

Grade 7 Math – Art of Problem Solving

3.1 Algebraic Expressions

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

1. Equivalent or just similar?

Which expressions are equivalent to $2t + 7$? Justify each decision by simplifying.

- A. $5t + 4 - 3t + 3$ B. $7 + 2t$ C. $2t + 8$ D. $-t + 7 + 3t$

2. Recover the missing terms

An expression begins $5p - 3q + 8$. Add terms so that the complete expression simplifies to $2p + q + 5$. Use as few added terms as possible, with each added term a constant or a multiple of one variable. Explain why fewer terms cannot work.

3. Enough information?

A craft fair sells b bead kits and r ribbon kits. Its earnings, in dollars, are represented by $2.25b + 1.75b + 3.50r + 0.50r$. You know only that 23 kits were sold altogether. Is that enough information to find the earnings? Explain and find the total if possible.

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3.1 Algebraic Expressions | Continued

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

4. A convincing check?

Two expressions are $x^2 + 2x$ and $4x + 3$. They have the same value at $x = -1$ and at $x = 3$. Are they equivalent? Find a value that settles the question and explain what the two matching checks fail to establish.

5. Different rectangles, same perimeter

A rectangle has perimeter $(14t + 18)$ centimeters. Each side length has the form $at + b$, where a and b are positive whole numbers. Give two different length-and-width pairs. Verify both by adding all four side lengths. Assume $t > 0$.

6. Coefficient challenge

Use the numbers 1, 2, 3, and 4 exactly once in the four boxes.

$$\square x + \square x - \square x + \square$$

- Make the coefficient of x as large as possible, then as small as possible. Justify that each is an extreme.
- Compare your two simplified expressions at $x = 0$ and $x = 1$. Does the larger coefficient always give the larger value? Explain.