GCSE HIGHER YEAR 9 SPRING TERM UNIT 4 FRACTIONS, PERCENTAGES, RATIO AND PROPORTION

Comparing Fractions	To compare fractions, they each need to be rewritten so that they have a **common denominator**. **Ascending** means **smallest to biggest**. **Descending** means **biggest to smallest**.	Put in to ascending order : . $\frac{3}{4}, \frac{2}{3}, \frac{5}{6}, \frac{1}{2}$ Equivalent: $\frac{9}{12}, \frac{8}{12}, \frac{10}{12}, \frac{6}{12}$ Correct order: $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{6}$
Fraction of an Amount	**Divide** by the **bottom**, **times** by the **top**	Find of $\frac{2}{5}$ £60 $60 \div 5 = 12$ $12 \times 2 = 24$
Adding or Subtracting Fractions	Find the **LCM of the denominators** to find a common de-nominator. Use equivalent fractions to change each fraction to the **common denomi-nator**. Then just **add or subtract the numerators** and keep the denominator the **same**.	$\frac{2}{3} + \frac{4}{5}$ Multiples of 3: 3, 6, 9, 12, **15**.. Multiples of 5: 5, 10, **15**.. LCM of 3 and 5 = 15 $\frac{2}{3} = \frac{10}{15}$ $\frac{4}{5} = \frac{12}{15}$ $\frac{10}{15} + \frac{12}{15} = \frac{22}{15} = 1\frac{7}{15}$
Multiplying Fractions	**Multiply** the **numerators** together and **multiply** the **denominators** together.	$\frac{3}{8} \times \frac{2}{9} = \frac{6}{72} = \frac{1}{12}$
Dividing Fractions	**'Keep it, Flip it, Change it – KFC'** Keep the first fraction the same Flip the second fraction upside down Change the divide to a multiply Multiply by the **reciprocal** of the second fraction.	$\frac{3}{4} \div \frac{5}{6} = \frac{3}{4} \times \frac{6}{5} = \frac{18}{20} = \frac{9}{10}$

Percentage Change	$\frac{Difference}{Original} \times 100\%$	A games console is bought for £200 and sold for £250. % change = $\frac{50}{200} \times 100$ $= 25\%$
Fractions to Decimals	**Divide the numerator by the denominator** using the bus stop method.	$\frac{3}{8} = 3 \div 8 = 0.375$
Decimals to Fractions	Write as a fraction over 10, 100 or 1000 and simplify.	$0.36 = \frac{36}{100} = \frac{9}{25}$
Percentages to Decimals	**Divide by 100**	$8\% = 8 \div 100 = 0.08$
Decimals to Percentages	**Multiply by 100**	$0.4 = 0.4 \times 100\% = 40\%$
Fractions to Percentages	Percentage is just a fraction out of 100. **Make the denominator 100 using equivalent fractions**. When the denominator doesn't go in to 100, use a calculator and **multiply the fraction by 100**.	$\frac{3}{25} = \frac{12}{100} = 12\%$ $\frac{9}{17} \times 100 = 52.9\%$
Percentages to Fractions	Percentage is just a fraction out of 100. **Write the percentage over 100** and simplify.	$14\% = \frac{14}{100} = \frac{7}{50}$

The reciprocal of a number is **1 divided by the number**.

The reciprocal of is x $\dfrac{1}{x}$

When we multiply a number by its reciprocal we get 1.

This is called the 'multiplicative inverse'.

$\frac{2}{3}$ $\frac{3}{2}$ $\frac{2}{3} \times \frac{3}{2} = 1$

5 $\frac{1}{5}$

Mixed Number	A number formed of both an **integer part** and a **fraction part**.	$3\frac{2}{5}$ is an example of a mixed number. Always convert to an improper fraction before adding, subtracting, multiplying and dividing. $\frac{17}{5}$

Percentage Change/ Profit or loss	$\frac{actual\ loss\ (profit)}{Original\ amount} \times 100\%$	Roxy bought a jacket for £45. Six months later she sold it for £34.65. What was her percentage loss? % change = $\frac{45-34.65}{45} \times 100$ $= 23\%$
Increase or Decrease by a Percentage	Non-calculator: **Find the percentage** and **add** or **subtract** it from the **original** amount. Calculator: Find the **percentage multiplier** and multiply.	Increase 500 by 20% (Non Calc): 10% of 500 = 50 so 20% of 500 = 100 500 + 100 = 600 Decrease 800 by 17% (Calc): 100%-17%=83% 83% ÷ 100 = 0.83 0.83 x 800 = 664
Percentage Multiplier	The **number** you **multiply** a quantity by to **increase or decrease** it by a **percentage**.	The multiplier for increasing by 12% is 1.12 The multiplier for decreasing by 12% is 0.88 The multiplier for increasing by 100% is 2.
Reverse Percentage	Find the **correct percentage given in the question**, then work backwards to **find 100%** Look out for words like '**before**' or '**original**'	A jumper was priced at £48.60 after a 10% reduction. Find its original price. 100% - 10% = 90% 90% = £48.60 1% = £0.54 100% = £54
Simple Interest	Interest calculated as a **percentage of the original** amount.	£1000 invested for 3 years at 10% simple interest. 10% of £1000 = £100 Interest = $3 \times £100 = £300$
Compound Interest Always use a multiplier This type of question is usually on a calculator paper	The interest earned each year is added to the **principle amount**. The new amount earns interest the following year and so on. Real life: mortgages and hire purchase. The principle grows or is **compounded**.	£1000 invested for 3 years at 1% compound interest. The multiplier for increasing by 1% is 1.01 £1000 x 1.01³= £1030.30

VOCABULARY

Denominator, numerator, reciprocal, equivalent, multiplier, reverse percentage

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Ratio	Ratio compares the size of **one part** to **another part**. Written using the '**:**' symbol.	**3 : 1**
Simplifying Ratios	**Divide** all parts of the ratio by a **common factor**.	5 : 10 = 1 : 2 (divide both by 5) 14 : 21 = 2 : 3 (divide both by 7)
Ratios in the form $1 : n$ or $n : 1$	**Divide** both parts of the ratio by one of the numbers to make **one part equal 1**.	5 : 7 = 1 : $\frac{7}{5}$ in the form 1 : n 5 : 7 = $\frac{5}{7}$: 1 in the form n : 1
Sharing in a Ratio	1. **Add** the total parts of the ratio. 2. **Divide** the amount to be shared by this value to find the value of one part. 3. **Multiply** this value by each part of the ratio. Use only if you **know the total**.	Share £60 in the ratio 3 : 2 : 1. 3 + 2 + 1 = 6 60 ÷ 6 = 10 3 x 10 = 30, 2 x 10 = 20, 1 x 10 = 10 £30 : £20 : £10
Ratio already shared	Find what **one part** of the ratio is worth using the **unitary method**.	Money was shared in the ratio 3:2:5 between Ann, Bob and Cat. Given that Bob had £16, found out the total amount of money shared. £16 = 2 parts So £8 = 1 part 3 + 2 + 5 = 10 parts, so 8 x 10 = £80

Reasoning *J* is directly proportional to *K*. Work out the missing values, **a** and **b**, in the table. *(4 marks)*

J	K
52	36
39	a
b	22.5

c   Write a formula for *J* in terms of *K*.

J	K
52	36
39	27
32.5	22.5

Note the relationship between 52 and 36 (they are in the ratio of 13:9)

13 x 3 = 39 and 9 x 2.5 = 22.5

Talil is going to make some concrete mix.
He needs to mix cement, sand and gravel in the ratio 1 : 3 : 5 by weight.
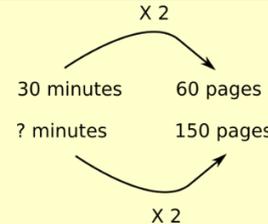Talil wants to make 180 kg of concrete mix.
Talil has
   15 kg of cement
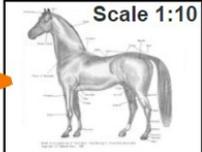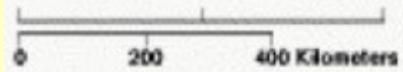   85 kg of sand
   100 kg of gravel.
Does Talil have enough cement, sand and gravel to make the concrete mix? *(4 marks)*

No he needs he needs 20Kg of cement

Proportion	Proportion compares the size of **one part** to the size of the **whole**. Usually written as a fraction.	In a class with 13 boys and 9 girls, the proportion of boys is $\frac{13}{22}$ and the proportion of girls is $\frac{9}{22}$
Proportional Reasoning	Comparing two things using **multiplicative reasoning** and applying this to a new situation. Identify one multiplicative link and use this to find missing quantities.	X 2 30 minutes → 60 pages ? minutes → 150 pages X 2
Best Buys	Find the **unit cost** by **dividing** the **price by the quantity**. The **lowest** number is the best value.	8 cakes for £1.28 à 16p each (÷by 8) 13 cakes for £2.05 à 15.8p each (÷by 13) Pack of 13 cakes is best value.

| Scale | The **ratio** of the **length** in a **model** to the length of the **real** thing. | Scale 1:10 Real Horse 1500 mm high 2000 mm long Drawn Horse 150 mm high 200 mm long |
| Scale (Map) | The **ratio** of a **distance on the map** to the actual **distance in real life**. | 1 in. = 250 mi 1 cm = 160 km 0   200   400 Kilometers |