Balance-Scale Algebra: Solving for Unknown Weights

Original tasks 1, 2, 3 / complete keys

Task 1

A level balance scale has two identical squares and a 7-gram block on the left, and a 25-gram block on the right. Find the weight of one square.

Answer: One square weighs 9 grams.

Reason: Let s be the weight of one square. The left side is 2s + 7 and the right side is 25, so 2s + 7 = 25. Subtract 7: 2s = 18. Divide by 2: s = 9. Check: two squares weigh 18 grams, plus 7 grams gives 25 grams.

Check: Substitute 9 into the left side: 2 times 9 plus 7 equals 25, which matches the right side.

Task 2

A level balance scale has five identical triangles on the left and a 35-gram block on the right. Find the weight of one triangle.

Answer: One triangle weighs 7 grams.

Reason: Let t be the weight of one triangle. The equation is 5t = 35. Divide both sides by 5: t = 7. Check: five triangles at 7 grams each weigh 35 grams, matching the right side.

Check: Multiply 5 by 7 and confirm the result is 35 grams.

Task 3

Scale one is level with one circle and one square on the left and a 20-gram block on the right. Scale two is level with two circles and one square on the left and a 28-gram block on the right. Find the weight of one circle and one square.

Answer: One circle weighs 8 grams and one square weighs 12 grams.

Reason: Let c be a circle's weight and s a square's weight. Scale one gives c + s = 20. Scale two gives 2c + s = 28. Subtracting the first equation from the second gives c = 8. Then 8 + s = 20, so s = 12. Check: 8 + 12 = 20 and 16 + 12 = 28.

Check: Substitute c = 8 and s = 12 into both scale equations and confirm each side equals the stated total.

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Original tasks 4 / complete keys

Task 4

A level balance scale has one circle and one square on the left and a 30-gram block on the right. No second scale is given. Describe all possible whole-number weights for the circle and square, and explain why one unique answer cannot be found.

Answer: The circle and square weights must be positive whole numbers that add to 30, such as 1 and 29, 10 and 20, or 15 and 15. A unique answer cannot be found because one equation with two unknowns has many solutions.

Reason: Let c be the circle's weight and s the square's weight. The only equation is c + s = 30. For each positive whole-number choice of c, s is 30 minus c. Without a second balanced scale or an extra condition relating c and s, many pairs satisfy the diagram.

Check: Pick any listed pair, add the two weights, and confirm the sum is 30 grams. Then confirm that a different pair also sums to 30, showing the answer is not unique.

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Source rubric / reflection

- [ ] Defines each variable clearly and states its unit.
- [ ] Writes an equation that correctly matches the balanced diagram.
- [ ] Shows solving steps in a logical order with correct arithmetic.
- [ ] Substitutes the answer back into the diagram description to check.
- [ ] For two-unknown problems, uses both scales or states the family of solutions when only one scale is given.
- [ ] Accepts equivalent correct forms such as fractions or decimals when the value is not a whole number.

Reflection: What did you check, what did you change, and what will you try next?