JUNIOR CYCLE MATHS · FREE REVISION SHEET

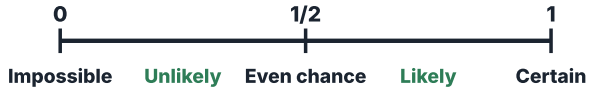
Probability: chance & sample spaces

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Learning outcomes (2018 specification): SP.1a, SP.2a, SP.2b. Play the game: **leim.ie/spin-and-predict.html**

1. The probability scale

A probability is a number from **0** (impossible) to **1** (certain). Write it as a fraction, a decimal or a percentage: 1/4 = 0.25 = 25%. It can never be below 0 or above 1.



2. Equally likely outcomes

A fair die, a fair coin, a spinner with **equal** sectors, a card or counter picked at random: every outcome has the same chance.

P(event) = outcomes that fit ÷ total outcomes

Roll a die: P(prime) = 3/6 = 1/2 (2, 3, 5). Bag of 2 red, 5 blue, 3 green: P(red or green) = 5/10 = 1/2. Always divide by the **total**, not by "the rest".

3. "Not"

An event either happens or it doesn't, so **P(not A) = 1 − P(A)**. P(rain) = 0.3 → P(no rain) = 0.7. P(a 6) = 1/6 → P(not a 6) = 5/6.

4. Sample spaces

The **sample space** is the list of every possible outcome. Work in order. Two coins: **{HH, HT, TH, TT}**. HT and TH are different, so there are 4 outcomes, not 3.

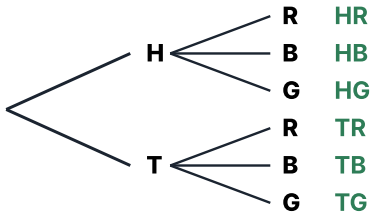
5. Two-way tables

Two dice, scores added: 6 × 6 = 36 equally likely cells. A total of 7 is in 6 cells: P(7) = 6/36 = 1/6.

+	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

6. Tree diagrams

Toss a coin, then spin R, B, G. Each branch splits again: 2 × 3 = 6 outcomes. P(H and G) = 1/6.



Exam tip: "3 out of 8" and "3 : 5" are not probabilities: write **3/8**. List outcomes in order so nothing is missed or written twice, and check every answer is between 0 and 1.

PRACTICE · 34 QUESTIONS

Have a go

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A. Impossible, unlikely, even chance, likely or certain?

1. Rolling a 7 on a fair die _____
2. Rolling a number less than 7 on a fair die _____
3. Getting heads when you toss a fair coin _____
4. Rolling a 6 on a fair die _____
5. Rolling a number bigger than 1 on a fair die _____
6. Picking a red counter from a bag of 9 red and 1 blue _____

B. Equally likely outcomes (give fractions in their simplest form)

7. You roll a fair die. Find P(a prime number). _____
8. You roll a fair die. Find P(a multiple of 3). _____
9. Cards numbered 1 to 20: find P(a multiple of 4). _____
10. Cards numbered 1 to 20: find P(a prime number). _____
11. A bag has 3 red, 5 blue and 2 green counters. Find P(blue). _____
12. Same bag: find P(not green). _____
13. Same bag: find P(red or green). _____
14. The letters of BALLYBUNION are put on cards. Find P(B). _____

C. "Not" and "how many?"

15. P(rain in Cork tomorrow) = 0.6. Find P(no rain). _____
16. P(winning a raffle prize) = 3/7. Find P(not winning). _____
17. P(the bus is late) = 12%. Find P(the bus is not late). _____
18. A bag has 24 counters and P(red) = 3/8. How many are red? _____
19. A spinner has 10 equal sectors and P(blue) = 3/10. How many sectors are blue? _____
20. Which of these can NOT be a probability: 0.7, 5/4, 0, 85%? _____

D. Sample spaces, tables and trees

21. List the sample space when you toss two coins. _____
22. List the sample space when you spin a spinner with sectors R, B, then a spinner numbered 1 to 3. _____
23. How many outcomes are there when you toss a coin and roll a die? _____
24. Two dice are rolled and the scores added. How many cells are in the two-way table? _____
25. Two dice: find P(a total of 9). _____
26. Two dice: find P(both dice show the same number). _____
27. Two dice: find P(a total greater than 9). _____
28. Two dice: which total is most likely? _____
29. A spinner numbered 1 to 3 is spun and a die is rolled; the scores are multiplied. Find P(the product is even). _____
30. A coin is tossed, then a spinner numbered 1 to 4 is spun. Use a tree diagram to find P(a head and an even number). _____

Questions 31–34 are on the next page.

EXAM-STYLE · THEN CHECK

Exam corner + answers

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E. Exam-style questions (show your work)

31. A bag has 5 red, 3 yellow and 4 green marbles. One is taken at random. (a) Find P(yellow). (b) Find P(not red). (c) How many green marbles must be taken out of the bag so that P(green) = 1/5?

32. Spinner A is numbered 1 to 4 and spinner B is numbered 1 to 3 (equal sectors). Both are spun and the scores multiplied. (a) Draw a two-way table. (b) Find P(the product is 6). (c) Find P(the product is greater than 5).

33. A fair coin is tossed three times. (a) Use a tree diagram to list the sample space. (b) Find P(exactly two heads). (c) Find P(at least one tail).

34. Seán says: "The probability that Cork win their next match is 0.6, so the probability that they lose is 0.4." Explain why Seán may be wrong.

Answers

A	1. impossible (0) · 2. certain (1) · 3. even chance (1/2) · 4. unlikely (1/6) · 5. likely (5/6) · 6. likely (9/10)
B	7. 1/2 · 8. 1/3 · 9. 1/4 · 10. 2/5 · 11. 1/2 · 12. 4/5 · 13. 1/2 · 14. 2/11
C	15. 0.4 · 16. 4/7 · 17. 88% · 18. 9 · 19. 3 · 20. 5/4
D	21. {HH, HT, TH, TT} · 22. {R1, R2, R3, B1, B2, B3} · 23. 12 · 24. 36 · 25. 1/9 · 26. 1/6 · 27. 1/6 · 28. 7 · 29. 2/3 · 30. 1/4
E	31. (a) **1/4** (b) **7/12** (c) take out 2: 2/10 = 1/5, so **2** · 32. (a) 12 cells (b) 2×3, 3×2: **1/6** (c) 6, 6, 8, 9, 12: **5/12** · 33. (a) HHH, HHT, HTH, HTT, THH, THT, TTH, TTT (b) **3/8** (c) **7/8** · 34. P(not win) = 0.4, but **not winning** includes a **draw**. P(lose) is 0.4 only if a draw is impossible.

Got one wrong? Check: did you divide by the total number of outcomes? Did you count repeated letters? Did you list HT and TH separately? Is your answer between 0 and 1? Then play **Spin & Predict** at leim.ie/spin-and-predict.html: the "Go back over these" list at the end shows the rule for each mistake.

All questions written by Léim. Léim is independent and not connected with the State Examinations Commission or the NCCA.