Complete Mathematics for Cambridge IGCSE®
Teacher Resource Pack
Fifth edition

Core

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This guide is designed to provide a structure for the teaching of the Cambridge IGCSE Mathematics syllabus at Core level. There are a number of possible approaches suggested within the lessons but it does not give a definitive programme of study.

Each lesson (or series of lessons) usually covers one or two key aspects of the syllabus and refers to the relevant pages of the Core student textbook and associated exercises. It is expected that most of the main teaching points will be covered in the body of a single lesson, but that further lessons may be needed to consolidate and refresh the learning. Hence, each lesson in the guide is a guide to the time it might take to teach the topic rather than a prescriptive scheme of work.

Many of the starter activities are designed to get the students engaging with mathematics and are often only loosely connected with the body of the lesson. Often they are activities which are designed to refresh a fundamental skill required to achieve success in the topic(s) covered (for example, calculation skills). They are suggestions and can be modified or interchanged according to the needs of the specific group of students.

The main lesson commentary is designed to guide you through the topic(s), suggesting a possible order of teaching and picking up on certain key points which should be noted. These notes are not prescriptive and may often suggest activities that are not appropriate to either the teaching style of the teacher or the learning styles of the students. Flexibility of approach is to be expected. Suggested consolidation activities and/or extension activities are also noted where relevant.

The exercise commentary guides you through the various exercises associated with the topic. It suggests the types of question students of differing abilities should be attempting. Key misconceptions are also addressed. The nature and extent of the textbook exercises allow flexibility when students are consolidating, and a differentiated approach is encouraged.

The plenary activities are designed to summarise learning, but again these are not prescriptive. Card-matching activities, pairs and group work may not be appropriate, and a simple question and answer session or short test can be used instead. The aim is to suggest possible activities that might engage the learners in a different way.

There are many references to ‘mass response’ tools such as mini-whiteboards and response cards. Many schools do not have access to this type of equipment and therefore alternative methods have also been suggested, such as the students writing the answers in exercise books and checking them at the end.

There are references to the use of overhead projectors, interactive whiteboards, and other computer equipment. Not all schools will have access to these facilities, so all of the activities which suggest them can be easily modified to use paper and pencil or prepared worksheets.

Suggestions on resources:

- Response cards such as ‘True’ or ‘False’ can easily be made in class by the students by taking a piece of stiff card (A5 size or equivalent) and putting a ‘T’ on one side and an ‘F’ on the other. They work even better if the ‘T’ is one colour and the ‘F’ a different colour.
- Card-matching activities can be prepared beforehand and laminated (if facilities exist). They can be placed into a ‘bank’ of resources for use by other teachers and in future years.
- Mini-whiteboards can also be made by laminating stiff card, but dry-wipe pens and erasers will still be needed. Mini-chalkboards make an excellent alternative if the school has access to them.
- Scientific calculators should be available for all students following this course but if they are not, expected approximations to $\pi$ are given and trigonometrical tables should be made available at the appropriate points.

The online components are designed to supplement and support the teaching of this course. There are support and challenge worksheets for use at certain points during the course, practice papers, sample worked solutions and a glossary of key terms.

Access your support website at www.oxfordschools.com/9780198427995
Candidates can be entered for one of two tiers of assessment. The table below indicates the method of assessment for both the core and extended curriculum:

**Syllabus 0580**

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<th>Core curriculum (grades available C–G):</th>
<th>Extended curriculum (grades available A*–E):</th>
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<tr>
<td><strong>Paper 1, Short-answer questions</strong></td>
<td><strong>Paper 2, Short-answer questions</strong></td>
</tr>
<tr>
<td>1 hour, 35% of total marks</td>
<td>1 hour 30 minutes, 35% of total marks</td>
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<tr>
<td><strong>Paper 3, Structured questions</strong></td>
<td><strong>Paper 4, Structured questions</strong></td>
</tr>
<tr>
<td>2 hours, 65% of total marks</td>
<td>2 hours 30 minutes, 65% of total marks</td>
</tr>
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**Notes**

- Candidates should have an electronic calculator for all papers. Algebraic or graphical calculators are not permitted. Three significant figures will be required in answers except where otherwise stated.
- Candidates should use the value of π from their calculators if their calculator provides this. Otherwise, they should use the value of 3.142 given on the front page of the question paper only.
- Tracing paper may be used as an additional material for each of the written papers.
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CHAPTER 1
SHAPE AND SPACE 1

Lesson 1 – Accurate drawing
Textbook pages 1–3

Objectives
C4.2: Measure and draw lines and angles. Construct a triangle given the three sides using a ruler and a pair of compasses only.
C4.3: Read and make scale drawings.

Starter
Fast-paced conversions: Ask students to convert 50 mm to cm, 200 cm to m, etc. Student responses could be via mini-whiteboards or mini-chalkboards or the activity could take the form of a quick quiz or test with students writing the answers in their exercise book.

Lesson commentary
- Provide students with a section from a map and discuss the idea of a scale drawing. Ask them to accurately measure certain distances on the map and convert them to ‘real-life’ distances.
- Discuss the importance of accurate drawing when constructing scale diagrams. Imagine if the designers of the Channel Tunnel were 1 mm out when drawing the plans. How far apart would the two ends have been when they were supposed to meet in the middle? Discuss the tools that are used to construct accurate diagrams and reinforce the importance of careful measurement.
- Provide students with examples of triangles, either from the exercise or otherwise. Ask them to accurately construct them using a protractor, a pair of compasses and a ruler. You can check the accuracy by asking them to measure the size of missing sides and angles. Repeat for triangles where the three side lengths are given as in exercise 2.
- Students could then be asked to construct further examples, checking each other’s work for accuracy as they go along.

Plenary
Ask students to complete one further construction. Give them the task of constructing a triangle with side lengths 12 cm, 5 cm and 6 cm. You should expect them to fairly quickly spot that it cannot be done, and this can lead into a discussion about ‘impossible’ constructions. Ask small groups of students to summarise the key points about accuracy and construction from the lesson.

Exercise commentary
In exercise 1, questions 1 to 8 are all examples which require a ruler and protractor. Check that students are reading the protractor angles carefully when constructing these triangles.
Questions 9 to 12 require successive constructions. Point out to students that initial inaccuracies tend to multiply into further problems as they go along.
In exercise 2, all constructions require only a ruler and pair of compasses. Protractors should be used to measure the angles at the end.
Lesson 2 – Nets

Textbook pages 4–5

Objectives
C4.1: Use and interpret vocabulary of simple solid figures including nets.

Starter
Ask small groups of students to write down the names of as many geometrical solids as they can in two minutes. Collect a list at the end.

Lesson commentary
● Discuss different ways of representing three-dimensional objects in two dimensions. Show examples of orthographic projection, isometric projection and plan drawing (plan, front and side elevations). Comment on the need for effective methods for constructing the three-dimensional object from the two-dimensional representation. Use this to lead into the idea of a net.

● Provide students with stiff card, glue and scissors. Ask them to construct a square in the centre of their card, about 5 cm by 5 cm. Refer back to the previous lesson and emphasise the need for accuracy when doing this. Students can then complete the drawing of a standard ‘cross’ net for a cube, add appropriate flaps and cut out the net. Students should then be encouraged to ‘picture’ the folding up process before sticking their cube together. Animations of this folding up process for cubes and other polyhedra can be found on the internet.

Exercise commentary
Question 1 in exercise 3 requires students to mentally fold up the nets to see which work. Some students will have problems with this and could be asked to cut out the nets from a copy of the diagrams.

Question 3 asks students to complete a net and they could be asked to cut out their solution to check that it works.

Questions 4 and 5 will require careful construction (refer back to the previous lesson) and will take quite some time to do properly. Students could work in groups of three on question 5, each making one pyramid before joining them together.

Question 6 asks students to sketch possible nets. Discourage accurate drawing at this point.

Plenary
Provide students with examples of polyhedra such as cereal boxes, chocolate packaging, etc. and ask them to sketch the nets on mini-whiteboards, mini-chalkboards or in their exercise books. Emphasise the need for the lengths to be relative to each other. They could also be invited to sketch the net of a cylinder.
Lessons 3 and 4 – Angle facts

Textbook pages 5–11

Expected prior knowledge It is expected that students will have met many of these angle rules beforehand so these lessons will provide an ideal opportunity to revise them.

Objectives

C4.1: Use and interpret the geometrical terms: point, line, parallel, bearing, right angle, acute, obtuse and reflex angles and perpendicular.

C4.7: Calculate unknown angles using geometrical properties.

Note: section 1.2 is extensive but many of the angle facts themselves will be prior knowledge. An appropriate selection of questions will ensure students have sufficient practice in applying the facts without unnecessary repetition.

Starter

Ask pairs of students to write down all the angle facts that they can think of. Ask them to provide an example of each one as well. They could simply write them in their books or on mini-whiteboards or poster paper.

Lesson commentary

● By discussion of the starter activity, ensure that the whole class have a complete set of angle facts. They should know ‘angles at a point’, ‘angles on a straight line’, ‘angles in a triangle’, ‘X’, ‘F’, ‘Z’ and ‘C’ angles for parallel lines and ‘angles in a quadrilateral’.

● Students could then work together to devise their own questions (and answers) which test the recall and application of the facts. Groups of students could be directed to work on different facts and then swap their questions with another group.

● The second lesson on this topic can be used to consolidate the learning that has taken place and ensure that all students have sufficiently diverse practice in applying angle facts. Appropriate selection of questions from the range of exercises available will ensure that this is achieved.

Exercise commentary

Exercises 4, 5, 6 and 7 are made up of basic practice questions which test the angle facts discussed here. Weaker students will benefit from completing several of these questions but stronger students should be directed straight to exercise 8.

In exercise 8, questions 1 to 24 require students to work with the full range of angle facts and decide which they are going to use. Encourage students to give reasons for their answers.

Questions 25 to 28 are a bit more complex and students should be encouraged to fill in other angles as they work towards finding the unknown(s).

Plenary

Students could take part in a fast question and answer quiz. Responses could be by mini-whiteboard, or the questions could be true/false or multiple choice using response cards. Alternatively, students could write the answers in their exercise books and then swap books at the end when the answers are given out.
Lesson 5 – Angles in polygons and circles 1

Textbook pages 11–13

Objectives
C4.7: Calculate unknown angles using geometrical properties.

Starter
Ask students to write down the names of as many polygons as they can in one minute.

Lesson commentary

- Ask for a volunteer and invite them to walk the edges of a number of polygons. Ask the class to observe closely and work out the number of times the volunteer rotates their body during each walk (once only for each one). Use this demonstration to deduce the rule that the sum of the exterior angles of a polygon is always 360°.
- Discuss the relationship between the exterior and interior angles of a polygon and use this to lead onto general rules for regular polygons. Encourage students to try and formulate their own versions of the rules before supplying the answers. They could work on the rules in pairs or small groups and discuss their ideas.
- At this point, students could complete work from exercise 9.

Exercise commentary
All the questions in exercise 9 provide routine practice in applying the rules for polygons that students have learnt/discovered. Being able to work without a diagram is an important skill, particularly when the number of sides is large, so ensure students are correctly applying the rules throughout.

Plenary
A fast question and answer quiz could be used to test the recall of the angle rules for polygons. Answers could be via mini-whiteboards, mini-chalkboards or response cards. Alternatively students could just write the answers in their books and then give them to a partner to mark when the answers are given out.
**Lesson 6 – Angles in polygons and circles 2**

Textbook pages 13–14

**Objectives**

C4.7: Calculate unknown angles using geometrical properties.

**Starter**

Ask students to write down definitions for *acute angle, obtuse angle, right angle, straight angle and reflex angle*, giving an example of each in terms of a number of degrees.

**Lesson commentary**

- Students could be given a number of pre-prepared diagrams and asked to measure the angles to discover the radius/tangent rule for circles and the angle in a semi-circle themselves. Pairs or small group work should be encouraged here and students should be confident of using correct mathematical terminology. It should not take long to produce the correct hypotheses. Dynamic geometry software such as Geogebra could also be used, if available, to demonstrate them to the whole class. Accurately drawn transparencies could also be used with an overhead projector and OHP protractor.

- Once the students have discovered or been given the rules, they could be asked to draw a neatly labelled diagram in their exercise books and explain the rules in their own words. They can then practise the application of these rules by completing appropriate questions from the exercise or generating their own.

**Exercise commentary**

*Question 1* in exercise 10 can be omitted if students have discovered the rules using a similar approach. *Questions 2 to 13* provide routine practice in applying the rules and can be added to as appropriate for weaker students. Emphasise the need to give reasons throughout. More able students might miss out these questions or be asked to set their own questions and challenge a partner.

**Plenary**

Provide students with one further example which combines these rules, possibly with other angle facts from previous lessons, and ask them to write down the size of a number of different angles as described.
Lesson 7 – Symmetry

Textbook pages 14–16

Expected prior knowledge It is expected that students will have met the idea of symmetry beforehand and this lesson provides an excellent opportunity to refresh and revise these skills.

Objectives
C4.6: Recognise rotational and line symmetry (including order of rotational symmetry) in two dimensions.

Starter
Shape recognition: Show quickly a series of shapes on an interactive whiteboard or overhead projector with prepared slides and students respond quickly with the name of the shape. They could use mini-whiteboards or mini-chalkboards. Alternatively, students could quickly write down the answers in their exercise books and feedback answers at the end. Shapes could include both geometrical ones (pentagon, hexagon, rhombus, etc.) and others such as a ‘star’, ‘oval’ or ‘squiggle’.

Lesson commentary
● Students at IGCSE level will have met symmetry before but give them a reminder of what it means to call something ‘symmetrical’. Discuss the two types of symmetry and distinguish them using examples of shapes from the starter activity. Students could then work in pairs, trying to classify the (capital, sans serif) letters of the alphabet into those which have reflective/rotational symmetry (or both). This is an ideal opportunity to discuss problems with, say, the letter ‘Q’ which depending on how it is drawn may or may not have a line of symmetry.
● Students should also be able to complete shapes given symmetry properties (see exercise 12). They could be given squared paper and asked to challenge a partner to complete a symmetrical design of their own.

Exercise commentary
Exercise 11 is a simple classification exercise. Obvious misconceptions might include students who think that parallelograms (question 7) have lines of symmetry, while the playing card (question 6) will provoke discussion since the 5s in the corners are not reflective.
Exercise 12 requires students to complete diagrams using the information given. Photocopied worksheets will help to avoid any copying errors. Diagonal lines of symmetry (questions 3 and 4) may cause problems and could be omitted for weaker students. Questions 7 and 8 can be set aside for challenge work.

Plenary
Repeat the starter activity but this time ask students to write down the number of lines of symmetry and the order of rotational symmetry for the shapes provided.
Lessons 8 and 9 – Circle calculations

Textbook pages 16–23

Expected prior knowledge Students will have met the formulae for the area and circumference of a circle beforehand and these lessons provide consolidation and questions in a practical context.

Objectives
C5.3 Carry out calculations involving the circumference and area of a circle.
C5.5: Carry out calculations involving the areas and volumes of compound shapes.

Starter
Ask students to write down as many parts of the circle (radius, circumference, sector, diameter, arc, etc.) as they can in one minute. They should be prepared to define the words during a class discussion.

Lesson commentary
● Students should be familiar with the basic formulae for the area and circumference of the circle and this could be checked with a fast question and answer activity using calculators. Students could be given the diameter or radius of a circle and then be asked to quickly work out the circumference or area using the standard formulae, and display the answer on a mini-whiteboard or write them down in their exercise books before feeding back to the class at the end. Avoid using radius for circumference and diameter for area at this stage.
● Develop the use of the formulae for cases where diameter is given for area and radius for circumference to ensure that students are happy to work with either. This is often a common area for mistakes since students just automatically use the number given. Also work with a series of examples which ‘go backwards’. You could do this as a thought experiment. Ask questions like ‘What would happen if you were given the circumference and asked to find the diameter?’ Try to avoid any more formulae here \( d = \frac{C}{\pi} \) for example) and get students to understand the process.
● At this point, students could begin to practise consolidating the work using appropriate questions from the range of exercises available. A second lesson could then be set aside for further consolidation and coverage of more complex problems and/or support for weaker students.
● Introduce more ‘what if ...’ scenarios. These could be given out on prepared worksheets and could include the area of a semicircle, perimeter of a quadrant, etc. Students could be given two or three of these in pairs or groups and asked to explain their methods. Differentiation can be built into this exercise by the complexity of the questions given to each group.

Exercise commentary
Depending on the ability of the group, the amount of consolidation can be varied. With more able groups, use the questions from the exercises sparingly and encourage students to work on the problems rather than the routine practice.

In exercise 13, the first eight questions provide routine practice and could be missed out, whereas the rest of the exercise has more ‘problem-solving’ types of question. Similarly, exercise 14 has eight basic practice questions at the start for consolidation before applied problems are introduced. More able students should be able to complete question 15 without assistance.

More complicated shapes are introduced in exercises 15 and 16. The compound shapes in exercise 15 are all combinations of sections from the circumference plus straight lines. Check that students are adding all the components together at the end. Exercise 16 is quite challenging, particularly questions 6 and 7. Ensure students are comfortable with examples such as question 1 and question 4 before moving onto questions 6 and 7. Exercise 17 focuses on working backwards to find the radius of a circle when given the area or circumference. Questions 11 to 23 provide students with applied problems to solve using the reasoning developed in the lesson.

Plenary
A fast question and answer quiz which not only tests going forwards with the formulae (see lesson commentary) but also includes examples which need to be worked backwards. Include a semicircle or quadrant. Students could be asked to write the answers in their exercise books or given a mini-whiteboard and 30 seconds to work out the answers on their calculators for each one.
Lesson 10 – Arc length and sector area

Textbook pages 24–26

Objectives
C5.3: Solve simple problems involving the arc length and sector area as fractions of the circumference and area of a circle.

Starter
Ask students to write down the simplified fraction equivalent to $\frac{\theta}{360}$ for given values of $\theta$ (e.g. 30, 60, 90, 120).

Lesson commentary
- Begin with a series of examples where students have to work out the area and/or arc length for semicircles and quadrants. Discuss the methods that they use (divide the circle area or circumference by 2 or 4). Referring back to the starter activity, discuss the link to $\frac{180}{360}$ and $\frac{90}{360}$.
- Ask students how they might go about finding the area and arc length for a 60° sector (divide by 6). Use this and other examples to generate a general approach to problems of this type. Formulae can be introduced at this point if necessary, but encourage students to think about what they are doing.
- Discuss what you need to add to the arc length to find the perimeter of a sector (add two radii).
- Introduce the idea of working backwards to find either the radius of the sector or the angle subtended. Ask students to write down the approach they could take in either case and encourage class discussion of the methods used. Try to avoid too much demonstration and structure unless the group require this to access the solutions.

Exercise commentary
Questions 1 to 6 in exercise 18 are routine practice. Questions 7 to 9 combine several sectors but should still be treated as routine practice for most students. Questions 10 to 14 develop the idea of working backwards. Question 15 is of a more problem-solving nature and could be used as the basis for a whole-class discussion, perhaps after it has already been attempted by the stronger students.

Plenary
Students could be provided with three sets of cards (one with diagrams, one with arc lengths and one with sector areas) and asked to match one card from each set to form groups of three cards. Alternatively, further questions could be given and students asked to write the answers in their exercise books for checking at the end.
Lessons 11 and 12 – Area

Textbook pages 26–30

Expected prior knowledge Students should be familiar with the formulae for the areas of simple geometrical shapes such as rectangles and triangles so these lessons provide an opportunity to work on more complex compound shapes and thoroughly revise their use of the formulae.

Objectives
C5.2: Carry out calculations involving the perimeter and area of a rectangle, triangle, parallelogram and trapezium and compound shapes derived from these.

Starter
Ask students to write down the names of as many quadrilaterals as they can in 60 seconds. Collect a list at the end.

Lesson commentary

- Students should be familiar with the formulae for the areas of rectangles and triangles. A fast question and answer session will test this recall. Students could respond as a class using mini-whiteboards or mini-chalkboards; the questioning could be targeted to individuals, or students could write the answers down in the exercise books for checking at the end.

- Similarly, they should also be able to work out the areas of simple parallelograms and trapeziums. The trapeziums may need revision since the formula is less familiar. Encourage students to work together and check that they are happy when the orientation of the shape is ‘non-standard’.

- The exercises focus on compound shapes and applied problems. Students could be given a series of examples (possibly on prepared worksheets) and asked to work together in small groups to solve the problems. Differentiated examples could be given to groups according to ability.

- The second lesson can be used to allow students time to consolidate this work further and get additional support or challenge as appropriate.

Plenary
Ask students to devise their own compound shape and mark sufficient lengths to enable a partner to work out the area of it. Students then swap shapes and solve each other’s problems before discussing the answers at the end. Check students have correctly solved their partner’s problems and discuss any issues (not enough information, etc.)

Exercise commentary

Exercise 19 has a collection of examples where the shapes are compounds of rectangles and triangles. Encourage students to show the steps of working in these examples to ensure they are splitting the shapes up correctly. Questions from 9 onwards have several possible approaches when dividing the shapes up.

Exercise 20 focuses on using a coordinate grid to work out the areas of skew triangles and irregular quadrilaterals. Encourage a systematic approach to these situations.

Exercise 21 tests students on parallelograms and trapeziums.
Lesson 13 – Volume and surface area 1

Textbook pages 31–32

Objectives
C5.4: Carry out calculations involving the surface area and volume of a cuboid and prism.
C5.5: Carry out calculations involving the areas and volumes of compound shapes.

Starter
Give students some fast-paced multiplication questions (responses on mini-whiteboards, mini-chalkboards or in students’ exercise books) which may include calculations where at least one of the numbers is to one decimal place. Include some involving three numbers.

Lesson commentary
- Introduce the idea of a prism and discuss the fact that cuboids and cylinders are merely special cases of prisms. Physical examples could be used from a typical household (cans, cereal boxes, chocolate boxes, etc.). Recall that the area of the cross-section can be worked out using an appropriate area formula (see previous lessons). Discuss the formula ‘area of cross-section × length’ for the volume of a prism and link this to the special formula for cuboids.
- Develop the idea of the volume of cuboids by providing the students with an example of a (simple) compound prism made up of two cuboids stuck together. This could be a physically prepared model or in the form of a diagram. Discuss the possible approaches (find the area of the cross-section using the idea that it is a compound shape or split the prism into constituent cuboids before ‘sticking it back together again’). Students should be encouraged to use the method they prefer.
- Students can then practise working out the volumes of a variety of prisms and compound prisms using questions from exercise 23. Encourage students to work together.

Exercise commentary
The first two questions in exercise 23 give the area of the cross-section but, from this point on, students will need to work the area out themselves.
Ensure the correct formula is used for this and that students adopt a sensible approach for questions 6 to 9 where the prism is compound.
Questions 2, 6, 7 and 8 from exercise 26 can be used to extend more able students.

Plenary
A fast question and answer calculator quiz. Give students a series of prisms, including cuboids and simple compounds of cuboids, and ask them to write down the volumes on mini-whiteboards, mini-chalkboards or in their exercise books.
Lessons 14 and 15 – Volume and surface area 2

Textbook pages 32–36

Objectives
C5.4: Carry out calculations involving the surface area and volume of a cylinder. Carry out calculations involving the surface area and volume of a sphere, pyramid and cone.
C5.5: Carry out calculations involving the areas and volumes of compound shapes.

Starter
Give students fast-paced calculator questions involving π such as 4 × π and π × 3². They can write the answers in their exercise books (and check them at the end) or on mini-whiteboards or chalkboards for quick assessment.

Lesson commentary
• Refer back to the previous lesson on prisms and discuss the cylinder as a special case. Ask students to recall their work on circles and discuss how the cross-sectional area of the cylinder can be found. Demonstrate this with a number of examples and encourage students to develop the single formula for the volume of the cylinder rather than necessarily thinking about it as a prism.
• Students can practice some examples of their own at this point but encourage students to work together and check understanding at regular intervals.
• Students often don’t understand where the formula for the surface area of a cylinder comes from, but most students are able to apply the formula. A nice activity to try and encourage understanding is to use a food can with the label on and ask students how they might work out the area of the label – it is just a rectangle.
• Develop the formula and then allow students time to practise applying it. Again, encourage students to work together.
• The second lesson can be used to practise applying the formulas for spheres, cones and pyramids. A third lesson may be required for additional consolidation.

Exercise commentary
Exercise 24 contains routine practice which includes semicircular and quadrant cross-sections in question 12. Use these questions as appropriate for basic consolidation.
Exercise 25 contains questions relating to spheres, cones and pyramids.
Exercise 26 contains a wide variety of applied and compound problems. Less able students will benefit from further consolidation whereas more able students should be encouraged to complete the questions here with little assistance (although still encourage students to work together). Encourage students to show the steps of working in order to improve their mathematical communication skills – ask the question ‘If I read your solution would I understand how to solve the problem directly from it?’

Plenary
Provide students with a few further examples of cylinder volumes, including one where the volume is given but not the height, and ask them to calculate and then write down the answers in their books. Books can be swapped with a neighbouring student before the answers are given out. Questions on surface area could also be included.
Lesson 16 – Scale drawing

Textbook pages 37–39

Objectives
C4.3: Read and make scale drawings.

Starter
Give the students a scale, for example 2 cm : 1 m. Give them a number of conversions to do using this scale (both forwards and backwards). Responses can be given via mini-whiteboards or mini-chalkboards or written into student exercise books for checking at the end.

Lesson commentary
● The key aim of this lesson is to encourage students to be precise when drawing diagrams to scale and use scales appropriately. Discuss the importance of accuracy when drawing diagrams to scale by focusing on the later effects if there is imprecision. Students can be encouraged to think up their own situations where poor scale drawing might lead to ‘catastrophe’.
● Students could be asked to work in groups to make a scale drawing of their own classroom or another suitable space around school (the hall, the playground, etc.) Encourage them to choose an appropriate scale and focus on accuracy. Do they take into account the furniture in the room, little recesses, etc?

Exercise commentary
The first four questions in exercise 27 test the students’ ability to accurately construct the diagrams from the information given. Ensure right-angles are kept and that the arrowhead and sentry box roof are correctly constructed.
Questions 5 to 8 require students to interpret information before drawing their diagrams. Ensure compass directions are correctly understood here.
Question 10 asks students to interpret a diagram drawn to scale and could be given at the start of the exercise rather than at the end.

Plenary
Project a map or plan drawn to scale (lengths marked – similar to question 10 in exercise 27) using an interactive whiteboard or overhead projector and ask students to work out ‘real-life’ lengths using the given scale. Students could respond as a class using question and answer or mini-whiteboards, or they could write the answers in their exercise books for checking at the end.

The revision and examination-style exercises can be used as further practice as appropriate.

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