



Multi-step problems with rational numbers

GRADE 7 MATH

Answer keys for the exit ticket, practice worksheet, and homework, plus notes for the lesson slides. Each answer shows the steps and the most likely wrong answer (“If wrong”), so you can tell what a mistake means, not just that it is one. Questions go from **fluency** to **application** to **reasoning**.

Exit Ticket — answer key

Use: End of the multi-step lesson. 5–8 min, independent. Every item has an estimate line; mark it, or students will skip it.

Timing: 5–8 min · independent. A blank estimate box with a correct answer is worth flagging — the standard names estimation explicitly.

1. 3 shirts at \$12.50 plus 8% tax **APPLICATION**

Answer: **\$40.50**

1. Estimate: $3 \times \$12 = \$36$, plus a bit for tax, so somewhere near \$38–\$40.
2. Calculate: $3 \times 12.50 = 37.50$.
3. Tax: $37.50 \times 1.08 = 40.50$.
4. \$40.50 sits just above the estimate, as expected.

If wrong: Added 8 dollars instead of 8 percent, giving \$45.50. The estimate flags it — \$45.50 is far above \$36 for an 8% addition.

2. 45 students, $\frac{2}{3}$ go **APPLICATION**

Answer: **30 go, 15 stay**

1. $\frac{2}{3}$ of 45 = 30 students go.
2. $45 - 30 = 15$ stay.
3. Check: $30 + 15 = 45$, the whole class.

If wrong: Answered 15 go and 30 stay by finding $\frac{1}{3}$. Read which fraction the question names.

3. $-4.5 + 12\frac{1}{4}$ APPLICATION

Answer: $3\frac{1}{4}$, or $7\frac{3}{4}$

1. Convert to quarters: $-4.5 = -1\frac{8}{4}$ and $12\frac{1}{4} = \frac{49}{4}$.
2. $-1\frac{8}{4} + \frac{49}{4} = 3\frac{1}{4} = 7\frac{3}{4}$.
3. Sense check: starting below zero and adding over 12 should land a bit under 8.

If wrong: Answered $16\frac{3}{4}$ by adding the sizes and ignoring the negative.

4. \$68 bill, 15% tip, split 4 ways REASONING

Answer: **\$19.55 each**

1. Estimate: \$68 is about \$70; a 15% tip is about \$10, so roughly \$80 total, split 4 ways is about \$20 each.
2. Calculate the tip: $68 \times 1.15 = 78.20$.
3. Split: $78.20 \div 4 = 19.55$.
4. \$19.55 against an estimate of \$20 — close, so it is believable.
5. How the estimate helped: it gives a range to test against BEFORE the arithmetic, so a slip like forgetting to divide (giving \$78.20) or dividing first (giving \$19.55 by luck, or \$17 without the tip) is caught immediately.

If wrong: Divided before adding the tip and got \$17 plus tip errors, or forgot to divide entirely. Any of these sits far from \$20, which is what the estimate is for.

Quick answers for fast checking:

#	Level	Answer
1	application	\$40.50
2	application	30 go, 15 stay
3	application	$7\frac{3}{4}$
4	reasoning	\$19.55 each

Practice Worksheet — answer key

Use: During the lesson after the deck. Items 6–8 are a sequence: estimate, calculate, then explain the direction of the gap. That third step is what makes estimation a skill rather than a ritual.

Timing: 15–25 min · pairs or independent · circulate on 8 and 9. Do not let students fill the estimate box after calculating.

1. 4 items at \$7.25 FLUENCY

Answer: **\$29**

1. $4 \times 7.25 = 29$. Or $4 \times 7 = 28$ plus $4 \times 0.25 = 1$, giving 29.

If wrong: Answered \$28 by dropping the cents.

2. 10% off \$29 APPLICATION

Answer: **\$26.10**

1. 10% of 29 = 2.90. $29 - 2.90 = 26.10$.

2. Or multiply by 0.9: $29 \times 0.9 = 26.10$.

If wrong: Answered \$2.90, the discount rather than the price.

3. $\frac{3}{4}$ of 60 litres FLUENCY

Answer: **45 litres**

1. $\frac{3}{4} \times 60 = 45$.

If wrong: Answered 15, which is the empty quarter.

4. To fill it? FLUENCY

Answer: **15 litres**

1. $60 - 45 = 15$.

If wrong: Answered 60, the whole capacity.

5. $-8.5 - (-3\frac{1}{4})$ APPLICATION

Answer: **$-2\frac{1}{4}$, or $-5\frac{1}{4}$**

1. Subtracting a negative adds: $-8.5 + 3.25$.

2. In quarters: $-3\frac{4}{4} + 1\frac{3}{4} = -2\frac{1}{4} = -5\frac{1}{4}$.

3. Sense check: adding a positive to -8.5 moves right, so the answer is between -8.5 and 0.

If wrong: Answered $-11\frac{3}{4}$ by subtracting instead of adding the opposite.

6. Estimate 2.4×1.5 APPLICATION

Answer: **About 3**

1. Round 2.4 down to 2 and keep 1.5: $2 \times 1.5 = 3$.
2. Since 2.4 was rounded DOWN, the real answer should be a bit more than 3.

If wrong: Rounded both to whole numbers as $2 \times 2 = 4$, which is a worse estimate here.

7. 2.4×1.5 exactly APPLICATION

Answer: **3.6**

1. $2.4 \times 1.5 = 2.4 + 1.2 = 3.6$.
2. Or as fractions: $12/5 \times 3/2 = 36/10 = 3.6$.

If wrong: Answered 3.0 by multiplying only the whole parts.

8. Above or below the estimate? Why? REASONING

Answer: **Above — because 2.4 was rounded down to 2**

1. Estimate 3, exact 3.6, so the answer is above.
2. The estimate used 2 in place of 2.4, discarding 0.4.
3. That missing 0.4, multiplied by 1.5, is 0.6 — exactly the gap between 3 and 3.6.
4. Knowing you rounded DOWN tells you in advance that the true answer will be HIGHER, which makes the estimate a directed check rather than a vague one.
5. A good estimator tracks not just the size but the direction of the rounding.

If wrong: Said the estimate was wrong. The estimate was fine and did its job; it was deliberately approximate.

9. \$96 split 5 ways REASONING

Answer: **\$19.20 each — the \$20 estimate was close enough to catch errors**

1. $96 \div 5 = 19.2$, so \$19.20 each.
2. The estimate came from $100 \div 5 = 20$, using a friendlier numerator.
3. It was not exact, and did not need to be. Its job is to bracket the answer so a mistake stands out.
4. If someone had answered \$4.80 (dividing by 20) or \$480 (multiplying), the \$20 estimate flags both instantly.
5. An estimate does not have to be right to be useful. It has to be close enough that a wrong answer looks wrong.

If wrong: Said an estimate that is not exact has no value. Its value is in the size of the error it can detect, not in its own precision.

Quick answers for fast checking:

#	Level	Answer
1	fluency	\$29
2	application	\$26.10
3	fluency	45 litres
4	fluency	15 litres
5	application	$-5\frac{1}{4}$
6	application	about 3
7	application	3.6
8	reasoning	above — rounded down
9	reasoning	\$19.20; the estimate brackets it

Homework — answer key

Use: Parallels the practice sheet. Item 7 confronts the whole-number rule that multiplying always increases, which quietly survives into G7 and causes trouble in every decimal calculation.

Timing: ~15 min at home · independent · review items 7 and 8 as the next-day warm-up.

1. 5 tickets at \$9.50 FLUENCY

Answer: **\$47.50**

$1.5 \times 9.50 = 47.50$. Or $5 \times 10 = 50$ minus $5 \times 0.50 = 2.50$.

If wrong: Answered \$45 by dropping the cents.

2. 20% off \$47.50 APPLICATIONAnswer: **\$38**

1. Multiply by 0.8: $47.50 \times 0.8 = 38$.
2. Or 20% of 47.50 = 9.50, and $47.50 - 9.50 = 38$.

If wrong: Answered \$9.50, the discount.**3. $\frac{5}{8}$ of 72 pages** APPLICATIONAnswer: **45 pages**

1. $72 \div 8 = 9$, then $9 \times 5 = 45$.

If wrong: Answered 40 by estimating rather than computing.**4. Pages remaining?** FLUENCYAnswer: **27**

1. $72 - 45 = 27$.

If wrong: Answered 45 again.**5. $-6.75 + 2\frac{1}{2}$** APPLICATIONAnswer: **$-1\frac{7}{4}$, or $-4\frac{1}{4}$**

1. In quarters: $-2\frac{7}{4} + 1\frac{0}{4} = -1\frac{7}{4} = -4\frac{1}{4}$.
2. Still negative, because $2\frac{1}{2}$ was not enough to reach zero.

If wrong: Answered $-9\frac{1}{4}$ by adding the sizes.**6. 1.2×0.5** APPLICATIONAnswer: **0.6**

1. 1.2×0.5 is half of 1.2, which is 0.6.

If wrong: Answered 6 by misplacing the decimal point.

7. Why did multiplying make it smaller? REASONING

Answer: **Because 0.5 is less than 1 — multiplying by a number under 1 shrinks**

1. Multiplying by 1 leaves a number unchanged.
2. Multiplying by more than 1 makes it bigger; multiplying by less than 1 makes it smaller.
3. 0.5 is less than 1, so 1.2×0.5 must be less than 1.2 — and 0.6 is.
4. ‘Multiplying makes things bigger’ is a rule learned with whole numbers that stops being true once fractions and decimals appear.
5. Useful as a check: before multiplying, look at whether each factor is above or below 1.

If wrong: Said the calculation must be wrong because multiplying should increase. The rule, not the arithmetic, is what needs revising.

8. 4 items at \$19.75 REASONING

Answer: **\$79 exactly; the estimate of \$80 was above**

1. Estimate: \$19.75 is nearly \$20, so $4 \times \$20 = \$80$.
2. Exact: $4 \times 19.75 = 79$.
3. The estimate was ABOVE, because each item was rounded UP by \$0.25.
4. Four items rounded up by \$0.25 each accounts for exactly the \$1 difference: $4 \times 0.25 = 1$.
5. Rounding up gives an overestimate; rounding down gives an underestimate. Knowing which you did tells you which side the true answer lies on before you compute it.

If wrong: Estimated \$80 and then reported \$80 as the answer. The estimate is a check on the calculation, not a substitute for it.

Quick answers for fast checking:

#	Level	Answer
1	fluency	\$47.50
2	application	\$38
3	application	45 pages
4	fluency	27
5	application	$-4\frac{1}{4}$
6	application	0.6
7	reasoning	$0.5 < 1$ shrinks
8	reasoning	\$79; estimate was above

Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then the practice sheet. The standard names estimation explicitly, so slide 5 is not an aside — it is content.

Slide	~Time	Note
1/8	0:00	Frame it: getting an answer is half the job. Knowing whether to trust it is the other half.
2/8	1:00	Hook — demand a number in five seconds so nobody can calculate. That is the point.
3/8	2:30	Model estimating out loud. Students copy the thinking they hear, not the rule they are told.
4/8	4:30	WE1 — calculate and compare. Then show the \$8-not-8% error and how the estimate flags it.
5/8	7:00	Say this one plainly. Retrospective estimation is the commonest way this standard gets faked.
6/8	8:30	CFU — all-student response. About \$20; exactly \$19.55. Watch for the tip added after dividing.
7/8	11:00	Direction of rounding. This upgrades estimation from a rough guess to a directed prediction.
8/8	13:30	Launch the in-class practice sheet.