DIVISION

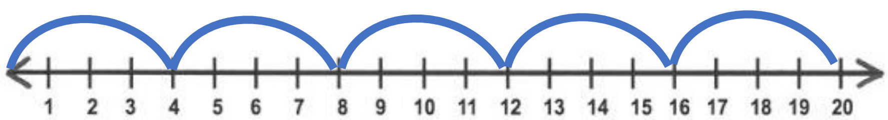
What is Division?

Division is the “inverse” of multiplication and undoes what multiplication accomplishes. Division is multifaceted and has various meanings that are equivalent. 1) Equal sharing, 2) Equal grouping, 3) Repeated subtraction, 4) Width or length of rectangle, 5) Rate.

Dividend ÷ Divisor = Quotient

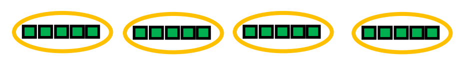
Repeat Subtraction

$20 \div 4 = 5$ is the number of times you can subtract 4 from 20.



Equal Groups

$20 \div 4 = 5$ is the number of equal groups you can make with 20 items.



Rate

$20 \div 4 = 5$ is the unit rate if 4 units make 20.

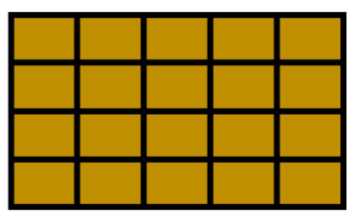
If 4 Pokémon cards costs $20, then each card costs $5.

Width/Length

$20 \div 4 = 5$ is the width of the rectangle with an area of 20 square units and a length of 4 units.

Area of 20 square units

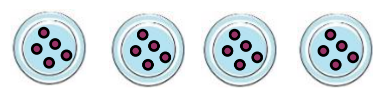
4 units long



5 units wide

Sharing

$20 \div 4 = 5$ is the amount each person will receive.



Saskatchewan CURRICULUM Education: The future within us.

Where is Division in the Sask Curriculum?

Grade Three

Demonstrate an understanding of division of whole numbers corresponding to multiplication (5x5, therefore $25 \div 5$)

Grade Four

Demonstrate an understanding of division of whole numbers with 1-digit divisor with 1-& 2-digit dividend with remainders. Ex)

Grade Five

Demonstrate an understanding of division (3-digit by 1-digit) and interpret remainders to solve problems.

Grade Six

Demonstrate an understanding of division with decimals by one-digit whole number divisor

What are the Common Properties of Division?

COMMUTATIVE

The order **does** matter when finding the quotient.

Ex) $20 \div 4 \neq 4 \div 20$

ASSOCIATIVE

The quotient **is not the same** regardless how the quantities are grouped.

Ex) $8 \div (4 \div 2) \neq (8 \div 4) \div 2$

ZERO & INDENTITY

When zero is divided by any real number, except itself, is zero. Ex) 0 ÷ 6 = 0

When a number (≠0) is divided by zero is undefined Ex) 9 ÷ 0 is undefined

Any number divided by 1 is the number being divided. Ex) 38 ÷ 1 = 38

Strategies vs Models

Strategies and models are not the same thing when solving a math problem. When we solve problems mentally, we need a way to show others how we solved the problem which we do through models.

A **strategy** is how you solve the problem.

A **model** is how you show the problem or your strategy.

For example, I may use a multiplying up strategy (p.4) to multiply two numbers mentally and model my strategy using an area model.

What are the Common Strategies of Division?

The order and sequence of the following strategies is not how they should be introduced or instructed to children. This is to show you the various strategies all at once to help you identify the method in which your child might be solving their problem and give you some familiarity with it so you can talk with your child about their strategy.

The division strategies below should be taught through the Concrete - Representational - Abstract, which allows students to build conceptual understanding first through concrete manipulatives, then drawings and representations and finally with abstract numbers. Skipping these steps and moving quickly to rote memorization will result in students having procedural understanding of subtraction which may result in coming to the correct answer, however the student will be unable to be flexible and efficient in transferring their understanding to other problems.

There is no expectation that your child will use or learn all the strategies below but rather should be exposed to a variety of strategies that they understand and can use depending on the situation.

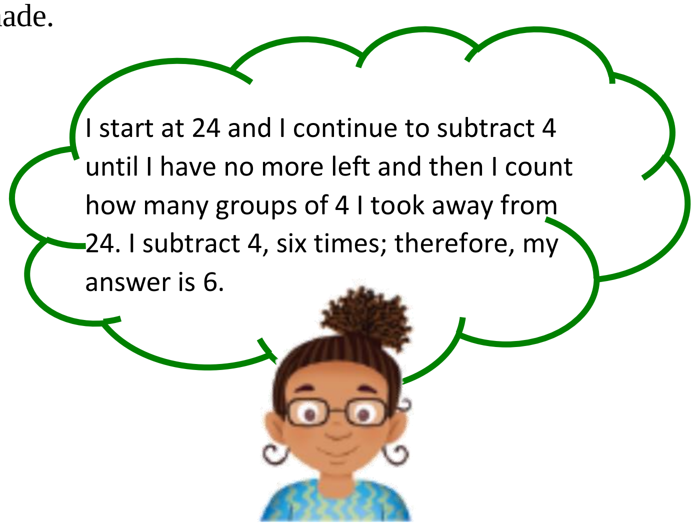
Single-Digit Division

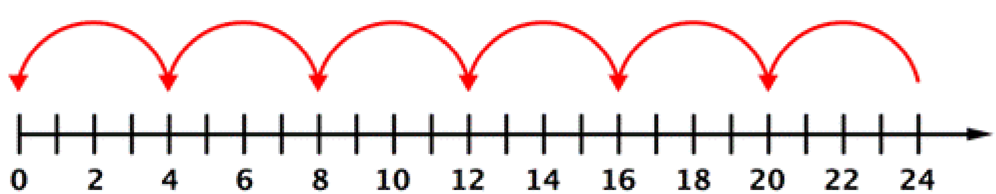
Repeated Subtraction

Students use this strategy when they are initially learning about division through story-problems. Students use this strategy when they know the size of the group and are trying to find out how many groups of a certain quantity can be made.

Example: 24 ÷ 4

$$\begin{array}{r} 24 \\ -\ 4 \\ \hline 20 \\ -\ 4 \\ \hline 16 \\ -\ 4 \\ \hline 12 \\ -\ 4 \\ \hline 8 \\ -\ 4 \\ \hline 4 \\ -\ 4 \\ \hline 0 \end{array}$$



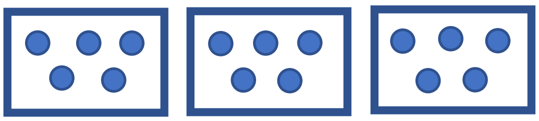


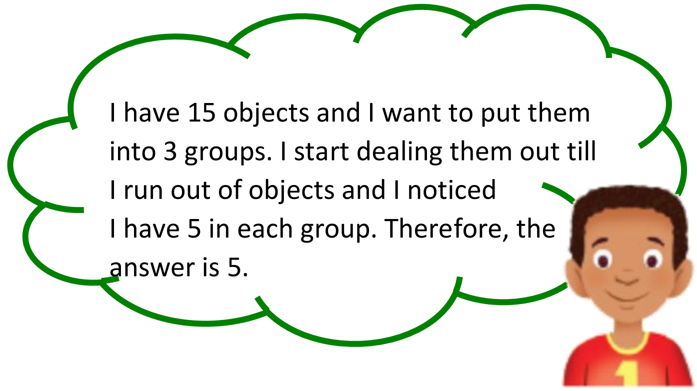
Division

Fair Share

Students use this strategy when they are in the early stages of understanding division and multiplication. Students associate the divisor with the number of groups between which the dividend (total/whole) is being shared.

Example: $15 \div 3$





<u>Multi-Digit Division</u>

Multiplying Up

Students build on their strength of multiplication and understanding of the relationship between multiplication and division. This strategy will become more efficient as students use larger factors which will result in less steps.

Example: $338 \div 13$

$10 \times 13 = 130$

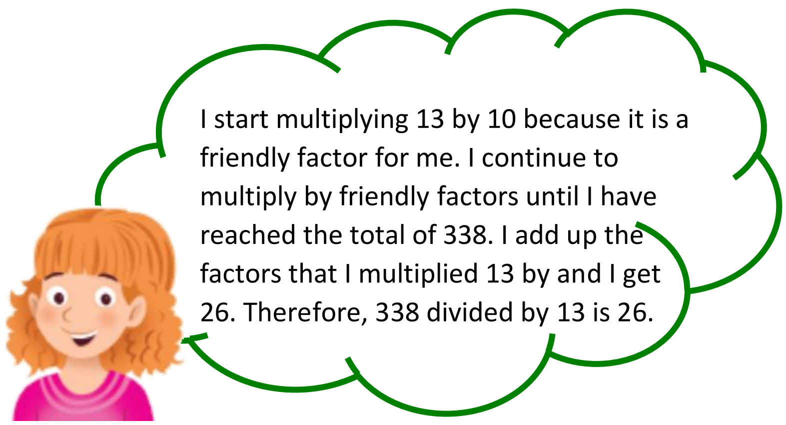
$10 \times 13 = 130$

$5 \times 13 = 65$

$1 \times 13 = 13$

$10 + 10 + 5 + 1 = 26$

$26 \times 13 = 338$



	10	**10**	**5**	**1**
13	$13 \times 10 = 130$	$13 \times 10 = 130$	$13 \times 5 = 65$	$13 \times 1 = 13$

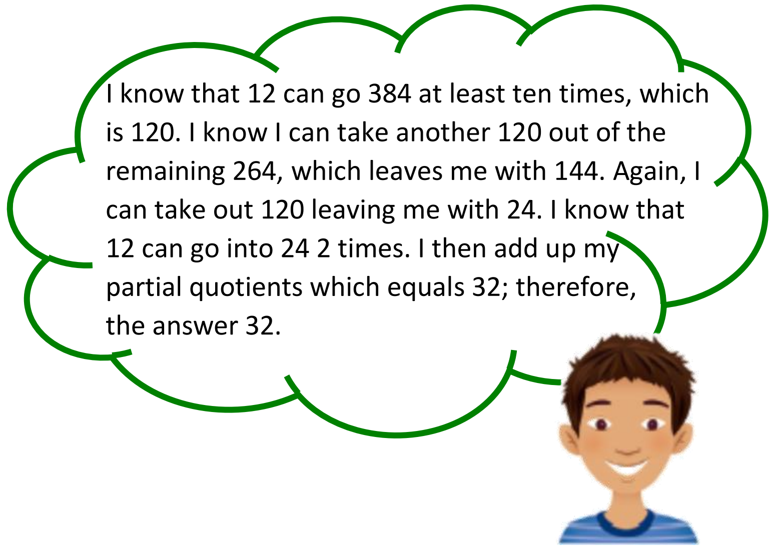
Division

Partial Quotients

Similar to the strategy of partial products in multiplication, this strategy maintains place value. Students can use friendly multipliers as they work toward the quotient. The strategy becomes more efficient as students choose larger multipliers.

Example: $384 \div 12$

$$\begin{array}{r|l} 12\overline{)384} & \\ -120 & 10 \\ \hline 264 & \\ -120 & 10 \\ \hline 144 & \\ -120 & 10 \\ \hline 24 & \\ -\ 24 & 2 \\ \hline 0 & \end{array} \Bigg\} \quad 32$$



Proportional Reasoning

Students may use if they have experience with doubling and halving with multiplication. Students can divide the dividend and divisor by the same amount to make a simpler problem. As student gain experience with factors, multiples and fractional reasoning they may use this strategy. Students can become more efficient at this strategy using larger factors to turn the question into a simpler problem for themselves.

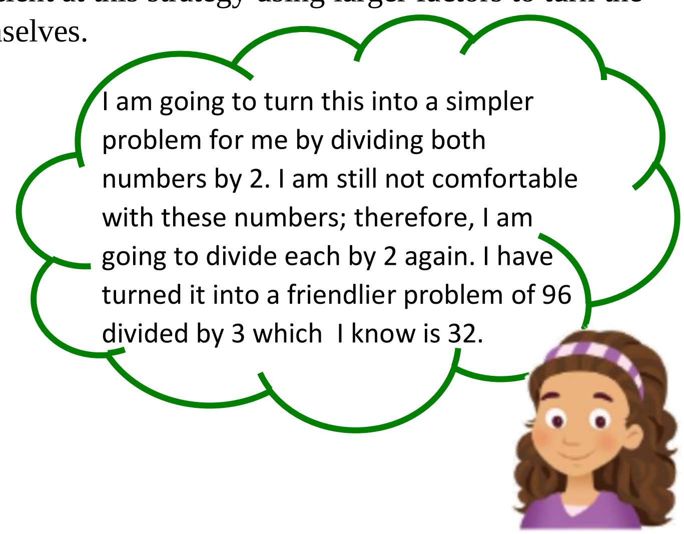
Example: $384 \div 12$

$384 \div 12$

$\div 2 \quad \div 2$

$192 \div 6$

$192 \div 6$
$\div 2 \quad \div 2$
$96 \div 3$



$96 \div 3 = 32$

$192 \div 6 = 32$

$384 \div 12 = 32$

$$\frac{384}{12} = \frac{192}{6} = \frac{96}{3}$$

Standard Algorithm

Students work from the left to right determining how many times the divisor goes into the dividend. Students will turn these multi-digit division problems one- or two-digit division problems. Students need to keep in mind the place value of each digit as they divide throughout the algorithm. When asked to explain their strategy, they can explain using correct language and understanding.

Example: $384 \div 12$

$$\begin{array}{r} 32 \\ 12\overline{)384} \\ -36 \\ \hline 24 \\ -24 \\ \hline 0 \end{array}$$