

Step by step guide_Probability Using Tree Diagrams

Pre-Class Preparation

- Prepare pair assignments.
- Have colored markers (different colors for each stage).
- Prepare large chart paper for demonstrations.
- Have coins and colored balls/marbles ready.
- Draw example tree diagrams on board or slides.
- Prepare tree diagram templates for struggling learners.
- Have worked examples ready.

Phase 1: Problem-Solving and Discovery (15 minutes)

[0-2 minutes] Introduction

[SAY] "Good morning! Today we learn about TREE DIAGRAMS - a powerful visual tool for calculating probabilities of multiple events."

[SAY] "Imagine picking balls from a bag one by one. How do we organize all the possibilities? Tree diagrams!"

[2-3 minutes] Pair Formation

[DO] Divide students into pairs.

[DO] Distribute chart paper and colored markers.

[3-5 minutes] Explain the Activity

[SAY] "You have a bag with 5 green balls and 3 red balls. You pick three balls one at a time WITHOUT putting them back."

[SAY] "Your job: Build a tree diagram step by step, following tasks a through e."

[SAY] "Start with task a - draw the first stage. You have 10 minutes."

[5-13 minutes] Pair Work

[DO] Circulate among pairs, observing their tree diagrams.

[DO] Check if they label branches correctly.

[ASK] "For task b, after removing one red ball, how many balls are left?"

[LISTEN] Students should say: 7 balls total, 2 red, 5 green.

[ASK] "Why does the denominator change from 8 to 7?"

[DO] Guide students who struggle with changing probabilities.

[13-15 minutes] Pair Sharing

[SAY] "Pair 1, show us your tree diagram for the first two stages."

[DO] Display their work or draw on board based on their description.

[SAY] "For task e, what did you multiply to get P(Red, Red, Red)?"

[LISTEN] Students should say: $\frac{3}{8} \times \frac{2}{7} \times \frac{1}{6}$.

[SAY] "Excellent! Let's learn the formal rules."

Phase 2: Structured Instruction (10 minutes)

[15-17 minutes] Define Tree Diagrams

[SAY] "A tree diagram is a visual way to organize probabilities for multiple events happening one after another."

[SAY] "Think of it like a tree: one trunk (starting point), branches split into more branches."

[17-20 minutes] Golden Rule 1: Branches Add to 1

[WRITE on board] "Rule 1: Branches from the same point add to 1"

[SAY] "At each stage, all possibilities must add to 100%. Why? Because something MUST happen!"

[EXAMPLE] "First pick: $P(\text{Red}) + P(\text{Green}) = \frac{3}{8} + \frac{5}{8} = \frac{8}{8} = 1$. Check!"

[20-22 minutes] Golden Rule 2: Multiply Along

[WRITE on board] "Rule 2: Multiply along the branches (AND rule)"

[SAY] "To find probability of a sequence, multiply along the path."

[EXAMPLE] " $P(\text{Red AND Red AND Red}) = \frac{3}{8} \times \frac{2}{7} \times \frac{1}{6}$ "

[22-25 minutes] Golden Rule 3: Add Down

[WRITE on board] "Rule 3: Add down the columns (OR rule)"

[SAY] "To find probability of different paths leading to same outcome, add them."

[EXAMPLE] " $P(\text{Same color}) = P(\text{Red, Red}) + P(\text{Green, Green})$ "

Phase 3: Practice and Application (15 minutes)

[25-30 minutes] Worked Example 3.2.27 (Coin)

[SAY] "Example 1: Toss a coin twice. Find P(two Heads)."

[DO] Draw tree diagram on board:

[DRAW] "First toss: H (0.5) and T (0.5)"

[DRAW] "From H: H (0.5) and T (0.5). From T: H (0.5) and T (0.5)"

[SAY] "Trace the path for two Heads: H then H."

[WRITE] " $P(\text{H and H}) = 0.5 \times 0.5 = 0.25$ "

[SAY] "Answer: 25% or $1/4$ "

[30-37 minutes] Worked Example 3.2.28 (Marbles)

[SAY] "Example 2: Bag has 5 red, 3 blue marbles. Draw two WITHOUT replacement. Find P(same color)."

[DO] Draw tree diagram:

[WRITE] "First: $P(R) = 5/8$, $P(B) = 3/8$ "

[WRITE] "If R first: $P(R) = 4/7$, $P(B) = 3/7$ (7 marbles left)"

[WRITE] "If B first: $P(R) = 5/7$, $P(B) = 2/7$ "

[SAY] "Same color means (R,R) OR (B,B). Two paths!"

[WRITE] " $P(R,R) = 5/8 \times 4/7 = 20/56$ "

[WRITE] " $P(B,B) = 3/8 \times 2/7 = 6/56$ "

[WRITE] " $P(\text{Same}) = 20/56 + 6/56 = 26/56 = 13/28$ "

[SAY] "Answer: $13/28$ or about 46%"

Phase 4: Assessment (5 minutes)

[37-39 minutes] Exit Ticket Review

[SAY] "Question 1 - Spinner with 3 colors, spin twice. P(Red both times)?"

[ASK] "What's P(Red) on one spin?"

[LISTEN] Students say: $1/3$

[SAY] "Independent events! Multiply: $1/3 \times 1/3 = 1/9$ "

[SAY] "Question 2 - 4 orange, 6 lemon sweets. P(different flavors)?"

[SAY] "Two paths: (Orange, Lemon) OR (Lemon, Orange)"

[DO] Calculate: $4/10 \times 6/9 + 6/10 \times 4/9 = 24/90 + 24/90 = 48/90 = 8/15$

[39-40 minutes] Closure

[SAY] "Excellent! Today we learned tree diagrams with three golden rules:"

[SAY] "1. Branches add to 1. 2. Multiply along (AND). 3. Add down (OR)."

[SAY] "Tree diagrams help us see ALL possibilities and calculate probabilities systematically!"

[DO] Collect exit tickets.

Teaching Tips

- Use different colors for each stage of the tree to improve clarity.
- Always verify that branches from the same point add to 1.
- Emphasize "multiply along, add down" as a memorable phrase.
- Draw tree diagrams large and clearly on the board.
- Use real objects (coins, balls) for hands-on demonstrations.
- Connect to real-world Kenyan contexts: matatus, farming, sports.
- Practice identifying "AND" (multiply) vs "OR" (add) situations.

Common Student Errors to Watch For

- Adding probabilities along a path instead of multiplying.
- Forgetting to adjust probabilities for "without replacement" scenarios.
- Not recognizing when to add probabilities (for "OR" situations).
- Branches from the same point not adding to 1.
- Confusing which branches to follow for a specific outcome.
- Incorrect simplification of fractions in final answers.