

100

A standard Fortnite Battle Royale lobby holds 100 players. On current build tests, only about 40 of them are real people; the rest are bots. — Source: Dexerto.

£69.99

That's the price of the 13,500 V-Bucks bundle, working out at 192.88 V-Bucks per £1. The 1,000 V-Bucks bundle costs £6.99, working out at 143.06 V-Bucks per £1 — a worse rate. — Source: fortnite.com official V-Bucks pricing page.

7,920,000

The XP needed to hit Battle Pass Level 100 in a recent season, at 80,000 XP per level. — Source: Sportskeeda.

Every one of these numbers is a percentage in disguise. Finding bots per lobby, value per pound, or XP per level runs on the exact same mathematical operation.

The Percentage Engine

Bots, V-Bucks and XP bars — one operation, every time

Syllabus	Cambridge Lower Secondary Mathematics 0862 (2020 framework, first teaching Sept 2021)	Chapter	Percentages — finding a percentage of an amount; $\% \leftrightarrow \text{fraction} \leftrightarrow \text{decimal}$ equivalence
Objectives	7Nf.01, 7Nf.05	Scenario	The Percentage Engine (Fortnite)
Made for	Ron	Level	Core (Stage 7 — no Core/Extended tiering at this stage)

By the end, you should be able to:

- Calculate any percentage of an amount without relying on a calculator.
- Prove whether a fraction, decimal, and percentage represent the same value, and identify the one that does not match.
- Calculate a percentage from a raw count, such as finding a win rate from matches played.
- Compare two percentages and justify which is larger by stating both numerical values.
- Read and construct a bar chart or table while preserving the correct units.
- Solve multi-step problems by chaining multiple percentage calculations together.

Answers to every question start on page 14. Quick checks flip instantly — no need to wait until the end.

1

The Engine the one move behind every percentage question

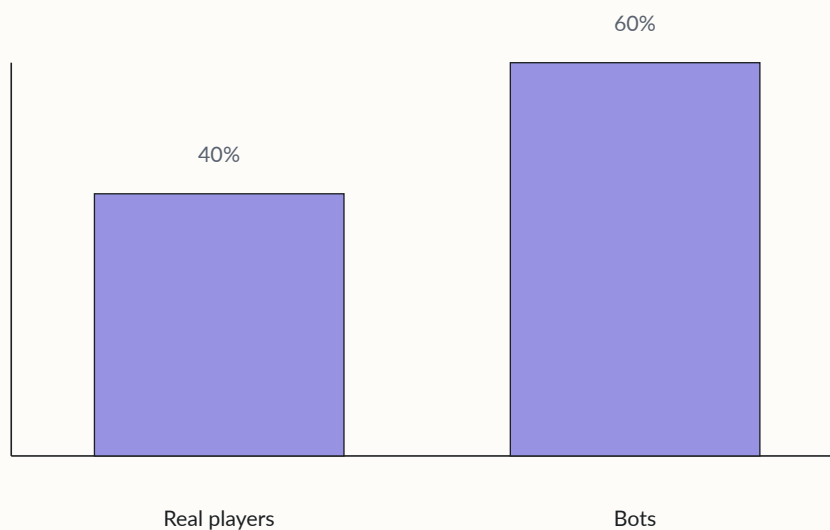


Every percentage question runs on a single mathematical move: divide the relevant amount by the total amount, then scale the result to 100. Whether you are calculating a bot-lobby ratio, a win rate, a V-Bucks deal, or an XP bar, you are performing this same operation with different labels. Once you identify which number represents the relevant slice and which represents the total, every problem uses the same underlying step.

For example, consider a standard Fortnite lobby of 100 players where 40 players are real. The relevant amount of real players is 40, and the total amount of players is 100. Because the total is already 100, the fraction is $\frac{40}{100}$, which means the percentage of real players is exactly 40%. The remaining 60% of the lobby consists of bots.

KEY IDEA – The ritual rule

relevant amount ÷ total amount, scaled to 100. Find the total. Find the slice you actually care about. Divide. Multiply by 100 if the total was not already 100. Every percentage calculation reduces to this relationship. Memorize this rule to solve any percentage problem.



A standard Fortnite lobby contains 100 players, showing a split of 40% real players and 60% bots.

QUICK CHECK – SECTION 1 Q1–Q2

- 1 An 'OG' playlist lobby contains 100 players, but only 12 of them are real. What percentage of this lobby consists of real players?
- 2 Using the same lobby, calculate the percentage of players that are bots.

Q Flip to check – Q1: 12% – Q2: 88%

Be careful: 40 real players and 40% only match in this specific example because the starting total was exactly 100 players. If the total is any other number—such as matches played, V-Bucks spent, or XP earned—you must divide the relevant amount by the total amount first. The mathematical rule remains the same, but the total is no longer pre-scaled to 100. Section 3 explains how to handle these cases.



 TOOLKIT — KEY TERMS

- **Percentage** — a value expressed as a fraction of 100. The symbol % literally means “out of 100.”
- **The ritual rule** — the formula of dividing the relevant amount by the total amount, then multiplying by 100.
- **Equivalent value** — a fraction, a decimal, and a percentage that represent the exact same proportion, such as $\frac{1}{4} = 0.25 = 25\%$.
- **Percentage of an amount** — the calculation performed by dividing the percentage by 100 and multiplying by the total amount. For example, 45% of £300 is calculated as $0.45 \times 300 = \text{£}135$.
- **Justify (compare)** — a requirement to state both numerical percentages explicitly, then declare which is larger. Writing only “larger” or “smaller” without the numbers will not earn marks on an exam.
- **Circle exactly one** — an instruction to select only a single option. Marking more than one option will result in zero marks, even if one of your choices is correct.

■ ■ You have completed Act 1. In Act 2, you will apply this same mathematical move to different game statistics.

■ □ □ □ □ □ your progress so far

2

Loadout Checks fraction / decimal / percentage equivalence – 7Nf.01

■ ■ □ □ □ □ □

Remember the rule: divide the relevant amount by the total amount, then scale to 100.

A fraction, a decimal, and a percentage can represent the exact same value wearing different skins. A skin changes how a character looks, but the character underneath remains the same. It is the same in mathematics: $\frac{1}{4}$, 0.25, and 25% are three different skins for the same underlying value. Exam questions will often show you a set of these values and ask you to identify the one that does not belong.

WORKED EXAMPLE 1 – The V-Bucks value check

Problem: You can buy 1,000 V-Bucks for £6.99, or 2,800 V-Bucks for £17.49. Which bundle gives you more V-Bucks for every pound you spend?

Solution: Step 1: Calculate the V-Bucks received per £1 for the smaller bundle.

$1000 \div 6.99 = 143.06$ V-Bucks per £1 (rounded to two decimal places). Step 2: Calculate the V-Bucks received per £1 for the larger bundle. $2800 \div 17.49 = 160.09$ V-Bucks per £1 (rounded to two decimal places). Step 3: Compare the two rates. Since $160.09 > 143.06$, the 2,800 V-Bucks bundle offers better value per pound.

Think: Why does this work? Both calculations divide the relevant amount (V-Bucks) by the total amount (cost in pounds). Even though we do not scale the result to 100, comparing these two rates is only possible because we divided both bundles using the same method.

QUICK CHECK – SECTION 2 Q1

- 1 A bundle of 5,000 V-Bucks costs £27.99. Calculate the V-Bucks received per £1 for this bundle, rounding your answer to two decimal places. State whether this rate is better than the 2,800 bundle's rate of 160.09 V-Bucks per £1.

Flip to check – $5000 \div 27.99 = 178.64$ V-Bucks per £1. Yes – $178.64 > 160.09$.

 EXERCISE 1 – ODD ONE OUT: LOADOUT CHECKS

- 2** Three of the following four values are equal. Circle the single value that does not match the others. [1 mark]

- ☐ **A** $\frac{1}{5}$
☐ **B** 0.2
☐ **C** 20%
☐ **D** $\frac{2}{5}$

- 3** Three of the following four values are equal. Circle the single value that does not match the others. [1 mark]

- ☐ **A** 0.75
☐ **B** $\frac{3}{4}$
☐ **C** 75%
☐ **D** $\frac{7}{4}$

Before you complete an odd-one-out question, check that you have circled only one option. Selecting more than one option will result in zero marks, even if one of your choices is correct.

 EXERCISE 2 – DECODE THE STATS SCREEN: MISSING-VALUE CHAIN

- 4** A loadout screen displays the following equation: $\frac{1}{4}$ of 100 XP tokens = ___% of 500 XP tokens. Calculate the missing percentage. [2 marks]

- 5** Using the rates calculated in Worked Example 1, determine if the rate of the 1,000 V-Bucks bundle is within 10% of the 2,800 V-Bucks bundle's rate, or if it is worse than that. [2 marks]

3

The Numbers Don't Lie percentage of an amount, compare and justify – 7Nf.05



Remember the rule: divide the relevant amount by the total amount, then scale to 100.

This topic typically appears in two formats. In the first format, you are given a percentage and must find the corresponding amount, such as calculating 45% of £300. In the second format, you are given two raw numbers and must calculate the percentage yourself to compare them. Students often lose marks on the second format because they fail to write a complete sentence to justify their comparison.

WORKED EXAMPLE 2 – XP-per-level, straight percentage of an amount

Problem: To reach the next Battle Pass level, you need 80,000 XP. Ron has earned 52,000 XP toward this goal. What percentage of the level has he completed?

Solution: Step 1: Identify the relevant amount (52,000 XP earned) and the total amount (80,000 XP needed). Step 2: Divide the relevant amount by the total amount.

$52000 \div 80000 = 0.65$. Step 3: Multiply the decimal by 100 to scale it to a percentage.

$0.65 \times 100 = 65\%$.

Think: Why does this work? Scaling to 100 is simply multiplying the decimal by 100. The ritual rule and the “divide, then multiply” method are the exact same mathematical operation.

QUICK CHECK – SECTION 3 Q1

- 1 Reaching Level 100 requires a total of 7,920,000 XP. Ron has earned 3,168,000 XP. What percentage of the total XP needed for Level 100 has he earned?

Flip to check – $3168000 \div 7920000 = 0.4$, $0.4 \times 100 = 40\%$

WORKED EXAMPLE 3 – Compare and justify: win rate

Problem: Ron wins 12 out of 16 matches, while his squadmate Deshawn wins 14 out of 20 matches. Determine who has the higher win rate and justify your answer.

Solution: Step 1: Calculate Ron’s win rate. $12 \div 16 = 0.75$, which is equivalent to 75%. Step 2: Calculate Deshawn’s win rate. $14 \div 20 = 0.7$, which is equivalent to 70%. Step 3: Compare the two percentages. Since $75\% > 70\%$, Ron has the higher win rate. Step 4: Write the justification. “Ron’s win rate is 75% and Deshawn’s win rate is 70%, so Ron has the higher win rate.” You must state both numerical percentages to earn the full marks.

Think: Why does this work? Although Deshawn played more matches in total, playing more matches does not guarantee a higher success rate. Exam mark schemes will reject explanations like “Deshawn played more matches” because only the calculated percentages provide a valid comparison.

Avoid a common exam trap: writing that a player has a better record simply because they played more matches. Playing more matches does not mean a player has a higher win

percentage. To earn marks, your justification must explicitly state both calculated percentages.

EXERCISE 3 – XP AND LOOT: PERCENTAGE OF AN AMOUNT

- 2** A Legendary skin bundle contains items worth 1,500 V-Bucks and is advertised as a 20% saving. If the bundle costs £12.99 and the full price of the items is £16.24, calculate 20% of £16.24 to determine the actual saving. [2 marks]

- 3** Calculate 35% of 80,000 XP. [1 mark]

EXERCISE 4 – COMPARE AND JUSTIFY: WIN RATE SHOWDOWN

- 4** Ron wins 18 out of 24 matches this week, and his rival Priya wins 21 out of 28 matches. Determine if Priya has a higher win rate than Ron. Calculate both percentages and justify your answer. [3 marks]

To earn the justification mark, you must use this structure: "Ron's win rate is __% and Priya's win rate is __%, so ___." Any comparison that does not state both numerical percentages will receive zero marks for the justification.

4 Mixed Drill spot the type before you solve it

You have practiced two distinct types of percentage questions. Before you begin the mixed exercises, identify which type you are solving:

- **Type A (Equivalence Check):** You are given several fractions, decimals, or percentages and must identify which values are equal or find the odd one out.
- **Type B (Percentage of an Amount or Comparison):** You are given a total and a specific part, and you must calculate the percentage or compare two different rates.

The following exercise mixes both types. For each question, identify the type before writing your solution.

 EXERCISE 5 – MIXED SET: ENGINE CHECK

1 Identify the question type (Type A or Type B), then find the value that does not match the others: $\frac{1}{2}$, 0.5, 50%, $\frac{5}{8}$. Circle exactly one option. [1 mark]

2 Identify the question type, then calculate 60% of 80,000 XP. [1 mark]

3 Identify the question type, then find the missing percentage in the equation: $\frac{1}{5}$ of 200 V-Bucks tokens = ___% of 40 tokens. [2 marks]

4 Identify the question type, then solve: Deshawn wins 9 out of 15 matches, and Priya wins 22 out of 40 matches. Determine who has the higher win rate and justify your answer by stating both percentages. [3 marks]

Before moving to the next section, review your answers. Ensure you have circled exactly one option for equivalence questions and stated both numerical percentages in your justifications. If you missed either of these steps, review the worked examples in Section 2 and Section 3 before proceeding to the multi-step problems.

■ ■ You have completed Act 2. In Act 3, you will solve multi-step problems where the question types are combined.

 your progress so far

5

Chained Calculations solving multi-step percentage problems



In this section, the questions are not labeled by type. You will solve multi-step problems where you must apply the division and scaling rules sequentially. The same fundamental rule still applies: divide the relevant amount by the total amount, then scale the result to 100.

WORKED EXAMPLE 4 – Chaining two percentage calculations

Problem: A Fortnite lobby contains 100 players, and 40 of them are real players. If 25% of the real players are on a squad with Ron, calculate how many real players are on his squad.

Solution: Step 1: Identify the number of real players in the lobby, which is 40. Step 2: Calculate 25% of those 40 real players. $0.25 \times 40 = 10$. Step 3: State the final count. There are 10 real players on Ron's squad.

Think: Why does this work? Chaining calculations means the output of the first step becomes the total amount for the second step. You are applying the same percentage rule twice in succession.

EXERCISE 6 – MULTI-STEP PERCENTAGE CHALLENGES

- 1 A lobby contains 100 players, of which 40 are real. In the first two minutes of the match, 30% of the real players are eliminated. Of those eliminated real players, half are eliminated by other real players rather than bots. Calculate the number of real players eliminated by other real players. [4 marks]

- 2 Ron has earned 3,168,000 XP this season toward the 7,920,000 XP required for Level 100. He also purchased a bundle of 2,800 V-Bucks for £17.49. He wants to compare this purchase to a bundle of 5,000 V-Bucks sold for £27.99. Calculate: (a) the percentage of the way to Level 100 Ron has reached, and (b) which bundle offers more V-Bucks per pound, justifying your answer by stating both rates. [5 marks]

Extension: You can apply these same calculations to your own gameplay statistics. Find your total matches played and your total wins, then calculate your actual win percentage by dividing wins by matches and multiplying by 100. You can do the same with your current XP progress toward the next level.

6

Exam Practice questions modeled on Cambridge exam papers



The following questions are written in the style of Cambridge exam papers to help you practice using official command words and mark allocations.

EXERCISE 7 – EXAM-STYLE

E1 Work out 35% of £200. [1 mark]

E2 A jacket costs 80% of its original price after a discount is applied. If the discounted price is £15, calculate the original price of the jacket. [2 marks]

E3 Circle the single value that does NOT belong to the set: $\frac{3}{10}$, 0.3, 30%, $\frac{13}{40}$. [1 mark]

E4 Complete the following equation: $\frac{1}{2}$ of 60 = ___% of 30. [2 marks]



Self-Evaluation verify your progress



Tick each box to confirm that you can confidently perform these operations without referring to your notes:

- ☐ I can calculate a percentage of any given amount.
- ☐ I can determine whether a fraction, a decimal, and a percentage are equivalent, and identify the odd one out.
- ☐ I can calculate a percentage from a raw count.
- ☐ I can compare two percentages and justify the comparison by stating both numerical values.

- ☐ I can read and interpret data from a table or a bar chart.
- ☐ I can chain multiple percentage calculations together to solve complex problems.

Check your answers

Attempt the questions yourself before checking your answers.

Section 1: The Engine

- Quick check Q1: 12% of the lobby is real players.
- Quick check Q2: 88% of the lobby consists of bots.

Section 2: Loadout Checks

- Worked Example 1: Fully worked in text.
- Quick check Q1: 178.64 V-Bucks per £1. This rate is better than the 2,800 bundle's rate of 160.09 V-Bucks per £1.
- Exercise 1, Question 1: D ($\frac{2}{5}$)
- Exercise 1, Question 2: D ($\frac{7}{4}$)
- Exercise 2, Question 1: 5%
- Exercise 2, Question 2: 10.6%, which is worse than a 10% difference.

Section 3: The Numbers Don't Lie

- Quick check Q1: 40% of the way to Level 100.
- Exercise 3, Question 1: 20% of £16.24 is £3.25, which matches the actual saving.
- Exercise 3, Question 2: 28,000 XP
- Exercise 4, Question 1: Ron's win rate is 75% and Priya's win rate is 75%, so their rates are equal. Priya does not have a higher win rate.

Section 4: Mixed Drill

- Exercise 5, Question 1: Type A. The odd one out is D ($\frac{2}{5}$).
- Exercise 5, Question 2: Type B. 48,000 XP.
- Exercise 5, Question 3: Type A. 100%.
- Exercise 5, Question 4: Type B. Deshawn's win rate is 60% and Priya's win rate is 55%, so Deshawn has the higher win rate.

Section 5: Chained Calculations

- Exercise 6, Question 1: 6 real players are eliminated by other real players.
- Exercise 6, Question 2: (a) Ron has reached 40% of Level 100. (b) Ron's bundle rate is 160.09 V-Bucks per £1 and the 5,000 bundle's rate is 178.64 V-Bucks per £1, so the 5,000 bundle offers better value.

Section 6: Exam Practice

- Exercise 7, Question E1: £70
- Exercise 7, Question E2: £18.75
- Exercise 7, Question E3: D ($\frac{13}{40}$)
- Exercise 7, Question E4: 100%

Mark scheme

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Section 1 — The Engine

Ex · Q	Answer	Working	Obj	Marks	Examiner note
Quick check Q1	12%	$12 \div 100 \times 100 = 12\%$	7Nf.05	— (self-check)	Tests the ritual rule when the total is already 100.
Quick check Q2	88%	$88 \div 100 \times 100 = 88\%$	7Nf.05	— (self-check)	Complement check — tests the “of what?” awareness.

Section 2 — Loadout Checks

Ex · Q	Answer	Working	Obj	Marks	Examiner note
Quick check Q1	178.64 V-Bucks/£1; beats 2,800 bundle	$5000 \div 27.99 = 178.64$	7Nf.01	— (self-check)	Rate comparison, not scaled to 100 — extension of the ritual rule.
Ex 1, Odd one out Q1	$\frac{2}{5}$	$\frac{1}{5} = 20\%.$ $\frac{2}{5} = 40\%.$	7Nf.01	1	Zero if more than one circled (framework trap, 2014 P1 Q11 mark scheme).
Ex 1, Odd one out Q2	$\frac{7}{4}$	$\frac{3}{4} = 75\%.$ $\frac{7}{4} = 1.75.$	7Nf.01	1	Same single-circle rule; distractor chosen to look

					numerically close to $\frac{3}{4}$.
Ex 2, Chain Q1	5%	$\frac{1}{4}$ of $100 = 25.25$ of $500 = 5\%$.	7Nf.01	2	1 mark for 25, 1 mark for final %; method mark stands alone per 2014 P2 Q20.
Ex 2, Chain Q2	10.6% (worse than 10%)	Diff $= 17.03$. $17.03 \div 160.09 = 10.6\%$	7Nf.01	2	Must divide by the bigger rate, not the smaller – common inversion slip.

Section 3 – The Numbers Don't Lie

Ex • Q	Answer	Working	Obj	Marks	Examiner note
Quick check Q1	40%	$3168000 \div 7920000 \times 100 = 40\%$	7Nf.05	– (self-check)	Direct application of the ritual rule to a large total.
Ex 3, XP and loot Q1	£3.25; matches	$0.2 \times 16.24 = 3.248 \approx 3.25$	7Nf.05	2	1 mark calculation, 1 mark for the verification step.
Ex 3, XP and loot Q2	28,000 XP	$0.35 \times 80000 = 28000$	7Nf.05	1	Matches real paper format exactly (2011 P2 Q4 pattern).

Ex 4, Compare & justify Q1	Equal, both 75%	$\frac{18}{24} = 75\%$. $\frac{21}{28} = 75\%$.	7Nf.05	3	1 mark each percentage; justification mark requires naming both AND correctly identifying equality – a student defaulting to “higher/ lower” without checking loses this mark.
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Section 4 – Mixed Drill

Ex • Q	Answer	Working	Obj	Marks	Examiner note
Ex 5, Mixed Q1	$\frac{5}{8}$	rest = 0.5 = 50%	7Nf.01	1	Single-circle rule applies.
Ex 5, Mixed Q2	48,000 XP	0.6×80000	7Nf.05	1	Direct calculation.
Ex 5, Mixed Q3	100%	$\frac{1}{5}$ of 200 = 40. $\frac{40}{40} = 100\%$.	7Nf.01	2	Method + answer marks, as Section 2 chain format.
Ex 5, Mixed Q4	Deshawn higher, 60% vs 55%	$\frac{9}{15} = 60\%$. $\frac{22}{40} = 55\%$.	7Nf.05	3	Justification mark requires both percentages named.

Section 5 – Boss Level

Ex • Q	Answer	Working	Obj	Marks	Examiner note
Ex 6, Boss Level Q1	6	Real = 40. 30% of 40 = 12. $12 \div 2 = 6$.	7Nf.05	4	Error carried forward across the three

					chained steps; final mark requires units (“players”).
Ex 6, Boss Level Q2	(a) 40% (b) 5,000 bundle better, 178.64 vs 160.09	(a) $3168000 \div 7920000 = 40\%$ (b) $2800 \div 17.49 = 160.09$ $5000 \div 27.99 = 178.64$	7Nf.05, 7Nf.01	5	(a) 2 marks method+answer. (b) 3 marks: 1 per rate, 1 for named justification – bare “bigger is better” scores 0 on that mark.

Section 6 – Where This Leads

Ex • Q	Answer	Working	Obj	Marks	Examiner note
Exam E1	£70	0.35×200	7Nf.05	1	Matches 2011 P2 Q4 exactly; answer only required.
Exam E2	£18.75	$15 \div 80 \times 100 = 18.75$	7Nf.05	2	1 mark for correctly treating £15 as 80% not 100%; 1 mark final answer. Matches 2011 P1 Q6.
Exam E3	$\frac{13}{40}$	rest = 0.3 = 30%	7Nf.01	1	Single-circle rule; zero if >1 circled. Matches 2014 P1 Q11.
Exam E4	100%	$\frac{1}{2}$ of 60 = 30. $\frac{30}{30} = 100\%$.	7Nf.01	2	Partial-credit-friendly per 2014 P2 Q20 – mark for correct answer seen anywhere in working.