



BROWN TUITION

FREE PARENT & STUDENT GUIDE

GCSE Maths: The 12 Topics Most Students Get Wrong

A "spot the mistake" self-diagnostic. Twelve real exam-style questions, each answered the way thousands of students answer them — wrongly. Can yours see why?

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The silent marks your child is losing

Most GCSE maths marks aren't lost on the hard questions. They're lost on questions your child thinks they got right — the same dozen mistakes, made by thousands of students, that look fine in homework and only surface on results day. In a class of 30, a teacher marking at speed often can't catch them. That's why they stay silent.

What a silent mistake looks like at home

Homework comes back mostly ticked. Your child says maths is "fine". But scores wobble between tests, they avoid showing working, and "I knew it, I just made a silly mistake" comes up a lot. Those aren't silly mistakes — they're patterns, and patterns can be fixed quickly once someone names them.

How to use this booklet

- Hand it to your child — or better, sit with them. Each page shows a question answered the way many students answer it. Their job: **find the mistake before reading the answer box.**
- After each page they score themselves with a traffic light: green (spotted it instantly), amber (knew something was off), red (it looked correct).
- Tally the lights on the last page. **Three or more reds** is a clear signal — and a very fixable one.

One question to ask tonight

"Can you show me a maths question you got right this week — and talk me through why each step works?" If the explanation is confident, great. If it's "that's just how you do it", that's a silent mark waiting to happen.

The minus sign that doesn't reach far enough

QUESTION

Simplify $5x - 2(x - 4)$

A STUDENT'S ANSWER

$$5x - 2x - 8 = 3x - 8$$

Spot the mistake before reading on. Where exactly does it go wrong?

The mistake: the -2 was only multiplied into the x , not the -4 . Multiplying -2 by -4 gives **$+8$** , not -8 .

The fix: $5x - 2(x - 4) = 5x - 2x + 8 = 3x + 8$. Say it aloud: "minus two times minus four is plus eight." Examiners see -8 here on thousands of papers — it usually costs the whole question, because every later step inherits the wrong sign.

☐ ☒ Spotted it instantly

☐ ☒ Knew something was off

☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) Simplify $7x - 3(x - 2)$

(b) Simplify $10 - 2(m - 5)$

(c) Simplify $4(y + 1) - 2(y - 3)$

(d) Simplify $6a - (a - 4)$

(e) Simplify $3 - 2(x - 1)$

BEFORE YOU CHECK

Did every minus sign reach both terms inside the bracket?

The disappearing middle term

QUESTION

Expand $(x + 3)^2$

A STUDENT'S ANSWER

$$(x + 3)^2 = x^2 + 9$$

Spot the mistake before reading on.

The mistake: squaring each term separately. $(x + 3)^2$ means $(x + 3)(x + 3)$ — a full double-bracket expansion, not "square the x , square the 3 ".

The fix: $(x + 3)(x + 3) = x^2 + 3x + 3x + 9 = x^2 + 6x + 9$. The middle term is never zero. Quick check: substitute $x = 1$. $(1+3)^2 = 16$, but $1^2 + 9 = 10$ — so $x^2 + 9$ can't be right.

- ☐ ☒ Spotted it instantly
 ☐ ☒ Knew something was off
 ☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) Expand $(x + 5)^2$

(b) Expand $(x - 4)^2$

(c) Expand $(x + 1)^2$

(d) Expand $(2x + 3)^2$

(e) Expand $(x - 6)^2$

BEFORE YOU CHECK

Three terms every time — if there's no middle term, go back.

Tops and bottoms don't just add

QUESTION

Work out $\frac{2}{3} + \frac{1}{4}$

A STUDENT'S ANSWER

$$\frac{2}{3} + \frac{1}{4} = \frac{3}{7}$$

Spot the mistake before reading on.

The mistake: adding numerators and denominators separately. But $\frac{3}{7}$ is smaller than $\frac{2}{3}$ — adding something positive can't make the answer shrink.

The fix: common denominator 12: $\frac{8}{12} + \frac{3}{12} = \frac{11}{12}$. Train the sense-check: is my answer bigger than both fractions I started with? If not, stop.

☐ ☒ Spotted it instantly

☐ ☒ Knew something was off

☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) Work out $\frac{1}{2} + \frac{1}{3}$

(b) Work out $\frac{3}{4} - \frac{2}{5}$

(c) Work out $\frac{2}{5} + \frac{1}{10}$

(d) Work out $\frac{5}{6} - \frac{1}{4}$

(e) Work out $\frac{1}{3} + \frac{3}{8}$

BEFORE YOU CHECK

Common denominator first. Is each answer a sensible size?

When doubling means halving

QUESTION

y is inversely proportional to x. When $x = 3$, $y = 8$. Find y when $x = 6$.

A STUDENT'S ANSWER

x has doubled, so y doubles too: $y = 16$

Spot the mistake before reading on.

The mistake: treating "inversely proportional" as ordinary (direct) proportion. Inverse means as x goes up, y comes down.

The fix: write $y = \frac{k}{x}$. Then $k = 3 \times 8 = 24$, so when $x = 6$, $y = \frac{24}{6} = 4$. Always write the k equation first — it's also where the method marks live.

- ☐ ☒ Spotted it instantly
 ☐ ☒ Knew something was off
 ☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) y is inversely proportional to x. When $x = 2$, $y = 12$. Find y when $x = 8$.

(b) Same relationship: find y when $x = 4$.

(c) Same relationship: find y when $x = 24$.

(d) Same relationship: find x when $y = 48$.

(e) y is inversely proportional to x. When $x = 6$, $y = 5$. Find y when $x = 10$.

BEFORE YOU CHECK

Did you write $y = \frac{k}{x}$ and find k before anything else?

Undoing steps in the wrong order

QUESTION

Make x the subject of $y = 3x + 2$

A STUDENT'S ANSWER

$$x = \frac{y}{3} - 2$$

Spot the mistake before reading on.

The mistake: dividing by 3 first, then subtracting 2. But the $\div 3$ has to apply to the whole of $(y - 2)$, and the -2 must be undone before the $\times 3$.

The fix: subtract 2 from both sides: $y - 2 = 3x$. Divide everything by 3: $x = \frac{y-2}{3}$. Check with numbers: if $x = 1$, $y = 5$. Does the answer return $x = 1$? $\frac{5-2}{3} = 1 \checkmark$ but $\frac{5}{3} - 2 \neq 1 \times$.

☐ ☒ Spotted it instantly

☐ ☒ Knew something was off

☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) Make x the subject of $y = 5x - 3$

(b) Make x the subject of $y = \frac{x}{4} + 1$

(c) Make x the subject of $y = 2x + 7$

(d) Make x the subject of $y = \frac{x-1}{3}$

(e) Make t the subject of $v = u + at$

BEFORE YOU CHECK

Check by substituting easy numbers — does your formula give them back?

Rounding 0.48 to the wrong "1"

QUESTION

Estimate $(8.21 \times 3.97) \div 0.48$

A STUDENT'S ANSWER

$\approx (8 \times 4) \div 1 = 32$

Spot the mistake before reading on.

The mistake: rounding 0.48 to 1. To one significant figure, 0.48 rounds to **0.5** — the first significant figure is the 4, not the 0.

The fix: $(8 \times 4) \div 0.5 = 32 \div 0.5 = 64$ — dividing by a half doubles. The real answer is about 67.9, so 64 is close; 32 is out by half. Estimation questions are marked on sensible 1 s.f. rounding, and $0.48 \rightarrow 1$ loses it immediately.

☐ ☒ Spotted it instantly

☐ ☒ Knew something was off

☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) Estimate $(19.6 \times 5.2) \div 0.39$

(b) Estimate 41.2×0.53

(c) Estimate $(6.8 \times 3.1) \div 0.52$

(d) Estimate $897 \div 0.42$

(e) Estimate 28.6×0.61

BEFORE YOU CHECK

One significant figure each — and decimals under 1 never round to 1 or 0.

"And" means multiply, not add

QUESTION

The probability it rains on any given day is 0.3, independently. What is the probability it rains on both Saturday and Sunday?

A STUDENT'S ANSWER

$$0.3 + 0.3 = 0.6$$

Spot the mistake before reading on.

The mistake: adding the probabilities. Adding is for "either/or" with events that can't both happen. "Both" — this and that — means multiply. (Sense-check: both days raining can't be more likely than one day raining.)

The fix: $0.3 \times 0.3 = 0.09$. And a notation warning while we're here: answers written as "3 in 10" or the ratio "3:10" score zero — probabilities must be a fraction, decimal or percentage.

- ☐ ☒ Spotted it instantly
 ☐ ☒ Knew something was off
 ☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) A fair coin is flipped twice. Find P(two heads).

(b) A spinner has $P(\text{red}) = 0.2$. Find P(red on both of two spins).

(c) A fair dice is rolled twice. Find P(two sixes).

(d) $P(\text{rain}) = 0.7$ each day. Find P(rain on both of two days).

(e) $P(\text{pass}) = 0.9$ per test. Find P(passing both of two tests).

BEFORE YOU CHECK

"Both" = multiply. Is each answer smaller than what you started with?

Right answer, missing reasons, lost marks

QUESTION

AB and CD are parallel lines. Angle x and a 68° angle are alternate angles. Find x . **Give reasons for your answer.** [3 marks]

A STUDENT'S ANSWER

$x = 68^\circ$ (nothing else written)

The answer is right. So where do the marks go?

The mistake: no reasons. On a 3-mark "give reasons" question, a bare correct answer typically earns 1 mark — the other 2 are for the geometric reasons, written in full sentences with the correct names.

The fix: " $x = 68^\circ$ because **alternate angles between parallel lines are equal.**" Not "Z angles" — mark schemes require the proper name. This is the single cheapest set of marks to reclaim on any geometry paper.

- ☐ ☒ Spotted it instantly
 ☐ ☒ Knew something was off
 ☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) An angle of 74° and angle y are corresponding angles. Find y , with a reason.

(b) A triangle has angles 52° and 61° . Find the third angle, with a reason.

(c) An angle of 118° and angle p are alternate angles. Find p , with a reason.

(d) Angles q and 135° sit on a straight line. Find q , with a reason.

(e) An angle of 65° and angle r are co-interior (allied) angles. Find r , with a reason.

BEFORE YOU CHECK

A full sentence with the proper name for every reason — no "Z angles".

The 2.33 that ruins the final answer

QUESTION

A tap fills 7 litres in 3 minutes at a steady rate. How many litres in 48 minutes?

A STUDENT'S ANSWER

Rate = $7 \div 3 = 2.33$ litres/min. $2.33 \times 48 = \mathbf{111.84}$ litres

Spot the mistake before reading on.

The mistake: rounding mid-calculation. $7 \div 3$ isn't 2.33 — it's 2.333..., and cutting it early drags the final answer off (the exact answer is a clean 112).

The fix: keep it exact: $\frac{7}{3} \times 48 = 7 \times 16 = \mathbf{112}$ litres — or keep the full decimal on the calculator and round only at the end. "Accuracy marks" on multi-step questions are lost to early rounding more than to anything else.

- ☐ ☒ Spotted it instantly
 ☐ ☒ Knew something was off
 ☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) A tap fills 5 litres in 3 minutes. How many litres in 36 minutes?

(b) A machine makes 8 parts in 3 minutes. How many parts in 27 minutes?

(c) A tap fills 7 litres in 3 minutes. How many litres in 24 minutes?

(d) 3 pencils cost £1. What do 24 pencils cost?

(e) A printer prints 9 pages in 4 minutes. How many pages in 20 minutes?

BEFORE YOU CHECK

Keep fractions exact all the way through — round only at the end (if at all).

The one word that tells you the method

QUESTION

(a) Show that $(x + 2)(x - 5) = x^2 - 3x - 10$. (b) **Hence** solve $x^2 - 3x - 10 = 0$.

A STUDENT'S ANSWER (part b)

Uses the quadratic formula from scratch: $x = \frac{3 \pm \sqrt{49}}{2} \dots$

The values come out right. So what's the problem?

The mistake: ignoring "hence". Part (a) already handed over the factorisation — "hence" means use it. Rebuilding with the formula burns several minutes and, when a question says "hence" alone (not "hence or otherwise"), other methods can forfeit the marks.

The fix: $(x + 2)(x - 5) = 0$, so $x = -2$ or $x = 5$. Ten seconds. Teach the reflex: "hence" = the previous part is the key, go and get it.

- ☐ ☒ Spotted it instantly ☐ ☒ Knew something was off ☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) Show $(x - 3)(x + 7) = x^2 + 4x - 21$. Hence solve $x^2 + 4x - 21 = 0$.

(b) Show $(x + 3)(x - 4) = x^2 - x - 12$. Hence solve $x^2 - x - 12 = 0$.

(c) Show $(x - 1)(x - 8) = x^2 - 9x + 8$. Hence solve $x^2 - 9x + 8 = 0$.

(d) Show $(x + 5)(x - 2) = x^2 + 3x - 10$. Hence solve $x^2 + 3x - 10 = 0$.

(e) Show $(x + 6)(x - 6) = x^2 - 36$. Hence solve $x^2 - 36 = 0$.

BEFORE YOU CHECK

If you reached for the quadratic formula, you missed the word "hence".

Dividing by the ratio, not the parts

QUESTION

Share £60 between Amy and Ben in the ratio 2 : 3.

A STUDENT'S ANSWER

Amy: $60 \div 2 = \text{£}30$. Ben: $60 \div 3 = \text{£}20$.

Spot the mistake before reading on.

The mistake: dividing £60 by each ratio number. Two giveaways: the shares total £50, not £60 — and Ben, who should get more, gets less.

The fix: total parts = $2 + 3 = 5$. One part = $60 \div 5 = \text{£}12$. Amy = $2 \times 12 = \text{£}24$, Ben = $3 \times 12 = \text{£}36$.

Final check every time: do the shares add back to the total?

- ☐ ☒ Spotted it instantly
 ☐ ☒ Knew something was off
 ☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) Share £45 in the ratio 4 : 5.

(b) Share 72 sweets in the ratio 1 : 3 : 5.

(c) Share £120 in the ratio 3 : 5.

(d) Share 84 in the ratio 2 : 5.

(e) A mix uses sand and cement in the ratio 5 : 2. Make 35 kg of mix.

BEFORE YOU CHECK

Add the parts first — and do your shares add back to the total?

Multiplying powers $\neq$ multiplying the powers

QUESTION

Simplify $2^3 \times 2^4$, giving your answer as a power of 2.

A STUDENT'S ANSWER

$$2^3 \times 2^4 = 2^{12}$$

Spot the mistake before reading on.

The mistake: multiplying the indices (3×4). When multiplying powers of the same base, the indices **add**. Multiplying indices is for a power of a power, like $(2^3)^4$.

The fix: $2^3 \times 2^4 = 2^{3+4} = 2^7 = 128$. Prove it by counting: $(2 \times 2 \times 2) \times (2 \times 2 \times 2 \times 2)$ is seven 2s, not twelve. Once that picture lands, the rule stops being a rule to memorise.

☐ ☒ Spotted it instantly

☐ ☒ Knew something was off

☐ ☒ Looked correct to me

NOW YOU TRY — SHOW YOUR WORKING

Answers on page 15

(a) Simplify $3^2 \times 3^5$ as a power of 3.

(b) Simplify $(5^2)^3$ as a power of 5.

(c) Simplify $7^8 \div 7^3$ as a power of 7.

(d) Simplify $2^6 \div 2^2$ as a power of 2.

(e) Simplify $10^5 \times 10^{-2}$ as a power of 10.

BEFORE YOU CHECK

Multiply $\rightarrow$ add the indices. Divide $\rightarrow$ subtract. Power of a power $\rightarrow$ multiply.

"Now you try" answers

Full marks means the right answer and dodging the trap from that page — signs handled, reasons written in full, nothing rounded early.

TOPIC 01

(a) $4x + 6$ (b) $20 - 2m$ (c) $2y + 10$ (d) $5a + 4$ (e) $5 - 2x$

TOPIC 02

(a) $x^2 + 10x + 25$ (b) $x^2 - 8x + 16$ (c) $x^2 + 2x + 1$ (d) $4x^2 + 12x + 9$ (e) $x^2 - 12x + 36$

TOPIC 03

(a) $\frac{5}{6}$ (b) $\frac{7}{20}$ (c) $\frac{1}{2}$ (d) $\frac{7}{12}$ (e) $\frac{17}{24}$

TOPIC 04

(a) $k = 24$, $y = 3$ (b) $y = 6$ (c) $y = 1$ (d) $x = 0.5$ (e) $k = 30$, $y = 3$

TOPIC 05

(a) $x = \frac{y+3}{5}$ (b) $x = 4(y - 1)$ (c) $x = \frac{y-7}{2}$ (d) $x = 3y + 1$ (e) $t = \frac{v-u}{a}$

TOPIC 06

(a) $100 \div 0.4 = 250$ (b) $40 \times 0.5 = 20$ (c) $21 \div 0.5 = 42$ (d) $900 \div 0.4 = 2250$ (e) $30 \times 0.6 = 18$

TOPIC 07

(a) 0.25 (b) 0.04 (c) $\frac{1}{36}$ (d) 0.49 (e) 0.81

TOPIC 08

(a) 74° — corresponding angles are equal (b) 67° — angles in a triangle sum to 180° (c) 118° — alternate angles are equal (d) 45° — angles on a straight line sum to 180° (e) 115° — co-interior angles sum to 180°

TOPIC 09

(a) 60 litres (b) 72 parts (c) 56 litres (d) £8 (e) 45 pages

TOPIC 10

(a) $x = 3$ or -7 (b) $x = -3$ or 4 (c) $x = 1$ or 8 (d) $x = -5$ or 2 (e) $x = 6$ or -6

TOPIC 11

(a) £20 and £25 (b) 8, 24, 40 (c) £45 and £75 (d) 24 and 60 (e) 25 kg sand, 10 kg cement

TOPIC 12

(a) 3^7 (b) 5^6 (c) 7^5 (d) 2^4 (e) 10^3

YOUR SCORE

Count your lights



Greens: ____

Secure — keep sharpening



Ambers: ____

Instinct is there, method isn't solid



Reds: ____

Silent marks being lost right now

0–2 reds: strong foundations — the priority is exam technique and timing.

3–5 reds: a handful of fixable patterns are quietly capping the grade. Named and drilled, these usually turn around in weeks, not months.

6+ reds: the gaps sit underneath the current topics, which is why school revision doesn't seem to stick. Worth mapping properly before adding more content on top.

3 OR MORE REDS?

That's exactly what a free Diagnostic Session maps out.

A relaxed 30 minutes with a qualified teacher (QTS, Enhanced DBS) — free, with no tests, no pressure and no obligation. You leave with a written picture of exactly where your child is, which of these patterns apply, and a plan to fix them. Confidence first; the grades follow.

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