Qualitative Graphs Worksheet: Sketching Rise, Fall, and Plateau Stories

Complete worked example / separate answer key

A student fills a water bottle. First, the bottle is empty. Then it fills quickly for a short time. Then the student pauses and the water level stays the same. Then it fills slowly to the top. Sketch a qualitative graph and write one sentence for each segment.

Answer: Axes: horizontal axis labeled 'time,' vertical axis labeled 'water level.' Start at the lowest shown level (empty). Segment 1: steep rise from start to point A, meaning the water level rises quickly as the bottle fills. Segment 2: flat plateau from A to B, meaning the water level stays the same during the pause. Segment 3: gentle rise from B to C, meaning the water level rises slowly to the top. Sentences: 'From start to A, the water level rises quickly because the bottle is being filled.' 'From A to B, the water level stays the same because the student pauses.' 'From B to C, the water level rises slowly until the bottle is full.'

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Original tasks 1, 2 / complete keys

Task 1

A bathtub is empty. The tap is turned on and the water level rises steadily. After a few minutes, the tap is turned off and the water level stays the same. Then the drain is opened and the water level falls until the tub is empty. Sketch a qualitative graph with time on the horizontal axis and water level on the vertical axis. Write one sentence for each segment.

Answer: Graph shows: rise from the lowest level to a high plateau, then a flat segment, then a fall back to the lowest level. Sentences: 'The water level rises steadily while the tap is on.' 'The water level stays the same while the tap is off.' 'The water level falls until the tub is empty when the drain is opened.'

Reason: The story has three events in order: filling (rise), waiting (plateau), draining (fall). The tub starts empty and ends empty, so the graph starts and ends at the lowest shown level. Steady filling and draining can be drawn as straight segments or smooth curves.

Check: Check that the graph has exactly three segments in the order rise, flat, fall; that the first and last vertical levels are the lowest shown; and that each sentence names water level and the cause.

Task 2

A candle is lit. Its height stays the same for a short time, then it burns down quickly, then it burns down more slowly. Sketch a qualitative graph with time on the horizontal axis and candle height on the vertical axis. Write one sentence for each segment.

Answer: Graph shows: a short flat plateau at the starting height, then a steep fall, then a gentler fall. Sentences: 'The candle height stays the same at first after it is lit.' 'The candle height falls quickly as it burns.' 'The candle height falls more slowly later.'

Reason: The story gives a plateau, then a fast fall, then a slow fall. The steepness comparison is qualitative: the second segment is steeper than the third. No exact heights are needed.

Check: Check that the first segment is flat, the second falls more steeply than the third, and each sentence compares or describes the behavior using candle height.

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Original tasks 3, 4 / complete keys

Task 3

A person walks away from home at a steady pace, stops to rest, then walks back home faster than before. Sketch a qualitative graph with time on the horizontal axis and distance from home on the vertical axis. Write one sentence for each segment.

Answer: Graph shows: a steady rise, a flat plateau, then a steeper fall back to the starting level. Sentences: 'The distance from home increases steadily as the person walks away.' 'The distance stays the same while the person rests.' 'The distance decreases quickly as the person walks back home faster.'

Reason: Walking away increases distance; resting keeps distance constant; walking back decreases distance. Returning home means the final distance equals the starting distance, often zero if the axis starts at zero. Walking back faster means the fall is steeper than the rise.

Check: Check that the graph rises, flattens, then falls to the starting level; that the fall is steeper than the rise; and that sentences mention distance from home and the events.

Task 4

A balloon is inflated quickly, then air is let out slowly, then it is inflated again more slowly than the first time. Sketch a qualitative graph with time on the horizontal axis and balloon size on the vertical axis. Write one sentence for each segment.

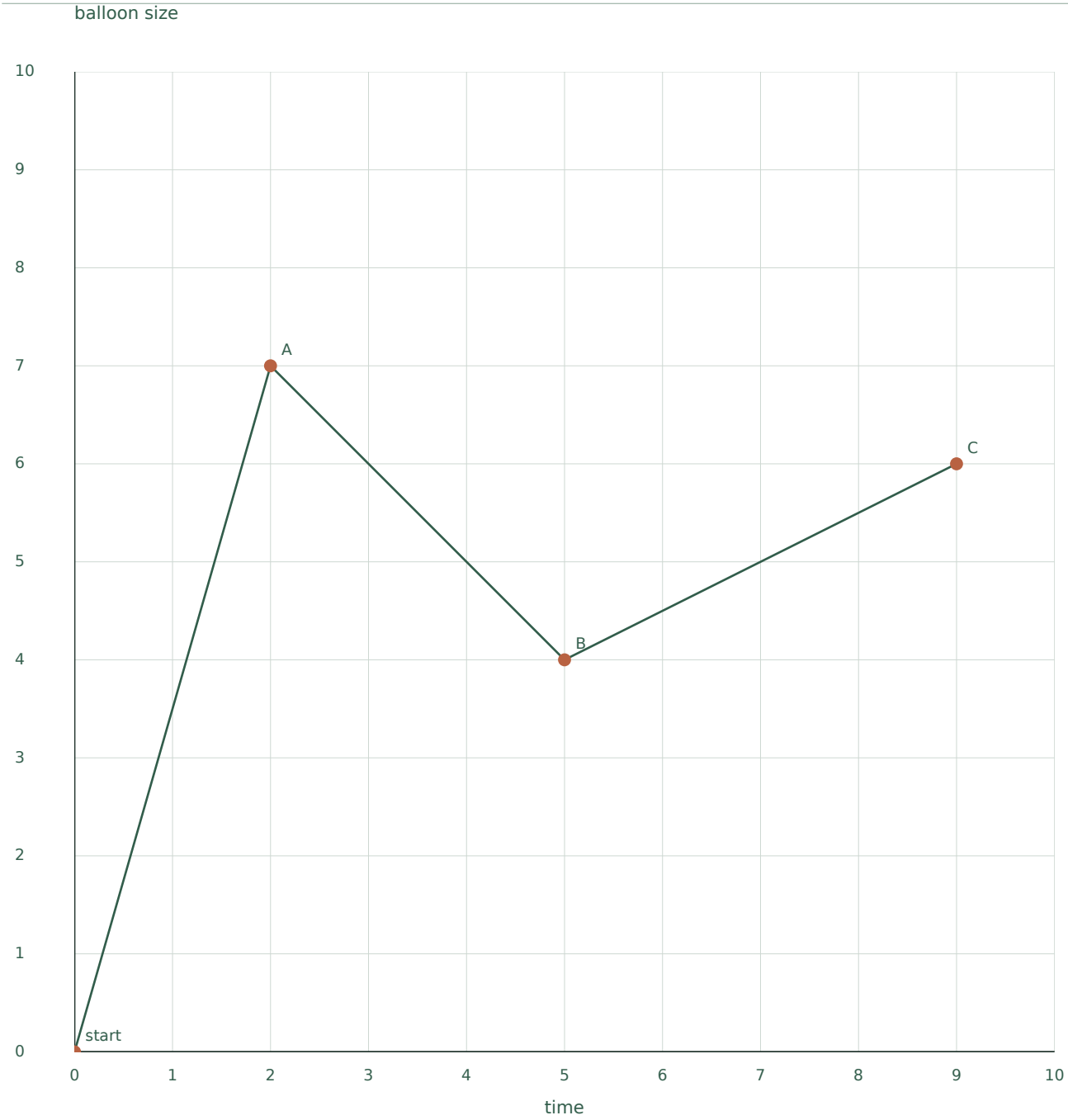
Answer: Graph shows: a steep rise, then a gentle fall, then a gentler rise than the first. Sentences: 'The balloon size increases quickly during the first inflation.' 'The balloon size decreases slowly as air is let out.' 'The balloon size increases more slowly during the second inflation.'

Reason: The story has three events: fast inflation (steep rise), slow deflation (gentle fall), slow inflation (gentle rise). The second rise is less steep than the first rise. The graph does not need to return to the starting level because the story does not say the balloon is fully deflated.

Check: Check that the first rise is steeper than the third rise, the middle segment falls gently, and each sentence names balloon size and the event.

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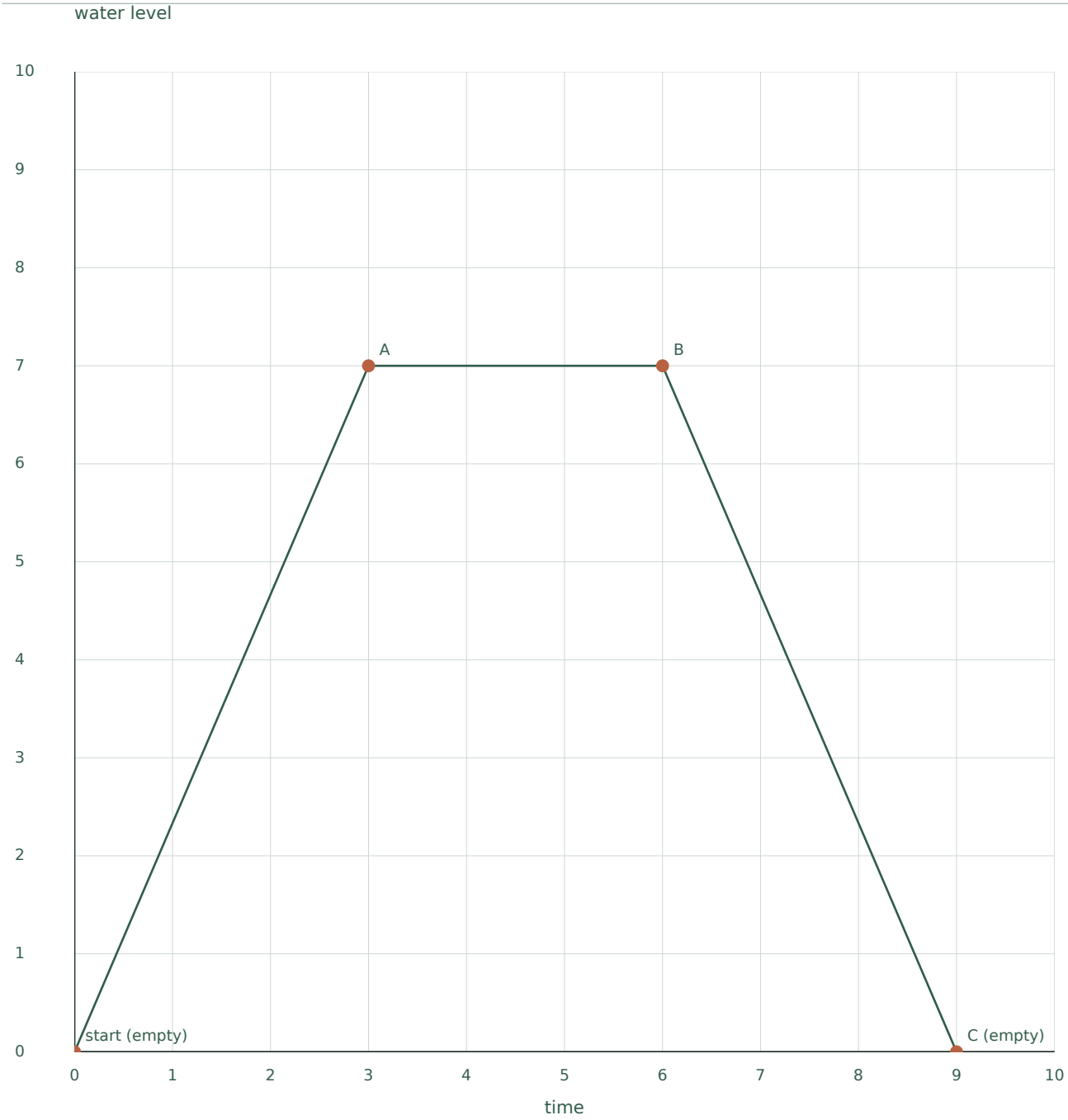
Task 4 / Model: Balloon Fast Inflate, Slow Deflate, Slow Inflate



Model sketch. Sentences: 'The balloon size increases quickly during the first inflation.' 'The balloon size decreases slowly as air is let out.' 'The balloon size increases more slowly during the second inflation.'

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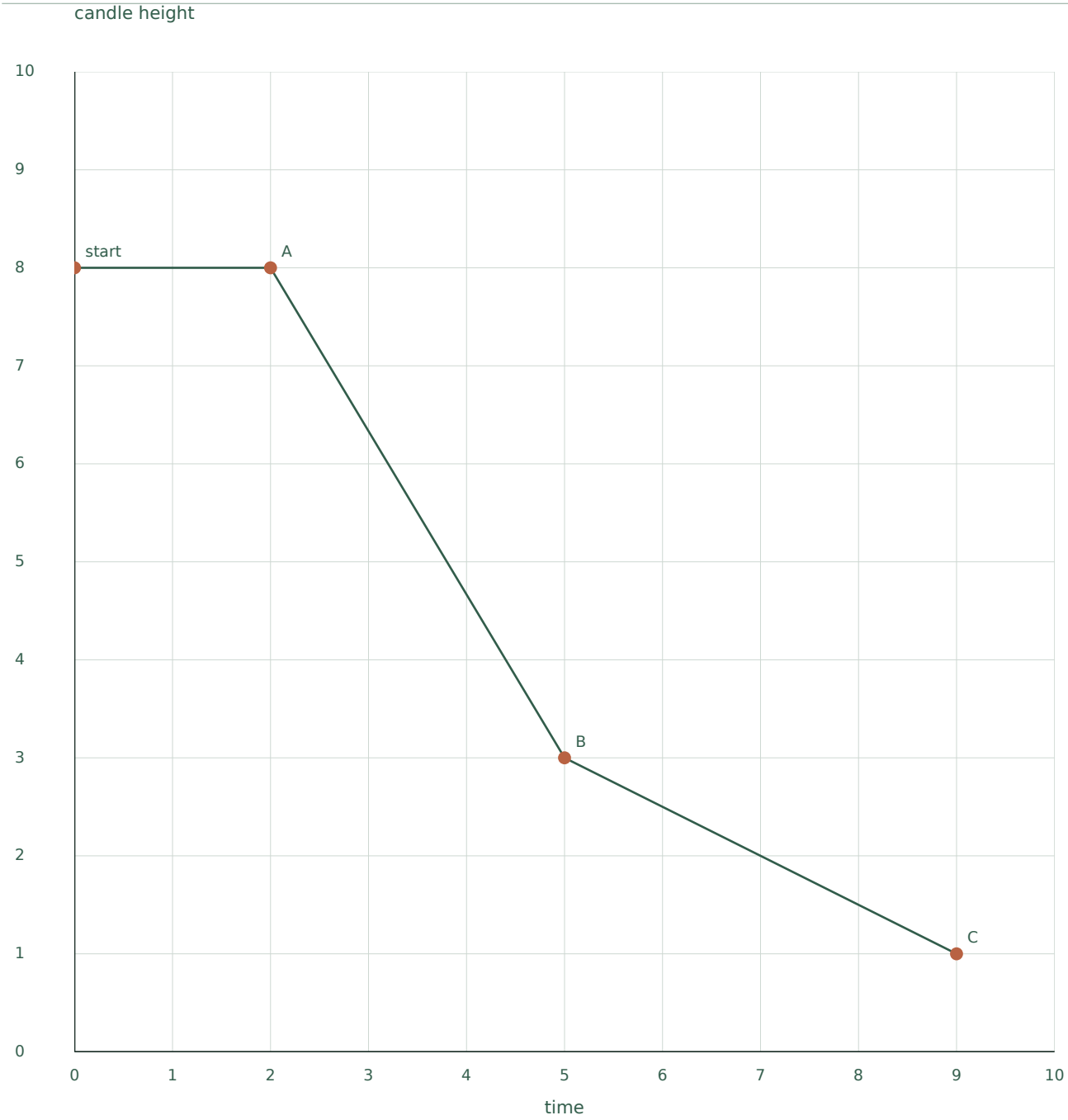
Task 1 / Model: Bathtub Rise, Plateau, Fall



Model sketch. Sentences: 'The water level rises steadily while the tap is on.' 'The water level stays the same while the tap is off.' 'The water level falls until the tub is empty when the drain is opened.'

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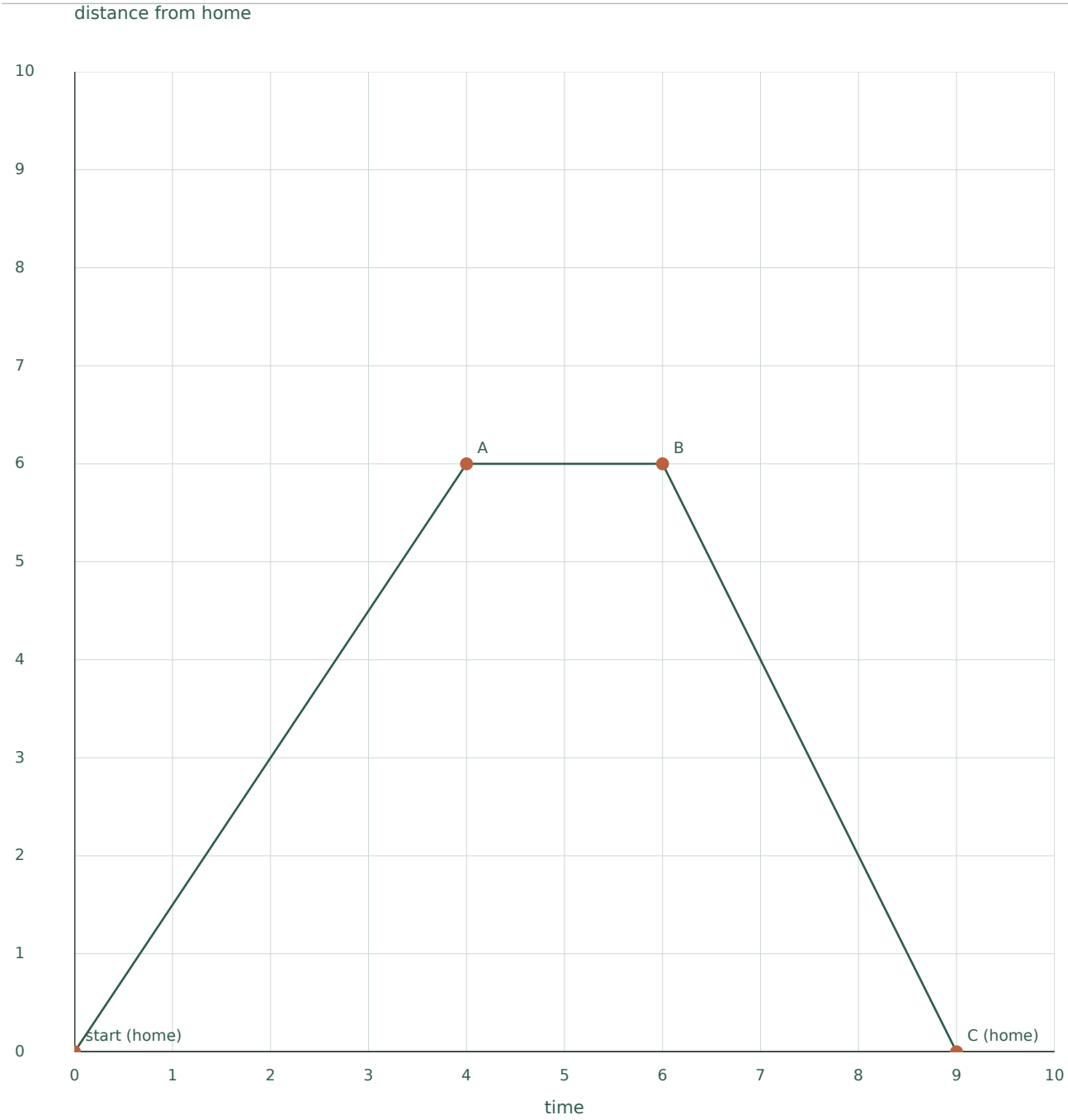
Task 2 / Model: Candle Plateau, Fast Fall, Slow Fall



Model sketch. Sentences: 'The candle height stays the same at first after it is lit.' 'The candle height falls quickly as it burns.' 'The candle height falls more slowly later.'

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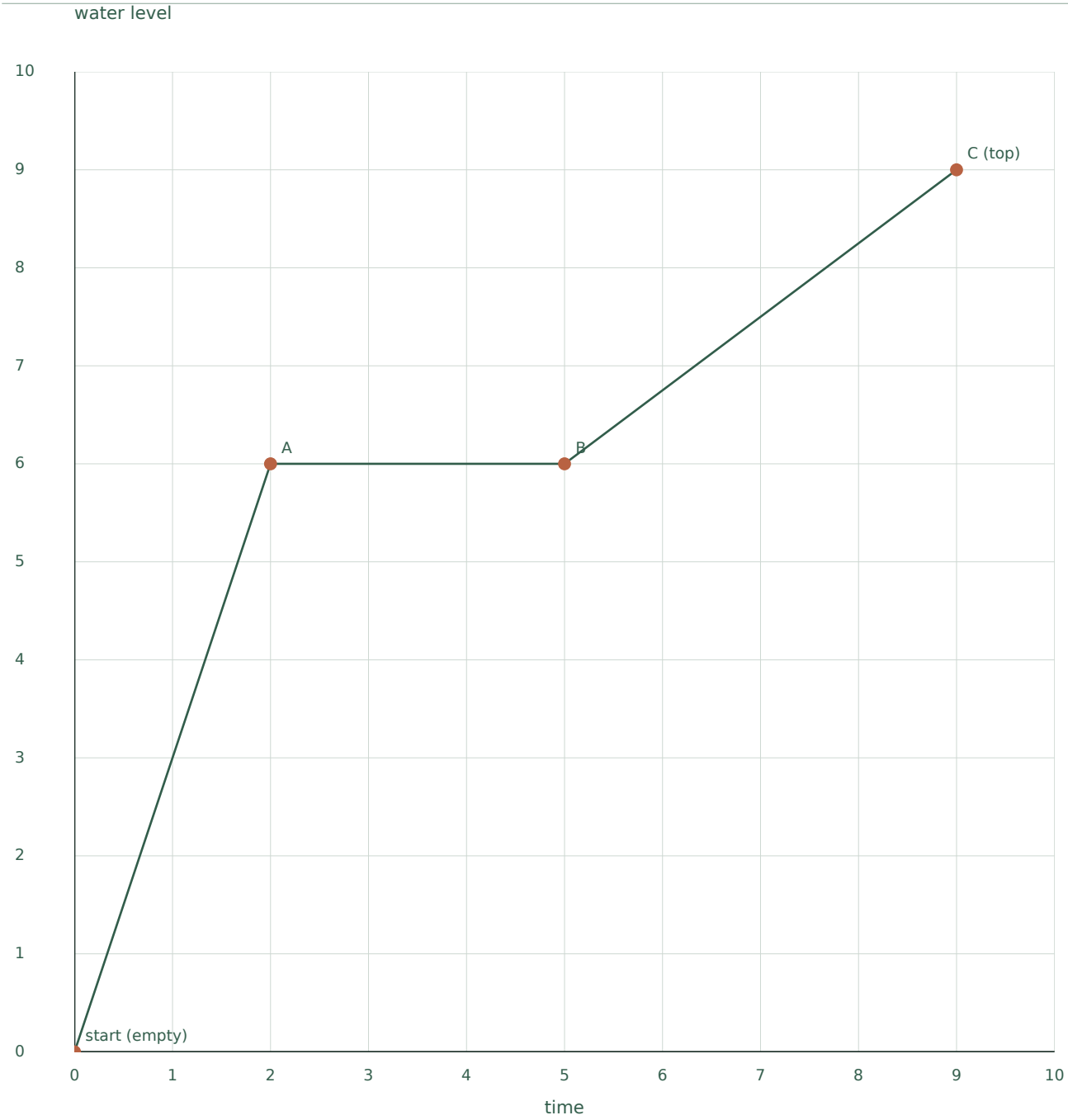
Task 3 / Model: Walk Away, Rest, Walk Back Faster



Model sketch. Sentences: 'The distance from home increases steadily as the person walks away.' 'The distance stays the same while the person rests.' 'The distance decreases quickly as the person walks back home faster.'

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Worked example / Worked Example: Filling a Water Bottle



Model sketch. Axes labeled with words; segment boundaries marked A, B, C. Sentences: 'From start to A, the water level rises quickly because the bottle is being filled.' 'From A to B, the water level stays the same','the

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Source rubric / reflection

- [ ] Axes are drawn with arrows and labeled with words for the independent and dependent quantities.
- [ ] The sequence of rise, fall, and plateau segments matches the order of events in the story.
- [ ] Relative steepness is shown qualitatively when the story compares fast and slow changes.
- [ ] A complete drain or empty state returns to the lowest shown level when the story says so.
- [ ] Each segment has one interpretation sentence that names the story quantity and event.
- [ ] The sketch is clear and consistent; valid alternatives such as curves or different boundary marks are accepted.

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