From Pattern Drawings to Equations: A Visual Algebra Worksheet

Original tasks 1, 2, 3 / complete keys

Task 1

A dot pattern shows term 1 with 3 dots, term 2 with 6 dots, and term 3 with 9 dots. Write the equation and predict the 8th term.

Answer: y = 3x; the 8th term has 24 dots.

Reason: The differences are 3 and 3, so the constant change is 3. Term 0 is 3 minus 3, which is 0. The equation is y = 3x + 0, or y = 3x. For term 8, 3 times 8 equals 24.

Check: Substitute term 2: 3 times 2 equals 6, which matches. Extend the table by 3: term 4 is 12, term 5 is 15, term 6 is 18, term 7 is 21, term 8 is 24.

Task 2

A dot pattern shows term 1 with 7 dots, term 2 with 10 dots, and term 3 with 13 dots. Write the equation and predict the 12th term.

Answer: y = 3x + 4; the 12th term has 40 dots.

Reason: The constant change is 3. Term 0 is 7 minus 3, which is 4. The equation is y = 3x + 4. For term 12, 3 times 12 plus 4 equals 36 plus 4, which is 40.

Check: Substitute term 3: 3 times 3 plus 4 equals 13, which matches. Extend the table by 3 from term 3 to term 12 and confirm the count reaches 40.

Task 3

A dot pattern shows term 1 with 2 dots, term 2 with 5 dots, and term 3 with 8 dots. Write the equation and predict the 15th term.

Answer: y = 3x - 1; the 15th term has 44 dots.

Reason: The constant change is 3. Term 0 is 2 minus 3, which is -1. The equation is y = 3x - 1. For term 15, 3 times 15 minus 1 equals 45 minus 1, which is 44.

Check: Substitute term 1: 3 times 1 minus 1 equals 2, which matches. Substitute term 2: 3 times 2 minus 1 equals 5, which matches. Extend the table by 3 to term 15.

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Original tasks 4 / complete keys

Task 4

A dot pattern shows term 1 with 6 dots, term 2 with 11 dots, and term 3 with 16 dots. Write the equation and predict the 9th term.

Answer: y = 5x + 1; the 9th term has 46 dots.

Reason: The constant change is 5 because 11 minus 6 equals 5 and 16 minus 11 equals 5. Term 0 is 6 minus 5, which is 1. The equation is y = 5x + 1. For term 9, 5 times 9 plus 1 equals 45 plus 1, which is 46.

Check: Substitute term 2: 5 times 2 plus 1 equals 11, which matches. Extend the table by 5: term 4 is 21, term 5 is 26, term 6 is 31, term 7 is 36, term 8 is 41, term 9 is 46.

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Source rubric / reflection

- [ ] Correctly identifies the constant change from the table or drawing.
- [ ] Correctly finds the term 0 value by working backward.
- [ ] Writes an equation in the form y = mx + b or an equivalent form.
- [ ] Tests the equation with at least one known stage.
- [ ] Predicts a later term using the equation and states the unit.
- [ ] Accepts valid alternative equation forms that produce the same counts.
- [ ] Uses the stated dot-counting convention consistently.

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