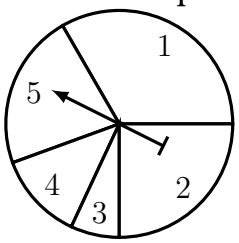
3.7 Lesson 7 Experimental probability and relative frequency

The **relative frequency** (or **Experimental Probability**) is an **estimation** of the probability by conducting an experiment with a number of trials and calculating the ratio :

$$\text{relative frequency} = \frac{\text{number of OBSERVED successful outcomes}}{\text{total number of trials}}$$

If the number of trials, or sample size, of an experiment is small then the relative frequency might not be very **reliable**. As the number of trials increases, the relative frequency will **get closer and closer** towards the probability.

■ **Exemple 3.5** This spinner has unequal sections. Anna and Sarah are spinning it and trying to work out the probability it lands on the number 5. Their results are as follows :



	Number of 5s observed	Total spins
Anna	18	120
Sarah	6	50

1. Use Anna's results to estimate the probability it lands on a 5 ? *Answer :* $p \approx \frac{18}{120} = 1.5\%$
2. Who's data will give a more reliable estimate ?*Answer : Anna's because she has more trials*

Exercise 15 Answer the questions. Write a sentence and show your workings

1. At a school of 600 pupils, 54 students are left handed. Use this information to estimate the probability of being left handed.

2. A survey asked how much families spend on food each week. The resultas are shown below.

Money spent x\$	$x < 30$	$30 < x \leqslant 60$	$60 < x \leqslant 90$	$90 < x \leqslant 120$	$x > 120$
Number of Families	12	38	20	15	5

Estimate the probability of a family spending more than 90\$:

3. A train is late 18 days out of 100. What is the relative frequency of the train being **on time**?

4. Tracey and Sarah are trying to work out the probability that someone needs to wear glasses. Tracey takes a sample of 100 people. Sarah asks 82 people. Who will get a better estimate of the probability? Explain your answer.

5. Sanya and Matteo are trying to work out the probability of a child having green eyes. They do a survey of eye colors and their results are shown in the table. They each ask different groups of people.

   a) Using Sanya's results, estimate the probability someone has green eyes.

   b) Who has the better estimate of someone having green eyes?

   c) Using all the data, work out the best estimate of someone having green eyes.

6. A bag contains red, yellow and green tokens. A token is taken from the bag, its color is recorded and then it is replaced. The results of the number of green tokens observed are shown. What is the best estimate of the probability of picking a green token?

Number of trials	10	20	50	100
Total number of observed greens seen	8	12	18	34

7. Arthur says that if he throws a fair coin 100 times, it will land on tails exactly 50 times. Is he correct?

8. John is monitoring the number of patients who report a particular side effect to a new drug treatment.

   He samples 120 patients from a GP practice and finds that 18 of them reported the side effect. He then samples 150 patients from a different GP practice and finds only 2 have this particular side effect.

   Work out the best possible estimate of of the probability a patient will have this side effect.