**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 decimals  Number 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 ratios  Number Strategies and Knowledge AO5:  Know commonly used fraction, decimal and percentage conversions  Number 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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| **Strategies being developed** | **Problem progression** | **References** | **Knowledge being developed** | **Resources** |
| 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 ÷  =  = 6  5 ÷  =  = 6  3 ÷  =  = 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) |

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

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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 = 0.96  0.72 × 8 = 5.76  0.25 × 2.4 = 0.6  15 × 0.33 = 4.95  5.6 ÷ 0.7 = 8  4.8 ÷ 1.5 = 3.2  7.2 ÷ 0.36 = 20  0.9 ÷ 0.03 = 30  24 ÷ 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) |

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

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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 6:9  56:16 as 21:6 as 7:2  28:12 as 49:21 as 7:3  27:36 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 Koor  PR 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 7.5  17 ÷ 3 = 5r2 or 5or 5.  43 ÷ 5 = 8r3 or 8or 8.6  157 ÷ 10 = 15r7 or 15or 15.7  90 ÷ 8 = 11r2 or 11or 11.25  58 ÷ 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) |  |  |

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

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| **Strategies being developed** | **Problem progression** | **References** | **Knowledge being developed** | **Resources** |
| 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 = 2:3  9:4  7:6 = 16:10 = 8:5  2:3  12:11 = 14:14= 1:1  8:5  7:5 = 15:10 = 3:2  7:2  9:4 = 16:6 = 8:3  2:5  2:5  8:5 = 12:15 = 4:5  7:3  7:3  7:3  3:7 = 24:16 = 3:2  1:3  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 1/100  e.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 amounts  e.g. Liam gets 35 out of 56 shots in. What percentage is that? | 25% of 64 = 16  80% of 45 = 36  35% of 24 = 8.4  65% of 36 = 23.4  58% 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, 16,25,28,15,40,18,36,70  Find 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) |  |