Discrete Random Variables Worksheet

Here's your worksheet again:

Discrete Random Variables Worksheet

Question 1

Rachel and Sam play a game with a biased dice. The dice has the following probability distribution for its outcome S:

S	$P(S = s)$
1	0.10
2	0.20
3	0.30
4	p
5	0.15
6	0.10

(a) Find the value of p.

(b) The game ends when Rachel receives a number greater than 3. Find the probability that the game ends after exactly 2 rolls.

Question 2

John and Lily play a game with a fair coin, where the first player to get two heads wins. The coin is flipped repeatedly.

(a) Find the probability that John wins after exactly 3 flips.

(b) Find the probability that Lily wins after exactly 4 flips.

Question 3

A fair four-sided spinner has 2 blue, 1 red, and 1 green section. The spinner is spun until a green appears or it is spun 4 times.

(a) Write down the probability distribution of Z, the number of spins until green appears.

(b) Find the probability that the spinner stops after 2 spins.

Question 4

Emma and Jake are playing a dice game where:

- Emma receives points if the outcome is an odd number.

- Jake receives points if the outcome is an even number.

The dice has the following probability distribution:

S	$P(S = s)$
1	0.20
2	0.20
3	0.20
4	0.15
5	0.15
6	0.10

(a) Find the probability that Emma wins after exactly 2 rolls.

(b) Find the probability that Jake wins after exactly 3 rolls.

Question 5

A biased spinner has 6 sections: 2 blue, 2 red, and 2 green. The probability of landing on each color is different:

Color	$P(\text{color})$
Blue	0.4
Red	0.35
Green	0.25

The game ends when a blue section is landed on.

(a) Find the probability that the game ends after exactly 1 spin.

(b) Find the probability that the game ends after exactly 3 spins.

Question 6

Kate and Mike are playing a number game with the following rule:

- Kate wins if the number is a multiple of 3.

- Mike wins if the number is not a multiple of 3.

The number is generated by a random spinner with values from 1 to 5. The probability distribution is given by:

S	$P(S = s)$
1	0.2
2	0.2
3	0.2
4	0.2
5	0.2

(a) Find the probability that Kate wins after exactly 3 spins.

(b) Find the probability that Mike wins after exactly 4 spins.

Question 7

A coin is flipped until two tails appear, or the coin is flipped five times.

The probability of flipping heads is $\frac{1}{2}$.

(a) Write down the probability distribution for X, the number of flips required.

(b) Find the probability that the coin is flipped exactly 4 times.

Question 8

A game involves spinning a fair five-sided spinner with colors blue, red, yellow, green, and purple. The first player to land on yellow wins.

(a) Find the probability distribution of Z, the number of spins until yellow appears.

(b) Find the probability that the game ends after exactly 3 spins.

Question 9

A biased coin with $P(\text{Head}) = 0.6$ is flipped repeatedly. The game ends when 3 heads appear.

(a) Write down the probability distribution of X, the number of flips required for 3 heads to appear.

(b) Find the probability that the game ends after exactly 5 flips.

Question 10

A fair six-sided dice is rolled. If the result is an even number, Alex wins. If the result is an odd number, Brian wins.

The game continues until one of them wins.

(a) Find the probability that Alex wins after exactly 2 rolls.

(b) Find the probability that Brian wins after exactly 3 rolls.

This worksheet includes a variety of creative problem-solving scenarios, with different games, probabilities, and setups. Each question requires students to understand the underlying probability and make calculations based on random variables.