OCR
RECOGNISING ACHIEVEMENT

Support for GCSE Maths 2010

GCSE Mathematics A
GCSE Mathematics B

OCR. Providing full support for Mathematics

Our accredited GCSE Mathematics A and B specifications have been developed for first teaching from September 2010 following close consultation with key stakeholders in the Maths teaching community. These build on our extensive experience of running pilot GCSEs in Mathematics and Additional Mathematics.

We want to provide you with everything you need to make the 2010 changes work for you, so we've carefully shaped our new Mathematics specifications and support materials to help you do this.

You'll be able to pick from a practical toolkit of support, including an AO3 (problem solving) guide, handy Teachers' Guide for Specification B, specimen assessment materials and a guide to curriculum planning – all designed to save you preparation time.

SCHEMES OF WORK

Topic outline of what can be covered.

Suggested teaching time.

Ideas for teaching and homework activities.

Suggested resources to help with teaching.

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Sample GCSE Scheme of Work

OCR GCSE Mathematics A J562 Unit: A501/01

Suggested teaching time	2-3 hours	**Topic**	Factors, multiples and primes

Topic outline	**Suggested teaching and homework activities**	**Suggested resources**	**Points to note**
Factors/multiples/primes • use the concepts and vocabulary of factor (divisor), multiple, common factor, highest common factor, least common multiple, prime number and prime factor decomposition(1) • find the prime factor decomposition of positive integers(2)	• Happy numbers activity – find numbers where sum of factors is equal to number • Use factor tree software to illustrate use of prime factors in finding LCM/HCF after definitions have been established **Class activity:** Identify a number from a description of its properties, for example, which number less than 50 has 3 and 5 as factors and is a multiple of 9? Students make up their own descriptions and test one another. • Multiples prison cell game • Prime factor decomposition powerpoint • Use factor trees/factor staircase • Goldbach's conjecture (counter example search)	• Tarsia puzzle – factors and multiples at SmartBoard Notepad files for teaching mathematics • Sieve of Eratosthenes - NLVM • Factors of Numbers - Waldomaths • Finding prime numbers - The Sieve of Eratosthenes 1 - Waldomaths • Factor Tree - NLVM • Factor Tree - NLVM	• (1) Write down a multiple of 7, a prime number and a factor of 104 that lie between 25 and 30 • (2) Write 96 as a product of prime factors using indices • Counter example problems could be bought in here eg Are all primes odd? • Emphasise 1 not a prime and factor trees should not contain 1's

= Innovative teaching idea = ICT opportunity

LESSON PLANS

Lesson objectives.

It takes you through the content to be delivered and the time this should take.

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Sample GCSE Lesson Plan 1

OCR GCSE Mathematics A J562 Unit A503/02

Number – Repeated Percentage Change

OCR recognises that the teaching of this qualification will vary greatly from school to school and from teacher to teacher. With that in mind this lesson plan is offered as a possible approach but will be subject to modifications by the individual teacher.

Lesson length is assumed to be **one hour**.

Learning Objectives for the Lesson

Objective 1	To solve problems involving repeated percentage change including compound interest and depreciation
Objective 2	To select and use suitable problem solving strategies and efficient techniques to solve numerical problems (HC1)
Objective 3	To present and interpret solutions in the context of the original problem (HC1)
Objective 4	To solve simple percentage problems in real life situations, functional contexts

Recap of Previous Experience and Prior Knowledge

Students will have used a multiplier for percentage increase and percentage decrease before and be able to increase and decrease an amount by a multiplier.

Content

Time	Content
10–15 minutes	Initial teacher exposition using provided PowerPoint (separate document entitled "A503-02 - Lesson Plan 1 - PowerPoint Presentation") or MyMaths – MyMaths.co.uk - Percentage Change 2 Develop the idea of a repeated percentage change. 1 Find multiplier – lots of Q & A on this area – it is the key. 2 Set up – initial amount × multiplier ^n, where n is the number of repeats. Explain terms depreciation and compound interest and simple interest so that students can see the difference between simple and compound interest.
15 minutes	Consolidation from practice question sheet eg http://www.cimt.plymouth.ac.uk/projects/mepres/allgcse/pr11-sa.pdf – try pages 139 and 140 on compound interest and depreciation – selected questions or endorsed text – individual work on appreciation and depreciation.
5 minutes	Review and set up tasks in small groups.
10 minutes	Work on Task 1 (see below).

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Sample GCSE Lesson Plan 1

Time	Content
10 minutes	Review and refine writing/solution model, sharing ideas, modelling a good solution.
5 minutes	Complete Task 1 and attempt Task 2 with write up for homework. Next lesson – share tasks and attempt exam style questions on repeated percentage change (see below).

Task 1

Tim has £500 to invest and he wishes to find the best return in interest for his money. He is not sure how long to invest his money for and is seeking advice.

These are the deals he is considering.

Deal 1
3·5% compound interest per year

Deal 2
5% simple interest per year

Write a report on which deal Tim should use. Use clear mathematics in your report.

Task 2

Stacey is buying a new car and wishes to buy a car which best maintains its value from year to year.

These are the cars she is considering with statistics on how much they depreciate.

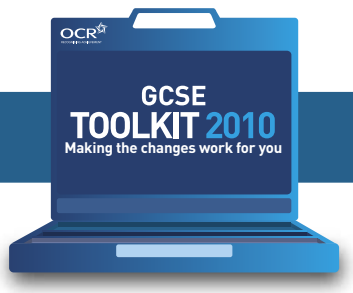
They each cost £10 000.

Car 1
Loses 22% of its value each year

Car 2
Loses £1800 of its value for each of the first 5 years and then 6% per year after that

Car 3
Loses 28% of its value in the first year and then 18% each year after that

Write a report on which car Stacey should buy. Use clear mathematics in your report.



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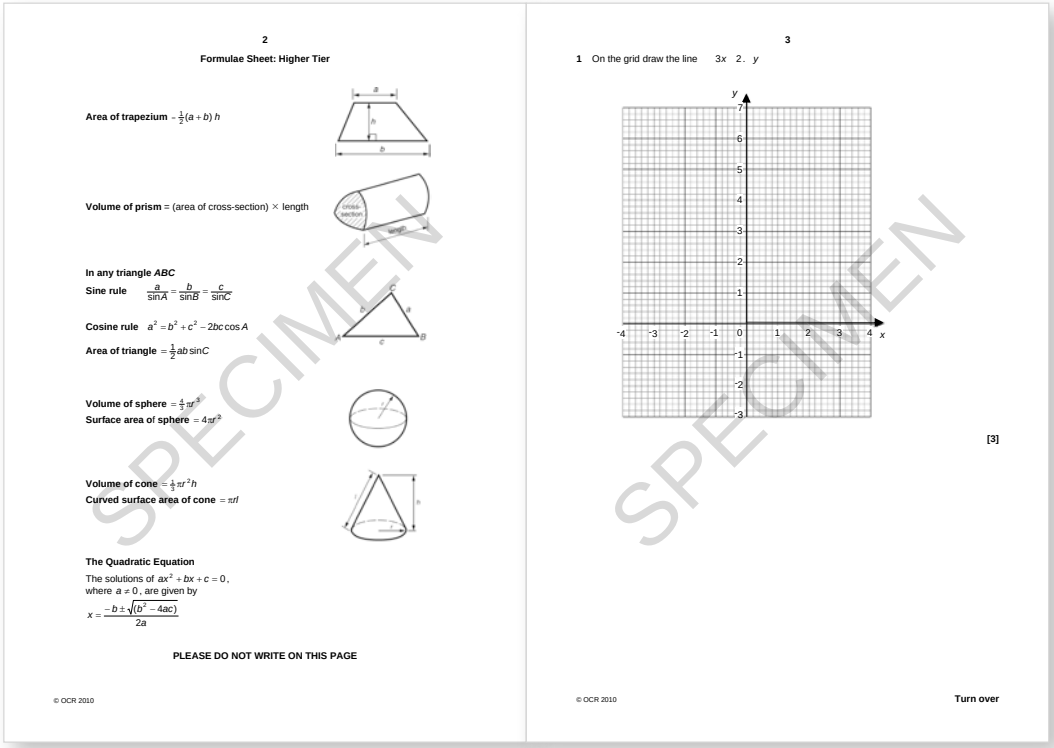
SPECIMEN ASSESSMENT MATERIALS – SPECIFICATION A

Shows the layout of our examination papers and the style of questions you can expect to see.



2

Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a+b)h$

Volume of prism = (area of cross-section) × length

In any triangle *ABC*

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$

Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$

Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

PLEASE DO NOT WRITE ON THIS PAGE

SPECIMEN

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3

1 On the grid draw the line $3x$ 2. y

[3]

SPECIMEN

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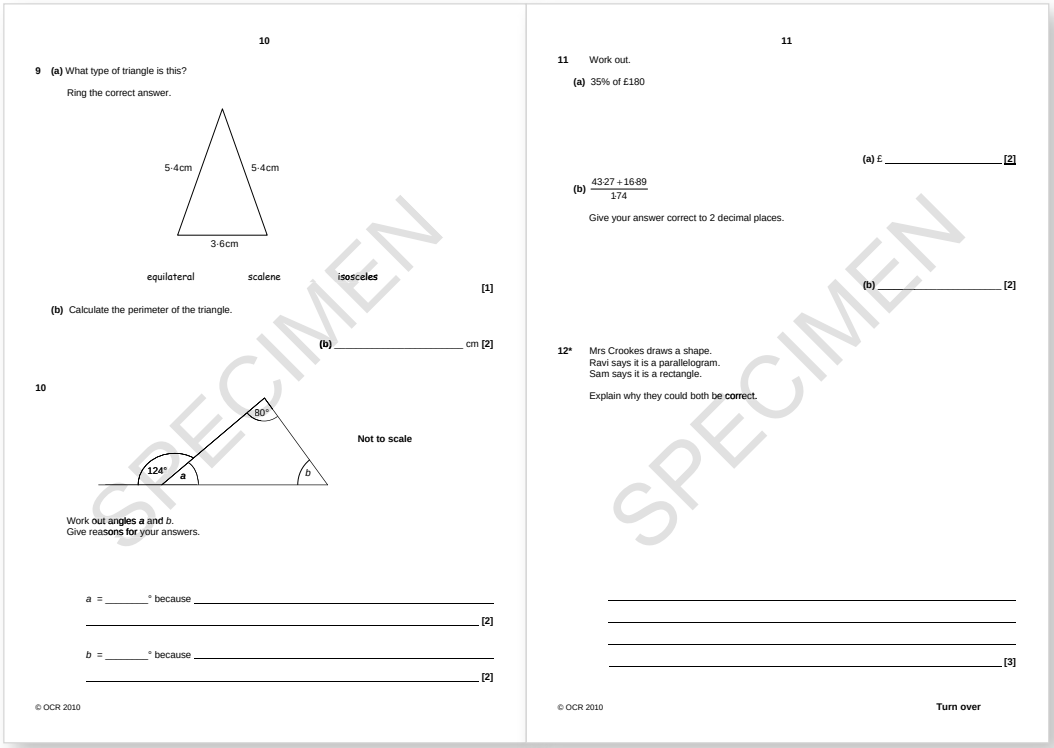
SPECIMEN ASSESSMENT MATERIALS – SPECIFICATION B

Shows the layout of our examination papers and the style of questions you can expect to see.



10

9 **(a)** What type of triangle is this?

Ring the correct answer.

equilateral scalene isosceles

[1]

(b) Calculate the perimeter of the triangle.

(b) _____ cm **[2]**

10

Not to scale

Work out angles *a* and *b*.
Give reasons for your answers.

a = _____° because _____

_____ **[2]**

b = _____° because _____

_____ **[2]**

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11

11 Work out.

(a) 35% of £180

(a) £ _____ **[2]**

(b) $\frac{43{\cdot}27 + 16{\cdot}89}{1{\cdot}74}$

Give your answer correct to 2 decimal places.

(b) _____ **[2]**

12* Mrs Crookes draws a shape.
Ravi says it is a parallelogram.
Sam says it is a rectangle.

Explain why they could both be correct.

_____

_____

_____

_____ **[3]**

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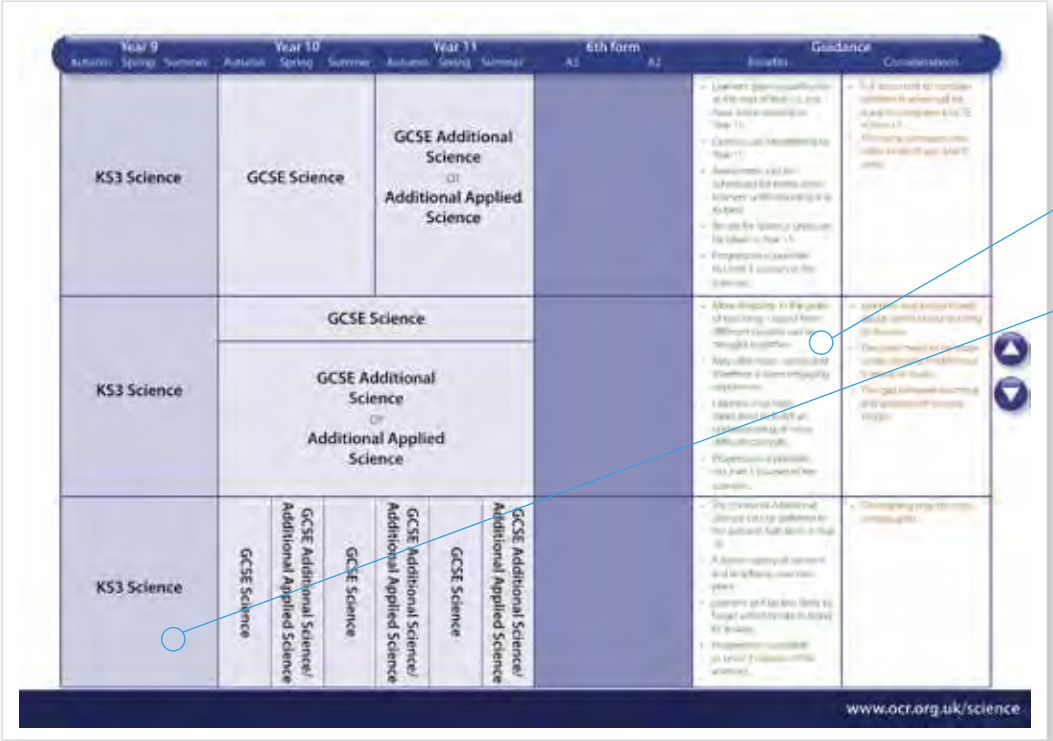
GUIDE TO CURRICULUM PLANNING

Outlines possible pathways you could use at your school between Years 9 and 13.

Shows guidance and benefits to each pathway.

Shows how you can use different pathways simultaneously.



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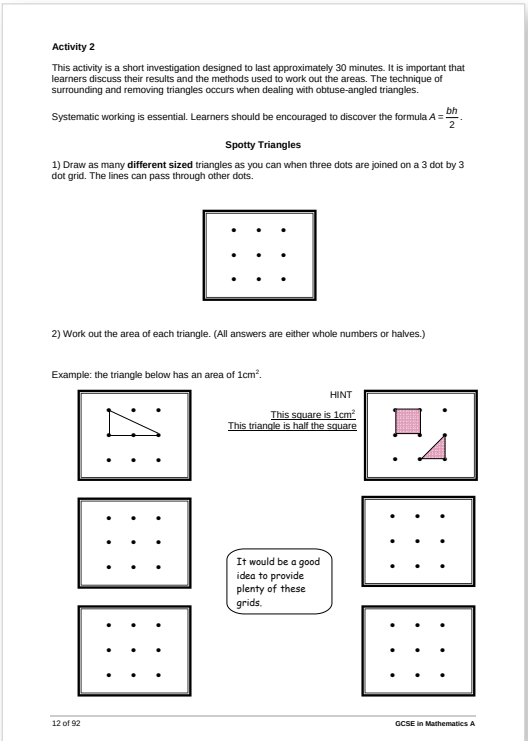
AO3 GUIDE

Designed to accompany our new GCSE Mathematics A specification.

Will help to spark ideas about how activities may be developed and used within a series of lessons.

Sets out seven extended cases, containing ideas for short and longer activities, and three cases with a single activity.

Some worked examples are also included.



Activity 2

This activity is a short investigation designed to last approximately 30 minutes. It is important that learners discuss their results and the methods used to work out the areas. The technique of surrounding and removing triangles occurs when dealing with obtuse-angled triangles.

Systematic working is essential. Learners should be encouraged to discover the formula $A = \frac{bh}{2}$.

Spotty Triangles

1) Draw as many **different sized** triangles as you can when three dots are joined on a 3 dot by 3 dot grid. The lines can pass through other dots.

2) Work out the area of each triangle. (All answers are either whole numbers or halves.)

Example: the triangle below has an area of 1cm^2.

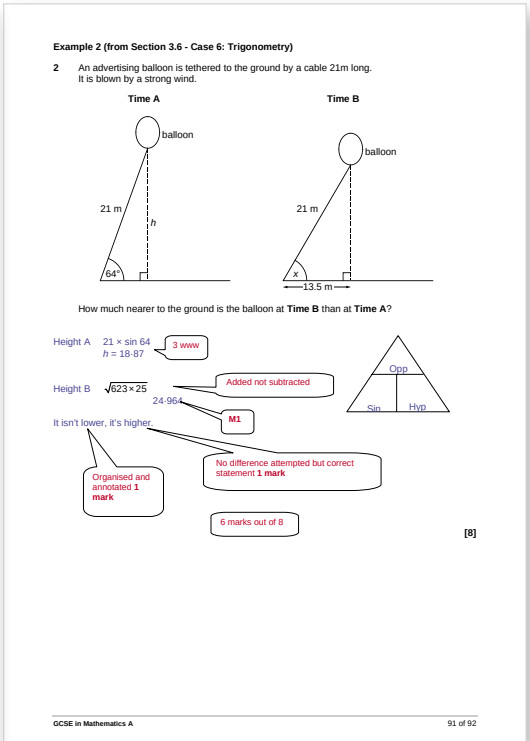
HINT

This square is 1cm^2

This triangle is half the square

It would be a good idea to provide plenty of these grids.

12 of 92 GCSE in Mathematics A



Example 2 (from Section 3.6 - Case 6: Trigonometry)

2 An advertising balloon is tethered to the ground by a cable 21m long. It is blown by a strong wind.

How much nearer to the ground is the balloon at **Time B** than at **Time A**?

Height A $21 \times \sin 64$ $h = 18{\cdot}87$ 3 www

Height B $\sqrt{623 \times 25}$ 24·964 Added not subtracted

M1

It isn't lower, it's higher

Organised and annotated **1 mark**

No difference attempted but correct statement **1 mark**

6 marks out of 8

[8]

GCSE in Mathematics A 91 of 92

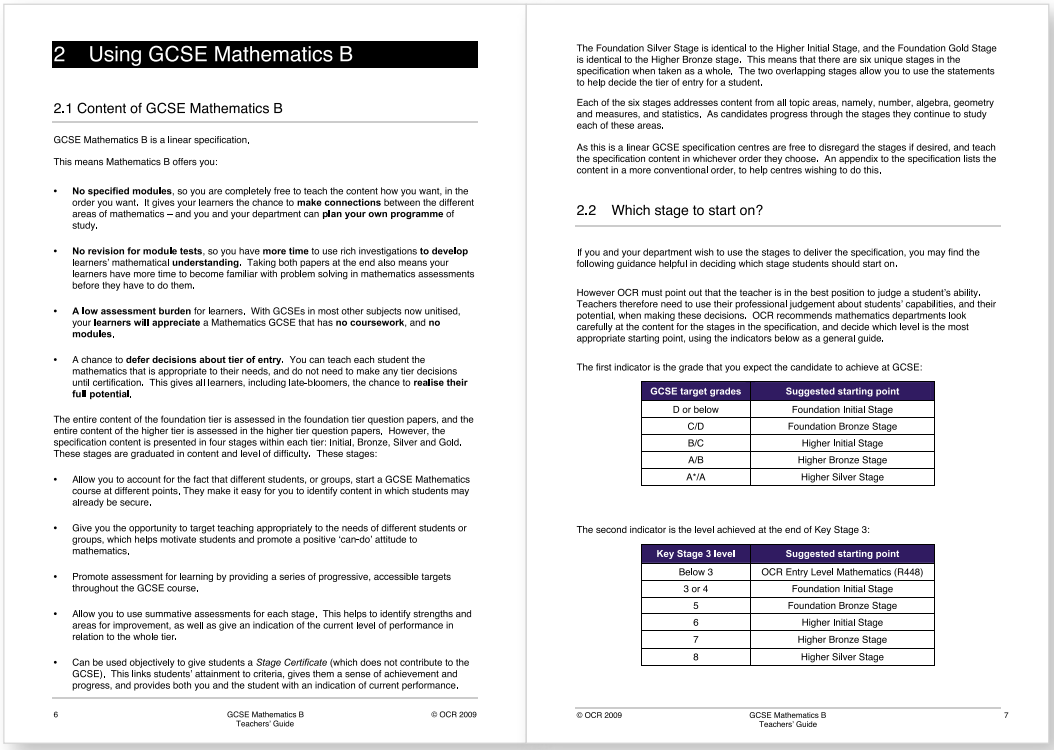
toolkit of support.

TEACHERS' GUIDE TO SPECIFICATION B

Designed to accompany our new linear GCSE Mathematics B specification in which the content of each tier is carefully divided into stages.

Answers some of the most common questions about using the stages to target the level of the course to the level of ability of your learners.

Note: an appendix to the specification lists the content in a more conventional order for teachers who want to use the specification in a more traditional linear way.



2 Using GCSE Mathematics B

2.1 Content of GCSE Mathematics B

GCSE Mathematics B is a linear specification.

This means Mathematics B offers you:

- **No specified modules**, so you are completely free to teach the content how you want, in the order you want. It gives your learners the chance to **make connections** between the different areas of mathematics – and you and your department can **plan your own programme** of study.
- **No revision for module tests**, so you have **more time** to use rich investigations **to develop** learners' mathematical **understanding**. Taking both papers at the end also means your learners have more time to become familiar with problem solving in mathematics assessments before they have to do them.
- **A low assessment burden** for learners. With GCSEs in most other subjects now unitised, your **learners will appreciate** a Mathematics GCSE that has **no coursework**, and **no modules**.
- A chance to **defer decisions about tier of entry**. You can teach each student the mathematics that is appropriate to their needs, and do not need to make any tier decisions until certification. This gives all learners, including late-bloomers, the chance to **realise their full potential**.

The entire content of the foundation tier is assessed in the foundation tier question papers, and the entire content of the higher tier is assessed in the higher tier question papers. However, the specification content is presented in four stages within each tier: Initial, Bronze, Silver and Gold. These stages are graduated in content and level of difficulty. These stages:

- Allow you to account for the fact that different students, or groups, start a GCSE Mathematics course at different points. They make it easy for you to identify content in which students may already be secure.
- Give you the opportunity to target teaching appropriately to the needs of different students or groups, which helps motivate students and promote a positive 'can-do' attitude to mathematics.
- Promote assessment for learning by providing a series of progressive, accessible targets throughout the GCSE course.
- Allow you to use summative assessments for each stage. This helps to identify strengths and areas for improvement, as well as give an indication of the current level of performance in relation to the whole tier.
- Can be used objectively to give students a *Stage Certificate* (which does not contribute to the GCSE). This links students' attainment to criteria, gives them a sense of achievement and progress, and provides both you and the student with an indication of current performance.

The Foundation Silver Stage is identical to the Higher Initial Stage, and the Foundation Gold Stage is identical to the Higher Bronze stage. This means that there are six unique stages in the specification when taken as a whole. The two overlapping stages allow you to use the statements to help decide the tier of entry for a student.

Each of the six stages addresses content from all topic areas, namely, number, algebra, geometry and measures, and statistics. As candidates progress through the stages they continue to study each of these areas.

As this is a linear GCSE specification centres are free to disregard the stages if desired, and teach the specification content in whichever order they choose. An appendix to the specification lists the content in a more conventional order, to help centres wishing to do this.

2.2 Which stage to start on?

If you and your department wish to use the stages to deliver the specification, you may find the following guidance helpful in deciding which stage students should start on.

However OCR must point out that the teacher is in the best position to judge a student's ability. Teachers therefore need to use their professional judgement about students' capabilities, and their potential, when making these decisions. OCR recommends mathematics departments look carefully at the content for the stages in the specification, and decide which level is the most appropriate starting point, using the indicators below as a general guide.

The first indicator is the grade that you expect the candidate to achieve at GCSE:

GCSE target grades	Suggested starting point
D or below	Foundation Initial Stage
C/D	Foundation Bronze Stage
B/C	Higher Initial Stage
A/B	Higher Bronze Stage
A*/A	Higher Silver Stage

The second indicator is the level achieved at the end of Key Stage 3:

Key Stage 3 level	Suggested starting point
Below 3	OCR Entry Level Mathematics (R448)
3 or 4	Foundation Initial Stage
5	Foundation Bronze Stage
6	Higher Initial Stage
7	Higher Bronze Stage
8	Higher Silver Stage

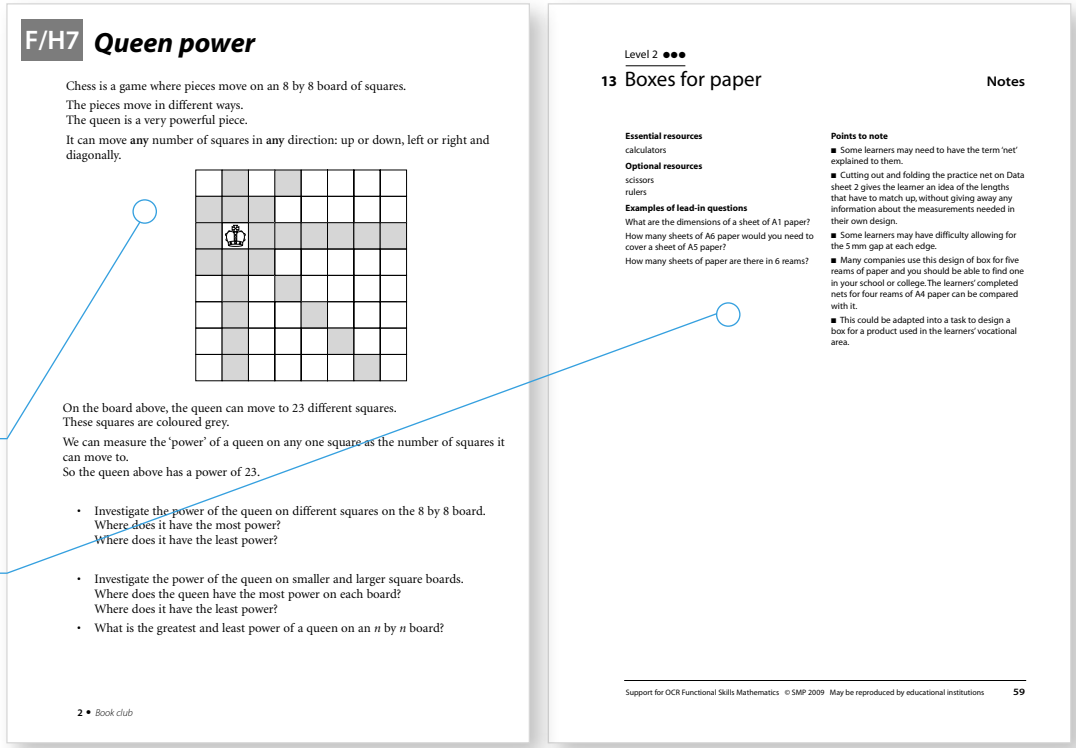
GCSE PROBLEM SOLVING TASKS AND FUNCTIONAL SKILLS MATHS SUPPORT FOR LEVELS 1 AND 2

Practical and engaging sets of resources to support the delivery of GCSE Mathematics A and B and Functional Skills Maths (Level 1 and Level 2). Produced in partnership with The School Mathematics Project (SMP).

GCSE Mathematics A and B - offers a comprehensive suite of tasks for each specification.

Functional Skills Maths - offers a comprehensive suite of tasks for each level.

The support includes teacher guidance notes and supporting information for each task.



F/H7 *Queen power*

Chess is a game where pieces move on an 8 by 8 board of squares.
The pieces move in different ways.
The queen is a very powerful piece.
It can move **any** number of squares in **any** direction: up or down, left or right and diagonally.

On the board above, the queen can move to 23 different squares.
These squares are coloured grey.
We can measure the 'power' of a queen on any one square as the number of squares it can move to.
So the queen above has a power of 23.

- Investigate the power of the queen on different squares on the 8 by 8 board.
  Where does it have the most power?
  Where does it have the least power?
- Investigate the power of the queen on smaller and larger square boards.
  Where does the queen have the most power on each board?
  Where does it have the least power?
- What is the greatest and least power of a queen on an n by n board?

Level 2 ●●●

13 Boxes for paper

Notes

Essential resources
calculators

Optional resources
scissors
rulers

Examples of lead-in questions
What are the dimensions of a sheet of A1 paper?
How many sheets of A6 paper would you need to cover a sheet of A5 paper?
How many sheets of paper are there in 6 reams?

Points to note
- Some learners may need to have the term 'net' explained to them.
- Cutting out and folding the practice net on Data sheet 2 gives the learner an idea of the lengths that have to match up, without giving away any information about the measurements needed in their own design.
- Some learners may have difficulty allowing for the 5 mm gap at each edge.
- Many companies use this design of box for five reams of paper and you should be able to find one in your school or college. The learners' completed nets for four reams of A4 paper can be compared with it.
- This could be adapted into a task to design a box for a product used in the learners' vocational area.

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INTERACTIVE SPECIFICATION PATHFINDER

Interactive support document designed to help you decide which of our new GCSE Mathematics specifications best fit you and your learners' needs. Especially helpful for teachers of our current Graduated Assessment (Mathematics) specification.

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PARENT AND LEARNER GUIDE

Provides a tool to use with parents and learners to highlight the benefits of the course.

Can be used as an option evening resource.

toolkit of support.

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RECOGNISING ACHIEVEMENT

We're here to help you with specialist advice, guidance and support for those times when you simply need a more individual service. You can call our dedicated subject specialist support team if you have any queries relating to Maths 2010 qualifications on

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