

S3 / S4 General Course Overview

Unit 3.1 – Calculations

Rounding

- Nearest whole number
- Nearest 10, 100, 1000

Multiplying

- by 10, 100, 1000
- by multiples eg. 20, 300, 4000

Dividing

- by 10, 100, 1000
- by multiples eg. 20, 300, 4000

Unit 3.2 – Angles

Types of angles

- acute, right, obtuse, straight
- reflex angles
- angles around a point add up to 360°

Naming angles

- arms, vertex of angles
- using letters eg. $\angle ABC$

Using a protractor

- Measuring angles
- Drawing an angle

Triangles

- Angles in a triangle add up to 180°
- Isosceles triangles
two equal sides, two equal angles
- Equilateral triangle
all sides equal, all angles equal (60°)

Unit 3.3 – Decimals

What is a decimal

- tenths, hundredths, thousandths
- decimal point notation
- H T U · t h th

Reading decimal scales

- to 1 decimal place
- to 2 decimal places
- where scale goes up by different amounts eg. 0.2, 0.4, 0.5 etc

Fractions and decimals

- Change a fraction to a decimal
- eg. $\frac{4}{5} \rightarrow 4 \div 5 = 0.8$ $\frac{3}{7} \rightarrow 3 \div 7 = 0.428\dots$

Add or subtract decimals

- lining up the decimal point
- putting zeros in any blank spaces

Multiply decimals

- multiply a decimal by a single whole number eg. 34.2×8
- multiply a decimal by 10, 100, 1000 by moving the point to the right
- multiply a decimal by 20, 300, 4000 eg. 54.8×300
multiply by 3, then multiply by 100

Divide decimals

- Divide a decimal by a single whole number eg. $421.4 \div 7$
- divide a decimal by 10, 100, 1000 by moving the point to the left
- divide a decimal by 20, 300, 4000 eg. $784.4 \div 4000$
divide by 4, then divide by 1000

Unit 3.4 – Percentages

What is a percentage

- a fraction, with denominator of 100
- parts in very 100

Write a percentage as a decimal

- divide the number by 100
- eg. $37\% = 37 \div 100 = 0.37$

Change a fraction to a percentage

- multiply the fraction by 100
- eg. $\frac{3}{5} \rightarrow \frac{3}{5} \times 100 = 60\%$

Comparing marks

- form the fraction, change to percentage eg. 37 out of 50

$$\frac{37}{50} \rightarrow \frac{37}{50} \times 100 = 74\%$$

Percentage of a quantity without a calculator

- Find 10%, then halve it for 5%
- Build up what you need.
eg 35% of 260
10% is 26, 5% is 13; so for 35%
we want $3 \times 26 + 13 = 91$

Percentage of a quantity with a calculator

- eg. 12% of £56
key in: $12 \div 100 \times 56 = £6.72$

Percentage rise

- Find percentage amount and add it on.

Percentage fall

- Find percentage amount and subtract it.

Unit 3.5 – Scale Drawing

Enlarging and reducing figures

- using squared paper
- scale factors of 2, 3, 4
- scale factors of $\frac{1}{2}$, $\frac{1}{4}$

Reading from scale drawing

- changing to real lengths

Making a simple scale drawing

- using a ruler and protractor
- use simple scales
- use angles of elevation and depression

Using compass points

- N, S, E, W
- NE, SE, SW, NW
- Simple bearings
- Scale drawings of journeys

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Unit 3.6 – Wages & Salaries

Hourly Rate

- calculating weekly wage
- comparing wages
- calculating the hourly rate

Weekly, monthly and annual pay

- annual pay: (monthly pay \times 12)
(weekly pay \times 52)
- monthly pay (annual pay \div 12)
- Comparing pay

Wage Rises

- calculate increase in wages due to a percentage rise

Commission

- a percentage of sales made
- calculating amount of commission

Overtime Pay

- extra hours worked above basic hours
- higher rate of pay
- time and a half; double time
- calculate total pay for week

Deductions on pay slips

- Tax, National Insurance
- Gross Pay, Net pay
- Completing pay slips

Unit 3.7 – Algebra

Tidying up terms

- collecting like terms
eg $5a + 2a \rightarrow 7a$

Simplify terms

- dealing with multiply (times)
eg $7 \times y \rightarrow 7y$

Remove a bracket

- multiply out the brackets
eg $4(3x - 5) \rightarrow 12x - 20$

Solving simple equations

- eg $x - 2 = 18 \rightarrow x = 20$
eg $3x = 15 \rightarrow x = 5$
- eg $2x + 4 = 14$
 $2x = 12$
 $x = 6$
- eg $2(p - 2) = 12$
 $2p - 4 = 12$
 $2p = 16$
 $p = 8$
- eg $8x + 1 = 5x + 7$
 $8x = 5x + 6$
 $3x = 6$
 $x = 2$

Unit 3.8 – Money

Simple Interest

- Bank accounts, savings
- Calculating interest on savings
- Over 1, 2, 3 years
- For less than 1 year eg 3 month

Simple Bills and VAT

- Calculate VAT 17.5% (now 15%)
- Calculate total on a bill

Electricity Bills

- Work out electricity used from meter readings
- Calculate cost of electricity
- Calculate VAT at 5%
- Calculate total bill

Unit 3.9 – Circles

Naming parts of a circle

- radius, diameter, circumference

Using π (= 3.14)

- Calculate circumference: $C = \pi D$
- Calculate circumference of shapes made up from half and quarter circles

Unit 3.10 – Distance, Time and Speed

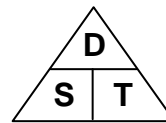
Time

- 24 hour and 12 hour time
- Calculating time intervals
- using TV programme guides
- using bus and train timetables

Using π (= 3.14)

- Calculate circumference: $C = \pi D$
- Calculate circumference of shapes made up from half and quarter circles

DST Triangle



Distance

- Calculating distance using: $D = S \times T$
- Calculating time intervals

Speed

- Calculating speed using: $S = \frac{D}{T}$

Time

- Calculating time using: $T = \frac{D}{S}$
- You **must** work in **decimal** hours
minutes \div 60

Graphs

- Work with Time-Distance graphs
- Interpret slope as speed

Interpret horizontal line as not moving

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Unit 3.11 – Fractions

A fraction is a part of a whole

- numerator, denominator

Simplifying fractions

- Cancelling down

Fractions of a quantity

- eg. $\frac{3}{8}$ of 240g

Divide by 8 to get $\frac{1}{8}$ (= 30 g)

Multiply by 3 to get $\frac{3}{8}$ (= 90 g)

Common Percentages as Fractions

- 10%, 20%, 30%, ... as $\frac{1}{10}, \frac{2}{10}, \frac{3}{10}$...
- 20%, 40%, 60%, ... as $\frac{1}{5}, \frac{2}{5}, \frac{3}{5}$...
- 25%, 50%, 75% as $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}$
- $33\frac{1}{3}\%$, $66\frac{2}{3}\%$ as $\frac{1}{3}, \frac{2}{3}$

Unit 3.12 – Statistics

Reading, Interpreting and Drawing Graphs

- Pictograph
- Bar Graphs
- Line Graphs
- Scattergraphs

Stem and Leaf Diagrams

- Reading from a stem and leaf diagram
- Drawing a stem and leaf diagram

Calculating Averages

- Range
- Mode
- Median
- Mean

Unit 3.13 – Pythagoras

Know Pythagoras' Theorem

in a right angled triangle $c^2 = a^2 + b^2$

- The hypotenuse always stands alone
- Identify hypotenuse
- hypotenuse opposite the right angle

Calculations

- Find the hypotenuse
- Find a shorter side
- Work with isosceles triangles

Unit 3.14 – Areas

Calculate Areas

- By counting squares
- Area of a rectangle = length \times breadth
- Area of a triangle = $\frac{1}{2}$ base \times height
- Calculate areas of combined shapes eg rectangles and triangles

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Calculations

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Unit 3.15 – Percentages and Money

Profit and Loss

- Calculate profit
- Calculate loss

Hire Purchase

- Deposits
- Monthly Payments
- HP price
- Cash Price

Household Insurance

- Buildings and contents
- Calculating premiums from a table
- Comparing rates

Life Insurance

- Whole Life Insurance
- Endowment Insurance

Foreign Currency

- Changing from £ to other currencies
- Changing other currencies back to £

Unit 3.16 – Trigonometry

Tangent only in this unit

Work with right angled triangles

- Identify sides
– opposite, hypotenuse, adjacent
- use tangent ratio TOA
- Find the angle from the tangent ratio using 2nd function tan. (\tan^{-1})
- Angles of elevation and depression

Unit 3.17 – Simple Linear Patterns

Identifying a pattern from a table of values

- Simple patterns
Stating a rule in words
- Making a formula eg $C = 4T$
- More complex patterns
Making a formula eg $C = 3T - 2$

Using a formula

- To calculate new values
- Working back to an original value

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Unit 3.18 – Probability

Describe probability in words

- likely, evens, unlikely
- impossible, certain

Calculate probability

- $P(\text{event}) = \frac{\text{number of favourable ways}}{\text{number of possible ways}}$
- Simplify fractions

Unit 4.1 – Integers

Positive and negative numbers

- Bank account balances
- Thermometers and temperatures

Work with positive and negative numbers

- Add and subtract
- Multiply
- Divide
- Know that Same Sign is PLUS
- Using coordinates

Unit 4.2 – Proportion

Unit value

- Calculating the rate

Direct Proportion

- Double one, double the other
- Calculations using direct proportion

Unit 4.3 – Symmetry

Lines of Symmetry

- Identify lines of symmetry
- Draw in lines of symmetry
- Complete a shape to make it symmetrical

Rotational or Turn symmetry

- Identify half turn symmetry
- Identify order of symmetry
half turn – order 2
quarter turn order 4
third turn – order 3

Rotate a shape

- complete the drawing
- half, third or quarter turn symmetry

Unit 4.4 – Scientific Notation

Using scientific notation

- Write a large or small number in scientific notation
eg. 2.7×10^7 , 3.1×10^{-5}
- Change a number from scientific notation to floating point form (ie. a normal number)

Unit 4.5 – Pythagoras II

Know Pythagoras' Theorem

in a right angled triangle $c^2 = a^2 + b^2$

- The hypotenuse always stands alone
- Identify hypotenuse
- hypotenuse opposite the right angle

Calculations

- Find the hypotenuse
- Find a shorter side
- Work with isosceles triangles
- Distance between coordinates
- Practical examples and problem solving

Unit 4.6 – Gradients and Lines

Gradient of a line

- Calculating the gradient – rise over run
- positive, negative and zero gradient
- calculate from coordinates

Equation of a line

- $y = mx + c$
- identify the gradient and y-intercept
- Find the equation of a line

Unit 4.7 – Surface Areas

Find area of:

- Cuboid
all six faces are rectangles

Nets of solids

- Identify object formed by net
- Draw net of an object
- Use net to find surface area.

Unit 4.8 – Volumes

Find volume of:

- Cuboid
Volume = length \times breadth \times height

Liquid Volume

- litres and millilitres
- cm^3 and millilitres are the same
- Problems involving volumes

Unit 4.9 – Similar Figures

Identify similar shapes

Finding the scale factor for

- enlargement
- reduction

Calculate length of a side using scale factor

Similar triangles

- identify similar triangles
- identify corresponding sides
- calculate sides using scale factor

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Unit 4.10 – Area of a circle

Revision of circumference

- Calculate circumference: $C = \pi D$
- Calculate diameter or radius

$$D = \frac{C}{\pi} \quad \text{radius} = \frac{1}{2} \text{ diameter}$$

Area of a circle

- Using formula: $A = \pi r^2$

Area of combined shapes

- parts of circles
half and quarter circles
- part circles and rectangles

Unit 4.11 – Ratio

Ratios

- Writing down ratios eg 3 : 1
- Simplify ratios eg 4 : 2 \rightarrow 2 : 1

Ratio calculations

- Using the ratio
eg red and yellow paint is mixed in ratio 1:3 to make orange paint
How much red paint is needed to make 9 litres of orange paint ?
- Sharing money in a given ratio.
eg Harry and Tom, share £15 in the ratio 2 : 3 How much does each get ?

Unit 4.12 – Angles in circles

Reminder of angles

- Angles on a straight line add up to 180°
- Angles in a triangle add up to 180°
- Vertically opposite angles are equal
- Corresponding angles are equal
- Alternate angles are equal

Angles in a semi circle

- Angles in a semi circle are 90°
- Using Pythagoras in a semi circle
- Using Trigonometry in a semi circle

Unit 4.13 – Trigonometry 2

Sine of an angle

- The sine ratio
- Calculate the opposite side
- Calculate the angle (2^{nd} function)

Cosine of an angle

- The cosine ratio
- Calculate the adjacent side
- Calculate the angle (2^{nd} function)

Which ratio ?

- Using SOH-CAH-TOA

Unit 4.14 – Formula

Working with expressions

- Evaluate an expression
Substitute numbers for letters

Making up formulae

- Using symbols

Using formulae

- to calculate values

Unit 4.15 – Factorising

Removing brackets

- Remove a bracket and simplify
eg $3(2p - 5) + 3p \rightarrow 9p - 15$

Factorising

- Using common factor
- eg $5ab + 10a \rightarrow 5a(b + 2)$

Unit 4.16 – Tolerance

Identify tolerance limits

- writing down maximum and minimum values
eg $150 \pm 3 \text{ mm} \rightarrow 147\text{mm to } 153\text{mm}$

Unit 4.17 – Variation

Writing a variation statement as a proportionality

Changing to an equation with a constant of proportionality

Finding the constant of proportionality

Using the equation to calculate a value.