

Chapter 1 Number

Specification

FS coverage and range	Understand and use positive and negative numbers of any size in practical contexts Carry out calculations with numbers of any size in practical contexts, to a given number of decimal places
FS exemplification	E.g. Temperature changes Put numbers in order Addition and subtraction Use the terms odd, even, multiple, factor Add, subtract, multiply and divide numbers up to two decimal places Estimate answers to calculations Includes negative numbers

GCSE

GCSE specification	N a Add, subtract, multiply and divide any number N b Order rational numbers N c Use the concepts and vocabulary of factor (divisor), multiple, common factor, Highest Common Factor (HCF), Least Common Multiple (LCM), prime number and prime factor decomposition N u Approximate to specified or appropriate degrees of accuracy including a given power of ten, number of decimal places and significant figures
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Edexcel GCSE course	Specification A: Foundation Chapter 1, 5.2, 5.7–5.10, 8.3 Higher Chapter 1, 4.1, 4.3–4.6, 25.2 Specification B: Foundation Unit 1: 1.1, 1.5, 3.1, 3.10; Unit 2: 1.2–1.9, 2.1–2.2, 3.2–3.4, 3.6–3.10, 4.3, 4.5–4.7; Unit 3: 1.2–1.4, 2.1 Higher Unit 1: 1.6, 2.1, 2.6, 5.1; Unit 2: Chapter 1, Chapter 2, 3.1–3.6, 5.2; Unit 3: 1.1–1.2, 1.4
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Resources

General resources	Calculators
Resource sheets	1.1, 1.2, 1.3, 1.4
Links	http://www.football-league.co.uk http://www.bbc.co.uk/weather/world/city_guides/
ActiveTeach resources	Video ResultsPlus Knowledge Check ResultsPlus Problem Solving Question Audio Animations

Lesson 1

Objectives

- Use a calculator to represent situations efficiently
- Use prime numbers
- Check answers to see if they work

Starter

- Give students a 'Guess the number' puzzle. For example, *I am less than 10, I am even, I am a multiple of 3 and a factor of 30. What number am I?* Then ask them to devise their own similar puzzles to try out on the group.

Main teaching and learning

- Discuss with students how the level of accuracy required in real-life calculations will vary in different circumstances. For example, when is a high degree of accuracy essential and when would a reasonable estimate suffice?
- Ask students for examples of prime numbers. Ask: *Which is the smallest prime number?* Discuss *Take a look*: Bar codes (p11). Ask students to suggest other possible answers.
- Go through *Take a look*: Bill with students, discussing the errors made. Point out that in order to write calculator answers in correct money notation, it may be necessary to round or add an additional zero.
- Give each student a plumber's job card from Resource sheet 1.1. Ask students to write out an invoice for their job card showing the total cost. Then ask them to check each other's work and compare the prices of different jobs.
- In preparation for *Have a go* Q3, ask students to play 'Scissors, paper, stone' in small groups. They should award points as in Q3. Ask each group to discuss their own ways of recording scores and to devise a results table.
- Ask students to complete Q1–3.

Issues and misconceptions

- Students need to understand that 2.4 on a calculator is £2.40 not £2.04.
- Ensure that students realise that 1 is not a prime number as it has only one factor.

Support

- Draw a vertical number line on the board to help students visualise the situation in Q2.

Extension

- Ask students to make up some more questions relating to the information about fish in Q2. They can then answer each other's questions.

Plenary

- Show students real football league data (for example, using www.football-league.co.uk) and compare league positions with goal difference. Ask: *Why can a team with a negative goal difference appear above a team with a positive goal difference?*

Formative assessment

- Check the accuracy of students' answers to the *Have a go* questions.
- Peer-assess the presentation of students' results tables for the 'Scissors, paper, stone' game and for Q3. Encourage students to identify a good point about each table and a suggestion for improvement.

Homework

- Ask students to use www.bbc.co.uk/weather/world/city_guides or a similar website to research and record minimum and maximum average monthly temperatures for Moscow and one other city.

Lesson 2

Objectives

- Use different techniques to inform decision making
- Interpret situations
- Give a level of accuracy of results
- Interpret and analyse unfamiliar situations

Starter

- Give each student a copy of the number line on Resource sheet 1.2. Give a number and a series of additions and subtractions for students to follow. Ask a student who offers the correct final answer to give a new starting number and set of operations.

Main teaching and learning

- Develop the Starter in the context of a bank account. Give an amount of money and a series of bills (debits) and payments (credits). Ask students to calculate the final balance.
- Present the table and open-ended question from *Take a look: Temperatures in Iceland* (p13). Discuss possible solutions.
- Ask students to work with a partner to compare minimum and maximum temperature data for at least two cities. Students may have found this data as homework from Lesson 1. If not, they can do so during the lesson or you can provide it for them (for example, see www.bbc.co.uk/weather/world/city_guides). Ask:
 - *Which city has the greatest range of average temperatures in a single month or during the year?*
 - *What are the overall mean maximum and minimum temperatures?*
- Finally, ask students to prepare to discuss their findings in small groups (see Plenary).

Issues and misconceptions

- Students may have misinterpreted the 'rules' about negative numbers. For example, 'two negatives make a positive' and so think $-4 + -6 = 10$. Emphasise that the sign in front of the first number gives the starting position above or below 0 on a number line.
- Ensure that students use brackets correctly when calculating means.

Support

- Encourage students to use or visualise number lines when completing calculations involving both positive and negative numbers.
- Check that students understand the concept of minimum and maximum monthly and daily temperatures.

Extension

- Ask students to display temperature data graphically in a manner enabling comparison.

Plenary

- Ask students to present their temperature findings within small groups. Each group should identify the hottest and coldest locations considered and nominate a student to present their findings to the whole class.

Formative assessment

- Ask students to give feedback on each other's temperature presentations, within their groups.

Homework

- Pose the following question:
Students A and B have Saturday jobs. Student A works from 8 am to 5.30 pm, has a 1 hour unpaid lunch break and earns £6.90 per hour. Student B works from 2 pm to 10 pm, has a 30 minute paid break and earns £7.45 per hour. Who earns more?

Lesson 3

Objectives

- Check answers to see if they work
- Give a level of accuracy of results
- Work with problems that require coordination of different features

Starter

- Show a restaurant menu with a variety of prices. Use a menu of your own choice or the one provided on Resource sheet 1.3. Tell students that they have a certain amount to spend on a meal and ask them to decide what they would choose and why. Discuss the variety of students' answers and their reasons.
- Identify this activity as a process where various factors are involved in finding an optimal answer.

Main teaching and learning

- Work through *Take a look: Gritting the roads* (pp14–15) with the students. As a first step, identify the key pieces of information involved.
- Ask students to consider how much money would be saved if the predictions are 1°C too low for each day. Ask them to rework the question, deciding how the change affects the -6°C or below category. Compare students' answers.
- Ask students to answer *Have a go* Q6–9, using the strategy of identifying the key points in the question first.

Issues and misconceptions

- Emphasise to students the need to present their working clearly so that they themselves (and the examiner) can follow it. This will help them to choose the best answer from several possibilities.
- Note that Q9 requires a volume calculation involving cm and mm, then conversion to litres.

Support

- Encourage students to estimate answers before they do the exact calculations in order to check accuracy.
- Encourage students to round for Q7.

Extension

- Ask students to make up a new version of Q6 for a different industry with different salaries. Students can then answer each other's questions.

Plenary

- Show students three bills with totals for meals chosen from the menu used for the Starter activity. Make up bills of your own or use those provided on Resource sheet 1.4. The total for one bill should be incorrect. Ask students to identify which bill is wrong by rounding values to obtain an estimate, rather than by using an accurate calculation. Emphasise the importance of using estimation as a check to spot errors.

Formative assessment

- Mark numerical answers with emphasis on clarity of working.
- Ask students to peer-assess each other's answers to the *Have a go* questions and rate on a scale of 1–10 the ease with which they could follow the solution given.

Homework

- Ask students to ask an adult about the last occasion on which they used numbers or a calculation to make a decision at work or in everyday life. Students should write up the scenario, the numbers and calculations involved and the criteria and strategies used.