

Grade 7 Math – Art of Problem Solving**4.1 Solving Equations Using Addition or Subtraction**

Work in class. Show reasoning, examples, or diagrams that support your conclusions.

REASON ABOUT SOLUTIONS

1. Same solution? Without solving each equation separately, decide which have the same solution as

$u + \frac{5}{6} = -\frac{1}{3}$. Explain each decision.

A. $u + \frac{11}{6} = \frac{2}{3}$

B. $u - \frac{1}{6} = -\frac{4}{3}$

C. $u + \frac{5}{6} = \frac{1}{3}$

D. $-\frac{1}{3} = u + \frac{5}{6}$

2. Recover the constants. Both $z + a = -\frac{7}{4}$ and $z - b = \frac{5}{2}$ have solution $z = -\frac{3}{2}$. Find a and b , which need not be positive. Check both equations.

3. A route with two changes. At the start, a research balloon has an unknown elevation. It rises 18.6 meters and then descends 27.4 meters, ending at -6.9 meters. Combine the changes to write one addition or subtraction equation. Find and check its starting elevation.

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DEEPEN THE REASONING

4. One check is enough? Two equations of the form $x + c = d$ both become true when $x = -6$. Must they be equivalent? Explain why this differs from two expressions that happen to match at one value.

5. A changing equation. In $x + c = -2$, the constant c increases by $\frac{3}{4}$. Describe how the solution changes without choosing a value for c . Prove your claim with an equation, then verify it with one numerical example.

6. Digit challenge. Use the digits 1, 4, and 7 exactly once in $x + \square = -\square.\square$. Make x as small as possible. Find x and explain why no other arrangement gives a smaller solution.
