

S3 / S4 Credit Course Overview

Unit 3.1 – Calculations

Rounding

- Decimal places
- Significant figures

Using the calculator

- Brackets ()
- Square key x^2
- Square root key $\sqrt{\quad}$
- Power key y^x

Standard Form

- Write large and small numbers in standard form
- Change back to floating point form
- Entering into the calculator EXP key
- Calculations using standard form

Fractions

- Mixed numbers
- add and subtract (Common Denom.)
- multiply (cancel, mult. numer. denoms.)
- divide (invert 2nd fraction, multiply)

Unit 3.2 – Similar Shapes

Scale Factors

- Enlargement
- Reduction
- S.F. = $\frac{\text{final size}}{\text{original size}}$

Similar shapes

- Corresponding sides equal
- Corresponding angles equal
- Scale factor same for all sides

Similar Triangles

- Triangles are special
- Equiangular means similar
- Identify corresponding sides

Parallel line in a triangle

- Always have two similar triangles

Unit 3.3 – Distance, Speed, Time

DST Triangle



Time

- You **must** work in **decimal** hours
- minutes \div 60

Graphs

- Read and interpret speed/distance
- Read and interpret distance/time

Unit 3.4 – Money – Saving & Spending

Wages & Salaries

- Monthly & Annual salaries
- Hourly rate
- Commission
- Overtime – time and a half
- Overtime – double time

Savings

- Simple interest
- Simple interest over more than 1 year
- Simple interest over less than 1 year

VAT

- Calculating VAT at 17.5% (now 15%)
- Calculating VAT inclusive price
- Comparisons of prices

Bills

- Telephone Bills
- Electric & Gas Bills

Loans

- Hire Purchase & Cash price
- Deposits, Monthly instalments
- Percentage deposits

Foreign Currency

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

Unit 3.5 – Algebra 1

Positive and negative numbers

- Add and subtract
- Multiply and divide
- same sign is plus; opposite signs minus
- Remember $- \times -$ is a plus.
- Apply to temperature, bank accounts

Evaluate expressions

- Evaluate an algebraic expression
- Substitute numbers for letters
- Use above rules to calculate answer.
- Evaluate squares and brackets

Unit 3.6 – 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
- The oil tanker problem

Converse of Pythagoras

- Is it a right angle ?

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Unit 3.7 – Algebra 2

Single Brackets

- Breaking a single bracket
- Negative multipliers eg $-2(2x - 3)$
- Solving equation with a bracket

Pairs of Brackets

- FOIL
- Two useful squares
$$(a + b)^2 = a^2 + 2ab + b^2$$
$$(a - b)^2 = a^2 - 2ab + b^2$$
- Solving equation

Unit 3.8 – Statistics 1

Interpret and compare using diagrams

- Bar graph
- Pie chart
- Line graph

Correlation

- Scattergraph
- Positive and negative
- strong, weak, no correlation

Mode, median, mean, range

- Frequency tables
- Frequency tables with class interval

Cumulative Frequency Distributions

- Cumulative frequency column
- Estimating median
- Estimating quartiles (upper & lower)
- Interquartile range

Unit 3.9 – Trigonometry

Right angle triangle calculations using

- Sine ratio (SOH)
- Cosine ratio (CAH)
- Tangent ratio (TOA)

Finding the angle

- Inverse (2^{nd}) function key
- \sin^{-1} , \cos^{-1} , \tan^{-1} ,
- Check calculator in degrees

SOH-CAH-TOA

- knowing which ratio to use
- application in problem solving
- interpreting the result.

Unit 3.10 – Simultaneous Equations

Solving a pair of equations by using a graph

- Plotting a graph of two straight lines
- Know the solution is where they cross.

Form two equations

- from descriptions of problems

Solve equations algebraically

- by substitution
- by elimination
- multiplying one or both equations by a number to eliminate a variable.
- finding the other variable by substitution.
- interpreting the answer.

Unit 3.11 – Area and Volumes

Rectangles, Triangles

- Area, perimeter

Circle

- Area, circumference

Composite shapes

Areas of quadrilaterals

- Rhombus and kite
- Parallelogram
- Trapezium

Prisms

- Knowing a prism has a uniform cross section
- Volume of prism = $A \times l$ or $A \times h$

Cylinders

- Volume of a cylinder
- Curved surface area of a cylinder

Unit 3.12 – Factors & Algebra 3

Factors

- Highest common factor (hcf)

Factorise an expression

- Common factor
- Difference of two squares
- Factorising a trinomial (quadratic)

Unit 3.13 – Money – Personal Finance

Payslips

- Gross pay, deductions, net pay
- Pensions, National Insurance
- Income Tax

Insurance

- Life, Household, Motor insurance

Compound Interest

- Appreciation, depreciation
- APR

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Unit 3.14 – Formulae

Using formulae

- Substituting numbers into formulae
- Making up a formula

Changing the subject of the formula

- Removing fractions
- Removing brackets
- Add, subtract – each side
- multiply, divide each side
- remove square roots by squaring
- remove squares by square rooting

Simple variation

- Halving and doubling
- Increasing and decreasing
- Effect when terms are squared

Unit 3.15 – Probability

Combined probability

- Tree diagrams
- Tables of outcomes eg two dice

Probability (A or B)

- mutually exclusive events
- add the probabilities

Relative Frequency and probability

- experimental results
- estimating probabilities
- estimating expected number of outcomes

3B – Statistics Supplement

Pie Charts

- Calculating the angles
- Drawing a pie chart

Dot plots

Stem and Leaf diagrams

Five Figure Summary

Box plots

Comparing distributions

- comparing mean
- comparing median
- comparing spread (interquartile range)

Calculating quartiles

4B – Statistics Supplement

Standard Deviation

- Drawing up a table
- Calculate the mean
- Calculate the standard deviation

Compare distributions

- Consistency – variability
- using standard deviation

Unit 4.1 – The Straight Line

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
- Find where line cuts the x-axis.
- Find equation of a line from 2 points.

Straight line as a mathematical model

- Forming an equation
- Using the equation to solve a problem
- Interpret the result

Scattergraphs

- Equation of line of best fit
- Making predictions using the equation

Unit 4.2 – Functions and Graphs

What is a function

- Using function notation: e.g.

$$f(x) = x^2 + 3$$

- Evaluate a function
- Working backwards
eg. find t if $f(t) = 6$

The Graph of the Quadratic - parabola

- $y = ax^2 + bx + c$
- Line of symmetry
- y-intercept
- Roots of the equation
- Graphical solution of $ax^2 + bx + c = 0$
- Maximum and minimum turning points
- Interpretation and problem solving

Graphs of other functions

- The linear function
- The cubic
- The reciprocal graph - hyperbola

Unit 4.3 – Symmetry in the circle

Angles in a circle

- Isosceles triangles
- Angle in a semi circle is a right angle
- Tangent to a circle
- Tangent is at right angles to the radius

Right Angles in a circle

- Pythagoras in the circle
- Trigonometry in the circle

Chords and symmetry

Lengths of arcs

Area of a sector

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Unit 4.4 – Inequalities

Inequalities on the number line

- forming an inequality
- solve same as equation
- add, subtract to each side
- multiply, divide each side.
- **IMPORTANT: if you multiply or divide by a negative number, you must change the direction of the inequality.**

Unit 4.5 – Trigonometry 2

2D calculations

- Exact values \sin , \cos , \tan 30° , 45° , 60°
- Angle of depression and elevation

3D calculations

- apply SOH-CAH-TOA to 3D problems

\sin , \cos , \tan of angles greater than 90°

- all four quadrants
- ASTC – All Sinners Take Care

Graphs of sine, cosine and tangent functions

- $y = a \sin bx + c$
- amplitude, frequency, centre line
- identify equation from graph
- sketch graph from equation
- Solving problems using graphs

Solving trigonometric equations

- Re-arrange the equation
- Finding the acute angle
- Finding all the solutions using graph or ASTC

Two trigonometric formulae

- $\sin^2 A + \cos^2 A = 1$
- $\frac{\sin A}{\cos A} = \tan A$

Unit 4.6 – Quadratic Equations

What is a quadratic equation

- Solving using a graph

Solving using factors

- The common factor
- Difference of two squares
- Factorising the trinomial

Standard form of a quadratic

- $ax^2 + bx + c = 0$
- solving using the formula

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

- Straight lines and parabolas

Quadratic Equations as models

- Forming quadratic equations
- Solving equations to solve the problem

Unit 4.7 – Proportion

Direct proportion

- Draw graph
- Gradient ratios
- Straight line through origin
- $y \propto x \rightarrow y = kx$
- Making and using models

Inverse proportion

- The hyperbola
- $y \propto \frac{1}{x} \rightarrow y = \frac{k}{x}$ or $xy = k$

Joint variation

- eg F varies directly as M and inversely as r^2

Unit 4.8 – Probability

Probability of (A and B)

- Independent events
- Multiply probabilities

Conditional Probability

- Sampling **without** replacement

Unit 4.9 – Indices and Surds

Using indices

- Indices as a shorthand
- Rules of indices
 - multiply – add indices
 $a^m \times a^n = a^{m+n}$
 - divide – subtract indices
 $a^m \div a^n = a^{m-n}$
 - powers – multiply indices
 $(a^m)^n = a^{mn}$

- Negative indices $a^{-n} = \frac{1}{a^n}$

- Zero indices $a^0 = 1$

- Fractional indices $a^{\frac{m}{n}} = (\sqrt[n]{a})^m$

- Growth and decay functions

Surds

- Surd is an irrational number
- Rules of surds
- $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$
- $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$
- Simplifying surds
- Rationalising the denominator

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Unit 4.10 – Triangle Calculations

Non right angled triangle calculations

- The sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{ac}{\sin C}$$

- Finding a side
- Finding an angle

- The cosine rule

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

- Finding a side
- Finding an angle

- The area of a triangle

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

- Deciding which to use

Unit 4.11 – Fractions and Equations

Algebraic fractions

- Simplify
- Cancel
- Common factors
- add, subtract using common denominator
- multiply
- divide

Solving algebraic equations with fractions

- Remove the fraction by multiplying