

Kinematic Equations 1

Objectives

Be able to use these formulas, the first three kinematic equations:

$$v_f = v_i + a \cdot \Delta t$$

$$\Delta x = v_i \cdot \Delta t + \frac{1}{2} a (\Delta t)^2$$

$$\Delta x = \left(\frac{v_i + v_f}{2} \right) \Delta t$$

- Know that when an object is falling down, it accelerates at a rate of 9.8 m/s^2 . Use this information the three formulas above.

Formula 1:

$$v_f = v_i + a \cdot \Delta t$$

Symbol	Quantity	SI Unit
v_f	Final velocity	m/s (meters per second)
v_i	Initial Velocity	m/s (meters per second)
a	Acceleration	m/s ² (meters per second squared)
Δt	Change in time	s (seconds)

1. I have an initial velocity of 4 m/s.

I have an acceleration of 5 m/s².

I have a time of 4 seconds.

What is my final velocity?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

2. I have an initial velocity of 18 m/s.
 I have an acceleration of 2 m/s².
 I have a time of 20 seconds.
 What is my final velocity?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

3. I have an acceleration of 3 m/s².
 I have a time of 4 seconds.
 I have a **final** velocity of 20 m/s.
 What was my **initial** velocity?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

4. I have an acceleration of 5 m/s².
 I have a time of 3 seconds.
 I have a **final** velocity of 40 m/s.
 What was my **initial** velocity?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

5. I have a final velocity of 30 m/s.

I have an initial velocity of 20 m/s.

I have a time of 5 seconds.

What is my acceleration?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

6. I have a final velocity of 23 m/s.

I have an initial velocity of 5 m/s.

I have a time of 6 seconds.

What is my acceleration?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

Formula 2:

$$\Delta x = v_i \cdot \Delta t + \frac{1}{2} a (\Delta t)^2$$

Symbol	Quantity	SI Unit
Δx	Displacement	m (meters)
v_i	Initial Velocity	m/s (meters per second)
Δt	Change in time	s (seconds)
a	Acceleration	m/s ² (meters per second squared)

7. I have an initial velocity of 4 m/s.

I have a time of 3 s.

I have an acceleration of 6 m/s.

What is my displacement?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

8. I have an initial velocity of 5 m/s.

I have a time of 10 s.

I have an acceleration of 4 m/s².

What is my displacement?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

Formula 3

$$\Delta x = \left(\frac{v_i + v_f}{2} \right) \Delta t$$

Symbol	Quantity	SI Unit
Δx	Displacement	m (meters)
v_i	Initial Velocity	m/s (meters per second)
v_f	Final velocity	m/s (meters per second)
Δt	Change in time	s (seconds)

9. I have an initial velocity of 15 m/s.

I have a final velocity of 5 m/s.

I have a time of 3 seconds.

What is my displacement?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

10. I have an initial velocity of 3 m/s.
 I have a final velocity of 13 m/s.
 I have a time of 4 s.
 What is my displacement?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

11. I have an initial velocity of 2 m/s.
 I have a final velocity of 10 m/s.
 I have a displacement of 48 m.
 What was my time?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

12. I have an initial velocity of 12 m/s.
 I have a final velocity of 18 m/s.
 I have a displacement of 90 m.
 What was my time?

Looking For	Formula	
Already Know		
Answer in a complete sentence <i>with unit</i> :		

Answers:

1. 24 m/s
2. 58 m/s
3. 8 m/s
4. 25 m/s
5. 2 m/s²
6. 3 m/s²
7. 39 m
8. 250 m
9. 30 m
10. 32 m
11. 8 s
12. 6 s