

Elementary Mathematics Methods

Video Guide Sheet

Numeration: Whole Numbers

Focus

- Multiplication: Commutative Property (Part A)

Concepts To Think About

- Commutative property: for any whole numbers a and b , $a \times b = b \times a$.
- Multiplication is a form of repeated addition.
- The sum of q added to itself m times is equal to the product of $m \times q$ (m times q).

Vocabulary

- Repeated addition – adding the same number to itself x amount of times
- Multiplier – the “specified number of times” by which another number is multiplied. In $m \times q$, the multiplier is m .
- Quantity – the number that is added to itself a specified number of times. In $m \times q$, the quantity being multiplied is q .
- Factors – the multiplier and the quantity being multiplied are both factors. In $m \times q$, the factors are m and q .
- Sum – the result of adding a quantity to itself a specified number of times.
- Product – the result of multiplying a quantity by a multiplier

Tools

- geoboards, red and blue cubes

Process

- Problem: $4 \times 3 = 12$
- The learner places cubes on the geoboard in four rows with three cubes in each row.
- The number 3 is added to itself 4 times and represents repeated addition.
- In this multiplication problem the number four is the multiplier and three is the quantity being multiplied.
- The factor four represents the number of sets and three represents the quantity of each set.
- The sum of $3+3+3+3$ equals 12. The product of four times three is also 12. There were 12 cubes in total because multiplication is a form of repeated addition.

Try Another Example

- Using a geoboard and cubes, follow the process presented in the video to explore 2×5 .

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Numeration: Whole Numbers

Focus

- Multiplication: Commutative Property (Part B)

Concepts To Think About

- Commutative Property: for any whole numbers a and b , $a \times b = b \times a$.
- Multiplication is a form of repeated addition.
- The commutative property of multiplication is also applicable for any pair of numbers a and b .

Vocabulary

- Repeated addition – adding the same number to itself x amount of times
- Multiplier – the “specified number of times” by which another number is multiplied. In $m \times q$, the multiplier is m .
- Quantity – the number that is added to itself a specified number of times. In $m \times q$, the quantity being multiplied is q .
- Factors – the multiplier and the quantity being multiplied are both factors. In $m \times q$, the factors are m and q .
- Product – the result of multiplying a quantity by a multiplier

Tools

- geoboards, green cubes

Process

- Problem: $3 \times 4 = 12$
- The learner places cubes on the geoboard in three columns with four cubes in each column.
- Four is being added to itself three times.
- In the case of three is multiplied by four, three is the multiplier and four is the quantity being multiplied.
- The product of three times four is 12 as was the product of four times three. This relationship is called the commutative property of multiplication.

Try Another Example

- Using a geoboard and cubes, follow the process presented in the video to explore 5×2 . Compare the result to the exploration of 2×5 .

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Numeration: Whole Numbers

Focus

- Associative Property for Multiplication (Part A)

Concepts To Think About

- Associative property: for any whole numbers a , b , and c , $a \times (b \times c) = (a \times b) \times c$.
- An array is just a set of rows and columns.

Vocabulary

- Array – A rectangular arrangement of quantities in rows and columns, as in a matrix.
- Multiplier – the “specified number of times” by which another number is multiplied. In $m \times q$, the multiplier is m .
- Quantity – the number that is added to itself a specified number of times. In $m \times q$, the quantity being multiplied is q .
- Product – the result of multiplying a quantity by a multiplier

Tools

- yellow cubes, green cubes

Process

- Problem: $2 \times (3 \times 4) = 24$
- The learner is creates an array.
- The first array has 3 columns and 4 rows and represents 3×4 .
- The second array also has 3 columns and 4 rows and represents 3×4 .
- There are 2 sets of 3×4 or $2 \times (3 \times 4)$.
- There are a total of 24 cubes so the product of $2 \times (3 \times 4)$ is 24.
- 2 is the multiplier and (3×4) is the quantity being multiplied.

Try Another Example

- Using cubes, follow the process presented in the video to explore $3 \times (2 \times 5)$.

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Numeration: Whole Numbers

Focus

- Associative Property for Multiplication (Part B)

Concepts To Think About

- Associative property: For any whole numbers a , b , and c , $a \times (b \times c) = (a \times b) \times c$.
- An array is just a set of rows and columns.
- Commutative Property: for any whole numbers a and b , $a \times b = b \times a$.
- The associative property of multiplication is also applicable for any set of numbers a , b , and c .

Vocabulary

- Array – A rectangular arrangement of quantities in rows and columns, as in a matrix.
- Multiplier – the “specified number of times” by which another number is multiplied. In $m \times q$, the multiplier is m .
- Quantity – the number that is added to itself a specified number of times. In $m \times q$, the quantity being multiplied is q .
- Product – the result of multiplying a quantity by a multiplier

Tools

- yellow cubes, green cubes

Process

- Problem: $2 \times (3 \times 4) = (2 \times 3) \times 4 = 24$
- For each set of 3×4 , the learner separates the sets to make 4 smaller sets of 2×3 .
- This represents $4 \times (2 \times 3)$.
- The product of $4 \times (2 \times 3)$ is 24, the product of $2 \times (3 \times 4)$ is also 24.
- Because $2 \times (3 \times 4) = 24$ and $4 \times (2 \times 3) = 24$, then $2 \times (3 \times 4) = 4 \times (2 \times 3)$.
- The commutative property leads to $2 \times (3 \times 4) = (2 \times 3) \times 4$.
- This relationship is called the associative property of multiplication.
- For any whole numbers a , b , and c , $a \times (b \times c) = (a \times b) \times c$.

Try Another Example

- Using cubes, follow the process presented in the video to explore $(3 \times 2) \times 5$. Compare the result to the previous to an exploration of $3 \times (2 \times 5)$.

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Focus

- Distributive Property of Multiplication Over Addition (Part A)

Concepts To Think About

- Distributive property: for any whole numbers a , b , and c ,
 $a \times (b + c) = (a \times b) + (a \times c)$.
- The distributive property of multiplication over addition is applicable for any set of numbers a , b , and c .

Vocabulary

- Commutative property – If a and b are any whole numbers, then $a \times b = b \times a$.

Tool

- red chips

Process

- Problem: $2 \times 8 = 2 \times (5 + 3) = 16$
- The learner shows 2 sets of 8 chips
- The two sets can also be represented as sets of $(5 + 3)$ chips.
- These 2 sets of 8 chips have a total quantity of 16 chips.
- $2 \times 8 = 16$ and $2 \times (5 + 3) = 16$
- Therefore $2 \times 8 = 2 \times (5 + 3) = 16$.

Try Another Example

- Using chips, follow the process presented in the video to show 3 sets of 6 chips as $3 \times (2 + 4)$.

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Numeration: Whole Numbers

Focus

- Distributive Property of Multiplication Over Addition (Part A)

Concepts To Think About

- Distributive property: for any whole numbers a , b , and c ,
 $a \times (b + c) = (a \times b) + (a \times c)$.
- The distributive property of multiplication over addition is applicable for any set of numbers a , b , and c .

Vocabulary

- Commutative property – If a and b are any whole numbers, then $a \times b = b \times a$.

Tool

- red chips

Process

- Problem: $2 \times (5 + 3) = (2 \times 3) + (2 \times 5) = 16$
- The learner rearranges the chips to represent 2 sets of 3 chips and 2 sets of 5 chips.
- This represents $(2 \times 3) + (2 \times 5)$.
- The total number of chips is still the same so $(2 \times 3) + (2 \times 5) = 16$.
- Combining the two processes, we have $2 \times (5 + 3) = (2 \times 3) + (2 \times 5)$.
- The commutative property of addition for whole numbers allows $2 \times (5 + 3) = (2 \times 5) + (2 \times 3)$.
- This is an example of the distributive property for multiplication over addition.

Try Another Example

- Using chips, follow the process presented in the video to show 3 sets of 2 chips and 3 sets of 4 chips as $(3 \times 2) + (3 \times 4)$.

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Numeration: Whole Numbers

Focus

- Measurement Division

Concepts To Think About

- Measurement division always asks “how many sets?”.
- An important principle of division is that each smaller set or group must have the same quantity.

Vocabulary

- Division – separating a set into smaller sets with the same quantity of objects in each set.
- Dividend – a quantity to be divided. In $c/a=b$, c is called the dividend
- Divisor – the quantity by which another quantity, the dividend, is to be divided. In $c/a=b$, a is called the divisor
- Quotient – the number obtained by dividing one quantity by another. In $c/a=b$, b is called the quotient

Tool

- colored chips

Process

- Problem: $16/8 = 2$
- The learner begins with 16 colored chips.
- To address the question “if 16 is divided so that there are 8 chips in each set, how many sets are there?”, the learner divides the chips by placing 8 chips in each set.
- This makes 2 groups with 8 chips in each set.
- This represents $16/8=2$, where 16 is the dividend; 8 is the divisor, and 2 is the quotient.
- In this example, 16 divided by 8 addresses the question of “how many sets of 8 are there in 16?”
- This is an example of measurement division.
- Measurement division always asks “how many sets?”

Try Another Example

- Using chips, follow the process presented in the video to show how many sets of 3 are in 12 as in 12 divided by 3.

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Numeration: Whole Numbers

Focus

- Partition Division

Concepts To Think About

- Partition division always asks “how many objects are there in each set?”.
- An important principle of division is that each smaller set or group must have the same quantity.

Vocabulary

- Division – separating a set into smaller sets with the same quantity of objects in each set.
- Dividend – a quantity to be divided. In $c/a=b$, c is called the dividend
- Divisor – the quantity by which another quantity, the dividend, is to be divided. In $c/a=b$, a is called the divisor
- Quotient – the number obtained by dividing one quantity by another. In $c/a=b$, b is called the quotient

Tool

- colored chips

Process

- Problem: $16/8 = 2$
- Remember that division is separating a set into smaller sets with the same number of objects in each set.
- Now the learner demonstrates partition division.
- By partitioning the 16 chips into a specified number of sets, in this case, 8, the learner is addressing the following Question: “if 16 is divided into 8 sets, how many objects are in each set?”.

Try Another Example

- Using chips, follow the process presented in the video to show 12 chips in 3 sets and find how many chips are in each set as in 12 divided by 3.