

4 Random variables and distributions

– Part 2

Name: _____ Class: _____ Date: _____

Recall

In Part A you found probabilities of single events. Now handle chance that varies:

- A number that depends on chance (like a dice total) is a random variable.
- Its possible values each have a probability.

Each idea has a worked example before the Practice.

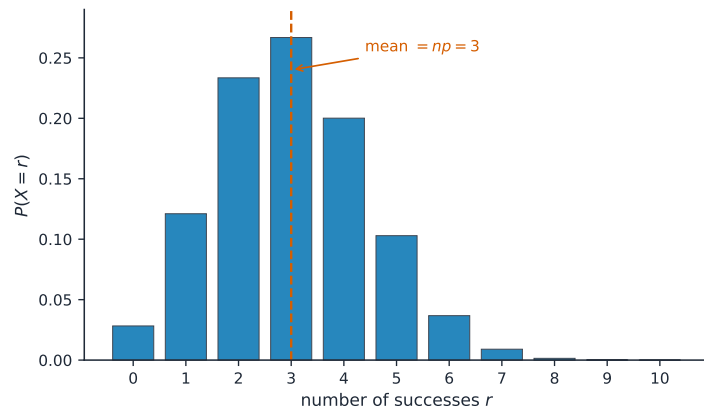
New ideas

■ 1 Random variables

A **random variable** is a number whose value depends on chance – like the number of heads in 3 coin flips.

■ 2 Probability distributions

A **probability distribution** lists each possible value and its probability. All the probabilities add up to 1.



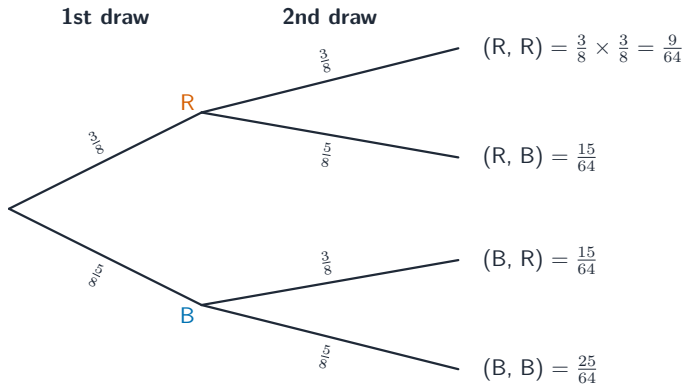
■ 3 Expected value

The **expected value** (mean) is the long-run average: multiply each value by its probability and add.

Worked example. A game pays \$0 with probability 0.5 and \$10 with probability 0.5: expected value = $0(0.5) + 10(0.5) = \$5$.

■ 4 Tree diagrams

A **tree diagram** maps out the outcomes of several stages, so you can multiply probabilities along the branches.



Watch out: in any probability distribution, all the probabilities must add up to exactly 1. If your listed probabilities do not sum to 1, something is missing or wrong.

Practice

Try these in order. The methods are all above.

2.1 State what a random variable is. [2]

2.2 State what all the probabilities in a distribution must add up to. [1]

2.3 A prize is \$0 with probability 0.8 and \$20 with probability 0.2. Find the expected value. [3]

2.4 A distribution lists probabilities 0.3, 0.3, and 0.3. State why something must be wrong. [2]

2.5 State what a tree diagram is used for. [1]