Worksheet - Probability basics

Year: Year 7 · 20

Show your working.

Question 1

Question 1 – The probability scale *(Section A · Skills practice)*

Probabilities are measured from 0 (impossible) to 1 (certain). Use the words impossible, unlikely, even chance, likely or certain.

a. You roll a normal six-sided dice and get a number less than 7.
b. You flip a fair coin and get tails.
c. A pupil picked at random from your class has a birthday in February.
d. You roll a normal dice and get a 7.
e. It will rain in the UK at some point next month.

Question 2

Question 2 – Calculating simple probabilities *(Section A · Skills practice)*

A bag contains 5 red, 3 blue and 2 green counters. One counter is taken out at random.

a. Find the probability that it is red.
b. Find the probability that it is blue.
c. Find the probability that it is not green.
d. Find the probability that it is yellow.
e. Write your answer to part (a) as a decimal and a percentage.

Question 3

Question 3 – Probabilities that add to 1 *(Section A · Skills practice)*

Complete each probability table.

Colour	Red	Blue	Green	Yellow
Probability	0.3	0.25	0.2	?

a. Find the probability of yellow.
b. A spinner has sectors A, B and C. P(A) = 0.4 and P(B) = 0.35. Find P(C).
c. The probability that Ravi is late is 0.12. Find the probability he is not late.
d. A bag has 20 counters. P(red) = 0.35. How many red counters are there?

Question 4

Question 4 – Listing outcomes *(Section A · Skills practice)*

Two coins are flipped at the same time.

a. List all the possible outcomes.
b. Find the probability of getting two heads.
c. Find the probability of getting one head and one tail.
d. Find the probability of getting at least one head.

Question 5

Question 5 – Two dice *(Section A · Skills practice)*

Two fair six-sided dice are rolled and their scores are added.

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

a. How many outcomes are there?
b. Find the probability that the total is 7.
c. Find the probability that the total is at least 10.
d. Find the probability that the total is a prime number.

Question 6

Question 6 – Expected outcomes *(Section A · Skills practice)*

Use probability to predict how many times an event will happen.

a. A fair dice is rolled 120 times. How many sixes do you expect?
b. The probability that a bus is late is 0.15. How many buses out of 200 do you expect to be late?
c. A spinner lands on blue with probability 0.3. It is spun 50 times. How many times do you expect blue?
d. Explain why you might not get exactly the expected number.

Question 7

Question 7 – The school raffle *(Section B · Real-life practice)*

At the school summer fair, 200 raffle tickets are sold. The prizes are 1 first prize, 4 second prizes and 15 third prizes. Aisha buys 5 tickets and her brother Dan buys 12 tickets.

a. What is the probability that one ticket wins the first prize?
b. What is the probability that a single ticket wins any prize?
c. What is the probability that a ticket does not win a prize? Write it as a percentage.
d. Who has the better chance of winning at least one prize, Aisha or Dan? Roughly estimate how many prizes each person expects to win.

Question 8

Question 8 – Weather forecast *(Section B · Real-life practice)*

The weather forecaster says the probability of rain on Saturday is 0.7 and the probability of rain on Sunday is 0.4.

a. What is the probability that it does not rain on Saturday?
b. What is the probability that it does not rain on Sunday?
c. Which day is it more likely to rain?
d. The school plans a football match. For how many of the next 20 Saturdays with the same forecast would you expect rain?

Question 9

Question 9 – Board game spinner *(Section B · Real-life practice)*

A board game uses a spinner with 8 equal sections. The sections are numbered 1, 2, 2, 3, 3, 3, 4, 5.

a. Find the probability of spinning a 3.
b. Find the probability of spinning an even number.
c. Find the probability of spinning a number greater than 2.
d. Find the probability of spinning a prime number.

Question 10

Question 10 – Pupils in Year 7 *(Section B · Real-life practice)*

In a Year 7 class of 30 pupils, 18 walk to school, 7 come by bus, 4 come by car and 1 cycles. One pupil is chosen at random.

a. Find the probability that the pupil walks.
b. Find the probability that the pupil does not come by car.
c. Another class has 28 pupils and the probability that a pupil walks is the same. How many walk?
d. The teacher chooses two pupils in turn. Explain why the probability changes after the first pupil is chosen.

Question 11

Question 11 – A pack of cards *(Section B · Real-life practice)*

A standard pack has 52 cards in four suits (hearts, diamonds, clubs, spades) with 13 cards in each suit. Hearts and diamonds are red, clubs and spades are black. One card is chosen at random.

a. Find the probability that it is a heart.
b. Find the probability that it is a king.
c. Find the probability that it is a red card.
d. Find the probability that it is the king of hearts.
e. Find the probability that it is not a spade.

Question 12

Question 12 – Experiments with a spinner *(Section B · Real-life practice)*

Ben spins a four-colour spinner 80 times and records the results.

Colour	Red	Blue	Green	Yellow
Frequency	26	18	22	14

a. Work out the relative frequency of each colour.
b. If the spinner were fair, what would the probability of each colour be?
c. Do the results suggest the spinner is fair? Explain.
d. How many times would you expect red if the spinner is spun 400 times, using the relative frequency?

Question 13

Question 13 – Lucky socks *(Section B · Real-life practice)*

A drawer contains 6 black socks, 4 white socks and 2 grey socks, all the same size. Mira takes one sock without looking.

a. Find the probability it is black.
b. Find the probability that it is not white.
c. Mira takes out a black sock and keeps it. She then takes a second sock. Find the probability that the second sock is black.
d. Mira wants the probability of black to be exactly 1/2 on the first pick. How many black socks should she add?

Question 14

Question 14 – The school disco playlist *(Section B · Real-life practice)*

A DJ has 40 songs on a playlist for the school disco: 16 pop songs, 12 rock songs, 8 dance songs and 4 slow songs. The next song is chosen at random.

a. Find the probability that the next song is pop.
b. Find the probability that it is not a slow song.
c. The DJ plays 10 songs during the first hour. How many dance songs would you expect?
d. After 20 songs, 8 pop songs, 6 rock songs, 4 dance songs and 2 slow songs have been played and not repeated. Find the probability that the next song is rock.

Question 15

Question 15 – Fair or unfair? *(Section C · Problem solving)*

Zara and Ben play a game with two fair dice. Zara wins if the total score is 7. Ben wins if the total score is 5 or 9. Otherwise it is a draw.

a. Find the probability that Zara wins.
b. Find the probability that Ben wins.
c. Find the probability of a draw.
d. Is the game fair? Suggest a change to the rules to make it fair.

Question 16

Question 16 – Using algebra with probability *(Section C · Problem solving)*

A bag contains red, blue and green counters. The probability of red is 0.2. The probability of blue is x. The probability of green is 3x.

a. Write an equation using the fact that the probabilities add to 1.
b. Solve it to find x.
c. There are 40 counters in the bag. How many of each colour are there?
d. Two more red counters are added. Find the new probability of red.

Question 17

Question 17 – Spot the mistake *(Section C · Problem solving)*

Each pupil made one mistake. Find it and correct it.

a. Ali: "There are two outcomes, win or lose, so the probability of winning the lottery is 1/2."
b. Beth: "The probability of rain is 0.6 and the probability of snow is 0.5."
c. Carl: "I rolled a dice 6 times and got no sixes so the dice is unfair."
d. Dina: "The probability of picking a red counter from 3 red and 5 blue is 3/5."

Question 18

Question 18 – Bags of sweets *(Section C · Problem solving)*

Bag A contains 4 mints and 6 toffees. Bag B contains 3 mints and 2 toffees. A sweet is

chosen at random from one bag.

a. Find P(mint) for each bag.
b. Which bag gives the better chance of a mint?
c. All the sweets are put together in one bag. Find P(mint).
d. Is this the same as the average of the two probabilities? Explain.

Question 19

Question 19 – Coin spinner game *(Section C · Problem solving)*

A fair coin is flipped and a fair dice is rolled at the same time.

	1	2	3	4	5	6
Heads	H1	H2	H3	H4	H5	H6
Tails	T1	T2	T3	T4	T5	T6

a. How many outcomes are there?
b. Find P(heads and an even number).
c. Find P(tails and a number greater than 4).
d. Find P(heads or a six).

Question 20

Question 20 – Challenge: the birthday problem *(Section D · Challenge)*

In a class of 4 pupils, what is the probability that at least two share the same birth month? Assume that each month is equally likely.

a. What is the probability that the second pupil has a different month from the first?
b. What is the probability that all 4 months are different?
c. What is the probability that at least two share a month?
d. Is the probability greater than 50%? Comment.