

CHAPTER 6 / 6A

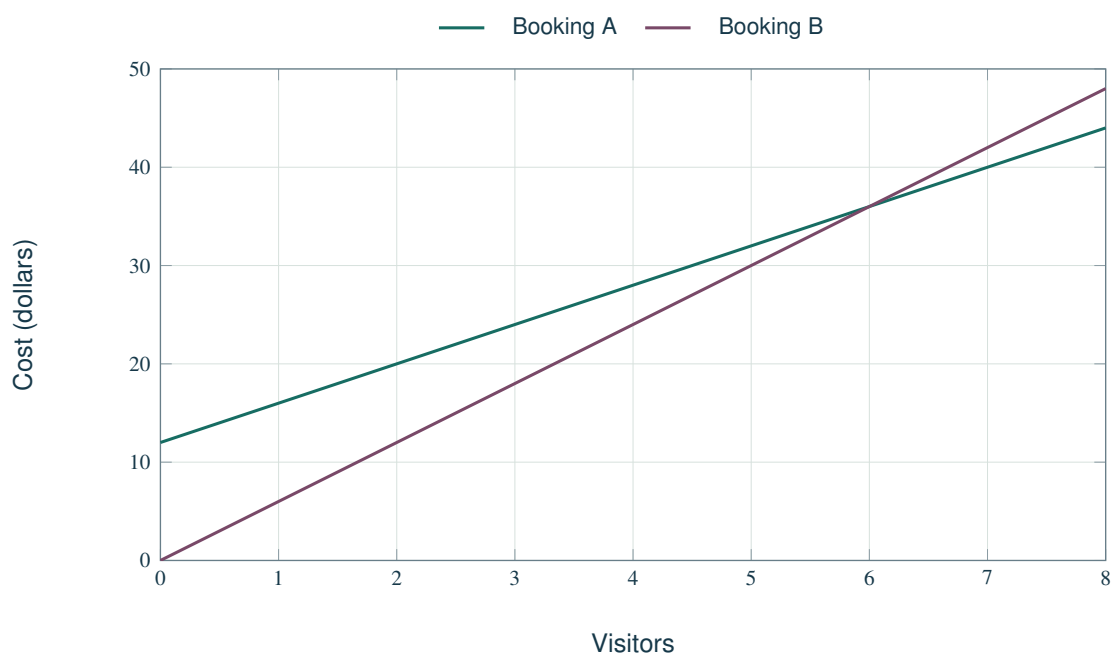
Interpreting straight-line graphs

Name: _____ Class: _____ Date: _____

Use graphs to make decisions. Read both axes carefully, distinguish starting values from changes, and decide when a straight-line forecast is reasonable.

What you will learn

- Read values and intercepts using the displayed scale.
- Compare two straight-line relationships in context.
- Use interpolation and cautious extrapolation to make decisions.

See the mathematics

Learning map: compare starting values, readings at one input, and where two lines meet.

Key ideas

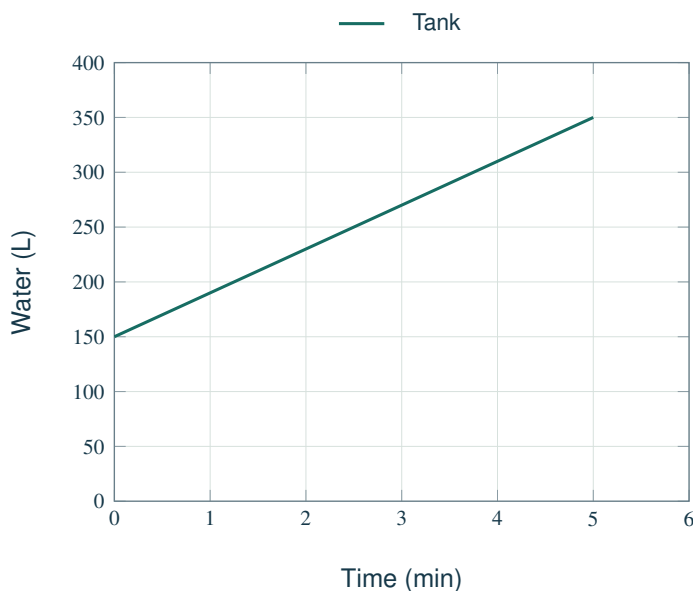
- The horizontal and vertical axes represent different quantities and units.
- An intercept records a value when the other variable is zero.
- A straight line represents a constant change over equal input intervals.
- Interpolation uses the recorded interval; extrapolation extends a trend beyond it.

Pages 1–8: student resource. Pages 9–10: worked answers.

Worked examples / connect the calculation to the graph

1. A stored-water forecast

A tank graph passes through $(0, 150)$ and $(5, 350)$, where time is in minutes and water is in litres. Find the volume at 3 minutes.



1. The volume increases by $350 - 150 = 200$ L in 5 min, or 40 L each minute.
2. At 3 min, the tank holds its initial 150 L plus 3×40 L.

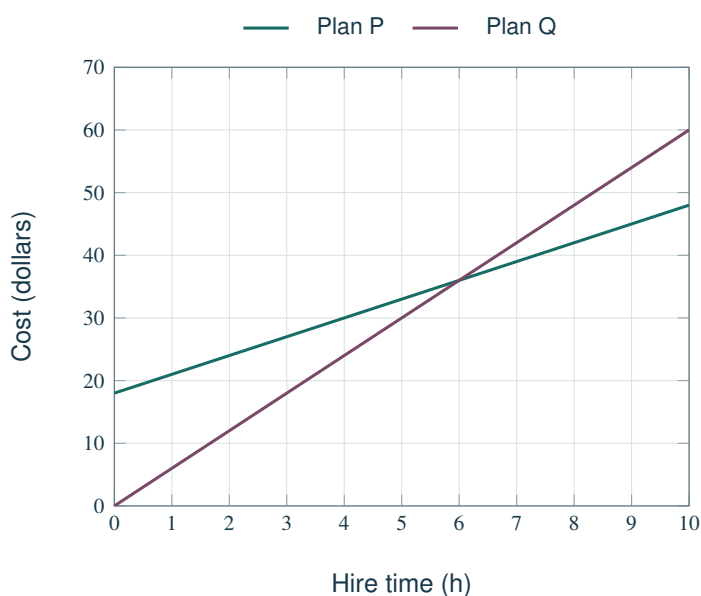
Result

270 L.

Worked example: read the volume within the measured filling interval.

2. Two hire plans

Plan P costs $C = 18 + 3h$. Plan Q costs $C = 6h$. Find when the costs are equal and the cheaper plan for 8 hours.



1. Set $18 + 3h = 6h$, giving $h = 6$.
2. At $h = 8$, P costs \$42 and Q costs \$48.

Result

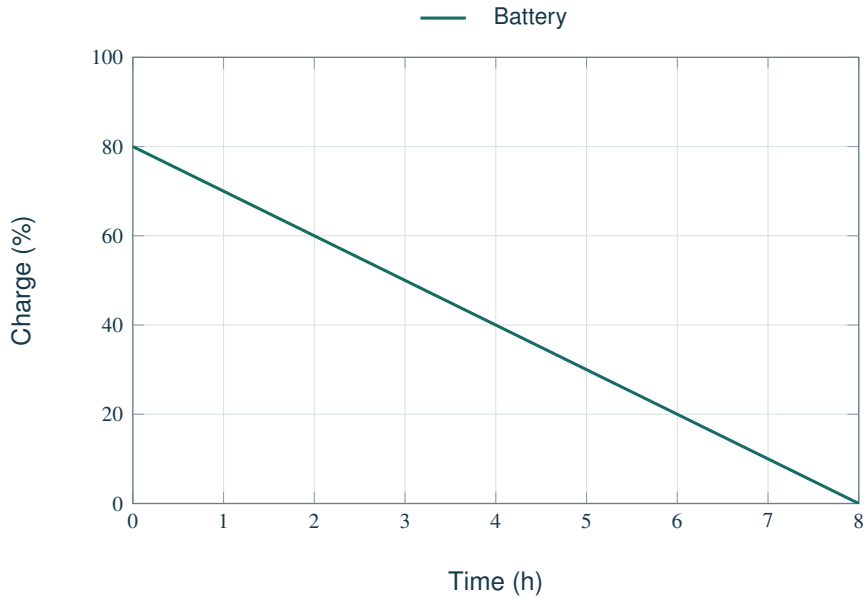
Equal at 6 hours; P is cheaper for 8 hours.

Worked example: compare costs at the same hire time.

Read the graph

Use the graph to record your thinking. Show calculations and include units where needed.

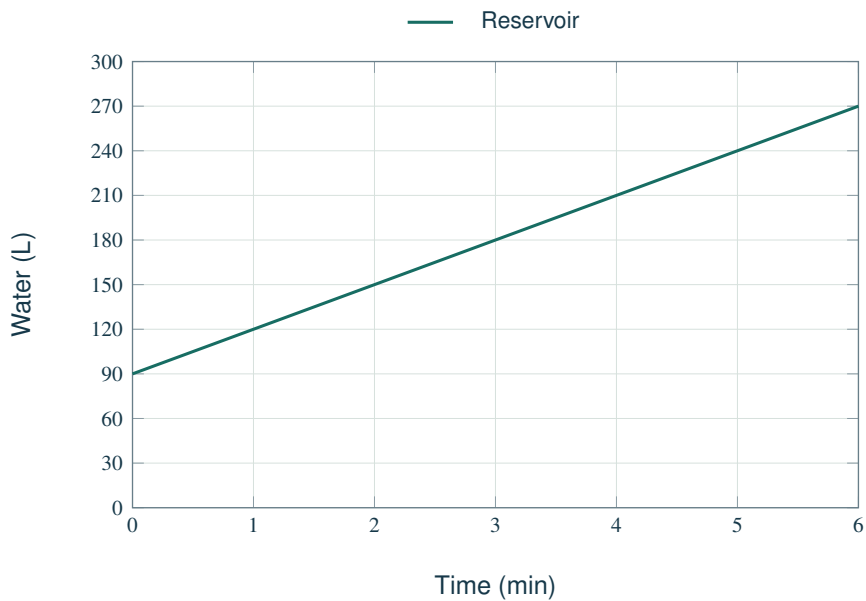
1. The graph shows a battery’s charge. Read its starting charge, its charge after 4 hours, and the first time it reaches 20%.



WORKING / DECISION

Read the quantities, scales and labelled line before answering.

2. A reservoir graph passes through (0, 90), (2, 150) and (6, 270), with time in minutes and volume in litres. What does (0, 90) mean? How much water is present at 4 minutes?



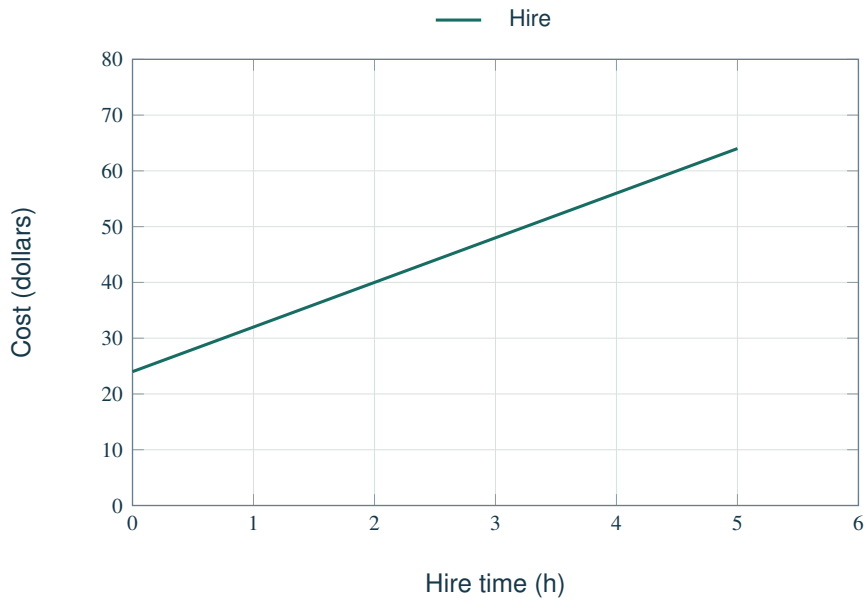
WORKING / DECISION

Read the initial water and the volume at the requested time.

Read the graph

Use the graph to record your thinking. Show calculations and include units where needed.

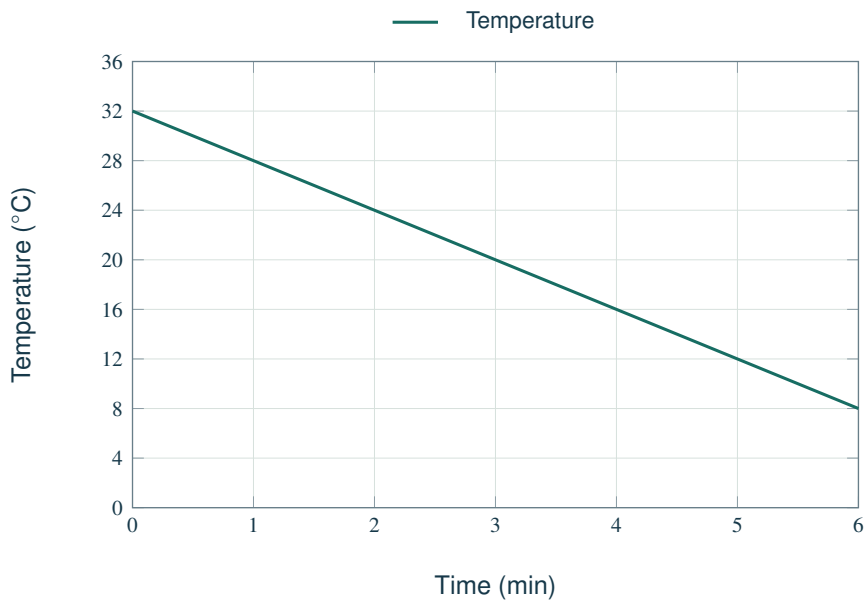
3. An equipment-hire graph has points $(0, 24)$, $(2, 40)$ and $(5, 64)$, where x is hours and y is dollars. Find the booking fee and the charge for 3 hours.



WORKING / DECISION

Use the cost graph to distinguish the booking charge from the time charge.

4. A machine's temperature graph falls from $(0, 32)$ to $(6, 8)$, with time in minutes. Read the time when it is 20°C . Explain what the falling line tells you.



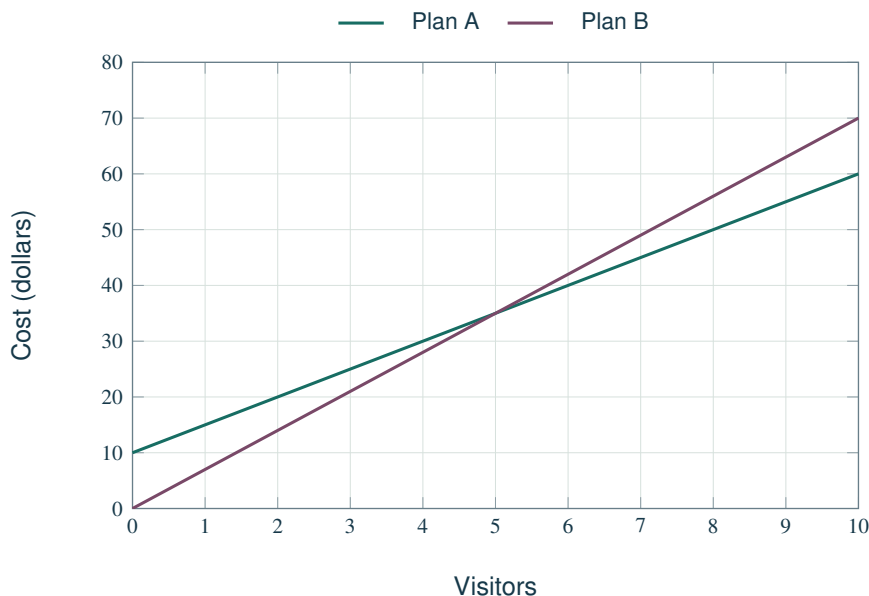
WORKING / DECISION

Read the quantities, scales and labelled line before answering.

Compare and interpret

Use the graph to record your thinking. Show calculations and include units where needed.

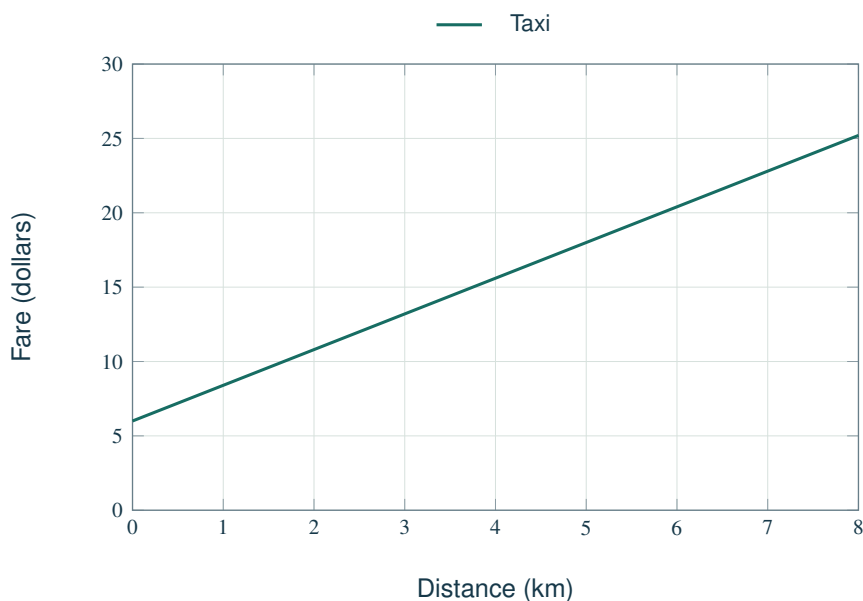
5. Two admission plans are $C = 10 + 5n$ and $C = 7n$, where n is visitors. Find the equal-price group size and choose the cheaper plan for 9 visitors.



WORKING / DECISION

Compare both booking plans at the same group size.

6. A taxi fare is $F = 6 + 2.4d$ dollars for d kilometres. A passenger says the point $(0, 6)$ means 6 km are free. Correct the statement and find the fare for 5 km.



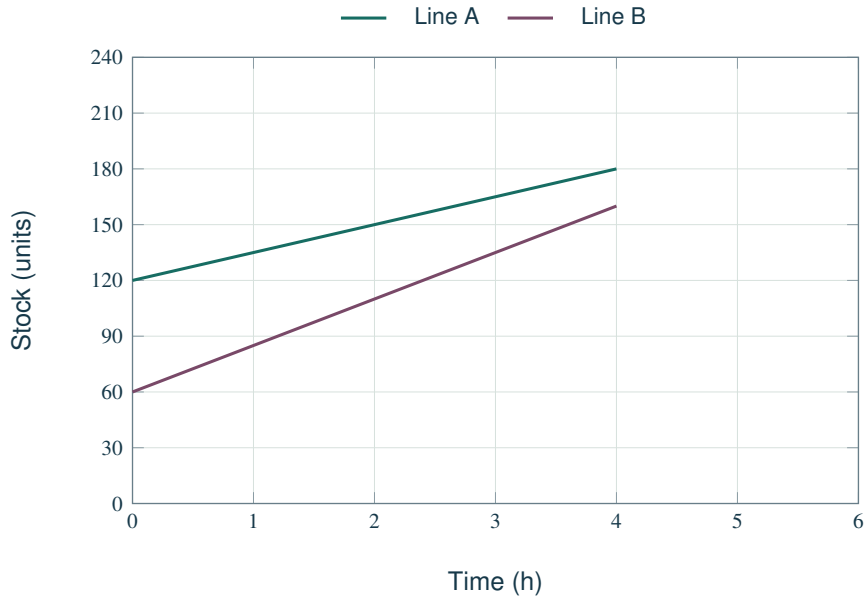
WORKING / DECISION

Interpret where the fare graph meets the vertical axis.

Compare and interpret

Use the graph to record your thinking. Show calculations and include units where needed.

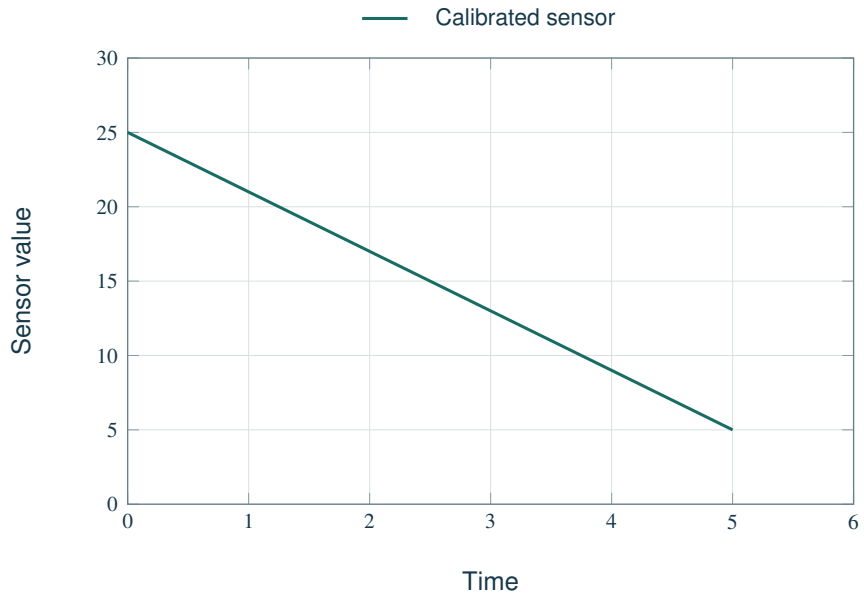
7. Line A records inventory at (0, 120) and (4, 180). Line B records (0, 60) and (4, 160). Which line has more stock at 4 hours, and which grows faster?



WORKING / DECISION

Compare starting stock, later stock and changes over the same interval.

8. A calibrated sensor follows the straight line through (0, 25) and (5, 5). Its log reports A: (1, 21), B: (3, 15), C: (4, 9). Identify and correct the faulty record.



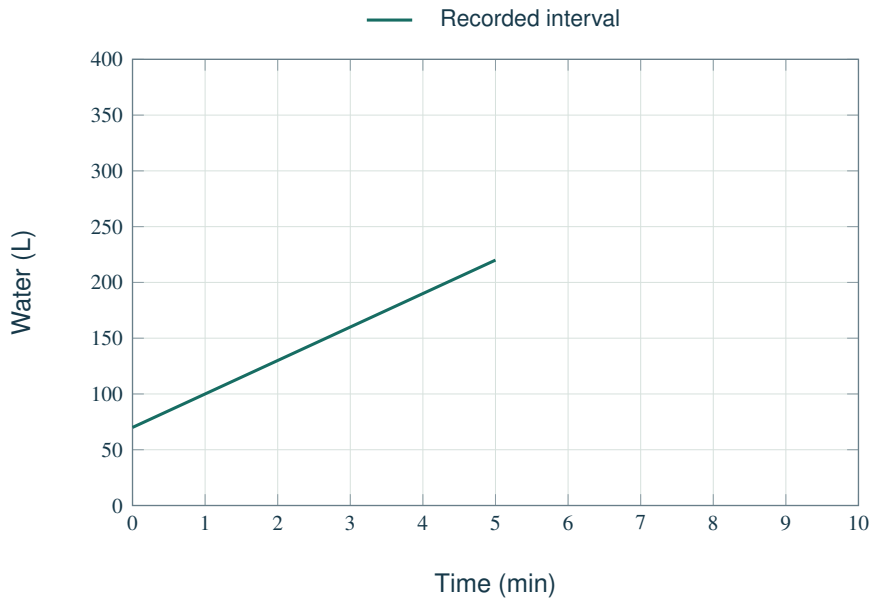
WORKING / DECISION

Compare the three records in the question with the calibrated line.

Forecast and decide

Use the graph to record your thinking. Show calculations and include units where needed.

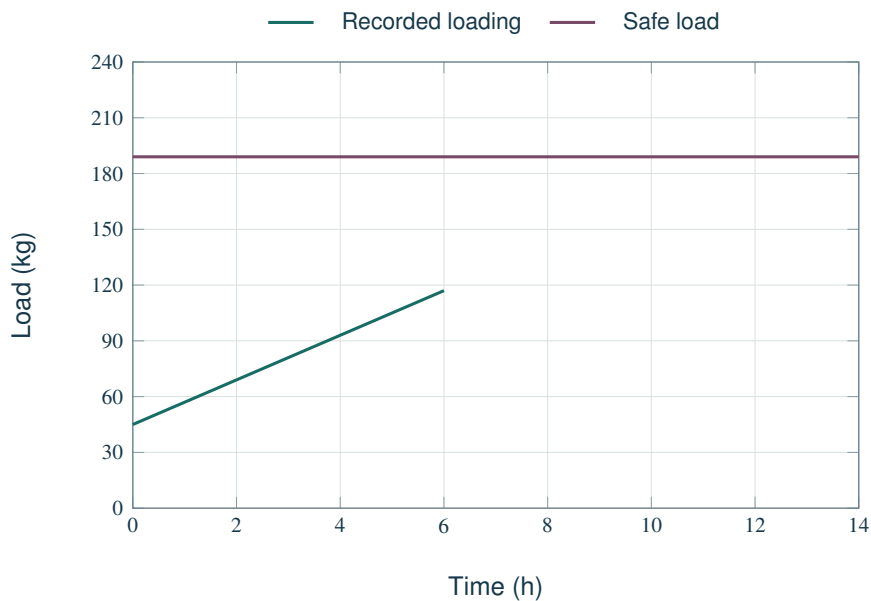
9. A pump's recorded graph runs from (0, 70) to (5, 220), with minutes and litres. Forecast the volume at 9 minutes. Is this interpolation or extrapolation?



WORKING / DECISION

Continue the recorded trend yourself to make the requested forecast.

10. A storage bin contains 45 kg initially and gains 12 kg each hour. Its maximum safe load is 189 kg. Find the shutoff time and name one condition your forecast assumes.



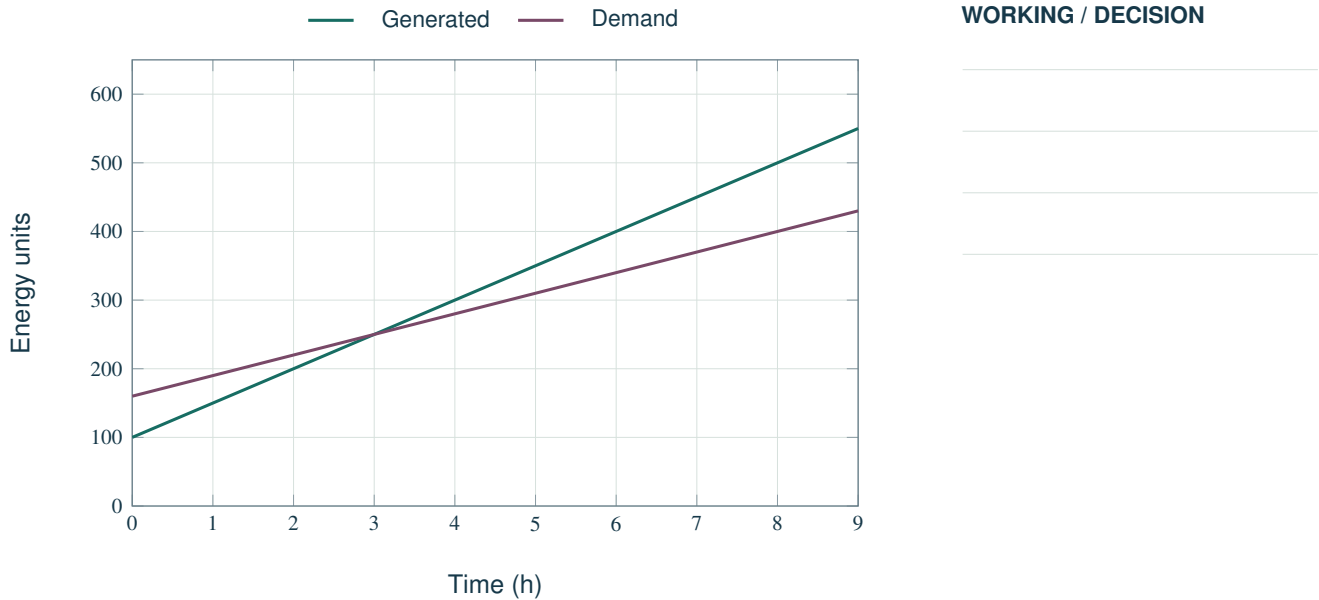
WORKING / DECISION

The safe-load line is supplied; determine where your continued loading plan reaches it.

Forecast and decide

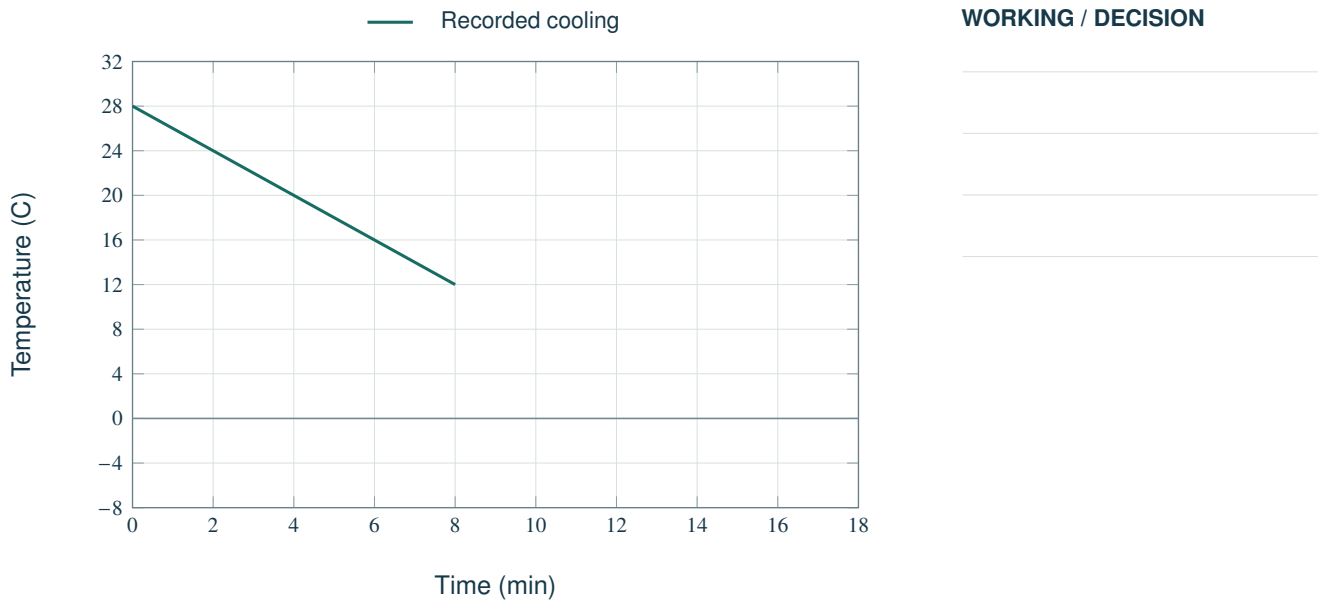
Use the graph to record your thinking. Show calculations and include units where needed.

11. Generated energy is $G = 50t + 100$ and demand is $D = 30t + 160$, in the same units. Find when they balance and the earliest whole hour with a reserve of at least 80 units.



Read both lines at one time to compare the amount generated with the amount required.

12. A cooling line fits $T = 28 - 2t$ from $t = 0$ to $t = 8$ min. Find T at 6 min and predict T at 16 min. Give a reason the later prediction may not describe the real machine.



Only the recorded interval is drawn. Add your own later prediction and discuss its limits.

6A / Worked answers

Teacher appendix. Equivalent exact forms are accepted. Use the reasoning to check student work.

1. 80%; 40%; 6 hours.

- The line starts at $(0, 80)$.
 - At $x = 4$ the vertical value is 40; the $y = 20$ level meets the line at $x = 6$.
-

2. Initially 90 L; 210 L at 4 min.

- The reservoir already contains 90 L when the clock starts.
 - Volume grows by 30 L/min, so $90 + 4 \times 30 = 210$.
-

3. \$24 booking fee; \$48 for 3 hours.

- At zero hours the cost is \$24.
 - The line rises \$8 per hour; $24 + 3 \times 8 = 48$.
-

4. 3 minutes; the machine cools as time increases.

- The temperature decreases by 4°C each minute.
 - A drop from 32°C to 20°C is 12°C , requiring $\frac{12}{4} = 3$ min.
-

5. Equal at 5 visitors; the first plan is cheaper at \$55.

- $10 + 5n = 7n$ gives $n = 5$.
 - At $n = 9$ the costs are \$55 and \$63.
-

6. It means a \$6 starting charge; the 5 km fare is \$18.

- When $d = 0$, the fare is already \$6.
 - $F = 6 + 2.4 \times 5 = 18$.
-

6A / Worked answers

Teacher appendix. Equivalent exact forms are accepted. Use the reasoning to check student work.

7. A has more stock; B grows faster.

- At 4 h, A has 180 and B has 160.
 - A gains 15 units/h while B gains 25 units/h.
-

8. B is faulty; it should be (3, 13).

- The value falls by 4 each time unit.
 - At $x = 3$, $y = 25 - 4 \times 3 = 13$; the other records fit.
-

9. 340 L; extrapolation.

- Rate = $(220 - 70)/5 = 30$ L/min.
 - Volume at 9 min is $70 + 30 \times 9 = 340$ L, outside the recorded interval.
-

10. 12 hours; the loading rate must remain 12 kg/h.

- The bin can gain $189 - 45 = 144$ kg.
 - $\frac{144}{12} = 12$ h.
-

11. Balance at 3 h; reserve target first met at 7 h.

- $50t + 100 = 30t + 160$ gives $t = 3$.
 - Reserve = $G - D = 20t - 60$; $20t - 60 \geq 80$ gives $t \geq 7$.
-

12. 16°C; predicted -4°C; cooling may slow or stop near room temperature.

- At 6 min, $T = 28 - 12 = 16$.
 - At 16 min, $T = 28 - 32 = -4$; this extrapolates beyond observed data.
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