



Title of Scheme of Learning: Proportional Reasoning

Subject: MATHS
Term: Spring 2
Year: 8
Length of Unit: 6 weeks

Big Learning Question: What's maths got to do with my life?

Big Assessment outcome? Calculate percentage change; use and apply ratios; use distance, speed time in real life contexts.

Success Criteria for Big Assessment Outcome:

Unit 10: Percentage change (2 weeks)

- Use percentages greater than 100%
- Express one quantity as a percentage of another
- Compare two quantities by percentage
- Increase or decrease a quantity by a given percentage
- Understand how to compare quantities using percentages
- Reverse percentages: find the original quantity given a part of it and its percentage
- Reverse percentages: find the original quantity when we know its final value after the percentage increase or decrease
- Solve problems involving percentages and reverse percentages

Unit 11: Ratio (equivalent, of a quantity) and rate (3 weeks)

- Interpret $a : b$ and $a : b : c$, where a , b and c are whole numbers
- Compare two or more quantities by ratio
- Relate ratios to fractions
- Write equivalent ratios, and find the missing term in a pair of equivalent ratios
- Express ratios involving rational numbers in their simplest form
- Divide a quantity in a given ratio
- Find the ratio of two or three given quantities
- Find one quantity given the other quantity and their ratio
- Express one quantity as a fraction of another, or how many times one quantity is as large as another given their ratio, and vice versa
- Express one quantity as a fraction of another given the two quantities
- Find the whole/ one part when a whole is divided into parts in a given ratio
- Calculate average rate
- Solve up to 2-step word problems involving ratio
- Understand and differentiate between the concepts of speed, average speed and uniform speed
- Use the relationship between distance, time and speed
 - * Distance = Speed \times Time,
 - * Speed = Distance \div Time,
 - * Time = Distance \div Speed
- Calculate speed, distance or time given the other two quantities
- Write speed in different units such as km/h, m/min, m/s and cm/s
- Convert from one unit of speed to another (e.g. km/h to m/s)
- Solve up to 3-step word problems involving speed, uniform speed and average speed

Unit 10: Percentage change

Framed work: Weekly review check- up (week 1 – peer assessed and week 2 teacher assessed – followed by mad time student responses)

Lesson	Learning Objective	Learning Outcomes	Planned Questions	Do Now	Main	Plenary	Differentiation	Mastery Skill Exit ticket	H/W
10.1	Find equivalent fractions, decimals and percentages	<p>To identify equivalent fractions, decimals and percentages</p> <p>To create equivalent fractions, decimals and percentages</p>	<p>What is a fraction? What is a percentage? When do we use fraction/decimal/percentage?</p> <p>Why does the denominator need to be 100? How does this relate to the base ten number system?</p>	Converts fractions to decimals	<p>Talk Task- Write diagrams as fractions/ percentages</p> <p>Independent Task-Use bar models to show which is the odd one out FDP</p>	True/ False equivalents	<p>Use only either f/d d/p p/f</p> <p>Convert improper fractions/ Mixed numbers to percentage/decimal</p>	10.1 I can find equivalent fractions, decimals and %	
10.2	Compare and order fractions, decimals and percentages	To compare and order fractions, decimals and percentages	<p>How could you show which is larger? How could this be represented as a decimal? How could this be represented as a fraction?</p>	Put fractions in ascending order	<p>Talk Task- Guess who students choose an FDP and use questions to identify their partners.</p> <p>Independent Task- Evaluating which is greater a given FDP of an amount</p>	Show me equivalence on mini W/B	<p>Use fractions which can be converted to percentage without a recurring numbers</p> <p>Order improper fractions/ Mixed numbers to percentage/decimal</p>	10.2 I can compare and order fractions, decimals and %	
10.3	Find a % of an amount	To calculate percentage of amount	<p>What is 75% as a fraction? What is 75% as a decimal? How can we use 25% to find 75%?</p> <p>What is 10% as a fraction? What is 10% as a decimal? How do we find a tenth of a number?</p>	Complete table of equivalent FDP	Talk Task- Complete percentage Maze.	Clock face comparisons	Use 10% to find every other percentage, encourage students to find 10% first by finding one tenth of a number.		

			How could we find 20%?		Main- Percentage Cross number		Find 100%, 200%, 150%		
10.4	I can find a % of an amount (including % more than 100%)	To compare percentages of amounts	<p>What must the amounts be? How could find other percentages of these amounts? What is 100%? What is 50%?</p> <p>Can you predict which will be larger? How do you know? How can you show which is larger? What would this look like as a bar model?</p>	Table fill in of percentages of amounts.	<p>Talk Tasks- Compare FDP of amounts which is larger?</p> <p>Independent Task- Which is larger? Compare percentages of different amounts using bar models or calculations to justify</p>	Exit Ticket	<p>Use percentages which are multiples of 10</p> <p>Find the whole given the percentages.</p>	10.3 I can find a % of an amount	
10.5	Express a quantity as a % of another	Express a quantity as a percentage of another	<p>What do the bar models represent? How do you know which is bigger? How can we compare fractions? What is the remaining percentage? What fraction is margin? How can you convert fractions to percentages?</p>	Comparing fractions in worded problem.	<p>Talk Task- Working out percentage covered by margins in Miss MC Maths Book.</p> <p>Independent Task- Flags problem.</p>	True or false evaluating question/ Exit Ticket	<p>Use of bar models to represent ideas</p> <p>Is there another way of doing it? How could you prove it? What could you do next?</p>	10.4 I can express a quantity as a % of another	
10.6	Calculate % increase and decrease	<p>Increase a number by a given percentage</p> <p>Decrease a number by a given percentage</p>	<p>What is 95% as a decimal? Is finding 95% of a number the same as multiplying by 0.95? What does of mean in maths? What is the equivalent decimal for 5%? If I decrease a number by 5% is that the same as 95% of it? Which method is correct? Which do you prefer?</p>	Calculate percentage of amount	TT- Match the calculations to the problems. There may be more than one match for each one.	Exit Ticket 10.5	Step it out	10.5 I can calculate % increase	

					IT- Nrich shopping problem		Explore simple interest Decimal percentages		
10.7	Solve problems with % increase and decrease		What does increase mean? What does decrease mean? Can you explain your method? Is there another way?	Write a % increase or decrease worded question that fits this bar model.	TT- Some pupils drew the following bar models in response to questions. What could the questions have been? IT- If the base of the rectangle is increased by 10%, but the area remains the same, what must the height be decreased by? What about if the base is increased by 20% 25% 120%?	Exit Ticket 10.6	Recap simple % increase and decrease shopping problems IT Task	10.6 I can calculate % decrease	
10.8	Calculate reverse percentages: find the original quantity given a part of it and its percentage/find the original quantity when we know its final value after the	Draw a bar model to represent a reverse percentage question Calculate the original amount	What is the original price? What is the sale price? What is the reduction?	What makes these adverts misleading?	TT- What other information could you calculate using the information given?	Exit Ticket 10.7 and 10.8	Use numbers which fit well into bar models	10.7 I can calculate reverse %s	

	percentage increase or decrease				A customer is offered a 20% discount when buying a new car. The discounted price is £16,800. Find the full price, p, of the car.		Introduce use of algebra		
10.9	Solve problems with percentages and reverse percentages	Identify information give in a question Calculate original price of percentage change	How could we draw a bar model for this? Have you been given the original price? What is the percentage increase or decrease? What is the new price? What was the original price?	These bar models represent problems on percentage change. What makes these models the same or different?	Draw a bar model for each question to find the original (Questions)	A shop has a sale with 30% off everything. A jumper costs £21 in the sale. How much did it cost before the sale? Pupil A works out the answer as £27.30 Pupil B works out the answer as £30 Which one is correct?	Highlight information in the question Give students bar models to complete info on. Students create their own problems	10.8 I can solve problems with reverse %s	
Unit 11: Ratio									
11.1	Write and simplify ratios	Articulate ratios from diagrams Simplify ratios	Is this a similar shape? Have I increased the base and height by the same amount? What have I increased them by? Have I added or multiplied? Why are these rectangles not similar? What are two rods that measure the same length as 3 rods? What is this as a ratio? "for every 3 whites, there is 1 green" How do we write this as a ratio? Can you use more rods to make an equivalent ratio? Which is the ratio in its simplest form?	Sketch two larger versions of this rectangle which retain the length comparisons. Sketch two smaller versions of this rectangle which retain the length comparisons.	TT- What pairs of rods can you find with a ratio of 3:2? IT- Write two ratio sentences about these diagrams	Exit Ticket 11.1	Provide sentence starters	11.1 I can write and simplify ratios	

11.2	Relate ratios to fractions	Calculate fractions from ratios	<p>What is the ratio of blue to orange? What is ratio of orange to blue? What fraction are blue/orange? How are ratios different to fractions? How are they the same? Where does the denominator come from?</p>	Simplify the following ratios	<p>TT- Find the ratio of orange dots to blue dots in each square. Which ratios are the same? Find the fraction of dots that are orange in each square.</p> <p>How does this relate to the ratio?</p> <p>IT- The fraction of the total number of counters that are orange in each box are given. If there are only blue and orange counters, what counters could go in each box?</p>	Exit Ticket 11.2	<p>Use counter manipulatives and encourage students to draw diagrams</p> <p>Introduce 3 part ratios</p>	11.2 I can relate ratios to fractions	
11.3	Divide a quantity into a ratio	<p>Share an amount into a given ratio</p> <p>Calculate a missing part of a ratio</p>	<p>How many parts are there in total? How much will be in each part? What fraction will A get? What fraction will B get? How does this relate to finding a fraction of a quantity?</p>	<p>What is the ratio of boys to girls? What is the ratio of girls to boys? How are these the same/different?</p>	<p>IT- Use bar models to share these amounts...</p> <p>TT- Which of these options would give him the largest number of blue smarties?</p>	<p>Merits are divided between two children in the ratio 2:3. Inclusion A receives 18 merits. How many are there in total?</p>	<p>Step it out</p> <p>Share into 3 part ratios</p>		

11.4	Divide a quantity into a ratio	Apply the golden ratio	What is the golden ratio? How can you find the golden ratio?	1. Share 90 chocolates in the ratio 5:3 2. Share £44 in the ratio 2:1 3. Share 180 in the ratio 5:1	For each face, find the following measurements: Does Mr Gray's face have the Golden ratio?	Exit Ticket 11.3	Recap measuring with a ruler Nrich problem- which car park is fuller?	11.3 I can divide a quantity into a ratio	
11.5	Use and apply ratio in problems	Identify similar shapes Scale recipes up and down using ratio	How do you know which triangles are similar? Compare the shortest side of the first triangle with the shortest side of the third triangle. What do you notice? How about comparing the two "middle length" sides? Can you use this to work out what the longest side length is in the third triangle? How does ratio help here? What if you needed to make pancakes for 24 people? How does simplifying ratio help you?	What is the simplified ratio of squares, triangles and circles?	TT- Which triangles are similar? IT- use ratio to scale up recipes	Exit Ticket 11.4	Scaffold using double number lines	11.4 I can solve problems with ratio	
11.6	Use proportional reasoning in rate	Solve problems using the unitary method	How would I set this up as a ratio? What do I mean by rate? Can you think of any other examples that we've seen over the last few lessons where we have used direct proportion?	Which is stronger? Why? Can you think of another method that will get you	TT- It takes 100 minutes to fix the punctures on 8 bikes.	Without doing any calculations, can you decide	Scaffolding using double number lines		

				to the same answer?	How long would it take to fix 7 bikes? What is the same/different about these three questions? 1) 12 people can paint a fence in 6 hours. a) How long would it take 6 people to paint it?b) How long would it take 3 people?c) How long would it take 18 people? etc	which of these questions is in direct proportion and which one is in inverse proportion ?			
11.7	Use the formula of distance = speed x time	Calculate speed, distance or time by applying the formula	What is the unit used here? Why?	How many miles would a vehicle travel in 1 minute if it was travelling at the speeds below?	TT- For each question identify what the speed/distance and time is. What is missing in each question? What calculation would you have to do to find the answer? IT- Consolidation questions	Exit Ticket 11.5	Give students minimally different examples to compute	11.5 I can use the formula for distance, speed and time	
11.8	Solve problems with ratio, distance, speed and time	Apply reasoning to worded problems	What is the same and what is different about these? What do you have to do to convert the units?	How long would it take these runners to get around a 500m track?	TT- Jad walked 5 metres in 4 seconds.How long should Ally take to walk 15 metres if he	Exit Ticket 11.6	Scaffold with double number lines	11.6 I can use and apply ratio to distance, speed, time problems	

					walks at the same speed as Jad? Independent task - http://nrich.maths.org/2384/index		Explore DST graphs		
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Curriculum Links to Oasis 9 habits Values:

Students are encouraged to interact with **patience** towards one another's contributions in class and support and help each other where appropriate. They are encouraged to be **compassionate** towards other student's efforts and contributions; supporting and celebrating where appropriate exercising **consideration** where others may find something more challenging than they do. Students are encouraged to see the **joy** that can be taken in mathematics and that it can be studied for the pleasure of it. Students are encouraged to understand that resilience is developed through **self-control** of one's reaction to challenging situations (including work one finds difficult. Students are encouraged to demonstrate **self-control** in terms of their interactions within the classroom. Students are encouraged to be **humble** in terms of understanding their achievements on the journey towards their GCSEs and the role they can play in supporting others along this journey. Students are encouraged to be **honest** when reflecting on their progress to accurately identify the best areas to focus on for development. This **honesty** is also encouraged in terms of owning one's own mistakes or poor choices within the classroom setting.

Resources to support teaching and learning

- www.mathematicsmastery.org (toolkit),
- www.vle.mathswatch.co.uk,
- www.mymaths.co.uk,
- www.mathsgenie.co.uk,
- www.corbettmaths.co.uk,
- <http://www.counon.org/resources/ks3framework/pdfs/vocabulary.pdf> (vocabulary list)