



Solving $x + p = q$

GRADE 6 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 $x + p = q$ lesson. 5–8 min, independent. Builds on substitution checking (the “Checking solutions by substitution” sheet (Grade 6)).

Timing: 5–8 min · independent. Every item should end with a substitution check — that habit makes the skill self-correcting.

1. $x + 7 = 12$? **FLUENCY**

Answer: $x = 5$

1. The equation ADDS 7, so undo it by SUBTRACTING 7.
2. Do it to both sides: $x + 7 - 7 = 12 - 7$.
3. $x = 5$. Check: $5 + 7 = 12$ ✓

If wrong: Answered 19 — added 7 again. The equation tells you what was done TO x ; you do the opposite.

2. $x + 15 = 40$? **APPLICATION**

Answer: $x = 25$

1. Subtract 15 from both sides: $40 - 15 = 25$.
2. Check: $25 + 15 = 40$ ✓

If wrong: Answered 55 — added instead of subtracting.

3. $x + 2.5 = 6$? **APPLICATION**

Answer: $x = 3.5$

1. Subtract 2.5 from both sides: $6 - 2.5 = 3.5$.
2. Check: $3.5 + 2.5 = 6$ ✓

If wrong: Answered 8.5, or misaligned the decimals (writing 6 as 6.0 prevents that).

4. 21 books, 8 on the shelf — how many more? REASONING

Answer: $8 + x = 21$; $x = 13$

1. Let x be the number still to be added.
2. Already there plus more equals the total: $8 + x = 21$.
3. Subtract 8 from both sides: $x = 13$. Check: $8 + 13 = 21$ ✓

If wrong: Wrote $21 + 8 = x$ (giving 29) — added the total to a part instead of finding the missing part.

Quick answers for fast checking:

#	Level	Answer
1	fluency	$x = 5$
2	application	$x = 25$
3	application	$x = 3.5$
4	reasoning	$8 + x = 21$; $x = 13$

Practice Worksheet — answer key

Use: During the lesson after the mini-lesson/deck. Items 3 and 9 both produce answers students distrust (0 and an unchanged value) — worth naming as legitimate.

Timing: 15–25 min · pairs or independent · circulate on 7–9. Items 1–3 fluency, 4–6 application, 7–9 reasoning. Require a substitution check on every item.

1. $x + 4 = 11$? FLUENCY

Answer: $x = 7$

1. $11 - 4 = 7$. Check: $7 + 4 = 11$ ✓

If wrong: Answered 15 — added.

2. $x + 9 = 23$? FLUENCY

Answer: $x = 14$

1. $23 - 9 = 14$. Check: $14 + 9 = 23$ ✓

If wrong: Answered 32 — added.

3. $x + 13 = 13$? FLUENCY

Answer: $x = 0$

1. $13 - 13 = 0$. Check: $0 + 13 = 13$ ✓

If wrong: Answered 13, or said 'no solution.' Zero is a perfectly good solution.

4. $x + \frac{1}{4} = \frac{3}{4}$? APPLICATION

Answer: $x = \frac{1}{2}$

1. Subtract $\frac{1}{4}$ from both sides: $\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$.
2. Check: $\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$ ✓

If wrong: Answered 1 — added the fractions instead of subtracting.

5. $x + 6.5 = 10$? APPLICATION

Answer: $x = 3.5$

1. Write 10 as 10.0, then subtract: $10.0 - 6.5 = 3.5$.
2. Check: $3.5 + 6.5 = 10$ ✓

If wrong: Answered 16.5, or misaligned the decimal points.

6. $x + 18 = 45$, with check? APPLICATION

Answer: $x = 27$

1. $45 - 18 = 27$.
2. Check: $27 + 18 = 45$ ✓

If wrong: Answered 63 — added.

7. Saved \$34, needs \$80 total? REASONING

Answer: $34 + x = 80$; $x = \$46$

1. Let x be what she still needs.
2. Saved plus needed equals the goal: $34 + x = 80$.
3. $x = 80 - 34 = 46$. Check: $34 + 46 = 80$ ✓

If wrong: Wrote $80 + 34 = x$ (\$114) — added the goal to the savings. A part plus a part makes the whole, so subtract to find a missing part.

8. Nico: $x + 2 = 9$ gives $x = 11$? REASONING

Answer: **Wrong** — substituting gives $11 + 2 = 13$, not 9; the answer is $x = 7$

1. Check: $11 + 2 = 13$. That does not equal 9, so 11 is not a solution.
2. Nico ADDED 2 instead of subtracting it.
3. Correct: $9 - 2 = 7$. Check: $7 + 2 = 9$ ✓

If wrong: Spotted that it was wrong but could not say why. The check tells you an answer is wrong; naming the inverse-operation error tells you how to fix it.

9. $x + 0 = 17$, and what does it show? REASONING

Answer: **$x = 17$** — adding zero changes nothing

1. Subtract 0 from both sides: $17 - 0 = 17$.
2. Adding zero leaves a number exactly as it was, so x must already equal 17.
3. Check: $17 + 0 = 17$ ✓

If wrong: Answered 0, thinking the equation asks for the zero. Zero is what is ADDED, not the solution.

Quick answers for fast checking:

#	Level	Answer
1	fluency	$x = 7$
2	fluency	$x = 14$
3	fluency	$x = 0$
4	application	$x = \frac{1}{2}$
5	application	$x = 3.5$
6	application	$x = 27$
7	reasoning	$34 + x = 80$; \$46
8	reasoning	$x = 7$
9	reasoning	$x = 17$

Homework — answer key

Use: Parallels the practice sheet. Items 3 and 8 both have the solution $x = 0$, which students frequently reject.

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

1. $x + 6 = 15$? FLUENCYAnswer: $x = 9$ 1. $15 - 6 = 9$. Check: $9 + 6 = 15$ ✓**If wrong:** Answered 21 — added.**2. $x + 12 = 30$? FLUENCY**Answer: $x = 18$ 1. $30 - 12 = 18$. Check ✓**If wrong:** Answered 42 — added.**3. $x + 21 = 21$? FLUENCY**Answer: $x = 0$ 1. $21 - 21 = 0$. Check: $0 + 21 = 21$ ✓**If wrong:** Answered 21 or 'no solution.'**4. $x + \frac{1}{3} = \frac{5}{6}$? APPLICATION**Answer: $x = \frac{1}{2}$ 1. Common denominator: $\frac{1}{3} = \frac{2}{6}$.2. $\frac{5}{6} - \frac{2}{6} = \frac{3}{6} = \frac{1}{2}$.3. Check: $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$ ✓**If wrong:** Subtracted without a common denominator, or added the fractions.**5. $x + 3.75 = 9$? APPLICATION**Answer: $x = 5.25$ 1. Write 9 as 9.00, then $9.00 - 3.75 = 5.25$.2. Check: $5.25 + 3.75 = 9$ ✓**If wrong:** Answered 12.75, or misaligned the decimals.

6. $x + 25 = 60$, with check? APPLICATION

Answer: $x = 35$

1. $60 - 25 = 35$. Check: $35 + 25 = 60$ ✓

If wrong: Answered 85 — added.

7. 112 pages, 47 read? REASONING

Answer: $47 + x = 112$; $x = 65$ pages

- Let x be the pages still to read.
- Read plus remaining equals the total: $47 + x = 112$.
- $x = 112 - 47 = 65$. Check: $47 + 65 = 112$ ✓

If wrong: Wrote $112 + 47 = x$ (159) — added the whole to a part.

8. $x + 14 = 14$, why not 14? REASONING

Answer: $x = 0$ — because 14 is what gets ADDED, not the answer

- Subtract 14 from both sides: $14 - 14 = 0$.
- The equation says ‘something plus 14 gives 14’, and only 0 does that.
- Check: $0 + 14 = 14$ ✓ The 14 in the equation is the addend, not the solution.

If wrong: Answered 14 by copying the number from the equation. Solving means finding what x IS, not restating what is in the problem.

Quick answers for fast checking:

#	Level	Answer
1	fluency	$x = 9$
2	fluency	$x = 18$
3	fluency	$x = 0$
4	application	$x = \frac{1}{2}$
5	application	$x = 5.25$
6	application	$x = 35$
7	reasoning	$47 + x = 112$; 65
8	reasoning	$x = 0$

Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then launch into the practice sheet. Slide numbers match the deck.

Slide	~Time	Note
1/8	0:00	Frame the skill: isolate x by undoing what was done to it.
2/8	1:00	Hook — poll add vs subtract. Do NOT resolve. Repeating the equation's own operation is the dominant error.
3/8	3:00	Name both halves: inverse operation AND both sides. Balance language (a scale) helps if you have a visual.
4/8	5:00	WE1 — resolve the hook and show what the wrong route produces, then let the check reject it.
5/8	7:00	Make checking non-optional. Students who check catch their own inverse-operation slips without you.
6/8	9:00	CFU — all-student response. Answer $x = 25$. Watch for 55.
7/8	11:00	Zero as a solution. Students often distrust it and re-solve; name it as legitimate now.
8/8	13:00	Launch the in-class practice sheet.