

Year 9 Probability — Two-Stage Experiments

Each tree diagram is already drawn with the correct branches. **Complete every tree:** write the outcome at the end of each complete path (the branch tips), and write the probability fraction on each branch — favourable $\div$ total at that point. On some trees the small box above each second branch is for that branch's label. When the first item is not replaced, the second stage is out of one fewer. Simplify your fractions.

Name: _____

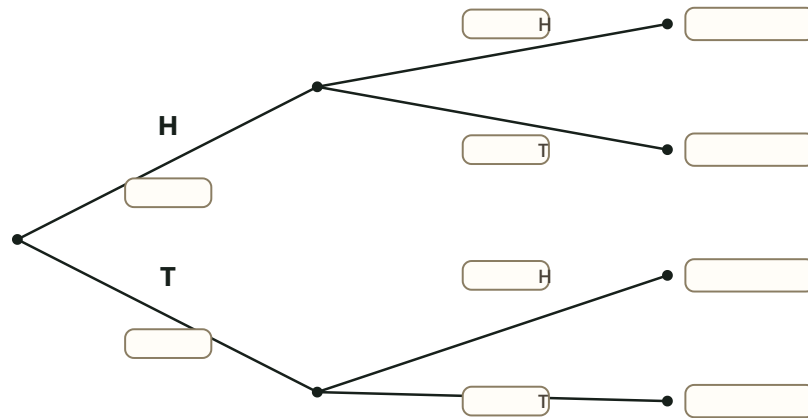
Class: _____

Date: _____

Question 1 • Coin toss twice

SECTION 1 • FAIR TWO-STAGE EXPERIMENTS

A fair coin is tossed twice. H = heads, T = tails. The tree shows the first toss, then the second.



(a) How many outcomes are in the complete sample space?

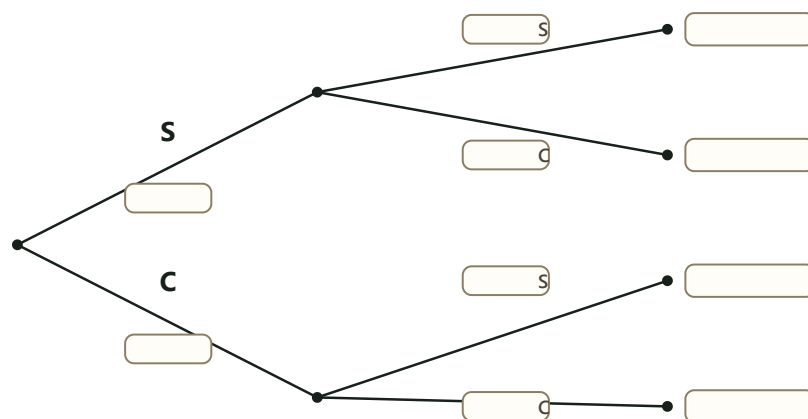
(b) Find the probability of two heads.

(c) Find the probability of exactly one head.

Question 2 • Weather spinner twice

SECTION 1 • FAIR TWO-STAGE EXPERIMENTS

A two-section spinner shows Sunny (S) on one half and Cloudy (C) on the other. It is spun twice.



(a) How many outcomes are in the sample space?

(b) Find the probability of two sunny spins.

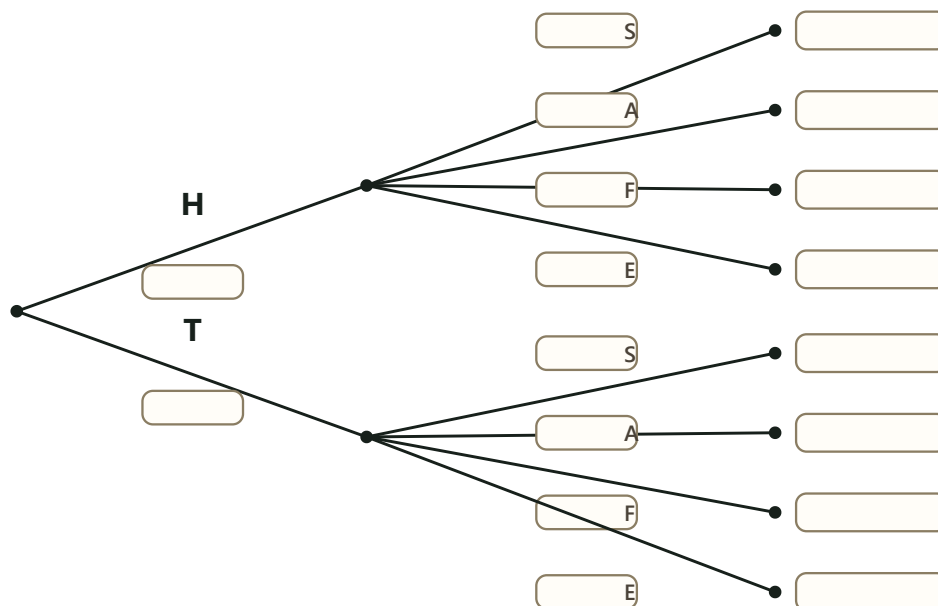
(c) Find the probability of at least one cloudy spin.

(d) Find the probability that both spins show the same weather.

Question 3 • Coin and a letter

SECTION 1 • FAIR TWO-STAGE EXPERIMENTS

A coin is tossed and a letter card is drawn from the word SAFE. The coin branch comes first.

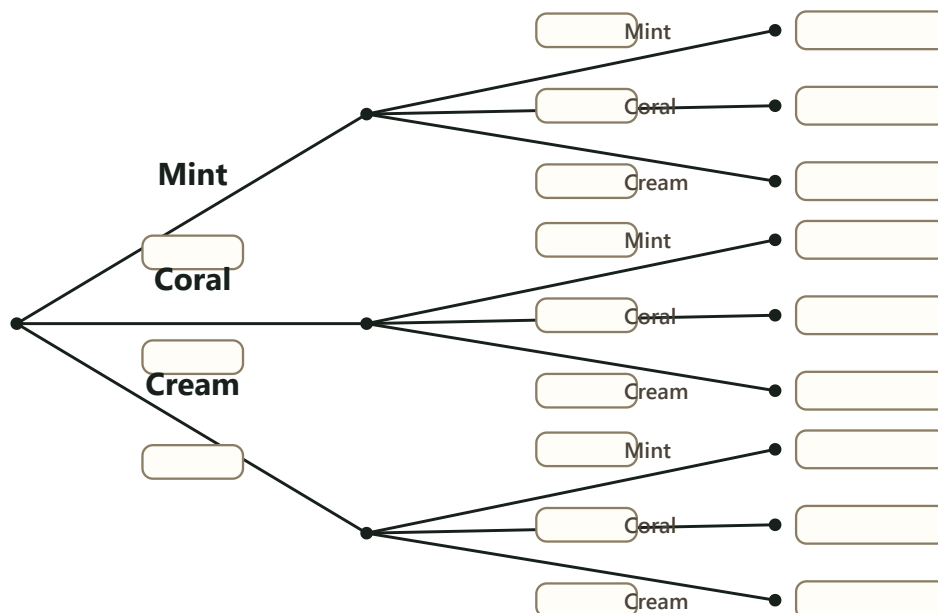


- How many outcomes are in the sample space?
- Find the probability of a head and the letter A.
- Find the probability of tails and a vowel (A or E).
- Which is more likely — heads with a consonant, or tails with a vowel?

Question 4 • Three-colour spinner twice

SECTION 1 • FAIR TWO-STAGE EXPERIMENTS

A spinner shows Mint (M), Coral (C) and Cream (R) in equal thirds. It is spun twice.

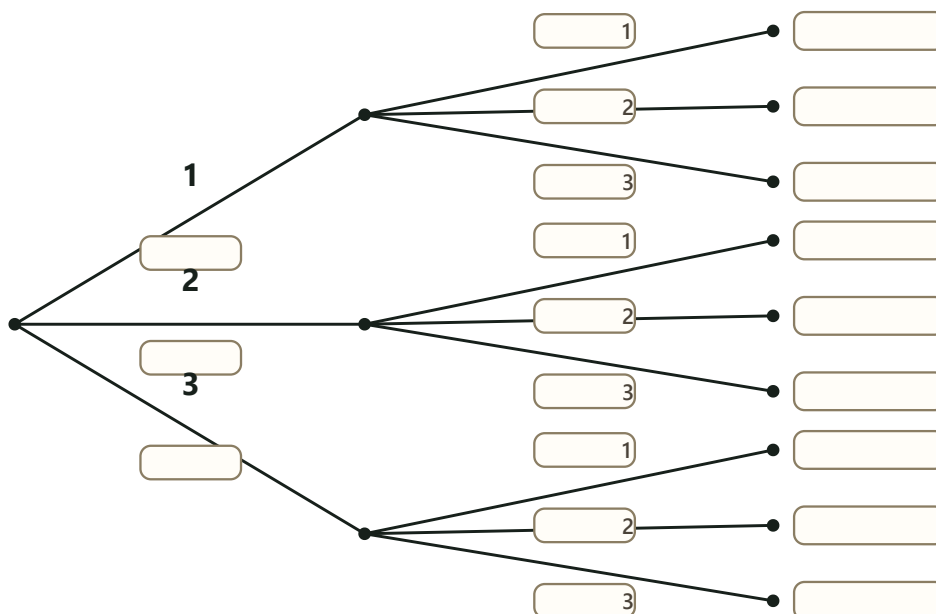


- How many outcomes are in the sample space?
- Find the probability of the same colour twice.
- Find the probability of no Cream at all.

Question 5 • Number spinner twice

SECTION 1 • FAIR TWO-STAGE EXPERIMENTS

A spinner lands on 1, 2 or 3. It is spun twice. Write the two results together at each branch tip (1-then-2 is outcome 12).

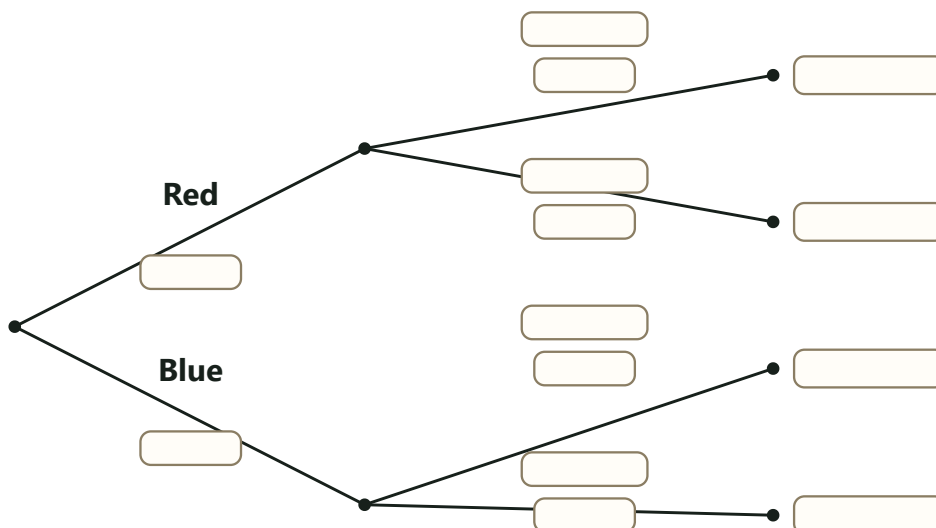


- How many outcomes are in the sample space?
- Find the probability that the two numbers add to 4.
- Find the probability that the two spins show the same number.
- Find the probability that the total is at least 5.

Question 6 • Counter bag, replaced

SECTION 2 • UNEVEN BRANCHES

A bag holds 3 red and 5 blue counters. Two are drawn, with the first replaced. Write R or B on each second branch, the outcome at each tip, and the fraction on every branch.

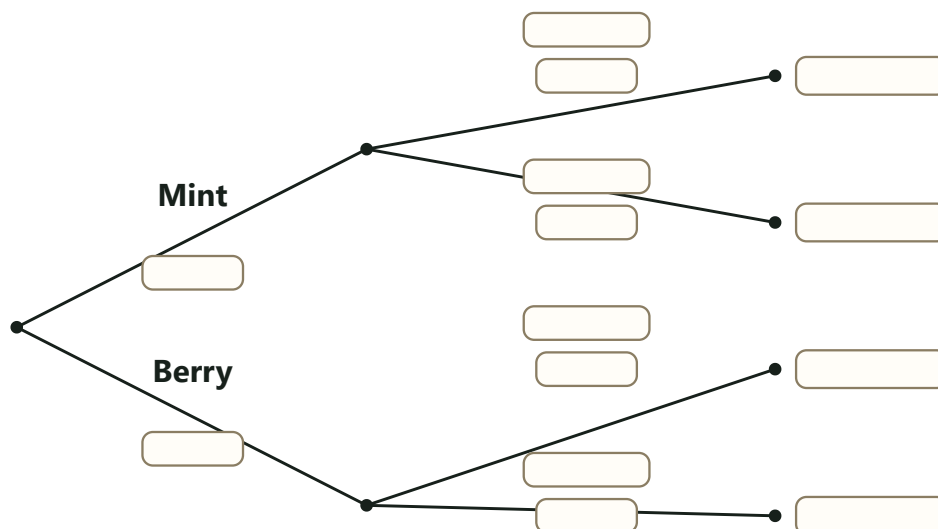


- Find the probability of drawing two red counters.
- Find the probability of two different colours.
- Find the probability of at least one blue counter.

Question 7 • Lolly jar, replaced

SECTION 2 • UNEVEN BRANCHES

A jar holds 4 mint and 6 berry lollies. Two are drawn, with the first replaced before the next draw.

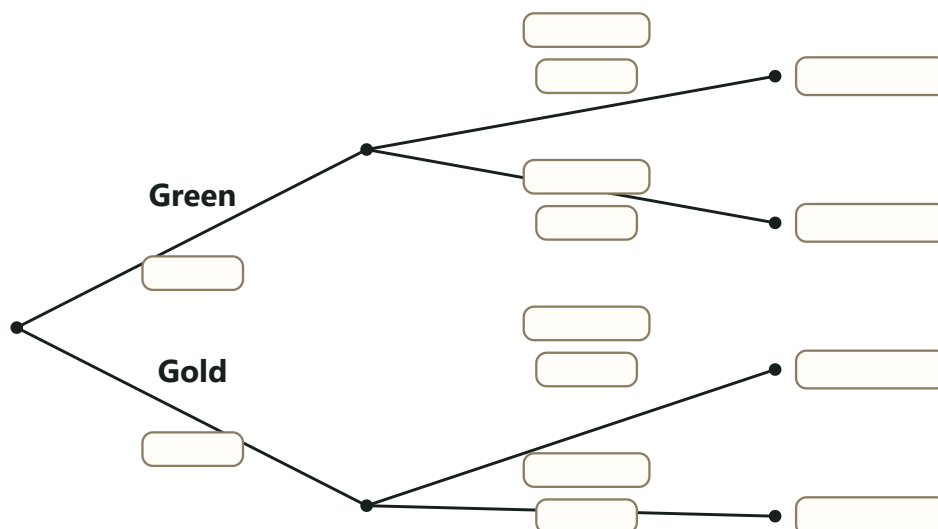


- (a) Find the probability of two mint lollies.
- (b) Find the probability of exactly one berry lolly.
- (c) Find the probability of at least one mint lolly.

Question 8 • Prize wheel, twice

SECTION 2 • UNEVEN BRANCHES

A prize wheel lands on Green (G) one quarter of the time and Gold (D) three quarters. It is spun twice.

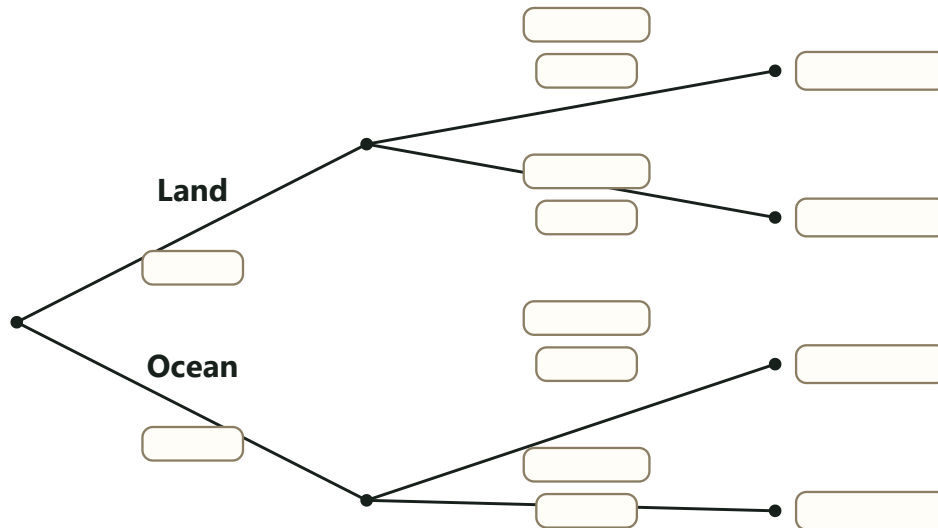


- (a) Find the probability of two golds.
- (b) Find the probability of at least one green.
- (c) Find the probability that the two spins are different colours.

Question 9 • Coast and ocean spinner

SECTION 2 • UNEVEN BRANCHES

A geography spinner shows Land (L) on two thirds and Ocean (O) on one third. It is spun twice.

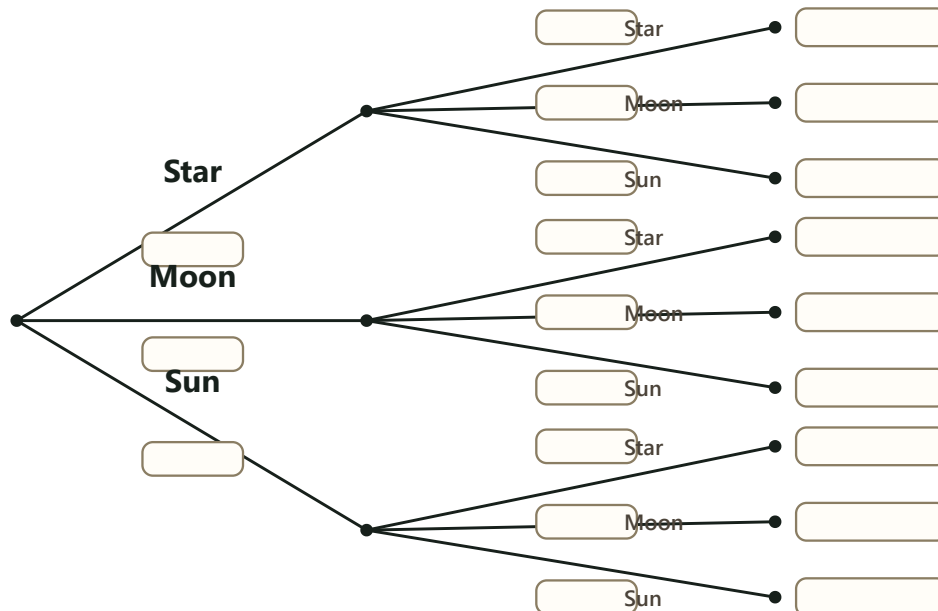


- (a) Find the probability of landing on Land twice.
- (b) Find the probability that both spins show the same result.
- (c) Find the probability that the two spins are different.

Question 10 • Star, Moon and Sun wheel

SECTION 2 • UNEVEN BRANCHES

A wheel shows Star (S) on half, Moon (M) on a quarter and Sun (U) on a quarter. It is spun twice.

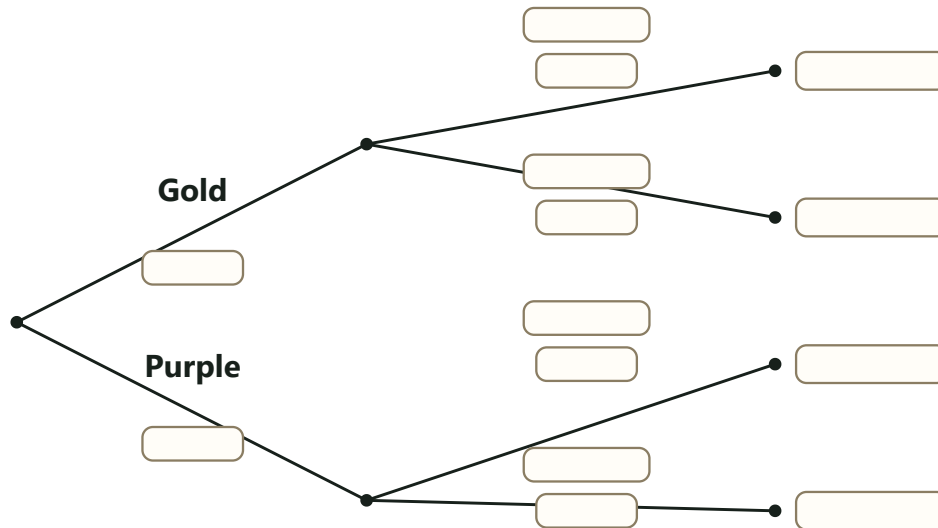


- (a) How many outcomes are in the sample space?
- (b) Find the probability of two stars.
- (c) Find the probability of exactly one star.
- (d) Find the probability of no star at all.

Question 11 · Counters, no replacement

SECTION 3 · WITHOUT REPLACEMENT

A bag holds 2 gold and 3 purple counters. Two are drawn without replacement. G = gold, P = purple.

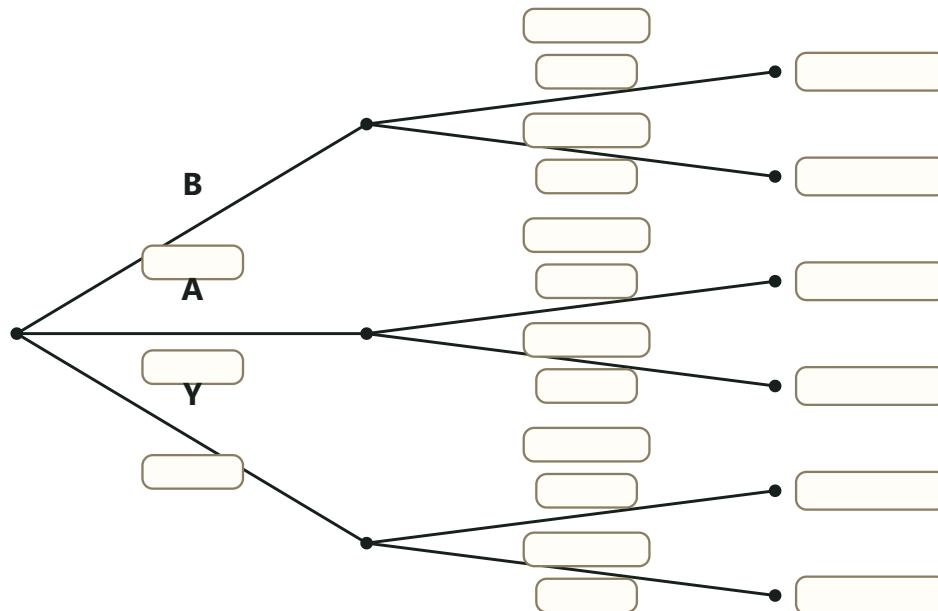


- (a) Find the probability of two gold counters.
- (b) Find the probability of at least one purple counter.
- (c) Find the probability of two different colours.

Question 12 · Letters from BAY

SECTION 3 · WITHOUT REPLACEMENT

Two letter cards are drawn from the word BAY without replacement.

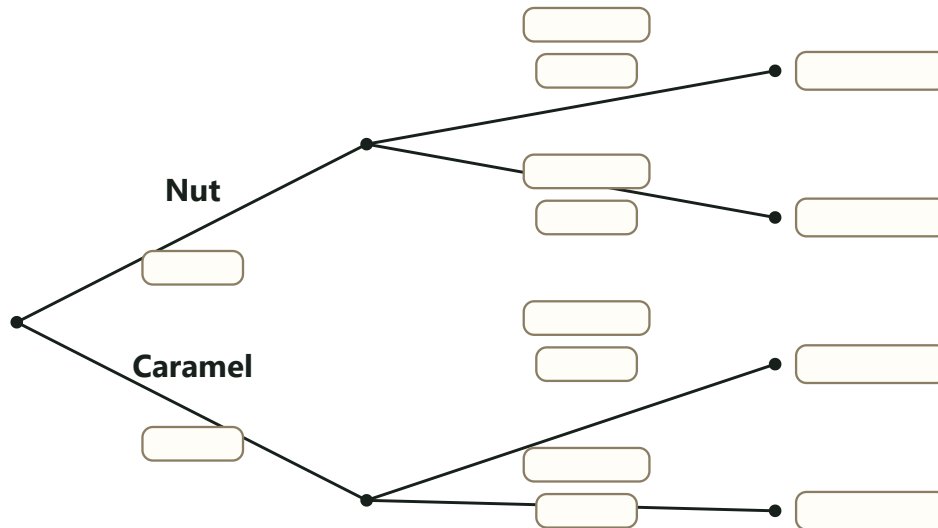


- (a) Find the probability of drawing A then Y, in that order.
- (b) Find the probability of A and Y in any order.
- (c) Find the probability that the outcome contains the letter B.

Question 13 • Box of chocolates

SECTION 3 • WITHOUT REPLACEMENT

A box holds 4 nut and 2 caramel chocolates. Two are taken without replacement. N = nut, C = caramel.

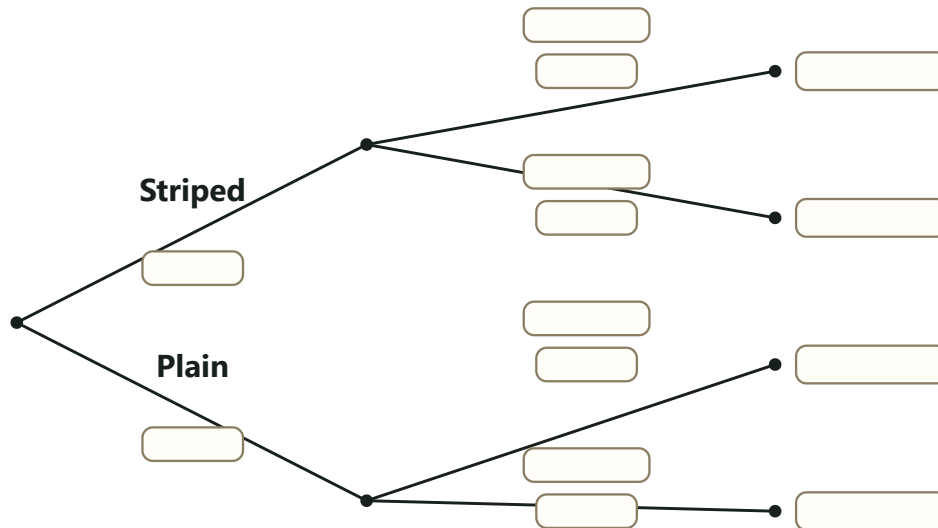


- (a) Find the probability of two nut chocolates.
- (b) Find the probability of one of each kind.
- (c) Find the probability of at least one caramel.

Question 14 • Winter scarves

SECTION 3 • WITHOUT REPLACEMENT

A rail of 7 scarves holds 3 striped and 4 plain. A student picks two without replacement.

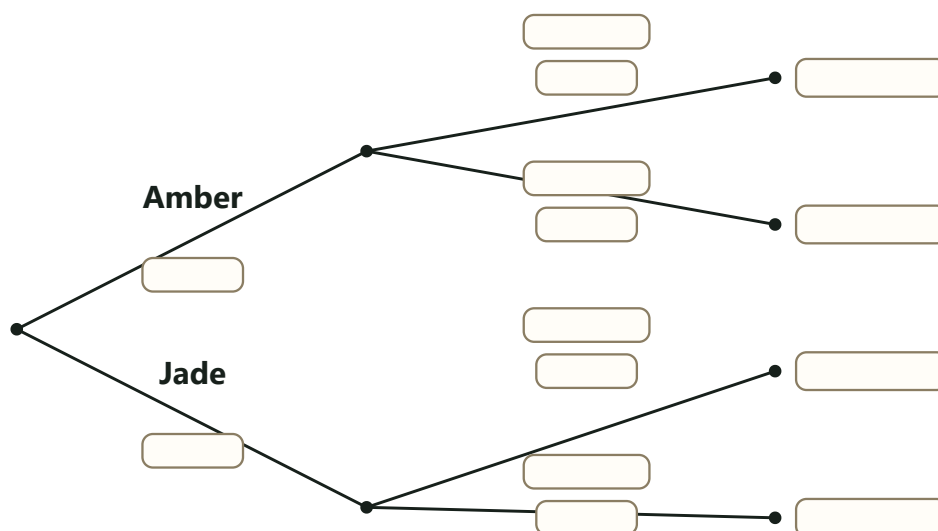


- (a) Find the probability of two striped scarves.
- (b) Find the probability of two plain scarves.
- (c) Find the probability of one striped and one plain.

Question 15 · Amber and jade marbles

SECTION 3 · WITHOUT REPLACEMENT

A bag holds 2 amber and 4 jade marbles. Two are drawn without replacement. A = amber, J = jade.



(a) Find the probability of two amber marbles.

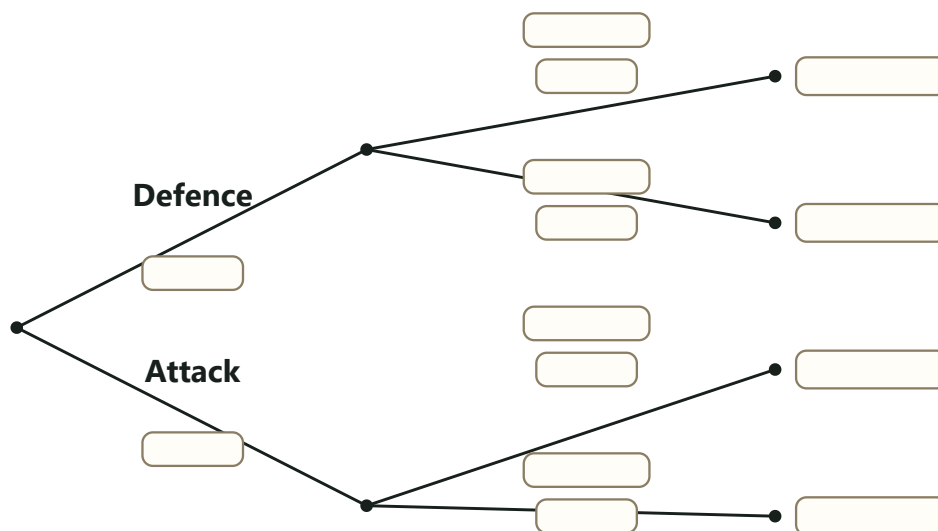
(b) Find the probability of at least one jade marble.

(c) Which gives a better chance of two amber — replacing the first marble, or not?

Question 16 · Defence and attack cards

SECTION 4 · FULL TREE ANALYSIS

A pile of 8 cards holds 5 defence and 3 attack. Two are drawn without replacement. D = defence, A = attack.



(a) Find the probability of two defence cards.

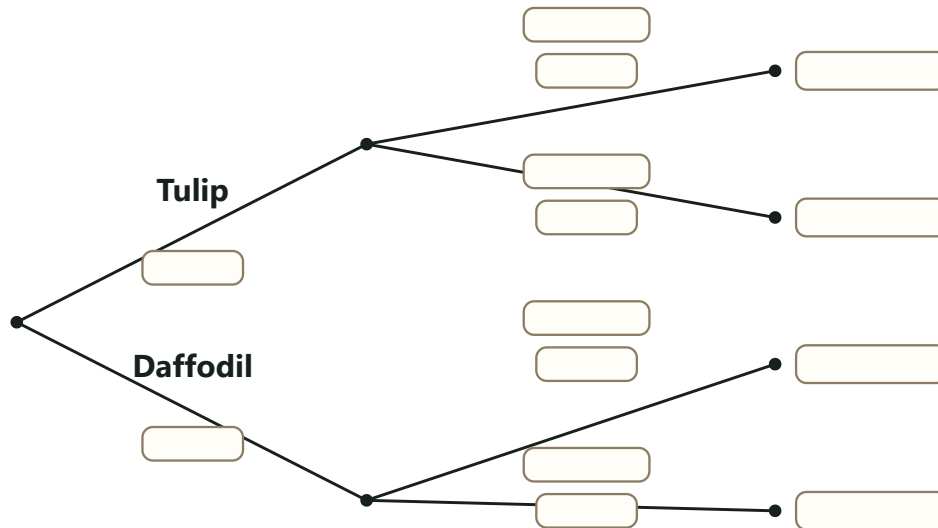
(b) Find the probability of at least one attack card.

(c) Find the probability of one of each type.

Question 17 · Planting bulbs

SECTION 4 · FULL TREE ANALYSIS

A tray holds 6 tulip and 3 daffodil bulbs. Two are planted without replacement. T = tulip, D = daffodil.

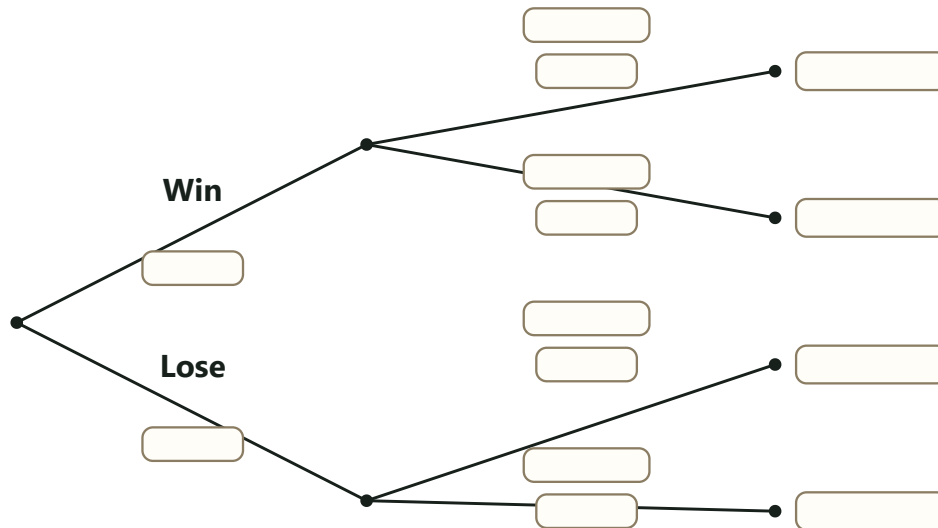


- (a) Find the probability of two tulips.
- (b) Find the probability that the two bulbs are the same variety.
- (c) Which is more likely — two of the same variety, or two different varieties?

Question 18 · Raffle tickets

SECTION 4 · FULL TREE ANALYSIS

A raffle has 5 tickets, 2 of them winning. Two tickets are drawn without replacement. W = win, L = lose.

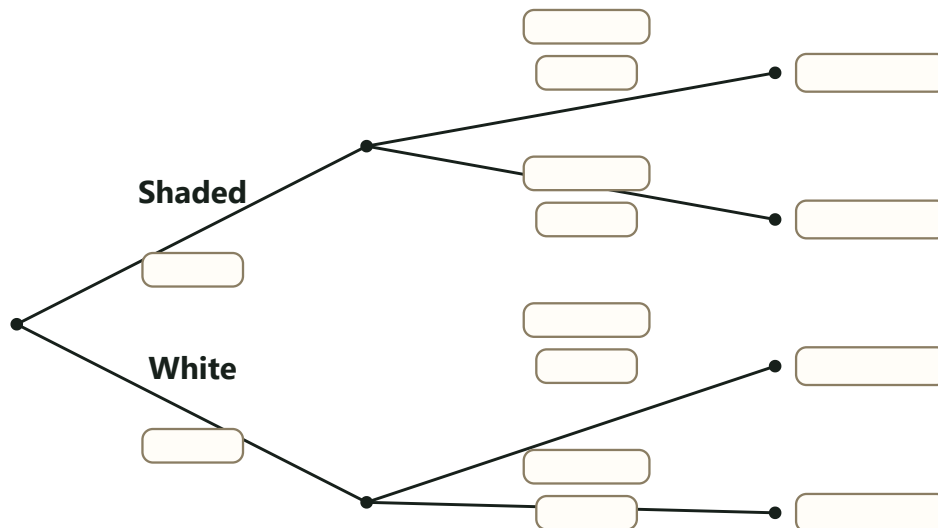


- (a) Find the probability that both tickets win.
- (b) Find the probability of at least one winning ticket.
- (c) Which would give a better chance of two winning tickets — replacing the first ticket or not?

Question 19 · Coin versus spinner

SECTION 4 · FULL TREE ANALYSIS

A spinner is shaded on $\frac{2}{5}$ of its surface and white on $\frac{3}{5}$. It is spun twice. S = shaded, W = white.

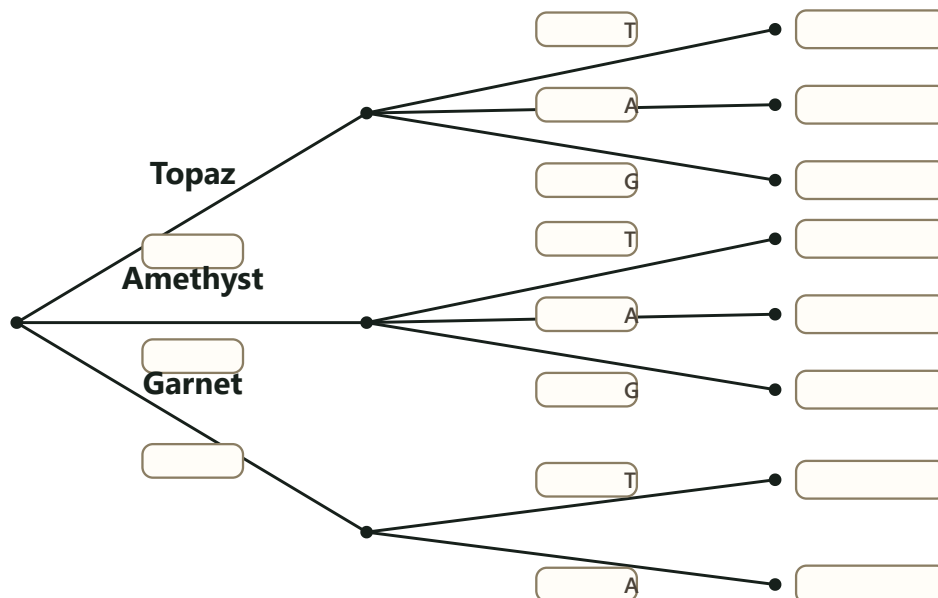


- (a) Find the probability that the two spins match.
- (b) A fair coin is tossed twice instead. Find the probability that the tosses match.
- (c) Which is more likely to give a matching pair — the spinner or the coin?

Question 20 · The gem collection

SECTION 4 · FULL TREE ANALYSIS

A collection holds 3 topaz, 2 amethyst and 1 garnet gem. Two are drawn without replacement. T = topaz, A = amethyst, G = garnet.



- (a) Find the probability of two topaz gems.
- (b) Find the probability of two different gems.
- (c) Find the probability of at least one amethyst.

Answer key (teacher copy)

Question	Tree answers and question answers
Q1 Coin toss twice	tips HH HT TH TT, all branches $\frac{1}{2}$; (a) 4 (b) $\frac{1}{4}$ (c) $\frac{1}{2}$
Q2 Weather spinner twice	tips SS SC CS CC, all branches $\frac{1}{2}$; (a) 4 (b) $\frac{1}{4}$ (c) $\frac{3}{4}$ (d) $\frac{1}{2}$
Q3 Coin and a letter	coin branches $\frac{1}{2}$, letter branches $\frac{1}{4}$; tips HS HA HF HE TS TA TF TE; (a) 8 (b) $\frac{1}{8}$ (c) $\frac{1}{4}$ (d) heads and a consonant ($\frac{3}{8}$ beats $\frac{2}{8}$)
Q4 Three-colour spinner twice	all branches $\frac{1}{3}$, 9 paths; (a) 9 (b) $\frac{1}{3}$ (c) $\frac{4}{9}$
Q5 Number spinner twice	all branches $\frac{1}{3}$, 9 paths; (a) 9 (b) $\frac{1}{3}$ (c) $\frac{1}{3}$ (d) $\frac{1}{3}$
Q6 Counter bag, replaced	branches $\frac{3}{8}$ and $\frac{5}{8}$ at both stages; (a) $\frac{9}{64}$ (b) $\frac{15}{32}$ (c) $\frac{55}{64}$
Q7 Lolly jar, replaced	branches $\frac{4}{10}$ and $\frac{6}{10}$ both stages; (a) $\frac{4}{25}$ (b) $\frac{12}{25}$ (c) $\frac{16}{25}$
Q8 Prize wheel, twice	branches $\frac{1}{4}$ and $\frac{3}{4}$ both stages; (a) $\frac{9}{16}$ (b) $\frac{7}{16}$ (c) $\frac{3}{8}$
Q9 Coast and ocean spinner	branches $\frac{2}{3}$ and $\frac{1}{3}$ both stages; (a) $\frac{4}{9}$ (b) $\frac{5}{9}$ (c) $\frac{4}{9}$
Q10 Star, Moon and Sun wheel	first branches $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{4}$, second $\frac{1}{4}$ each; (a) 9 (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) $\frac{1}{4}$
Q11 Counters, no replacement	$\frac{2}{5}, \frac{3}{5}$ then $\frac{1}{4}$ $\frac{3}{4}$ $\frac{2}{4}$ $\frac{2}{4}$; (a) $\frac{1}{10}$ (b) $\frac{9}{10}$ (c) $\frac{3}{5}$
Q12 Letters from BAY	first $\frac{1}{3}$ each, second $\frac{1}{2}$ each; (a) $\frac{1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{2}{3}$
Q13 Box of chocolates	$\frac{4}{6}, \frac{2}{6}$ then $\frac{3}{5}$ $\frac{2}{5}$ $\frac{4}{5}$ $\frac{1}{5}$; (a) $\frac{2}{5}$ (b) $\frac{8}{15}$ (c) $\frac{3}{5}$
Q14 Winter scarves	$\frac{3}{7}, \frac{4}{7}$ then $\frac{2}{6}$ $\frac{4}{6}$ $\frac{3}{6}$ $\frac{3}{6}$; (a) $\frac{1}{7}$ (b) $\frac{2}{7}$ (c) $\frac{4}{7}$ (the three answers add to 1)
Q15 Amber and jade marbles	$\frac{2}{6}, \frac{4}{6}$ then $\frac{1}{5}$ $\frac{4}{5}$ $\frac{2}{5}$ $\frac{3}{5}$; (a) $\frac{1}{15}$ (b) $\frac{14}{15}$ (c) replacing ($\frac{4}{36}$ beats $\frac{1}{15}$)
Q16 Defence and attack cards	$\frac{5}{8}, \frac{3}{8}$ then $\frac{4}{7}$ $\frac{3}{7}$ $\frac{5}{7}$ $\frac{2}{7}$; (a) $\frac{5}{14}$ (b) $\frac{9}{14}$ (c) $\frac{15}{28}$
Q17 Planting bulbs	$\frac{6}{9}, \frac{3}{9}$ then $\frac{5}{8}$ $\frac{3}{8}$ $\frac{6}{8}$ $\frac{2}{8}$; (a) $\frac{5}{12}$ (b) $\frac{1}{2}$ (c) equally likely (both $\frac{1}{2}$)
Q18 Raffle tickets	$\frac{2}{5}, \frac{3}{5}$ then $\frac{1}{4}$ $\frac{3}{4}$ $\frac{2}{4}$ $\frac{2}{4}$; (a) $\frac{1}{10}$ (b) $\frac{7}{10}$ (c) replacing ($\frac{4}{25}$ beats $\frac{1}{10}$)
Q19 Coin versus spinner	$\frac{2}{5}, \frac{3}{5}$ both stages; (a) $\frac{13}{25}$ (b) $\frac{1}{2}$ (c) the spinner ($\frac{13}{25}$ beats $\frac{1}{2}$)
Q20 The gem collection	$\frac{3}{6}$ $\frac{2}{6}$ $\frac{1}{6}$; second rows $\frac{2}{5}$ $\frac{2}{5}$ $\frac{1}{5}$ $\frac{3}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{3}{5}$ $\frac{2}{5}$; (a) $\frac{1}{5}$ (b) $\frac{11}{15}$ (c) $\frac{3}{5}$