Year 7 · Probability: What Are the Chances?

Name: _____ Date: _____

Hi! This sheet helps you work out theoretical probability, the chance of something happening when every outcome is equally likely. You'll write your answers as fractions, decimals and percentages, compare events, and use complements. Take your time and show your thinking!

Warm-up

1. A fair six-sided dice is rolled. What is the probability of rolling a 4? Write your answer as a fraction.

2. A bag has 10 marbles: 3 are red. Write P(red) as a fraction, a decimal, and a percentage.

3. Using the same bag of 10 marbles (3 red), what is the probability of NOT drawing a red marble?

4. A fair coin is flipped. What is the probability of it landing on heads? Give a fraction, decimal and percentage.

Practice

5. A spinner has 8 equal sections numbered 1 to 8. Find the probability of spinning a number greater than 5. Give your answer as a fraction, decimal and percentage.

6. The Avondale Primary gala sells 200 raffle tickets. Mere buys 8 tickets. If one winning ticket is drawn, what is the probability that Mere wins? Give a fraction in simplest form and a percentage.

7. A bag of lollies has 20 lollies: 5 pineapple, 7 jaffas and 8 eskimos. One lolly is taken without looking. Find P(jaffa), then say whether a pineapple or an eskimo is more likely, and explain.

8. A letter is chosen at random from the word AVONDALE. Find P(the letter is A) and P(the letter is a vowel). Which event is more likely?

9. The MetService forecast says the probability of rain in Auckland tomorrow is 0.65. What is the probability it does NOT rain? Give a decimal and a percentage.

10. Two fair coins are flipped. Draw a tree diagram or list to show all outcomes, then find P(two heads) and P(at least one head).

Challenge

11. Two fair dice are rolled and their numbers added. Make a table of all the possible totals, then find P(total is 8) and P(total is at least 10). Which total event is more likely?

12. A bag holds 40 marbles. The probability of drawing a green marble is 0.3 and the probability of drawing a blue marble is 1/4. The rest of the marbles are yellow. What is the probability of drawing yellow, and how many yellow marbles are in the bag?

Answer key (for parents and tutors)

1. A fair six-sided dice is rolled. What is the probability of rolling a 4? Write your answer as a fraction.
   There is 1 way to roll a 4 out of 6 equally likely outcomes. P(4) = 1/6.
2. A bag has 10 marbles: 3 are red. Write P(red) as a fraction, a decimal, and a percentage.
   P(red) = 3/10. As a decimal, 3 ÷ 10 = 0.3. As a percentage, 0.3 × 100 = 30%. So P(red) = 3/10 = 0.3 = 30%.
3. Using the same bag of 10 marbles (3 red), what is the probability of NOT drawing a red marble?
   The complement of 'red' is 'not red'. P(red) + P(not red) = 1, so P(not red) = 1 − 3/10 = 7/10 = 0.7 = 70%.
4. A fair coin is flipped. What is the probability of it landing on heads? Give a fraction, decimal and percentage.
   There is 1 head out of 2 equally likely outcomes. P(heads) = 1/2 = 0.5 = 50%.
5. A spinner has 8 equal sections numbered 1 to 8. Find the probability of spinning a number greater than 5. Give your answer as a fraction, decimal and percentage.
   Numbers greater than 5 are 6, 7 and 8, that's 3 outcomes out of 8. P(>5) = 3/8. As a decimal, 3 ÷ 8 = 0.375. As a percentage, 0.375 × 100 = 37.5%. So P(>5) = 3/8 = 0.375 = 37.5%.
6. The Avondale Primary gala sells 200 raffle tickets. Mere buys 8 tickets. If one winning ticket is drawn, what is the probability that Mere wins? Give a fraction in simplest form and a percentage.
   Mere has 8 winning chances out of 200 tickets. P(win) = 8/200. Simplify by dividing top and bottom by 8: 8 ÷ 8 = 1, 200 ÷ 8 = 25, so 1/25. As a decimal, 1 ÷ 25 = 0.04, which is 4%. So P(win) = 1/25 = 4%.
7. A bag of lollies has 20 lollies: 5 pineapple, 7 jaffas and 8 eskimos. One lolly is taken without looking. Find P(jaffa), then say whether a pineapple or an eskimo is more likely, and explain.
   P(jaffa) = 7/20 = 0.35 = 35%. P(pineapple) = 5/20 = 1/4 = 25%. P(eskimo) = 8/20 = 2/5 = 40%. An eskimo is more likely than a pineapple because 8/20 (40%) is greater than 5/20 (25%), there are more eskimos in the bag.
8. A letter is chosen at random from the word AVONDALE. Find P(the letter is A) and P(the letter is a vowel). Which event is more likely?
   AVONDALE has 8 letters: A, V, O, N, D, A, L, E. The letter A appears 2 times, so P(A) = 2/8 = 1/4 = 25%. The vowels are A, O, A, E, that's 4 vowels, so P(vowel) = 4/8 = 1/2 = 50%. Choosing a vowel is more likely because 1/2 (50%) is greater than 1/4 (25%).
9. The MetService forecast says the probability of rain in Auckland tomorrow is 0.65. What is the probability it does NOT rain? Give a decimal and a percentage.
   Rain and no-rain are complementary events, so they add to 1. P(no rain) = 1 − 0.65 = 0.35 = 35%.
10. Two fair coins are flipped. Draw a tree diagram or list to show all outcomes, then find P(two heads) and P(at least one head).
    The equally likely outcomes are: HH, HT, TH, TT, that's 4 outcomes. Two heads (HH) happens in 1 way: P(two heads) = 1/4 = 0.25 = 25%. 'At least one head' means HH, HT or TH, that's 3 ways: P(at least one head) = 3/4 = 0.75 = 75%. (Check: this is the complement of TT, and 1 − 1/4 = 3/4.)
11. Two fair dice are rolled and their numbers added. Make a table of all the possible totals, then find P(total is 8) and P(total is at least 10). Which total event is more likely?
    There are 6 × 6 = 36 equally likely outcomes. Total of 8 comes from: (2,6),(3,5),(4,4),(5,3),(6,2), that's 5 ways, so P(total is 8) = 5/36. Total of at least 10 means 10, 11 or 12: total 10 → (4,6),(5,5),(6,4) = 3 ways; total 11 → (5,6),(6,5) = 2 ways; total 12 → (6,6) = 1 way. That is 3 + 2 + 1 = 6 ways, so P(at least 10) = 6/36 = 1/6. 'At least 10' is more likely because 6/36 is greater than 5/36.
12. A bag holds 40 marbles. The probability of drawing a green marble is 0.3 and the probability of drawing a blue marble is 1/4. The rest of the marbles are yellow. What is the probability of drawing yellow, and how many yellow marbles are in the bag?
    The three colours are the whole sample space, so their probabilities add to 1. P(blue) = 1/4 = 0.25. P(yellow) = 1 − 0.3 − 0.25 = 0.45 = 45%. To find how many yellow marbles: 0.45 × 40 = 18 yellow marbles. (Check: green = 0.3 × 40 = 12, blue = 0.25 × 40 = 10, and 12 + 10 + 18 = 40. ✓)