Scheme of Work

Total duration: 10 periods (1 period is approximately 40 minutes.)

Sections	No. of Periods	Learning Outcomes	Resources	Thinking and Working Mathematically
Chapter Opener	1		• Student's Book 7, Chapter 11, p. 364	• Convincing • Critiquing • Improving
11.1 Measurement of Area		• **7Gg.04** Understand the relationships and convert between metric units of area, including hectares (ha), square metres (m^2), square centimetres (cm^2) and square millimetres (mm^2).	• Student's Book 7, Chapter 11, pp. 365-367 • Workbook 7, Chapter 11, Exercise 11.1 • Personalised Digital Assessment* 11.1	• Convincing • Critiquing • Improving
11.2 Area of Triangles and Compound Shapes	2	• **7Gg.05** Derive and know the formula for the area of a triangle. Use the formula to calculate the area of triangles and compound shapes made from rectangles and triangles.	• Student's Book 7, Chapter 11, pp. 368-374 • Workbook 7, Chapter 11, Exercise 11.2 • Personalised Digital Assessment* 11.2	• Generalising • Specialising • Conjecturing • Critiquing • Convincing • Improving
11.3 3D-Shapes and Measurement of Volume	2	• **7Gg.06** Identify and describe the combination of properties that determine a specific 3D shape.	• Student's Book 7, Chapter 11, pp. 375-382 • Workbook 7, Chapter 11, Exercise 11.3 • Personalised Digital Assessment* 11.3	• Characterising • Classifying • Generalising • Convincing • Critiquing • Improving

**This material has not been through the Cambridge International endorsement process.*

11.4 Volume of Cubes and Cuboids	1	• **7Gg.07** Derive and use a formula for the volume of a cube or cuboid. Use the formula to calculate the volume of compound shapes made from cuboids, in cubic metres (m^3), cubic centimetres (cm^3), and cubic millimetres (mm^3).	• Student's Book 7, Chapter 11, pp. 383-387 • Workbook 7, Chapter 11, Exercise 11.4 • Personalised Digital Assessment* 11.4	• Convincing • Generalising • Specialising • Critiquing
11.5 Surface Areas of Cubes and Cuboids	1	• **7Gg.09** Use knowledge of area, and properties of cubes and cuboids to calculate their surface area.	• Student's Book 7, Chapter 11, pp. 388-391 • Workbook 7, Chapter 11, Exercise 11.5 • Personalised Digital Assessment* 11.5	• Characterising • Specialising • Critiquing
11.6 Volume and Surface Area of Compound Solids	1	• **7Gg.07** Derive and use a formula for the volume of a cube or cuboid. Use the formula to calculate the volume of compound shapes made from cuboids, in cubic metres (m^3), cubic centimetres (cm^3), and cubic millimetres (mm^3). • **7Gg.09** Use knowledge of area, and properties of cubes and cuboids to calculate their surface area.	• Student's Book 7, Chapter 11, pp. 392-395 • Workbook 7, Chapter 11, Exercise 11.6 • Personalised Digital Assessment* 11.6	• Critiquing
Key Ideas	2		• Student's Book 7, Chapter 11, p. 396	
Revision			• Student's Book 7, Chapter 11, pp. 397-400	

**This material has not been through the Cambridge International endorsement process.*

Lesson Plan

11.1 Measurement of Area

Suggested Duration: 40 minutes

Learning Outcomes:

At the end of the lesson, students should be able to:

- **7Gg.04** Understand the relationships and convert between metric units of area, including hectares (ha), square metres (m^2), square centimetres (cm^2) and square millimetres (mm^2).

Estimated Time	Resources Required	Instructional Strategies
5 min	• Student's Book, p. 364	**Chapter Opener** • Using the comic strip, guide your students to predict what they will be learning in the chapter. ➢ Use the strategy of storytelling to narrate the chapter opener. ➢ Have students recall their prior knowledge and lead them to understand that area and volume are used in the measurement of space in 2D and 3D shapes respectively. Facilitate the discussion to find out the pre-requisite knowledge and skills of your students using trigger questions: ➢ What do you know about area? What do you know about the area of a square? What do you know about the area of rectangle (Possible answer: Area is a measure of how much 2D space is covered by an object. Area of a square is length × length. Area of a rectangle is length × breadth) ➢ What do you know about volume? (Possible answer: Volume is a measure of how much 3D space is occupied by an object.) • Students practise **convincing (TWM.04)** when they can explain who they agree with and the difference between considerations for area and volume and how to maximise the capacity of the stadium, for example, when considering the capacity of a stadium, the designer needs to consider maximising the surface area of the stadium to accommodate more audience. Unlike the stadium, if he is designing an aquarium, then he needs to consider maximising the volume of the aquarium to contain more water and aquatic animals. • Students practise **critiquing (TWM.07)** when they examine another mathematical statements that are different from theirs. • Students practise **improving (TWM.08)** when they are refining the mathematical statements or ideas by examining differing views.

Estimated Time	Resources Required	Instructional Strategies
15 min	• Student's Book, p. 365	**Recall** • Revisit the definition of area with students. Explain that area is the amount of space contained within the shape. ➢ *How do you find the area of a rectangle? What do you need to know?* • Remind students that the formula for area is length × breadth. **Units of Area** • Explain to students cm^2 and m^2 are common units used for measuring area. • Refer students to the example shown on the Student's Book page. • Draw on the board to illustrate the difference in size between 1 cm^2 and 1 m^2. • Highlight 1 m^2 should be taken as 100 cm ×100 cm or 10 000 cm^2. Conversely 1 cm^2 is equivalent to $\frac{1}{10\,000}$ m^2. • Use Think-Pair-Share strategy to have students discuss the question in **Think!** Students practise **convincing (TWM.04)** when they can explain that 1 cm^2 is the same as 10 mm ×10 mm which is equals to 100 mm^2. Note that this idea is similar to the one used in converting 1 m^2 to 10 000 cm^2. • Similarly, 1 km^2 should be taken as 1000 m × 1000 m or 1 000 000 cm^2. Conversely 1 km^2 is equivalent to $\frac{1}{1000\,000}$ km^2. • Point out it is a common mistake to take 1 m^2 as 100 cm^2. • A hectare (ha) is equivalent to 10 000 m^2. • Draw students' attention to **Note!** for a quick way to convert 1 m^2 to 1 cm^2. **For Challenge** • Direct students to the question in **Think!** Ensure that they can see that 1 m is the same as 1000 mm, so 1 m^2 is the same as 1000 mm ×1000 mm which is equals to 1 000 000 mm^2.

Estimated Time	Resources Required	Instructional Strategies
10 min	• Student's Book, p. 366	**Example 1** • Guide students through examples (a) and (b). • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.
10 min	• Student's Book, p. 366	**Example 2** • Guide students through examples (a) to (d). • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class. **Common Misconception** Students might assume that since 1 m = 100 cm, then 1 m^2 = 100 cm^2. Also, since 1 km = 1000 m, then 1 km^2 = 1000 m^2. Reiterate to students the differences between m and m^2, cm and cm^2, km and km^2 and have them work out the conversion.
	• Student's Book, Practice 11A, p. 367 • Workbook Exercise 11.1 • Personalised Digital Assessment* 11.1	***Additional Practice*** • If time allows, have students work on the questions in Practice 11A. If not, these questions can be assigned as homework together with the exercise in the Workbook. • In Question 9, students practise **critiquing (TWM.07)** and **improving (TWM.08)** when they can identify the mistake in the statement and explain why it is incorrect and how to arrive at the correct answer. • For students who require more practice to master the concept(s) or more challenge, assign them the personalised digital assessment*. **For Support** Engage the students to calculate the areas of various squares and rectangles using different units. **For Challenge** Engage the students to convert between ha^2 and km^2 and between km^2 and mm^2.

**This material has not been through the Cambridge International endorsement process.*

Lesson Plan

11.2 Area of Triangles and Compound Shapes

Suggested Duration: 80 minutes

Learning Outcomes:

At the end of the lesson, students should be able to:

- **7Gg.05** Derive and know the formula for the area of a triangle. Use the formula to calculate the area of triangles and compound shapes made from rectangles and triangles.

Estimated Time	Resources Required	Instructional Strategies
20 min	• Student's Book, pp. 368-369	**Knowledge-Building Task** • Allow students to work individually or in pairs. • Lead the students to cut an A4 paper into four rectangles of equal sizes. Label them and measure and record the length and breadth of one rectangle to find its area. • Using Rectangle 1, mark out a triangle and shade the triangle. Cut out the remaining unshaded regions and form another triangle. • Encourage them to compare the base and height of triangle to the length and breadth of Rectangle 1. • Repeat for other rectangles and direct students to write down the formula for the area of a triangle. • Highlight to them that the height of the triangle may not lie inside the triangle. • Students practise **generalising (TWM.02)** when they recognise the underlying pattern after identifying several examples and use the pattern to deduce the area of the triangle.
15 min	• Student's Book, p. 370	**Example 3** • Guide students through examples (a) and (b). • Guide students how to identify the base and height of a non-right-angle triangle. • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.

Estimated Time	Resources Required	Instructional Strategies
		Common Misconception With reference to Example 3(b), students might assume the base of the triangle to be 35 cm instead of 20 cm. Explain to students that the base of the triangle is always perpendicular to the height, so they can take reference from the height to identify the base and vice versa.
15 min	• Student's Book, pp. 370-371	**Example 4** • Revise with students how to find the area and perimeter of a triangle. Remind students to use the correct values of base and height of a triangle. ➢ Point out that the base and the height can be interchanged only if the triangle is a right-angled triangle. • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.
15 min	• Student's Book, p. 371	**Compound Shapes** • Refer students to Figure 1 and Figure 2 shown on the Student's Book. • The area of a rectangle is $l \times b$. • Explain to students that compound shapes are made up of basic shapes. Use Think-Pair-Share strategy and ask students how the area of compound shape in Figure 2 can be calculated from the areas of the basic shapes (Possible answers: The area can be calculated by adding the areas of the basic shapes.) • Engage students to consider the question in **Think!** Encourage them to think if there are other ways to spilt up Figure 2 into other basic shapes. Students practise **specialising (TWM.01)** when they choose a special case that satisfies the mathematical idea that it should be a square or rectangle. • Use Think-Pair-Share strategy and ask students how the three different figures can be spilt into basic shapes.
15 min	• Student's Book, p. 372	**Example 5** • Guide students through the example. • Show students how to find the area of a compound figure by breaking up the figure into smaller parts. • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.

Estimated Time	Resources Required	Instructional Strategies
		For Support Engage the students to identify the different heights and bases of different triangles in different orientations so that students can calculate the area of triangles in compound shapes. **For Challenge** Engage the students to use an alternative method of finding the area of the figure. (For example by taking subtraction in Example 5, a possible answer is 18×16 cm $- \frac{1}{2} \times 3 \times 4$ cm.)
	• Student's Book, Practice 11B, pp. 373-374 • Workbook Exercise 11.2 • Personalised Digital Assessment* 11.2 • Workbook Activity 11A	***Additional Practice*** • If time allows, have students work on the questions in Practice 11B. If not, these questions can be assigned as homework together with the exercise in the Workbook. • For students who require more practice to master the concept(s) or more challenge, assign them the personalised digital assessment*. • Allow students some time to work on Activity 11A in the workbook. Students practise **conjecturing (TWM.03)** when they form the mathematical ideas, **critiquing (TWM.07)** when they compare and evaluate each wallpaper based on the cost per square metre and **convincing (TWM.04)** when they suggest to the homeowner on which wall to be covered with wallpaper. When they are considering alternative approaches and refining their answers, students are also practising **improving (TWM.08)**.

**This material has not been through the Cambridge International endorsement process.*

Lesson Plan

11.3 3D-Shapes and Measurement of Volume

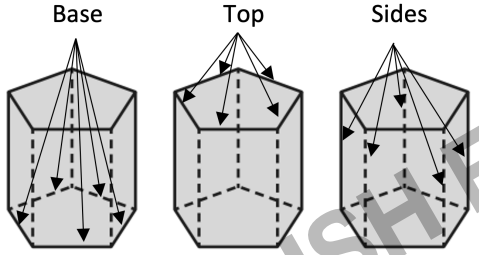
Suggested Duration: 80 minutes

Learning Outcomes:

At the end of the lesson, students should be able to:

- **7Gg.06** Identify and describe the combination of properties that determine a specific 3D shape.

Estimated Time	Resources Required	Instructional Strategies
20 min	• Student's Book, pp. 375-377	**Properties of 3D Shapes** • Refer students to the examples shown on the Student's Book page. • Explain how 3D shapes have volumes and areas as compared to 2D shapes which only have areas. • 3D shapes can be classified as those with curved surface and those without curved surfaces. • Bring real objects such as balls, cylinders, cones, cubes and cuboids to let students have a sense of the concrete objects. Show how spheres, cones and cylinders have curved surfaces while cubes, cuboids and triangle-based prisms have only flat surfaces and are known as polyhedra. • 3D shapes with uniform cross-sectional areas are known as prisms and have shapes of the same sizes to the bases. • Lengths of the prism sides are known as edges, while vertices are the points where any two edges meet. • The faces are the flat surfaces of the prism. • Ask students to identify and count the number of faces for cubes, cuboids and triangular prism. (Possible answers: Cubes and cuboids have 6 faces while the triangular prism has 5 faces.) • Lead students to identify the properties of the cross section of a prism. Students practise **characterising (TWM.05)** and **classifying (TWM.06)** when they identify and describe the mathematical properties of the objects as well as organise the objects according to their mathematical properties (cross-section). • Draw students' attention to the **Note!** A curved surface is not a face. ➢ *Does a sphere have any face?*

15 min	• Student's Book, p. 378	**Knowledge-Building Task** • (a) Encourage the students to count the number of edges, vertices, faces of the four prisms and record in the table. • (b) Lead them to discuss their observations about the number of edges and show that this number is always divisible by 3. Students will show they are **generalising (TWM.02)** when they spot a pattern in the number of edges based on the different cross-sectional areas of the prism and use this to work out the pattern in identifying the number of edges. Students are **convincing (TWM.04)** when they can explain that the number of edges at the base, top and sides are the same. For example, in the diagram below, the number of edges at the base, top and sides are 5 each. So, the total number of edges is always divisible by 3.  • (c) Similarly, have them to discuss their observations about the number of vertices and if the number is always divisible by 2. • Students will show that they are **convincing (TWM.04)** when they are able to present and explain that the total number of vertices is the sum of the number of vertices at the top and the base. Thus the total number of vertices is always divisibly by 2.
15 min	• Student's Book, p. 379	**Knowledge-Building Task** • (a) Encourage the students to count the number of edges, vertices, faces of the four triangular prisms and record in the table.

		• (b) Lead them to discuss their observations about the number of edges and the number is always divisible by 2. Students will show they are **generalising (TWM.02)** when they spot a pattern in the number of edges based on the different bases of the pyramid and use this to work out the pattern in identifying the number of edges. Students will show that they are **convincing (TWM.04)** when they are able to present and explain the pattern that the number of edges at the base and the number of edges joining the vertex to each point at the base are the same. Thus, it is an even number. • (c) Similarly, have them discuss their observations about the number of faces and vertices in the pyramids. Are they always the same? Students will show that they are **convincing (TWM.04)** when they are able to present and explain that the number of vertices is the sum of the number of vertices at the base and the vertex, while the number of faces is the sum of the number of slanted faces and the base. Since the number of vertices of any shape is the same its number of edges, and this number of edges of the shape at the base corresponds to the number of slanted faces, the total number of faces is always equals to the number of vertices.
15 min	• Student's Book, p. 380	**Volume** • Explain that the amount of space inside a 3D shape is known as its volume. • Refer students to the example shown on the Student's Book page. • Point out to them that 100 × 100 × 100 1-cm^3 cubes are needed to fill a cube of length 1 m. • Highlight 1 m^3 should be taken as 100 cm ×100 cm ×100 cm or 1 000 000 cm^3 . Conversely 1 cm^3 is equivalent to $\frac{1}{1\,000\,000}$ m^3. • A millilitre (m*l*) is equivalent to 1 cm^3 and a litre (*l*) is equivalent to 1000 cm^3. **Common Misconception** Students might assume that since 1 m = 100 cm, then 1 m^3 = 100 cm^3. Reiterate to students the differences between m and m^3, cm and cm^3 and have them work out the conversion.
15 min	• Student's Book, p. 381	**Example 6** • Guide students through examples (a) and (b). • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.

	• Student's Book, Practice 11C, p. 382 • Workbook Exercise 11.3 • Personalised Digital Assessment* 11.3	***Additional Practice*** • If time allows, have students work on the questions in Practice 11C. If not, these questions can be assigned as homework together with the exercise in the Workbook. • In Question 8, students practise **critiquing (TWM.07)** and **improving (TWM.08)** when they can identify the mistake in the statement and explain why it is incorrect and how to arrive at the correct answer. • For students who require more practice to master the concept(s) or more challenge, assign them the personalised digital assessment*.

**This material has not been through the Cambridge International endorsement process.*

Lesson Plan

11.4 Volume of Cubes and Cuboids

Suggested Duration: 40 minutes

Learning Outcomes:

At the end of the lesson, students should be able to:

- **7Gg.07** Derive and use a formula for the volume of a cube or cuboid. Use the formula to calculate the volume of compound shapes made from cuboids, in cubic metres (m^3), cubic centimetres (cm^3), and cubic millimetres (mm^3).

Estimated Time	Resources Required	Instructional Strategies
5 min	• Student's Book, p. 383	**Volume of Cubes and Cuboids** • Explain how a cube is a 3D object with perpendicular sides with edges having the same length. • A cuboid, however, is a 3D object with perpendicular sides with edges that can have different lengths.
5 min	• Student's Book, pp. 383-384	**Volume of a Cube** • Refer students to the example shown on the Student's Book page. • Draw the two cubes on the board and show 8 cubes with volume 1 cm^3 are needed to fill a larger cube with volume 2 cm^3. • Point out to students that the volume of a cube is l cm × l cm × l cm.
10 min	• Student's Book, p. 384	**Example 7** • Guide students through the example. • Guide students how to identify the values for length, breadth and height of the box. • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.

Estimated Time	Resources Required	Instructional Strategies
10 min	• Student's Book, p. 385	**Volume of a Cuboid** • Draw the two cuboids on the board and lead the students to show that 24 cubes with volume 1 cm^3 are needed to fill a larger cuboid with a volume of 24 cm^3. Students practise **convincing (TWM.04)** when they can justify that 24 cubes can fit into the larger cuboid. • Point out to students that the volume of a cube is $l \times b \times h$. • Get students to generalize the formula of the cuboid and apply the formula to check that the formula is correct in the above case. Students practise **generalising (TWM.02)** and **specialising (TWM.01)** when they can identify the unit cubes can fill up the volume of different cuboids and check for the specific example that is able to satisfy the same mathematical criteria.
10 min	• Student's Book, p. 386	**Example 8** • Guide students through the example. • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.
	• Student's Book, Practice 11D, pp. 386-387 • Workbook Exercise 11.4 • Personalised Digital Assessment* 11.4 • Workbook Activity 11B	***Additional Practice*** • If time allows, have students work on the questions in Practice 11D. If not, these questions can be assigned as homework together with the exercise in the Workbook. • For students who require more practice to master the concept(s) or more challenge, assign them the personalised digital assessment*. **For Support** Engage the students to solve simple equations such as $20x = 340$.

This material has not been through the Cambridge International endorsement process.

Lesson Plan

11.5 Surface Area of Cubes and Cuboids

Suggested Duration: 40 minutes

Learning Outcomes:

At the end of the lesson, students should be able to:

- **7Gg.09** Use knowledge of area, and properties of cubes and cuboids to calculate their surface area.

Estimated Time	Resources Required	Instructional Strategies
10 min	• Student's Book, p. 388	**Nets of a Cube** • Guide students see that the sets of squares can be folded to form cubes and are therefore known as the nets of a cube. • Point out that to form a cube, the net of a cube must consist of 6 squares. • Direct students to the question in **Think!** Students practise **characterising (TWM.05)** when they describe the net of an open cube has 5 squares. They practise **specialising (TWM.01)** when they draw two possible nets of an open cube.
10 min	• Student's Book, pp. 388-389	**Nets of a Cuboid** • Similarly, the sets of rectangles can be folded to form a cuboid and is known as the nets of a cuboid. • To form a 6-sided cuboid, the net of a cuboid must consist of 6 rectangles. • Direct students to the question in **Think!** Students practise **specialising (TWM.01)** when they draw other nets of a cube and a cuboid beside those shown. • Students practise **critiquing (TWM.07)** when they evaluate the mathematical ideas of volume and surface area and conclude that not all cuboids which have the same volume will have the same surface area.

10 min	• Student's Book, pp. 389-390	**Example 9** • Guide students through the example. • Have students check that they calculate the surface area of all faces of the cube. • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.
10 min	• Student's Book, p. 390	**Example 10** • Guide students through the example. • Show students how to form the net of the cuboid to calculate the total surface area. • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.
	• Student's Book, Practice 11E, p. 391 • Workbook Exercise 11.5 • Personalised Digital Assessment* 11.5	***Additional Practice*** • If time allows, have students work on the questions in Practice 11E. If not, these questions can be assigned as homework together with the exercise in the Workbook. • For students who require more practice to master the concept(s) or more challenge, assign them the personalised digital assessment*.

**This material has not been through the Cambridge International endorsement process.*

Lesson Plan

11.6 Volume and Surface Area of Compound Solids

Suggested Duration: 120 minutes

Learning Outcomes:

At the end of the lesson, students should be able to:

- **7Gg.07** Derive and use a formula for the volume of a cube or cuboid. Use the formula to calculate the volume of compound shapes made from cuboids, in cubic metres (m^3), cubic centimetres (cm^3), and cubic millimetres (mm^3).
- **7Gg.09** Use knowledge of area, and properties of cubes and cuboids to calculate their surface area.

Estimated Time	Resources Required	Instructional Strategies
20 min	• Student's Book, p. 392	**Example 11** • Engage students to discuss the question in **Think!** Students practise **critiquing (TWM.07)** when they can justify of the sum of the volume of the two cubes is the volume of the solid and explain if the same idea applies for surface area. • Guide students through the example. • Help students identify which surfaces are covered when one cube is placed on top of the other. • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.
20 min	• Student's Book, p. 393	**Example 12** • Guide students through the example. • Help students identify which surfaces are covered then the cube is stacked on top of the cuboid. • Allow students some time to work on the **Try!** question on their own. Then invite volunteers to share their answers with the class.
	• Student's Book, Practice 11F, pp. 394-395 • Workbook Exercise 11.6	***Additional Practice*** • If time allows, have students work on the questions in Practice 11F. If not, these questions can be assigned as homework together with the exercise in the Workbook.

**This material has not been through the Cambridge International endorsement process.*

Estimated Time	Resources Required	Instructional Strategies
	• Personalised Digital Assessment* 11.6	• For students who require more practice to master the concept(s) or more challenge, assign them the personalised digital assessment*.
40 min	• Student's Book, Key Ideas, p. 396	• Go through Key Ideas with the class to consolidate students' learning for the chapter. • Depending on the time available, assign Chapter 11 Revision as classwork or homework.
40 min	• Student's Book, Chapter 11 Revision, pp. 397-400	• Go through Chapter 11 Revision with the class. • Have students assess themselves using the self-assessment checklist in the Student's Book. • Have students identify their areas of weaknesses and use the personalised digital assessment* in the sections to help them master these areas.

**This material has not been through the Cambridge International endorsement process.*