DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES

Number: Decimals and Percentages

Level 3 (Year 5 - 6)

Teacher Booklet

Level 3/Year 5-6: Number: Decimals and Percentages

Task 1	What percentage of your one whole container is filled with water? Be ready to explain and justify how you know.
Big ideas	A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line.
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA4-3:** Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals. **NA4-5:** Know the equivalent decimal and percentage forms for everyday fractions.
Learning Outcomes: Students will be able to:	• Explain and justify the comparison of a part to the whole. • Represent reasoning using different forms of notation, including words.
Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent
Sharing back/Connect	Select students to share after each estimation who are able to explain and justify the numerical value that they have agreed on using their fingers to show numerical splitting and fraction or percent terms. **Connect:** If you have one glass of water 25% full. How much more water do you need to make it 100% full? What about 10%? 76%? 99%? 10%? 1%? When you add the water to make the glass 100% full have you made more than one whole glass of water? Why or why not?
Teacher Notes	• This can be done as either a whole class activity or half class activity. • Have available a range of different size transparent containers which can hold water. Fill the containers with a range of water levels and place one container between groups of four students. Ask students to discuss and agree on a numerical value from one to hundred to estimate percent 'fullness' of the container. Tell them that they must be able to explain and justify their estimate. Repeat the

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	activity a number of times using different levels of water and giving the students different shape and size containers • Facilitate the students to think of other names they could call the percent fullness. Have them notice that we are always talking about one whole and part of a whole whether we are using fractions, decimals or percentages. For example, 50% of the one whole bottle. Encourage students to co-ordinate their intuitive understandings of percent with strategies for operating on numbers 1-100 (*Strategies such as numerical halving using fingers to represent on the container 100, 50, 25, and composition 100=75+25)* • Monitor for students using vocabulary within the language of rational number…half full, or fifty per cent and that we are always talking about out of one hundred. • Notice the use of numerical splitting  used by students to explain and justify the value they have put on the fullness of the container. • Teacher to record in symbols the fractional language students use as they explain. When a half or a quarter or other fractions are used have students re-explain using percent and record as equivalent rational numbers.
Independent Tasks	1. Georgia has a bag of 12 jellybeans that she shares with her friends. She gives 25% to one friend and 50% to another and she keeps the rest? How many of her jellybeans do each of her friends have and how many does she have? 2. Georgia has a bag of 20 jellybeans that she shares with her friends. She gives 30% to one friend and 20% to another and she keeps the rest? How many of her jellybeans do each of her friends have and how many does she have? 3. Georgia has a bag of 60 jellybeans that she shares with her friends. She gives 35% to one friend and 25% to another and she keeps the rest? How many of her jellybeans do each of her friends have and how many does she have?

	4. Georgia has a bag of 60 jellybeans that she shares with her friends. She gives 10% to one friend and 60% to another and she keeps the rest? How many of her jellybeans do each of her friends have and how many does she have? 5. Georgia has a bag of 100 jellybeans that she shares with her friends. She gives 40% to one friend and 30% to another and she keeps the rest? How many of her jellybeans do each of her friends have and how many does she have? 6. Georgia has a bag of 60 jellybeans that she shares with her friends. She gives 15% to one friend and 70% to another and she keeps the rest? How many of her jellybeans do each of her friends have and how many does she have?
Anticipations	

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Task 2	What percentage have you downloaded of that app? How much more would you need to download to complete it? Record using a range of different representations including symbols and be ready to explain and justify how they are equivalent.
Big ideas	A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line.
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA4-3:** Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals. **NA4-5:** Know the equivalent decimal and percentage forms for everyday fractions.
Learning Outcomes: Students will be able to:	• Explain and justify the comparison of a part to the whole. • Represent reasoning to explain and justify equivalence using different forms of notation, including symbols and words.
Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent
Sharing back/Connect	Select students to share after each estimation who can explain and justify the numerical value that they have agreed on using an informal measure and have represented their estimation in multiple ways. **Connect:** What is the fraction, percentage, or decimal equivalences for: 50%, 25%, $\frac{1}{2}$, 33%, .99, .11, .54, .1, .5, .7? What pattern can you notice?
Teacher Notes	• Have a long and unmarked tape on the floor of the classroom to represent the download bar used on a cell phone when downloading an app. Use a white board marker to mark a point on the tape which indicates the level of download reached. Repeat the activity many times always ensuring that the mark on the line is above 10%. • Facilitate the students to notice that when talking about percentages and decimals we are always talking about one whole and that we use tenths and hundredths when we represent percentages and decimals as fractions. Numbers

	are grouped into multiples of powers of tens (tens, hundreds, thousands, tenths, hundredths, thousandths, and so on. • Expect students to represent using a range of different representations including justifying using percent, decimals, fractions and pictures of water bottles, chocolate bars, lines. If the students do not use decimals re-represent the measure as equivalent decimals and fractions.
Independent Tasks	1. Daniel has a 750ml pump bottle. By playtime he has drunk 15% of the bottle. How many ml of water are left in his bottle? 2. Sunny take a 12L container with water on his camping trip. By the end of the first day of camp he has used 25% of the water in the container. How much water has he used (ml/l) how much water is left in the container (ml/l)? 3. Jo eats 40% of her chocolate bar and gives the rest to her sister. Her sister shares the left-over chocolate between herself and a friend. How much of the chocolate bar do they each eat? 4. The cross-country track is 3km long. Jan runs 65% of the distance before stopping to catch her breath. Max runs $\frac{3}{4}$ of the distance before stopping to catch his breath. How far did each of them run before stopping to catch their breath? Who ran the longest distance before stopping?
Anticipations	

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Task 3	You are running the cross country and this tape represents the track you run. If I put the 2-digit card down at the start of it that indicates so far you have run 2 metres and the 3-digit card indicates that you have not reached 3 metres yet. How far have you run exactly? How far have you run now? Record using a range of different representations including symbols and be ready to explain and justify how they are equivalent.
Big ideas	A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line.
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA4-3:** Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions and decimals. **NA4-5:** Know the equivalent decimal and percentage forms for everyday fractions.
Learning Outcomes: Students will be able to:	• Explain and justify the comparison of a part to the whole. • Represent and explain reasoning using corresponding points on a number line. • Represent reasoning to explain and justify equivalence using different forms of notation, including symbols and words.
Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent
Sharing back/Connect	Select students to share after each estimation who can explain and justify the numerical value that they have agreed on and have represented their estimation in multiple ways. **Connect:** What are the fraction and decimal equivalence for these numbers: 10%, 1%, 5%, 9%, 103%, 901%, 209%

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	If you were showing these to a younger child, what do you think would puzzle them? What would you say in response?
Teacher Notes	• During the launch, revisit equivalent numbers for fractions and decimals. • Have available and use the long-unmarked tape on the floor of the classroom to represent a running track used in athletics and digit cards to represent whole numbers. Use a white board marker to mark a point on the tape which indicates where they have reached on the running track between numbers. Repeat the activity two times with a focus on numbers between numbers. The third time put down the 0-digit card at the start and the 1-digit card at the end. Mark on the line a place around 5%. Repeat a number of times always putting the mark below 10%. • Facilitate the students to notice that there are numbers between numbers and that includes between 0 and .1. Ensure extensive discussion including student explanation and justification of why for example 1% is recorded as $\frac{1}{100}$ and .01 and expect students to experience cognitive conflict related to numbers below .1. • Expect students to explain and represent using a range of different representations to justify why for example 5% = .05 =$\frac{5}{100}$. These should include water containers, chocolate bars and lines but may include a place value chart. Notice students who voice cognitive conflict about why numbers under 10% are represented as hundredths and recorded to three decimal places with a zero to represent the tenths.
Independent Tasks	What are their equivalent fractional numbers? 1. 50% = = 2. ¼ = = 3. .1 = = 4. $\frac{3}{4}$ = = 5. 90% = = 6. .25 = = 7. Two-thirds = = 8. $\frac{1}{5}$ = = 9. 60% = = 10. Three-fifths = =

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Anticipations	

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Task 4	Samson and Mat were having a jump-off in the sandpit to see where they could jump to if they stood with their toes just before the edge. Jeremiah measured each jump and he said that Samson won because although they both jumped 1.36 metres and neither of them reached 1.37 metres Samson jumped further. Can you record at least 12 different distances for his jump which shows Samson did jump further. Be ready to explain and justify your answers using number lines, diagrams, drawings, fractions, and decimals.
Big ideas	A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line. A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. Benchmark fractions like $\frac{1}{2}$ (0.5) and $\frac{1}{4}$ (0.25) can be used to estimate calculations involving fractions and decimals. If two quantities vary proportionally, the quantities are either directly related (as one increases the other increases) or inversely related (as one increases the other decreases).
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA3-6:** Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality. **NA4-2:** Understand addition and subtraction of fractions, decimals and integers. **NA4-3:** Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions and decimals. **NA4-4:** Apply simple linear proportions, including ordering fractions. **NA4-5:** Know the equivalent decimal and percentage forms for everyday fractions. **NA4-6:** Know the relative size and place value structure of positive and negative integers and decimals to three places.
Learning Outcomes: Students will be able to:	• Explain and justify the comparison of a part to the whole. • Represent and explain reasoning using corresponding points on a number line.

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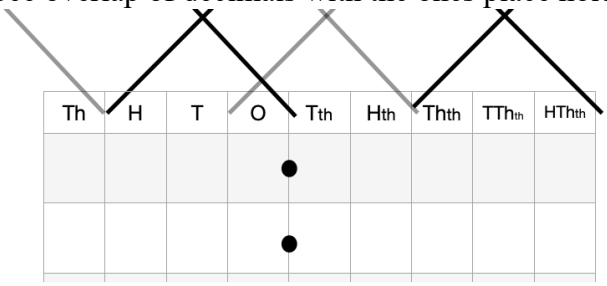
	• Represent reasoning to explain and justify equivalence using different forms of notation, including symbols and words.
Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent
Sharing back/Connect	Select students to share who have given a range of explanations which cause need for wide student discussion and justification including the use of the place value houses to support reasoning. **Connect:** What are some numbers between: 5 and 6? 1.12 and 1.13? .03 and .04? What do you notice? Can you make a conjecture about numbers between numbers?
Teacher Notes	• During the launch revisit equivalences between fractions and decimals to two decimal places • Have place value houses (which include decimal places) displayed on the wall but do not direct students' attention to it until the sharing back. See overlap of decimals with the ones place holder below  • Explore the notion that places to the left of the decimal point are powers of ten. $10 = 10^1$ $100 = 10^2$ • The place values to the right of the decimal place are also powers of ten: $.1 = 10^{-1}$ $.01 = 10^{-2}$ $.001 = 10^{-3}$ • When numbers are written with decimal notation, the relationship between the places to the right of the decimal point is the same as the relationship between the left of the decimal point-each place has a value that is ten times that of the place to its right. • Facilitate the students to notice that you are always talking about a fraction or decimal of one whole and therefore in the place value houses the decimal dot does not separate the ones house from the tenths but rather overlaps across it.

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	• Notice students who recognise that there are infinite numbers between numbers. • Expect students to represent using symbols and in the end to the place in the place value houses.
Independent Tasks	What are the fraction, percentage, or decimal equivalences for the following? 1. 50% 2. 5% 3. $\frac{1}{2}$ 4. 33% 5. .99 6. .11 7. .54 8. .1 9. .5 10. .7
Anticipations	

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Task 5	In a gymnastic competition Gracie scored 9.32 on the bar in her first round. She scored 8.964 in the second round, and she scored 9.72 in the third round. What was her total score? Can you explain and justify what her score was in more than one way?
Big ideas	A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line. A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. Benchmark fractions like $\frac{1}{2}$ (0.5) and $\frac{1}{4}$ (0.25) can be used to estimate calculations involving fractions and decimals. If two quantities vary proportionally, the quantities are either directly related (as one increases the other increases) or inversely related (as one increases the other decreases). The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers.
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA3-6:** Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality. **NA4-2:** Understand addition and subtraction of fractions, decimals and integers. **NA4-3:** Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions and decimals. **NA4-4:** Apply simple linear proportions, including ordering fractions. **NA4-5:** Know the equivalent decimal and percentage forms for everyday fractions. **NA4-6:** Know the relative size and place value structure of positive and negative integers and decimals to three places.
Learning Outcomes: Students will be able to:	• Solve problems involving decimal by adding or subtracting and explain and justify the solution. • Represent reasoning to explain and justify place value involving decimal numbers.
Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

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Sharing back/Connect	Select students to share who have used a numberline to represent their reasoning and combined these in groupings of ten and can explain and justify why they used numbers in groupings of ten. **Connect:** Represent these on a numberline .9 + .1 = 1 .09 + .01 = .1 .009 + .001 = .01 What patterns do you notice? Be prepared to explain and justify the pattern you notice using the place value house.
Teacher Notes	• During the launch, revisit the use of a numberline to add whole numbers. Use numbers which combine to make the next 10, 100, and 1000. Explore with the students how they can relate these to place value of whole numbers. • Have a place value house for whole and decimal numbers on the wall. • Facilitate the students to notice that when recombining decimals to make the next hundredth, tenth or one that the shift in the place value chart is from right to left the same as when adding whole numbers. • Notice students who use recombining the decimal numbers in groupings of ten. • Expect students to represent their reasoning using informal notation across the page and on a numberline and **not using a formal algorithm where the line up the numbers after the decimal dot.**
Independent Tasks	Rosa had to do some homework. She had to put some decimal numbers in order from largest to smallest and this is what she did: .90146 .9015 .9 .4405 .321 .4 .450000 .45100 .510 .52 You need to put them in the right order to help her out and then write her an explanation of why you needed to change the order she had them in. Explain the rules you were using to order each row.
Anticipations	

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Task 6	Quantum is training for the school cross country race. She aims to be able to run 20 km without stopping across five days in a week. On Monday she runs 2.03km. On Tuesday she runs 3.9km. On Wednesday she runs 4.111. On Thursday she runs 4.0002km. On Friday she runs 4.2. Has she reached her target of running 20km over the five days?
Big ideas	A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line. A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. Benchmark fractions like $\frac{1}{2}$ (0.5) and $\frac{1}{4}$ (0.25) can be used to estimate calculations involving fractions and decimals. If two quantities vary proportionally, the quantities are either directly related (as one increases the other increases) or inversely related (as one increases the other decreases). The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers.
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA3-6:** Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality. **NA4-2:** Understand addition and subtraction of fractions, decimals and integers. **NA4-3:** Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions and decimals. **NA4-4:** Apply simple linear proportions, including ordering fractions. **NA4-5:** Know the equivalent decimal and percentage forms for everyday fractions. **NA4-6:** Know the relative size and place value structure of positive and negative integers and decimals to three places.
Learning Outcomes: Students will be able to:	• Solve additive problems involving numbers beyond three decimal places and explain and justify the solutions. • Represent reasoning to explain and justify place value involving numbers beyond three decimal places.

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Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent
Sharing back/Connect	Select students to share who have used a numberline to represent their reasoning and combined these in groupings of ten and can explain and justify why they used numbers in groupings of ten. **Connect**: .3 + .03 =? .3 + .0303 = ? How would you explain your solution to a younger child using place value?
Teacher Notes	• During the launch, explore with the students the different decimal and whole numbers, and their place in the place value house. Discuss their face, place and total value. • Have a place value house on the wall. • Facilitate the students to notice the need to consider the place value of the number they are working with and the way in which they regroup in tens. • Expect students to represent using both addition across the page and numberlines. If they use a formal algorithm press them to connect it to the combinations used informally.
Independent Tasks	Daisy had to do some homework. She had to put some decimal numbers in order from largest to smallest and this is what she did: .077 .7070 .12 .3905 .3090 .3 .260000 .207 .102 .3099 You need to put them in the right order to help her out and then write her an explanation of why you needed to change the order she had them in. Explain the rules you were using to order each row.
Anticipations	

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Task 7	Mereana has a rope which is 4.05 metres long. She uses 2.056 metres to make a skipping rope for herself. She wants to make another one for her little sister. How much rope does she have left for her little sister's skipping rope?
Big ideas	A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line. A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. Benchmark fractions like $\frac{1}{2}$ (0.5) and $\frac{1}{4}$ (0.25) can be used to estimate calculations involving fractions and decimals. If two quantities vary proportionally, the quantities are either directly related (as one increases the other increases) or inversely related (as one increases the other decreases). The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers.
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA3-6:** Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality. **NA4-2:** Understand addition and subtraction of fractions, decimals and integers. **NA4-3:** Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions and decimals. **NA4-4:** Apply simple linear proportions, including ordering fractions. **NA4-5:** Know the equivalent decimal and percentage forms for everyday fractions. **NA4-6:** Know the relative size and place value structure of positive and negative integers and decimals to three places.
Learning Outcomes: Students will be able to:	• Solve problems involving decimal by adding or subtracting and explain and justify the solution. • Represent reasoning to explain and justify place value involving decimal numbers.
Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent
Sharing back/Connect	Select students to share who can explain and justify their solutions drawing on a range of representations and using place value to justify what they did.

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	Connect: What pattern can you see? .1 - .01 .1 - .001 .1 - .0001 Be ready to explain and justify the pattern you see using place value.
Teacher Notes	• During the launch, continue to explore the face, place, and total value of whole and decimal numbers. • Facilitate the students to notice that when subtracting using decimals they need to be recombined to make the next hundredth, tenth or one and that the shift in the place value chart is from right to left the same as when adding whole numbers. • Notice students who use recombining the decimal numbers in groupings of ten. • Expect students to represent their reasoning using informal notation across the page and on a numberline and **not using a formal algorithm where they line up the numbers after the decimal dot.**
Independent Tasks	Represent these on a numberline .9 + .1 = 1 .09 + .01 = .1 .009 + .001 = .01 What patterns do you notice? Represent your reasoning to explain and justify the pattern you notice using the place value house.
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Task 8	Jonah has handed in his homework and is puzzled about why the teacher has marked his answer wrong. This is what he had done. 1.4 + 1.8 = 2.12 Can you explain what he was thinking and why he got the answer wrong? What is the correct answer and how would you explain why? Rebekah subtracted $1.15 from $1.65 on her calculator. The answer she got was .5. She is puzzled about that because she is sure that she should have more than 5 cents. Can you explain what she is thinking and why?
Big ideas	A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line. A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. Benchmark fractions like $\frac{1}{2}$ (0.5) and $\frac{1}{4}$ (0.25) can be used to estimate calculations involving fractions and decimals. If two quantities vary proportionally, the quantities are either directly related (as one increases the other increases) or inversely related (as one increases the other decreases). The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers.
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Learning Outcomes: Students will be able to:	• Solve problems involving decimal by adding or subtracting and explain and justify the solution.

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	• Represent reasoning to explain and justify place value involving decimal numbers. • Explain and justify reasoning using notation, symbols, and words.
Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent
Sharing back/Connect	Select students to share who can recognise that the two students have used whole number thinking and can explain their reasoning using place value for decimals. **Connect:** True or false? Be ready to use place value to justify your reasoning. 3.15 + 3.15 = 3.3 1.9 + 1. 9 = 1.18 1.09 + 1.009 = 2. 099
Teacher Notes	• Facilitate the students to notice that when adding using decimals they need to be recombined and the shift in the place value chart is the same as when adding whole numbers. • Monitor for students using vocabulary ten**th,** hundred**th** • Notice students who use place value to explain and justify their reasoning
Independent Tasks	Solve the following: .5 + .05 = .5 + .505 = .3 + .03 = .3 + .0303 = .7 + .07 = .7 + 0.707 = Write a statement to explain your solution to a younger child using place value.
Anticipations	

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Task 9	Viliami is going on a holiday to Australia. Different family members give him money to spend, and he has some money saved up. The exchange rate is $1 New Zealand for $.8544 Australian. First his uncle gives him NZ$10. How much Australian money will he get in exchange? Then his aunty gives him NZ$100. How much Australian money will he get in exchange? He has saved NZ$85. How much Australian money will he get in exchange? How much in Australian dollars does he have altogether?
Big ideas	A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line. A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. Different real-world interpretations can be associated with the product of a whole number and fraction (decimal), a fraction (decimal) and whole number, and a fraction and fraction (decimal and decimal). Different real-world interpretations can be associated with division calculations involving fractions (decimals). The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Division with a decimal divisor is changed to an equivalent calculation with a whole number divisor by multiplying the divisor and dividend by an appropriate power of ten. Benchmark fractions like $\frac{1}{2}$ (0.5) and $\frac{1}{4}$ (0.25) can be used to estimate calculations involving fractions and decimals.
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA3-6:** Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality. **NA4-2:** Understand addition and subtraction of fractions, decimals and integers. **NA4-3:** Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions and decimals. **NA4-4:** Apply simple linear proportions, including ordering fractions. **NA4-5:** Know the equivalent decimal and percentage forms for everyday fractions.

Level 3/Year 5-6: Number: Decimals and Percentages

	NA4-6: Know the relative size and place value structure of positive and negative integers and decimals to three places.
Learning Outcomes: Students will be able to:	• Explain and justify the comparison of a part to the whole. • Represent reasoning using different forms of notation, including symbols and words. • Solve problems involving decimal numbers by multiplying and explain and justify the solution. • Represent reasoning to explain and justify place value involving decimal numbers.
Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent, ratio
Sharing back/Connect	Select students to share who are able to explain and justify their reasoning using groupings (powers) of tens and hundreds. **Connect:** As you solve these, think about their place on the place value chart. 6 x 1 = 6 x 10 = 6 x 100 = .6 x 1 = .6 x 10 = .6 x 100 = Can you identify and explain the pattern you notice in the shifts in place value?
Teacher Notes	• Facilitate the students to notice that when multiplying decimals you are using powers of ten • Expect students to represent using place value and symbols
Independent Tasks	True or false? 3.15 + 3.15 = 3.3 1.9 + 1. 9 = 1.18 1.09 + 1.009 = 2. 099 Use place value to represent and justify your reasoning.
Anticipations	

Level 3/Year 5-6: Number: Decimals and Percentages

Task 10	Mohammed is copying a mosaic tile from a picture of the inside of a beautiful mosque in Abu Dhabi. Each tile is 1.25cm in width and 6.8cm in length. What is the area of the tile he is copying?
Big ideas	A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line. A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. Different real-world interpretations can be associated with the product of a whole number and fraction (decimal), a fraction (decimal) and whole number, and a fraction and fraction (decimal and decimal). Different real-world interpretations can be associated with division calculations involving fractions (decimals). The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Division with a decimal divisor is changed to an equivalent calculation with a whole number divisor by multiplying the divisor and dividend by an appropriate power of ten. Benchmark fractions like $\frac{1}{2}$ (0.5) and $\frac{1}{4}$ (0.25) can be used to estimate calculations involving fractions and decimals.
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA3-6:** Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality. **NA4-2:** Understand addition and subtraction of fractions, decimals and integers. **NA4-3:** Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions and decimals. **NA4-4:** Apply simple linear proportions, including ordering fractions. **NA4-5:** Know the equivalent decimal and percentage forms for everyday fractions. **NA4-6:** Know the relative size and place value structure of positive and negative integers and decimals to three places.
Learning Outcomes: Students will be able to:	• Solve area problems involving decimal numbers by multiplying and explain and justify the solution. • Represent reasoning using notation to explain and justify place value involving decimal numbers.

Level 3/Year 5-6: Number: Decimals and Percentages

Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent
Sharing back/Connect	Select students to share who are able to explain and justify their reasoning using a range of representations including place value and notation **Connect:** As you solve these, think about their place on the place value chart. .6 x .1 = .6 x .01 = .6 x .001 Can you identify and explain the pattern you notice in the shifts in place value?
Teacher Notes	• During the launch, explore the place value related to multiplication and division of whole numbers, and fractional numbers • Facilitate the students to notice that when multiplying a rational number by a rational number in contrast to multiplying whole numbers by whole numbers the product gets small rather than bigger.
Independent Tasks	Write these as decimals: • 7 and $\frac{5}{10}$ • 6 and $\frac{9}{10}$ • 11 and $\frac{1}{10}$ • 2 and $\frac{57}{100}$ • 7 and $\frac{33}{100}$ What is the tenths digit in these? • 9.12 • 0.02 • 7.81 • 0.301 Which 6 has the biggest value in 0.066? Represent your reasoning to explain your ideas. How many thousandths are there altogether in 0.087?
Anticipations	

Level 3/Year 5-6: Number: Decimals and Percentages

Task 11 (optional)	Ben and Mattie are having a book reading competition. They want to know who reads more pages in 10 hours. Ben reads 10.5 pages in 15 minutes. Mattie reads 8.75 pages in 10 minutes. Who is the winner?
Big ideas	A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line. A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. Different real-world interpretations can be associated with the product of a whole number and fraction (decimal), a fraction (decimal) and whole number, and a fraction and fraction (decimal and decimal). Different real-world interpretations can be associated with division calculations involving fractions (decimals). The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Division with a decimal divisor is changed to an equivalent calculation with a whole number divisor by multiplying the divisor and dividend by an appropriate power of ten. Benchmark fractions like $\frac{1}{2}$ (0.5) and $\frac{1}{4}$ (0.25) can be used to estimate calculations involving fractions and decimals. A ratio is a multiplicative comparison of quantities; there are different types of comparisons that can be represented as ratios. Ratios give the relative sizes of the quantities being compared, not necessarily the actual sizes. Ratios can be expressed as units by finding an equivalent ratio where the second term is one.
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA3-6:** Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality. **NA4-2:** Understand addition and subtraction of fractions, decimals and integers. **NA4-3:** Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions and decimals. **NA4-4:** Apply simple linear proportions, including ordering fractions.

Level 3/Year 5-6: Number: Decimals and Percentages

	NA4-5: Know the equivalent decimal and percentage forms for everyday fractions. **NA4-6:** Know the relative size and place value structure of positive and negative integers and decimals to three places.
Learning Outcomes: Students will be able to:	• Solve problems involving decimal numbers by multiplying and explain and justify the solution. • Represent reasoning using notation, symbols, and words to explain and justify place value involving decimal numbers.
Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent
Sharing back/Connect	Select students to share who are able to explain and justify their reasoning using a range of ways to represent their reasoning. **Connect:** Write each of these as a single decimal number • $\frac{5}{10} + \frac{6}{100}$ • $\frac{1}{100} + \frac{1}{10}$ • $\frac{8}{1000} + \frac{6}{100}$ • $\frac{6}{10} + \frac{2}{100} + \frac{9}{1000}$ What do you notice?
Teacher Notes	• Facilitate the students to notice the need to keep a balance of both sides in a clear representation. • Notice students who use informal reasoning before formal reasoning. • Expect students to represent using a systematic way of recording their reasoning as ratios.
Independent Tasks	As you solve these, think about their place on the place value chart. 8 x 1 = 8 x 10 = 8 x 100 = .8 x 1 = .8 x 10 = .8 x 100 = Identify, record, and explain the pattern you notice in the shifts in place value?
Anticipations	

Level 3/Year 5-6: Number: Decimals and Percentages

Task 12 (optional)	Where does the decimal go? Before you compute an answer put in the decimal and write and explanation of why you put it where it is. 0.24 x 6.3 24 x 0.63 2.4 x 63 0.24 x 0.63 Now check your answers with computation. If there are differences be ready to share why.
Big ideas	A decimal is another name for a fraction and thus can be associated with the corresponding point on the number line. A percent is another way to write a decimal that compares part to a whole where the whole is 100 and thus can be associated with the corresponding point on the number line. Percent is relative to the size of the whole. A percent is a special type of ratio where a part is compared to a whole and the whole is 100. Different real-world interpretations can be associated with the product of a whole number and fraction (decimal), a fraction (decimal) and whole number, and a fraction and fraction (decimal and decimal). Different real-world interpretations can be associated with division calculations involving fractions (decimals). The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Division with a decimal divisor is changed to an equivalent calculation with a whole number divisor by multiplying the divisor and dividend by an appropriate power of ten. Benchmark fractions like $\frac{1}{2}$ (0.5) and $\frac{1}{4}$ (0.25) can be used to estimate calculations involving fractions and decimals. A ratio is a multiplicative comparison of quantities; there are different types of comparisons that can be represented as ratios. Ratios give the relative sizes of the quantities being compared, not necessarily the actual sizes. Ratios can be expressed as units by finding an equivalent ratio where the second term is one.
Curriculum links	**NA3-1:** Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. **NA3-4:** Know how many tenths, tens, hundreds, and thousands are in whole numbers. **NA3-5:** Know fractions and percentages in everyday use. **NA3-6:** Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality. **NA4-2:** Understand addition and subtraction of fractions, decimals and integers.

Level 3/Year 5-6: Number: Decimals and Percentages

	NA4-3: Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions and decimals. **NA4-4:** Apply simple linear proportions, including ordering fractions. **NA4-5:** Know the equivalent decimal and percentage forms for everyday fractions. **NA4-6:** Know the relative size and place value structure of positive and negative integers and decimals to three places.
Learning Outcomes: Students will be able to:	• Solve problems involving decimal numbers by multiplying and explain and justify the solution. • Represent reasoning using notation, symbols, and words to explain and justify place value involving decimal numbers.
Mathematical language	Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent
Sharing back/Connect	Select students to share who are able to explain and justify their reasoning using a range of ways to represent their reasoning. **Connect:** Use your fractional equivalent to solve these. .5 x .25 .1 x .25 .4 x .5 What pattern can you see? Can you make a conjecture about what you discovered?
Teacher Notes	• Facilitate the students to notice that sometimes it is quicker and easier to use fractional equivalents to multiply with.
Independent Tasks	Which of these is not the same as 0.67? • $\frac{6}{100}+\frac{7}{100}$ • $\frac{6}{10}+\frac{7}{100}$ • 67 hundredths • 6 tenths and 7 hundredths Represent your reasoning to explain and justify your ideas. OR Select one or more of the following assessment tasks (attached at the end of the document) as the independent activity: • N10A: Ordering decimals, fractions, and percentages from smallest to biggest. • NR7:Decimals. • NR9: Fractions, Decimals, Percentages.

Level 3/Year 5-6: Number: Decimals and Percentages

Anticipations	

DMIC

DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER – FRACTIONS/PROPORTION, RATIOS & DECIMALS: LEVEL 3
Task 10A

Put these decimals, fractions, and percentages in order from smallest to biggest.

$\frac{24}{48}$ 0.781 0.9 $\frac{1}{4}$ 80% 0.009 25%

Explain and show how you know this.

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DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER – FRACTIONS/PROPORTION, RATIOS & DECIMALS: LEVEL 3 - 4
Task NR7

Give 12 examples of different sized decimal numbers. Put them in order from smallest to largest. Prove that they are in the correct order by using three different representations.

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DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER – FRACTIONS/PROPORTION, RATIOS & DECIMALS: LEVEL 3 - 5
TASK NR9

Write some word problems for a friend involving any of the operations (addition, subtraction, multiplication, division) using fractions, decimals, or percentages. Show how you would solve the problems.