

# Uniform Acceleration

## Examples

$$v = u + at$$

$$x = ut + \frac{1}{2}at^2$$

$$x = \frac{1}{2}(u + v)t$$

$$x = vt - \frac{1}{2}at^2$$

$$v^2 = u^2 + 2ax$$

## Example 1

A rally car accelerates from  $10 \text{ ms}^{-1}$  to  $58 \text{ ms}^{-1}$  in 8 seconds as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

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A rally car accelerates from  **$10 \text{ ms}^{-1}$**  to  $58 \text{ ms}^{-1}$  in 8 seconds as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

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A rally car accelerates from  $10 \text{ ms}^{-1}$  to  **$58 \text{ ms}^{-1}$**  in 8 seconds as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

$$v = \mathbf{58 \text{ ms}^{-1}}$$

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A rally car accelerates from  $10 \text{ ms}^{-1}$  to  $58 \text{ ms}^{-1}$  in **8 seconds** as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

$$v = 58 \text{ ms}^{-1}$$

$$t = 8 \text{ s}$$

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### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

$$v = 58 \text{ ms}^{-1}$$

$$t = 8 \text{ s}$$

$$a = ?$$

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A rally car accelerates from  $10 \text{ ms}^{-1}$  to  $58 \text{ ms}^{-1}$  in 8 seconds as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

$$v = 58 \text{ ms}^{-1}$$

$$t = 8 \text{ s}$$

$$a = ?$$

### Step 2 Select the equation



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A rally car accelerates from  $10 \text{ ms}^{-1}$  to  $58 \text{ ms}^{-1}$  in 8 seconds as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

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### Step 2 Select the equation

$$v = u + at$$

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A rally car accelerates from  $10 \text{ ms}^{-1}$  to  $58 \text{ ms}^{-1}$  in 8 seconds as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

$$v = 58 \text{ ms}^{-1}$$

$$t = 8 \text{ s}$$

$$a = ?$$

### Step 2 Select the equation

$$v = u + at$$

### Step 3 Substitute & solve

$$v = u + at$$

$$58 = 10 + 8a$$

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A rally car accelerates from  $10 \text{ ms}^{-1}$  to  $58 \text{ ms}^{-1}$  in 8 seconds as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

$$v = 58 \text{ ms}^{-1}$$

$$t = 8 \text{ s}$$

$$a = ?$$

### Step 2 Select the equation

$$v = u + at$$

### Step 3 Substitute & solve

$$v = u + at$$

$$58 = 10 + 8a$$

$$58 - 10 = 10 + 8a - 10$$

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A rally car accelerates from  $10 \text{ ms}^{-1}$  to  $58 \text{ ms}^{-1}$  in 8 seconds as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

$$v = 58 \text{ ms}^{-1}$$

$$t = 8 \text{ s}$$

$$a = ?$$

### Step 2 Select the equation

$$v = u + at$$

### Step 3 Substitute & solve

$$v = u + at$$

$$58 = 10 + 8a$$

$$58 - 10 = 10 + 8a - 10$$

$$48 = 8a$$

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A rally car accelerates from  $10 \text{ ms}^{-1}$  to  $58 \text{ ms}^{-1}$  in 8 seconds as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

$$v = 58 \text{ ms}^{-1}$$

$$t = 8 \text{ s}$$

$$a = ?$$

### Step 2 Select the equation

$$v = u + at$$

### Step 3 Substitute & solve

$$v = u + at$$

$$58 = 10 + 8a$$

$$58 - 10 = 10 + 8a - 10$$

$$48 = 8a$$

$$a = 48/8$$

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A rally car accelerates from  $10 \text{ ms}^{-1}$  to  $58 \text{ ms}^{-1}$  in 8 seconds as it moves along a straight road. Given that the acceleration is constant, what is the acceleration of the car?

### Step 1 State the variables

$$u = 10 \text{ ms}^{-1}$$

$$v = 58 \text{ ms}^{-1}$$

$$t = 8 \text{ s}$$

$$a = ?$$

### Step 2 Select the equation

$$v = u + at$$

### Step 3 Substitute & solve

$$v = u + at$$

$$58 = 10 + 8a$$

$$58 - 10 = 10 + 8a - 10$$

$$48 = 8a$$

$$a = 48/8$$

$$\underline{a = 6 \text{ ms}^{-2}}$$

## Example 2

A bus traveling along a straight road accelerates at  $2 \text{ ms}^{-2}$ , for 4 seconds, covering a distance of 44 metres. After the 4 seconds what velocity is the bus traveling at?

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### Step 1 State the variables

$$a = 2 \text{ ms}^{-2}$$

## Example 2

A bus traveling along a straight road accelerates at  $2 \text{ ms}^{-2}$ , for **4 seconds**, covering a distance of 44 metres. After the 4 seconds what velocity is the bus traveling at?

### Step 1 State the variables

$$a = 2 \text{ ms}^{-2}$$

$$t = 4 \text{ s}$$

## Example 2

A bus traveling along a straight road accelerates at  $2 \text{ ms}^{-2}$ , for 4 seconds, covering a **distance of 44 metres**. After the 4 seconds what velocity is the bus traveling at?

### Step 1 State the variables

$$a = 2 \text{ ms}^{-2}$$

$$t = 4 \text{ s}$$

$$\mathbf{x = 44 \text{ m}}$$

## Example 2

A bus traveling along a straight road accelerates at  $2 \text{ ms}^{-2}$ , for 4 seconds, covering a distance of 44 metres. After the 4 seconds **what velocity is the bus traveling at?**

### Step 1 State the variables

$$a = 2 \text{ ms}^{-2}$$

$$t = 4 \text{ s}$$

$$x = 44 \text{ m}$$

$$v = ?$$

## Example 2

A bus traveling along a straight road accelerates at  $2 \text{ ms}^{-2}$ , for 4 seconds, covering a distance of 44 metres. After the 4 seconds what velocity is the bus traveling at?

### Step 1 State the variables

$$a = 2 \text{ ms}^{-2}$$

$$t = 4 \text{ s}$$

$$x = 44 \text{ m}$$

$$v = ?$$

### Step 2 Select the equation

## Example 2

A bus traveling along a straight road accelerates at  $2 \text{ ms}^{-2}$ , for 4 seconds, covering a distance of 44 metres. After the 4 seconds what velocity is the bus traveling at?

### Step 1 State the variables

$$a = 2 \text{ ms}^{-2}$$

$$t = 4 \text{ s}$$

$$x = 44 \text{ m}$$

$$v = ?$$

### Step 2 Select the equation

$$x = vt - \frac{1}{2}at^2$$

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A bus traveling along a straight road accelerates at  $2 \text{ ms}^{-2}$ , for 4 seconds, covering a distance of 44 metres. After the 4 seconds what velocity is the bus traveling at?

### Step 1 State the variables

$$a = 2 \text{ ms}^{-2}$$

$$t = 4 \text{ s}$$

$$x = 44 \text{ m}$$

$$v = ?$$

### Step 2 Select the equation

$$x = vt - \frac{1}{2}at^2$$

### Step 3 Substitute & solve

$$x = vt - \frac{1}{2}at^2$$

$$44 = (v \times 4) - (\frac{1}{2} \times 2 \times 4^2)$$

## Example 2

A bus traveling along a straight road accelerates at  $2 \text{ ms}^{-2}$ , for 4 seconds, covering a distance of 44 metres. After the 4 seconds what velocity is the bus traveling at?

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$$a = 2 \text{ ms}^{-2}$$

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$$x = vt - \frac{1}{2}at^2$$

### Step 3 Substitute & solve

$$x = vt - \frac{1}{2}at^2$$

$$44 = (v \times 4) - (\frac{1}{2} \times 2 \times 4^2)$$

$$44 = 4v - 16$$



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$$a = 2 \text{ ms}^{-2}$$

$$t = 4 \text{ s}$$

$$x = 44 \text{ m}$$

$$v = ?$$

### Step 3 Substitute & solve

$$x = vt - \frac{1}{2}at^2$$

$$44 = (v \times 4) - (\frac{1}{2} \times 2 \times 4^2)$$

$$44 = 4v - 16$$

$$44 + 16 = 4v - 16 + 16$$

### Step 2 Select the equation

$$x = vt - \frac{1}{2}at^2$$

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A bus traveling along a straight road accelerates at  $2 \text{ ms}^{-2}$ , for 4 seconds, covering a distance of 44 metres. After the 4 seconds what velocity is the bus traveling at?

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$$a = 2 \text{ ms}^{-2}$$

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$$v = ?$$

### Step 2 Select the equation

$$x = vt - \frac{1}{2}at^2$$

### Step 3 Substitute & solve

$$x = vt - \frac{1}{2}at^2$$

$$44 = (v \times 4) - (\frac{1}{2} \times 2 \times 4^2)$$

$$44 = 4v - 16$$

$$44 + 16 = 4v - 16 + 16$$

$$60 = 4v$$

## Example 2

A bus traveling along a straight road accelerates at  $2 \text{ ms}^{-2}$ , for 4 seconds, covering a distance of 44 metres. After the 4 seconds what velocity is the bus traveling at?

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$$a = 2 \text{ ms}^{-2}$$

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$$x = 44 \text{ m}$$

$$v = ?$$

### Step 2 Select the equation

$$x = vt - \frac{1}{2}at^2$$

### Step 3 Substitute & solve

$$x = vt - \frac{1}{2}at^2$$

$$44 = (v \times 4) - (\frac{1}{2} \times 2 \times 4^2)$$

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$$60 = 4v$$

$$v = 60/4$$

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### Step 2 Select the equation

$$x = vt - \frac{1}{2}at^2$$

### Step 3 Substitute & solve

$$x = vt - \frac{1}{2}at^2$$

$$44 = (v \times 4) - (\frac{1}{2} \times 2 \times 4^2)$$

$$44 = 4v - 16$$

$$44 + 16 = 4v - 16 + 16$$

$$60 = 4v$$

$$v = 60/4$$

$$\underline{v = 15 \text{ ms}^{-1}}$$

### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how far past the finish line will the rowing boat come to a stop?

### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how far past the finish line will the rowing boat come to a stop?

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#### Step 1 State the variables

$$u = 12 \text{ ms}^{-1}$$

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#### Step 1 State the variables

$$u = 12 \text{ ms}^{-1}$$

$$a = -4 \text{ ms}^{-2}$$



### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it **comes to rest**, how far past the finish line will the rowing boat come to a stop?

#### Step 1 State the variables

$$u = 12 \text{ ms}^{-1}$$

$$a = -4 \text{ ms}^{-2}$$

$$v = 0 \text{ ms}^{-1}$$

### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how **far past the finish line** will the rowing boat come to a stop?

#### Step 1 State the variables

$$u = 12 \text{ ms}^{-1}$$

$$a = -4 \text{ ms}^{-2}$$

$$v = 0 \text{ ms}^{-1}$$

$$\mathbf{x = ?}$$

### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how far past the finish line will the rowing boat come to a stop?

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$$u = 12 \text{ ms}^{-1}$$

$$a = -4 \text{ ms}^{-2}$$

$$v = 0 \text{ ms}^{-1}$$

$$x = ?$$

#### Step 2 Select the equation

### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how far past the finish line will the rowing boat come to a stop?

#### Step 1 State the variables

$$u = 12 \text{ ms}^{-1}$$

$$a = -4 \text{ ms}^{-2}$$

$$v = 0 \text{ ms}^{-1}$$

$$x = ?$$

#### Step 2 Select the equation

$$v^2 = u^2 + 2ax$$

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A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how far past the finish line will the rowing boat come to a stop?

#### Step 1 State the variables

$$u = 12 \text{ ms}^{-1}$$

$$a = -4 \text{ ms}^{-2}$$

$$v = 0 \text{ ms}^{-1}$$

$$x = ?$$

#### Step 2 Select the equation

$$v^2 = u^2 + 2ax$$

#### Step 3 Substitute & solve

$$v^2 = u^2 + 2ax$$

$$0^2 = 12^2 + (2 \times -4 \times x)$$

### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how far past the finish line will the rowing boat come to a stop?

#### Step 1 State the variables

$$u = 12 \text{ ms}^{-1}$$

$$a = -4 \text{ ms}^{-2}$$

$$v = 0 \text{ ms}^{-1}$$

$$x = ?$$

#### Step 2 Select the equation

$$v^2 = u^2 + 2ax$$

#### Step 3 Substitute & solve

$$v^2 = u^2 + 2ax$$

$$0^2 = 12^2 + (2 \times -4 \times x)$$

$$0 = 144 + (-8 \times x)$$

### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how far past the finish line will the rowing boat come to a stop?

#### Step 1 State the variables

$$u = 12 \text{ ms}^{-1}$$

$$a = -4 \text{ ms}^{-2}$$

$$v = 0 \text{ ms}^{-1}$$

$$x = ?$$

#### Step 3 Substitute & solve

$$v^2 = u^2 + 2ax$$

$$0^2 = 12^2 + (2 \times -4 \times x)$$

$$0 = 144 + (-8 \times x)$$

$$0 = 144 - 8x$$

#### Step 2 Select the equation

$$v^2 = u^2 + 2ax$$

### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how far past the finish line will the rowing boat come to a stop?

#### Step 1 State the variables

$$u = 12 \text{ ms}^{-1}$$

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$$v = 0 \text{ ms}^{-1}$$

$$x = ?$$

#### Step 2 Select the equation

$$v^2 = u^2 + 2ax$$

#### Step 3 Substitute & solve

$$v^2 = u^2 + 2ax$$

$$0^2 = 12^2 + (2 \times -4 \times x)$$

$$0 = 144 + (-8 \times x)$$

$$0 = 144 - 8x$$

$$0 - 144 = 144 - 8x - 144$$



### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how far past the finish line will the rowing boat come to a stop?

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$$u = 12 \text{ ms}^{-1}$$

$$a = -4 \text{ ms}^{-2}$$

$$v = 0 \text{ ms}^{-1}$$

$$x = ?$$

#### Step 2 Select the equation

$$v^2 = u^2 + 2ax$$

#### Step 3 Substitute & solve

$$v^2 = u^2 + 2ax$$

$$0^2 = 12^2 + (2 \times -4 \times x)$$

$$0 = 144 + (-8 \times x)$$

$$0 = 144 - 8x$$

$$0 - 144 = 144 - 8x - 144$$

$$-144 = -8x$$

### Example 3

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$$u = 12 \text{ ms}^{-1}$$

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$$v = 0 \text{ ms}^{-1}$$

$$x = ?$$

#### Step 2 Select the equation

$$v^2 = u^2 + 2ax$$

#### Step 3 Substitute & solve

$$v^2 = u^2 + 2ax$$

$$0^2 = 12^2 + (2 \times -4 \times x)$$

$$0 = 144 + (-8 \times x)$$

$$0 = 144 - 8x$$

$$0 - 144 = 144 - 8x - 144$$

$$-144 = -8x$$

$$x = -144 / -8$$

### Example 3

A rowing boat crosses the finish line at  $12 \text{ ms}^{-1}$  and carries on in a straight line. If it immediately decelerates at  $4 \text{ ms}^{-2}$  until it comes to rest, how far past the finish line will the rowing boat come to a stop?

#### Step 1 State the variables

$$u = 12 \text{ ms}^{-1}$$

$$a = -4 \text{ ms}^{-2}$$

$$v = 0 \text{ ms}^{-1}$$

$$x = ?$$

#### Step 2 Select the equation

$$v^2 = u^2 + 2ax$$

#### Step 3 Substitute & solve

$$v^2 = u^2 + 2ax$$

$$0^2 = 12^2 + (2 \times -4 \times x)$$

$$0 = 144 + (-8 \times x)$$

$$0 = 144 - 8x$$

$$0 - 144 = 144 - 8x - 144$$

$$-144 = -8x$$

$$x = -144 / -8$$

$$\underline{x = 18 \text{ ms}^{-1}}$$

### Example 4

During the middle of an 800 metre race an athlete running at  $6.8 \text{ ms}^{-1}$  constantly accelerates, along part of the straight, to  $8 \text{ ms}^{-1}$  in order to get in a better position for the final lap. Given this took 2 seconds, what distance did the athlete cover in this time?

### Example 4

During the middle of an 800 metre race an athlete running at  $6.8 \text{ ms}^{-1}$  constantly accelerates, along part of the straight, to  $8 \text{ ms}^{-1}$  in order to get in a better position for the final lap. Given this took 2 seconds, what distance did the athlete cover in this time?

#### Step 1 State the variables

### Example 4

During the middle of an 800 metre race an athlete running at  $6.8 \text{ ms}^{-1}$  constantly accelerates, along part of the straight, to  $8 \text{ ms}^{-1}$  in order to get in a better position for the final lap. Given this took 2 seconds, what distance did the athlete cover in this time?

#### Step 1 State the variables

$$u = 6.8 \text{ ms}^{-1}$$

### Example 4

During the middle of an 800 metre race an athlete running at  $6.8 \text{ ms}^{-1}$  constantly accelerates, along part of the straight, to  $8 \text{ ms}^{-1}$  in order to get in a better position for the final lap. Given this took 2 seconds, what distance did the athlete cover in this time?

#### Step 1 State the variables

$$u = 6.8 \text{ ms}^{-1}$$

$$v = 8 \text{ ms}^{-1}$$

### Example 4

During the middle of an 800 metre race an athlete running at  $6.8 \text{ ms}^{-1}$  constantly accelerates, along part of the straight, to  $8 \text{ ms}^{-1}$  in order to get in a better position for the final lap. Given this took **2 seconds**, what distance did the athlete cover in this time?

#### Step 1 State the variables

$$u = 6.8 \text{ ms}^{-1}$$

$$v = 8 \text{ ms}^{-1}$$

$$t = 2 \text{ s}$$



### Example 4

During the middle of an 800 metre race an athlete running at  $6.8 \text{ ms}^{-1}$  constantly accelerates, along part of the straight, to  $8 \text{ ms}^{-1}$  in order to get in a better position for the final lap. Given this took 2 seconds, what **distance did the athlete cover** in this time?

#### Step 1 State the variables

$$u = 6.8 \text{ ms}^{-1}$$

$$v = 8 \text{ ms}^{-1}$$

$$t = 2 \text{ s}$$

$$x = ?$$

### Example 4

During the middle of an 800 metre race an athlete running at  $6.8 \text{ ms}^{-1}$  constantly accelerates, along part of the straight, to  $8 \text{ ms}^{-1}$  in order to get in a better position for the final lap. Given this took 2 seconds, what distance did the athlete cover in this time?

#### Step 1 State the variables

$$u = 6.8 \text{ ms}^{-1}$$

$$v = 8 \text{ ms}^{-1}$$

$$t = 2 \text{ s}$$

$$x = ?$$

#### Step 2 Select the equation

### Example 4

During the middle of an 800 metre race an athlete running at  $6.8 \text{ ms}^{-1}$  constantly accelerates, along part of the straight, to  $8 \text{ ms}^{-1}$  in order to get in a better position for the final lap. Given this took 2 seconds, what distance did the athlete cover in this time?

#### Step 1 State the variables

$$u = 6.8 \text{ ms}^{-1}$$

$$v = 8 \text{ ms}^{-1}$$

$$t = 2 \text{ s}$$

$$x = ?$$

#### Step 2 Select the equation

$$x = \frac{1}{2}(u + v)t$$

### Example 4

During the middle of an 800 metre race an athlete running at  $6.8 \text{ ms}^{-1}$  constantly accelerates, along part of the straight, to  $8 \text{ ms}^{-1}$  in order to get in a better position for the final lap. Given this took 2 seconds, what distance did the athlete cover in this time?

#### Step 1 State the variables

$$u = 6.8 \text{ ms}^{-1}$$

$$v = 8 \text{ ms}^{-1}$$

$$t = 2 \text{ s}$$

$$x = ?$$

#### Step 3 Substitute & solve

$$x = \frac{1}{2}(u + v)t$$

$$x = \frac{1}{2} \times (6.8 + 8) \times 2$$

#### Step 2 Select the equation

$$x = \frac{1}{2}(u + v)t$$

### Example 4

During the middle of an 800 metre race an athlete running at  $6.8 \text{ ms}^{-1}$  constantly accelerates, along part of the straight, to  $8 \text{ ms}^{-1}$  in order to get in a better position for the final lap. Given this took 2 seconds, what distance did the athlete cover in this time?

#### Step 1 State the variables

$$u = 6.8 \text{ ms}^{-1}$$

$$v = 8 \text{ ms}^{-1}$$

$$t = 2 \text{ s}$$

$$x = ?$$

#### Step 3 Substitute & solve

$$x = \frac{1}{2}(u + v)t$$

$$x = \frac{1}{2} \times (6.8 + 8) \times 2$$

$$\underline{x = 14.8 \text{ m}}$$

#### Step 2 Select the equation

$$x = \frac{1}{2}(u + v)t$$

### Example 5

A train leaves a station from rest and travels along a straight track. If after 20 seconds the train is 500 metres from the station, what is the acceleration of the train?

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A train leaves a station from rest and travels along a straight track. If after 20 seconds the train is 500 metres from the station, what is the acceleration of the train?

### Step 1 State the variables

## Example 5

A train leaves a station **from rest** and travels along a straight track. If after 20 seconds the train is 500 metres from the station, what is the acceleration of the train?

### Step 1 State the variables

$$u = 0 \text{ ms}^{-1}$$



## Example 5

A train leaves a station from rest and travels along a straight track. If after **20 seconds** the train is 500 metres from the station, what is the acceleration of the train?

### Step 1 State the variables

$$u = 0 \text{ ms}^{-1}$$

$$t = 20 \text{ s}$$

## Example 5

A train leaves a station from rest and travels along a straight track. If after 20 seconds the train is **500 metres** from the station, what is the acceleration of the train?

### Step 1 State the variables

$$u = 0 \text{ ms}^{-1}$$

$$t = 20 \text{ s}$$

$$x = 500 \text{ m}$$

## Example 5

A train leaves a station from rest and travels along a straight track. If after 20 seconds the train is 500 metres from the station, **what is the acceleration** of the train?

### Step 1 State the variables

$$u = 0 \text{ ms}^{-1}$$

$$t = 20 \text{ s}$$

$$x = 500 \text{ m}$$

$$\mathbf{a = ?}$$

## Example 5

A train leaves a station from rest and travels along a straight track. If after 20 seconds the train is 500 metres from the station, what is the acceleration of the train?

### Step 1 State the variables

$$u = 0 \text{ ms}^{-1}$$

$$t = 20 \text{ s}$$

$$x = 500 \text{ m}$$

$$a = ?$$

### Step 2 Select the equation

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### Step 3 Substitute & solve

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$$\underline{a = 2.5 \text{ ms}^{-2}}$$

### Example 6

A lift at the ground floor rises vertically from rest with constant acceleration of  $0.6 \text{ ms}^{-2}$ . If it passes the first floor at  $1.8 \text{ ms}^{-1}$ , how high is the first floor?

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A lift at the ground floor rises vertically **from rest** with constant acceleration of  $0.6 \text{ ms}^{-2}$ . If it passes the first floor at  $1.8 \text{ ms}^{-1}$ , how high is the first floor?

### Step 1 State the variables

$$u = 0 \text{ ms}^{-1}$$

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A lift at the ground floor rises vertically from rest with constant acceleration of  **$0.6 \text{ ms}^{-2}$** . If it passes the first floor at  $1.8 \text{ ms}^{-1}$ , how high is the first floor?

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$$a = 0.6 \text{ ms}^{-2}$$

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$$a = 0.6 \text{ ms}^{-2}$$

$$v = \mathbf{1.8 \text{ ms}^{-1}}$$

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$$v^2 = u^2 + 2ax$$

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$$v = 1.8 \text{ ms}^{-1}$$

$$x = ?$$

### Step 3 Substitute & solve

$$v^2 = u^2 + 2ax$$

$$1.8^2 = 0^2 + 2 \times 0.6 \times x$$

$$3.24 = 1.2x$$

$$x = 3.24/1.2$$

### Step 2 Select the equation

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$$3.24 = 1.2x$$

$$x = 3.24/1.2$$

$$\underline{x = 2.7 \text{ m}}$$