RICH MATHEMATICAL TASK BOOKLET

NUMBER Decimals, Percentages

YEAR 7-8 ODD YEARS

Teacher Booklet

Task 1

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

What percentage have you downloaded of that computer game? 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

Before the launch give students a grid for the 1 to 10 times-tables and ask students to solve them and record their time (in a non-public way).
http://www.mental-arithmetic.co.uk/multiplication-grids-pdf-generator.htm
The goal is to complete the grid in under 5 minutes so stop at 5 minutes. Get them to record their time OR how much they have completed.

This activity will be used throughout the unit and should be used as a warm-up throughout the year to develop fluency with times-tables

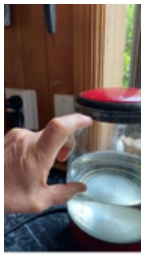
This can be done as either a whole class activity or half class activity.

Have available a range of different size transparent bottles which can hold water. Fill the bottles with a range of water levels and place one bottle 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 activity a number of times using different levels of water and giving the students different shape and size containers.

Encourage the students to use numerical splitting using their fingers.



For the second task have a long and unmarked tape on the floor of the classroom to represent the download of a computer game. 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%.

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 7 and Year 8

Identify, read, write, and represent fractions, decimals (to three places, Year 7 only), and percentages

Compare, order, and convert between fractions, decimals (to three places, Year 7 only), and percentages

Teacher Notes

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)

For the second part facilitate the students to notice that numbers are grouped into multiples of powers of tens (tens, hundreds, thousands, tenths, hundredths, thousandths, and so on).

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.

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.

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.

Shareback

Select students to share after each estimation in the first one 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. In the second task, select students who can explain and justify the numerical value and have represented their estimation in multiple ways.

Connect

What are the decimal equivalences for:

$25\%, \frac{1}{4}, 50\%, \frac{1}{2}, 20\%, \frac{1}{5}, 10\%, \frac{1}{10}$

What pattern can you notice?

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

Practise your timetables with a buddy and make flash cards with the equation on one side and answer on the other side for any that you do not know automatically. Use your flash cards to practice the multiplication facts that you do not know.

1. Marie is playing a computer game. She attempted 100 times to hit a target and was able to successfully hit it 50% of the attempts. How many attempts was she unsuccessful in hitting the target?

2. Marie is playing a computer game. She attempted 100 times to hit a target and was able to successfully hit it 25% of the attempts. How many attempts was she unsuccessful in hitting the target?

3. Marie is playing a computer game. She attempted 100 times to hit a target and was able to successfully hit it 75% of the attempts. How many attempts was she unsuccessful in hitting the target?

4. Marie is playing a computer game. She attempted 100 times to hit a target and was able to successfully hit it 80% of the attempts. How many attempts was she unsuccessful in hitting the target?

5. In Marie's class of 30 students only 20% play the same computer game as Marie. How many students play the game?

6. In Marie's double class of 55 students only 30% play the same computer game as Marie. How many students play the game?

7. If there are 20 girls in a class of 30 students. What percentage are boys?

8. If there are 18 girls in a class of 33 students. What percentage are boys?

Anticipations

Solutions, Misconceptions

Task 2

You and your friends are running on the athletics track in the park. This tape represents the track you run on.

If I put the 0-digit card down at the start of it that indicates so far you have run 0 metres and the 1-digit card indicates that you have not reached 1 metre yet.

As a percentage of the metre 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

Before the launch give students a completed grid for the 1 to 10 times-tables, ask them to highlight the facts which they don't need to learn due to the commutative property - these should be a triangle on the right side of the grid. Then ask them to highlight the 1s, 2s, 5s, and 10s, that should leave 21 facts to learn. Highlight that you are going to target the 6 remaining square numbers first (3 x 3, 4 x 4, 6 x 6, 7 x 7, 8 x 8, 9 x 9)... write the equation and answer on the board and ask students to make flash cards for these facts if they do not know them automatically to practice during the independent maths activity.

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 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 = 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 7 and Year 8

Identify, read, write, and represent fractions, decimals (to three places, Year 7 only), and percentages

Compare, order, and convert between fractions, decimals (to three places, Year 7 only), and percentages

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 fractional ways.

Connect

What are the fraction and decimal equivalence for these numbers:

10%, 1%, 5%, 50%, 9%, 99%, 100%

What patterns do you notice?

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

Use your flash cards with a buddy and for any multiplication facts that you do not know automatically, write them out and say out loud quietly to yourself at least 4 times.

What are their equivalent fractional numbers?

1. 75% = =
2. $\frac{1}{4}$ = =
3. .7 = =
4. $\frac{3}{4}$ = =
5. 23% = =
6. .45 = =
7. two thirds = =
8. $\frac{1}{5}$ = =
9. 70% = =
10. Three-fifths = =
11. 130% = =
12. .10 = =
13. .01 = =
14. 0.7 = =
15. .13 = =

Mathematical Language

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

Anticipations

Solutions, Misconceptions

Task 3

Mike and Jonah were competing to see who could push toy cars further across the floor. Mike measured the distance each car went, and he said that Jonah won because although both their cars reached 3.45 metres and neither of them reached 3.46 metres Jonah's car went further.

Can you record at least 12 different distances for his car which shows Jonah's car went further.

Be ready to explain and justify your answers using number lines, diagrams, drawings, fractions, and decimals.

Teacher Notes

Before you launch the task write up the following string. Ask the students to solve each equation before writing the next one:

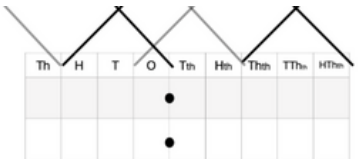
3 x 3 =
3 x 3 + 3 x 3 =
6 x 6 =
6 x 3 =

4 x 4 =
4 x 4 + 4 x 4 =
8 x 8 =
4 x 8 =

Ask them to discuss the patterns that they notice and highlight that if they know 3 x 3 or 6 x 6 then 6 x 3 is either double 3 x 3 or half 6 x 6 and similarly if they know 4 x 4 or 8 x 8 then 4 x 8 is double 4 x 4 or half 8 x 8

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 place value house with the overlap of decimals with the ones place holder



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.

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.

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

During Year 7 and Year 8

During Year 7: multiply and divide numbers by 10, 100, and 1,000

During Year 8: multiply and divide numbers by powers of 10

Teacher Notes

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.

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:

1 and 2? 2.12 and 2.13? .09 and .1?

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.

Mathematical Language

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

Independent Tasks

Use your flash cards for 3 x 3, 6 x 6, 4 x 4, 8 x 8. Make new flash cards for 6 x 3 and 4 x 8 and practice these while also noting the relationship between the square numbers and the new facts.

What numbers can you record between:

1. .1 and .2
2. 50% and 51%
3. 5% and 6%
4. .4 and .5
5. .51 and .56
6. .11 and .12
7. .541 and .542
8. 1.3 and 1.4
9. 478.51 and 478.52

Anticipations

Solutions, Misconceptions

Task 4

There are 4 finalists in a skateboarding competition. Here are their scores for their 2 runs and trick stage. This competition scores each stage out of 10.

Contestant	1	2	3	4
Run·1	8.903	7.796	7.897	8.03
Run·2	7.0001	9.9911	8.98	8.004
Tricks	8.987	7.5	8.0	8.039

Who came first? Second? Third?

How many points would the second finalist have needed to come first?

How many points would the third finalist have needed to come first?

Teacher Notes

Before the launch give students a grid for the 1 to 10 times-tables and ask students to solve them and record their time (in a non-public way). http://www.mental-arithmetic.co.uk/multiplication-grids-pdf-generator.htm
The goal is to complete the grid in under 5 minutes so stop at 5 minutes. Get the students to record their time OR how much they have completed. Ask them to check whether they have improved their time or how much they completed.

During the launch, revisit the use of a numberline to add and subtract 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 with a matching process for subtraction.

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.

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.

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

During Year 7 and Year 8: Identify, read, write, and represent decimals (to three places, Year 7 only)

Add and subtract decimals (to three decimal places, Year 7 only) with an emphasis on estimating before calculating

Connect

Represent these on a numberline

.7 + .3 = 1

.07 + .03 = .1

.007 + .003 = .01

What patterns do you notice? Be prepared to explain and justify the pattern you notice using the place value house.

Suggested Learning Outcomes

Solve additive problems involving numbers up to three decimal places and explain and justify the solutions.

Represent reasoning to explain and justify place value involving numbers up to three decimal places.

Independent Tasks

Put these decimal numbers in order from largest to smallest:

1. .9, 1.00000, .900000, .99, .009
2. .90146, .9015, .9000000, .99
3. .4405, .4, .321, .99999, .4.9
4. .50000, .45100, .510, .52, .5200009
5. 1.2, 1.209, 1.21, 1.20099
6. .89, .8, .9, .089, .09

Write an explanation to explain the rules you were using to order each row.

Mathematical Language

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

Anticipations

Solutions, Misconceptions

Task 5

Solve these equations using two different ways

.625 + .78
1.324 + 1.0769
.469 + 8
19.2 + 8091
1 - .05
.1 - .05
9.99 - .001

Teacher Notes

Before you launch the task write up the following equations:

6 x 6 =
Model that 6 x 6 can be written as (2 x 3) x (2 x 3)

Ask students to discuss what they notice and highlight that 2 x 3 are factors of 6 connecting to previous work.

Record (2 x 2) x (3 x 3) = 4 x 9

Ask them to discuss the patterns that they notice and make a connect to 6 x 6 = 36 and 4 x 9 = 36.

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.

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.

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

During Year 7 and Year 8

Identify, read, write, and represent decimals (to three places, Year 7 only)

Add and subtract decimals (to three decimal places, Year 7 only) with an emphasis on estimating before calculating

Connect

.1 + .9=

.17 + .93=

1 -.9

.1 -.09

What patterns do you notice. Use the place value house to explain your regroupings.

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.

Mathematical Language

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

Independent Tasks

Put these numbers in order from smallest to largest:

1. $\frac{1}{2}$, .49999, 49%
2. $\frac{1}{3}, \frac{1}{2}$, 93%, .510, .003, 51%
3. .2409, .2, 25%, $\frac{1}{4}$, .2000001, $\frac{3}{4}$
4. $1\frac{1}{2}$, 1.9, 1.09, 125%, 100%
5. $\frac{1}{5}$, 21%, .201
6. 3%, $\frac{1}{3}$, .03, .3909
7. $\frac{1}{2}$, .49999, 49%
8. .20009, $\frac{2}{3}$, .9, 99%, $\frac{9}{10}$
9. $1\frac{1}{2}$, 1.49999, 160%, 1.9, 150%
10. .1, $\frac{1}{2}$, .00001, $\frac{1}{100}$, 200%

Write an explanation about the rules you used to order them.

Anticipations

Solutions, Misconceptions

Task 6

Alani is going to a family reunion in Tuvalu. She has some money saved up. In Tuvalu they use Australian dollars but their own coins. The exchange rate is $1 New Zealand for $.9301 Australian.

How much Australian money will she get in exchange for NZ$10? NZ$100? NZ$550?

In Samoa the exchange rate is $1 New Zealand for 1.5204 tala.
How much will she get in exchange for NZ$10? NZ$100? NZ$550?

Teacher Notes

Before you launch the task write up the following string of equations. Ask the students to solve each one before writing up the next and ask them to discuss and identify the patterns they notice:

3 x 4 =
3 x 8 =
6 x 4 =
6 x 8 =

Ask students to discuss what they notice and highlight the multiplicative relationship of times two (or doubling between each one) that they can use to learn their multiplication facts. Highlight that for the last one, they could use 3 x 4 = 12 and double that twice because 3 x 2 = 6 and 4 x 2 = 8

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.

9 x 1 =

9 x 10 =

9 x 100 =

.9 x 1 =

.9 x 10 =

.9 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.

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.

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

Look at your flash cards for or write them out if you don't have them.

3 x 4 =
3 x 8 =
6 x 4 =
6 x 8 =

Discuss with a partner the patterns that you notice between each one.
Use the patterns to help remember the times-table facts.

Solve the following:

.5 + .05 =
.5 + .505 =
.5 + .5555
.3 + .03 =
.3 + .0303 =
.03 + .3033=
.7 + .07 =
.7 + 0.707 =
1 x .5 =
1 x .05 =
1 x .005 =
1 x .000505

Curriculum Links

During Year 7 and Year 8

Identify, read, write, and represent decimals (to three places, Year 7 only)

Multiply fractions and decimals by whole numbers

During Year 7: multiply and divide numbers by 10, 100, and 1,000

During Year 8: multiply and divide numbers by powers of 10

Mathematical Language

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

Anticipations

Solutions, Misconceptions

Task 7

Estimate where you think the decimal point goes and then compute to check that you have put it in the right place.

2.4 x 200 = 480
0.218 x 1 = 2180
0.24 x 0.63 = 1512
0.108 x 0.19 = 002052
0.99 x 0.999 = 098901

What did you notice?

Teacher Notes

Before you launch the task write up the following string of equations. Ask the students to solve each one before writing up the next and ask them to discuss and identify the patterns they notice:

3 x 7 =
6 x 7 =
9 x 7 =

Ask students to discuss what they notice and highlight the multiplicative relationship of times two (or doubling between each one) and times 3 between the first and last equation that they can use to learn their multiplication facts. Highlight that for the last one, they could use 3 x 7 = 21 and triple it for 9 x 7 = 63

Facilitate the students to notice that when multiplying a rational number by a rational number that they should estimate the size of the product to check the reasonableness of their answer before they carry out the operation.

Shareback

Select students to share who are able to explain and justify their reasoning using a range of representations including place value and notation

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.

Connect

What happens to the product when you multiply a whole number by a decimal? What happens to the product when you multiply a decimal by a decimal? Use examples to prove your explanations.

Suggested Learning Outcomes

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

Solve these equations to the nearest whole number. Estimate the nearest whole number and then check whether your estimate was close.

1. 2.9 + .9 + .199
2. .0009 + 1.0009
3. .5 + .034 + 3.33
4. 6 - .0009
5. .8 - .008
6. 34.267 - .9
7. 5 x .9
8. .08 x 1
9. 2.8 x 10
10. .89 x 2

Curriculum Links

During Year 7 and Year 8

Identify, read, write, and represent decimals (to three places, Year 7 only)

Multiply decimals by whole numbers
Use rounding, estimation, (and benchmarks, Year 8 only) to predict results and to check the reasonableness of calculations

During Year 7: multiply and divide numbers by 10, 100, and 1,000

During Year 8: multiply and divide numbers by powers of 10

Mathematical Language

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

Anticipations

Solutions, Misconceptions

Task 8

The Huia train service travels 121km from Hamilton to Auckland. It takes 1.5 hours to complete the journey. What is the average rate in kilometres per hour?

Now use the same strategy you used to solve this equation. Estimate first and then do the calculation.

35.6 ÷ 1.92

Be ready to explain and justify your reasoning.

Teacher Notes

Before you launch the task write up the following string of equations. Ask the students to solve each one before writing up the next and ask them to discuss and identify the patterns they notice:

2 x 7 =
4 x 7 =
8 x 7 =

3 x 9 =
6 x 9 =

Ask students to discuss what they notice and highlight the multiplicative relationship of times two (or doubling between each one) a that they can use to learn their multiplication facts.

Facilitate the students to notice the need to consider use of multiplication and rounding to 120km.

Notice students in the second problem who round to 36 and 2 before solving.

Shareback

Select students to share who are able to explain and justify their reasoning using a range of ways to represent their reasoning.

Connect

136 ÷ 6 = 22666 correct to five digits but without the decimal point.
Can you use only this information to solve the following?

136 ÷ 0.6, 1.36 ÷ 6, 13.6 ÷ 0.6, 1360 ÷ 60

Can you explain the patterns you notice 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.

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.

A ratio is a multiplicative comparison of quantities; there are different types of comparisons that can be represented as ratios.

Suggested Learning Outcomes

Find equivalent rates.
Represent reasoning using different forms of notation, including symbols and words.
Use multiplicative understanding of place value to solve multiplication and division problems with decimal numbers.
Represent reasoning to explain and justify place value involving decimal numbers.

Independent Tasks

Look at your flash cards for or write them out if you don't have them.

2 x 7 =
4 x 7 =
8 x 7 =

3 x 9 =
6 x 9 =

Discuss with a partner the patterns that you notice between each one.
Use the patterns to help remember the times-table facts.

Write these as decimals:

- 1 and $\frac{5}{10}$
- 12 and $\frac{7}{10}$
- 23 and $\frac{3}{10}$
- 4 and $\frac{83}{100}$
- 1 and $\frac{10}{100}$
- 2 and $\frac{3}{100}$
- 9 and $\frac{831}{1000}$
- 5 and $\frac{83}{1000}$
- 4 and $\frac{1}{1000}$

What is the tenths digit in these?

- 9.92
- 0.02
- 7.816
- 0.30198
- 1.33333
- 1.00009

Which 2 has the biggest value in 0.022? Represent your reasoning to explain your ideas.

How many thousandths are there altogether in 0.022?

Curriculum Links

During Year 7 and Year 8:

Identify, read, write, and represent decimals (to three places, Year 7 only)

Multiply decimals by whole numbers

Use rounding, estimation, (and benchmarks, Year 8 only) to predict results and to check the reasonableness of calculations

Mathematical Language

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

Anticipations

Solutions, Misconceptions

Task 9

The local bakery cool stores a large quantity of dough for when it is needed. If they use 28 cups of flour and the ratio of cups of flour to water is 7:4. How much water do they use?

What if they use 80 cups of flour? The ratio of cups of flour to cups of water they use is 10:8. How much water should they use?

What if they use 78 cups of flour? The ratio of cups of flour to cups of water they use is 10:3. How much water should they use?

Teacher Notes

Facilitate the students to notice the need to keep a balance of both sides in a clear representation

Facilitate students to understand that when considering ratios, the relationship between two quantities is invariant across these situations.

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

The ratio of yellow jelly beans to red jelly beans is 5:6. What is the fraction of yellow jelly beans to red jelly beans?

The ratio of yellow jelly beans to red jelly beans is 10:20. What is the fraction of yellow jelly beans to red jelly beans?

The ratio of yellow jelly beans to red jelly beans is 1:2. What is the fraction of yellow jelly beans to red jelly beans?

What pattern can you see? Can you make a conjecture about what you discovered?

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.
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.
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.

Suggested Learning Outcomes

Find equivalent ratios.

Represent reasoning using different forms of notation, including symbols and words.

Use multiplicative understanding of place value to solve multiplication and division problems with decimal numbers.

Represent reasoning to explain and justify place value involving decimal numbers.

Independent Tasks

As you solve these, think about their place on the place value chart.

1. 32.8 x 6
2. 73 x 9
3. 1.00001 x 10
4. 745 ÷ .9
5. 1.43 ÷ 1.6
6. 4. 0009 ÷ 1.9991
7. 6.5 – 1.9
8. 12. 32 – 0.31
9. 33.1 - .99

Identify, record, and explain the pattern you notice in the shifts in place value?

Curriculum Links

During Year 7 and Year 8

Use rounding, estimation, (and benchmarks, Year 8 only) to predict results and to check the reasonableness of calculations.

During Year 7: use proportional reasoning to explore multiplicative relationships between quantities.

During Year 8: use proportional reasoning to share with unequal proportions.

Mathematical Language

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

Anticipations

Solutions, Misconceptions

Task 10

Tom's Mum is saving for a new phone which will cost $1650. She earns $3500 each month.

She spends her money on the bills, food and extras in the ratio of 6:4:5.

Of the money she spends on extras, she has to spend 80% and she puts 20% in her savings for the phone. How long will it take her to save for her new phone?

Teacher Notes

Before the launch give students a grid for the 1 to 10 times-tables and ask students to solve them and record their time (in a non-public way).
http://www.mental-arithmetic.co.uk/multiplication-grids-pdf-generator.htm
The goal is to complete the grid in under 5 minutes so stop at 5 minutes. Get them to record their time OR how much they have completed. Ask them to check whether they have improved on their time or how much they have completed.

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

In a Day Care Centre, the ratio of children to adults is 4:1. The ratio of adult males to young boys is 1:6 and the ratio of adult females to young girls is 1:2.

What fraction of the people in the Day Care Centre are children?

Big Ideas

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Ratios can be expressed as units by finding an equivalent ratio where the second term is one.

Suggested Learning Outcomes

Find equivalent ratios.

Represent reasoning using different forms of notation, including symbols and words.

Use multiplicative understanding of place value to solve multiplication and division problems with decimal numbers.

Represent reasoning to explain and justify place value involving decimal numbers.

Independent Tasks

1. On a farm the ratio of cows to sheep is 6:8. What is the fraction of cows to sheep?
2. On a farm the ratio of cows to sheep is 10:30. What is the fraction of cows to sheep?
3. On a farm the ratio of cows to sheep is 2:3. What is the fraction of cows to sheep?
4. On a farm the ratio of cows to sheep is 5:6. What is the fraction of cows to sheep?
5. On a farm the ratio of cows to sheep is 20:50. What is the fraction of cows to sheep?

What pattern can you see? Can you make a conjecture about what you discovered? Record your reasoning.

Curriculum Links

During Year 7

Use proportional reasoning to explore multiplicative relationships between quantities

Find a percentage of a whole number, and find a whole amount, given a simple fraction or percentage

During Year 8

Use proportional reasoning to share with unequal proportions

Find a percentage of a whole number, and find a whole amount, given a simple fraction or percentage

Mathematical Language

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

Anticipations

Solutions, Misconceptions

Task 11

Replace the letter with a number

m x .20 = 28
j x .5 = 25
346 = p x 10 + y x 100
2.333 = 64 ÷ a
b = .77 ÷ 100

Write five more to share with the group.

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

Share those constructed by the students testing out why they work as they do. Focus the student reasoning on using multiplicative understanding of place value

Big Ideas

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Suggested Learning Outcomes

Represent reasoning using different forms of notation, including symbols and words.
Use multiplicative understanding of place value to solve multiplication and division problems with decimal numbers.
Represent reasoning to explain and justify place value involving decimal numbers.

Independent Tasks

Where does the decimal point go? Before you compute an answer put in the decimal and write an explanation of why you put it where it is.

0.33 x 6.3
33 x 0.63
3.3 x 63
0.33 x 0.63

Now check your answers with computation. If there are differences record your reasoning.

Curriculum Links

During Year 7 and Year 8

Multiply decimals by whole numbers

Form and solve one- (or two-step, Year 8 only) linear equations

Mathematical Language

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

Anticipations

Solutions, Misconceptions

Task 12

Replace the letter with a number

8÷ .1 = p
8.4 ÷ .1 = y
.45 ÷ .1 = h
j = 8.2 ÷ .2
t = 8.45 ÷ 2.2
8.04 ÷ 2.2 = w

Can you write some using multiplication to share with the group?

Teacher Notes

Notice students who use relationships in their solutions to explain and justify

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

Share those constructed by the students testing out why they work as they do

Suggested Learning Outcomes

Represent reasoning using different forms of notation, including symbols and words.

Use multiplicative understanding of place value to solve multiplication and division problems with decimal numbers.

Represent reasoning to explain and justify place value involving decimal numbers.

Big Ideas

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Independent Tasks

Assessment tasks

- Task 1: Decimals
- Task 2: Fractions, Decimals, Percentages

Curriculum Links

During Year 7 and Year 8:

Multiply decimals by whole numbers

Form and solve one- (or two-step, Year 8 only) linear equations

Mathematical Language

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

Anticipations

Solutions, Misconceptions

Assessment Task 1 - Decimals - Year 7- 8

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 2 - Fractions, Decimals, Percentages - Year 7- 8

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.