# Test answers - Probability basics

Year: Year 7 · Duration: 45 minutes · /20

## Answer to Question 1 (4 marks)

a. The bag holds $6 + 4 + 5 = 15$ counters, all equally likely to be chosen. Four are blue, so $P(\text{blue}) = \frac{4}{15}$. (1 mark)

b. The probability of red is $\frac{6}{15}$. "Not red" is the opposite event, so $P(\text{not red}) = 1 - \frac{6}{15} = \frac{9}{15} = \frac{3}{5}$. (1 mark)

c. There are no yellow counters in the bag, so choosing one is impossible: the probability is **0**. (1 mark)

d. Expected number = probability × total: $30 \times 0.4 =$ **12** green counters. (1 mark)

Check (b) directly: 4 blue and 5 green make 9 counters that are not red, giving $\frac{9}{15}$ again. Probabilities always lie between 0 and 1.

## Answer to Question 2 (4 marks)

a. Each of the 3 spinner numbers can go with heads or with tails. A systematic list is **1H, 2H, 3H, 1T, 2T, 3T**, which is $3 \times 2 = 6$ outcomes. (1 mark for a partly correct list, 2 marks for all six with no repeats)

b. Exactly one of the six equally likely outcomes, 3H, matches. The probability is $\frac{1}{6}$. (1 mark)

c. Tails with an odd number gives 1T or 3T, which is 2 outcomes out of 6: $\frac{2}{6} = \frac{1}{3}$. (1 mark)

A two-way table, with spinner numbers along the top and H, T down the side, is a neat way to be sure no outcome is missed.

## Answer to Question 3 (4 marks)

a. Expected number = probability × number of pupils: $240 \times 0.1 =$ **24** left-handed pupils. (1 mark)

b. **Yes**. About 24 pupils are expected to be left-handed, and 30 pairs of scissors is more than 24, leaving 6 spare in case the real number is a little higher. (1 mark)

c. Relative frequency = number of times it happens ÷ number in the group: $\frac{4}{28} = 0.142\ldots$, which is **0.14** to 2 decimal places. (1 mark)

d. **No**, it is not surprising. In a class of 28 we would expect about $28 \times 0.1 = 2.8$, so around 3 left-handers. Getting 4 is very close, and small groups often vary a little from the long-run probability. (1 mark)

## Answer to Question 4 (4 marks)

a. The wheel has 10 equal sections and only 1 pays £5, so the probability is $\frac{1}{10}$. (1 mark)
b. Winning something means landing on the £5 section or one of the two £2 sections, which is $1 + 2 = 3$ sections: $\frac{3}{10}$. (1 mark)
c. The probability of £2 is $\frac{2}{10} = 0.2$, so in 50 games she expects $50 \times 0.2 =$**10** wins of £2 (1 mark). She also expects $50 \times 0.1 = 5$ wins of £5. Total expected winnings: $5 \times 5 + 10 \times 2 = 25 + 20 =$**£45** (1 mark).

Mia pays £50 to play 50 times, so on average she loses about £5 overall, which is how the fair makes money.

## Answer to Question 5 (4 marks)

a. "Rain" and "no rain" cannot both happen and one of them must happen, so their probabilities add to 1: $1 - 0.35 =$**0.65**. (1 mark)
b. Expected number of rainy Saturdays = $20 \times 0.35 =$**7**. (1 mark)
c. It rained on 5 of the first 8 Saturdays, so the relative frequency is $\frac{5}{8} =$**0.625**. (1 mark)
d. Eight matches is a very small sample, so chance has a big effect on the result. The relative frequency gets closer to the true probability of 0.35 only when many more Saturdays are recorded. (1 mark)

With the probability 0.35 we would expect only $8 \times 0.35 = 2.8$ rainy Saturdays among those first eight.