



DESC Mathematics KS4 Foundation Year 11

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OVERVIEW & REVISION GUIDE

Unit 1

Unit 1 Overview

1.1 Number System

1.1 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Recall times tables up to 12x12 Dr Frost Times Tables Practice	Addition K5a, K5b	Subtraction K5d	Multiplication K7c, K7d	Division K9a, K9e	
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
1.1a Place Value*					
1.1b Four Operations*					
1.1c Calculate With Negative Numbers*	Adding/ Subtracting				
	Multiplying/ Dividing				
1.1d Identify Factors, Multiples, Primes, Squares, Cubes and Roots*					
1.1e Calculate with Indices and Roots*					
1.1f Use the Order of Operations (BIDMAS)*					
1.1g Product of Primes*					
1.1h HCF and LCM*					

1.2 Expressions

1.1 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Recall timestables up to 12x12 Dr Frost Times Tables Practice	Simplify expressions by collecting like terms K80a, K80b, K80d, K80e	Identify the highest common factor of two numbers K115a			
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
1.2a Simplify Expressions*					
1.2b Expand Single Brackets*					
1.2c Factorise Into a Single Bracket*					
1.2d Substitution*					

* Commonly assessed topics

Unit 1 Revision Checklist

I have reviewed my feedback quizzes and used the videos and practice questions from the Unit 1 Overview to secure my gaps	
I have attended revision session 1 in on	
I have finished the Dr Frost tasks set from revision session 1 at home.	
I have attended revision session 2 in on	
I have finished the Dr Frost tasks set from revision session 2 at home.	
I have memorised the required facts and formulae for Unit 1 from the memorise sheet.	

Unit 1 Memorise Sheet

Place Value:

M	HTh	TTh	T	H	T	O	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
0	0	0	0	0	0	0	0	0	0
Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

Negative Numbers:

ADDITION (+)	SUBTRACTION (-)
$2 + 3 = 5$ $(-2) + (-3) = (-5)$ $(-2) + 3 = 1$	$(-2) - 3 = (-5)$ $2 - (-3) = 5$ $(-2) - (-3) = (-2) + 3 = 1$
MULTIPLICATION (X)	DIVISION (÷)
$2 \times 3 = 6$ $(-2) \times (-3) = 6$ $(-2) \times 3 = (-6)$ $2 \times (-3) = (-6)$	$6 \div 3 = 2$ $(-6) \div (-3) = 2$ $(-6) \div 3 = (-2)$ $6 \div (-3) = (-2)$

Factors, Multiples and Primes:

Multiples and Factors of a Number

The multiple of a number is obtained by multiplying it with another number.

Example:
 $1 \times 12 = 12$ The first four multiples of 12 are 12, 24, 36 and 48
 $2 \times 12 = 24$
 $3 \times 12 = 36$
 $4 \times 12 = 48$

Factors are the numbers that are multiplied to get a given number.

Example:
 $1 \times 12 = 12$ The factors of 12 are 1, 2, 3, 4, 6, and 12
 $2 \times 6 = 12$
 $3 \times 4 = 12$

Prime Numbers

13

1 13

13 has only two factors - itself and 1. So it is a prime number.

4

1 2 4

4 has three factors - itself, 1 and 2. So it is NOT a prime number.

Squares, Cubes and Roots:

Square Numbers
 16 is a square number because $4^2 = 4 \times 4 = 16$
 The first 12 square numbers: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144

Cube Numbers
 27 is a cube number because $3^3 = 3 \times 3 \times 3 = 27$
 The first 5 cube numbers: 1, 8, 27, 64, 125

Roots
 $\sqrt{25} = 5$ - The square root of 25 is 5 because $5^2 = 25$
 $\sqrt[3]{64} = 4$ - The cube root of 64 is 4 because $4^3 = 64$

BIDMAS:

B	- Brackets
I	- Indices
D	- Division
M	- Multiplication
A	- Addition
S	- Subtraction

HCF and LCM:

$36 = 2^2 \times 3^2$ $120 = 2^3 \times 3 \times 5$

The remaining factors of 36 go in here. The remaining factors of 120 go in here.

2^2 and 3 are common factors of both numbers.

$HCF = 2^2 \times 3 = 12$

$LCM = 2 \times 2^2 \times 3 \times 3 \times 5 = 360$

Simplifying Expressions:

- $a + a + a + a = 4a$
- $a \times a \times a = a^3$
- $a^2 + a^2 = 2a^2$

Expanding vs Factorising:

expand

$3(2x + 5) \quad \rightleftarrows \quad 6x + 15$

Factorise



Unit 2 Overview

2.1 Decimals and Estimation

2.1 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Column addition and subtraction E5	Multiplying integers up to 3 digit x 3 digit E7	Divide using the bus stop method K9a			
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
2.1a Order Decimals*					
2.1b Add and Subtract Decimals*					
2.1c Multiply Decimals*					
2.1d Divide Decimals					
2.1e Money Calculations*					
2.1f Rounding*					
2.1g Estimating Calculations*					
2.1h Error Intervals*					
2.1i Using a Calculator					
2.1j Standard Form Conversions*					
2.1k Standard Form Calculations					

2.2 Measures

2.2 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Read the time from an analogue clock K43a	Convert between the 12-hour and 24-hour clock K44a	Multiply and divide by powers of 10 E19			
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
2.2a Time Calculations*					
2.2b Converting Units*					
2.2c Reading Scales					

* Commonly assessed topics

Unit 2 Revision Checklist

I have reviewed my feedback quizzes and used the videos and practice questions from the Unit 2 Overview to secure my gaps	
I have attended revision session 1 in on	
I have finished the Dr Frost tasks set from revision session 1 at home.	
I have attended revision session 2 in on	
I have finished the Dr Frost tasks set from revision session 2 at home.	
I have memorised the required facts and formulae for Unit 2 from the memorise sheet.	

Unit 2 Memorise Sheet

Rounding:

Cut-off point 5 or more Round up
 $3.68\overset{\color{red}{\uparrow}}{7}4 \longrightarrow 3.6\overset{\color{green}{\uparrow}}{9}$

2nd significant figure	4th significant figure	6th significant figure
1st significant figure	3rd significant figure	5th significant figure
1 5 0 8 . 0 6		
Not significant	1st significant figure	2nd significant figure
Not significant	3rd significant figure	4th significant figure
0 . 0 1 7 0 4		

Notice: the zeros are not significant when they are at the beginning of the number

Estimation

When estimating:

- Round all numbers to 1 significant figure
- Perform the calculations

$$\frac{12.4 \times 302.8}{0.45} \approx \frac{10 \times 300}{0.5}$$

Error Intervals:

A number, n, is rounded to 4.76 correct to 2 decimal places.



$$LB \leq n < UB$$

$$4.755 \leq n < 4.765$$

Error Interval:

↖ ↗
The inequality signs always go this way

Standard Form:

4.2×10^9

↖ Must be 1 to 10 (but not 10!)
↕ Must be x 10
↗ Must be an Integer

Positive Power = Large Number
 $4.3 \times 10^6 = 4\,300\,000$
Negative Power = Small Number
 $2.1 \times 10^{-3} = 0.021$

Converting Units:

Length	Mass	Capacity	Time
1 km = 1000 m 1 m = 100 cm 1 cm = 10 mm	1 kg = 1000 g	1 L = 1000 ml 1 L = 1000 cm ³	1 hour = 60 mins 1 min = 60 seconds



Unit 3 Overview

3.1 Fractions

3.1 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Simplify Fractions K29c	Find a Fraction of an Amount (Numerator is 1) K101a	Add/Subtract Fractions with Common Denominators K94a	Convert Between Improper Fractions and Mixed Numbers K97a, K97b		
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
3.1a Order Fractions*					
3.1b Fractions of an Amount*					
3.1c Reverse Fractions					
3.1d Add and Subtract Fractions*					
3.1e Multiply Fractions*					
3.1f Divide Fractions*					
3.1g Calculate with Mixed Numbers*					
3.1h Ordering Fractions, Decimals and Percentages*					
3.1i Reciprocals					

3.2 Percentages

3.2 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Convert Between Fractions, Decimals and Percentages E31	Find Simple Percentages of An Amount Without a Calculator K108a, K108b				
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
3.2a Percentages of an Amount*					
3.2b Percentage Change*					
3.2c Reverse Percentages*	<div style="display: flex; justify-content: space-around;"> <div>Non-Calc </div> <div>Calc </div> </div>				
3.2d Simple Interest					
3.2e Compound Interest*					

* Commonly assessed topics

3.3 Averages and the Range

Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
3.3a Calculate the Mean, Median, Mode and Range of a List of Data*					
3.3b Combined Mean					
3.3c Stem and Leaf Diagrams*					
3.3d Averages and Range from Ungrouped Frequency Tables*					
3.3e Estimate the Mean from a Grouped Frequency Table*					
3.3f Identify the Median and Modal Class intervals from a Grouped Frequency Table*					

* Commonly assessed topics

Unit 3 Revision Checklist

I have reviewed my feedback quizzes and used the videos and practice questions from the Unit 3 Overview to secure my gaps	
I have attended revision session 1 in on	
I have finished the Dr Frost tasks set from revision session 1 at home.	
I have attended revision session 2 in on	
I have finished the Dr Frost tasks set from revision session 2 at home.	
I have memorised the required facts and formulae for Unit 3 from the memorise sheet.	

Unit 3 Memorise Sheet

Fraction of an Amount:

$\frac{3}{4}$ of 36

Divide by the denominator then multiply by the numerator

$36 \div 4 = 9 \times 3 = 27$

($\frac{3}{4}$ of 36 = 27)

Reciprocals:

Reciprocal

To get the reciprocal of a fraction, we swap the numerator and denominator.

$$\frac{2}{5} \leftrightarrow \frac{5}{2}$$

To get the reciprocal of a whole number, we rewrite the whole number as a fraction and then swap.

$$6 = \frac{6}{1} \leftrightarrow \frac{1}{6}$$

To get the reciprocal of a mixed number, we rewrite the mixed number as an improper fraction and then swap.

$$1\frac{3}{4} = \frac{7}{4} \leftrightarrow \frac{4}{7}$$

Calculating with Fractions:

Adding and Subtracting:

$$\frac{3 \times 7}{3 \times 9} - \frac{2 \times 9}{3 \times 9} \rightarrow \frac{3}{27}$$

When adding/subtracting, you need a COMMON DENOMINATOR

Multiplying:

$$\frac{3}{4} \times \frac{1}{2} = \frac{3 \times 1}{4 \times 2} = \frac{3}{8} \leftarrow \text{Simplify}$$

Dividing:

$$\frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1}$$

KEEP CHANGE FLIP

Keep Change Flip

Unit 3 Memorise Sheet Continued

Fraction, Decimal and Percentage Equivalences:

Fraction	Decimal	Percentage
1	1	100%
$\frac{1}{2}$	0.5	50%
$\frac{1}{4}$	0.25	25%
$\frac{3}{4}$	0.75	75%
$\frac{1}{10}$	0.1	10%
$\frac{1}{100}$	0.01	1%
$\frac{1}{3}$	0.3	33.3%
$\frac{2}{3}$	0.6	66.6%

Percentage of an Amount:

To Find:

50% → Divide by 2
 10% → Divide by 10
 1% → Divide by 100

To Find:

25% → Divide 50% by 2
 5% → Divide 10% by 2

All percentages can be made up of a combination of 50%, 10% and 1%

42% → 10% + 10% + 10% + 10% + 1% + 1%

Percentage Multipliers:

Calculate 87% of 300

Convert the percentage to a decimal → 0.87

Multiply by the amount → 0.87 × 300

= 261

Percentage Multiplier Method

Increase £42 by 3%

$$\begin{array}{r} 100\% \text{ of } 42 \\ + 3\% \text{ of } 42 \\ \hline 103\% \text{ of } 42 \end{array} \quad 42 \times 1.03 = \pounds 43.26$$

Decrease £42 by 3%

$$\begin{array}{r} 100\% \text{ of } 42 \\ - 3\% \text{ of } 42 \\ \hline 97\% \text{ of } 42 \end{array} \quad 42 \times 0.97 = \pounds 40.74$$

Percentage Change:

$$\text{Percentage Change} = \frac{\text{Change in Value}}{\text{Original Value}} \times 100$$

Compound Interest:

COMPOUND INTEREST
(COMPOUNDED ANNUALLY)

$$\text{Value} = [\text{initial investment}] \times [\text{multiplier}]^n$$

(where n = number of years)

$$\text{multiplier} = \left(1 + \frac{r}{100}\right)$$

(where r = annual rate of interest %)

Mean, Mode, Median and Range:

Mean

7, 3, 4, 1, 7, 6

Sum of numbers divided by the total numbers

$$\text{Mean} = (7+3+4+1+7+6)/6 = 28/6 = 4.66$$

Median

7, 3, 4, 1, 7, 6

Arrange in order and pick the middle value

1, 3, 4, 6, 7, 7

$$\text{Median} = (4+6)/2 = 5$$

Mode

7, 3, 4, 1, 7, 6

Most common number

7, 3, 4, 1, 7, 6

Mode = 7

Range

7, 3, 4, 1, 7, 6

Difference between highest and lowest

$$\text{Range} = 7 - 1 = 6$$



Unit 4 Overview

4.1 2D Shapes

4.1 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:






















Find the Perimeter by Counting Squares K69a		Find the Area by Counting Squares K70a			
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
4.1a Find the Perimeter of a Shape*					
4.1b Find the Area of a Rectangle*					
4.1c Find the Area of a Triangle*					
4.1d Find the Area of a Parallelogram					
4.1e Find the Area of a Trapezium*					
4.1f Find the Area of a Compound Shape*					
4.1g Identify Parts of a Circle*					
4.1h Find the Circumference of a Circle*					
4.1i Find the Area of a Circle*					
4.1j Find the Length of an Arc					
4.1k Find the Area of a Sector					

* Commonly assessed topics

4.2 Ratio and Proportion 1

4.2 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Use Ratio Notation K105e	Find the HCF of Two Numbers K115a	Find a Fraction of an Amount K101b		Find a Percentage of an Amount K108c	
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
4.2a Use Ratio Notation*					
4.2b Simplify Ratios*					
4.2c Convert Between Fractions, Percentages and Ratios*					
4.2d Share into a Ratio (3 types: Total, One Part, Difference)*					
4.2e Combine Ratios					
4.2f Best Buys and Exchange Rates*					
4.2g Recipes*					

* Commonly assessed topics

Unit 4 Revision Checklist

I have reviewed my feedback quizzes and used the videos and practice questions from the Unit 4 Overview to secure my gaps	
I have attended revision session 1 in on	
I have finished the Dr Frost tasks set from revision session 1 at home.	
I have attended revision session 2 in on	
I have finished the Dr Frost tasks set from revision session 2 at home.	
I have memorised the required facts and formulae for Unit 4 from the memorise sheet.	

Unit 4 Memorise Sheet

Area of Rectangles, Triangles, Parallelograms and Trapezia:

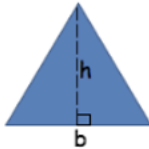
Rectangle

$$Area = l \times w$$



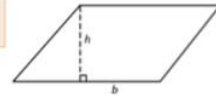
Triangle

$$Area = \frac{b \times h}{2}$$



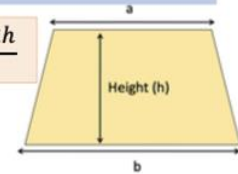
Parallelogram

$$Area = b \times h$$



Trapezium

$$Area = \frac{(a + b) \times h}{2}$$

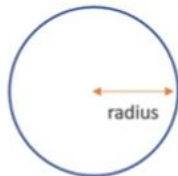


- Add the parallel sides together
- Multiply by the height
- Half the answer

Area and Circumference of a Circle:

Circle

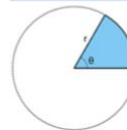
$$Area = \pi r^2$$



$$Circumference = 2\pi r \text{ or } \pi d$$

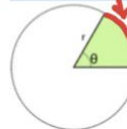
Area and Perimeter of a Sector:

Area of a Sector



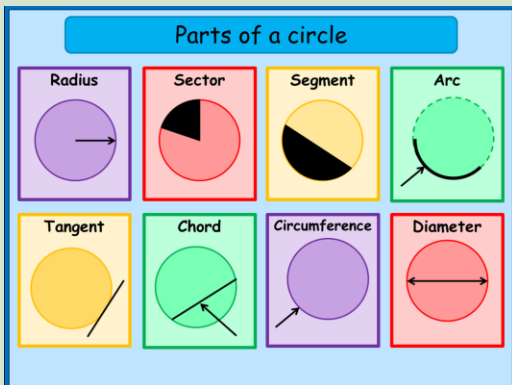
$$Area = \frac{\theta}{360} \times \pi r^2$$

Arc Length



$$Arc Length = \frac{\theta}{360} \times \pi d$$

Parts of a Circle:



Converting Ratios to Fractions:

The ratio of red pens to blue pens is 3:5
What fraction of the pens are red?

Red : Blue
3 : 5

$$\frac{3}{3 + 5} = \frac{3}{8} \text{ are red}$$



Unit 5 Overview

5.1 Equations

5.1 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Solving One-Step Equations K181a		Expanding Single Brackets K83a, K83c			
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
5.1a Solve a One-Step Equation *					
5.1b Solve a Two-Step Equation *					
5.1c Solve an Equation with Brackets*					
5.1d Solve a Two-Step Equation Involving Fractions*					
5.1e Solve an Equation with Unknowns on Both Sides*					
5.1f Solve an Equation Involving Fractions with Unknowns on Both Sides					
5.1g Form and Solve Equations*					

5.2 Formulae

5.2 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Substitute into Expressions K79a-d












Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
5.2a Function Machines*					
5.2b Substitute into Formulae*					
5.2c Change the Subject of a Formula*					

* Commonly assessed topics







5.3 Angles 1

5.3 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Know the properties of special types of triangles K59c		Know the properties of special types of quadrilaterals K59d			
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
5.3a Draw and Measure Angles	Drawing 				
	Measuring 				
5.3b Basic Angle Facts: Angles on a Straight Line, Around a Point and Vertically Opposite Angles*	Vertically Opposite 				
5.3c Angles in a Triangle*	Straight Line Around a Point Triangles Quadrilaterals 				
5.3d Angles in a Quadrilateral*					
5.3e Angles in Parallel Lines*					

5.4 Similarity and Congruence

Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
5.4a Identify Congruent Shapes					
5.4b Similar Shapes*					
5.4b Similar Triangles*					

* Commonly assessed topics

Unit 5 Revision Checklist

I have reviewed my feedback quizzes and used the videos and practice questions from the Unit 5 Overview to secure my gaps	
I have attended revision session 1 in on	
I have finished the Dr Frost tasks set from revision session 1 at home.	
I have attended revision session 2 in on	
I have finished the Dr Frost tasks set from revision session 2 at home.	
I have memorised the required facts and formulae for Unit 5 from the memorise sheet.	

Unit 5 Memorise Sheet

Changing the Subject:

Make x the subject

$$2x - 5y = p$$

$$+5y \quad +5y$$

$$2x = p + 5y$$

$$\div 2 \quad \div 2$$

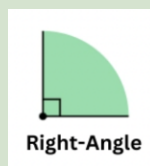
$$x = \frac{p + 5y}{2}$$

Make x the subject means to rearrange until you have $x =$

Types of Angles:



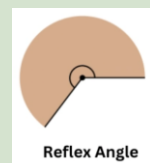
0 - 90 degrees



90 degrees



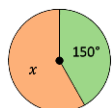
90 - 180 degrees



180 - 360 degrees

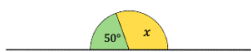
Basic Angle Facts:

Angles around a point add up to 360°



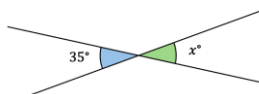
$$x + 150 = 360$$

Angles on a straight line add up to 180°



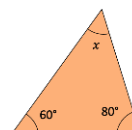
$$x + 50 = 180$$

Vertically opposite angles are equal.



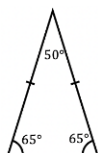
$$x = 35$$

Angles in a triangle add up to 180°

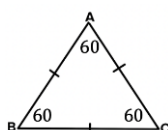


$$x + 60 + 80 = 180$$

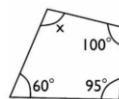
Base Angles in an Isosceles Triangle are Equal



Angles in an Equilateral Triangle are All Equal

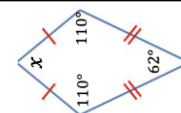


Angles in a quadrilateral add up to 360°

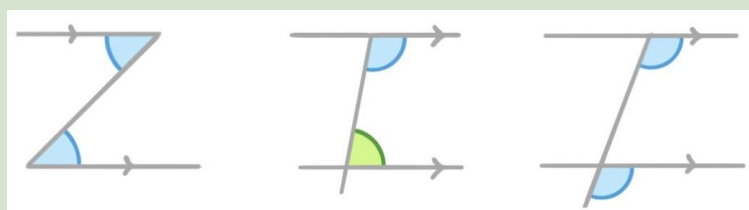


$$x + 100 + 95 + 60 = 360$$

A Kite Has One Line of Symmetry and One Pair of Equal, Opposite Angles



Angles in Parallel Lines:



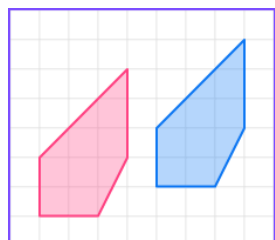
Alternate angles are equal

Co-Interior angles add up to 180°

Corresponding angles are equal

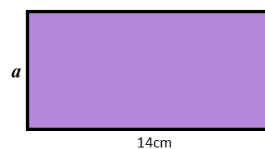
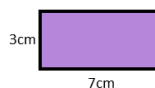
Congruent Shapes:

Congruent shapes are exactly the **same shape and size**. All corresponding sides and angles are the same.



Similar Shapes:

Here are two similar rectangles.



Similar shapes are the **same shape but different size**. You can enlarge one shape using a **scale factor** to get the other.

Calculate the length marked a .

$$\text{Scale Factor} = \frac{\text{Big}}{\text{Small}}$$

$$\begin{aligned} \text{S.F.} &= \frac{14}{7} = 2 \\ 3 \times 2 &= 6 \\ \text{So } a &= 6 \text{ cm} \end{aligned}$$



Unit 6 Overview

6.1 Data and Graphs

Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
6.1a Drawing Frequency Tables					
6.1b Draw and Interpret Pictograms*					
6.1c Draw and Interpret Bar Charts*					
6.1d Draw and Interpret Two-Way Tables*					
6.1e Draw and Interpret Pie Charts*		Draw Interpret	Draw Interpret		
6.1f Frequency Polygons*					

6.2 Probability

6.2 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
6.2a Probability Scale*					
6.2b Calculate Probabilities*					
6.2c Experimental Probability					
6.2d Probabilities from a Table*					
6.2e Sample Spaces					

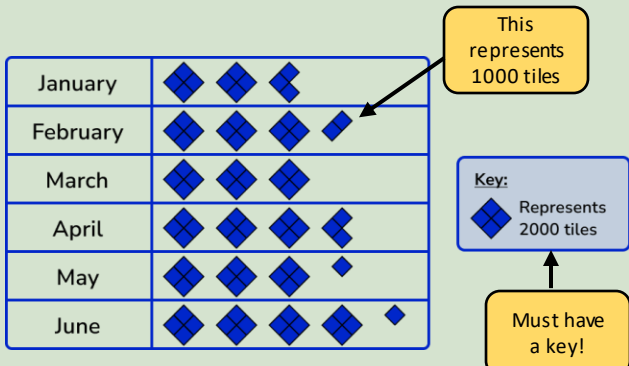
* Commonly assessed topics

Unit 6 Revision Checklist

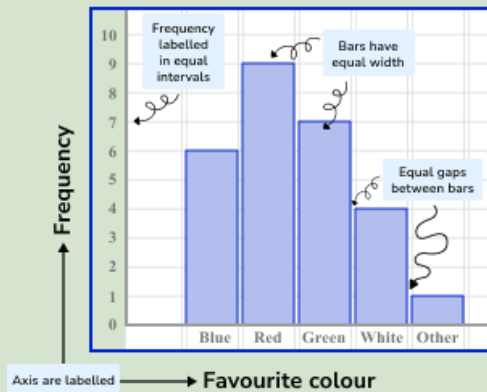
I have reviewed my feedback quizzes and used the videos and practice questions from the Unit 6 Overview to secure my gaps	
I have attended revision session 1 in on	
I have finished the Dr Frost tasks set from revision session 1 at home.	
I have attended revision session 2 in on	
I have finished the Dr Frost tasks set from revision session 2 at home.	
I have memorised the required facts and formulae for Unit 6 from the memorise sheet.	

Unit 6 Memorise Sheet

Pictograms:



Bar Charts:



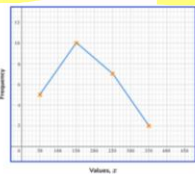
Frequency Polygons:

Midpoint Mountains!
 (Use the midpoints and they are points so look like mountains)

To construct a **frequency polygon** we use grouped data. We use the midpoints of the class intervals to plot points with the frequencies and then join up the points with straight lines.

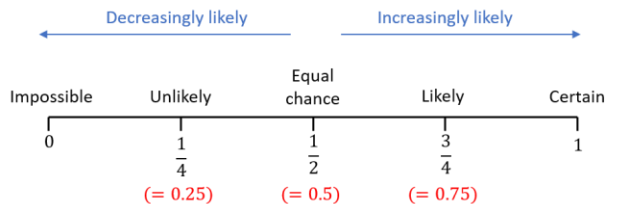
E.g.

Values, x	Frequency
$0 \leq x < 100$	5
$100 \leq x < 200$	10
$200 \leq x < 300$	7
$300 \leq x < 400$	2



Probability Scale:

Probabilities are always between 0 and 1



Calculating Probabilities

Theoretical probability is what is **expected** to happen based on the possible outcomes, assuming equally likely events.

What is the **theoretical** probability of choosing a green marble?

Number of green marbles: 6
 Total number of marbles: 10

The theoretical probability of choosing a green marble is $\frac{6}{10}$ or 60%

$$\text{Theoretical Probability} = \frac{\text{Number of favorable (desired) outcomes}}{\text{Total number of possible outcomes}}$$

Expected Outcomes:

Expected Frequency

- Expected Frequency:

Probability OR Relative Frequency	X	No. of Trials
-----------------------------------	---	---------------
- Example:

A dice is rolled 300 times, how many times would expect to land on the number 3?

$\bullet \frac{1}{6} \times 300 = 50$



Dare Excel Share Create

DESC Mathematics KS4

OVERVIEW & REVISION GUIDE

Unit 7

Unit 7 Overview

7.1 3D Shapes

7.1 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Find the area of a rectangle K71a	Find the area of a parallelogram, triangle and trapezium K73a, K74a, K146a			Find the area of a circle K144a	
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
7.1a Properties of 3D Shapes*					
7.1b Plans and Elevations*					
7.1c Volume of Prisms*					
7.1d Surface Area of Prisms*					
7.1e Surface Area of Cylinders					
7.1f Volume and Surface Area of Spheres and Cones					
7.1g Convert Between Units of Area and Volume					

7.2 Sequences

7.2 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:






















Substitute into expressions K79b	Solving two-step equations K181b				
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
7.2a Continue Sequences*					
7.2b Recognise Square, Cube and Triangular Numbers					
7.2c Generate Terms Using Nth Term					
7.2d Find the Nth Term of a Linear Sequence*					
7.2e Solving Problems with Patterns					

* Commonly assessed topics

7.3 Graphs 1

7.3 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Objective	Substitute Into Expressions K79b, K79d		Change the Subject K186b		
	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
7.3a Plot and Read Coordinates*					
7.3b Midpoint of a Line Segment					
7.3c Recognise and Draw Horizontal and Vertical Lines*					
7.3d Plot Straight-Line Graphs*					
7.3e Use the Equation of a Line $y=mx+c$ *					
7.3f Find the Equation of a Line from a Graph*					
7.3g Find the Equation of a Line Between Two Points					
7.3h Equations of Parallel Lines					

* Commonly assessed topics

Unit 7 Revision Checklist

I have reviewed my feedback quizzes and used the videos and practice questions from the Unit 7 Overview to secure my gaps	
I have attended revision session 1 in on	
I have finished the Dr Frost tasks set from revision session 1 at home.	
I have attended revision session 2 in on	
I have finished the Dr Frost tasks set from revision session 2 at home.	
I have memorised the required facts and formulae for Unit 7 from the memorise sheet.	

Unit 7 Memorise Sheet Continued

Area of 2D Shapes:

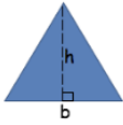
Rectangle

$$\text{Area} = l \times w$$



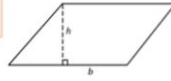
Triangle

$$\text{Area} = \frac{b \times h}{2}$$



Parallelogram

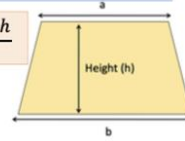
$$\text{Area} = b \times h$$



Trapezium

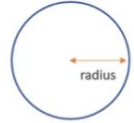
$$\text{Area} = \frac{(a + b) \times h}{2}$$

- Add the parallel sides together
- Multiply by the height
- Half the answer



Circle

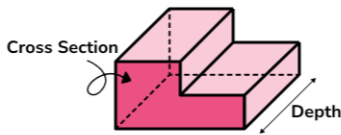
$$\text{Area} = \pi r^2$$



$$\text{Circumference} = 2\pi r \text{ or } \pi d$$

Volume of a Prism

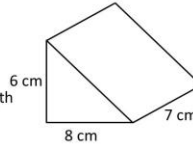
$$\text{Volume of Prism} = \text{Area of Cross Section} \times \text{Depth}$$



Example 1

$$\begin{aligned} \text{Area of triangle} &= \frac{1}{2} \times 8 \times 6 \\ &= \frac{1}{2} \times 48 \\ &= 24 \text{ cm}^2 \end{aligned}$$

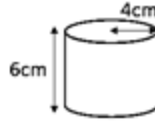
$$\begin{aligned} \text{Volume} &= \text{area} \times \text{length} \\ &= 24 \times 7 \\ &= 168 \text{ cm}^3 \end{aligned}$$



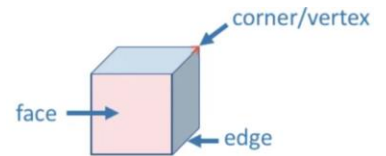
Example 2

$$\begin{aligned} \text{Area of circle} &= \pi \times 4^2 \\ &= 16\pi \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume} &= 16\pi \times 6 \\ &= 96\pi \text{ cm}^3 \\ &= 301.6 \text{ cm}^3 \text{ (1 dp)} \end{aligned}$$



Faces, Edges and Vertices:

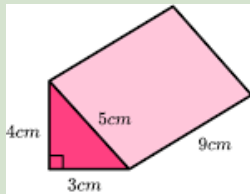


A cuboid has:

- 6 faces
- 12 edges
- 8 vertices

Surface Area of a Prism:

Find the area of each surface and add the areas together

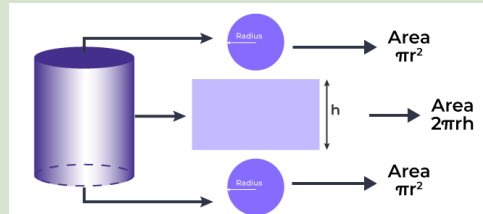


Face	Area
Front	$\frac{1}{2} \times 3 \times 4 = 6$
Back	6
Bottom	$3 \times 9 = 27$
Left side	$4 \times 9 = 36$
Right side	$5 \times 9 = 45$

$$\begin{aligned} \text{Total surface area} &= 6 + 6 + 27 + 36 + 45 \\ &= 120 \text{ cm}^2 \end{aligned}$$

Surface Area of a Cylinder:

$$\text{Surface area of a cylinder} = 2\pi r^2 + 2\pi rh$$



Volume of a Pyramid:

Volume of a Pyramid

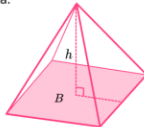
Volume of a pyramid is the volume of a three dimensional pyramid.

To calculate the volume of a pyramid, we use the formula:

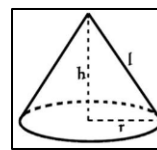
$$V = \frac{1}{3} B h$$

Where:

- V represents the volume of the pyramid,
- B represents the area of the base of the pyramid,
- h represents the perpendicular height of the pyramid.

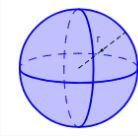


Volume and Surface Area of Spheres and Cones:



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

$$\text{Area of curved surface} = \pi r l$$



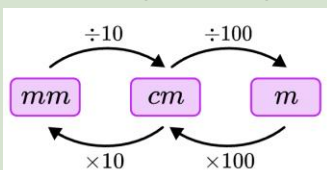
Volume of Sphere

$$= \frac{4}{3} \pi r^3$$

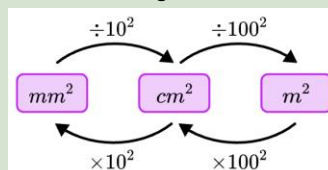
$$\text{Surface Area of a sphere} = 4\pi r^2$$

Converting Units of Area and Volume:

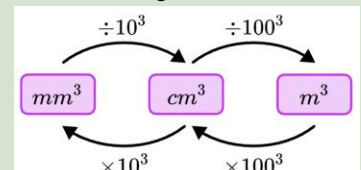
Converting Units of Length



Converting Units of Area



Converting Units of Volume



Unit 7 Memorise Sheet Continued

Square Numbers, Cube Numbers and Triangular Numbers:

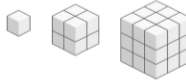
List the first few square numbers:

1, 4, 9, 16, 25, 36, 49...



List the first few cube numbers:

1, 8, 27, 64, 125...



List the first few triangle numbers:

1, 3, 6, 10, 15...



Nth Term:

Write down an expression, in terms of n , for the n th term of the number sequence.

5, 7, 9, 11, ...

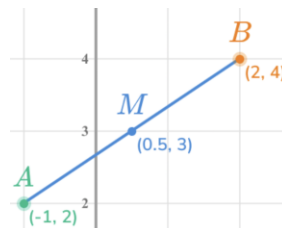
$\begin{array}{cccc} & +2 & +2 & +2 \\ \curvearrowright & & \curvearrowright & \curvearrowright \\ 5 & 7 & 9 & 11 \\ \uparrow +3 & \uparrow +3 & \uparrow +3 & \uparrow +3 \\ 2n = 2 & 4 & 6 & 8 \end{array}$

 (So compare the sequence to the +2 times table $2n$)

 $n^{\text{th}} \text{ term} = 2n + 3$

Midpoint:

$$\text{midpoint} = \left(\frac{x_1 + y_1}{2}, \frac{x_2 + y_2}{2} \right)$$

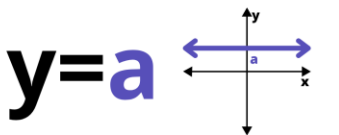


$$\left(\frac{-1 + 2}{2}, \frac{2 + 4}{2} \right)$$

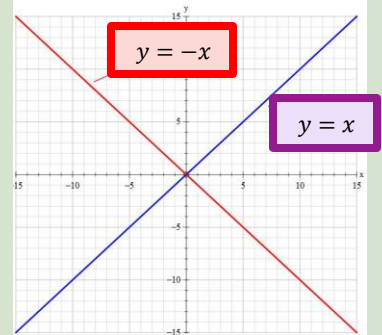
Midpoint = (0.5, 3)

Horizontal, Vertical and Simple Diagonal Lines:

Equation of a Horizontal Line



Equation of a Vertical Line



$y = mx + c$:

$y = mx + c$

 \swarrow gradient \searrow y-intercept

Gradient:

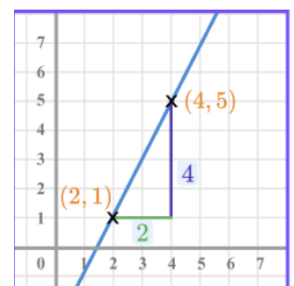
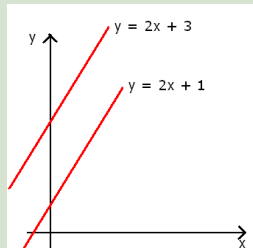
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Example

$$m = \frac{5 - 1}{4 - 2} = \frac{4}{2} = 2$$

Parallel Lines

Parallel lines have the same gradient









Unit 8 Overview

8.1 Pythagoras' Theorem

8.1 Pre-requisite knowledge




















The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Solving Equations K181c	Area of 2D Shapes K71a, K73a, K74a, K146a, K144a		Perimeter of 2D Shapes E72		
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
8.1a Find Missing Sides Using Pythagoras' Theorem*					
8.1b Solve Problems Using Pythagoras' Theorem*					

8.2 Rates of Change

8.2 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:










Converting Units of Length, Mass and Capacity E62	Converting Units of Time E42	Find the Gradient of a Line from a Graph K189b	Find the y-intercept of a Line from a Graph K181b		
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
8.2a Conversion Graphs*					
8.2b Interpreting Real-Life Graphs					
8.2c Convert Units of Speed*					
8.2d Speed, Distance and Time*					
8.2e Density, Mass and Volume*					
8.2f Pressure, Force and Area*					
8.2g Multi-Stage Compound Measure Problems					

* Commonly assessed topics

8.3 Angles 2

8.3 Representing and Interpreting Data







The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Angles on a Straight line, Around a Point and Vertically Opposite K66a, K66b, K67a	Angles in a Triangle K68a			Angles in a Quadrilateral K153a	
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
8.3a Interior Angles in Polygons*					
8.3b Exterior Angles in Polygons*					
8.3c Problem Solving with Angles in Polygons*					
8.3d Bearings*					

8.4 Tree Diagrams

8.4 Representing and Interpreting Data

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Calculate probabilities K55a	Multiply fractions K95a			Multiple decimals K22c	
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
8.4a Frequency Trees*					
8.4b Probability Trees*					

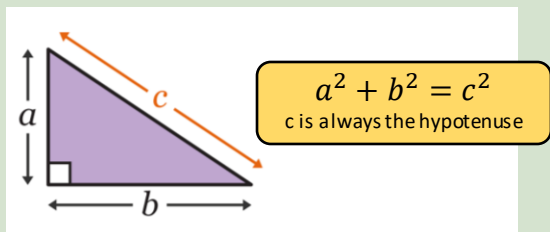
* Commonly assessed topics

Unit 8 Revision Checklist

I have reviewed my feedback quizzes and used the videos and practice questions from the Unit 8 Overview to secure my gaps	
I have attended revision session 1 in on	
I have finished the Dr Frost tasks set from revision session 1 at home.	
I have attended revision session 2 in on	
I have finished the Dr Frost tasks set from revision session 2 at home.	
I have memorised the required facts and formulae for Unit 8 from the memorise sheet.	

Unit 8 Memorise Sheet

Pythagoras' Theorem:



Compound Measures:

Compound measures

Speed

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$



Density

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

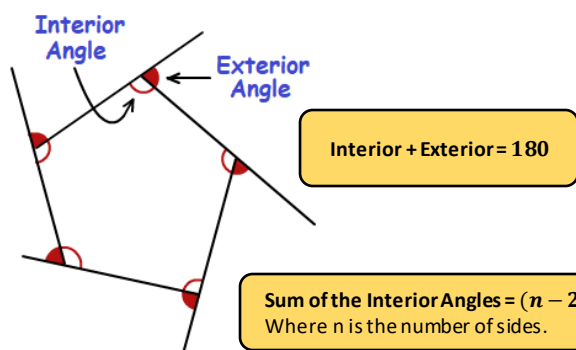


Pressure

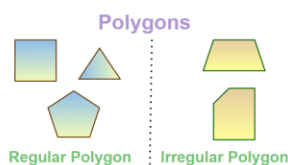
$$\text{pressure} = \frac{\text{force}}{\text{area}}$$



Interior and Exterior Angles in Polygons:



For Regular Polygons Only:



- Regular polygons:
- All angles are same size
 - All sides are same length

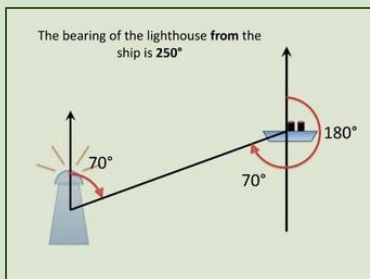
One Interior Angle = $\frac{(n-2) \times 180}{n}$

One Exterior Angle = $\frac{360}{n}$

Bearings:

- Measured from North
- Anti-Clockwise
- Given as 3 figures.

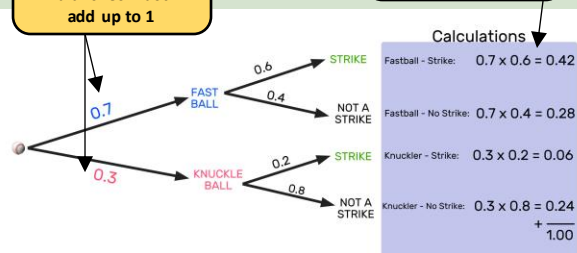
The bearing of the ship from the lighthouse is 070°



Probability Trees:

The probabilities on each set of branches must add up to 1

Multiply along the branches





Unit 9 Overview

9.1 Further Equations and Inequalities

9.1 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Expand Single Brackets E83	Factorise into a Single Bracket K178a, K178b, K178c	Solve Two-Step Equations K181c		Solve Equations with Unknowns on Both Sides K182a	
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
9.1a Expanding Double Brackets*					
9.1b Factorise Quadratics*					
9.1c Difference of Two Squares					
9.1d Solve Quadratic Equations*					
9.1e Inequalities on Number Lines*					
9.1f Solving Inequalities*					
9.1g Solving Simultaneous Equations Algebraically*					
9.1h Solving Simultaneous Equations Graphically					

9.2 Transformations and Vectors

9.2 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Draw and Read Coordinates in All Four Quadrants K75f	Draw Horizontal and Vertical Lines from a Given Equation K188b				
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
9.2a Reflections*					
9.2b Translations*					
9.2c Rotations*					
9.2d Enlargements*					
9.2e Column Vectors*					
9.2f Adding and Subtracting Vectors*					






* Commonly assessed topics

9.3 Line Diagrams and Scatter Graphs

9.3 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Draw and Read Coordinates in All Four Quadrants **K75f**

Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
9.3a Time Series Graphs					
9.3b Scatter Graphs*					
9.3c Correlation*					

9.4 Sets and Venn Diagrams

9.4 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Calculate Probabilities **K55a**

Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
9.4a Drawing Venn Diagrams*					
9.4b Set Notation and Probability*					
9.4c 3-Part Venn Diagrams					

* Commonly assessed topics

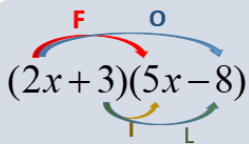
Unit 9 Revision Checklist

I have reviewed my feedback quizzes and used the videos and practice questions from the Unit 9 Overview to secure my gaps	
I have attended revision session 1 in on	
I have finished the Dr Frost tasks set from revision session 1 at home.	
I have attended revision session 2 in on	
I have finished the Dr Frost tasks set from revision session 2 at home.	
I have memorised the required facts and formulae for Unit 9 from the memorise sheet.	

Unit 9 Memorise Sheet

Expand Double Brackets:

FOIL Method



First: $(2x)(5x) = 10x^2$

Outer: $(2x)(-8) = -16x$

Inner: $(3)(5x) = 15x$

Last: $(3)(-8) = -24$

$$(2x+3)(5x-8)$$

$$= 10x^2 - 16x + 15x - 24$$

$$= 10x^2 - x - 24$$

Grid Method

$$(2x+3)(5x-8)$$

	$2x$	$+3$
$5x$	$10x^2$	$+15x$
-8	$-16x$	-24

$$10x^2 + 15x - 16x - 24$$

$$= 10x^2 - x - 24$$

Factorise Quadratics:

Remember **TEAM**

- **T**ime to make the
- **E**nd
- **A**dd to make the
- **M**iddle

Factorise $x^2 + 3x - 10$

\oplus \otimes
 $\otimes -10$

1 and $-10 \rightarrow 1 + (-10) = -9 \times$
 -1 and $10 \rightarrow -1 + 10 = 9 \times$
 2 and $-5 \rightarrow 2 + (-5) = -3 \times$
 -2 and $5 \rightarrow -2 + 5 = 3 \checkmark$

$= (x - 2)(x + 5)$

Difference of Two Squares

$$a^2 - b^2 = (a+b)(a-b)$$

Examples:

$$x^2 - 25$$

$$= x^2 - 5^2$$

$$= (x+5)(x-5)$$

$$y^2 - 81$$

$$= y^2 - 9^2$$

$$= (y+9)(y-9)$$

Solve Quadratic Equations:

1. quadratic = 0
2. Factorise the quadratic
3. Set each bracket = 0 and solve

Example Solve $x^2 - 8x + 15 = 0$

$$(x-3)(x-5) = 0$$

$$x-3 = 0$$

$$x = 3$$

$$x-5 = 0$$

$$x = 5$$

Inequalities:

- > means greater than
- < means less than
- \geq means greater than or equal to
- \leq means less than or equal to

An open circle \circ shows that the value is not included - i.e.

A closed circle \bullet shows that the value is included - i.e.

Example $1 < x \leq 5$



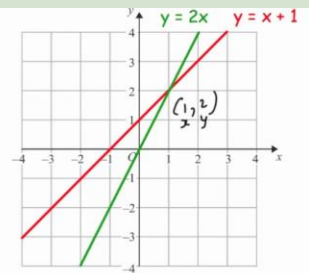
Solving Simultaneous Equations Graphically:

Use the graphs drawn to solve the simultaneous equations

$$y = 2x$$

$$y = x + 1$$

$$x = 1 \text{ and } y = 2$$





Unit 10 Overview

10.1 Trigonometry

Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
10.1a Use Trigonometry to Find Missing Sides*					
10.1b Use Trigonometry to Find Missing Angles*					
10.3c Exact Trigonometric Values					

10.2 Ratio and Proportion 2

10.2 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Direct Proportion Problems in Context **K47b**

Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
10.2a Worded Inverse Proportion					
10.2b Algebraic Direct Proportion					
10.2c Algebraic Inverse Proportion					
10.2d Proportional Graphs					

10.3 Graphs 2

10.3 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Coordinates in All Four Quadrants
K75f

Plot Linear Graphs
K188a

Substitute into Expressions with Powers
K79b, K79d















Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
10.3a Plotting Curved Graphs*					
10.3b Matching Curved Graphs*					
10.3c Roots, Intercepts and Turning Points of Quadratics*					

* Commonly assessed topics

10.4 Construction and Loci

10.4 Pre-requisite knowledge

The following skills are expected to be secure going into this unit. Type the codes below into the Dr Frost search bar to secure your skills:

Use a protractor to draw and measure angles K63b, K63d		Draw and measure bearings K156c, K156d			
Objective	Video Lesson	Practice Questions	Answers	FB Quiz Secure?	Unit Assessment Secure?
10.4a Construct Triangles*					
10.4b Bisect an Angle					
10.4c Construct a Perpendicular Bisector					
10.4d Construct a Perpendicular to a Line Through a Given Point					
10.4e Loci Regions					
10.4f Scale Diagrams and Bearings*					

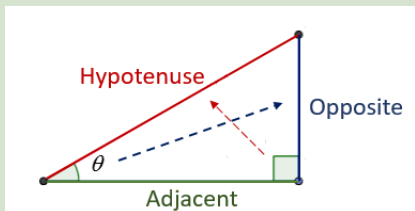
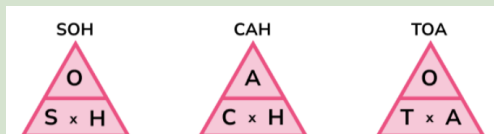
* Commonly assessed topics

Unit 10 Revision Checklist

I have reviewed my feedback quizzes and used the videos and practice questions from the Unit 10 Overview to secure my gaps	
I have attended revision session 1 in on	
I have finished the Dr Frost tasks set from revision session 1 at home.	
I have attended revision session 2 in on	
I have finished the Dr Frost tasks set from revision session 2 at home.	
I have memorised the required facts and formulae for Unit 10 from the memorise sheet.	

Unit 10 Memorise Sheet

Trigonometry



Exact Trig Values:

	0°	30°	45°	60°	90°
$\sin(\theta)$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos(\theta)$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan(\theta)$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undefined

Direct and Inverse Proportion:

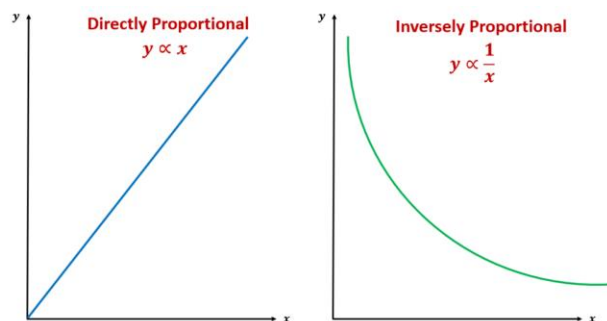
Direct Proportion:

$$y \propto x \rightarrow y = kx$$

Inverse Proportion:

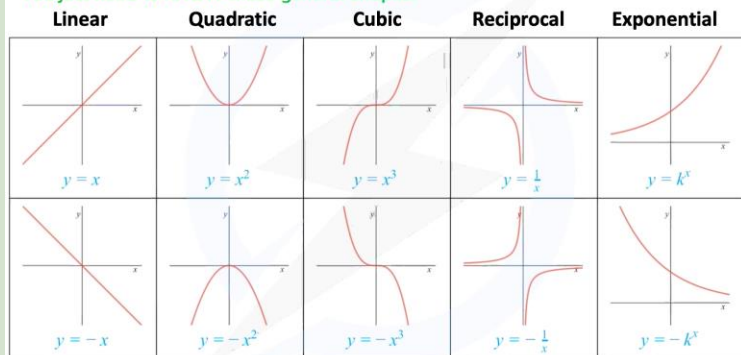
$$y \propto \frac{1}{x} \rightarrow y = \frac{k}{x}$$

Proportional Graphs:



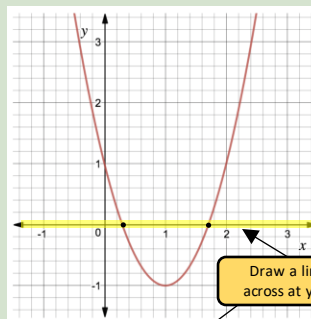
Curved Graphs:

You just need to KNOW these general shapes!



Roots and Turning Points of Quadratic Graphs:

The grid below shows the graph of $2x^2 - 4x + 1$



Solve $2x^2 - 4x + 1 = 0$

Solutions:
 $x = 0.3$ $x = 0.7$