

Using a sample space to calculate probabilities

Year 7 About 60 minutes No calculator 48 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/ks3-year-7-using-a-sample-space-to-calculate-probabilities/

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark] Write $\frac{15}{36}$ in its simplest form.
- A2** Needed today [1 mark] Write 6 out of 20 as a fraction in its simplest form.

Answer _____

Answer _____

- A3** Last lesson [1 mark] $P(\text{red}) = 0.35$. Find $P(\text{not red})$.
- A4** From chapter 2 [1 mark] A quadrilateral has angles 85° , 110° , 70° , x . Find x .

Answer _____

Answer _____

B Example, then your turn

Year 7

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

A coin is tossed and a spinner numbered 1 to 4 is spun. The sample space shows every outcome. Work out (i) $P(\text{tail and } 3)$ (ii) $P(\text{head and an odd number})$ (iii) $P(\text{tail and less than } 4)$.

	1	2	3	4
Head	H, 1	H, 2	H, 3	H, 4
Tail	T, 1	T, 2	T, 3	T, 4

Hint Count the outcomes in the table: there are $2 \times 4 = 8$, all equally likely.

- B1** A coin is tossed and a spinner numbered 1 to 5 is spun. [3 marks]
numbered 1 to 5 is spun.
Complete the sample space.
Then work out (i) $P(\text{head and } 4)$ (ii) $P(\text{tail and an even number})$ (iii) $P(\text{head and a number greater than } 2)$.

	1	2	3	4	5
Head	H, 1				
Tail					

Answer (i) (ii) (iii)

EXAMPLE 2

Two spinners, each numbered 1 to 4, are spun and the scores are added. (a) Which total is most likely? (b) Work out $P(\text{total is 6 or more})$. (c) Work out $P(\text{total is odd})$.

+	1	2	3	4
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8

Hint The grid has 16 equally likely totals. Count how many times each total appears.

EXAMPLE 3

A club has 40 members. 18 are adults. 12 members swim, and 7 of the swimmers are children. Complete the two-way table. Work out the probability that a member chosen at random is an adult who does not swim.

	Adult	Child	Total
Swimmer		7	12
Non-swimmer			
Total	18		40

Hint Fill in the cells you can find straight away, then use the totals to find the rest.

B2 A fair dice and a spinner [3 marks]

numbered 1 to 3 are used. The scores are multiplied. Dice scores are across the top. Complete the grid. Then work out (i) $P(\text{product is even})$ (ii) $P(\text{product is greater than 10})$ (iii) the most likely product.

×	1	2	3	4	5	6
1	1					
2						
3						

Answer (i) (ii) (iii)

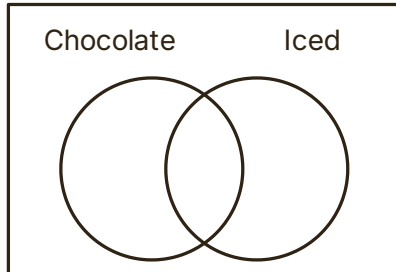
B3 36 pupils go on a school trip. [3 marks]

20 are girls. 9 pupils bring a packed lunch, and 4 of these are boys. Complete the two-way table. Then work out (i) $P(\text{a girl with a school lunch})$ (ii) $P(\text{a boy with a packed lunch})$.

	Girl	Boy	Total
Packed lunch			
School lunch			
Total			

Answer (i) (ii)

- C1** 80 cakes are each chocolate or vanilla. 45 are iced, including 28 chocolate cakes. 12 vanilla cakes are not iced. Use the Venn diagram to find $P(\text{a chocolate cake that is not iced})$. [3 marks]



Answer

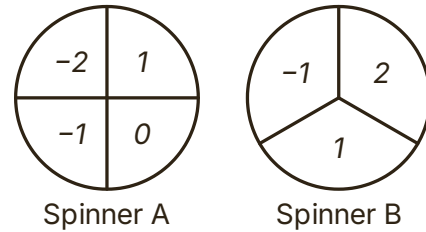
- C3** A game uses a grid with some winning squares. Grid A is 5 by 5 with 6 winning squares. Grid B is 4 by 8 with 7 winning squares. Grid C is 10 by 10 with 23 winning squares. A square is picked at random. Which grid gives the best chance of a win? Show how you decide. [2 marks]

Answer

- C5** Two fair dice are rolled and the scores are added. Work out the probability that the total is a prime number. [2 marks]

Answer

- C2** Both spinners are spun and the two scores are multiplied. Work out the probability that the product is greater than 0. [2 marks]



Answer

- C4** Three coins are tossed. List all the outcomes. Work out the probability of exactly two heads. [2 marks]

Answer

- C6** Drawer 1 has 2 red socks, 1 blue and 1 green. Drawer 2 has 1 red, 2 blue and 2 green. One sock is taken from each drawer. Find $P(\text{both socks are the same colour})$. [3 marks]

Answer

- D1** Zoe tosses two fair coins. She says, "There are three outcomes: two heads, two tails, or one of each. So the probability of one head and one tail is $\frac{1}{3}$." [3 marks]
- Is Zoe correct? Explain your answer and give the correct probability.

- D2** 60 people were asked how they travel to work. The two-way table shows some of the results.

- (a) Complete the two-way table. [3 marks]

	Bus	Car	Walk	Total
Adult		11		25
Child	9		14	
Total	16			60

- (b) One person is chosen at random. [1 mark]
Work out the probability that this person is a child who travels by car.

Answer

- (c) Work out the probability that the person chosen does not walk. [1 mark]

Answer

Total for D2: 5 marks

- D3** Spinner A is numbered 1, 2, 3, 4. Spinner B is numbered 1, 3, 5. Both are spun. The score is the larger number take away the smaller number. The grid shows some of the scores, with spinner A across the top.

- (a) Complete the grid. [2 marks]

	1	2	3	4
1	0			3
3		1		
5			2	

- (b) Leo says, "The most likely score is 2." Is Leo correct? [2 marks]
Give a reason for your answer.

- (c) Work out the probability that the score is 3 or more. [1 mark]

Answer

Total for D3: 5 marks

D4 A café sells a meal deal. You choose a starter (soup or melon), a main (chicken, fish or pie) and a dessert (cake or fruit).

(a) How many different meal deals are there? Show how you work it out. [2 marks]

Answer

(b) A meal deal is chosen at random. Work out the probability that it has melon and does not have fish. [2 marks]

Answer

Total for D4: 4 marks

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 A fair dice is rolled and a fair spinner numbered 1 to n is spun. The probability that the dice and the spinner show the same number is $\frac{1}{8}$. Work out the value of n . [4 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** The sample space has $6n$ equally likely outcomes.
- Hint 2** If n is 6 or more, the same number can happen in 6 ways. If n is less than 6, it can happen in n ways.
- Hint 3** With n less than 6 the probability is $\frac{n}{6n} = \frac{1}{6}$, which is not $\frac{1}{8}$. So $\frac{6}{6n} = \frac{1}{n} = \frac{1}{8}$ and $n = 8$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can draw a sample space that lists every outcome of two events. ☐ ☐ ☐

I can complete a two-way table from information given in words. ☐ ☐ ☐

I can work out a probability from a sample space, a table or a Venn diagram. ☐ ☐ ☐

I can count equally likely outcomes when items come in different numbers. ☐ ☐ ☐