RICH MATHEMATICAL TASK BOOKLET

NUMBER Decimals, Percentages

YEAR 5-6 EVEN YEARS

Teacher Booklet

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Task 1

What percentage of your one whole container is filled with water? Be ready to explain and justify how you know.

Teacher Notes

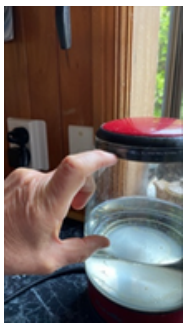
This can be done as either a whole class activity or half class activity.

Have available a range of different size bottle which can hold water. Have the students fill the bottles with a range of water levels. 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 discussion a number of times using different levels of water to estimate the percentage.

Facilitate the students to think of other names they could call the percent fullness. Ensure that they 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. Use these to show other students how to measure if they are not using this strategy.



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.

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

During Year 5

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write and represent tenths and hundredths as fractions and decimals

Divide whole numbers by 10 and 100 to make decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write, and represent fractions, decimals (to two places), and percentages, and convert decimals and percentages to fraction

Shareback

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?

Suggested Learning Outcomes

Explain and justify the comparison of a part to the whole.

Represent reasoning using different forms of notation, including words.

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?

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

Independent Tasks

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

Solutions, Misconceptions

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.

Teacher Notes

Have a long and unmarked tape on the floor of the classroom to represent the way in the bar on a computer represents how much of a computer game has been downloaded. 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.

Shareback

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%, 33%, $\frac{1}{2}$, 0.99, 0.11, 0.54, 0.1, 0.5, 0.7?
What pattern can you notice?

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

During Year 5

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write and represent tenths and hundredths as fractions and decimals

Divide whole numbers by 10 and 100 to make decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write, and represent fractions, decimals (to two places), and percentages, and convert decimals and percentages to fraction

Suggested Learning Outcomes

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

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

Solutions, Misconceptions

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.

Teacher Notes

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 bottles, 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.

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

During Year 5

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write and represent tenths and hundredths as fractions and decimals

Divide whole numbers by 10 and 100 to make decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write, and represent fractions, decimals (to two places), and percentages, and convert decimals and percentages to fraction

Shareback

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%
If you were showing these to a younger child, what do you think would puzzle them? What would you say in response?

Suggested Learning Outcomes

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.

Independent Tasks

What are their equivalent fractional numbers?

1. 50% = =
2. $\frac{1}{4}$ =
3. 0.1 = =
4. $\frac{3}{4}$ =
5. 90% = =
6. .25 = =
7. Two-thirds = =
8. $\frac{1}{5}$ =
9. 60% = =
10. Three-fifths = =

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

Anticipations

Solutions, Misconceptions

Task 4

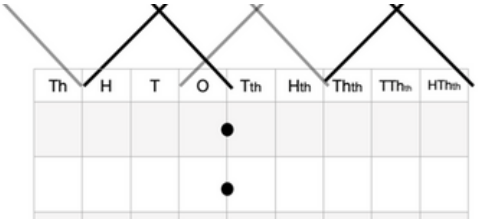
Samson and Mat were having a jump-off in the sandpit to see where they could jump to if they stood with their toes just before the edge. Jeremiah measured each jump and he said that Samson won because although they both jumped 1.36 metres and neither of them reached 1.37 metres Samson jumped further.

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.

Teacher Notes

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.

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.

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).

Shareback

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?

Suggested Learning Outcomes

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.

Independent Tasks

What numbers can you record between:

1. 50%
2. 5%
3. $\frac{1}{2}$
4. 33%
5. 0.99
6. 0.11
7. 0.54
8. 0.1
9. 0.5
10. 0.7

Curriculum Links

During Year 5

Identify, read, write and represent tenths and hundredths as fractions and decimals

Compare and order tenths and hundredths as fractions and decimals, and convert decimal tenths and hundredths to fractions

Divide whole numbers by 10 and 100 to make decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write, and represent fractions, decimals (to two places), and percentages, and convert decimals and percentages to fraction

Compare and order fractions, decimals (to two places), and percentages, and convert decimals and to fractions

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

Anticipations

Solutions, Misconceptions

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?

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.

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.

Shareback

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.

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).

Suggested Learning Outcomes

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.

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.

Curriculum Links

During Year 5

Identify, read, write and represent tenths and hundredths as fractions and decimals

Compare and order tenths and hundredths as fractions and decimals, and convert decimal tenths and hundredths to fractions

Divide whole numbers by 10 and 100 to make decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write, and represent fractions, decimals (to two places), and percentages, and convert decimals and percentages to fraction

Compare and order fractions, decimals (to two places), and percentages, and convert decimals and to fractions

Add and subtract whole numbers and decimals to two decimal places (e.g., 250.11 + 135.29 = 385.4)

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

Anticipations

Solutions, Misconceptions

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?

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.

Shareback

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?

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).

Suggested Learning Outcomes

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.

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.

Curriculum Links

During Year 5

Identify, read, write and represent tenths and hundredths as fractions and decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Add and subtract whole numbers and decimals to two decimal places (e.g., 250.11 + 135.29 = 385.4)

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

Anticipations

Solutions, Misconceptions

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?

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. **

Shareback

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.

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.

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).

Suggested Learning Outcomes

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.

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.

Curriculum Links

During Year 5

Identify, read, write and represent tenths and hundredths as fractions and decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Add and subtract whole numbers and decimals to two decimal places (e.g., 250.11 + 135.29 = 385.4)

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

Anticipations

Solutions, Misconceptions

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?

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

Shareback

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?

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).

Suggested Learning Outcomes

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.

Explain and justify reasoning using notation, symbols, and words.

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.

Curriculum Links

During Year 5

Identify, read, write and represent tenths and hundredths as fractions and decimals

Compare and order tenths and hundredths as fractions and decimals, and convert decimal tenths and hundredths to fractions

Divide whole numbers by 10 and 100 to make decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write, and represent fractions, decimals (to two places), and percentages, and convert decimals and percentages to fraction

Add and subtract whole numbers and decimals to two decimal places (e.g., 250.11 + 135.29 = 385.4)

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

Anticipations

Solutions, Misconceptions

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?

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

Shareback

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?

Big Ideas

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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).

Suggested Learning Outcomes

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.

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.

Curriculum Links

During Year 5

Identify, read, write and represent tenths and hundredths as fractions and decimals

Divide whole numbers by 10 and 100 to make decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Add and subtract whole numbers and decimals to two decimal places (e.g., 250.11 + 135.29 = 385.4)

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent, ratio

Anticipations

Solutions, Misconceptions

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

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.

Shareback

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?

Suggested Learning Outcomes

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.

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).

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?

Curriculum Links

During Year 5

Identify, read, write and represent tenths and hundredths as fractions and decimals

Compare and order tenths and hundredths as fractions and decimals, and convert decimal tenths and hundredths to fractions

Divide whole numbers by 10 and 100 to make decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write, and represent fractions, decimals (to two places), and percentages, and convert decimals and percentages to fraction

Compare and order fractions, decimals (to two places), and percentages, and convert decimals and to fractions

Add and subtract whole numbers and decimals to two decimal places (e.g., 250.11 + 135.29 = 385.4)

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

Anticipations

Solutions, Misconceptions

Task 11

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?

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.

Shareback

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

- $\frac{5}{10} + \frac{6}{100}$
- $\frac{1}{100} + \frac{1}{10}$
- $\frac{8}{1000} + \frac{6}{100}$
- $\frac{6}{10} + \frac{2}{100} + \frac{9}{1000}$

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).

Suggested Learning Outcomes

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.

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?

Curriculum Links

During Year 5

Identify, read, write and represent tenths and hundredths as fractions and decimals

Compare and order tenths and hundredths as fractions and decimals, and convert decimal tenths and hundredths to fractions

Divide whole numbers by 10 and 100 to make decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Identify, read, write, and represent fractions, decimals (to two places), and percentages, and convert decimals and percentages to fraction

Compare and order fractions, decimals (to two places), and percentages, and convert decimals and to fractions

Add and subtract whole numbers and decimals to two decimal places (e.g., 250.11 + 135.29 = 385.4)

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

Anticipations

Solutions, Misconceptions

Task 12

Where does the decimal point 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.

Teacher Notes

Facilitate the students to notice that sometimes it is quicker and easier to use fractional equivalents to multiply with.

Shareback

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?

Big Ideas

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Suggested Learning Outcomes

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.

Independent Tasks

Assessment tasks

Task 1: Ordering decimals, fractions, and percentages from smallest to biggest.

Task 2: Decimals.

Task 3: Fractions, Decimals, Percentages.

Curriculum Links

During Year 5

Identify, read, write and represent tenths and hundredths as fractions and decimals

Divide whole numbers by 10 and 100 to make decimals

During Year 6

Use rounding, estimation, and inverse operations to predict results and to check the reasonableness of calculations.

Add and subtract whole numbers and decimals to two decimal places (e.g., 250.11 + 135.29 = 385.4)

Mathematical Language

Percent, percentage, whole, fraction, fractional number, decimal number, rational number, equal, equivalent

Anticipations

Solutions, Misconceptions

Assessment Task 1 - Decimals - Year 5-6

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.

Assessment Task 2 - Decimals and Percentages - Year 5-6

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.

Assessment Task 3 - Decimals and Percentages - Year 5-6

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.