

MCEduHub SLS Application User Guide

Updated on 23 Nov 2023



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How to navigate to the MCEduHub App from SLS


Log In to MOE SLS Website

SINGAPORE
Student Learning Space

Help us improve 😊



[Back to Main Login Page](#)


 Users should use their SLS Username and Password to log in.

SLS Username

SLS Password

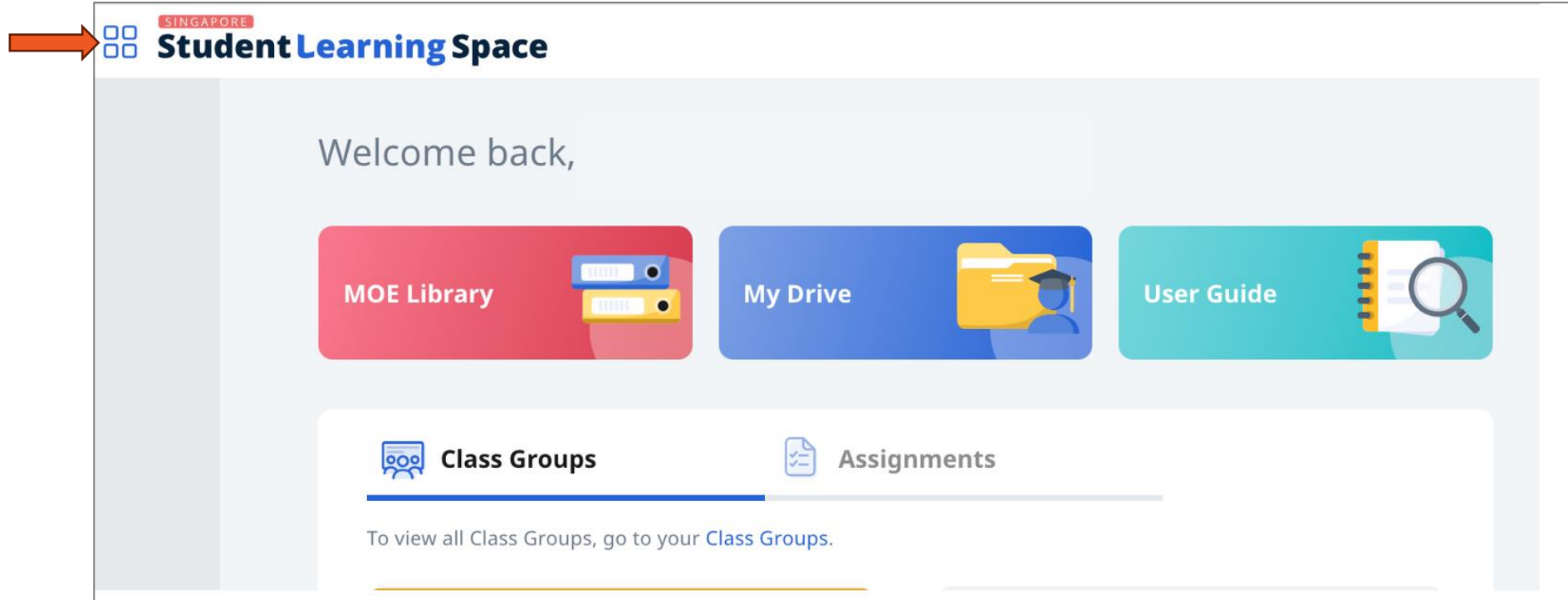
LOGIN


[Forgot Password](#)

 If you have difficulties logging in or would like to apply for a new MIMS account, please refer to [Accounts and Login Troubleshooting](#) for more information.

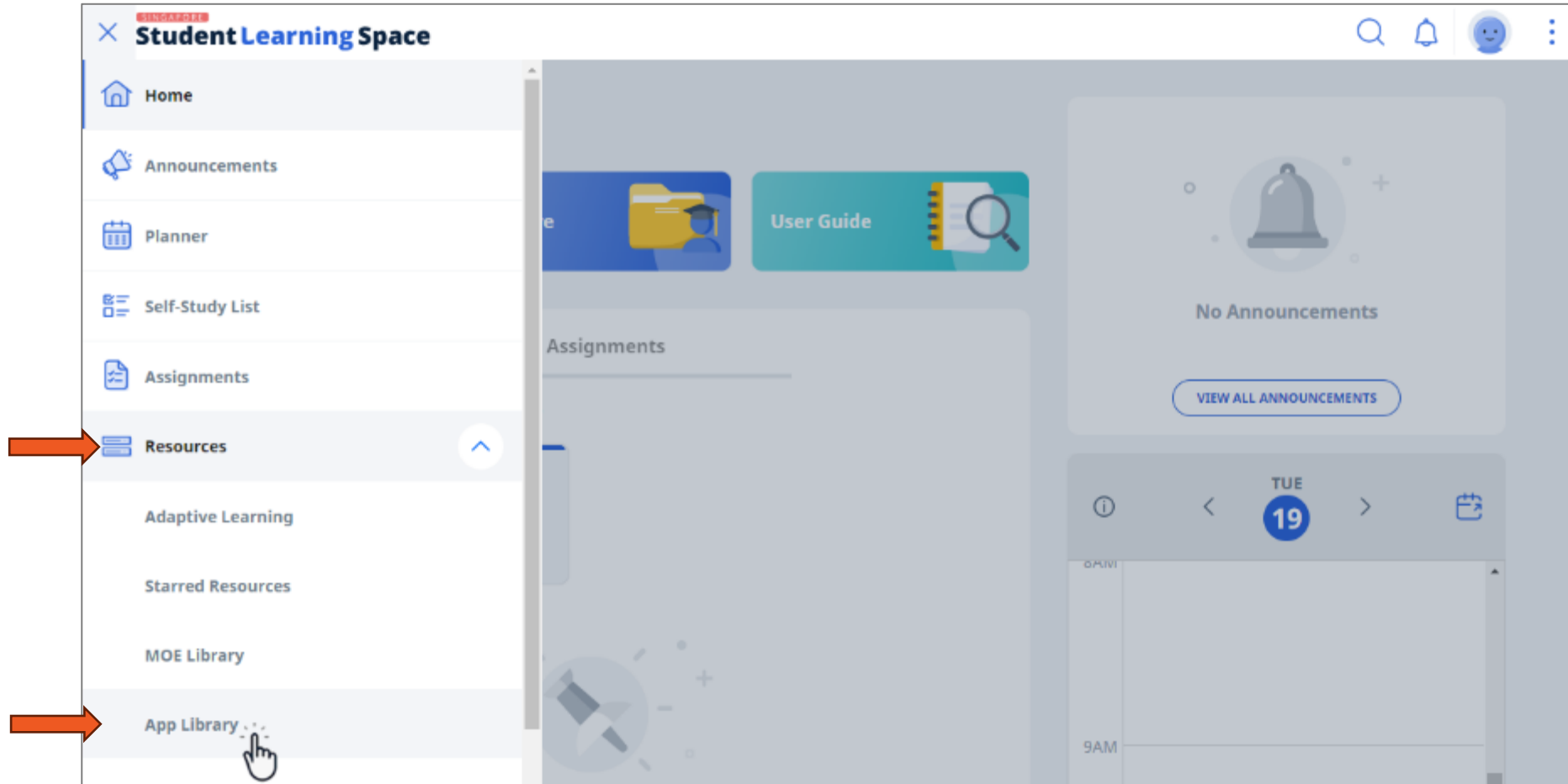
Go to the MOE SLS website at vle.learning.moe.edu.sg and log in using your SLS Username and Password.

Access the SLS Sidebar Menu



Click on the  icon at the top left-hand corner to access the SLS sidebar menu.

Go to App Library



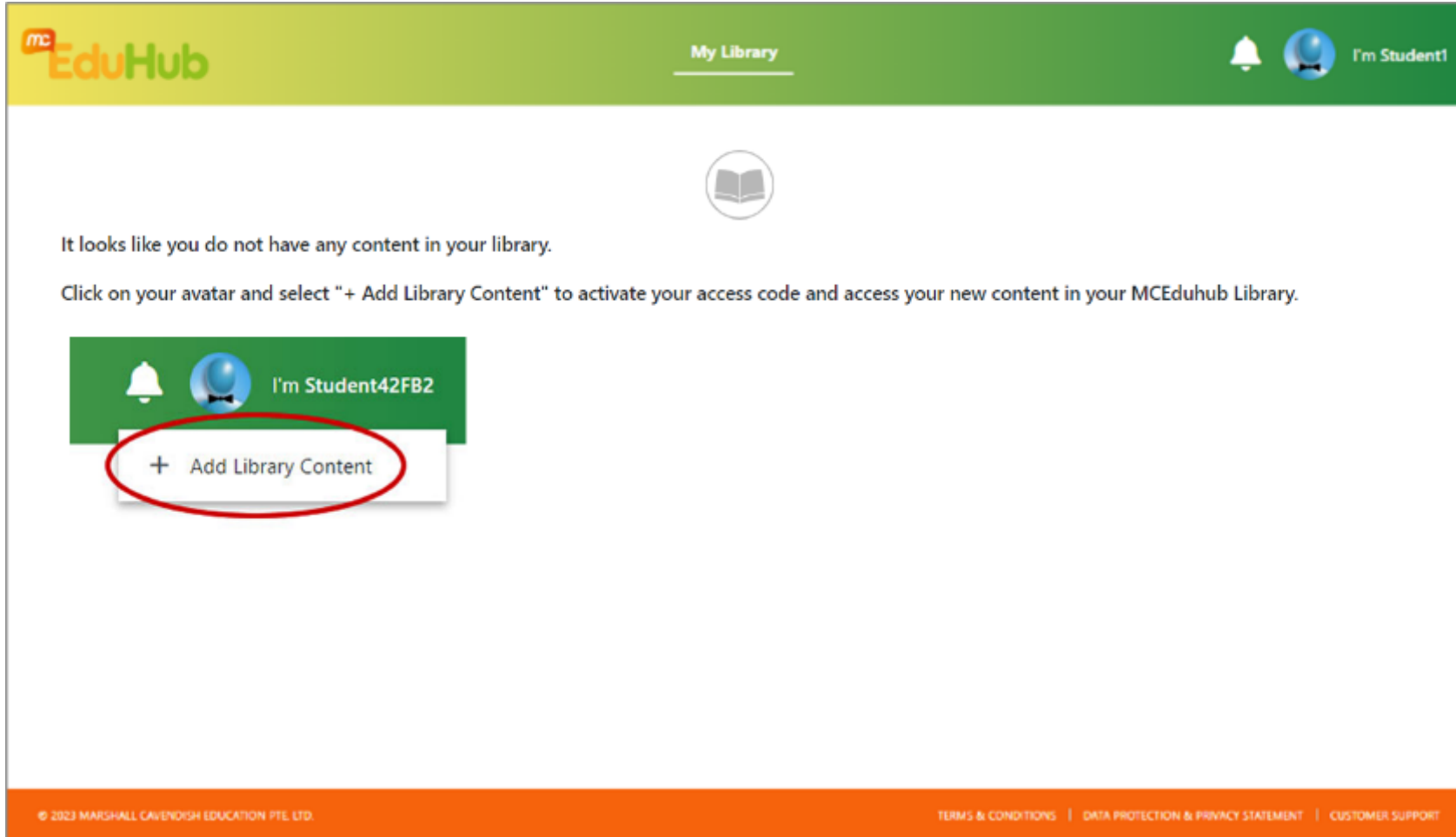
Expand the menu under "Resources" and select "App Library".

Launch MCEduHub App

The screenshot shows the 'Student Learning Space' interface. At the top, there is a search bar labeled 'Search in App Library' with the placeholder text 'Search for resources'. Below the search bar are filters for 'Subject' and 'Level', both set to 'Select Subject' and 'Select Level' respectively. There is also a 'FILTER 2 X' button and an 'APPLY' button. The 'App Library' and 'Apps' tabs are visible. The 'Search Results' section shows 'Sort by Latest' and 'View by' options. Under the 'Apps' section, the 'MCEduHub App' is listed with a red arrow pointing to its icon.

Click on the MCEduHub app icon in the list of apps shown below to launch it.

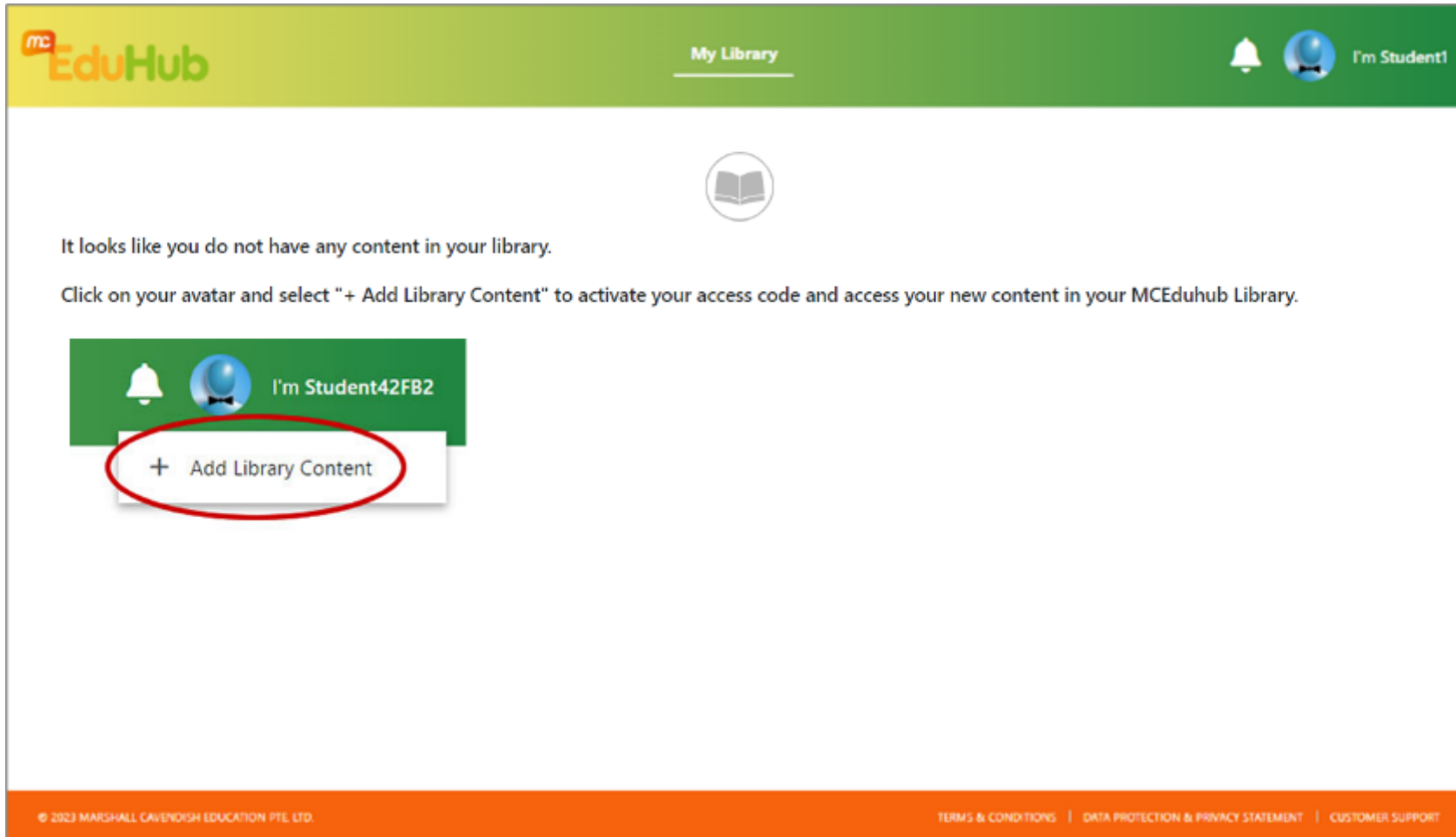
App Opens in a New Tab



MCEduHub App will launch in a new browser tab.

How to redeem your access codes

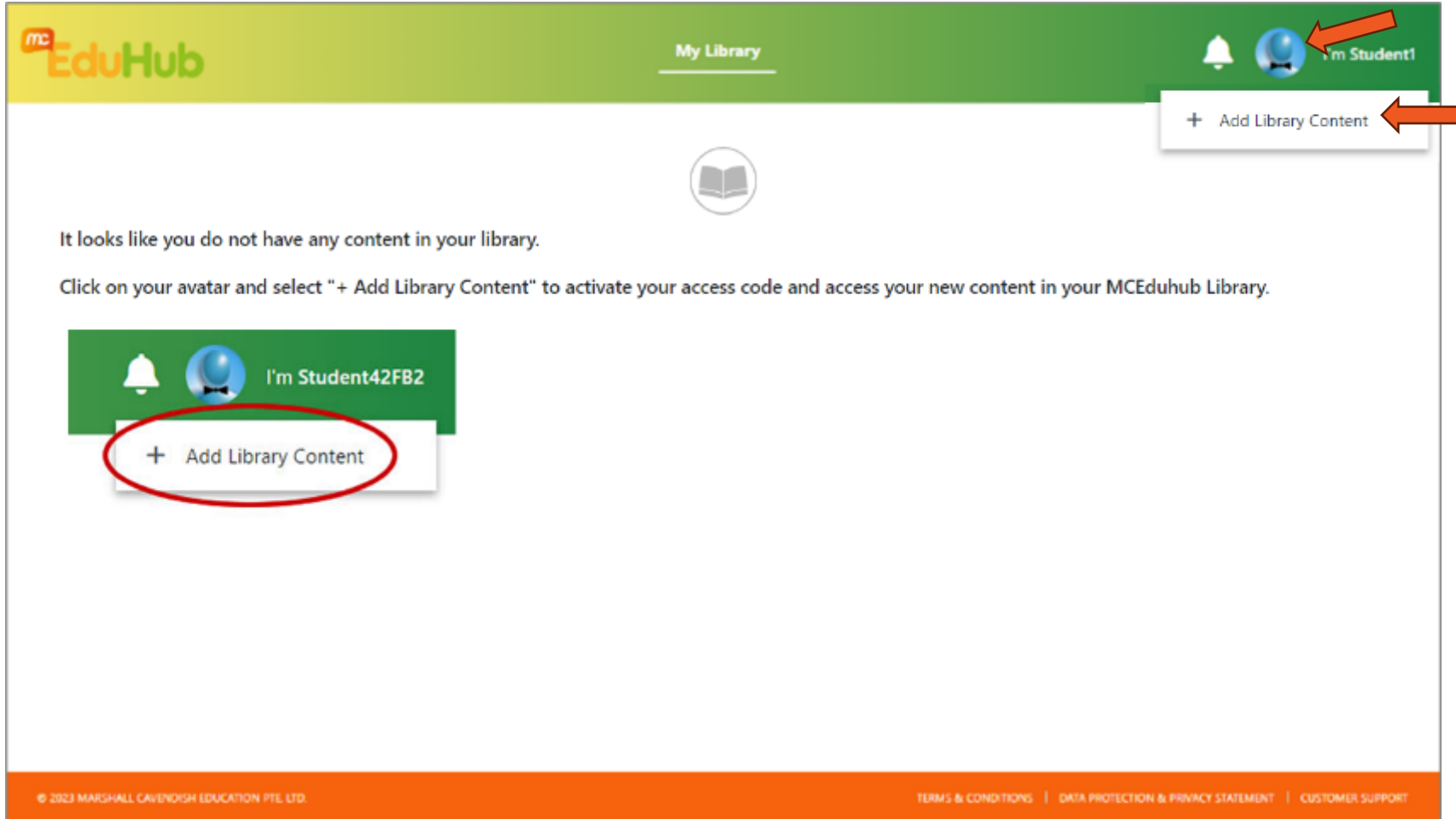
MCEduHub Library



Upon initial login, your MCEduHub Library will be empty.

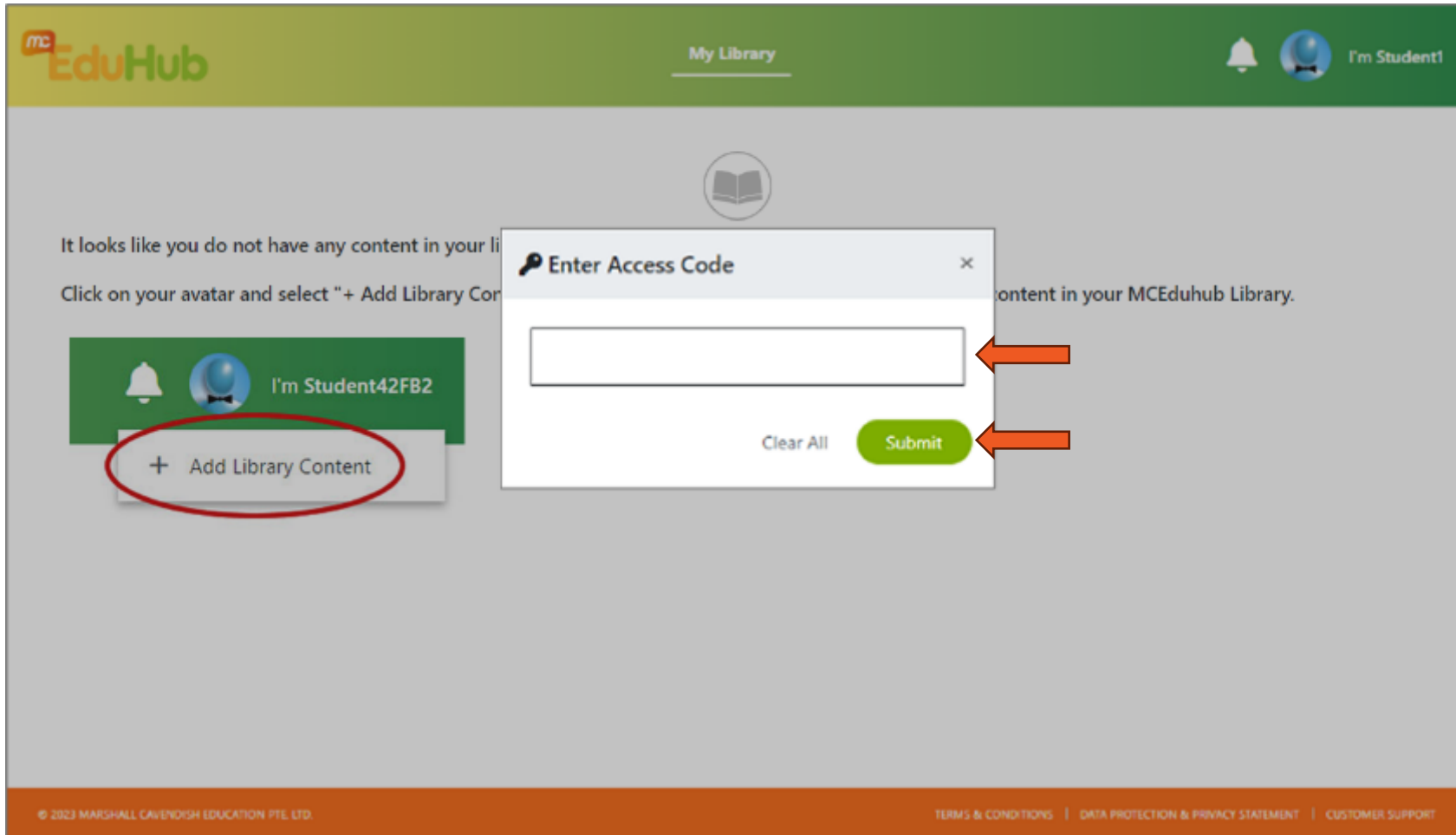
A message will be displayed to show you how to activate your access code.

Add Library Content



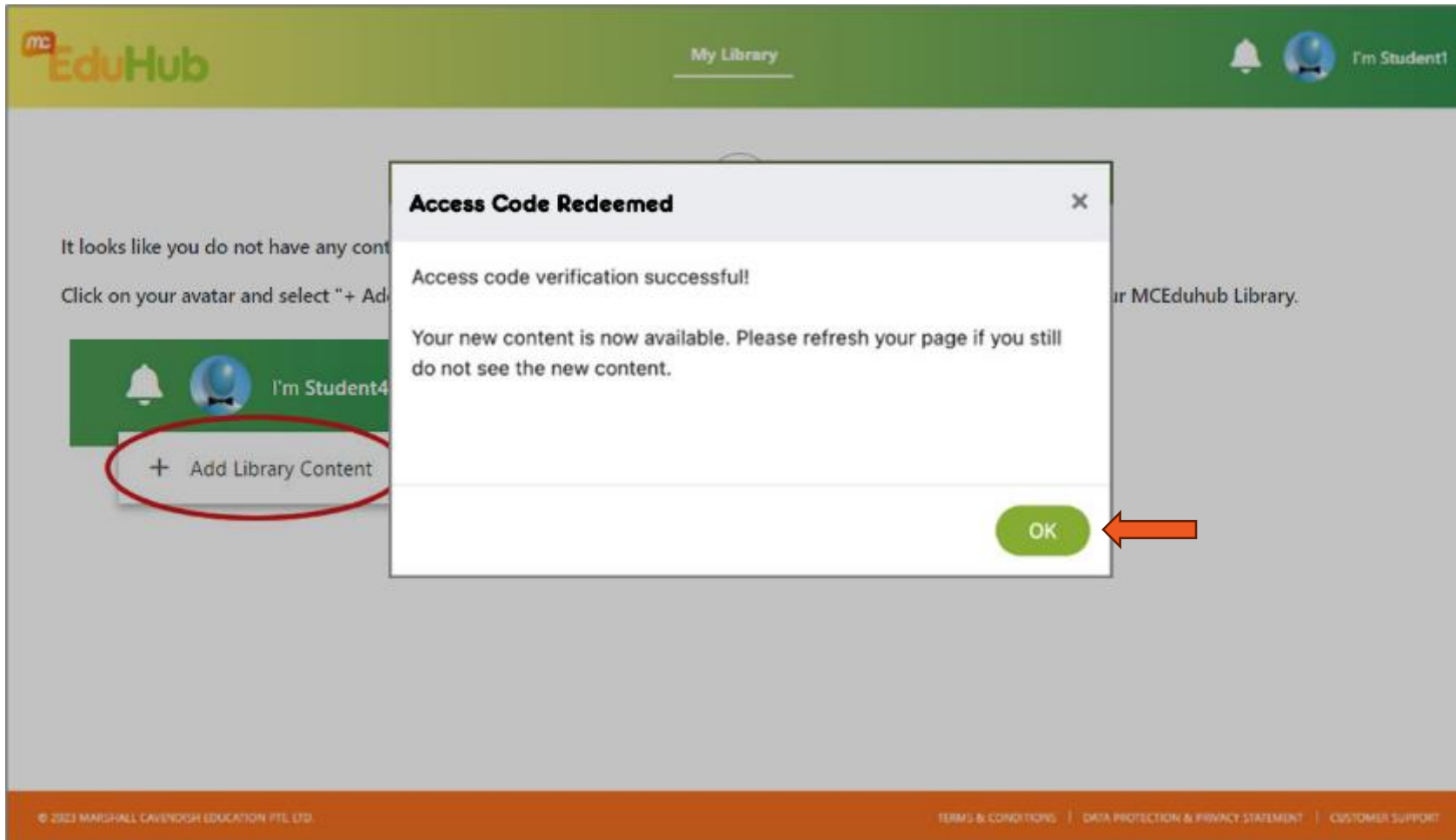
Click on your avatar at the top right-hand corner and select "+Add Library Content"

Enter Access Code



Enter your Access Code in the pop-up and click "Submit".

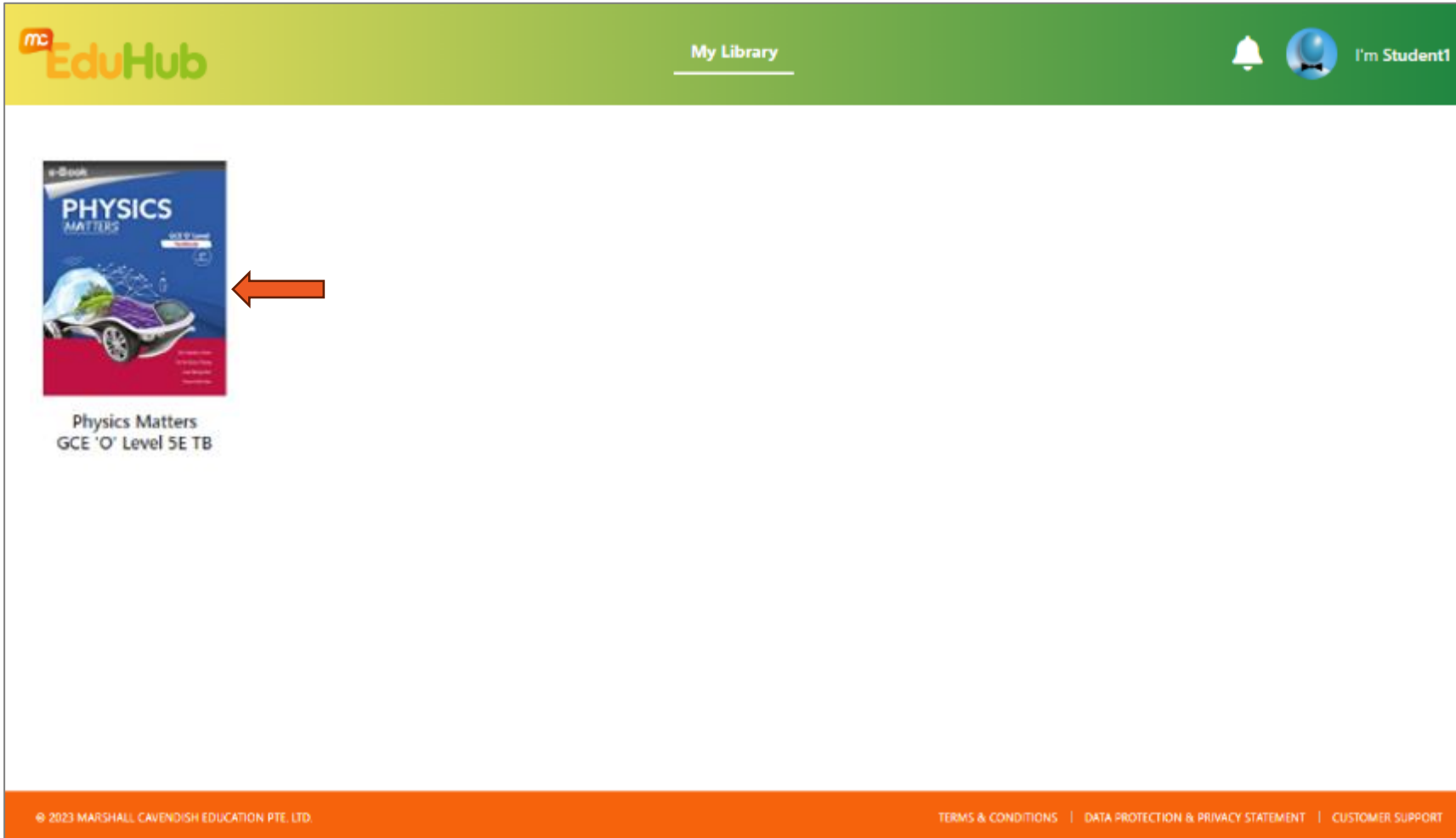
Successful Activation



Upon successful access code activation, a success message will be displayed.

Click "OK" to proceed.

View Available eBooks in MCEduHub Library

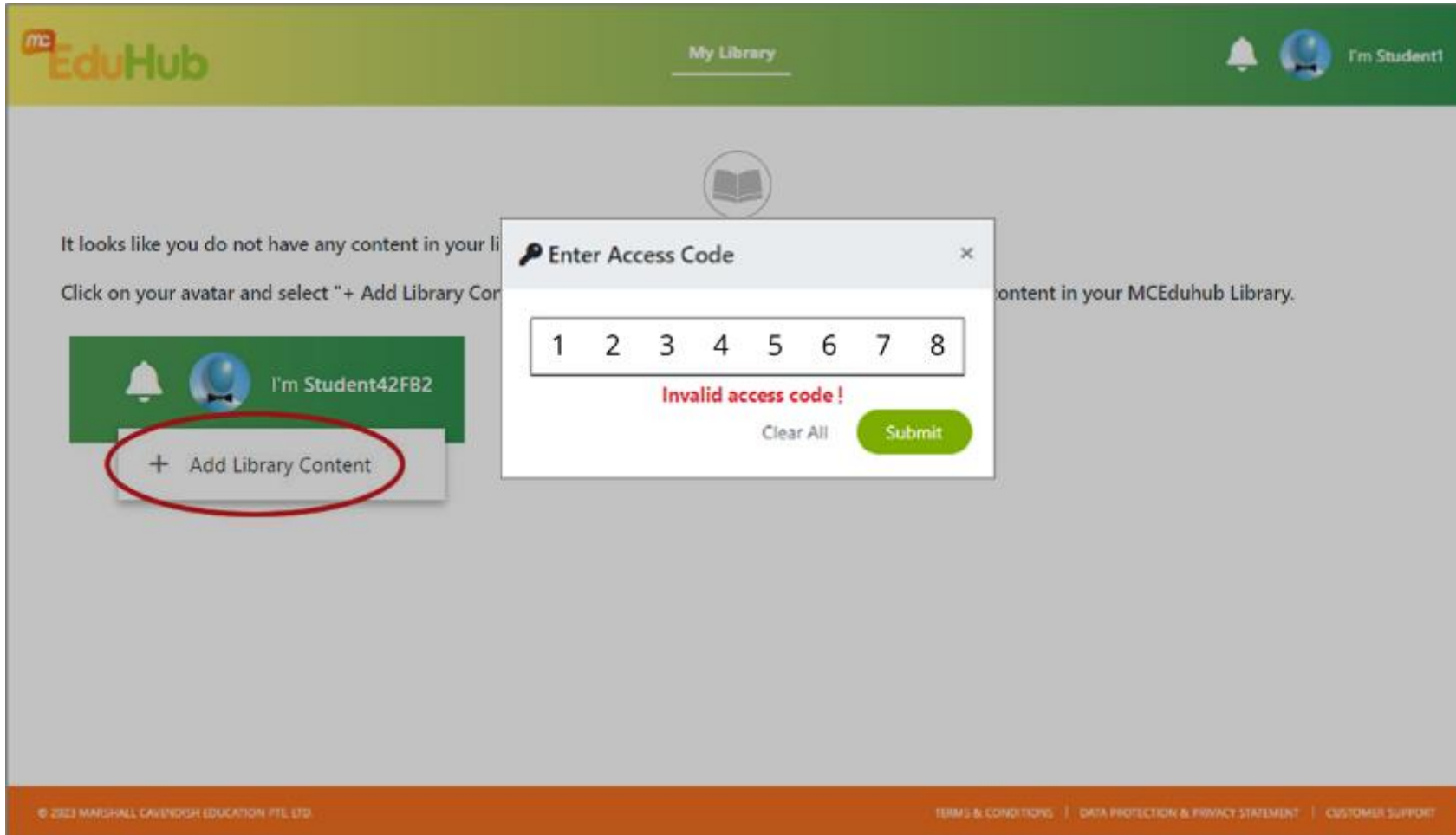


The screenshot displays the MCEduHub library interface. At the top, there is a green header with the 'mc EduHub' logo on the left, 'My Library' in the center, and a notification bell, a user profile icon, and the text 'I'm Student1' on the right. Below the header, a book cover for 'Physics Matters' is shown. The cover features a blue background with a car and a globe, and the text 'e-Book', 'PHYSICS MATTERS', and 'GCE 'O' Level 5E TB'. An orange arrow points to the book cover. At the bottom of the page, there is an orange footer with the text '© 2023 MARSHALL CAVENDISH EDUCATION PTE. LTD.' on the left and 'TERMS & CONDITIONS | DATA PROTECTION & PRIVACY STATEMENT | CUSTOMER SUPPORT' on the right.

All your activated eBook(s) will be shown here and can be accessed for the duration of the subscription period.

Click on the eBook icon to launch the eBook.

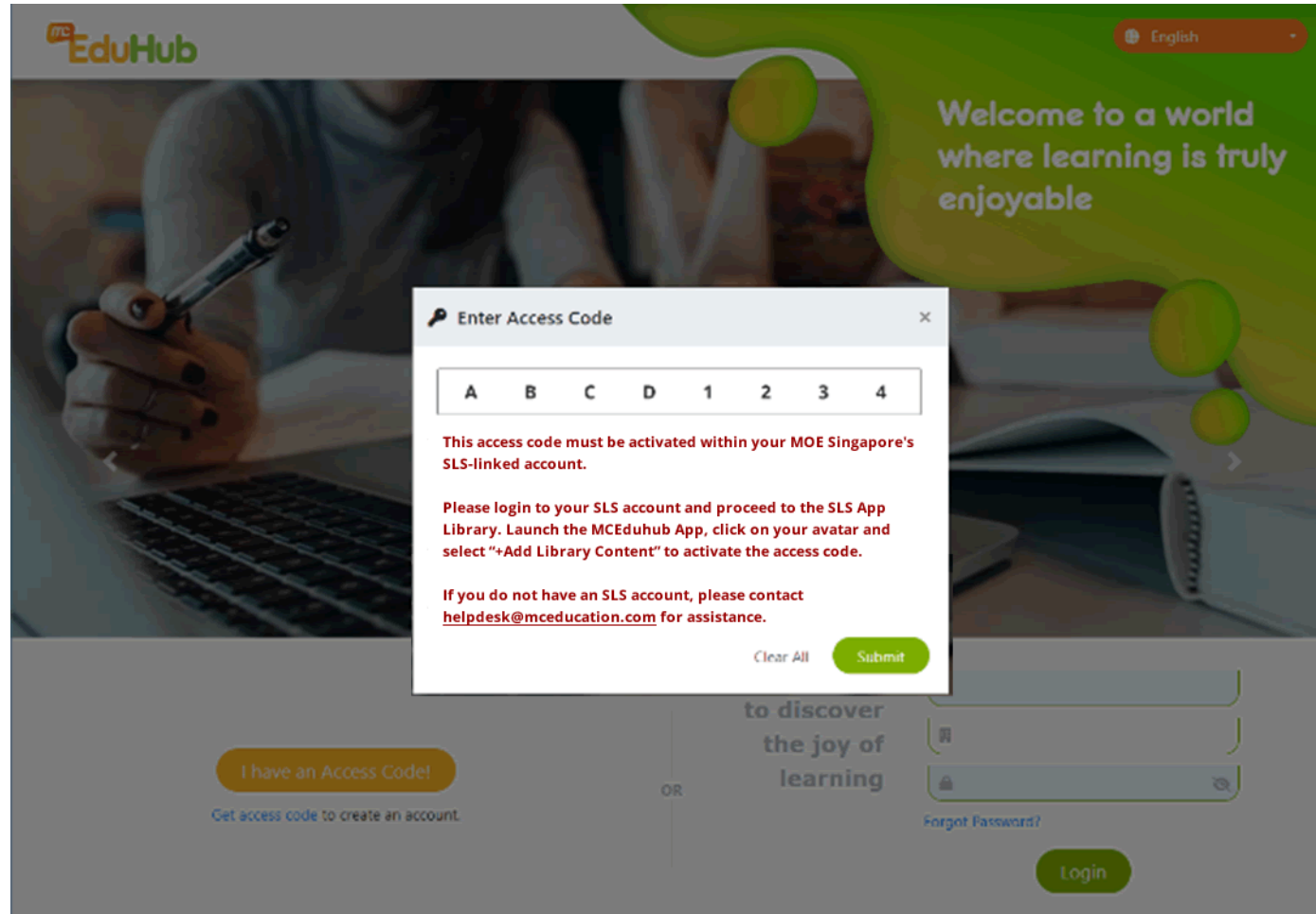
Unsuccessful Activation



If you receive an "Invalid access code!" error, please verify that the correct access code has been entered.

Otherwise, email helpdesk@mceducation.com with the access code so that we may investigate further.

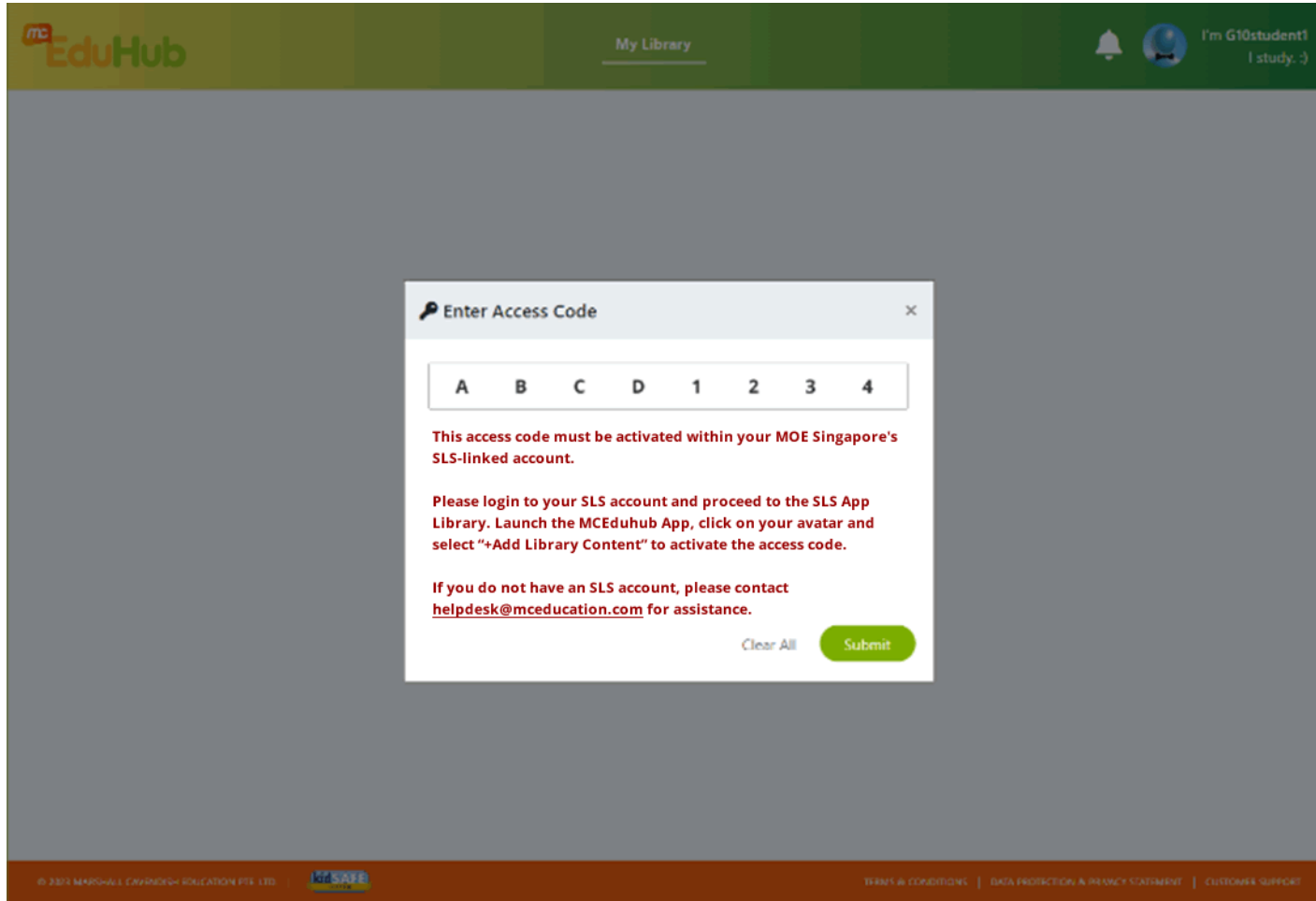
Attempting to Activate SLS-based Access Codes on MCEduHub Login Page



The access codes for eBooks used by MOE schools in Singapore can only be activated in the MCEduHub app in the SLS App Library.

Attempting to activate them directly on the MCEduHub login page will result in this error.

Attempting to Activate SLS-based Access Codes from Non-SLS MCEduHub Account



Similarly, if you log in directly to your MCEduHub account and attempt to activate SLS-based access codes, you will receive the same error as shown.

These access codes can only be activated within your SLS-linked account via the MCEduHub app in the SLS App Library.

Launch eBook in MCEduHub Library

The screenshot displays the MCEduHub Library interface. At the top, there is a green header with the 'mc EduHub' logo on the left, 'My Library' in the center, and a notification bell, a user profile icon, and the text 'I'm User_HT42FB2' on the right. Below the header, the section is titled 'Student Books (2)'. Two eBook covers are shown side-by-side. The left cover is for 'PHYSICS MATTERS' and the right cover is for 'CHEMISTRY MATTERS'. Both covers are labeled 'e-Book' and 'GCE 'O' Level'. Below each cover, the text reads 'Physics Matters GCE 'O' Level 5E TB' and 'Chemistry Matters GCE 'O' Level 3E TB' respectively. An orange arrow points to the Chemistry Matters eBook cover. At the bottom of the page, there is an orange footer containing the copyright notice '© 2023 MARSHALL CAVENDISH EDUCATION PTE. LTD.', the 'KidSAFE' logo, and links for 'TERMS & CONDITIONS', 'DATA PROTECTION & PRIVACY STATEMENT', and 'CUSTOMER SUPPORT'.

In your MCEduHub Library, click on the icon of the eBook that you want to launch.

Navigate Using the Page Number or the Next & Previous Buttons

Chapter 2 | Newtonian Mechanics Kinematics | Chapter 2

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform accelerations.

Speed

If Usain Bolt were to race against a cheetah in a 100-metre sprint, who would be the winner (Figure 2.1)?




Figure 2.1 Who's the real king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves.

Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

Speed = $\frac{\text{distance travelled}}{\text{time taken}}$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s,

Speed = $\frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m/s.

(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$

(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Average Speed

Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Table 2.1 Results for men's running events at the 2020 Tokyo Olympics

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Lambertus Marcell	Italy	100	9.80	10.2
Andre de Groot	Canada	200	19.67	10.2
Simeon Garbarov	Bulgaria	400	41.85	9.57
Emmanuel Kipkoech Korir	Kenya	800	105.66	7.61

The speeds shown in Table 2.1 are average speeds. Average speed assumes that each athlete ran at the same speed throughout the entire distance.

Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}}$

In reality, the athletes did not run at the same speed throughout their races. The speed at any instant may be different from the speed at another instant. The speed of an object at a particular **instant** is known as its **instantaneous speed**.

Word Alert
Instant: a point in time

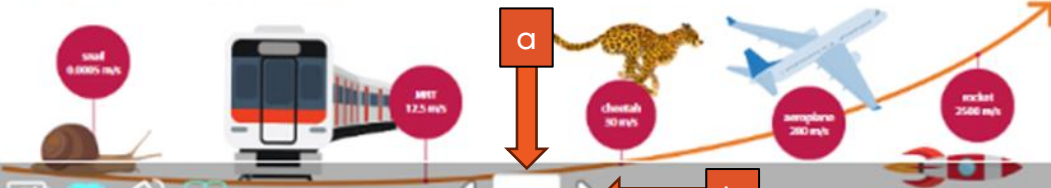


Figure 2.2 Average speeds of various objects

You may navigate to the desired page by using the navigation tools in the Toolbar at the bottom of the Content Player:

(a) Page number box

(b) Next and Previous arrow buttons

View the Page Thumbnails Feature

Chapter 2 | Newtonian Mechanics

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform accelerations.

Speed

If Usain Bolt were to race against a cheetah in a 100-metre sprint, who would be the winner (Figure 2.1)?

Figure 2.1 Which is the real king of speed?

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Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

Speed = $\frac{\text{distance travelled}}{\text{time taken}}$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s,

Speed = $\frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Average Speed

Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Table 2.1 Results for men's running events at the 2020 Tokyo Olympics

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Lambertucci	Italy	100	9.80	10.2
Andre de Groot	Canada	200	19.67	10.2
Simeon Garbarino	Romania	400	41.85	9.53
Emmanuel Kipkurui Kosgei	Kenya	800	205.66	3.91

The speeds shown in Table 2.1 are average speeds. Average speed assumes that each athlete ran at the same speed throughout the entire distance.

Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}}$

In reality, the athletes did not run at the same speed throughout their races. The speed at one instant may be different from the speed at another instant. The speed of an object at a particular instant is known as its instantaneous speed.

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m/s.
(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$
(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Word Alert

Instant: a point in time

Figure 2.2 Average speeds of various objects

Figure 2.2 Average speeds of various objects

snail 0.0005 m/s

train 125 m/s

cheetah 30 m/s

airplane 280 m/s

rocket 2500 m/s

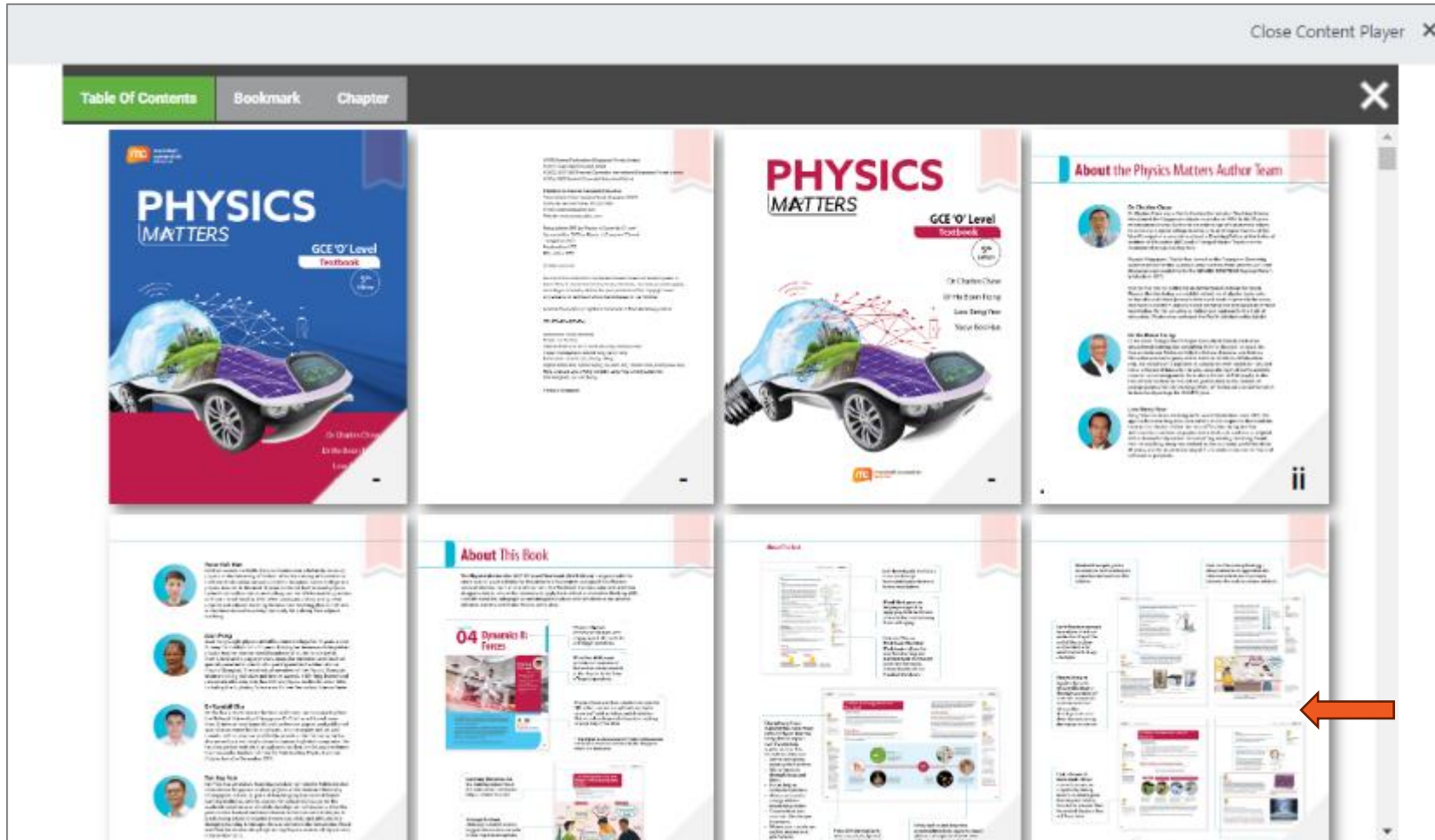
Page navigation bar: 18

Page thumbnails icon highlighted with a red circle and arrow.

Alternatively, you may activate the Page Thumbnails feature to facilitate page navigation.

Click on the  icon at the bottom right of the Tools menu below.

Navigate Using the Page Thumbnails



Scroll through the page thumbnails to locate the correct page.

Click on the correct page thumbnail to jump directly to that page.

How to use the eBook annotation tool

Access the eBook Annotation Tool

Chapter 2 | Newtonian Mechanics Kinematics | Chapter 2

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform accelerations.

Speed

If Usain Bolt were to race against a cheetah in a 100-metre sprint, who would be the winner (Figure 2.1)?




Figure 2.1 Who's the real king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves.

Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

Speed = $\frac{\text{distance travelled}}{\text{time taken}}$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s,

Speed = $\frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m/s.

(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$

(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Average Speed

Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Table 2.1 Results for men's running events at the 2020 Tokyo Olympics

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Lambertus Marcell	Italy	100	9.80	10.2
Andre de Grasse	Canada	200	19.67	10.2
Simeon Garbarino	Romania	400	41.85	9.57
Emmanuel Kipkandie Koei	Kenya	800	105.66	7.61


The speeds shown in Table 2.1 are average speeds. Average speed assumes that each athlete ran at the same speed throughout the entire distance.


Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}}$

In reality, the athletes did not run at the same speed throughout their races. The speed at one instant may be different from the speed at another instant. The speed of an object at a particular **instant** is known as its **instantaneous speed**.

Word Alert
Instant: a point in time

Figure 2.2
Average speeds of different objects



After you have launched the eBook via MCEduHub Library, click on the Annotation icon  in the toolbar below.

Use the Annotation Toolbar

Chapter 2 | Newtonian Mechanics

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Integrate given examples of non uniform acceleration.

Speed

if that's not wise to race against a cheetah in a 100-metre sprint, who would be the winner (Figure 2.1)?

Figure 2.1 Who is the real king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves. Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

Speed = distance travelled / time taken

Based on Usain Bolt's 100-metre fastest record time of 9.58 s, ...

Average Speed

Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Table 2.1 Results for men's running events at the 2020 Tokyo Olympics

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Lawrence Mwaniti	Rwanda	100	9.88	10.2
Andrei de Gasse	Canada	200	19.67	10.2
Silverio Gardiner	Bahamas	400	43.85	9.12
Emanuel Akyeampong	Korea	800	105.96	7.61

The speeds shown in Table 2.1 are average speeds. Average speed assumes that each athlete ran at the same speed throughout the entire distance.

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m/s.
(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer:

(a) Average speed = total distance travelled / total time taken = 6 x 1000 m / 5 x 60 s = 20 m/s

(b) No. The car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Figure 2.2

small 0.465 m/s
AMT 12.5 m/s
cheetah 30 m/s
airplane 280 m/s
rocket 2500 m/s

To begin annotation:

1) Firstly, select the Pen type – Thin Pen  / Thick Pen 

2) Then, select the freeform or standard shape required



3) Select the preferred pen colour 

Inline Text Highlighting and Freeform Drawing/Writing

Chapter 2 | Newtonian Mechanics

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform acceleration.

Speed

If Usain Bolt were to race against a cheetah in a 100 metre sprint, who would be the winner? (Figure 2.1)

Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

For a cheetah Bolt:
speed = $\frac{\text{distance travelled}}{\text{time taken}} = \frac{100\text{ m}}{3.5\text{ s}} = 28.6\text{ m/s}$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Sio		100	9.80	10.2
Yin		200	19.62	10.2
Bin		400	41.80	9.57
Emmanuel Ugwu	Nigeria	800	105.06	7.61

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m/s.
(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?





Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000\text{ m}}{5 \times 60\text{ s}} = 20\text{ m/s}$

(b) No. The car's average speed of 20 m/s is lower than the cheetah's average speed of 28 m/s.

Figure 2.2 Average speeds of various objects or animals

- snail 0.0003 m/s
- AMT 12.5 m/s
- cheetah 30 m/s
- airplane 280 m/s
- rocket 2600 m/s

- 1) Use a combination of the Thick Pen  and Straight Line  to perform Inline Text Highlighting.
- 2) Use a combination of the Thin Pen  and Freeform Tool  to perform Freeform Drawing or Writing. This is best utilised with a stylus pen on touchscreen devices.

The Textbox, Move & Erase Tools

Chapter 2 | Newtonian Mechanics

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Integrate given examples of non uniform acceleration.

Speed

if that's all we use to race against a cheetah in a 100-metre sprint, who would be the winner (Figure 2.1)?

Figure 2.1 Who is the real king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves.

Speed is the distance travelled per unit time. Its SI unit is m s^{-1} .

Speed = $\frac{\text{distance travelled}}{\text{time taken}}$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s,
Speed = $\frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m s}^{-1}$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Average Speed

Table 2.1 shows the results for men's running events at the 2000 Sydney Olympics.

Table 2.1 Results for men's running events at the 2000 Sydney Olympics

Athlete	Country	Dist / m	Time / s	Average Speed / m s^{-1}
Jacobs Leonard Morosi	Rwanda	100	9.88	10.2
Anden de Casson	Canada	200	19.67	10.2
Silverio Gardiner	Bahamas	400	43.85	9.12
Emanuel Bikapindi Koki	Kenya	800	105.96	7.61

The speeds shown in Table 2.1 are average speeds. **Average speed** assumes that each athlete ran at the same speed throughout the entire distance.

Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}}$

In reality, the athletes did not run at the same speed throughout their races. The speed of an object at a particular **instant** is known as its **instantaneous speed**.

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m s^{-1} .

(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer:





(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m s}^{-1}$

(b) No. The car's average speed of 20 m s^{-1} is lower than the cheetah's average speed of 30 m s^{-1} .

Figure 2.2 Average speeds of different objects or animals.

Annotations on the page:

- Move**: Points to the 'Speed' definition text.
- Textbox**: Points to the 'Speed' definition text.
- Erase**: Points to the 'Speed' definition text.
- Close**: Points to the 'Close Content Player' icon.

- 1) For non-touchscreen devices, you may opt to use the Textbox tool  to ensure text legibility.
- 2) Annotations can be moved using the Move tool  and can be erased using the Erase tool .
- 3) To save your annotations, you must click on the Close icon  at the bottom right-hand of the Annotation Tool.

How to Add a Whiteboard

Add a Whiteboard

The screenshot shows an eBook page titled "2.1 What Are Speed, Velocity and Acceleration?". A context menu is open over the page, with "Add Whiteboard" highlighted. The menu options are: Add Whiteboard, Add Note, Add URL, Zoom, and Copy Page URL. The eBook content includes learning outcomes, a table of average speeds for athletes at the 2020 Tokyo Olympics, and a worked example.

Chapter 2 | Newtonian Mechanics Kinematics | Chapter 2

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and change in velocity / time taken.
- Interpret given examples of non-uniform acceleration.

Speed

Speed is the distance travelled per unit time. Its speed = $\frac{\text{distance travelled}}{\text{time taken}}$.

Based on Usain Bolt's 100 metre fastest record time of 9.58 s, Speed = $\frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$.

Compare this with the cheetah's average running speed shown in Figure 2.2.

Average Speed

Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Lambertus Marcel	Italy	100	9.80	10.2
Andre de Grasse	Canada	200	19.67	10.2
Simeon Garbarov	Bulgaria	400	41.85	9.57
Emmanuel Kipketer Koei	Kenya	800	101.66	7.87

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m/s.
(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$
(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

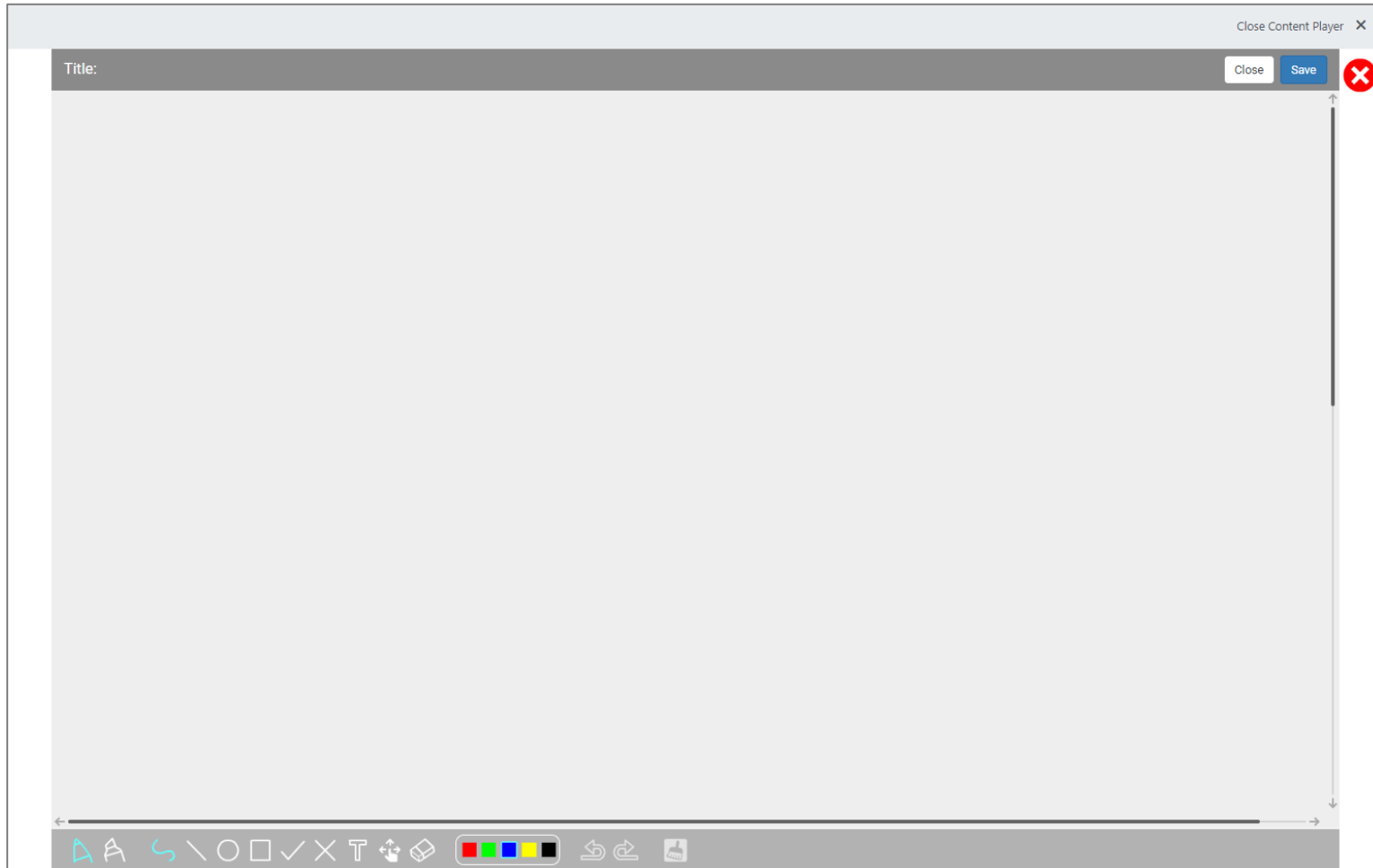
Figure 2.2 Average speeds of different objects

Object	Speed
snail	0.0005 m/s
train	125 m/s
cheetah	30 m/s
airplane	200 m/s
rocket	2500 m/s

On the eBook page, right-click to activate the Options Menu, and then left-click on "Add Whiteboard".

The Add Whiteboard tool allows teachers to write and draw during lessons just like a normal whiteboard.

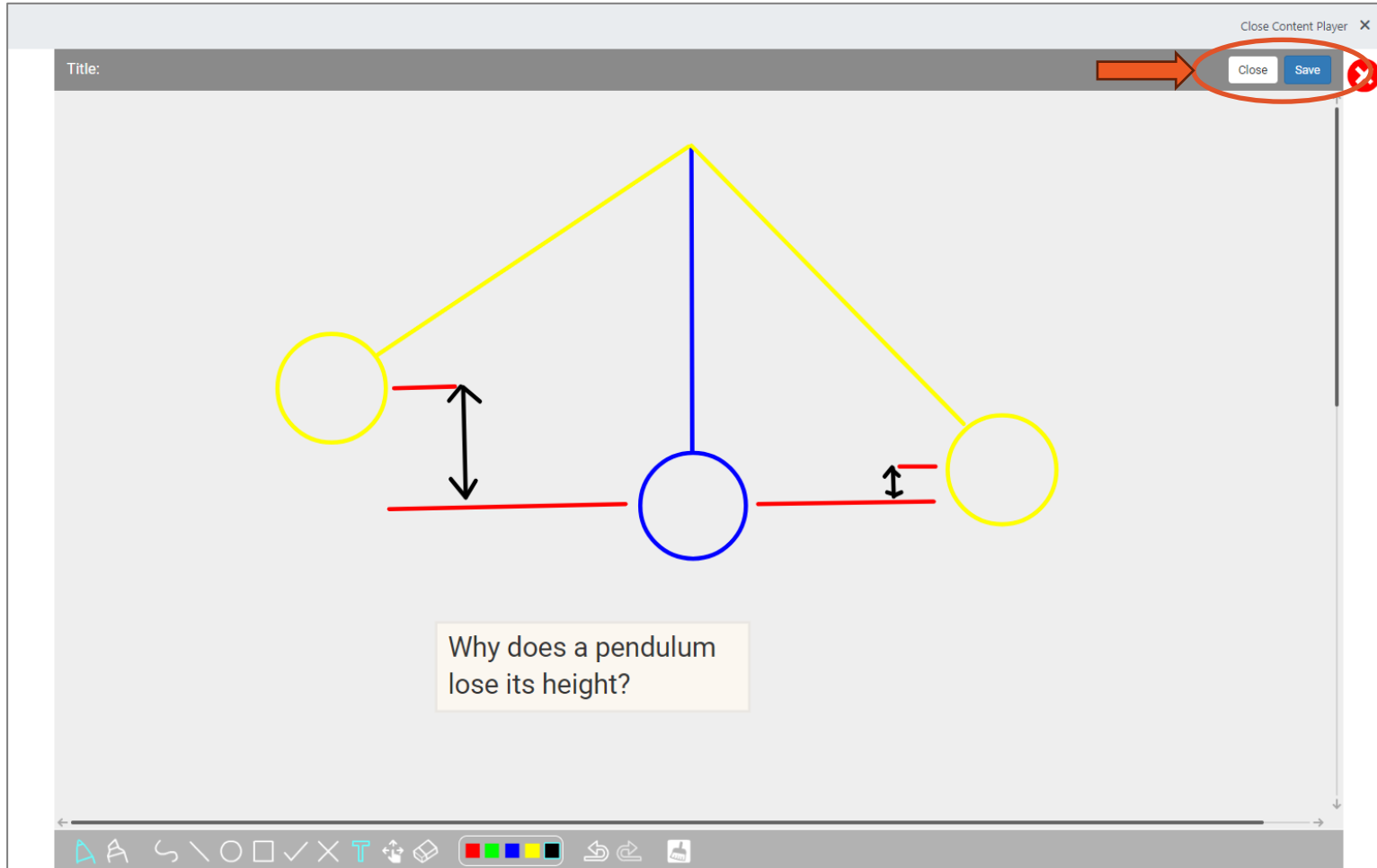
Add a Whiteboard



A full screen whiteboard will be displayed containing the exact same tools as the eBook annotation tools.

You may refer to the section ["How to use the eBook annotation tool"](#) for further details.

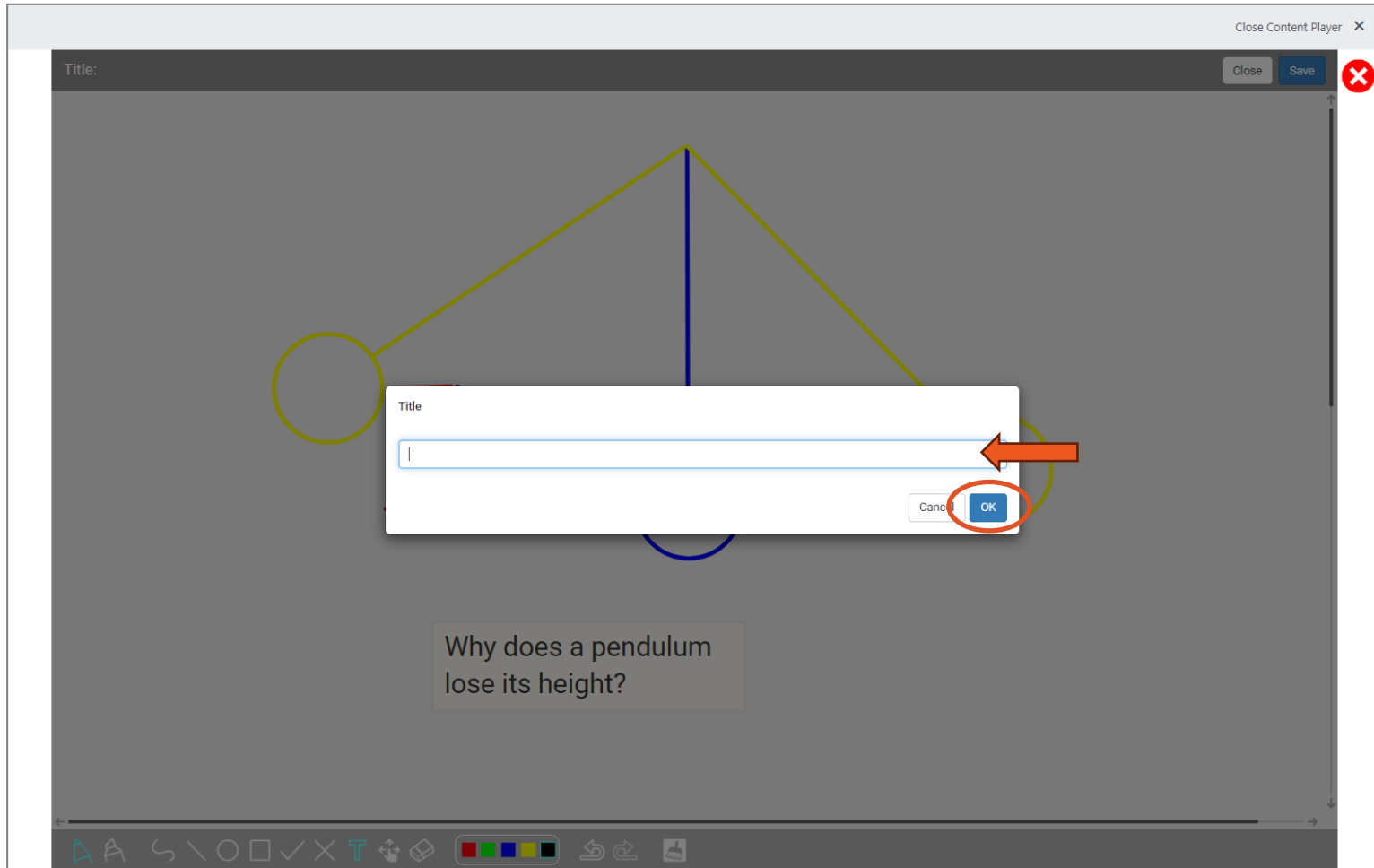
Save or Discard Your Whiteboard



Once you have completed your whiteboard drawing, click "Save" to save the whiteboard onto your eBook page.

Click "Close" to discard it.

Name Your Saved Whiteboard



Enter a title for your whiteboard and click "OK".

Access and Edit Your Saved Whiteboard

Chapter 2 | Newtonian Mechanics

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform accelerations.

Speed

If Usain Bolt were to race against a cheetah in a 100-metre sprint, who would be the winner (Figure 2.1)?

Figure 2.1 Who's the real king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves. Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

Speed = $\frac{\text{distance travelled}}{\text{time taken}}$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s,

Speed = $\frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Average Speed

Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Table 2.1 Results for men's running events at the 2020 Tokyo Olympics

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Lambertus Marcell	Italy	100	9.90	10.2
Andre de Grasse	Canada	200	19.62	10.2
Simeon Garbarov	Bulgaria	400	41.85	9.53
Emmanuel Kipkoech Korir	Kenya	800	101.66	7.86

The speeds shown in Table 2.1 are average speeds. Average speed assumes that each athlete ran at the same speed throughout the entire distance.

Worked Example 2A

A car travels 6 km in 5 minutes. Calculate its average speed in m/s. Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$

(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Word Alert

Instant: a point in time

Figure 2.2 Average speeds of different objects

snail 0.0005 m/s
BRT 125 m/s
cheetah 30 m/s
airplane 200 m/s
rocket 2500 m/s

Your saved whiteboard(s) will be displayed on the eBook page as a whiteboard icon.

Click on the icon to see a preview of its content and click "Edit" to open the whiteboard in full-screen mode and to make further changes.

Delete Your Saved Whiteboard

Chapter 2 | Newtonian Mechanics Kinematics | Chapter 2

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform accelerations.

Speed

If Usain Bolt were to race against a cheetah in a 100-metre sprint, who would be the winner (Figure 2.1)?

Figure 2.1 Which is the real king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves. Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s,

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Worked Example 2A

A car travels 6 km in 5 minutes. Calculate its average speed in m/s. Is the average speed of a car higher than the cheetah's speed shown in Figure 2.1?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$

(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Figure 2.2 Average speeds of different objects

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Latoum Manville	Italy	100	9.90	10.2
Andre de Grasse	Canada	200	19.67	10.2
Simeon Garhear	Romania	400	41.85	9.57
Emmanuel Kipkoech Korir	Kenya	800	101.66	7.87

Left-click and hold momentarily on the icon. A delete symbol will appear at the top right-hand corner of the icon.

Click on the delete symbol to delete your saved whiteboard.

How to Add a Note

Add a Note

The screenshot shows an eBook page titled "2.1 What Are Speed, Velocity and Acceleration?". A context menu is open over the page, with the "Add Note" option highlighted by a red circle and an arrow. The menu also includes "Add Whiteboard", "Add URL", "Zoom", and "Copy Page URL". The page content includes learning outcomes, a table of average speeds for athletes, and a worked example.

Chapter 2 | Newtonian Mechanics Kinematics | Chapter 2

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and change in velocity / time taken.
- Interpret given examples of non-uniform acceleration.

Speed

Speed is the distance travelled per unit time. Its speed = $\frac{\text{distance travelled}}{\text{time taken}}$.

Based on Usain Bolt's 100 metre fastest record time of 9.58 s, Speed = $\frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$.

Compare this with the cheetah's average running speed shown in Figure 2.2.

Average Speed

Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Table 2.1 Results for men's running events at the 2020 Tokyo Olympics

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Lambertus Marcel	Italy	100	9.80	10.2
Andre de Grasse	Canada	200	19.67	10.2
Simeon Garbarov	Bulgaria	400	41.85	9.57
Emmanuel Kipkoech Korir	Kenya	800	101.66	7.87

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m/s.
(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$
(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Figure 2.2 Average speeds of different objects

snail 0.0005 m/s, BRT 125 m/s, cheetah 30 m/s, aeroplane 200 m/s, rocket 2500 m/s

On the eBook page, right-click to activate the Options Menu, and then left-click on "Add Note".

The Add Note tool allows users to add post-it notes in multiple places in the eBook.

Add a Note

The screenshot shows a digital textbook page titled "2.1 What Are Speed, Velocity and Acceleration?". The page includes a "Learning Outcomes" section with three bullet points, a "Table 2.1 Results for men's 100m running events at the 2020 Tokyo Olympics" with columns for Athlete, Country, Event / m, Time / s, and Average Speed / m/s. Below the table is a "Helpful Note" section. A white popup box is overlaid on the page, containing a large empty text area and two buttons: "Close" and "Save". An orange arrow points to the "Save" button. The background page also features a "Figure 2.2 Average speeds of various objects" with a speedometer-like graphic showing speeds for a snail (0.005 m/s), MRT (125 m/s), cheetah (30 m/s), airplane (280 m/s), and rocket (2500 m/s).

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Latvala	Italy	100	9.80	10.2
Andre de Groot	Canada	200	19.62	10.2
Simeon Gaidarov	Bulgaria	400	41.85	9.32

A popup textbox will appear. Type your note and click "Save" to save the note.

Or click "Close" to discard it.

Access and Edit Your Saved Note

The screenshot shows an eBook page titled "2.1 What Are Speed, Velocity and Acceleration?". The page content includes learning outcomes, a disciplinary idea, a helpful note, and a table of average speeds for various athletes. Annotations include a callout box with the text "A characteristic or property of an object that can be measured or calculated from other measurements." pointing to the "Speed" definition, and two red circles with arrows pointing to "Edit" and "Note" icons.

Chapter 2 | Newtonian Mechanics Kinematics | Chapter 2

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform accelerations.

Disciplinary Idea
Motion and energy make up the universe.

Speed
If Usain Bolt were to race against a cheetah in a 100-metre sprint, who would be the winner (Figure 2.1)?

Figure 2.1 Which is the real king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves.

Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

Speed = $\frac{\text{distance travelled}}{\text{time taken}}$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s,
Speed = $\frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Average Speed
Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Table 2.1 Results for men's running events at the 2020 Tokyo Olympics

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Leonard Morill	Italy	100	9.90	10.2
Andre de Grasse	Canada	200	19.62	10.2
Simeon Garoos	Rubens	400	41.85	9.57
Emmanuel Kipkoech Kor	Kenya	800	101.66	7.87

The speeds shown in Table 2.1 are average speeds. Average speed assumes each athlete ran at the same speed throughout the entire distance.

Word Alert
Instant: a point in time

Figure 2.2 Average speeds of different objects

snail 0.0005 m/s
BRT 125 m/s
cheetah 30 m/s
aeroplane 200 m/s
rocket 2500 m/s

Your saved note(s) will be displayed on the eBook page as a note icon.

Click on the icon to see a preview of its content and click "Edit" to open the note in full and to make further changes.

Delete Your Saved Note

The screenshot shows a digital textbook page titled "2.1 What Are Speed, Velocity and Acceleration?". The page includes sections for "Learning Outcomes", "Speed", "Average Speed", and "Worked Example 2A". A red circle highlights a delete icon (a blue square with a white 'X') in the bottom right corner of the page. An orange arrow points from the delete icon to the "Worked Example 2A" section. The page also features a "Word Alert" icon and a "Close Content Player" button in the top right corner.

Chapter 2 | Newtonian Mechanics

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using $\text{distance travelled} / \text{time taken}$.
- State what is meant by uniform acceleration and calculate the value of acceleration using $\text{change in velocity} / \text{time taken}$.
- Interpret given examples of non-uniform accelerations.

Speed

If Usain Bolt were to race against a cheetah in a 100-metre sprint, who would be the winner? (Figure 2.1)

Figure 2.1 Who's the real king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves. Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s,

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Average Speed

Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Table 2.1 Results for men's running events at the 2020 Tokyo Olympics

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Lambertucci	Italy	100	9.80	10.2
Andre de Groot	Canada	200	19.67	10.2
Steven Gardiner	Bahamas	400	41.85	9.57
Emmanuel Kipkoech Korir	Kenya	800	101.66	7.87

The speeds shown in Table 2.1 are average speeds. Average speed assumes that each athlete ran at the same speed throughout the entire distance.

Worked Example 2A

A car travels 6 km in 5 minutes. Calculate its average speed in m/s. Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$

(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Figure 2.2 Average speeds of various objects

snail 0.0005 m/s, snail, train 125 m/s, cheetah 30 m/s, aeroplane 200 m/s, rocket 2500 m/s

Left-click and hold momentarily on the icon. A delete symbol will appear at the top right-hand corner of the icon.

Click on the delete symbol to delete your saved note.

How to Add a URL

Add a URL

The screenshot shows an eBook page titled '2.1 What Are Speed, Velocity and Acceleration?' from 'Chapter 2 | Newtonian Mechanics'. The page contains text, a table of athlete results, and a diagram of average speeds. An options menu is overlaid on the page, with 'Add URL' highlighted by an orange oval and an arrow. The menu also includes 'Add Whiteboard', 'Add Note', 'Zoom', and 'Copy Page URL'. The page number '18' is visible at the bottom.

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Lambertucci	Italy	100	9.80	10.2
Andre de Grasse	Canada	200	19.67	10.2
Steven Gardiner	Bahamas	400	41.85	9.37
Emmanuel Kipkoech Korir	Kenya	800	101.66	7.87

Object	Speed (m/s)
snail	0.0005
BRT	12.5
cheetah	30
airplane	200
rocket	2500

On the eBook page, right-click to activate the Options Menu, and then left-click on “Add URL”.

The Add URL tool allows users to add external web links.



Add a URL

Chapter 2 | Newtonian Mechanics

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.

Web Link

Name / Description
Kahoot!

URL
https://kahoot.com/

Cancel OK

Average Speed
Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Latvala	Finland	100	9.58	10.4
Andre de Groot	Canada	200	19.62	10.2

Figure 2.2
Average speeds of various objects

snail 0.0005 m/s
bullet 125 m/s
cheetah 30 m/s
airplane 280 m/s
rocket 2500 m/s

A popup textbox will appear. Enter the name and the URL of the web link and click "OK" to save the URL.

Or click "Cancel" to discard it.

Launch Your Saved URL

Chapter 2 | Newtonian Mechanics

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform accelerations.

Speed

If Usain Bolt were to race against a cheetah in a 100-metre sprint, who would be the winner? (Figure 2.1)




Figure 2.1 Who's the real king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves.

Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s,

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Average Speed

Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Table 2.1 Results for men's running events at the 2020 Tokyo Olympics

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Leonard Marcel	Italy	100	9.90	10.2
Andre de Grasse	Canada	200	19.67	10.2
Simeon Garibayev	Rubaniya	400	41.85	9.57
Emmanuel Kipkoech Korir	Kenya	800	101.66	7.87

The speeds shown in Table 2.1 are average speeds. **Average speed** assumes that each athlete ran at the same speed throughout the entire distance.

Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}}$

In reality, the athletes did not run at the same speed throughout their races. The speed at one instant may be different from the speed at another instant. The speed of an object at a particular **instant** is known as its **instantaneous speed**.

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m/s.
(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$
(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Word Alert
Instant: a point in time

Figure 2.2 Average speeds of different objects




Figure 2.2 Average speeds of different objects

Your saved URL(s) will be displayed on the eBook page as a URL icon.

Click on the icon to launch the external site in a new tab.

Delete Your Saved URL

The screenshot shows a digital textbook page with the following content:

- Chapter 2 | Newtonian Mechanics** (top left)
- KINEMATICS | Chapter 2** (top right)
- 2.1 What Are Speed, Velocity and Acceleration?** (main heading)
- Learning Outcomes:**
 - State what is meant by speed and velocity.
 - Calculate average speed using distance travelled / time taken.
 - State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
 - Interpret given examples of non-uniform accelerations.
- Speed:** A section discussing Usain Bolt's 100m race and comparing it to a cheetah's speed.
- Figure 2.1:** A photograph of Usain Bolt running.
- Figure 2.2:** A diagram showing average speeds of various objects: snail (0.0005 m/s), train (125 m/s), cheetah (30 m/s), aeroplane (200 m/s), and rocket (2500 m/s).
- Table 2.1:** Results for men's running events at the 2020 Tokyo Olympics.
- Worked Example 2A:** A problem involving a car's average speed.
- Word Alert:** A note about the word 'instant'.
- WWW icon:** A red 'X' is placed over the WWW logo in the bottom right corner of the page content.

Left-click and hold momentarily on the icon. A delete symbol will appear at the top right-hand corner of the icon.

Click on the delete symbol to delete your saved note.

How to use the Zoom tool

Access the Zoom Tool

The screenshot shows an eBook page titled "2.1 What Are Speed, Velocity and Acceleration?". A context menu is open over the page, with the "Zoom" option highlighted by a red circle and an orange arrow. The menu options are: Add Whiteboard, Add Note, Add URL, Zoom, and Copy Page URL. The eBook page content includes a table of results for men's running events at the 2020 Tokyo Olympics, a worked example, and a diagram showing average speeds of various objects.

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Lambertucci	Italy	100	9.80	10.2
Andre de Groot	Canada	200	19.67	10.2
Simeon Carstensen	Romania	400	41.85	9.57
Emmanuel Kipkoech Korir	Kenya	800	101.66	7.87

Worked Example 2A
A car travels 6 km in 5 minutes.
(a) Calculate its average speed in m/s.
(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer
(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$
(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Figure 2.2 Average speeds of various objects

Object	Average Speed
snail	0.0005 m/s
train	125 m/s
cheetah	30 m/s
airplane	200 m/s
rocket	2500 m/s

On the eBook page, right-click to activate the Options Menu, and then left-click on "Zoom".

The Zoom tool allows users to zoom in on a specific area on the page in the eBook.

Select the Zoom Area

Chapter 2 | Newtonian Mechanics

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform accelerations.

Speed

If Usain Bolt were to race against a cheetah in a 100-metre sprint, who would be the winner (Figure 2.1)?




Figure 2.1 Who's the real king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves.

Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s,

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Average Speed

Table 2.1 shows the results for men's running events at the 2020 Tokyo Olympics.

Table 2.1 Results for men's running events at the 2020 Tokyo Olympics

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Leonard Morill	Italy	100	9.90	10.2
Andre de Grasse	Canada	200	19.67	10.2
Simeon Garbarov	Bulgaria	400	41.85	9.57
Emmanuel Kipkoech Korir	Kenya	800	101.66	7.87

The speeds shown in Table 2.1 are average speeds. **Average speed** assumes that each athlete ran at the same speed throughout the entire distance.

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m/s.
(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.1?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$
(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Word Alert
Instant: a point in time

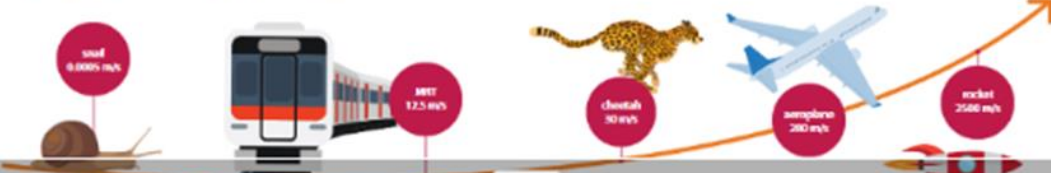


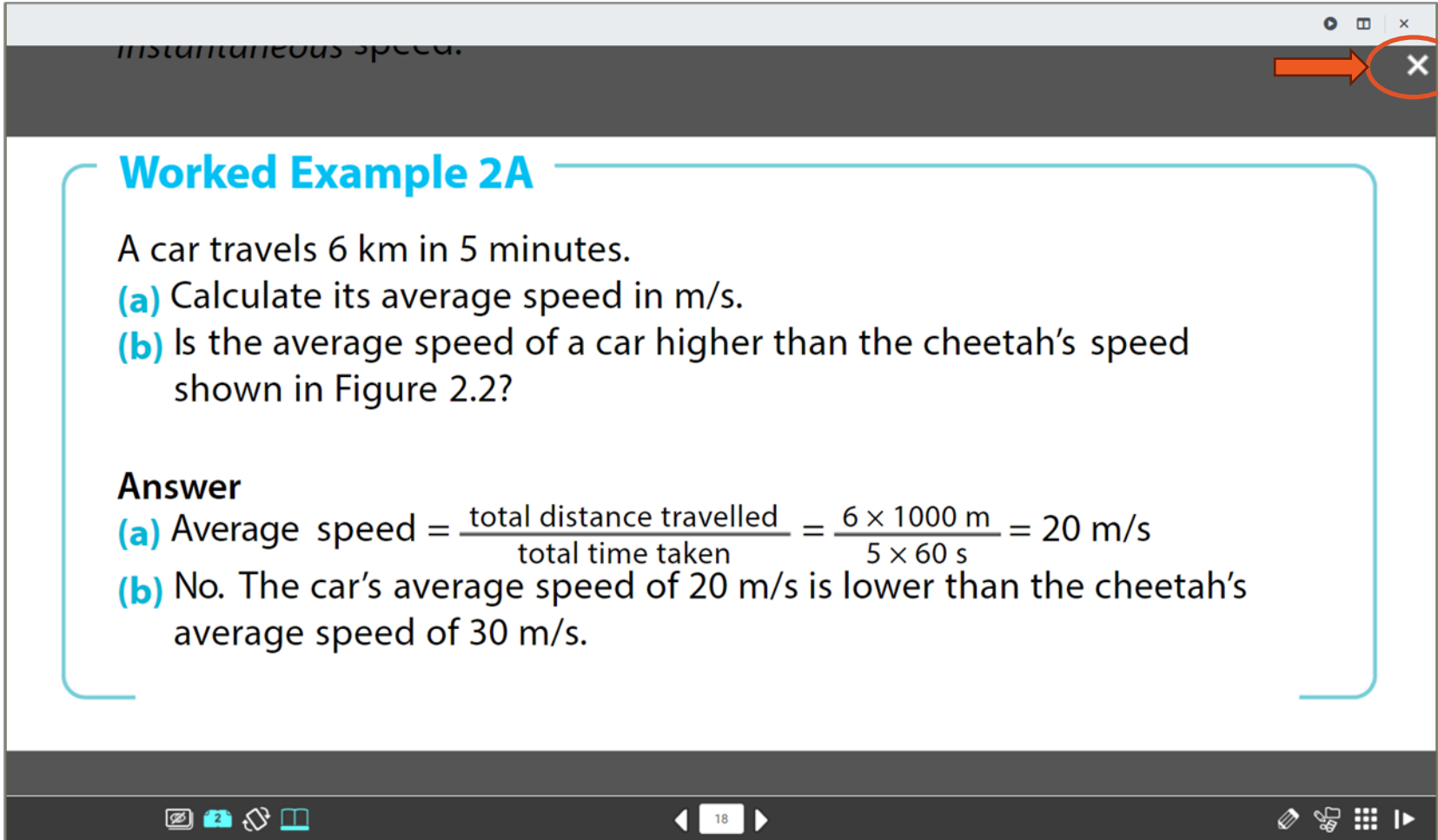
Figure 2.2 Average speeds of different objects

18

Left-click and drag your mouse over the area you would like to zoom in to.

A rectangular dotted line will appear to indicate the selected zoom area.

Select the Zoom Area



instantaneous speed.

Worked Example 2A

A car travels 6 km in 5 minutes.

- (a) Calculate its average speed in m/s.
- (b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer

- (a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$
- (b) No. The car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

The screenshot shows a presentation window with a zoomed-in area. An orange arrow points to a white 'X' icon in the top-right corner of the zoomed area, which is circled in red. The presentation content includes a worked example with two parts and their answers. The bottom of the window shows a navigation bar with icons for back, forward, and search, and a page number '18'.

When the mouse button is released, the selected area will be zoomed in.

Click on the white Close icon on the top-right corner to return to the normal page view.

How to use the Copy Page URL tool

Copy the Direct Page URL

The screenshot shows a digital textbook page titled "2.1 What Are Speed, Velocity and Acceleration?". A context menu is overlaid on the page, listing options: "Add Whiteboard", "Add Note", "Add URL", "Zoom", and "Copy Page URL". An orange arrow points to the "Copy Page URL" option. The page content includes learning outcomes, a table of 100m sprint results, and a worked example.

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Latoum Manu	Italy	100	9.80	10.2
Andre de Groot	Canada	200	19.67	10.2
Simeon Gardiner	Bahamas	400	41.85	9.57
Emmanuel Kipkwal Kotek	Kenya	800	105.06	7.61

Worked Example 2A
A car travels 6 km in 5 minutes.
(a) Calculate its average speed in m/s.
(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer
(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$
(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

On the desired eBook page, right-click to activate the Options Menu, and then left-click on "Copy Page URL".

The direct page URL allows teachers to provide students with a link in their assignments that jumps directly to the required eBook page.



Copy the Direct Page URL

The screenshot shows a digital textbook page from a content player. The page title is "2.1 What Are Speed, Velocity and Acceleration?". It includes a "Learning Outcomes" section with bullet points, a "Speed" section with a definition and a formula, and a "Worked Example 2A" section with a problem and solution. A table of results for the 2020 Tokyo Olympics is also present. A white notification box with the text "URL copied." is overlaid on the page. The page number "18" is visible at the bottom.

Chapter 2 | Newtonian Mechanics

2.1 What Are Speed, Velocity and Acceleration?

Learning Outcomes

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform acceleration.

Speed

Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

Based on Usain Bolt's 100 metre fastest record time of 9.58 s,

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$$

Compare this with the cheetah's average running speed shown in Figure 2.2.

Worked Example 2A

A car travels 6 km in 5 minutes.

(a) Calculate its average speed in m/s.
(b) Is the average speed of a car higher than the cheetah's speed shown in Figure 2.2?

Answer

(a) Average speed = $\frac{\text{total distance travelled}}{\text{total time taken}} = \frac{6 \times 1000 \text{ m}}{5 \times 60 \text{ s}} = 20 \text{ m/s}$
(b) No, the car's average speed of 20 m/s is lower than the cheetah's average speed of 30 m/s.

Athlete	Country	Event / m	Time / s	Average Speed / m/s
Jacobs Leonard Marcel	Italy	100	9.80	10.2
Andre de Groot	Canada	200	19.62	10.2
Steven Gardiner	Jamaica	400	41.85	9.53
Emmanuel Opikemi Koki	Kenya	800	30.56	7.63

Figure 2.2 Average speeds of different objects

snail 0.0005 m/s
BRT 125 m/s
cheetah 30 m/s
airplane 200 m/s
rocket 2500 m/s

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Physics eBook: Chapter 2.1 - What are Speed, Velocity and Acceleration?

Disciplinary Idea
Matter and energy make up the universe.
Kinematics (study of motion) provides us with a vocabulary for describing the motion of matter in the universe such as the 100-m sprint on land or the seasonal migration of humpback whales in the oceans in search of feeding and breeding grounds.

- State what is meant by speed and velocity.
- Calculate average speed using distance travelled / time taken.
- State what is meant by uniform acceleration and calculate the value of acceleration using change in velocity / time taken.
- Interpret given examples of non-uniform acceleration.

Speed
If Usain Bolt were to race against a cheetah in a 100-metre sprint, who would be the winner (Figure 2.1)?




Figure 2.1: Who is the walking king of speed?

To find out, we will need to compare their speeds. Speed refers to how fast something moves.

Speed is the distance travelled per unit time. Its SI unit is metre per second (m/s).

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

Based on Usain Bolt's 100-metre fastest record time of 9.58 s.

$$\text{Speed} = \frac{\text{distance travelled}}{\text{time taken}} = \frac{100 \text{ m}}{9.58 \text{ s}} = 10.4 \text{ m/s}$$

Compare this with the cheetah's average running speed shown in Figure 2.2.

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