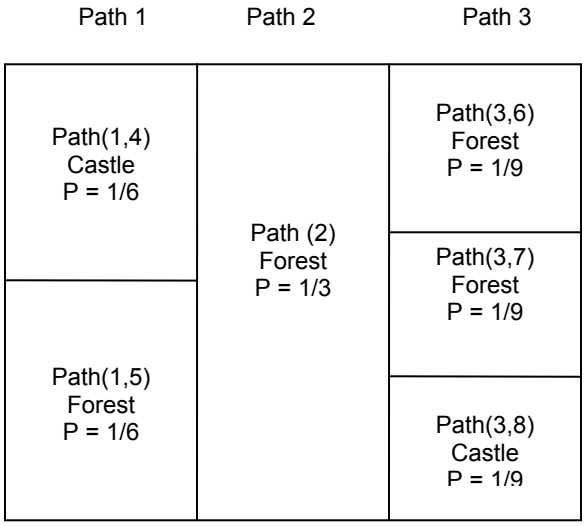


Area Model for Determining the P(finding the castle):

Initially there are three path choices (1, 2, 3) so cut the square into three equal columns. On path 1 there are two path choices so draw one horizontal line across column 1 to cut it into two equal pieces. These two pieces represent path 4 and path 5. Path 4 leads to the castle; path 5 leads deeper into the forest.

On path 2 there are no additional path choices; path 2 leads deeper into the forest.

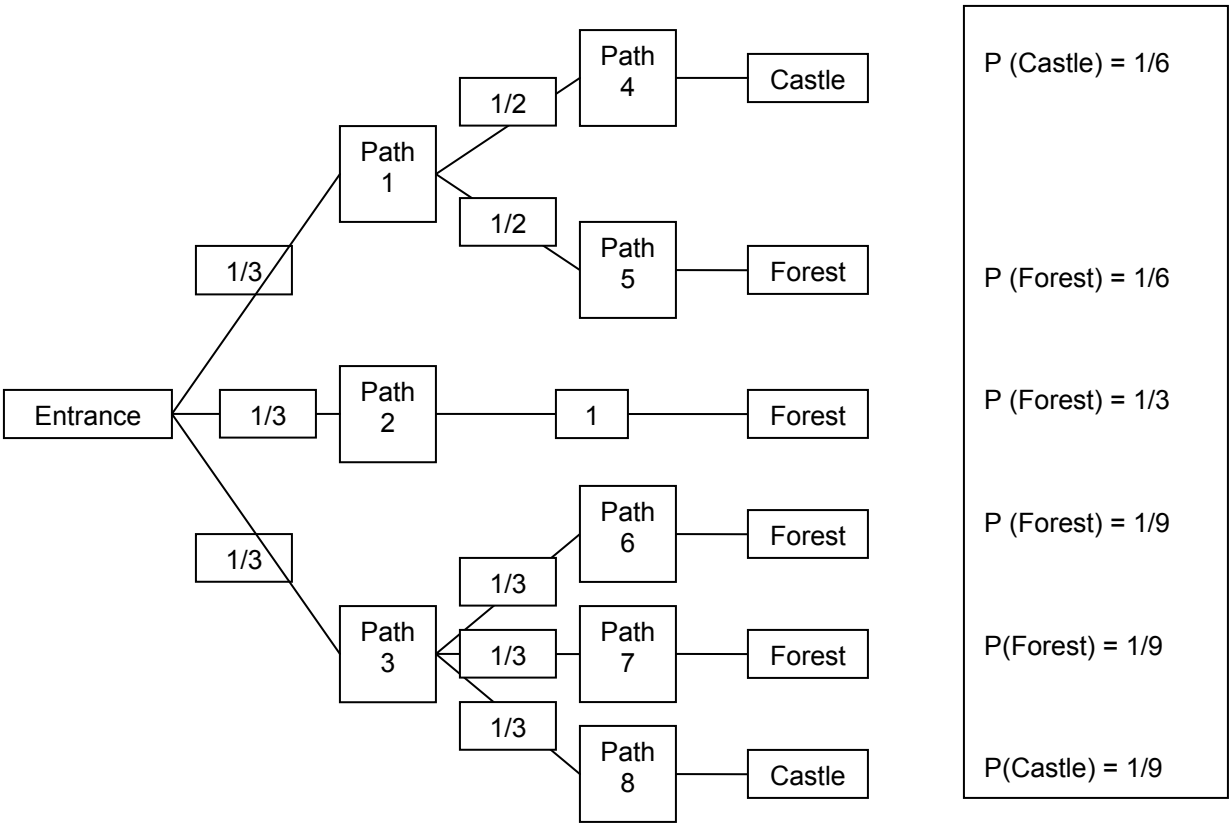
On path 3 there are three path choices so draw two horizontal lines across column 3 to cut it into three equal pieces. These three pieces represent paths 6, 7, and 8. Paths 6 and 7 lead deeper into the forest; path 8 leads to the castle.



P(Castle) = 1/6 + 1/9 = 5/18 or ≈ 28%

P(Forest) = 1/6 + 1/3 + 1/9 + 1/9 =
13/18 or ≈ 72%

Tree Diagram:



P (castle) = P (Path 1, 4) + P (Path 3, 8) = 1/6 + 1/9 = 5/18

P (forest) = P (Path 1, 5) + P (2) + P(Path 3, 6) + P(Path 3, 7) = 1/6 + 1/3 + 1/9 + 1/9 = 13/18

References:

Phillips, E., Lappan, G., Winter, M. J., & Fitzgerald, W. (1986). Activity 6: Area models. *Middle grades mathematics project: Probability* (pp. 99-102). Menlo Park, CA: Addison-Wesley.