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 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 AO6: Know the relative size and place value structure of positive and negative integers and decimals to three places	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.

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 $\frac{1}{4}$ or 25 %	Mixtures with same units, e.g. litres of cordial to litres of water. 6:9 as 16:24 as 2:3 ($\frac{2}{5}$ = 40%) 8:24 as 12:36 as 1:3 ($\frac{1}{4}$ = 25%) 20:12 as 45:27 as 5:3 ($\frac{5}{8}$ = 62.5%) 9:12 as 3:4 or 15:20 ($\frac{3}{7}$ = 42.86...%) 28:35 as 4:5 ($\frac{4}{9}$ = 44.$\overline{4}$ %)	*Teaching Fractions, Decimals and Percentages (Book 7)* Introduction (53-56) Extending Hotshots (56-60) Extending Mixing Colours (61-62) *Figure It Out* PR 3-4.1 Top Shoot (24) PR 3-4.2 Flavoursome (6) PR 3-4.1 da Vinci's Ratio (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 (5) Number Fans (4) More Reading of Decimal Fractions (9) Using Calculators (14)

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Add and subtract fractions and mixed numbers with uncommon denominators, e.g. $\frac{2}{3} + \frac{3}{4} = \frac{17}{12} = 1\frac{5}{12}$	$\frac{3}{5} + \frac{2}{3} = \frac{19}{15} = 1\frac{4}{15}$ $\frac{7}{8} - \frac{5}{12} = \frac{11}{24}$ $\frac{3}{8} + \frac{5}{6} = \frac{29}{24} = 1\frac{5}{24}$ $\frac{14}{10} - \frac{3}{4} = \frac{13}{20}$ $\frac{3}{4} + \frac{3}{7} = \frac{33}{28} = 1\frac{5}{28}$ $\frac{7}{3} - \frac{7}{11} = \frac{56}{33} = 1\frac{23}{33}$	***Teaching Fractions, Decimals and Percentages (Book 7)*** Comparing Apples with Apples (65-67) ***Figure It Out*** NS&AT 3-4.1 Stripping Fractions (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 (4) Skip-counting on the Number Line (11) Lucky Dip (13)
Solve problems that involve multiplying fractions and dividing whole numbers by fractions, recognising that division can result in a larger answer, e.g. $4 \div \frac{2}{3} = \frac{12}{3} \div \frac{2}{3} = 6$	$1 \div \frac{2}{3} = \frac{3}{2} = 1\frac{1}{2}$, $\frac{2}{3} \times \frac{1}{2} = \frac{2}{6}$ $1 \div \frac{3}{4} = \frac{4}{3} = 1\frac{1}{3}$, $\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$ $1 \div \frac{3}{8} = \frac{8}{3} = 3\frac{2}{3}$, $\frac{2}{5} \times \frac{3}{5} = \frac{6}{25}$ $4 \div \frac{2}{3} = \frac{12}{2} = 6$ $5 \div \frac{3}{4} = \frac{20}{3} = 6\frac{2}{3}$ $3 \div \frac{3}{8} = \frac{24}{3} = 8$	***Teaching Number sense and Algebraic Thinking (Book 8)*** Harder Division of Fractions (22) When Small Gets Bigger (24)	Order fractions, decimals, and percentages	***Teaching Number Knowledge (Book 4)*** Packets of Lollies (8) Rocket - Where Will I Fit? (15) Bead Strings (17) Who Has More Cake? (18) Little Halves and Big Quarters (19) Who Wins? (20) Who Gets More? (20) Using Calculators (14) ***Figure It Out*** N 3-4.1 Waves Win (8) N7/8 4.3 Awesome Athletes (13) N7/8 4.5 Gentle Giants (18)

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Solve problems that involve multiplying and dividing decimals using place value estimation and conversion to known fractions, e.g. $0.4 \times 2.8 = 1.12$ ($0.4 < \frac{1}{2}$) $8.1 \div 0.3 = 27$ ($81 \div 3$ in tenths)	$3.2 \times 0.3 = 0.96$ $0.72 \times 8 = 5.76$ $0.25 \times 2.4 = 0.6$ $15 \times 0.33 = 4.95$ $5.6 \div 0.7 = 8$ $4.8 \div 1.5 = 3.2$ $7.2 \div 0.36 = 20$ $0.9 \div 0.03 = 30$ $24 \div 36 = 0.\overline{66}$	***Teaching Fractions, Decimals and Percentages (Book7)*** Folding Fractions and Decimals (63-64) ***Teaching Number sense and Algebraic Thinking (Book 8)*** Estimation in Decimal Multiplication and Division Problems (25) Multiplication of Decimal Fractions (37) ***Figure It Out*** N 3-4.2 Spring Fever (6) N 3-4.2 Ageing in Space (8) N3-4.2 Meal Deal (9) N 3-4.3 Dog's Dinner (14) NS@AT 3-4.2 Using Mates (16) NS&AT 3-4.2 Compatible Multiples (21) NS&AT7/8 4.2 Astronomical Proportions (16) NS 7/8 4.2 Line Up (20) N 7/8 4.5 Body Mass (10) N 7/8 4.6 Accident-prone (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 (10) Tens in Hundreds and More (27)

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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](#) (71-75) *Figure It Out* NS 7/8 4.2 [Fair Exchanges](#) (13) NS 7/8 4.2 [Energy Levels](#) (14) N 7/8 4.3 [Cycling On…](#) (20) N 7/8 4.5 [Dreaming of Millions](#) (9) PR 3-4.1 The Caves of Koor PR 3-4.1 [Running Hot and Cold](#) (1) PR 3-4.2 [Deb the Driver](#) (2) PR 3-4.2 [Pay Rates](#) (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](#) (26) [Digits on the Move](#) (29) ***Figure It Out*** N 7/8 4.2 L [Placing Points](#) (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. $19 \div 8 = 2r3$ or $2\frac{3}{8}$ or 2.375.	$30 \div 4 = 7r2$ or $7\frac{1}{2}$ or 7.5 $17 \div 3 = 5r2$ or $5\frac{2}{3}$ or $5.\overline{66}$ $43 \div 5 = 8r3$ or $8\frac{3}{5}$ or 8.6 $157 \div 10 = 15r7$ or $15\frac{7}{10}$ or 15.7 $90 \div 8 = 11r2$ or $11\frac{1}{4}$ or 11.25 $58 \div 6 = 9r4$ or $9\frac{2}{3}$ or $9.\overline{66}$	***Teaching Number sense and Algebraic Thinking (Book 8)*** [Finding Remainders](#) (31) [Applying Remainders](#) (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. $2:5 \oplus 2:5 \oplus 3:4 = 7:14 = 1:2$	$5:6 \oplus 7:12 = 12:18 = 2:3$ $9:4 \oplus 7:6 = 16:10 = 8:5$ $2:3 \oplus 12:11 = 14:14 = 1:1$ $8:5 \oplus 7:5 = 15:10 = 3:2$ $7:2 \oplus 9:4 = 16:6 = 8:3$ $2:5 \oplus 2:5 \oplus 8:5 = 12:15 = 4:5$ $7:3 \oplus 7:3 \oplus 7:3 \oplus 3:7 = 24:16 = 3:2$ $1:3 \oplus 1:3 \oplus 4:5 \oplus 4:5 \oplus 4:5 = 14:21 = 2:3$	***Teaching Number sense and Algebraic Thinking (Book 8)*** Sharing in Ratios (43) Ratios with Whole Numbers (42) ***Figure It Out*** PR 3-4.1 The Right Mix (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 (28)
Find fractions between two given fractions using equivalence, conversion to decimals or percentages, and proximity to benchmark fractions, e.g. $\frac{3}{5} < \frac{9\frac{1}{2}}{15} < \frac{2}{3}$, $\frac{9\frac{1}{2}}{15} = \frac{19}{30}$.	Find fractions between: $\frac{2}{5}$ and $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{3}{10}$, $\frac{3}{4}$ and $\frac{4}{5}$, $\frac{3}{5}$ and $\frac{7}{12}$, $\frac{5}{8}$ and $\frac{7}{12}$, $\frac{7}{8}$ and $\frac{9}{10}$, $\frac{5}{4}$ and $\frac{6}{5}$, $\frac{3}{7}$ and $\frac{4}{9}$, $\frac{8}{9}$ and $\frac{9}{10}$, $\frac{3}{4}$ and $\frac{7}{11}$.	***Teaching Fractions, Decimals and Percentages (Book7)*** Feeding Pets (67-68) ***Figure It Out*** NS&AT 3-4.1 Fishy Fractions (16) PR 3-4.2 Just Right (8) PR 3-4.2 Fruit Proportions (20) PR 3-4.2 Ratio Rip (10) PR 3-4.2 Laser Blazer (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 (21) Difficult Fractions to Percentages (21) ***Figure It Out*** N 3-4.1 Bottle Ups (10) NS 7/8 4.2 Pizza Pieces (19) N 7/8 4.5 Percentage Passes (22)

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Solve measurement problems with fractions by using equivalence and reunitising the whole (one), e.g. $\frac{3}{4} \div \frac{2}{3} = \frac{9}{12} \div \frac{8}{12} = \frac{9}{8} = 1\frac{1}{8}$ lots of two thirds.	$\frac{7}{8} \div \frac{1}{4} = \frac{7}{8} \div \frac{2}{8} = \frac{7}{2} = 3\frac{1}{2}$ units of one quarter. $\frac{4}{5} \div \frac{1}{2} = \frac{8}{10} \div \frac{5}{10} = \frac{8}{5} = 1\frac{3}{5}$ units of one half $\frac{9}{10} \div \frac{3}{4} = \frac{18}{20} \div \frac{15}{20} = \frac{18}{15} = 1\frac{1}{5}$ units of three quarters $\frac{7}{8} \div \frac{2}{3} = \frac{21}{24} \div \frac{16}{24} = \frac{21}{16} = 1\frac{5}{16}$ $\frac{1}{4} \div \frac{2}{5} = \frac{5}{20} \div \frac{8}{20} = \frac{5}{8}$ $\frac{3}{10} \div \frac{3}{4} = \frac{6}{20} \div \frac{15}{20} = \frac{6}{15} = \frac{2}{5}$	***Teaching Fractions, Decimals and Percentages (Book 7)*** [Brmmm! Brmmm!](#) (68-71)
Solve percentage change problems, e.g. The house price rises from \$240,000 to \$270,000. The increase is $\frac{\$270,000-\$240,000}{\$240,000} =$ $\frac{\$30,000}{\$240,000} = \frac{1}{8} = \frac{12\frac{1}{2}}{100} = 12.5\%$	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](#) (26) [Estimating Percentages](#) (26) ***Figure It Out*** NS 7/8.2 [Gains and Losses](#) (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 $3\frac{1}{3} \times 22$ = 77% (75.8%)	*Teaching Number sense and Algebraic Thinking (Book 8)* Percentage Problems in Two Steps (27) Percentage Increases and Decreases in One Step (27) Reverse Percentage Problems (44) Inflation (45) 50% On is Not the Same as 50% Off! (45) GST Rules (46) *Figure It Out* N 3-4.2 Flying Home (2) N 7/8 4.3 Purchasing Payments (11) PR 3-4.2 Fully Grown (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? $\frac{3}{15}$ = 0.2, $\frac{5}{15}$ = 0.$\overline{33}$ $\frac{9}{18}$ = 0.5, $\frac{2}{18}$ = 0.$\overline{11}$	*Teaching Number sense and Algebraic Thinking (Book 8)* Recurring and Terminating Decimal Fractions (38) *Figure It Out* NS&AT 3-4.2 Non-stop Ninths (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? ($4\frac{1}{2}$ 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 (43) Inverse Ratios (43) ***Figure It Out*** PR 3-4.2 Balancing Act (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 (76-83)	