

Probability

Exercise 12.1 — Complete Solutions

Class 10th Mathematics

Step-by-step worked solutions for Exercise 12.1

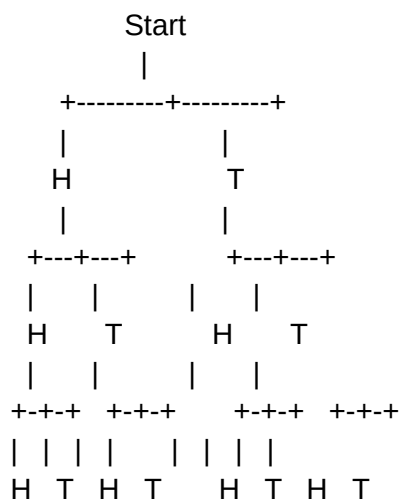
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Question 1: Sample Space for Tossing Three Coins

Tree Diagram:

First Toss:

text



Sample Space:

Total Outcomes = 8

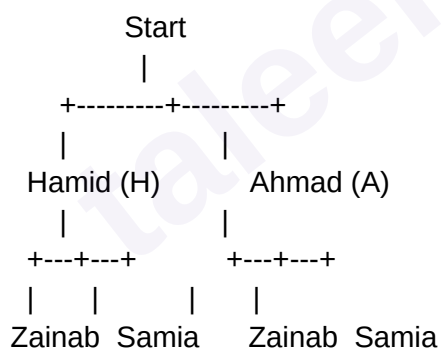
Question 2: Selecting One Boy and One Girl

Given:

- Boys: Hamid (H), Ahmad (A)
- Girls: Zainab (Z), Samia (S)

Tree Diagram:

text



Sample Space:

Total Outcomes = 4

Question 3: Probability Problem

Given:

Solution:

Step 1: Let and .

Step 2: Since :

Step 3: Find :

Step 4: Find :

Answers:

- (i)
- (ii)

Question 4: Probability of Getting Two Consecutive Tails

Sample Space for tossing a coin thrice:

Favorable outcomes (two consecutive tails):

- HTT (tails at positions 2 and 3)
- TTH (tails at positions 1 and 2)
- TTT (three tails - contains consecutive tails)

Favorable outcomes = {HTT, TTH, TTT}

Number of favorable outcomes = 3

Answer:

Question 5: Dice and Coin Together

5(i) Sample Space by Possibility Diagram

Coin outcomes: H, T

Dice outcomes: 1, 2, 3, 4, 5, 6

text

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      Dice
    1  2  3  4  5  6
+---+---+---+---+---+
H |H1 |H2 |H3 |H4 |H5 |H6 |
+---+---+---+---+---+
T |T1 |T2 |T3 |T4 |T5 |T6 |
+---+---+---+---+---+
    
```

Sample Space:

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Total Outcomes = 12

5(ii) Sample Space by Tree Diagram

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text

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      Start
      |
+-----+-----+
|         |         |
|   H     |   T     |
|         |         |
+---+---+   +---+---+
| | |       | | |
1 2 3       1 2 3
    
```

Sample Space:

5(iii) Probability of Getting a Tail and an Even Number

Favorable outcomes: Tail with even number (2, 4, 6)

Number of favorable outcomes = 3

Total outcomes = 12

Answer:

Summary Table

Question	Answer
1	8 outcomes: HHH, HHT, HTH, HTT, THH, THT, TTH, TTT
2	4 outcomes: (H,Z), (H,S), (A,Z), (A,S)
3(i)	
3(ii)	
4	
5(i)	12 outcomes in possibility diagram
5(ii)	12 outcomes in tree diagram
5(iii)	

Key Concepts

Probability Formula:

Important Properties:

- 1.
- 2.
- 3.

Tree Diagram Rules:

1. Each branch represents a possible outcome
2. Number of branches multiplies for each event
3. Sample space = all paths from start to end

Sample Space for Coin Tosses:

Number of Coins	Total Outcomes
1	2
2	4
3	8
n	

EXERCISE 12.1 (Continued) - Probability

Question 6: Two Unbiased Dice Rolled Once

6(i) Sample Space by Tree Diagram

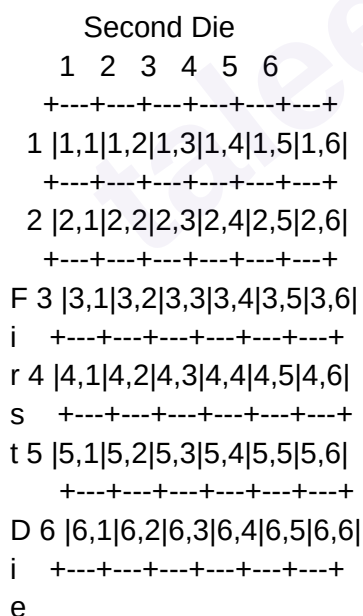
First Die:

text



6(ii) Sample Space by Possibility Diagram

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Total Outcomes = 36

6(iii)(a) Probability of Same Number on Both Dice

Number of favorable outcomes = 6

6(iii)(b) Probability of Product as a Prime Number

Prime numbers possible as product: 2, 3, 5

Favorable outcomes:

- Product = 2: (1,2), (2,1)
- Product = 3: (1,3), (3,1)
- Product = 5: (1,5), (5,1)

Number of favorable outcomes = 6

6(iii)(c) Probability of Sum as an Even Number

Even sum occurs when both numbers are even or both are odd.

Favorable outcomes (sum is even):

- Both odd: (1,1), (1,3), (1,5), (3,1), (3,3), (3,5), (5,1), (5,3), (5,5) → 9 outcomes
- Both even: (2,2), (2,4), (2,6), (4,2), (4,4), (4,6), (6,2), (6,4), (6,6) → 9 outcomes

Total favorable = $9 + 9 = 18$

6(iii)(d) Probability of Sum as 13

Maximum sum with two dice = $6 + 6 = 12$

Number of favorable outcomes = 0

Question 7: Three Fair Coins Tossed

Sample Space:

Total Outcomes = 8

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7(i) Probability of All Tails

Favorable: {TTT}

7(ii) Probability of At Least One Head

At least one head = All outcomes except TTT

7(iii) Probability of At Most Two Tails

At most two tails = All outcomes except TTT

7(iv) Probability of 2 Heads

Favorable outcomes with exactly 2 heads: {HHT, HTH, THH}

7(v) Probability of At Most 2 Heads

At most 2 heads = All outcomes except HHH

7(vi) Probability of No Head

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No head = All tails = {TTT}

Question 8: Probability of Drawing a Ball

Given:

- Red balls = 4
- White balls = 5
- Green balls = 6
- Black balls = 3

Total balls = $4 + 5 + 6 + 3 = 18$

8(i) Probability of White

8(ii) Probability of Red

8(iii) Probability of Not White

8(iv) Probability of Not Black

Question 9: Numbers from 1 to 15

Sample Space: {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15}

Total Outcomes = 15

9(i) Probability of Odd Number

Odd numbers: {1, 3, 5, 7, 9, 11, 13, 15} → 8 numbers

9(ii) Probability of Multiple of 5

Multiples of 5: {5, 10, 15} → 3 numbers

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9(iii) Probability of Square of 2

Square of 2 = 4

Favorable: {4} → 1 number

9(iv) Probability of Prime Number

Prime numbers: {2, 3, 5, 7, 11, 13} → 6 numbers

9(v) Probability of 20
20 is not in the sample space.

Question 10: Probability of Event "Not A"
Given:

Answer:

Question 11: Dice Rolled Twice - Number Greater Than 4 on Each Roll
Numbers greater than 4 on a die: 5, 6
Total outcomes for two rolls = 36
Favorable outcomes: Both rolls show 5 or 6 $\rightarrow$ (5,5), (5,6), (6,5), (6,6)
Number of favorable outcomes = 4

Summary Table

Question	Answer
6(a)	
6(b)	
6(c)	
6(d)	0
7(i)	
7(ii)	
7(iii)	
7(iv)	
7(v)	
7(vi)	
8(i)	
8(ii)	
8(iii)	

Question

Answer

8(iv)

9(i)

9(ii)

9(iii)

9(iv)

9(v)

0

10

11

Key Concepts

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Probability Formula:

Complement Rule:

Two Dice Outcomes:

- Total outcomes = 36
- Same number = 6 outcomes
- Sum even = 18 outcomes
- Product prime = 6 outcomes

Coin Toss Outcomes (3 coins):

- Total outcomes = 8
- Exactly 2 heads = 3 outcomes
- At least one head = 7 outcomes