

Student Name

Mathematics Stage 5 Paths

VARIATION & RATES OF CHANGE B

Book 3 Construct graphical representations of rates of change

Version: 260207

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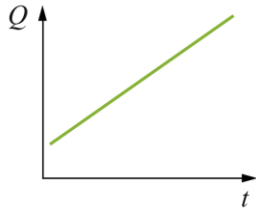
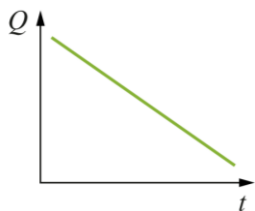
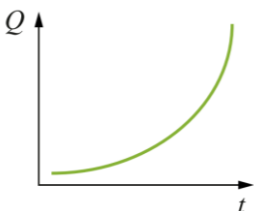
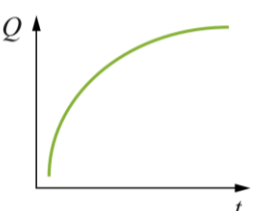
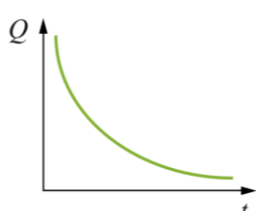
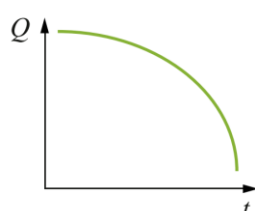
MA5-RAT-P-02 analyses and constructs graphs relating to rates of change

Construct graphical representations of rates of change

- Represent a given description of a variable rate of change of one quantity over time

REVIEW OF PRIOR KNOWLEDGE

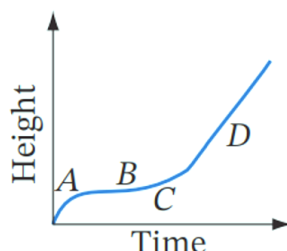
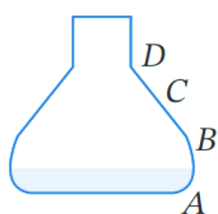
GRAPHS OF CHANGE

Increasing at a constant rate		Decreasing at a constant rate	
			
Increasing at an Increasing rate	Increasing at a Decreasing rate	Decreasing at a Decreasing rate	Decreasing at an Increasing rate
			

- For questions on height increase as you pour water at a constant rate:
 - Larger** cross-section: **Slower** increase in water height.
 - Smaller** cross-section: **Faster** increase in water height.
 - Consistent** cross-section: **Constant** rate of increase in water height.

Example Construct graphical representations of rates of change.

Water is poured into this container at a constant rate.
Draw a graph showing the height of water changes over time.



Why does water height increase at a decreasing rate in part B?

Since the water is poured at a rate, the height will rise more in a wider section because a larger volume is required to make the height increase.

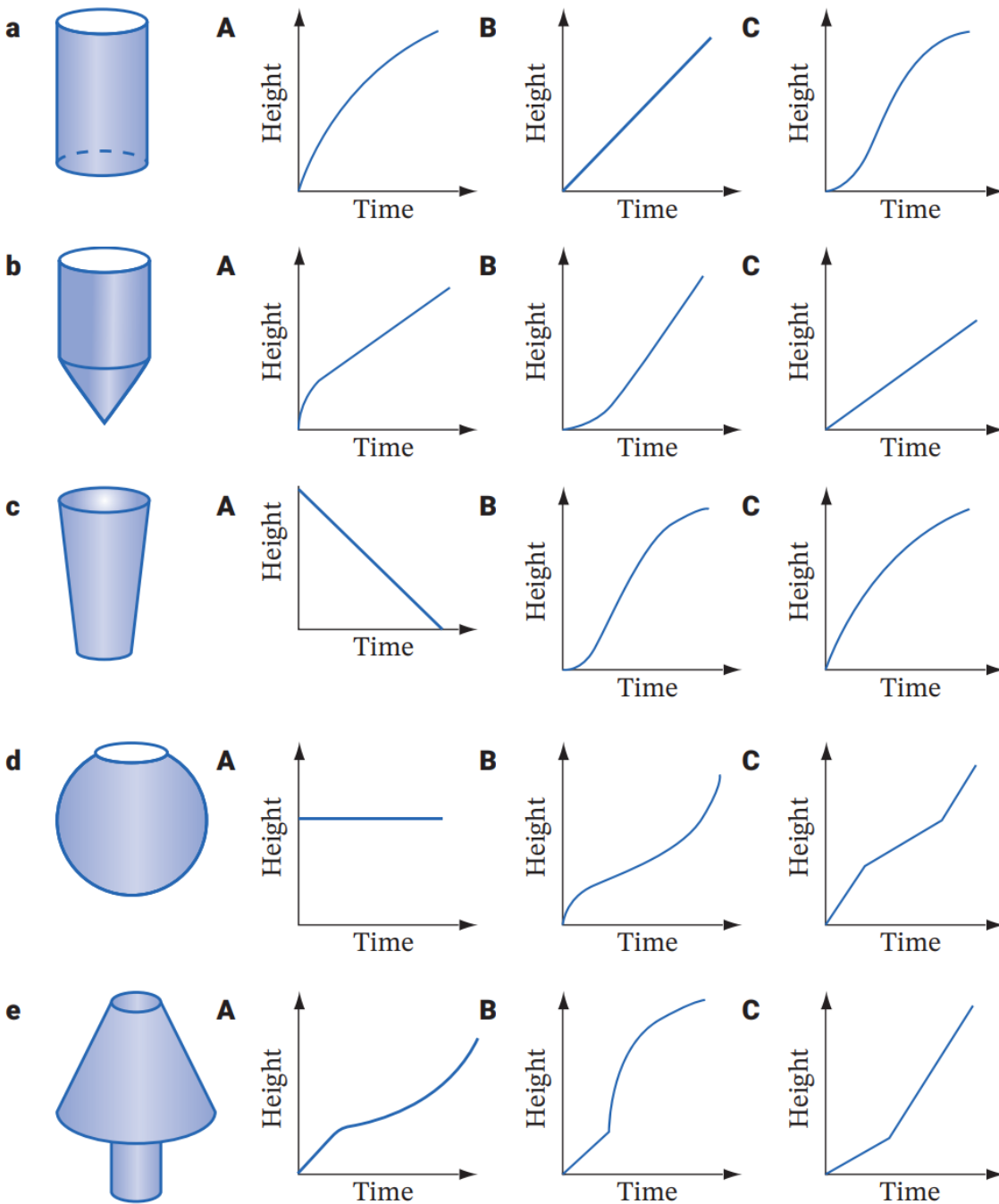
Why does the water height increase at an increasing rate part C?

A section means the water will rise more quickly as a smaller volume is required to make the height increase.

Why is the water level increasing at a constant rate in part D?

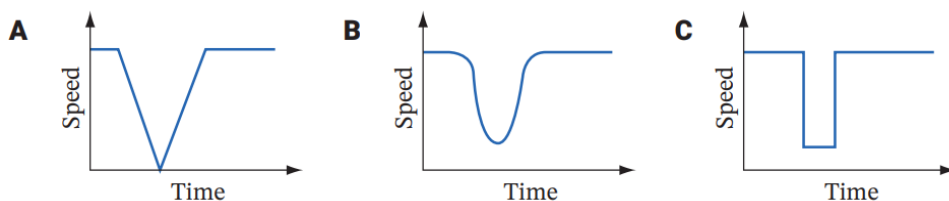
The container has vertical sides, meaning the-..... area is constant, so the height increases at a constant rate.

- 1 For each container, select the graph that best describes the height of the water as it is poured at a constant rate into the container.

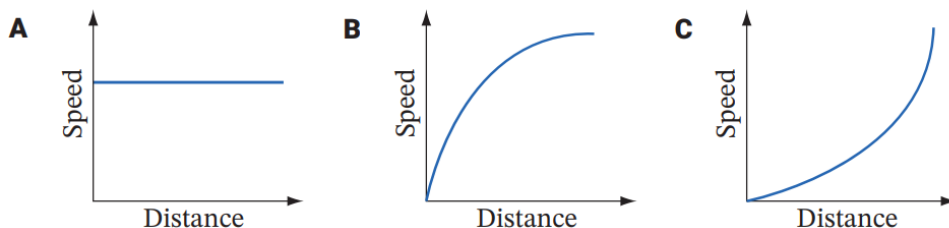


2 Select the most appropriate graph for each scenario.

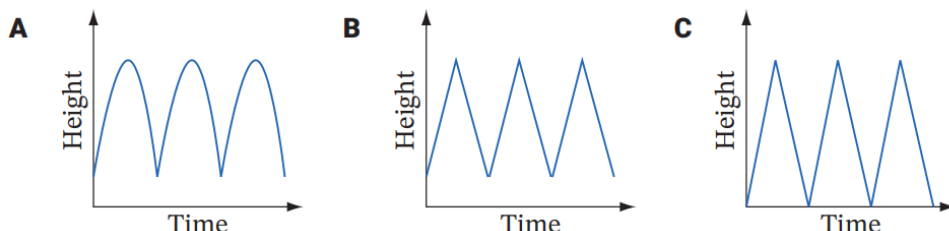
a The speed of a car as it goes around a corner.



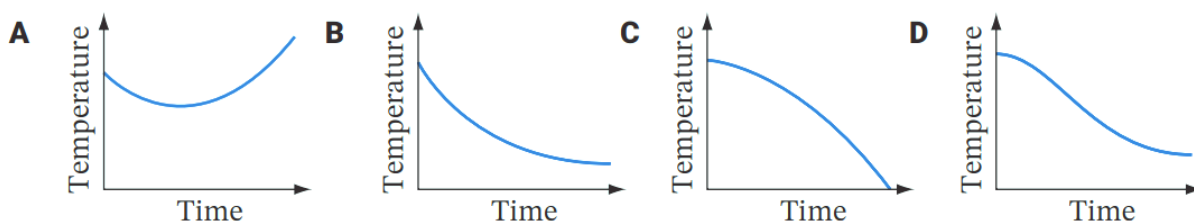
b The speed of a runner going up a steep hill from a standing start.



c The height of a person jumping on a trampoline.



d A bowl of hot soup is cooling. It loses heat quickly at first but as time passes, it loses heat more slowly until it is at room temperature.



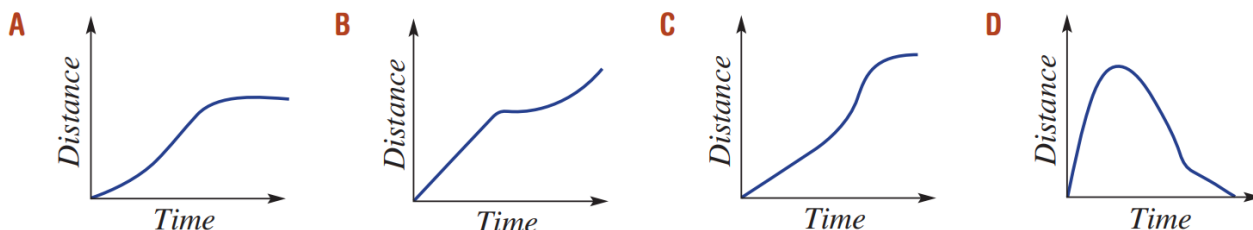
3 Match each distance–time graph (A – D) with the journey described (a – d).

a A soccer player runs at a steady speed across the field, stops briefly to avoid a tackle and then accelerates farther away.

b A rocket stage 1 booster accelerates to huge speed, then detaches and quickly decelerates, then accelerates as it falls towards Earth. Finally, a parachute opens and it slows, falling to Earth at a steady speed.

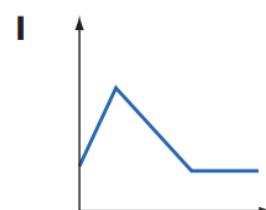
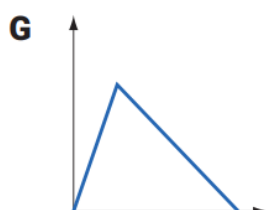
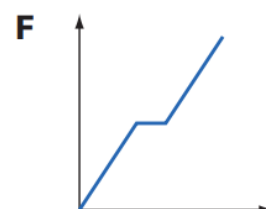
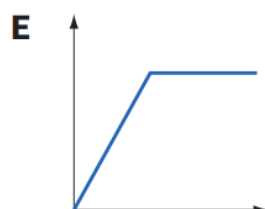
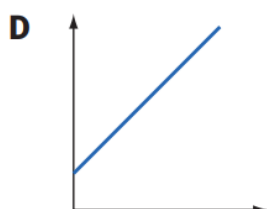
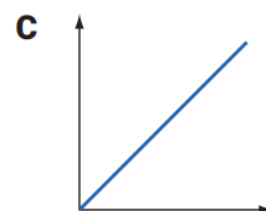
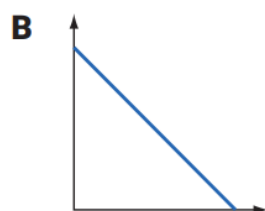
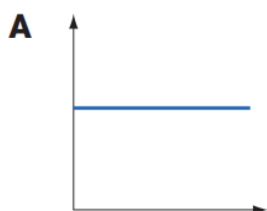
c A motorbike moves at a steady speed, then accelerates to pass a car, then brakes and decelerates, coming to a stop at traffic lights.

d A school bus accelerates away from the bus stop, then moves at a steady speed and then decelerates and stops.



4 Match each story to its graph(the variables are given in brackets).

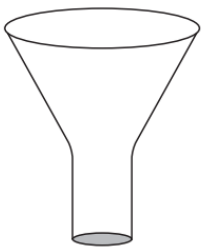
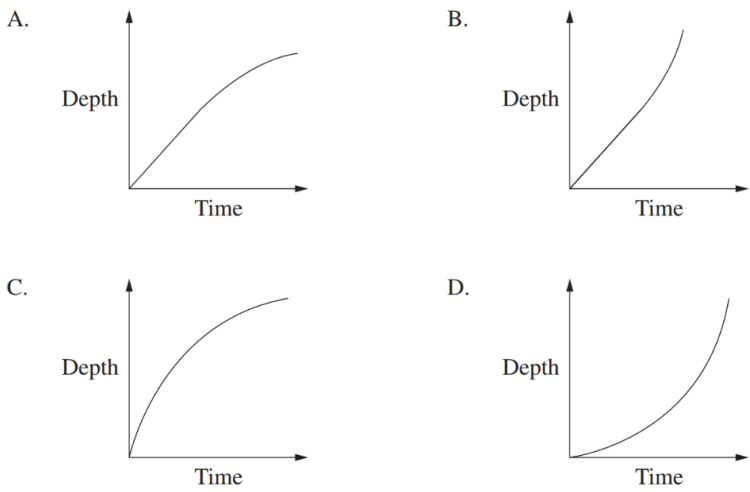
- | | | |
|----------|--|--|
| a | People were purchasing from the vending machine until it broke down.
(number of cans in machine, time) | |
| b | The tank was half full of water all day.
(depth of water, time) | |
| c | The cost of a mobile phone call is charged at a constant rate.
(cost, time) | |
| d | Jo was watching a movie but stopped to take a phone call halfway.
(amount of movie seen, time) | |
| e | Water level rises rapidly at a constant rate, then steadily falls at a constant rate and stay at a constant low. (water level, time) | |
| f | A taxi fare includes the hire charge plus a constant amount per kilometre. (cost, kilometres travelled) | |
| g | The car is consuming petrol at a steady rate until it runs out of fuel.
(litres in tank, time) | |
| h | Dario jogs at a steady rate, then stops and rests.
(distance travelled, time) | |
| i | Jordan jogs at a steady rate, then walks home.
(distance travelled, time) | |



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The diagram shows a container, closed at the base.
It is to be filled with water at a constant rate.

Which graph best shows the depth of water in the container as time varies?



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The container shown is initially full of water.
Water leaks out of the bottom of the container at a constant rate.

Which graph best shows the depth of water in the container as time varies?

