Grade 8 Mathematics: Algebra and Coding

Free sample lesson

Ontario curriculum: Mathematics (2020), Strand C: Algebra. 18 days.

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This is Lesson 1 of 12 from the full unit, exactly as it appears in the Teacher Guide, followed by the student worksheet. The full unit is at unitplans.ca.

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Lesson 1: Repeating, growing and shrinking patterns

1 day · about 60 minutes · C1.1

> **Learning goal**
>
> - We are learning to sort patterns and to compare linear patterns by their constant rate and initial value.

> **Success criteria**
>
> - I can tell whether a pattern repeats, grows or shrinks.
> - I can find the constant rate and initial value of a linear pattern and explain what they mean.

Materials

- Chart paper
- Graph paper
- Cards with patterns from daily life

Minds On (10 min)

1. Show three patterns: traffic lights (red, green, yellow, red, …), a gym that costs $25 to join plus $12 a month (37, 49, 61, …), and a phone battery that drops 8% an hour (100, 92, 84, …).
2. Pairs sort them and name what makes each kind different. Collect words: repeats, core, grows, shrinks, same amount each time.

Action (35 min)

1. Define repeating (a core repeats), growing and shrinking patterns. A linear pattern changes by the same amount each term.
2. Introduce constant rate (change per term) and initial value (the value at term 0). Work backwards one term to find the initial value: $37 - 12 = 25$.
3. Compare Gym A ($25 + $12 a month) with Gym B ($15 a month, no fee) in a table and on one graph. Which line is steeper? Which starts higher?
4. Students complete the worksheet in pairs.

Consolidation (15 min)

1. Discuss question 3: when does the steeper line catch up, and why?

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2. Exit: "Describe a pattern from your life. Is it repeating, growing or shrinking? If it is linear, what are its constant rate and initial value?"

Questions to ask

- What stays the same from term to term?
- What would the value be one step before the first term?
- How does the constant rate show up on the graph?

Watch for

- Thinking the first term is the initial value (the initial value is at term 0).
- Calling every growing pattern linear (2, 4, 8, 16 grows but not by the same amount).

Differentiation

Support	Extend
Give a table with a term 0 column already drawn in.	Write two linear patterns with the same constant rate but different initial values. What do their graphs look like?

Answer key: Kinds of patterns

1. Is each pattern repeating, growing or shrinking? a) 4, 9, 14, 19, … b) ▲ ● ● ▲ ● ● … c) 80, 72, 64, 56, … d) 2, 4, 8, 16, …

   > **Answer:** a) growing (adds 5) b) repeating (core ▲ ● ●) c) shrinking (subtracts 8) d) growing but not linear (doubles each time)

2. A gym charges $25 to join plus $12 per month. What is the initial value and the constant rate? What is the total cost after 8 months?

   > **Answer:** Initial value $25, constant rate $12 per month. After 8 months: $121.00

3. Gym A costs $25 to join plus $12 per month. Gym B costs $15 per month with no fee. Which has the greater constant rate? Which has the greater initial value? From which month does Gym B cost more in total?

   > **Answer:** Gym B has the greater rate ($15 vs $12). Gym A has the greater initial value ($25 vs $0). Gym B costs more from month 9 ($135.00 vs $133.00).

4. A phone battery is at 100% and drops 8% every hour. Is this pattern growing or shrinking? What is the constant rate? After how many hours is it at 20%?

   > **Answer:** Shrinking, constant rate −8% per hour. After 10 hours.

5. Pattern P is 3, 7, 11, 15, … and pattern Q is 10, 12, 14, 16, … (term 1, 2, 3, 4). Which has the greater constant rate? Which has the greater initial value (term 0)?

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> **Answer:** P has the greater rate (4 vs 2). Q has the greater initial value (8 vs −1).

6. How is the graph of a linear growing pattern different from the graph of a linear shrinking pattern?

> **Answer:** A growing pattern's points go up to the right; a shrinking pattern's points go down to the right. Both lie on a straight line.

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Student worksheet: Kinds of patterns

Success criteria

- I can tell whether a pattern repeats, grows or shrinks.
- I can find the constant rate and initial value of a linear pattern and explain what they mean.

Show the change from term to term.

1. Is each pattern repeating, growing or shrinking? a) 4, 9, 14, 19, … b) ▲ ● ● ▲ ● ● … c) 80, 72, 64, 56, … d) 2, 4, 8, 16, …

2. A gym charges $25 to join plus $12 per month. What is the initial value and the constant rate? What is the total cost after 8 months?

3. Gym A costs $25 to join plus $12 per month. Gym B costs $15 per month with no fee. Which has the greater constant rate? Which has the greater initial value? From which month does Gym B cost more in total?

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