

Pearson Functional Skills Mathematics Level 2 Scheme of Work overview

| Subject content | Level | GLH |
|---|--------------|------------|
| Using numbers and the number system – whole numbers, fractions, decimals and percentages | | |
| 1. Read, write, order and compare positive and negative numbers of any size | L2 | 1 |
| 2. Carry out calculations with numbers up to one million including strategies to check answers including estimation and approximation | L2 | 2 |
| 3. Evaluate expressions and make substitutions in given formulae in words and symbols | L2 | 2 |
| 4. Identify and know the equivalence between fractions, decimals and percentages | L2 | 1 |
| 5. Work out percentages of amounts and express one amount as a percentage of another | L2 | 2 |
| 6. Calculate percentage change (any size increase and decrease), and original value after percentage change | L2 | 2 |
| 7. Order, add, subtract and compare amounts or quantities using proper and improper fractions and mixed numbers | L2 | 2 |
| 8. Express one number as a fraction of another | L2 | 1 |
| 9. Order, approximate and compare decimals | L2 | 1 |
| 10. Add, subtract, multiply and divide decimals up to three decimal places | L2 | 2 |
| 11. Understand and calculate using ratios, direct proportion and inverse proportion | L2 | 2 |
| 12. Follow the order of precedence of operators, including indices | L2 | 2 |
| Using common measures, shape and space | | |
| 13. Calculate amounts of money, compound interest, percentage increases, decreases and discounts including tax and simple budgeting | L2 | 2 |
| 14. Convert between metric and imperial units of length, weight and capacity using a) a conversion factor and b) a conversion graph | L2 | 2 |
| 15. Calculate using compound measures including speed, density and rates of pay | L2 | 2 |

| Subject content | Level | GLH |
|--|--------------|------------|
| 16. Calculate perimeters and areas of 2-D shapes including triangles and circles and composite shapes including non-rectangular shapes (formulae given except for triangles and circles) | L2 | 2 |
| 17. Use formulae to find volumes and surface areas of 3-D shapes including cylinders (formulae to be given for 3-D shapes other than cylinders) | L2 | 2 |
| 18. Calculate actual dimensions from scale drawings and create a scale diagram given actual measurements | L2 | 2 |
| 19. Use coordinates in 2-D, positive and negative, to specify the positions of points | L2 | 1 |
| 20. Understand and use common 2-D representations of 3-D objects | L2 | 1 |
| 21. Draw 3-D shapes to include plans and elevations | L2 | 2 |
| 22. Calculate values of angles and/or coordinates with 2-D and 3-D shapes | L2 | 2 |
| Handling information and data | | |
| 23. Calculate the median and mode of a set of quantities | L2 | 2 |
| 24. Estimate the mean of a grouped frequency distribution from discrete data | L2 | 2 |
| 25. Use the mean, median, mode and range to compare two sets of data | L2 | 2 |
| 26. Work out the probability of combined events including the use of diagrams and tables, including two-way tables | L2 | 2 |
| 27. Express probabilities as fractions, decimals and percentages | L2 | 1 |
| 28. Draw and interpret scatter diagrams and recognise positive and negative correlation | L2 | 2 |
| Revision | L2 | 4 |
| Assessment | L2 | 2 |

Prior knowledge

- Read, write, order and compare large numbers (up to one million)
- Recognise and use positive and negative numbers
- Multiply and divide whole numbers and decimals by 10, 100, 1000
- Use multiplication facts and make connections with division facts
- Use simple formulae expressed in words for one- or two-step operations
- Calculate the squares of one-digit and two-digit numbers
- Follow the order of precedence of operators
- Read, write, order and compare common fractions and mixed numbers
- Find fractions of whole number quantities or measurements
- Read, write, order and compare decimals up to three decimal places
- Add, subtract, multiply and divide decimals up to two decimal places
- Approximate by rounding to a whole number or to one or two decimal places
- Read, write, order and compare percentages in whole numbers
- Calculate percentages of quantities, including simple percentage increases and decreases by 5% and multiples thereof
- Estimate answers to calculations using fractions and decimals
- Recognise and calculate equivalences between common fractions, percentages and decimals
- Work with simple ratio and direct proportions
- Calculate simple interest in multiples of 5% on amounts of money
- Calculate discounts in multiples of 5% on amounts of money
- Convert between units of length, weight, capacity, money and time, in the same system
- Recognise and make use of simple scales on maps and drawings
- Calculate the area and perimeter of simple shapes including those that are made up of a combination of rectangles
- Calculate the volumes of cubes and cuboids
- Draw 2-D shapes and demonstrate an understanding of line symmetry and knowledge of the relative size of angles
- Interpret plans, elevations and nets of simple 3-D shapes
- Use angles when describing position and direction, and measure angles in degrees
- Represent discrete data in tables, diagrams and charts including pie charts, bar charts and line graphs
- Group discrete data and represent grouped data graphically
- Find the mean and range of a set of quantities
- Understand probability on a scale from 0 (impossible) to 1 (certain) and use probabilities to compare the likelihood of events
- Use equally likely outcomes to find the probabilities of simple events and express them as fractions

Specification references

Using numbers and the number system – whole numbers, fractions, decimals and percentages

- 1 Read, write, order and compare positive and negative numbers of any size
- 2 Carry out calculations with numbers up to one million including strategies to check answers including estimation and approximation

Keywords

positive, negative, order, compare, mathematical operations, sum, difference, product, quotient, place value, level of accuracy, significant figure, estimation, rounding, approximation, reverse calculation

Objectives

The learner should be able to:

- read and write numbers of any size (both written in words and using digits)
- explain the value represented by a specific digit in a given number
- place numbers of any size in ascending and/or descending order, including positive and negative numbers
- compare numbers using greater than and less than symbols
- add, subtract, multiply and divide positive and negative numbers (up to one million)
- understand and use approximation, rounding, estimation and reverse calculation as valid checking methods.

Possible success criteria

- Match numbers in words and numerals.
- Place numbers in ascending or descending order, including negative numbers.
- Work out sums, differences, products and quotients using numbers up to one million, including negative numbers.
- Provide final answers to a specified level of accuracy.
- Select effective checking methods and explain what they signify.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Write a large number using digits when reading a number written in words.
- ✓ Find the total profit or loss made across several months or quarters from information presented in a table or graph.
- ✓ Work out monthly sales based on annual figures.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Add positive and negative figures to find a difference in temperature or income.
- ✓ Use multiplication and division to find total costs or costs per item.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ Work out the total loss the business made last year.
- ✓ Is the cost per unit less than £40?

Common misconceptions

- Learners may lack understanding that the position of a numeral gives it a particular value.
- Learners may not understand the value a digit represents in large numbers which have a zero in the middle, e.g. they may consider 10,148 to be one thousand one hundred and forty-eight.
- Learners may not understand that negative numbers are ordered in ascending order starting from the lowest value, which is represented by the highest numeral.
- Learners may not realise that subtracting a negative number involves adding a positive.
- Learners may make arithmetical errors due to an inability to recall timetables or a lack of checking procedures.

Specification references

Using numbers and the number system – whole numbers, fractions, decimals and percentages

3 Evaluate expressions and make substitutions in given formulae in words and symbols

Keywords

substitution, constant, variable, order of operations (BIDMAS)

Objectives

The learner should be able to:

- substitute a correct value for a variable in a formula
- evaluate expressions in a given formula
- follow the correct order of operations to evaluate a formula
- understand the principles for rearranging formulae.

Possible success criteria

- Substitute a value into a given formula to work out a total cost.
- Convert between different units using a given formula.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify values to be substituted into a formula, from a text or diagram.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Use a formula to provide a quote for a plumbing job.
- ✓ Use a formula to find the total value of a mortgage loan.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ How much should Kirash charge for this job?
- ✓ Can Yoko afford to apply for a mortgage of more than £450,000?

Common misconceptions

- Learners may substitute incorrect values into a formula.
- Learners may not understand that a constant and variable placed together should be multiplied, e.g. $2d = 2 \times d$.
- Learners may not follow BIDMAS, especially when brackets are used.
- Learners may not know or understand how to calculate with indices.

Specification references

Using numbers and the number system – whole numbers, fractions, decimals and percentages

4 Identify and know the equivalence between fractions, decimals and percentages

Keywords

place value, conversion, equivalence, common denominator, simplifying

Objectives

The learner should be able to:

- recognise and calculate equivalences between fractions, percentages and decimals.

Possible success criteria

- Simplify fractions.
- Find a common denominator between fractions to compare them.
- Work out equivalences between fractions, decimals and percentages.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify relevant figures in a text, table or chart.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Compare test results presented as fractions and percentages.
- ✓ Compare 23% of 300 with $\frac{3}{7}$ of 160 to find which group liked the product in a survey more.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ In which subject was Julie most successful?
- ✓ Which group of people in the survey liked the product more?

Common misconceptions

- Learners may confuse equivalences, e.g. $\frac{2}{5}$ with 25% or 0.25.
- Learners may convert decimals into percentages incorrectly, e.g. $0.64 = 6.4\%$.
- When simplifying, learners may simplify the denominator only, rather than the whole fraction.

Specification references

Using numbers and the number system – whole numbers, fractions, decimals and percentages

5 Work out percentages of amounts and express one amount as a percentage of another

6 Calculate percentage change (any size increase and decrease), and original value after percentage change

Keywords

place value, discount, interest rate, mortgage, savings, profit margin, tax, percentage increase/decrease

Objectives

The learner should be able to:

- work out percentages of quantities
- express one amount as a percentage of another
- calculate percentage change (any size increase and decrease)
- work back to the original value after a percentage change.

Possible success criteria

- Work out what percentage of people in a survey agreed with a statement.
- Work out a percentage increase of a gas bill.
- Work out the original price from a discounted price.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Use tables and charts to identify correct figures to work with.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Find 12% of a bill's total to work out the amount to give as a tip.
- ✓ Work out the percentage of people in a survey who agreed with a statement.
- ✓ Work out the original price of a product, e.g. a product discounted by 37% that has a new price of £299.25.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ Work out 12% of £84.79.
- ✓ Did more than 66% of people agree with the statement?
- ✓ Was the original price less than £450?

Common misconceptions

- Learners may believe that increasing a number by $x\%$ is the same as increasing the number by x .
- Learners may make place value errors when converting between percentages and decimals, e.g. they may believe $0.67 = 6.7\%$.
- Learners may not understand the process to work out percentage change.
- Learners may use the discount % in calculations to find the original value, e.g. $299.25 \div 0.37$ rather than $299.25 \div (1 - 0.37)$, when the original value was decreased by 37% to give 299.25.

Specification references

Using numbers and the number system – whole numbers, fractions, decimals and percentages

7 Order, add, subtract and compare amounts or quantities using proper and improper fractions and mixed numbers

8 Express one number as a fraction of another

Keywords

fraction, numerator, denominator, common denominator, improper fraction, equivalent fractions

Objectives

The learner should be able to:

- find equivalent fractions (simplify fractions)
- order fractions in ascending or descending order and compare them
- add proper and improper fractions with different denominators
- subtract proper and improper fractions with different denominators
- work with mixed numbers
- express one number as a fraction of another.

Possible success criteria

- Simplify fractions to include in a report.
- Compare and order fractions and identify equivalent fractions.
- Add and subtract fractions (proper, improper and mixed).
- Work out the fraction of a number represented by another number.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify what values should be placed in the numerator and denominator of a fraction, based on the information in a text or table.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Present the information as a fraction in its simplest form, e.g. 464 out of 1392 people who took part in a survey liked the product.
- ✓ Work out how many small apples were harvested last year, knowing that $\frac{2}{3}$ of the apples were large, $\frac{1}{5}$ of the apples were medium, and the rest of the 30,000 apples harvested that year were small.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ Show this information as a fraction in its simplest form.
- ✓ Is the number of small apples harvested last year less than 3500?

Common misconceptions

- Learners may confuse the numerator with the denominator and treat them as separate whole numbers.
- Learners may unnecessarily and incorrectly convert fractions into decimals to work out values using a calculator.
- Learners may fail to find a common denominator when adding or subtracting fractions with unlike denominators, or they may forget to apply changes to the numerator as well.
- Learners may believe that only whole numbers should be manipulated in calculations with improper or mixed fractions.

Specification references

Using numbers and the number system – whole numbers, fractions, decimals and percentages

9 Order, approximate and compare decimals

10 Add, subtract, multiply and divide decimals up to three decimal places

Keywords

place value, degree of accuracy, terminating and recurring decimals

Objectives

The learner should be able to:

- explain the value represented by a specific digit in a given decimal
- place decimals in ascending and/or descending order
- compare decimals using greater than and less than symbols
- add, subtract, multiply and divide decimals up to three decimal places
- approximate by rounding to a whole number or to one, two or three decimal places.

Possible success criteria

- Place decimals in ascending and/or descending order to show the winners of a sporting event.
- Compare decimals in terms of greater than or less than.
- Add prices together to work out the total cost.
- Subtract prices from the total to check calculations.
- Use conversion factors up to 3 dp to convert between currencies.
- Present answers to a required degree of accuracy (up to three decimal places).

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Use tables and charts to identify correct figures.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Find the difference between lap times in a Formula 1 race.
- ✓ Convert between currencies, e.g. £ and \$, using the conversion rate £1 = \$1.291.
- ✓ Work out the length settings to calibrate a machine.
- ✓ Approximate the total cost of a project.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ Work out the difference between lap times.
- ✓ Is £375.45 more than \$440?
- ✓ What length setting should the machine have, correct to 3 dp?
- ✓ What is the total cost of the project, rounded to 2 dp?

Common misconceptions

- Learners may lack understanding that the position of a numeral gives it a particular value.
- Learners may believe a longer decimal is always larger, e.g. 2.10746 is more than 2.234.
- Learners may put the decimal point in an incorrect position during calculations (e.g. they may not align figures when adding or multiplying).

Specification references

Using numbers and the number system – whole numbers, fractions, decimals and percentages

11 Understand and calculate using ratios, direct proportion and inverse proportion

Keywords

ratio notation, multiplicative relationship, proportionality, factor, constant, variable

Objectives

The learner should be able to:

- understand the multiplicative relationship between two quantities in a ratio
- simplify ratio notation
- relate ratios to fractions correctly
- work out values of individual terms in a ratio and scale them up or down
- understand how variables are related in direct and inverse proportion
- understand the role of the constant in direct and inverse proportion.

Possible success criteria

- Work out the amount of ingredient needed to follow a recipe or identify amounts needed for mixing.
- Scale quantities up or down as required.
- Work out parts and totals using ratios, including ratios with three terms.
- Work out values using direct and inverse proportion.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Express information in a text in the form of a ratio.
- ✓ Identify the scaling factor from the information provided.
- ✓ Work with direct or inverse proportion appropriately, based on the information provided.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Work out the amount of an ingredient needed for 7 people, if the recipe gives you the quantity required for 4 people (e.g. 350 g of flour).
- ✓ You have 300 ml of white paint and you mix it in the ratio 1 : 4 : 2 with red and blue paint to make violet paint.
- ✓ Work out the amount of time 4 workers will need to pave part of a garden, knowing that 1 worker would need 6 hours.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ What amount of flour will you need for 7 people?
- ✓ How many litres of violet paint can you make with 300 ml of white paint?
- ✓ How much time will 4 workers need to pave the garden?

Common misconceptions

- Learners may confuse ratio amounts with fractions, e.g. they may confuse 1 : 3 with $\frac{1}{3}$.
- Learners may form ratios incorrectly, e.g. if there are 10 people, 3 of whom are women, they may believe there is a 3 : 10 ratio of women to men.
- Learners may form proportional relationships incorrectly and hence work out the value of the constant incorrectly.

Specification references

Using numbers and the number system – whole numbers, fractions, decimals and percentages

12 Follow the order of precedence of operators, including indices

Keywords

BIDMAS, index, timetables

Objectives

The learner should be able to:

- understand that squaring means multiplying a number by itself
- understand the concept of index notation
- follow the order of operations to solve calculations.

Possible success criteria

- Work out the value of any two-digit number raised to a power, e.g. 25^3 .
- Comprehend a written problem in terms of two-step operation, and realise which operation takes precedence.
- Follow BIDMAS when evaluating formulae, including indices.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify the figures to be used in a table or graph.
- ✓ Analyse a written problem to identify the appropriate operations to use and their order.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Evaluate compound interest.
- ✓ Identify the calculations required to work out a quote for a job, which requires separate calculations for labour and material costs.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ What is the total amount James will have in his savings account after 3 years?
- ✓ How much should Richard charge for this job?

Common misconceptions

- Learners may not understand that indices require repeated multiplication, not multiplication by the index itself, e.g. $25^3 = 25 \times 25 \times 25$, not 25×3 .
- Learners may not follow the rules of BIDMAS and may instead complete calculations from left to right indiscriminately.

Specification references

Using common measures, shape and space

13 Calculate amounts of money, compound interest, percentage increases, decreases and discounts including tax and simple budgeting

Keywords

place value, discount, annual interest rate, principal sum, investment period, mortgage, savings, profit margin, tax, rebate, income, spending, overheads

Objectives

The learner should be able to:

- calculate confidently with money, using 2 dp accuracy and correct money notation
- know and use the compound interest formula
- work out percentages of quantities, including increases and decreases in a variety of money and budgeting contexts.

Possible success criteria

- Calculate the total bill and present the figure in correct money notation, including a trailing zero.
- Work out a percentage increase in production for a company.
- Work out the total sum after several years of investment earning compound interest.
- Work out the percentage decrease in prices of laptops.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Use tables and charts to identify correct figures to work with.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Work out the total value of a 3-year investment with a compound interest of 4%.
- ✓ Work out the percentage increase in production for a company producing TV sets.
- ✓ Work out the percentage decrease in prices of laptops.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ What is the total amount of the investment after 3 years?
- ✓ Has the production of TV sets increased by more than 17%?
- ✓ Has the price of the laptop decreased by more than 29%?

Common misconceptions

- Learners may believe that increasing a number by $x\%$ is the same as increasing the number by x .
- Learners may confuse discounts with interest.
- Learners may incorrectly convert a percentage to a decimal or fraction.
- Learners may round inaccurately, or truncate figures in the middle of their calculations.
- Learners may lack knowledge of the compound interest formula.
- Learners may not follow BIDMAS.
- Learners may use inconsistent time units when expressing compound frequency and length of investment.

Specification references

Using common measures, shape and space

14 Convert between metric and imperial units of length, weight and capacity using a) a conversion factor and b) a conversion graph

Keywords

conversion graph, conversion factor, kilometres, metres, centimetres, millimetres, miles, yards, feet, inches, kilograms, grams, stone, pounds, ounces, litres, millilitres, gallons, fluid ounces, cubic units, scale factor, key

Objectives

The learner should be able to:

- convert between units of length, weight and capacity in metric and imperial systems
- calculate using these units accurately to three decimal places
- read and use effectively conversion factors and conversion graphs.

Possible success criteria

- Work out the total weight of a parcel in kg.
- Convert miles to km.
- Work out the capacity of a bottle.
- Use a conversion graph to convert between ml and fluid ounces.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify the scale factor in a scale drawing or a map.
- ✓ Identify which units to convert between.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Work out the total weight of a parcel to send abroad.
- ✓ Work out the total capacity of a fish tank.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ What is the total weight of the parcel to the nearest 10 grams?
- ✓ Is 300 litres more than 60 gallons?

Common misconceptions

- Learners may misunderstand scale factors when converting units and reading scales.
- Learners may miscalculate when using decimals.

Specification references

Using common measures, shape and space

15 Calculate using compound measures including speed, density and rates of pay

Keywords

speed, distance, time, density, mass, volume, compound units

Objectives

The learner should be able to:

- recall, use and calculate using speed and density formulae
- understand and convert between units of distance, time, mass, volume and money
- apply knowledge of direct and inverse proportion to set rates of pay formulae (equations).

Possible success criteria

- Work out the distance a car travels at a given speed in a given time.
- Work out the mass of a given object, knowing its density and volume.
- Work out overtime pay.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify which units to use or convert between.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Work out the distance you can travel in a given time at a constant speed of 55 mph.
- ✓ Work out the amount of petrol needed for a journey.
- ✓ Work out the total overtime pay.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ Will Sam travel more than 320 km in 3.5 hours?
- ✓ Are 15 gallons of petrol enough for this journey?
- ✓ How much overtime pay will Usha get?

Common misconceptions

- Learners may miscalculate when converting units and use inconsistent units in calculations.
- Learners may lack knowledge of the relevant formulae.
- Learners may set incorrect proportional relationships between values.

Specification references

Using common measures, shape and space

16 Calculate perimeters and areas of 2-D shapes including triangles and circles and composite shapes including non-rectangular shapes (formulae given except for triangles and circles)

17 Use formulae to find volumes and surface areas of 3-D shapes including cylinders (formulae to be given for 3-D shapes other than cylinders)

Keywords

area, perimeter, volume, composite shape, surface area, faces, vertices, edges, radius, diameter, circle, rectangle, square, trapezium, parallelogram, rhombus, kite, pentagon, sphere, cube, cuboid, cylinder, cone, prism, pyramid

Objectives

The learner should be able to:

- work out the perimeter of simple and composite shapes
- work out the area of simple and composite shapes
- calculate the volume of 3-D shapes, using formulae provided when necessary
- calculate the surface area of 3-D shapes, using formulae provided when necessary
- calculate using correct units to a required level of accuracy
- recall the required formulae (as indicated in the specification) for perimeter, area and volume, e.g. area of rectangles, triangles and circles.

Possible success criteria

- Work out the perimeter of an L-shaped garden.
- Work out the area of a room (composite shape).
- Work out the volume of a swimming pool, where the pool is not a cuboid.
- Work out the surface area of a cone (using the formula provided).

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify the figures (dimensions) they need to calculate with.
- ✓ Identify which units to use or convert between.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Work out the perimeter of an L-shaped garden to find the number of fencing panels required to go around it.
- ✓ Work out the cost of the tiles required to cover the floor of a composite-shaped kitchen.
- ✓ Work out the total capacity of a swimming pool in the shape of a pentagonal prism, using formulae.
- ✓ Work out the total amount of paint needed to cover the surface of a cone, excluding the base.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ How many fencing panels will Yemi need to surround the garden?
- ✓ Is £500 enough to buy all the tiles for the kitchen floor?
- ✓ Are 70,000 litres of water enough to fill this pool?
- ✓ How much will it cost to buy the paint needed to cover this statue?

Common misconceptions

- Learners may confuse the concepts of area ('cover space') and perimeter ('around the space').
- Learners may misinterpret 1-D, 2-D and 3-D units.
- Learners may miscalculate when converting between units.
- Learners may miscalculate when using decimals.
- Learners may not follow BIDMAS when using formulae, and may substitute values incorrectly.
- Learners may lack functional thinking when rounding, e.g. they may not round to the nearest whole number to find the number of boxes of tiles needed.

Specification references

Using common measures, shape and space

18 Calculate actual dimensions from scale drawings and create a scale diagram given actual measurements

Keywords

2-D and 3-D shapes, line of symmetry, plan (top view), elevation (front and side view), net, faces, vertices, edges, radius, diameter, scale factors, unit conversion

Objectives

The learner should be able to:

- calculate actual dimensions from scale drawings
- create a scale diagram given actual measurements.

Possible success criteria

- Interpret a net, front elevation and plan of a 3-D shape to identify a relevant size (length or area).
- Use a scale given as a ratio and convert between units.
- Create a scale diagram of a plan, elevation or net of a common 3-D shape using a given scale.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify lines of symmetry on a diagram.
- ✓ Identify relevant dimensions and the scale factor by interpreting a plan or elevation.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Interpret the plan of a building to find the area of the roof.
- ✓ Work out a distance from a map, or a real-life dimension from a scale drawing.
- ✓ Create a scale drawing of a plan of a building, using the scale 1 : 200.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ What is the area of the roof?
- ✓ Work out the distance between town A and town B.
- ✓ Create a scale drawing of the plan of the building.

Common misconceptions

- Learners may not realise that the distance from a vertex to a line of symmetry is half the total length.
- Learners may confuse plans with elevations.
- Learners may use incorrect scale factors.
- Learners may misinterpret scales.

Specification references

Using common measures, shape and space

19 Use coordinates in 2-D, positive and negative, to specify the positions of points

22 Calculate values of angles and/or coordinates with 2-D and 3-D shapes

Keywords

axes, coordinates, quadrants, scale, protractor, bearings

Objectives

The learner should be able to:

- read coordinates to specify the position of a point
- plot a point according to given coordinates (in all four quadrants)
- calculate angles using knowledge of common shape characteristics (e.g. sum of internal angles, angles at a point, angles on a straight line, vertically opposite angles).

Possible success criteria

- Correctly read off coordinates.
- Correctly plot a set of points.
- Work out the value of a given angle.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify the correct quadrant to plot or read from.
- ✓ Identify relevant values of angles by interpreting a plan or elevation.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Correctly plot points to indicate a position on a map.
- ✓ Work out the value of an angle at the apex of a shed.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ Indicate the position of the camp on the map.
- ✓ What is the value of the angle at the apex of the shed?

Common misconceptions

- Learners may confuse positive and negative coordinates.
- Learners may confuse the x and y axes.
- Learners may lack knowledge of common shape characteristics.

Specification references

Using common measures, shape and space

20 Understand and use common 2-D representations of 3-D objects

21 Draw 3-D shapes to include plans and elevations

Keywords

2-D and 3-D shapes, faces, vertices, edges, radius, diameter, parallel, perpendicular, angle, triangle, quadrilateral, pentagon, circle, cube, cuboid, cylinder, cone, prism, pyramid, line of symmetry, plan (top view), elevation (front and side view), net

Objectives

The learner should be able to:

- interpret front elevations and plans of 3-D shapes
- interpret working nets of a cube, cuboid, cylinder, pyramid and prism
- draw elevations and plans of simple 3-D shapes and identify lines of symmetry.

Possible success criteria

- Identify the dimensions of a solid from a 2-D representation.
- Identify the correct elevation of a 3-D shape to work out the area of a specific face.
- Interpret a net of a box to identify a relevant size or volume.
- Create a scale drawing of a 3-D shape (plan, elevation, net).

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify lines of symmetry on a diagram.
- ✓ Identify relevant dimensions and a suitable scale to include when creating a drawing.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Interpret the plan of a building to find the area of the roof.
- ✓ Draw a plan of a shed to be built in a garden.
- ✓ Draw a side view of a house to a given scale.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ Work out the area of the roof from the scale drawing.
- ✓ Create an accurate plan of the shed at 1 : 100 scale.
- ✓ Draw the side elevation of the house at 1 : 200 scale.

Common misconceptions

- Learners may confuse plans with elevations.
- Learners may make errors relating to spatial awareness and relevant dimensions (joining edges) when designing a net.
- Learners may confuse units or misinterpret scales.

Specification references

Handling information and data

23 Calculate the median and mode of a set of quantities

24 Estimate the mean of a grouped frequency distribution from discrete data

25 Use the mean, median, mode and range to compare two sets of data

Keywords

mean, average, range, median, mode, discrete data, grouped frequency distribution, class interval, class width, midpoint, frequency, lowest and highest value, modal class

Objectives

The learner should be able to:

- analyse information presented in different ways and apply statistics to interpret it
- work out the median of a set of quantities
- work out the mode of a set of quantities
- estimate the mean of a grouped frequency distribution from discrete data
- use the mean, median, mode and range to compare two sets of data, including discrete grouped data.

Possible success criteria

- Work out the median salary for a company.
- Find the mode of the types of soup sold.
- Estimate the mean of the athletes' times in a competition, based on grouped discrete data.
- Identify statistical measures to use to compare data from two warehouses.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Identify which statistical measure to use.
- ✓ Identify the figures to use in statistical calculations.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Work out the median of salaries in the company.
- ✓ Find the modal class of the types of soup sold over a month.
- ✓ Estimate the mean of the athletes' times in a competition, based on grouped discrete data.
- ✓ Compare data from two warehouses.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ Work out the median salary in the company.
- ✓ Which type of soup was the most popular?
- ✓ What is the estimated mean time of an athlete in the 10 km run?
- ✓ Use statistics to compare the performance data from the warehouses.

Common misconceptions

- Learners may confuse the terms 'range' and 'mean'.
- Learners may confuse 'mean', 'median' and 'mode'.
- Learners may incorrectly identify the lowest and highest values.
- Learners may not follow BIDMAS in mean calculations.
- Learners may not use the midpoint values when estimating the mean of grouped discrete data.
- Learners may divide by the number of class intervals rather than by the frequency total.

Specification references

Handling information and data

26 Work out the probability of combined events including the use of diagrams and tables, including two-way tables

27 Express probabilities as fractions, decimals and percentages

Keywords

probability scale, sample space, tree diagram, combined events, equivalence, fair/unfair dice/coin/spinner

Objectives

The learner should be able to:

- understand probability on a scale from 0 (impossible) to 1 (certain)
- work out the probability of combined events including the use of diagrams and tables
- express probability as a fraction or a decimal or percentage equivalent.

Possible success criteria

- Complete a sample space or tree diagram.
- Work out the probability of selecting an outcome of two combined events at random from a given selection.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Use the probability scale effectively.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Work out the probability of selecting 2 red cards, with replacement, from a deck consisting of 10 red and 7 black cards.
- ✓ Use a sample space to show the probability of throwing a total of 7 with two fair dice.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ What is the probability of selecting 2 red cards, one from each of two piles?
- ✓ What is the probability of throwing a total of 7 with two fair dice?

Common misconceptions

- Learners may misunderstand percentage and decimal equivalents.
- Learners may not understand that the single event divided by the total number of events represents probability.
- Learners may write the probability of selecting one item out of the number of items with the same feature, rather than out of the total number of items.

Specification references

Handling information and data

28 Draw and interpret scatter diagrams and recognise positive and negative correlation

Keywords

scale, labels, plotting, axes, criteria, line of best fit, positive and negative correlation

Objectives

The learner should be able to:

- extract and interpret information from a scatter diagram
- plot points accurately on a scatter diagram
- draw a line of best fit on a scatter diagram
- describe the correlation of the data plotted on a scatter diagram
- represent discrete data on a scatter diagram, including accurate plotting, labels and selection of an appropriate scale.

Possible success criteria

- Plot a point on a scatter diagram to complete it.
- Draw a line of best fit to help identify correlation.
- Construct a functional scatter diagram with accurate labels, scale and plotting.
- Interpret information presented to describe correlation.

Opportunities for solving mathematical problems and decision making

Level 2 learners are expected to be able to:

- interpret and analyse context in order to independently identify and carry out appropriate mathematical processes
- apply mathematical thinking effectively to solve complex problems which require multi-step processes.

These complex problems may be set in unfamiliar contexts and require learners to make connections between different content areas.

Examples of opportunities

Learners are required to extract information given in relevant real-world contexts, e.g.

- ✓ Read and interpret scales.
- ✓ Identify correlation.

Learners are required to obtain and present results and check their own working to an appropriate level of accuracy necessary for the specific task, e.g.

- ✓ Design a scatter diagram to investigate the correlation between the weather and high street sales.
- ✓ Use a line of best fit to indicate correlation between the price of a TV and its resolution.

Learners are required to show working in order to gain marks. This working rationalises the answer they present. Learners may be expected to make a yes/no decision.

E.g.

- ✓ Plot a point on a scatter diagram.
- ✓ Describe the correlation shown on a scatter diagram.
- ✓ Read off values from a scatter diagram.

Common misconceptions

- Learners may misinterpret scales or plot points incorrectly.
- Learners may forget to include labels (including a key), or labels may be inaccurate.
- Learners may misinterpret correlation.