

## OPENING PROBLEM

In a sideshow game, players have a 50% chance of winning a prize worth \$2, \$5, \$10, or \$20. The probabilities of winning these prizes are given in the table below.

Prize value	\$0	\$2	\$5	\$10	\$20
Probability	0.5	0.35	0.1	0.04	0.01



## Things to think about:

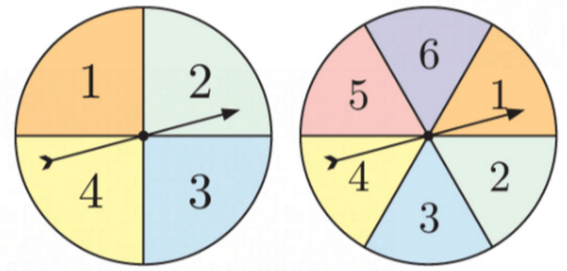
- a What is the sum of the probabilities in the table? Why must this be the answer?
- b What is the most likely outcome from playing the game?
- c What is the *average* result from playing the game?
- d What is a *fair* price for playing the game?

## 1 Classify each random variable as continuous or discrete:

- |                                    |   |
|------------------------------------|---|
| a the quantity of fat in a sausage | b the mark out of 50 for a geography test |
| c the weight of a Year 12 student  | d the volume of water in a cup of coffee  |
| e the number of trout in a lake    | f the number of hairs on a cat            |
| g the length of a horse's mane     | h the height of a skyscraper.             |

2. Suppose the spinners alongside are spun, and  $X$  is the sum of the numbers.

- a Explain why  $X$  is a discrete random variable.
- b State the possible values of  $X$ .



3. A supermarket has three checkouts A, B, and C. A government inspector checks the weighing scales for accuracy at each checkout. The random variable  $X$  is the number of accurate weighing scales at the supermarket.

- a List the possible outcomes and the corresponding values of  $X$ .
- b What value(s) of  $X$  correspond to there being:
  - i one accurate scale
  - ii at least one accurate scale?

## DISCRETE PROBABILITY DISTRIBUTIONS

If  $X$  is a random variable with possible values  $\{x_1, x_2, x_3, \dots, x_n\}$  and corresponding probabilities  $\{p_1, p_2, p_3, \dots, p_n\}$  such that  $P(X = x_i) = p_i, i = 1, \dots, n$ , then:

- $0 \leq p_i \leq 1$  for all  $i = 1, \dots, n$
- $\sum_{i=1}^n p_i = p_1 + p_2 + p_3 + \dots + p_n = 1$
- $\{p_1, \dots, p_n\}$  describes the **probability distribution** of  $X$ .

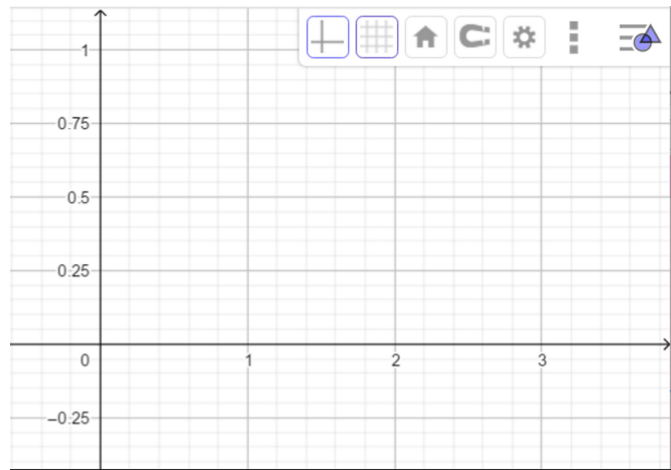
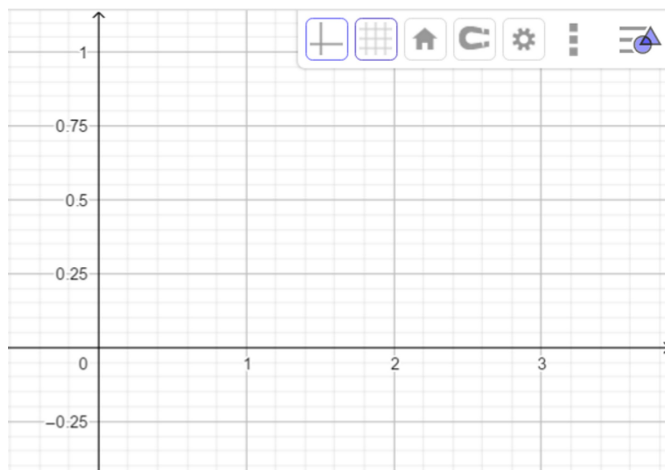
Example 1: Suppose  $X$  is the number of heads obtained when two coins are tossed.

The possible values for X:

The corresponding probabilities:

We can display probability distribution in a table or a graph:

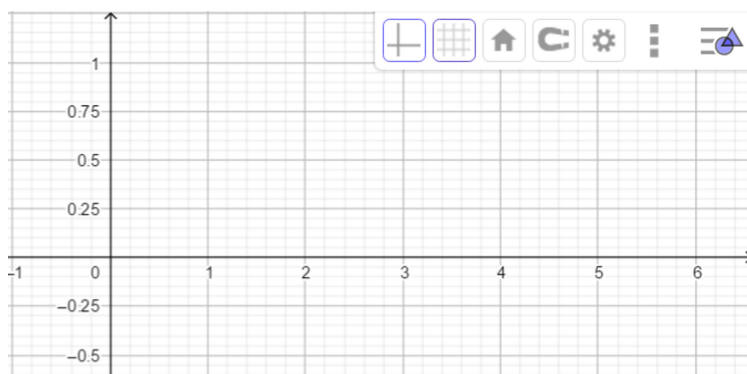
[illegible]



Example 2: Suppose  $X$  is the result when a die is rolled.

Possible values for  $X$ :

The corresponding probabilities:



A magazine store recorded the number of magazines purchased by its customers in one week. 23% purchased one magazine, 38% purchased two, 21% purchased three, 13% purchased four, and 5% purchased five. Let  $X$  be the number of magazines sold to a randomly selected customer.

- |  |  |
|--|--|
| <b>a</b> State the possible values of $X$ .  | <b>b</b> Construct a probability table for $X$ . |
| <b>c</b> Graph the probability distribution. | <b>d</b> Find the mode and median of $X$ .       |