**Transition: Advanced Multiplicative to Advanced Proportional Domain: Ratios and Proportions**

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| **Achievement Objectives** | **Number: Level Four**  | **Number: Level Five** |
| Number Strategies and Knowledge AO3:Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimalsNumber Strategies and Knowledge AO6:Know the relative size and place value structure of positive and negative integers and decimals to three places  | Number Strategies and Knowledge AO2:Use prime numbers, common factors and multiples, and powers [including square roots].Number Strategies and Knowledge AO3:Understand operations on fractions, decimals, percentages, and integers.Number Strategies and Knowledge AO4:Use rates and ratiosNumber Strategies and Knowledge AO5:Know commonly used fraction, decimal and percentage conversionsNumber Strategies and Knowledge AO6:Know and apply standard form, significant figures, rounding, and decimal place value. |

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| **Strategies being developed** | **Problem progression** | **References** | **Knowledge being developed** | **Resources** |
| Find equivalent ratios by identifying common whole number factors and express them as fractions and percentages (ratios), e.g. 16:48 is equivalent to 2:6 or 1:3 (8 and 16 as common factors), 1:3 means or 25 % | Mixtures with same units, e.g. litres of cordial to litres of water.6:9 as 16:24 as 2:3 ( = 40%)8:24 as 12:36 as 1:3 ( = 25%)20:12 as 45:27 as 5:3 ( = 62. 5%)9:12 as 3:4 or 15:20 ( = 42.86…%)28:35 as 4:5 ( = 44. %) | ***Teaching Fractions, Decimals and Percentages (Book 7)***Introduction (53-56)[Extending Hotshots](https://nzmaths.co.nz/node/1114) (56-60)[Extending Mixing Colours](https://nzmaths.co.nz/node/1115) (61-62)***Figure It Out***PR 3-4.1 [Top Shoot](https://nzmaths.co.nz/node/4745) (24)PR 3-4.2 [Flavoursome](https://nzmaths.co.nz/node/4761) (6)PR 3-4.1 [da Vinci’s Ratio](https://nzmaths.co.nz/node/4775) (24) | Say the forward and backwards decimal word sequences by thousandths, hundredths, tenths, ones, and tens, starting at any decimal number | ***Teaching Number Knowledge (Book 4)***[Place Value Houses](https://nzmaths.co.nz/node/1042) (5)[Number Fans](https://nzmaths.co.nz/node/1039) (4)[More Reading of Decimal Fractions](https://nzmaths.co.nz/node/1051) (9)[Using Calculators](https://nzmaths.co.nz/node/1059) (14) |

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| Add and subtract fractions and mixed numbers with uncommon denominators, e.g.  +  =  = 1 |  +  =  = 1 -  =   +  =  = 1 -  =  +  =  = 1 -  =  = 1 | ***Teaching Fractions, Decimals and Percentages (Book 7)***[Comparing Apples with Apples](https://nzmaths.co.nz/node/967) (65-67)***Figure It Out***NS&AT 3-4.1 [Stripping Fractions](https://nzmaths.co.nz/node/4154) (8) | Say the number one-thousandth, one-hundredth, one-tenth, one, ten etc before and after any given decimal number  | ***Teaching Number Knowledge (Book 4)***[Number Fans](https://nzmaths.co.nz/node/1039) (4)[Skip-counting on the Number Line](https://nzmaths.co.nz/node/1055) (11)[Lucky Dip](https://nzmaths.co.nz/node/873) (13) |
| Solve problems that involve multiplying fractions and dividing whole numbers by fractions, recognising that division can result in a larger answer, e.g. 4 ÷  =  ÷  = 6 | 1 ÷  =  = 1, ×=1 ÷  =  = 1,×=1 ÷  =  = 3,×=4 ÷  =  = 65 ÷  =  = 63 ÷  =  = 8 | ***Teaching Number sense and Algebraic Thinking (Book 8)***[Harder Division of Fractions](https://nzmaths.co.nz/node/992) (22)[When Small Gets Bigger](https://nzmaths.co.nz/node/996) (24) | Order fractions, decimals, and percentages | ***Teaching Number Knowledge (Book 4)***[Packets of Lollies](https://nzmaths.co.nz/node/1049) (8)[Rocket - Where Will I Fit?](https://nzmaths.co.nz/node/1060) (15)[Bead Strings](https://nzmaths.co.nz/node/1066) (17)[Who Has More Cake?](https://nzmaths.co.nz/node/1068) (18)[Little Halves and Big Quarters](https://nzmaths.co.nz/node/1069) (19)[Who Wins?](https://nzmaths.co.nz/node/1071) (20)[Who Gets More?](https://nzmaths.co.nz/node/1072) (20)[Using Calculators](https://nzmaths.co.nz/node/1059) (14)***Figure It Out***N 3-4.1 [Waves Win](https://nzmaths.co.nz/node/3255) (8)N7/8 4.3 [Awesome Athletes](https://nzmaths.co.nz/node/3430) (13)N7/8 4.5 [Gentle Giants](https://nzmaths.co.nz/node/3546) (18) |

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| **Strategies being developed** | **Problem progression** | **References** | **Knowledge being developed** | **Resources** |
| Solve problems that involve multiplying and dividing decimals using place value estimation and conversion to known fractions, e.g. 0.4 × 2.8 = 1.12 (0.4<) 8.1 ÷ 0.3 = 27 (81÷ 3 in tenths) | 3.2 × 0.3 = 0.960.72 × 8 = 5.760.25 × 2.4 = 0.615 × 0.33 = 4.955.6 ÷ 0.7 = 84.8 ÷ 1.5 = 3.27.2 ÷ 0.36 = 200.9 ÷ 0.03 = 3024 ÷ 36 = 0. | ***Teaching Fractions, Decimals and Percentages (Book7)***[Folding Fractions and Decimals](https://nzmaths.co.nz/node/1021) (63-64)***Teaching Number sense and Algebraic Thinking (Book 8)***[Estimation in Decimal Multiplication and Division Problems](https://nzmaths.co.nz/node/990) (25)[Multiplication of Decimal Fractions](https://nzmaths.co.nz/node/988) (37)***Figure It Out***N 3-4.2 [Spring Fever](https://nzmaths.co.nz/node/3288) (6)N 3-4.2 [Ageing in Space](https://nzmaths.co.nz/node/3289) (8)N3-4.2 [Meal Deal](https://nzmaths.co.nz/node/3290) (9)N 3-4.3 [Dog’s Dinner](https://nzmaths.co.nz/node/3318) (14)NS@AT 3-4.2 [Using Mates](https://nzmaths.co.nz/node/4175) (16)NS&AT 3-4.2 [Compatible Multiples](https://nzmaths.co.nz/node/4179) (21)NS&AT7/8 4.2 [Astronomical Proportions](https://nzmaths.co.nz/node/4224) (16)NS 7/8 4.2 [Line Up](https://nzmaths.co.nz/node/4227) (20)N 7/8 4.5 [Body Mass](https://nzmaths.co.nz/node/3539) (10)N 7/8 4.6 [Accident-prone](https://nzmaths.co.nz/node/3565) (11) | Recall the number of tenths, hundredths, and one-thousandths in numbers of up to three decimal places | ***Teaching Number Knowledge (Book 4)***[Measurement and Zeros](https://nzmaths.co.nz/node/1053) (10)[Tens in Hundreds and More](https://nzmaths.co.nz/node/1082) (27) |

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| **Strategies being developed** | **Problem progression** | **References** | **Knowledge being developed** | **Resources** |
| Solve problems with rates using common whole number factors and convertion to unit rates, e.g. 490 km in 14 hours is an average speed of 35 k/h (dividing by 7 then 2).  | Washing cars, picking fruit 18 cars in 6 hours. How many in 15 hours? (18:6 as 45:15)14:21 as 20:30 as 6:956:16 as 21:6 as 7:228:12 as 49:21 as 7:327:36 as 12:16 as 3:4 | ***Teaching Fractions, Decimals and Percentages (Book7)***[Rates of Change](https://nzmaths.co.nz/node/1117) (71-75)*Figure It Out*NS 7/8 4.2 [Fair Exchanges](https://nzmaths.co.nz/node/4221) (13)NS 7/8 4.2 [Energy Levels](https://nzmaths.co.nz/node/4222) (14)N 7/8 4.3 [Cycling On…](https://nzmaths.co.nz/node/3437) (20)N 7/8 4.5 [Dreaming of Millions](https://nzmaths.co.nz/node/3538) (9)PR 3-4.1 The Caves of KoorPR 3-4.1 [Running Hot and Cold](https://nzmaths.co.nz/node/4757) (1)PR 3-4.2 [Deb the Driver](https://nzmaths.co.nz/node/4759) (2)PR 3-4.2 [Pay Rates](https://nzmaths.co.nz/node/4769) (17) | Recall what happens when a whole number or decimal is multiplied or divided by the power of 10 | ***Teaching Number Knowledge (Book 4)***[Zap](https://nzmaths.co.nz/node/1081) (26)[Digits on the Move](https://nzmaths.co.nz/node/1081) (29)***Figure It Out***N 7/8 4.2 L [Placing Points](https://nzmaths.co.nz/node/3413) (18) |
| Solve division problems that have fraction answers and express the remainder as a whole number, fraction or decimal appropriate to the problem, e.g. 19 ÷ 8 = 2r3 or 2or 2.375. | 30 ÷ 4 = 7r2 or 7or 7.517 ÷ 3 = 5r2 or 5or 5.43 ÷ 5 = 8r3 or 8or 8.6157 ÷ 10 = 15r7 or 15or 15.790 ÷ 8 = 11r2 or 11or 11.2558 ÷ 6 = 9r4 or 9or 9. | ***Teaching Number sense and Algebraic Thinking (Book 8)***[Finding Remainders](https://nzmaths.co.nz/node/1127) (31)[Applying Remainders](https://nzmaths.co.nz/node/1128) (32) |  |  |

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| Combine and partition ratios, and express the resulting ratio using fractions and percentages, e.g. Tina twice as many marbles as Ben. She has a ratio of 2 steelies to 5 milkies. Ben’s ratio is 3:4.If they combine their collections what will the ratio be? i.e. 2:5  2:5  3:4 = 7:14 = 1:2 | 5:6  7:12 = 12:18 = 2:39:4  7:6 = 16:10 = 8:52:3  12:11 = 14:14= 1:18:5  7:5 = 15:10 = 3:27:2  9:4 = 16:6 = 8:32:5  2:5  8:5 = 12:15 = 4:57:3  7:3  7:3  3:7 = 24:16 = 3:21:3  1:3  4:5  4:5  4:5 = 14:21 = 2:3 | ***Teaching Number sense and Algebraic Thinking (Book 8)***[Sharing in Ratios](https://nzmaths.co.nz/node/986) (43)[Ratios with Whole Numbers](https://nzmaths.co.nz/node/985) (42)***Figure It Out***PR 3-4.1 [The Right Mix](https://nzmaths.co.nz/node/4744) (22) | Rounds decimals to the nearest 100, 10, 1, 1/10, or 1/100e.g., rounding 5234 to nearest 100 gives 5200 | ***Teaching Number Knowledge (Book 4)***[Sensible Rounding](https://nzmaths.co.nz/node/1084) (28) |
| Find fractions between two given fractions using equivalence, conversion to decimals or percentages, and proximity to benchmark fractions,e.g. <  <,  = . | Find fractions between: and ,  and , and , and ,  and ,  and , and ,  and ,  and ,  and . | ***Teaching Fractions, Decimals and Percentages (Book7)***[Feeding Pets](https://nzmaths.co.nz/node/1023) (67-68)***Figure It Out***NS&AT 3-4.1 [Fishy Fractions](https://nzmaths.co.nz/node/4161) (16)PR 3-4.2 [Just Right](https://nzmaths.co.nz/node/4762) (8)PR 3-4.2 [Fruit Proportions](https://nzmaths.co.nz/node/4742) (20)PR 3-4.2 [Ratio Rip](https://nzmaths.co.nz/node/4764) (10)PR 3-4.2 [Laser Blazer](https://nzmaths.co.nz/node/4765) (12) | Recall fraction ⇔ decimal ⇔ percentage conversions for fractions in common use, e.g., eighths, tenths, twentieths | ***Teaching Number Knowledge (Book 4)***[Equivalent Fractions, Decimals and Percentages](https://nzmaths.co.nz/node/1073) (21)[Difficult Fractions to Percentages](https://nzmaths.co.nz/node/1074) (21)***Figure It Out***N 3-4.1 [Bottle Ups](https://nzmaths.co.nz/node/3257) (10)NS 7/8 4.2 [Pizza Pieces](https://nzmaths.co.nz/node/4226) (19)N 7/8 4.5 [Percentage Passes](https://nzmaths.co.nz/node/3551) (22) |

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| Solve measurement problems with fractions by using equivalence and reunitising the whole (one), e.g.  ÷  =  ÷  =  = 1 lots of two thirds. |  ÷  =  ÷  =  = 3 units of one quarter.÷  = ÷ =  = 1units of one half÷  = ÷ = = 1units of three quarters÷ = ÷= = 1÷  = ÷ = ÷  = ÷ == | ***Teaching Fractions, Decimals and Percentages (Book 7)***[Brmmm! Brmmm!](https://nzmaths.co.nz/node/1116) (68-71) |
| Solve percentage change problems, e.g. The house price rises from $240,000 to $270,000. The increase is  =  =  =  = 12.5% | GST of 12.5 % has been added to these prices.What are the nett prices?$81 less 12.5% is $72$108 ($96 nett), $225 ($200)$99 ($88)The house price increases. What is the percentage change?$125,000 🡪 $150,000$96,000 🡪 $168,000$495,000 🡪 $495,000$333,000 🡪 $444,000$256,000 🡪 $332,800 | ***Teaching Number sense and Algebraic Thinking (Book 8)***[Calculating Percentage Changes](https://nzmaths.co.nz/node/981) (26)[Estimating Percentages](https://nzmaths.co.nz/node/1013) (26)***Figure It Out***NS 7/8.2 [Gains and Losses](https://nzmaths.co.nz/node/4229) (21) |

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| Estimate and find percentages of whole number and decimal amounts and calculate percentages from given amountse.g. Liam gets 35 out of 56 shots in. What percentage is that? | 25% of 64 = 1680% of 45 = 3635% of 24 = 8.465% of 36 = 23.458% of 82 is about 60% of 80 = 48 (actual 47.56)77% of 38 is about 75% of 40 = 30 (actual 29.26)32 out of 48 is about 32 out of 50 = 64% (66.6%)32 out of 39 is about 32 out of 40 = 80% (82%)22 out of 29 is about 22 out of 30 which is 3× 22 = 77% (75.8%) | ***Teaching Number sense and Algebraic Thinking (Book 8)***Percentage Problems in Two Steps (27)[Percentage Increases and Decreases in One Step](https://nzmaths.co.nz/node/979) (27)[Reverse Percentage Problems](https://nzmaths.co.nz/node/978) (44)[Inflation](https://nzmaths.co.nz/node/977) (45)[50% On is Not the Same as 50% Off!](https://nzmaths.co.nz/node/975) (45)[GST Rules](https://nzmaths.co.nz/node/976) (46)***Figure It Out***N 3-4.2 [Flying Home](https://nzmaths.co.nz/node/3277) (2)N 7/8 4.3 [Purchasing Payments](https://nzmaths.co.nz/node/3428) (11)PR 3-4.2 [Fully Grown](https://nzmaths.co.nz/node/4763) (9) |
| Predict which divisions result in terminating and non-terminating decimals using prime factors | Find prime factors of 20, 16,25,28,15,40,18,36,70Find which divisions result in terminating and non terminating decimals:1 ÷ 16 = 🞏, 1 ÷ 25 = 🞏, 1 ÷ 28 = 🞏, 1 ÷ 15 = 🞏, 1 ÷ 40 = 🞏, 1 ÷ 18 = 🞏, 1 ÷ 36 = 🞏, 1 ÷ 70 = 🞏.Why do these fractions result in terminating or non-terminating decimals? = 0.2,  = 0. = 0.5,  = 0. | ***Teaching Number sense and Algebraic Thinking (Book 8)***[Recurring and Terminating Decimal Fractions](https://nzmaths.co.nz/node/1002) (38)***Figure It Out***NS&AT 3-4.2 [Non-stop Ninths](https://nzmaths.co.nz/node/4173) (12) |

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| Solve problems with inverse rates, e.g. 4 people can paint a house in 9 days. How long will 3 people take to do it?It takes 36 people days to paint the house so it will take 3 people 12 days. | Building houses:5 people take 4 days. How long will 2 people take? (10 days)4 people take 7 days. How long will 14 people take?(2 days)6 people take 6 days. How long will 8 people take?(4 days)It takes 3 hens 4 days to lay 6 eggs. How long will it take 5 hens to lay 10 eggs?(4 days)It takes 8 workers 7 days to build 1 house. How long does it 6 workers to build 3 houses? (56 days) | ***Teaching Number sense and Algebraic Thinking (Book 8)***[Comparing by Finding Rates](https://nzmaths.co.nz/node/987) (43)[Inverse Ratios](https://nzmaths.co.nz/node/984) (43)***Figure It Out***PR 3-4.2 [Balancing Act](https://nzmaths.co.nz/node/4230) (4) |
| Solve problems using trigonometry, e.g. What is the angle of take-off for an aeroplane that has a height of 670 metres above ground level after flying a total distance of 2604 metres? | ***Teaching Fractions, Decimals and Percentages (Book 7)***[Tree-mendous Measuring](https://nzmaths.co.nz/node/1118) (76-83) |  |