RICH MATHEMATICAL TASK BOOKLET

NUMBER & ALGEBRA

YEAR 5- 6 EVEN YEARS

Teacher Booklet

Task 1

Moana is playing Monopoly with her friends. She had $235 in monopoly money. After she had bought two properties, she had only $119 in monopoly money left. How much did she spend to buy the two properties?

Moana is playing Monopoly with her friends. She had $1327 in monopoly money. After she had bought five properties, she had only $158 in monopoly money left. How much did she spend to buy the five properties?

Teacher Notes

Before the launch do a choral count in seven starting from 0. Record on the board like this:

7 14 21 28 35 42 49 56 63 70
77...

Ask students to identify the patterns that they notice.

Write up multiplication facts, for the 7 times-tables.
Ask student to solve the multiplication facts and make connections between the choral count (skip counting) and multiplication facts.

Before you launch the task, write 3629 on the board.

Ask students, what is this number? How can you write and explain this number in different ways? Support the students to read the number correctly. Give them an opportunity to work in pairs and record and represent their reasoning. Explore concepts of place, face, and total value.

Support students to discuss thousands, hundreds, tens, ones and make links to place, face, and total value. Introduce a place value house as a representation and have this on the wall or whiteboard for students to refer to. Repeat this as a warm-up throughout the year and increase the numbers up to 1 000 000.

Notice use of place value and the ability to see hundreds as ten tens and tens as ten ones. Draw connections to represent these within place value houses.

Introduce empty number line as a way to represent solution strategies.

Expect students to use equations to represent their thinking.

Big Ideas

Our number system is based on groupings of ten or base ten. Groupings of ones, tens, hundreds, and thousands can be taken apart in different ways.

Curriculum Links

During Year 5:
Reading, writing, comparing, and ordering whole numbers up to 1,000,000 and representing them using base 10 structure.

Rounding whole numbers to the nearest hundred thousand, ten thousand, thousand, hundred, or ten

Adding and subtracting increasingly large whole numbers

During Year 6:
Reading, writing, comparing, and ordering any whole number and representing them using base 10 structure

Rounding whole numbers to the nearest hundred thousand, ten thousand, thousand, hundred, or ten

Adding and subtracting increasingly large whole numbers

Shareback

Select student solution strategies that have used inverse relationships of addition and subtraction, equivalence and compensation or place value and renaming.

Place value and renaming
235 – 119 =
5 – 9 = ?
Rename one ten so 15 ones – 9 ones = 6
20 – 10 = 10
200 – 100 = 100

Inverse relationship
235 - 119 =
119 + _ = 235

Equivalence and compensation
235 – 119 =
235 - 120 = 115
115 + 1 = 116

Connect

Ask students to solve the following equations and describe any patterns they notice:
100 – 49 =
1000 – 449 =
10000 – 4449 =

Suggested Learning Outcomes

Explain the face, place, and total value of the digits in numbers.

Explain and justify the use of place value to solve subtraction problems.

Explain and justify the use of equivalence and compensation to solve subtraction problems.

Use and justify the inverse relationship between addition and subtraction to solve problems.

Represent equations on an empty number line, in notation and using a place value house.

Mathematical Language

Ones, tens, hundreds, thousands, add, subtract, place value, face value, total value, digit, addition, subtraction, inverse relationship.

Independent Tasks

Work with a partner and make flash cards to practice the 7 times-tables. Write the fact on one side and the answer on the other side. Test each other and note the ones that you don't know instantly and practice writing these out and saying it aloud to yourself four times.

Use a place value house and solve the following equations:
246 + 352 =
374 + 314 =
545 + 1253 =
2561 + 339 =
6331 + 1899 =
What do you notice? Justify your thinking.

Anticipations

Solutions, Misconceptions

Task 2

Mere and Hurae are playing the Game of Life. Hurae wins the golden lottery and now has $7442. Before he won the golden lottery, he had $2789. How much money did he win?

Mere and Hurae are playing the Game of Life. Hurae wins the golden lottery and now has $5432. Before he won the golden lottery, he had $4785. How much money did he win?

Teacher Notes

Before the launch give students a grid for the 1 to 7 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

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.

Notice use of place value and the ability to see hundreds as ten tens and tens as ten ones. Draw connections to represent these within the place value houses.

Expect students to use equations and the empty number line to represent their thinking.

If students use the standard algorithm, ensure procedural and conceptual understanding, e.g., can they explain this in a sense-making way referring to place value and renaming.

Shareback

Select student solution strategies that have used inverse relationships of addition and subtraction, equivalence and compensation or place value and renaming.

Connect

Ask students to describe what they notice is similar and different in the student solution strategies.

Will the solution strategy always work?

Big Ideas

Our number system is based on groupings of ten or base ten. Groupings of ones, tens, hundreds, and thousands can be taken apart in different ways.

Addition and subtraction and multiplication and division have an inverse relationship.

Curriculum Links

During Year 5:
Rounding whole numbers to the nearest hundred thousand, ten thousand, thousand, hundred, or ten

Adding and subtracting increasingly large whole numbers

Calculating the total cost of several items costing whole-dollar amounts and with different prices, or of multiples of the same item, including giving change

During Year 6:
Rounding whole numbers to the nearest hundred thousand, ten thousand, thousand, hundred, or ten, tenths or hundredths to the nearest whole number

Adding and subtracting any whole numbers

Investigating questions involving purchases

Suggested Learning Outcomes

Explain the face, place, and total value of the digits in numbers.

Explain and justify the use of place value to solve subtraction problems.

Explain and justify the use of equivalence and compensation to solve subtraction problems.

Use and justify the inverse relationship between addition and subtraction to solve problems.

Represent equations on an empty number line, in notation and using a place value house.

Independent Tasks

Solve the following equations:

535 – 266 =

434 – ☐ = 216

☐ – 539 = 182

2 544 – 1 689 =

Work with a partner and make flash cards to practice any of the 1 to 6 times-tables that you don't know instantly. Write the fact on one side and the answer on the other side. Use the new flash cards and the 7 times-tables ones to test each other and note the ones that you don't know instantly and practice writing these out and saying it aloud to yourself four times.

Mathematical Language

Ones, tens, hundreds, thousands, add, subtract, place value, face value, total value, digit, addition, subtraction, inverse relationship.

Anticipations

Solutions, Misconceptions

Task 3

Junior's mum needs to order tipani flowers to make 'ei katu for his sister's wedding. There are 19 people in the bridal party and each 'ei katu needs 26 tipani flowers. How many flowers will Junior's mum need to order?

Junior's mum needs to order tipani flowers to make 'ei katu for his sister's wedding. There are 18 people in the bridal party and each 'ei katu needs 22 tipani flowers. How many flowers will Junior's mum need to order?

Teacher Notes

Before the launch do a choral count in eight starting from 0. Record on the board like this:

8 16 24 32 40
48 56 64 72...

Ask students to identify the patterns that they notice and use these to predict further terms.

Write up multiplication facts, for the 8 times-tables,
Ask student to solve the multiplication facts and make connections between the choral count (skip counting) and multiplication facts

Notice student solution strategies either using distributive property or equivalence and compensation. Explicitly talk about the type of mathematical property they have used and use correct mathematical language.

Introduce students to representations using array/area model.

Expect students to record their solutions using equations.

Shareback

Select student solution strategies which use the distributive property or equivalence and compensation.

Distributive property
26 x 19 = (26 x 10) + (26 x 9)
26 x 19 = (20 x 10) + (20 x 9) + (6 x 10) + (6 x 9)
Equivalence and compensation
26 x 19 = (26 x 20) − (26 x 1)

Big Ideas

Our number system is based on groupings of ten or base ten. Groupings of ones, tens, hundreds, and thousands can be taken apart in different ways. There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties.

Curriculum Links

Year 5:
Multiplication and corresponding division facts for 2s to 12s

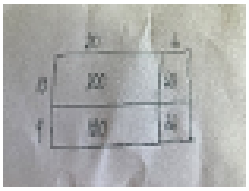
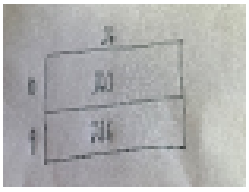
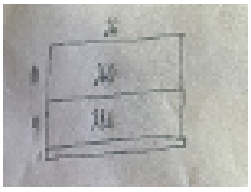
Applying mental strategies, number facts, derived facts, factor pairs, and multiples to multiply and divide increasingly large numbers

Multiplying two two-digit numbers

Year 6:
Multiplying any whole number by a two-digit number (e.g. 542 × 12)

Shareback continued

If either solution strategy has not been used, introduce this as a solution strategy that students have used previously. Record these as equations and model representing these using the area model.

Connect

Ask students to describe how you would solve the following equation using either the distributive property or equivalence and compensation and represent it using the area model:

34 x 29 =

Suggested Learning Outcomes

Explain and justify the use of the distributive property in multiplication.

Explain and justify the use of equivalence and compensation in multiplication.

Represent reasoning using different forms of notation including an area and an array model.

Independent Tasks

Make flash cards for the 8 times-tables with a partner. Write the equation on one side and the answer on the other. Use the flash-cards to test each other. For any that you don't know instantly, write it out and say it aloud four times.
Solve the following equations:

17 x 23 =
29 x 21 =
38 x 37 =

Represent your solution strategy using equations and an area model.

Mathematical Language

Distributive property, area, equivalence, compensation, factor, product.

Anticipations

Solutions, Misconceptions

Task 4

Nga and her family are planning a family reunion. It is Nga's job to look at what funding is needed for this and she needs make an accurate estimate for fundraising. Nga says that there are 284 people coming including children and that $36 per person should cover the costs for them all.

How much do they have to fundraise?

What if they had to raise or lower the cost?

Explore whether your solution strategy would work with other possible amounts.

Teacher Notes

Before the launch Give students a grid for the 1 to 7 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. Ask them them to check whether they have improved their time.
Expect students to record using equations and the area model.

Notice students' solution strategies using the distributive property or the associative property.

Explore what happens when using the associative property.

If students use the standard algorithm, links could be made between this and the distributive property.

Shareback

Select and sequence student solution strategies that use the distributive property or associative property.

Associative property
284 x 36 = (284 x 3 x 10) + (284 x 6)

If either solution strategy has not been used, introduce this as a solution strategy that students have used previously.

Big Ideas

Our number system is based on groupings of ten or base ten.

Equations show relationships of equality between parts on either side of the equal sign. The properties of equality are: If the same real number is added or subtracted to both sides of an equation, equality is maintained; If both sides of an equation are multiplied or divided by the same real number (not dividing by 0), equality is maintained; Two quantities equal to the same third quantity are equal to each other. Patterns and relationships can be used, represented, and generalised in a variety of ways.

Curriculum Links

During Year 5:
Multiplication and corresponding division facts for 2s to 12s

Multiplying three-digit and four-digit numbers by a one-digit number and multiplying two two-digit numbers

During Year 6:
Multiplying any whole number by a two-digit number (e.g. 542 × 12)

Connect

Ask students to describe how the associative property would be used if multiplying by 20 or 50.

Ask students to describe how the equation below could be solved by using either the distributive and/or associative property:

245 x 123 =

Model links to standard written algorithm for multiplication (if appropriate).

Suggested Learning Outcomes

Represent reasoning using different forms of notation including an area and an array model.

Independent Tasks

Use your flash cards with a partner to practice your times-tables. For any that you are unsure of, write them out and say them out loud at least four times.
Solve the following equations:
31 x 98 =
78 x 63 =
145 x 56 =

What patterns did you notice and use to help you solve the equations?

Would the patterns work for any numbers when multiplying?

Mathematical Language

Distributive property, area, associative property, factor, product.

Anticipations

Solutions, Misconceptions

Task 5

At Polyfest, there are 278 dancers in the Sāsā group.
If they sit in rows of 15, how many rows will there be?

Will there be some people left over to make back row which is not the same size as the front rows?

What possible numbers would they have to use to get the exact numbers in every row and with no people left over?

Make sure you can prove this using an example which you can explain and justify.

Teacher Notes

Select strategies that start at use of some form of multiplicative thinking.

If addition or subtraction used have students rework as multiplication or division.

Notice whether students draw on multiplying by ten when using the inverse relationship. Model use of x 10 then x 5 as an easy process.

Notice whether students have used partial quotients .

Note use of doubling and shift towards concept of multiplying by two as doubling.

Shareback

Select student solution strategies where they have used the inverse relationship of multiplication and division or the partial quotient/distributive property in the solution. If either solution strategy has not been used, introduce this as a solution strategy that students have used previously.

Inverse relationship

278 ÷ 15 =
15 x ? = 278

15 x 10 = 150 ...

Distributive property/partial quotients

278 ÷ 15 = (150 ÷ 15) + (60 ÷ 15) + (60 ÷ 15) + (8 ÷ 15)

Big Ideas

There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties.

Addition and subtraction and multiplication and division have an inverse relationship.

Curriculum Links

During Year 5:
multiplication and corresponding division facts for 2s to 12s

Multiplying three-digit and four-digit numbers by a one-digit number and multiplying two two-digit numbers

During Year 6:
Finding factor pairs for numbers that result from multiplying any two whole numbers between 1 and 12

Multiplying any whole number by a two-digit number (e.g. 542 × 12)

Connect

Ask students to describe how you would solve the following equation using either the inverse relationship or the partial quotient/distributive property:

487 ÷ 35 =

Mathematical Language

Distributive property, inverse relationship, factor, product, quotient, divisor, dividend.

Suggested Learning Outcomes

Explain and justify the use of the partial quotients/distributive property in division.

Explain and represent the inverse relationship of multiplication and division.

Represent reasoning using different forms of notation.

Independent Tasks

Solve the following equations:

556 ÷ 25 =

866 ÷ 42 =

765 ÷ 33 =

Anticipations

Solutions, Misconceptions

Task 6

Our school is going on a picnic and using buses to take all the children, teachers, and adults. Each bus can take 46 passengers and there are 942 people to transport.

How many buses do we need?

What numbers could you use with your solution strategy that would mean you had the same number of people in every bus?

Be ready to explore and explain at least three other sets of numbers.

Teacher Notes

Before the launch do a choral count in nine starting from 0. Record on the board like this:

9 18 27 36 45 54 63 72 81 90
99 ....

Ask students to identify the patterns that they notice and use these to predict further terms.

Write up multiplication facts, for the 9 times-tables,
Ask student to solve the multiplication facts and make connections between the choral count (skip counting) and multiplication facts

Notice students who are using addition or subtraction and support them to re-work as multiplicative thinking.

Notice students who use the inverse property or who are using partial quotients/distributive property in their calculations.

Shareback

Select student solution strategies where they have used the partial quotient/distributive property in the solution.

Big Ideas

There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties.

Addition and subtraction and multiplication and division have an inverse relationship.

Curriculum Links

During Year 5:
Multiplying three-digit and four-digit numbers by a one-digit number and multiplying two two-digit numbers

Dividing up to four-digit whole numbers by a one-digit divisor, with a remainder (e.g. 278 ÷ 4 = 69 remainder 2)

During Year 6:
Multiplying any whole number by a two-digit number (e.g. 542 × 12)

Dividing up to five-digit whole numbers by a one-digit divisor, with a remainder (e.g. 1283 ÷ 5 = 256, remainder 3)

Connect

What numbers would you change these into when using partial quotient/distributive property to divide?

776 ÷ 35 =
867 ÷ 42 =
935 ÷ 31 =

Have children discuss possible number combinations without solving these. Model links to the relationship between the partial quotients/distributive property and the standard division algorithm.

Suggested Learning Outcomes

Explain and justify the use of the partial quotients/distributive property in division.

Explain and represent the inverse relationship of multiplication and division.

Represent reasoning using different forms of notation.

Independent Tasks

Make flash cards for the 9 times-tables with a partner. Write the equation on one side and the answer on the other. Use the flash-cards to test each other. For any that you don't know instantly, write it out and say it aloud four times.

Solve the following equations:

387 ÷ 49 =

822 ÷ 73 =

778 ÷ 86 =

$1 \div \frac{1}{2} =$

$2 \div \frac{1}{4} =$

Mathematical Language

Distributive property, inverse relationship, factor, product, quotient, divisor, dividend.

Anticipations

Solutions, Misconceptions

Task 7

Can you work together in your group to solve these number sentences? Make sure that you develop an explanation of how you solved these that everyone can share.

18 + 7 = _ + 6

_ + 16 = 29 + 14

85 − _ = 86 − 28

185 − 29 = _ − 26

674 + 56 − _ = 671

73 + 5 + 3 = 73 + _

Teacher Notes

Before you launch the task, ask the students to discuss these true and false number sentences and justify their thinking. Ensure that students understand what true and false means. Introduce notation of not equal (≠) for the number sentences that they think are false:

188 = 188 99 + 255 = 255 + 99

45 − 17 = 43 − 15 37 = 10 + 26

38 + 26 = 39 + 25 45 − 7 = 38 − 5

Use true and false and open number sentence tasks as a warm up throughout the year.

Students may initially treat the equals sign as an operator or indication to write the answer next.

Students also may compute each side to work out whether they are equal.

Notice students who use the relationships across the equals sign to see whether there is balance.

Highlight to the students to look across the equals sign and find the relationships between numbers to the left and the numbers on the right.

Notice students who use the relationships across the equals sign to see whether there is balance.
Press for use of arrows and notations to highlight the relationships.

Big Ideas

Equations show relationships of equality between parts on either side of the equal sign.

The properties of equality are: If the same real number is added or subtracted to both sides of an equation, equality is maintained; If both sides of an equation are multiplied or divided by the same real number (not dividing by 0), equality is maintained; Two quantities equal to the same third quantity are equal to each other.

Curriculum Links

During Year 5:
Adding and subtracting increasingly large whole numbers

Completing number sentences that involve addition and subtraction by using equality (=) and inequality (<, >) symbols (e.g. 2,456 + 203,938 ☐ 3,456 + 231,930; 2,456 × 2 ☐ 1,228 × 4)

During Year 6:
Adding and subtracting any whole numbers

Checking the truth of and completing open number sentences that involve all four operations and that include the use of inequalities, respecting the order of operations (e.g. $8 \times 7 \leq 8 \times 5 + 4^2$, true or false?)

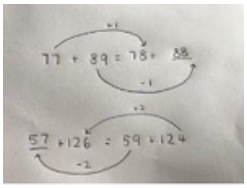
Shareback

Allow students to share misconceptions related to the equal sign (e.g., 18 + 7 = 25 + 6) to position them to engage in argumentation.

Select student solution strategies that use relational reasoning.

18 + 7 = 19 + 6 because 6 is one less than 7 so it has to be one more than 18.

If no students use a relational strategy, model this to them using arrows and explanations.



Connect

Ask students to solve the following problems using a relational solution:

_ + 219 = 177 + 218

783 – 729 = 83 – _

Support students to notice the variation in directionality between addition equivalence problems (+1, -1) and subtraction equivalence problems (-700, -700).

Suggested Learning Outcomes

Explain and justify relationships between numbers in an equation.

Write statements of equivalence in words and using notation.

Solve equivalence problems and explain and justify the solutions.

Independent Tasks

With a partner, practice your times-tables with the flash cards. For any that you do not know automatically, write them out and say them out loud at least four times.

Solve these equations:

16 + 9 = _ + 8

_ + 18 = 25 + 16

63 – _ = 73 – 28

132 – 47 = _ – 45

453 + 67 – _ = 451

69 + 4 + 2 = 69 + _

Mathematical Language

Equivalent, equal sign.

Anticipations

Solutions, Misconceptions

Task 8

Work together to decide which equations are true or false.
Make sure that everyone in your group agrees and can explain.

398 + 467 = 396 + 469

657 + 18 = 657 + 9 + 10

85 – 34 = 87 – 36

8 x 7 = (8 x 5) + 8

9 x 7 = (10 x 7) – 7

16 + 17 + 18 + 19 + 20 = 21 + 22 + 23 + 24

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.

Remind students of the notation of not equal (≠) for the number sentences that they think are false.

Students may initially treat the equals sign as an operator or indication to write the answer next. These misconceptions can be used to position students to engage in mathematical argumentation.

Students also may compute each side to work out whether they are equal. However, work with them to facilitate them to notice that you can use the relationships across the equals sign to see whether there is balance.

Highlight the students' relational responses (e.g., noticing the + 2, – 2 relationships).

Press for use of arrows and notations to highlight the relationships.
For the independent task, have cards or strips of paper ready for students to write on and create a space called the true and false number sentence wall.

Big Ideas

Equations show relationships of equality between parts on either side of the equal sign.

The properties of equality are: If the same real number is added or subtracted to both sides of an equation, equality is maintained; If both sides of an equation are multiplied or divided by the same real number (not dividing by 0), equality is maintained; Two quantities equal to the same third quantity are equal to each other.

Patterns and relationships can be used, represented, and generalised in a variety of ways.

Curriculum Links

During Year 5:
Completing number sentences that involve addition and subtraction by using equality (=) and inequality (<, >) symbols (e.g. 2,456 + 203,938 ☐ 3,456 + 231,930; 2,456 × 2 ☐ 1,228 × 4)

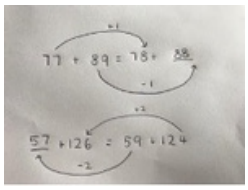
During Year 6:
Checking the truth of and completing open number sentences that involve all four operations and that include the use of inequalities, respecting the order of operations (e.g. $8 \times 7 \leq 8 \times 5 + 4^2$, true or false?)

Shareback

Select student solution strategies that use relational reasoning.

85 – 34 = 87 – 36 is true because 85 is two less than 87 and 34 is two less than 36.

If no students use a relational strategy, model this to them using arrows and explanations.



Connect

Can you work out whether the following are true or false without calculating each side?

472 – 449 = 72 - 49

117 + 239 = 127 + 249

Suggested Learning Outcomes

Explain and justify relationships between numbers in an equation.

Write statements of equivalence in words and using notation.

Solve equivalence problems and explain and justify the solutions.

Independent Tasks

Explain and justify which number sentences are true and false:

19 = 1 + 8 + 10
15 + 17 = 16 + 18
225 – 178 = 235 – 168
25 – 5 = 20 – 2
183 – 87 = 181 – 89
5 + 18 + 87 = 6 + 17 + 87

Write your own true and false number sentences.

Mathematical Language

Equivalent, equal sign.

Anticipations

Solutions, Misconceptions

Task 9

Tasa is working out if the number sentences are true or false

14 x 6 = (10 x 6) + (4 x 6)
32 x 3 = (30 x 3) + 2
17 x 4 = (8 x 4) + (8 x 4)
24 x 15 = (12 x 15) + (12 x 15)

He notices patterns when working out which are true or false. What do you think he notices?

Does this always work?

Use the equipment (grid paper, counters to build arrays) to explore the relationship.

Can you write your own examples using different numbers?

Big Ideas

There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties.

Addition and subtraction and multiplication and division have an inverse relationship.

Teacher Notes

Students may focus on finding the answers for each number sentence. Position them instead to recognise the relationship across the equal sign instead of calculating the products.

Have appropriate equipment for students to build concrete models to prove their conjectures (e.g., counters, grid paper, peg boards).

Shareback

Select students who have used the relationships across the equals sign to justify equivalence rather than finding the products.

Select students that have used multiple representations to develop concrete forms of proof related to the conjecture. Support students to explain how their model would apply to any numbers.

Connect

Can you write a range of number sentences that would match the following number sentences:
6 x 14 =
25 x 17 =
Look for students drawing on the distributive property and understanding that you could adjust relationally to find all options.

Curriculum Links

During Year 5:
Completing number sentences that involve addition and subtraction by using equality (=) and inequality (<, >) symbols (e.g. 2,456 + 203,938 ☐ 3,456 + 231,930; 2,456 × 2 ☐ 1,228 × 4)

During Year 6:
Checking the truth of and completing open number sentences that involve all four operations and that include the use of inequalities, respecting the order of operations (e.g. $8 \times 7 \leq 8 \times 5 + 4^2$, true or false?)

Suggested Learning Outcomes

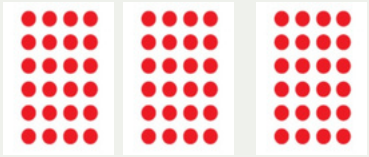
Explain and justify the distributive property of multiplication.

Use different representations to justify.

Mathematical Language

Distributive property, factors, equivalence, conjecture, generalisation.

Independent Tasks



Write your own set of number sentences to describe this in as many ways as possible.

Make connections across the number sentences. What patterns do you notice?

Why do your patterns work?

Will these work with other numbers? Can you write them as a generalisation?

Anticipations

Solutions, Misconceptions

Task 10

Hemi's teacher asks him to multiply 5 x 4 x 2

Hemi solves the problem by changing it to 5 x 8

Hemi also thinks that you could solve the problem by changing it to 20 x 2

Work in a group and explore whether you agree or disagree with how Hemi's ideas.

Does Hemi's idea work with different numbers?

Does it work for addition, subtraction, and division?

Use the material to explore and prove whether it works for different operations.aper, counters to build arrays) to explore the relationship.

Can you write your own examples using different numbers?

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.

Students may begin by testing different examples with numbers and different types of numbers (e.g., large, small, positive, negative, fractions, decimals). After they have explored multiple examples, prompt them by asking whether they can prove it would work with every number.

Have appropriate equipment for students to build concrete models to prove their conjectures (e.g., counters, grid paper, peg boards).

Look for students drawing on the associative property and understanding that it works for multiplication and addition but not for subtraction and division.

Students may generate counter examples to prove the associative property does not apply to subtraction or division. Students may also generate special cases (e.g., 5 – 5 – 5 = 5 – 5 – 5).

Big Ideas

There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties.

Addition and subtraction and multiplication and division have an inverse relationship.

Curriculum Links

During Year 5:
Completing number sentences that involve addition and subtraction by using equality (=) and inequality (<, >) symbols (e.g. 2,456 + 203,938 ☐ 3,456 + 231,930; 2,456 × 2 ☐ 1,228 × 4)

During Year 6:
Checking the truth of and completing open number sentences that involve all four operations and that include the use of inequalities, respecting the order of operations (e.g. $8 \times 7 \leq 8 \times 5 + 4^2$, true or false?)

Shareback

Select students that have used multiple representations to develop concrete forms of proof related to the conjecture. Support students to explain how their model would apply to any numbers.

Highlight to students that letters or symbols can be used in maths to represent any numbers.

Connect

Can you represent the conjectures that you have made using a statement, a diagram and a number sentence using symbols or letters to represent any number?

(e.g., a × b × c = a × (b + c).

Suggested Learning Outcomes

Explain and justify how the associative property applies to addition and multiplication.

Independent Tasks

Lola's teacher asks her to solve 36 ÷ 12 =

Lola thinks that she can solve the problem by taking away 12.

How do you think Lola would solve this?

Would this always work? Can you test this with different numbers?

What is a conjecture that you can make related to division and subtraction?

Mathematical Language

Associative property, factors, product, conjecture, generalisation, counter-example, special cases.

Anticipations

Solutions, Misconceptions

Task 11

The library needs to be packed up to be moved.

There are 2953 books that need to be packed and each box will fit 187 books.

How many boxes are needed?

Teacher Notes

Notice students using the inverse relationship.

Support them to notice the efficiency of multiplication by 10.

Expect students to represent using equations.

Shareback

Select student solution strategies where they have used the inverse relationship in the solution.

Connect

Ask students to explain and justify the inverse relationship of multiplication and division and discuss what they would multiply by to estimate the answers to the division problems

4897 ÷ 243 =
4625 ÷ 2251 =

Big Ideas

There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties. Addition and subtraction and multiplication and division have an inverse relationship.

Curriculum Links

During Year 5:
Multiplying three-digit and four-digit numbers by a one-digit number and multiplying two two-digit numbers

Dividing up to four-digit whole numbers by a one-digit divisor, with a remainder (e.g. 278 ÷ 4 = 69 remainder 2)

During Year 6:
Multiplying any whole number by a two-digit number (e.g. 542 × 12)

Dividing up to five-digit whole numbers by a one-digit divisor, with a remainder (e.g. 1283 ÷ 5 = 256, remainder 3)

Suggested Learning Outcomes

Explain and justify how the associative property applies to addition and multiplication.

Independent Tasks

Solve the following equations:

$7085 \div 385 =$

$8643 \div 221 =$

$9999 \div 2133 =$

$\frac{1}{2} \div \frac{1}{4} =$

Mathematical Language

Associative property, factors, product, conjecture, generalisation, counter-example, special cases.

Anticipations

Solutions, Misconceptions

Task 12

Solve these problems:

55 x 48 =

23 x 471 =

867 x 898 =

What patterns and operational properties did you use to help you solve the problems?

Teacher Notes

Notice student solution strategies either using distributive property or equivalence and compensation. Explicitly talk about the type of mathematical property they have used and use correct mathematical language.

Expect students to use representations using array/area model.

Expect students to record their solutions using equations.

Shareback

Select student solution strategies which use the distributive property or equivalence and compensation.

Connect

Ask students to describe the properties or rules related to multiplication that they used to solve the tasks.

Big Ideas

Our number system is based on groupings of ten or base ten. Groupings of ones, tens, hundreds, and thousands can be taken apart in different ways. There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties. Addition and subtraction and multiplication and division have an inverse relationship.

Curriculum Links

During Year 5:
Multiplying three-digit and four-digit numbers by a one-digit number and multiplying two two-digit numbers

Dividing up to four-digit whole numbers by a one-digit divisor, with a remainder (e.g. 278 ÷ 4 = 69 remainder 2)

During Year 6:
Multiplying any whole number by a two-digit number (e.g. 542 × 12)

Dividing up to five-digit whole numbers by a one-digit divisor, with a remainder (e.g. 1283 ÷ 5 = 256, remainder 3)

Suggested Learning Outcomes

Explain and justify the use of the distributive property in multiplication.

Explain and justify the use of equivalence and compensation in multiplication.

Represent reasoning using different forms of notation including an area and an array model.

Mathematical Language

Distributive property, area, equivalence, compensation, factor, product.

Independent Tasks

Select one or more of the following assessment tasks (attached at the end of the document) as the independent activity:

Task 1: Addition and subtraction problems to solve.

Task 2: Addition and subtraction problems to solve.

Task 3: Multiplication and division problems to solve.

Task 4: Multiplication and division problems to solve.

Task 5: Properties of numbers and operations.

Task 6: Properties of numbers and operations.

Anticipations

Solutions, Misconceptions

Assessment Task 1 - Number and Algebra - Year 5-6

Sose has 97 Pokemon cards in her collection. She wins another 48 Pokemon cards. How many Pokemon cards does Sose have altogether? Prove and justify your answer.

Brandon is playing a video game. He scores 522 points. His sister Louisa scores 385 points. How many more points did Brandon score? Prove and justify your answer.

At the athletics competition, Alexi jumped 3.35 metres for the long-jump. Sima jumped 2.8 metres. Who jumped further and by how much? Solve the problem and justify your answer.

Write one or more word problems for a friend involving addition or subtraction. Show how you would solve it.

Assessment Task 2 - Number and Algebra - Year 5-6

Litea collected 87 flowers to make leis. She already had 46 flowers. How many flowers does Litea have now? Prove and justify your answer.

Fetu's rugby team scored 334 points for the season. They scored 96 points more than the next closest team. What did the other team score for the season? Prove and justify your answer.

To get fit for indoor netball, Hemi ran 4.35km a day, while Maraea ran 3.82 km a day. Who ran further and by how much? Solve the problem and justify your answer.

Write one or more word problems for a friend involving addition or subtraction. Show how you would solve it.

Assessment Task 3 - Number and Algebra - Year 5-6

The school is going on a trip and has ordered 17 buses. Each bus can take 28 children. How many children can go on the trip?

The library is moving. They have 484 books and can fit 22 books into each box. How many boxes will be needed for the books?

Write your own multiplication or division problems. Show how you would solve them.

Assessment Task 4 - Number and Algebra - Year 5-6

Lola's family is setting up the hall for a family party. They have already set up 24 tables but need to put 18 chairs around each table. How many chairs will they need altogether?

The school is preparing for a school trip and booking buses. There are 426 people at the school. Each bus can take 24 people. How many buses are needed?

Write your own multiplication or division problems. Show how you would solve them.

Assessment Task 5 - Number and Algebra - Year 5-6

27 x 12. 567 + 39 72 ÷ 6 (27 x 6) + (27 x 6)

36 ÷ 3 12 x 27 95 – 27

85 – 17 567 + 39 + 1 = ☐ - 1 27 x 2 x 6

Look at the number sentences above
Describe what patterns you can find

- Why do your patterns work?
- Do they work with other numbers?
- Will they always work? Explain and justify your thinking

Assessment Task 6 - Number and Algebra - Year 5-6

26 x 14 479 + 58 84 ÷ 8 (26 x 10) + (26 x 4)

42 ÷ 4 14 x 26 73 – 28

83 – 38 479 + 58 – 5 = ☐ – 5 26 x 7 x 2

Look at the number sentences above

- Describe what patterns you can find
- Why do your patterns work?
- Do they work with other numbers?
- Will they always work? Explain and justify your thinking