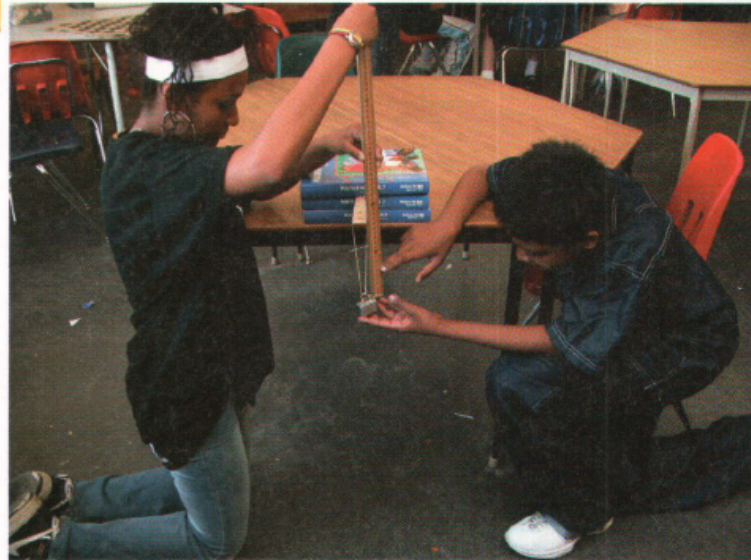


# Patterns and Trends with Integers

When you hang a mass from an elastic band, it will bounce up and down a few times before becoming still. The amount the elastic band stretches depends on the mass and on the thickness of the elastic.



## How can you relate integers to patterns?

1. Place a ruler between the top two books in a stack of three books on top of a desk.
2. Hang an elastic band and a paper clip from the ruler.
3. Hook the smallest mass to the paper clip.
4. When the mass stops moving, measure its distance from the top surface of the desk, to the nearest millimetre.
5. Record your results in a table with the headings shown. If the mass reaches below the top surface of the table, record the distance as a negative number.

Mass (g)	Distance From the Desk Surface (mm)

6. Repeat steps 4 and 5 for the remaining masses.
7. Plot a graph of the results with mass on the horizontal axis and distance on the vertical axis.
8. **Reflect** Describe the pattern or trend of distances that you recorded.

Mass (g)	Distance From the Desk Surface (mm)
50	80.8
100	79.6
200	78.3
500	64.0

$\downarrow$  -1.2  
 $\downarrow$  -1.3  
 $\downarrow$  -14.3

### Example 1: Continue a Pattern

Describe each pattern. Then, find the next four numbers in each pattern. Finally, determine which integers, other than 1 and -1, are factors of all the numbers in each pattern.

a) 4, 2, 0, -2, -4, ...

b) -6, -12, -18, -24, ...

subtract 2  
 No. Zero has no  
 factors

subtract 6  
 6 and -6  
 3 and -3  
 2 and -2

**Example 2: Calculate Profit or Loss**

When George started a business clearing snow, he borrowed \$300 from his parents. He charges \$10 per driveway.

- a) Calculate George's profit or loss from his business after clearing three driveways.
- b) Describe the pattern.
- c) George bought a snowblower with the \$300. Will he make a profit after clearing 50 driveways?

# Drives	Money
0	-\$300
1	-\$290
2	-\$280
3	-\$270

50 driveways  
 =  $50 \times \$10$   
 = \$500 revenue

Costs \$300 (that he borrowed)

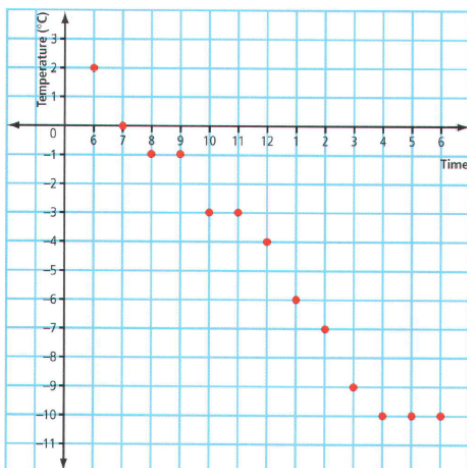
Profit = Revenue - Costs  
 =  $500 - 300$   
 = \$200

**Example 3: Temperature Readings**

The table shows the temperature readings from 6:00 P.M. to 6:00 A.M.

- a) Plot the data on a coordinate grid. Place time on the horizontal axis and temperature on the vertical axis.
- b) Describe the trend in temperature.
- c) What is the mean decrease in temperature per hour?
- d) Predict the temperature at 9 A.M.

Time	Temperature (°C)
6 P.M.	2
7 P.M.	0
8 P.M.	-1
9 P.M.	-1
10 P.M.	-3
11 P.M.	-3
midnight	-4
1 A.M.	-6
2 A.M.	-7
3 A.M.	-9
4 A.M.	-10
5 A.M.	-10
6 A.M.	-10



Decreasing  
 $= \frac{-62}{13}$   
 $= -4 \frac{10}{13}^\circ$

Not as straight forward as adding on the "mean" 3 times

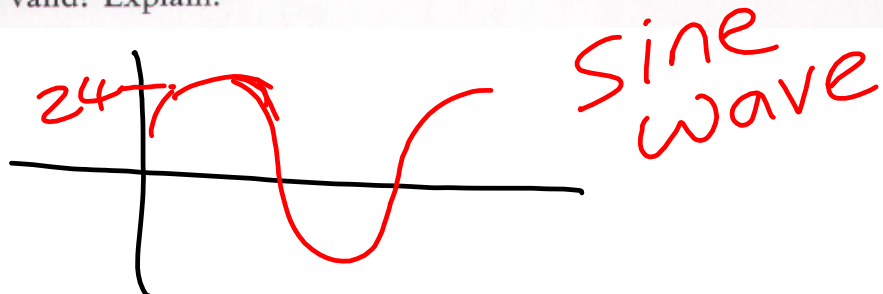
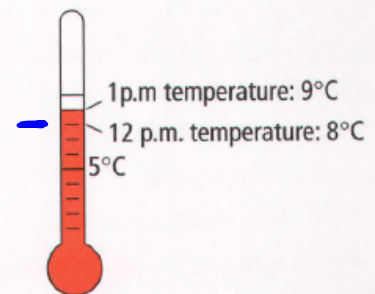
2. You owe \$200. You plan to pay off \$20 a month.
- How long will it take to pay off the debt?
  - Describe the pattern you used to answer this question. Explain why you used this pattern.

200, 180, 160, ...

# months	Money owed
0	200
1	180
2	160
⋮	⋮

3. At 12 noon, the temperature was  $8^{\circ}\text{C}$ . The temperature rose an average of  $1^{\circ}\text{C}$  per hour between 12 noon and 6 P.M.  $\rightarrow 14^{\circ}\text{C}$  at 6 pm

- Predict the temperature at 9 P.M. Explain your prediction.
- Jaap predicts that the temperature at 9 P.M. will be  $11^{\circ}\text{C}$ . Explain how he might have made this prediction.
- Is Jaap's answer valid? Explain.



## Key Ideas

- When working with patterns, identify the rules for the pattern.
  - Look for repeated sets of operations.
  - Identify what operation is used.

For example, Sylvia owes \$100. She pays back \$5 per week. How long will it take her to pay the debt?

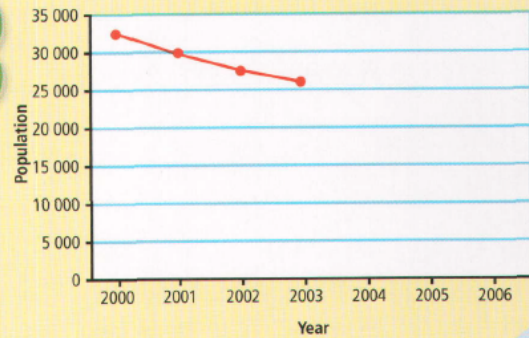
The pattern starts with  $-\$100$ . Add \$5 each week. It will take 20 weeks to pay off the debt?

$$5 \times 20 = 100$$



- To solve patterns with integers, look for patterns and trends.

The population is dropping. In 2006, the population will likely be about 20 000.



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