

Year 9 Higher Maths

Knowledge Organiser

Term 3

| | |
|--------------|---------------|
| Name: | Class: |
|--------------|---------------|

| Keyword | Definition |
|-------------------|---|
| Simplify | To make simpler or easier to understand by reducing the size of numbers or the number of terms. |
| Like terms | Terms which have the exact same letters in an expression. |
| Expression | One or more terms combined by addition or subtraction. |
| Function | A special relationship where each input has one output. |
| Numerator | The top number in a fraction. |
| Denominator | The bottom number in a fraction. |
| Improper Fraction | A fraction where the numerator is not smaller than the denominator. |
| Mixed Number | A combination of a whole number and a fraction. |
| Product | The result of multiplication. |
| Percent | Out of 100 |
| Simplify | To make simpler or easier to understand by reducing the size of numbers or the number of terms. |
| Reciprocal | The result of dividing 1 by the number. |

| | |
|------------------------|--|
| Homework 1 due: | |
| Homework 2 due: | |
| Homework 3 due: | |



Term 3 Overview

Big Questions for the term

Simplifying and substitution

- How do we factorise quadratic expressions?
- How do we simplify algebraic fractions?
- How do we operate with algebraic fractions?

Constructions

- How can we construct triangles?
- How can we bisect a line?
- How can we bisect an angle?
- How can we bisect a line from different points?
- How can we construct different angles?
- How can we map 3D shapes?
- What is a locus of points?

Knowledge Retrieval Questions – From Year 7

Unit 3 – Ratio and proportion

| # | Question | Answer |
|---|---|---|
| 1 | How do you simplify a ratio? | Divide both numbers by a common factor. |
| 2 | How do you write a ratio into the form n:1? | Divide both numbers in the ratio by the second number in the ratio. |
| 3 | What is the unitary method? | A method where the first step is making the ratio 1:n or n:1 |
| 4 | How do you calculate best value? | Work out the cost of the same amount for each option and compare those. |
| 5 | How do you share an amount in a ratio? | Add the ratio numbers and divide by that to get the value of each part. |

Unit 4 – Fractions, decimals and percentages

| # | Question | Answer |
|----|---|---|
| 1 | What is a numerator? | Top number in a fraction |
| 2 | What is a denominator? | Bottom number in a fraction |
| 3 | What operation does a fraction represent? | Division |
| 4 | Which operation do we use for the word 'of'? | Multiplication |
| 5 | What's the first step when adding or subtracting fractions? | Write the fractions with a common denominator |
| 6 | How do you multiply fractions? | Multiply the numerators and multiply the denominators. |
| 7 | How do you convert a decimal to a percentage? | Multiply by 100 (%) |
| 8 | How do you simplify fractions? | Divide both the numerator and denominator by a common factor. |
| 9 | How do you find an equivalent fraction? | Multiply or divide the numerator and denominator by the same number. |
| 10 | How do you convert a mixed number to an improper fraction? | Multiply the whole number by the denominator and add it to the numerator |
| 11 | How do you find a fraction of an amount? | Divide the amount by the denominator and multiply by the numerator. |
| 12 | What does percent mean? | Out of 100 |
| 13 | How do you convert a fraction to a decimal if the denominator is a factor of 100? | Write the equivalent fraction with a denominator of 100 (then divide by 100) |
| 14 | How do you convert a decimal to a fraction? | The numerator is the same digits without the decimal point, the denominator is the place value of the last digit. |
| 15 | How do you convert a percentage to a decimal? | Divide by 100 (%) |

Unit 5 – Simplifying and substitution

| # | Question | Answer |
|---|---|---|
| 1 | In algebra, what does "collecting like terms" mean? | Adding or subtracting terms with the exact same letters |
| 2 | In algebra, what is substitution? | Replacing something in an expression with something else which is equal to it |
| 3 | The symbol for which operation is not written in algebra? | Multiplication |
| 4 | How is division represented algebraically? | As a fraction |
| 5 | How do you write expressions from sentences? | Replace unknown numbers with letters, everything else should be a number or an operation. |

Unit 6 – Constructions

None

Knowledge Retrieval Questions – From Year 8

Unit 3 – Ratio and proportion

None.

Unit 4 – Fractions, decimals and percentages

| # | Question | Answer |
|---|---|---|
| 1 | With a calculator, how do you convert a decimal to a percentage? | Multiply by 100 (%) |
| 2 | With a calculator, how do you convert a decimal to a fraction? | Type the decimal in and press = |
| 3 | With a calculator, how do you convert a fraction to a percentage? | Multiply by 100 (%) and press S <=> D |
| 4 | With a calculator, how do you convert a fraction to a decimal? | Type the fraction in and press =, followed by S <=> D |
| 5 | With a calculator, how do you convert a percentage to a decimal? | Type the percentage in and press =, followed by S <=> D |
| 6 | With a calculator, how do you convert a percentage to a fraction? | Type the percentage in and press = |

Unit 5 – Simplifying and substitution

| # | Question | Answer |
|---|---|---|
| 1 | How do you expand single brackets? | Multiply the term outside the brackets by each of the terms inside |
| 2 | How do you expand double brackets? | Multiply each of the terms in the first bracket by each of the terms in the second bracket. |
| 3 | What is the first step in factorising into single brackets? | Find the highest common factor of the terms. |
| 4 | When are brackets used in an expression? | When the order of operations is different to BIDMAS order. |

Unit 6 – Constructions

None

Knowledge Retrieval Questions – For Year 9

Unit 3 – Ratio and proportion

| # | Question | Answer |
|---|--|--|
| 1 | How do you share in a ratio if you are given the difference? | Work out the difference in the ratio and scale up to the difference you want |
| 2 | How do you share in a ratio if you are given one of the final amounts? | Scale up from the ratio to the amount you know and apply to the other |
| 3 | How do you use exchange rates to convert money? | Scale up the currency you know and apply to the other |
| 4 | What is direct proportion? | Describes quantities which have a constant ratio |
| 5 | What is indirect proportion? | Describes quantities which have a constant product |
| 6 | What is a scale factor? | The ratio between corresponding measurements of similar shapes |

Unit 4 – Fractions, decimals and percentages

| # | Question | Answer |
|----|---|--|
| 1 | How do you find 30% of an amount without a calculator? | Find 10% by dividing the amount by 10, then multiply by 3. |
| 2 | How do you increase an amount by 40% without a calculator? | Find 10% by dividing by 10, multiply that by 4, then add the result onto the original amount. |
| 3 | How do you increase an amount by a percentage? | Calculate the percentage of the amount, then add it on to the original amount |
| 4 | How do you decrease an amount by a percentage? | Calculate the percentage of the amount, then subtract it from the original amount |
| 5 | With a calculator, how do you increase an amount by a percentage? | Add the percentage to 100%, then multiply by the amount |
| 6 | With a calculator, how do you decrease an amount by a percentage? | Subtract the percentage from 100%, then multiply by the amount |
| 7 | How do you work out the value after adding simple interest? | amount + % of amount × number of years |
| 8 | How do you work out percentage change? | $(\text{Change} \div \text{Original}) \times 100 (\%)$ |
| 9 | What does it mean to work out a reverse percentage? | You are given the amount AFTER a percentage has been applied and asked to work out the original amount |
| 10 | How do you work out the value after adding compound interest? | amount × $(100\% + \% \text{ interest})^{\text{number of years}}$ |

Unit 5 – Simplifying and substitution

| # | Question | Answer |
|---|---|--|
| 1 | How do you add algebraic fractions? | Same as number fractions, make the denominators the same and add the numerators. |
| 2 | How do you multiply algebraic fractions? | Same as number fractions, multiply the numerators and the denominators, then simplify. |
| 3 | How do you divide algebraic fractions? | Same as number fractions, multiply the first one by the reciprocal of the second, then simplify. |
| 4 | How do you factorise a quadratic with a leading coefficient of 1? | Find the 2 numbers which add to make the coefficient of x and multiply to make the constant. |

Unit 6 – Constructions

| # | Question | Answer |
|---|--|---|
| 1 | What does it mean to "construct" in maths? | To draw accurately, using a combination of pencil, ruler, protractor and a pair of compasses. |
| 2 | How do you construct a triangle, given one side length and two angles? | Use a ruler to draw the side, measure the angles on either end, draw the lines so they connect. |
| 3 | How do you construct a triangle, given two side lengths and the angle between? | Use a ruler to draw one side, measure the angle, use a ruler to draw the second side, join the ends up. |
| 4 | How do you construct a triangle, given three side lengths? | Use a ruler to draw one side, use a pair of compasses to draw arcs on either end with radii equal to the two remaining sides, the point they intersect is the third vertex. |
| 5 | How do you construct a perpendicular bisector? | Set your compass to more than half way, draw two arcs from each end of the line, connect the two points where the arcs meet |
| 6 | How do you construct an angle bisector? | Put your compass on the vertex and make a mark on each line, draw an arc with your compass on each mark, connect the point where the arcs meet with the vertex. |

Term 3 - Homework 1

| # | Type | Question | Answer |
|---|---------------|---|--------|
| 1 | Knowledge | With a calculator, how do you decrease an amount by a percentage? | |
| | Application 1 | Decrease 77 by 11% | |
| | Application 2 | Decrease 40 by 34% | |

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|---|---------------|---|--|
| 2 | Knowledge | With a calculator, how do you increase an amount by a percentage? | |
| | Application 1 | Increase 45 by 24% | |
| | Application 2 | Increase 78 by 9% | |

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|---|---------------|--|--|
| 3 | Knowledge | How do you share in a ratio if you are given the difference? | |
| | Application 1 | Anna and Ben share money in the ratio 8:1. Anna gets £560 more than Ben, how much does Anna get? | |
| | Application 2 | Anna and Ben share money in the ratio 7:1. Anna gets £240 more than Ben, how much does Anna get? | |

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|---|---------------|--|--|
| 4 | Knowledge | How do you work out the value after adding compound interest? | |
| | Application 1 | Calculate the balance if an account with £9800 got 6% compound interest for 5 years. | |
| | Application 2 | Calculate the balance if an account with £5200 got 2% compound interest for 3 years. | |

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|---|---------------|--|--|
| 5 | Knowledge | How do you find 30% of an amount without a calculator? | |
| | Application 1 | Find 30% of 90 | |
| | Application 2 | Find 30% of 70 | |

| # | Type | Question | Answer |
|---|---------------|--|--------|
| 6 | Knowledge | How do you decrease an amount by a percentage? | |
| | Application 1 | Decrease 100 by 25% | |
| | Application 2 | Decrease 120 by 40% | |

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|---|---------------|--|--|
| 7 | Knowledge | How do you increase an amount by 40% without a calculator? | |
| | Application 1 | Increase 120 by 40% | |
| | Application 2 | Increase 120 by 40% | |

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|---|---------------|---|--|
| 8 | Knowledge | How do you use exchange rates to convert money? | |
| | Application 1 | The exchange rate for GBP to USD is 1:1.23. How many Dollars would get for £220? | |
| | Application 2 | The exchange rate for GBP to USD is 1:1.21. How many Pounds would get for \$350.90? | |

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| 9 | Knowledge | How do you share in a ratio if you are given one of the final amounts? | |
| | Application 1 | Carly and Dan share money in the ratio 9:4. Dan gets £120, how much does Carly get? | |
| | Application 2 | Carly and Dan share money in the ratio 7:4. Dan gets £200, how much does Carly get? | |

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|----|---------------|--|--|
| 10 | Knowledge | What does it mean to work out a reverse percentage? | |
| | Application 1 | In a sale where prices are cut by 40% a pair of trainers cost £36.00, work out the original price. | |
| | Application 2 | In a sale where prices are cut by 20% a pair of trainers cost £72.00, work out the original price. | |

| # | Type | Question | Answer |
|----|---------------|--|--------|
| 11 | Knowledge | What is indirect proportion? | |
| | Application 1 | x and y are in indirect proportion. When $x = 12$ $y = 16$. What would x be if $y = 8$? | |
| | Application 2 | x and y are in indirect proportion. When $x = 24$ $y = 30$. What would x be if $y = 12$? | |

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|----|---------------|--|--|
| 12 | Knowledge | What is a scale factor? | |
| | Application 1 | Corresponding sides on two similar shapes are 10cm and 30cm. What is the scale factor? | |
| | Application 2 | Corresponding sides on two similar shapes are 10cm and 35cm. What is the scale factor? | |

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|----|---------------|--|--|
| 13 | Knowledge | How do you work out the value after adding simple interest? | |
| | Application 1 | Calculate the balance if an account with £7100 got 3% simple interest for 5 years. | |
| | Application 2 | Calculate the balance if an account with £6300 got 6% simple interest for 3 years. | |

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|----|---------------|--|--|
| 14 | Knowledge | How do you work out percentage change? | |
| | Application 1 | Over a year, your bank account goes from £6300 to £10200, calculate the percentage change. | |
| | Application 2 | Over a year, your bank account goes from £6300 to £5100, calculate the percentage change. | |

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|----|---------------|--|--|
| 15 | Knowledge | What is direct proportion? | |
| | Application 1 | x and y are in direct proportion. When $x = 10$ $y = 40$. What would x be if $y = 48$? | |
| | Application 2 | x and y are in direct proportion. When $x = 9$ $y = 27$. What would x be if $y = 42$? | |

Working space

Term 3 - Homework 2

| # | Type | Question | Answer |
|---|---------------|--|--------|
| 1 | Knowledge | How do you work out the value after adding simple interest? | |
| | Application 1 | Calculate the balance if an account with £3600 got 4% simple interest for 2 years. | |
| | Application 2 | Calculate the balance if an account with £6600 got 5% simple interest for 5 years. | |

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|---|---------------|---|--|
| 2 | Knowledge | With a calculator, how do you decrease an amount by a percentage? | |
| | Application 1 | Decrease 88 by 27% | |
| | Application 2 | Decrease 108 by 9% | |

| | | | |
|---|---------------|---|--|
| 3 | Knowledge | What is direct proportion? | |
| | Application 1 | x and y are in direct proportion. When $x = 6$ $y = 12$. What would x be if $y = 26$? | |
| | Application 2 | x and y are in direct proportion. When $x = 7$ $y = 21$. What would x be if $y = 45$? | |

| | | | |
|---|---------------|--|--|
| 4 | Knowledge | How do you work out the value after adding compound interest? | |
| | Application 1 | Calculate the balance if an account with £7200 got 5% compound interest for 3 years. | |
| | Application 2 | Calculate the balance if an account with £5500 got 6% compound interest for 5 years. | |

| | | | |
|---|---------------|---|--|
| 5 | Knowledge | How do you share in a ratio if you are given one of the final amounts? | |
| | Application 1 | Carly and Dan share money in the ratio 5:4. Dan gets £120, how much does Carly get? | |
| | Application 2 | Carly and Dan share money in the ratio 6:1. Dan gets £40, how much does Carly get? | |

| # | Type | Question | Answer |
|---|---------------|---|--------|
| 6 | Knowledge | With a calculator, how do you increase an amount by a percentage? | |
| | Application 1 | Increase 40 by 7% | |
| | Application 2 | Increase 60 by 11% | |

| | | | |
|---|---------------|--|--|
| 7 | Knowledge | How do you decrease an amount by a percentage? | |
| | Application 1 | Decrease 50 by 30% | |
| | Application 2 | Decrease 120 by 35% | |

| | | | |
|---|---------------|--|--|
| 8 | Knowledge | What is indirect proportion? | |
| | Application 1 | x and y are in indirect proportion. When $x = 40$ $y = 40$. What would x be if $y = 20$? | |
| | Application 2 | x and y are in indirect proportion. When $x = 16$ $y = 32$. What would x be if $y = 16$? | |

| | | | |
|---|---------------|--|--|
| 9 | Knowledge | How do you work out percentage change? | |
| | Application 1 | Over a year, your bank account goes from £8400 to £10200, calculate the percentage change. | |
| | Application 2 | Over a year, your bank account goes from £6300 to £6800, calculate the percentage change. | |

| | | | |
|----|---------------|--|--|
| 10 | Knowledge | How do you increase an amount by 40% without a calculator? | |
| | Application 1 | Increase 400 by 40% | |
| | Application 2 | Increase 200 by 40% | |

| # | Type | Question | Answer |
|----|---------------|---|--------|
| 11 | Knowledge | How do you use exchange rates to convert money? | |
| | Application 1 | The exchange rate for GBP to USD is 1:1.26. How many Dollars would get for £390? | |
| | Application 2 | The exchange rate for GBP to USD is 1:1.24. How many Pounds would get for \$533.20? | |

| | | | |
|----|---------------|--|--|
| 12 | Knowledge | How do you share in a ratio if you are given the difference? | |
| | Application 1 | Anna and Ben share money in the ratio 5:1. Anna gets £640 more than Ben, how much does Anna get? | |
| | Application 2 | Anna and Ben share money in the ratio 4:1. Anna gets £420 more than Ben, how much does Anna get? | |

| | | | |
|----|---------------|--|--|
| 13 | Knowledge | How do you find 30% of an amount without a calculator? | |
| | Application 1 | Find 30% of 20 | |
| | Application 2 | Find 30% of 40 | |

| | | | |
|----|---------------|--|--|
| 14 | Knowledge | How do you increase an amount by a percentage? | |
| | Application 1 | Increase 70 by 35% | |
| | Application 2 | Increase 40 by 5% | |

| | | | |
|----|---------------|---|--|
| 15 | Knowledge | What is a scale factor? | |
| | Application 1 | Corresponding sides on two similar shapes are 6cm and 21cm. What is the scale factor? | |
| | Application 2 | Corresponding sides on two similar shapes are 8cm and 32cm. What is the scale factor? | |

Working space

Term 3 - Homework 3

| # | Type | Question | Answer |
|---|---------------|--|--------|
| 1 | Knowledge | How do you find 30% of an amount without a calculator? | |
| | Application 1 | Find 30% of 30 | |
| | Application 2 | Find 30% of 70 | |

| | | | |
|---|---------------|--|--|
| 2 | Knowledge | How do you multiply algebraic fractions? | |
| | Application 1 | What is $2(p-1)/r \times p/7(q-1)$ | |
| | Application 2 | What is $3(q-1)/r \times r/5(p-1)$ | |

| | | | |
|---|---------------|--|--|
| 3 | Knowledge | How do you work out the value after adding simple interest? | |
| | Application 1 | Calculate the balance if an account with £2900 got 6% simple interest for 4 years. | |
| | Application 2 | Calculate the balance if an account with £8100 got 6% simple interest for 5 years. | |

| | | | |
|---|---------------|---|--|
| 4 | Knowledge | With a calculator, how do you increase an amount by a percentage? | |
| | Application 1 | Increase 63 by 20% | |
| | Application 2 | Increase 79 by 9% | |

| | | | |
|---|---------------|-------------------------------------|--|
| 5 | Knowledge | How do you add algebraic fractions? | |
| | Application 1 | What is $2r/(p-1) + 7p/(q-1)$? | |
| | Application 2 | What is $3r/(q-1) + 5r/(p-1)$? | |

| # | Type | Question | Answer |
|---|---------------|--|--------|
| 6 | Knowledge | How do you increase an amount by a percentage? | |
| | Application 1 | Increase 120 by 35% | |
| | Application 2 | Increase 80 by 5% | |

| | | | |
|---|---------------|--|--|
| 7 | Knowledge | How do you decrease an amount by a percentage? | |
| | Application 1 | Decrease 60 by 40% | |
| | Application 2 | Decrease 100 by 25% | |

| | | | |
|---|---------------|---|--|
| 8 | Knowledge | With a calculator, how do you decrease an amount by a percentage? | |
| | Application 1 | Decrease 45 by 35% | |
| | Application 2 | Decrease 68 by 26% | |

| | | | |
|---|---------------|--|--|
| 9 | Knowledge | How do you divide algebraic fractions? | |
| | Application 1 | What is $2(p-1)/r \div 7(q-1)/p$ | |
| | Application 2 | What is $3(q-1)/r \div 5(p-1)/r$ | |

| | | | |
|----|---------------|--|--|
| 10 | Knowledge | How do you work out the value after adding compound interest? | |
| | Application 1 | Calculate the balance if an account with £2300 got 6% compound interest for 5 years. | |
| | Application 2 | Calculate the balance if an account with £4100 got 4% compound interest for 4 years. | |

| # | Type | Question | Answer |
|----|---------------|--|--------|
| 11 | Knowledge | What does it mean to work out a reverse percentage? | |
| | Application 1 | In a sale where prices are cut by 25% a pair of trainers cost £45.00, work out the original price. | |
| | Application 2 | In a sale where prices are cut by 10% a pair of trainers cost £90.00, work out the original price. | |

| | | | |
|----|---------------|--|--|
| 12 | Knowledge | How do you increase an amount by 40% without a calculator? | |
| | Application 1 | Increase 80 by 40% | |
| | Application 2 | Increase 120 by 40% | |

| | | | |
|----|---------------|---|--|
| 13 | Knowledge | How do you work out percentage change? | |
| | Application 1 | Over a year, your bank account goes from £10500 to £10200, calculate the percentage change. | |
| | Application 2 | Over a year, your bank account goes from £7000 to £8500, calculate the percentage change. | |

Working space