With Leaps and Bounds, mathematics is as easy as 1, 2, 3!

Step 1: Administer the diagnostic assessment

Step 2: Select the intervention pathway

Step 3: Choose an open-ended intervention or guided intervention based on your students' learning preferences or your instructional situation
Contents

Strand: Number

Use the Diagnostic Tool in the Teacher’s Resource to determine the most appropriate pathway for each student for each topic.

Representing Whole Numbers
- Pathway 1: Representing Numbers to 100 000 (Open-ended 1, Guided 2)
- Pathway 2: Representing Numbers to 10 000 (Open-ended 6, Guided 7)
- Pathway 3: Representing Numbers to 1000 (Open-ended 11, Guided 12)
- Pathway 4: Multiplying and Dividing by 10s (Open-ended 16, Guided 17)

Comparing Whole Numbers
- Pathway 1: Comparing Numbers to 100 000 (Open-ended 21, Guided 22)
- Pathway 2: Comparing Numbers to 10 000 (Open-ended 26, Guided 27)
- Pathway 3: Comparing Numbers to 1000 (Open-ended 31, Guided 32)

Adding and Subtracting
- Pathway 1: Different Numbers of Digits (Open-ended 36, Guided 37)
- Pathway 2: Same Number of Digits (Open-ended 41, Guided 43)
- Pathway 3: Using Mental Math to Subtract (Open-ended 47, Guided 48)
- Pathway 4: Using Mental Math to Add (Open-ended 51, Guided 52)

Multiplying Whole Numbers
- Pathway 1: Multiplying Two-Digit Numbers (Open-ended 55, Guided 56)
- Pathway 2: Multiplying by One-Digit Numbers (Open-ended 60, Guided 61)
- Pathway 3: Multiplication Fact Strategies (Open-ended 65, Guided 66)

Dividing Whole Numbers
- Pathway 1: Dividing Three-Digit Numbers (Open-ended 70, Guided 71)
- Pathway 2: Dividing Two-Digit Numbers (Open-ended 75, Guided 76)
- Pathway 3: Division Fact Strategies (Open-ended 80, Guided 81)
- Pathway 1: Division Situations (Open-ended 85, Guided 86)

Relating Situations to Operations
- Pathway 2: Multiplication Situations (Open-ended 89, Guided 90)
- Pathway 3: Subtraction Situations (Open-ended 93, Guided 94)
Representing Fractions
- Pathway 1: Improper Fractions: Parts of Sets
  - Open-ended
  - Guided
- Pathway 2: Improper Fractions: Parts of Wholes
  - Open-ended
  - Guided
- Pathway 3: Proper Fractions: Parts of Sets
  - Open-ended
  - Guided
- Pathway 4: Proper Fractions: Parts of Wholes
  - Open-ended
  - Guided

Comparing Fractions
- Pathway 1: Fractions More and Less Than 1
  - Open-ended
  - Guided
- Pathway 2: Equivalent Fractions
  - Open-ended
  - Guided
- Pathway 3: Comparing: Same Numerators
  - Open-ended
  - Guided
- Pathway 4: Comparing: Same Denominators
  - Open-ended
  - Guided
- Pathway 5: Comparing Fractions to $\frac{1}{2}$ and 1
  - Open-ended
  - Guided

Representing Decimals
- Pathway 1: Representing Thousandths
  - Open-ended
  - Guided
- Pathway 2: Representing Hundredths
  - Open-ended
  - Guided
- Pathway 3: Representing Tenths
  - Open-ended
  - Guided

Comparing Decimals
- Pathway 1: Comparing Mixed Decimals
  - Open-ended
  - Guided
- Pathway 2: Comparing Thousandths
  - Open-ended
  - Guided
- Pathway 3: Comparing Tenths and Hundredths
  - Open-ended
  - Guided

Decimal Computation
- Pathway 1: Multiply and Divide by 10 or 100
  - Open-ended
  - Guided
- Pathway 2: Add and Subtract to Thousandths
  - Open-ended
  - Guided
- Pathway 3: Add and Subtract Thousandths
  - Open-ended
  - Guided
- Pathway 4: Add and Subtract to Hundredths
  - Open-ended
  - Guided
- Pathway 5: Add and Subtract Tenths or Hundredths
  - Open-ended
  - Guided
**Strand: Patterns and Algebra**

Use the Diagnostic Tool in the Teacher’s Resource to determine the most appropriate pathway for each student for each topic.

*Patterns*
- Pathway 1: Using Pattern Rules
- Pathway 2: Growing and Shrinking Patterns
- Pathway 3: Repeating Patterns

*Equality*
- Pathway 1: Using Algebra
- Pathway 2: Solving Equations

**Strand: Geometry**

Use the Diagnostic Tool in the Teacher’s Resource to determine the most appropriate pathway for each student for each topic.

*3-D Shapes*
- Pathway 1: Modelling with Nets
- Pathway 2: Modelling with Skeletons
- Pathway 3: Modelling with Solid Shapes

*2-D Shapes*
- Pathway 1: Classifying Triangles
- Pathway 2: Classifying Quadrilaterals
- Pathway 3: Line Symmetry

*Location and Movement*
- Pathway 1: Using Cardinal Directions on Grids
- Pathway 2: Locating Objects on Grids

*Transformations*
- Pathway 1: Single Rotations
- Pathway 2: Multiple Reflections
- Pathway 3: Multiple Translations
- Pathway 4: Single Reflections and Translations

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Leaps and Bounds

Contents
Strand: Measurement

Use the Diagnostic Tool in the Teacher’s Resource to determine the most appropriate pathway for each student for each topic.
**Strand: Data Management**

Use the Diagnostic Tool in the Teacher’s Resource to determine the most appropriate pathway for each student for each topic.

### Summarizing Data
- Pathway 1:
  - Data: Using the Mean
  - Open-ended
  - Guided
- Pathway 2:
  - Data: Using the Median and Mode
  - Open-ended
  - Guided

### Displaying Data
- Pathway 1:
  - Data: Using Broken-Line Graphs
  - Open-ended
  - Guided
- Pathway 2:
  - Data: Using Stem-and-Leaf Plots
  - Open-ended
  - Guided
- Pathway 3:
  - Data: Using Double Bar Graphs
  - Open-ended
  - Guided
- Pathway 4:
  - Data: Using Line Plots
  - Open-ended
  - Guided

### Probability
- Pathway 1:
  - Probability: Using Numbers
  - Open-ended
  - Guided
- Pathway 2:
  - Probability: Using Words
  - Open-ended
  - Guided

### Glossary

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Leaps and Bounds  
Contents
Raven is arranging books on bookshelves. She has to put between 30 and 90 books on each shelf. There are about 3000 books altogether.

- How many shelves can Raven fill if each shelf has the same number of books?
  - How many books are on each shelf?
  - How many books altogether are on the shelves?

Think of as many solutions as you can. Explain how you chose your numbers and how you did some of your calculations.

You will need
- base ten blocks

You will need
- base ten blocks
You will need
• base ten blocks

Sarah has 12 boxes of baking cups.
Each box holds 24 cups.
You can multiply using a variety of strategies
to figure out the total number of baking cups.

• You can use a doubling strategy.
  For example, figure out the number of cups in 6 boxes. Then double the product.
  \[
  6 \times 24 = 144, \quad \text{so} \quad 12 \times 24 = 2 \times 144 = 288
  \]

• You can separate the tens and ones.
  For example, think of 12 as 10 + 2.
  There are 10 \times 24 = 240 baking cups in 10 boxes.
  There are 2 \times 24 = 48 baking cups in 2 boxes.
  \[
  240 + 48 = 288 \text{ baking cups altogether.}
  \]

• You can use an array.
  Imagine the baking cups in an array.
  Use base ten blocks to represent the array.
  12 rows of 24 looks like this:

  \[
  \begin{array}{c}
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \text{24 Baking Cups} \\
  \end{array}
  \]

  There are 2 hundreds, 8 tens, and 8 ones.
  That is 288.
  \[
  24 \times 12 = 288
  \]
  The 2 hundreds come from 10 \times 20.
  The 8 tens come from 10 \times 4 and 2 \times 20.
  The 8 ones come from 2 \times 4.
  \[
  \begin{align*}
  200 (10 \times 20) & \\
  40 (10 \times 4) & \\
  40 (2 \times 20) & \\
  8 (2 \times 4) & \\
  \hline
  288 & \\
  \end{align*}
  \]

• Which strategy makes the most sense to you? Why?
Try These

1. Write the multiplication expression that goes with each model. One expression has no match.

\[
\begin{align*}
34 \times 15 & \quad 23 \times 34 & \quad 52 \times 41 & \quad 18 \times 28 & \quad 32 \times 43 \\
34 \times 15 & \quad 23 \times 34 & \quad 52 \times 41 & \quad 18 \times 28 & \quad 32 \times 43 \\
\end{align*}
\]

a) \[\square\] \quad c) \[\square\]

b) \[\square\] \quad d) \[\square\]

2. Draw a line to match each multiplication expression with a description of how to complete it.

\[
\begin{align*}
23 \times 26 & \quad 30 \times 60 + 2 \times 60 + 2 \times 30 + 2 \times 2 \\
32 \times 62 & \quad 30 \times 20 + 6 \times 30 + 2 \times 20 + 2 \times 6 \\
63 \times 22 & \quad 20 \times 20 + 3 \times 20 + 6 \times 20 + 3 \times 6 \\
32 \times 26 & \quad 20 \times 60 + 3 \times 20 + 2 \times 60 + 3 \times 2 \\
\end{align*}
\]

3. Estimate. Your estimates should have 0s in the ones and tens digits.

a) \(53 \times \$47\) is about \[\square\]

b) \(29 \times \$37\) is about \[\square\]

c) \(62 \times \$13\) is about \[\square\]

d) \(72 \times \$22\) is about \[\square\]
4. Calculate the total number. Show your thinking.
   
   a) 12 boxes with 15 pencils in each box

   b) 22 piles with three $5 bills and 1 loonie in each pile

   c) 14 hours of work earning $14 each hour

   d) 18 classes with 24 students in each class

5. Calculate.
   
   a) \[ \begin{array}{c}
   43 \\
   \times 32
   \end{array} \]
   
   c) \[ \begin{array}{c}
   29 \\
   \times 37
   \end{array} \]

   b) \[ \begin{array}{c}
   43 \\
   \times 61
   \end{array} \]
   
   d) \[ \begin{array}{c}
   17 \\
   \times 72
   \end{array} \]
6. Draw a picture or use words to show that 
\[ 38 \times 25 = 19 \times 50. \]

7. Omar multiplied 2 two-digit numbers and got a product close to 2500. What numbers might he have multiplied? Show 2 solutions.

8. a) Use the digits 1, 5, 7, and 9 in the blanks to create the greatest product you can. Calculate the product.

\[
\begin{array}{c}
\square \square \\
\times \quad \square \square \\
\end{array}
\]

\[ = \quad \square \square \square \square \square \square \]

b) Use the digits 1, 5, 7, and 9 in the blanks to create the least product you can. Calculate the product.

\[
\begin{array}{c}
\square \square \\
\times \quad \square \square \\
\end{array}
\]

\[ = \quad \square \square \square \square \square \square \]

FYI
It is a good idea to understand that you can break up numbers in different ways to multiply them.
A truck can hold up to 3000 kg in a load of crates. In each load, all the crates have the same mass.

• If the truck loads fewer than 10 crates and the total mass is almost 3000 kg, what masses might the crates have?

Think of as many solutions as you can. Explain how you chose your numbers and how you did some of your calculations.
Multiplying by One-Digit Numbers

Thomas bought 3 bags of trail mix. Each bag had a mass of 224 g. You can use a variety of strategies to figure out the total number of grams.

You will need
• base ten blocks

• You can calculate the product using repeated addition.
There are 3 groups of 224.
\[224 + 224 + 224 = 672\]
So \(3 \times 224 = 672\)

• You can multiply using repeated addition in parts.
Think of each group of 224 as
\[224 \times 3\]
2 hundreds + 2 tens + 4 ones.
3 groups of 2 hundreds \[\frac{600}{3 \times 200}\]
3 groups of 2 tens \[\frac{60}{3 \times 20}\]
3 groups of 4 ones \[\frac{12}{3 \times 4}\]
6 hundreds + 6 tens + 12 ones = 672

• You can multiply using base ten blocks.
Model the numbers using base ten blocks and count the total.

6 hundreds + 6 tens + 12 ones = 672

• Which strategy do you prefer? Why?
Try These

1. Write the multiplication expression that goes with each model. One expression has no match.

\[ 5 \times 234 \quad 3 \times 34 \quad 5 \times 41 \quad 8 \times 248 \quad 3 \times 43 \]

a) [Diagram of model a]

b) [Diagram of model b]

c) [Diagram of model c]

d) [Diagram of model d]

2. Draw pictures to show that \( 4 \times 10 = 40 \) and \( 4 \times 100 = 400 \).
3. Draw a line to match each multiplication expression with a description of how to complete it.

- $7 \times 26 \quad 2 \times 400 + 2 \times 70 + 2 \times 2$
- $5 \times 362 \quad 7 \times 20 + 7 \times 6$
- $2 \times 472 \quad 7 \times 50 + 7 \times 2$
- $7 \times 52 \quad 5 \times 300 + 5 \times 60 + 5 \times 2$

4. Estimate. Your estimates should have 0s in the ones digits.

   a) $5 \times $47 is about ______________$
   
   b) $4 \times $37 is about ______________$
   
   c) $6 \times $213 is about ______________$
   
   d) $7 \times $822 is about ______________$

5. Calculate the total number or cost. Show your thinking.

   a) 5 shirts that cost $16 each

   b) 8 books with 18 pages per book

   c) 6 video game consoles that cost $289 each
6. Calculate.
   a) \[ \begin{array}{c}
   41 \\
   \times 5
   \end{array} \]
   c) \[ \begin{array}{c}
   362 \\
   \times 7
   \end{array} \]
   b) \[ \begin{array}{c}
   37 \\
   \times 4
   \end{array} \]
   d) \[ \begin{array}{c}
   213 \\
   \times 6
   \end{array} \]

7. Draw a picture or use words to show that \( 8 \times 28 \) is double \( 4 \times 28 \).

8. Edwin multiplied 2 numbers and got a product close to 250. What numbers might he have multiplied? Show 3 solutions.

9. Use the digits 5, 7, and 9 in the blanks to create the greatest product you can. Calculate the product.
   \[ \begin{array}{c}
   \underline{\phantom{579}} \\
   \times \underline{\phantom{579}} = \underline{\phantom{579}}
   \end{array} \]

   FYI
   It is a good idea to understand that you can break up numbers in different ways to multiply them.
Ariana says that if you know how to multiply by 2 and by 5, you can figure out any multiplication fact.

• Use pictures, numbers, and/or words to explain why Ariana is right.

• Make up your own sentence:
If you know how to multiply by ______ and by _______, you can figure out any multiplication fact.

Use at least one number that is different from Ariana’s. Explain your thinking.

If you know how to multiply by 2 and by 5, you can figure out any multiplication fact.
Suppose you are setting up tables and chairs for a dinner. You can use 9 tables, but you don’t have to use all of them. Each table can have up to 9 chairs. The same number of chairs should be at each table.

You can use **multiplication fact** strategies to figure out the total number of seats for different numbers of tables and chairs.

- You can multiply using a doubling strategy.

  Use what you know about multiplying by 2 (doubling). Since \(2 \times 7 = 14\), 2 tables of 7 can seat \(7 + 7 = 14\).

  \[
  4 \times 7 \text{ is double } 2 \times 7. \\
  14 + 14 = 28
  
  4 \text{ tables of } 7 \text{ can seat } 28 \text{ people.}
  
  8 \times 7 \text{ is double } 4 \times 7. \\
  28 + 28 = 56
  
  8 \text{ tables of } 7 \text{ can seat } 56 \text{ people.}
  
**multiplication fact**

a statement that shows the product of 2 one-digit numbers
e.g., \(8 \times 4 = 32\)

**product**

the result when you multiply

\(3 \times 4 = 12 \leftarrow \text{ product}\)
You can use a skip-counting strategy.
For example, use what you know about multiplying by 5. You say 5, 10, 15, 20, 25, 30, 35, 40, 45 when you count by 5s. So 9 tables with 5 people at each table can seat 45 people (the 9th number you say).

• You can multiply in parts.
For example, if there are 6 tables of 8 people, you can think $5 \times 8 = 40$ and another 8 makes 48.

You can also think of $3 \times 8$ first.

$3 \times 8 = 2 \times 8 + 1 \times 8$

$= 16 + 8$

$= 24$

$6 \times 8$ is twice as much as $3 \times 8$.

$24 + 24 = 48$

Try These

1. 3 tables with 6 chairs seat 18 people.
That means $3 \times 6 = 18$.
How can you use that fact to complete each product?

a) $6 \times 6$

b) $7 \times 6$

c) $5 \times 6$

d) $9 \times 6$
2. How can you use $4 \times 9 = 36$ to complete each product?

a) $2 \times 9$

b) $6 \times 9$

c) $4 \times 8$

d) $5 \times 9$

3. List the multiplication facts for each product.
Remember, multiplication facts are one-digit numbers multiplied by one-digit numbers.

a) $24$

b) $48$

c) $36$

4. What is a good strategy for each situation?

a) multiplying by 3

b) multiplying by 6

c) multiplying by 7

FYI

Sometimes it is a lot faster to multiply in your head than to use a calculator or pencil and paper.
Mental math also helps you check answers you get on a calculator to see if they make sense.
5. Draw a picture to show why each statement is true.
   a) $4 \times 5$ is twice as much as $2 \times 5$.

   b) $3 \times 7$ is 7 more than $2 \times 7$.

   c) $8 \times 9$ is 8 less than $8 \times 10$.

6. a) Fill in the blanks to make the sentence true. Explain your thinking.
    
    If you can multiply by ________, it is really easy to multiply by ________ because _________________________.

   b) Fill in the blanks in a different way. Explain your thinking.
    
    If you can multiply by ________, it is really easy to multiply by ________ because _________________________.

Julia was dividing some comic books into equal piles. There were more than 100 but fewer than 1000 comic books. She could make anywhere between 2 and 9 piles.

- **Step 1:** Choose a number of comic books. Then choose a number of piles to divide them into.

- **Step 2:** Predict how many comic books will be in each pile if the pile sizes are about equal. Then calculate the number of comic books in each pile. Explain your thinking.

- **Step 3:** Repeat Step 1 and Step 2 for a different number of piles.

- **Step 4:** Repeat Step 1 to Step 3 for different numbers of comic books.

You will need

- base ten blocks
The students in Zara’s class raised $457 for 3 charities. They want to give each charity the same amount.

You can divide using different strategies to figure out the amount for each charity.

• Estimate the quotient first.

It has to be more than $100 because $3 \times 100$ is only $300$.

• You can divide using your estimate and then adjust it.

Choose an amount each charity could get.

Then figure out how much money is left and share that amount.

For example, suppose you chose $100$ for each charity.

$3 \times 100 = 300$

$457 - 300 = 157$

There is still $157$ left to share.

If you gave each charity $50$ more, that would use $3 \times 50 = 150$.

$157 - 150 = 7$, so there is $7$ left.

$3 \times 2 = 6$. Each charity can get $2$ more.

Each charity gets $100 + 50 + 2 = 152$.

There is a $1$ remainder.

• You can divide in parts.

For example, break up 457 into numbers that are easy to divide by 3. Then divide each part of the number.

$457 = 300 + 60 + 60 + 30 + 7$

$457 \div 3 = 300 \div 3 + 60 \div 3 + 60 \div 3 + 30 \div 3 + 6 \div 3 + 1$

$= 100 + 20 + 20 + 10 + 2 + 1$

$= 152$ R1 (R1 means remainder 1.)

$3 \div 457$ is $3 \div 300 + 60 + 60 + 30 + 6 + 1$
You can divide using base ten blocks. Model 457 with base ten blocks. Then share the blocks equally into 3 piles. The number in 1 pile is the amount each charity gets.

For example, put 1 hundreds block in each circle. Trade the leftover hundreds block for 10 tens. Now there are 15 tens. Put 5 in each circle. There are still 7 ones. Put 2 in each circle. There is 1 ones block left over.

$457 \div 3 = 152 \text{ R}1$

Each charity gets $152.

Try These
1. Write the division expression that goes with each model. One expression has no match.
   $243 \div 3 \quad 465 \div 3 \quad 243 \div 5 \quad 465 \div 4$

   a) 
   b) 
   c)
2. Draw a line to match each division expression with a description of how you could complete it.

\[
\begin{align*}
276 \div 3 & \quad 300 \div 5 + 50 \div 5 + 48 \div 5 \\
398 \div 5 & \quad 240 \div 3 + 30 \div 3 + 6 \div 3 \\
153 \div 2 & \quad 360 \div 6 + 120 \div 6 + 10 \div 6 \\
490 \div 6 & \quad 140 \div 2 + 13 \div 2
\end{align*}
\]

3. Estimate. Your estimate should have a 0 in the ones place.

a) \(850 \div 4\) is about 

b) \(884 \div 7\) is about 

c) \(295 \div 3\) is about 

d) \(708 \div 9\) is about 

4. Calculate the size of each group and the remainder (if there is one). The objects are shared equally. Show your thinking.

a) 520 cards shared by 4 people

b) $485 shared among 6 people

c) 494 cookies on 8 trays
5. Calculate.

a) \(4 \div 563\)  

b) \(6 \div 372\)  

c) \(3 \div 965\)  

d) \(5 \div 265\)

6. What are some numbers that could be used to complete this sentence?

\[\_\_\_\_\_\_\_ \div \_\_\_\_ = 94\]

7. Rashid divided a three-digit number by a one-digit number. The remainder was 4.

\[\_\_\_\_\_\_\_ \div \_\_\_\_ = \_\_\_\_ \text{ R4}\]

What might he have divided?

 Different division strategies can be used in different situations to make dividing easier.

FYI
Evan delivers newspapers on Saturday mornings. He has more than 40 papers to deliver, but fewer than 100. Sometimes 1 friend helps him. Sometimes as many as 5 friends help.

- **Step 1:** Choose a number of papers for Evan to deliver. Then choose the number of friends who will help.

- **Step 2:** Predict the number of papers each person will deliver if they each deliver about the same number. Be sure to include Evan. Then calculate the number of papers each friend will deliver. Explain your thinking.

- **Step 3:** Repeat Step 1 and Step 2 for a different number of friends.

- **Step 4:** Repeat Step 1 through Step 3 for different numbers of papers.

---

**You will need**

- base ten blocks or counters and 10-frames (BLM 5)
Guided

There are 72 mittens in a pile.

You can divide using different strategies to figure out the number of pairs of mittens.

• You can estimate first.

How do you know there are more than 30 pairs?
2 \times 30 = 60, and 72 is more than 60.

• You can divide by using an estimate and then adjusting it.

Choose a number of pairs.
Figure out the number of mittens left.
Then decide how many more pairs you need.

For example, suppose you chose 30 pairs.

\[
\begin{align*}
2 \times 30 &= 60 \text{ mittens} \\
72 - 60 &= 12 \\
\text{There are still 12 mittens left.} \\
12 \div 2 &= 6 \text{ pairs}
\end{align*}
\]

There are \(30 + 6 = 36\) pairs of mittens.

• You can divide in parts.

\[
\begin{align*}
72 &= 60 + 12 \\
72 \div 2 &= 60 \div 2 + 12 \div 2 \\
&= 30 + 6 \\
&= 36
\end{align*}
\]

\[
2 \overline{)72} \quad \text{is} \quad 2 \overline{)60 + 12}
\]

Remember

• You can check division by multiplying.
E.g., \(64 \div 4 = 16\), since \(4 \times 16 = 64\).
There are 72 mittens in a pile.

You can divide using different strategies to figure out the number of pairs of mittens.

• You can estimate first. How do you know there are more than 30 pairs? 2
  3
  30 is 60, and 72 is more than 60.

• You can divide by using an estimate and then adjusting it. Choose a number of pairs. Figure out the number of mittens left. Then decide how many more pairs you need. For example, suppose you chose 30 pairs.

  2
  3
  30
  5
  60 mittens

  2
  3
  72
  4
  2
  6
  5

  There are still 1 2 mittens left.

  4
  2
  5
  6 pairs

  There are 30 1 6 5 36 pairs of mittens.

• You can divide in parts.

  72
  5
  60
  1
  1
  2

• Sometimes there is a remainder after you make your equal groups.

  For example, 73 ÷ 2 = 36 + Remainder 1 That is because there are not enough mittens to make another pair.

Try These

1. Write the division expression that goes with each model. One expression has no match.

  91 ÷ 5  65 ÷ 5  85 ÷ 5  85 ÷ 7  84 ÷ 6

a) __________________

b) __________________

c) __________________

d) __________________

remainder the amount left over after a number is divided into a whole number of equal parts e.g., 44 ÷ 7 = 6 Remainder 2
2. Draw a line to match each division expression with a description of how you could complete it.

\[
\begin{align*}
76 \div 4 &\quad 40 \div 4 + 13 \div 4 \\
98 \div 6 &\quad 40 \div 4 + 36 \div 4 \\
53 \div 4 &\quad 30 \div 6 + 60 \div 6 \\
90 \div 6 &\quad 60 \div 6 + 38 \div 6
\end{align*}
\]

3. Estimate.

a) \(50 \div 4\) is about \underline{_______}  

b) \(84 \div 7\) is about \underline{_______}  

c) \(95 \div 3\) is about \underline{_______}  

d) \(98 \div 9\) is about \underline{_______}

4. Calculate the size of each pile and the remainder (if there is one). The objects are shared equally. Show your thinking.

a) 88 pencils in 4 piles

b) 80 pennies in 6 piles

c) 95 photos in 5 piles

d) 94 cookies on 7 trays
5. Calculate.

   a) \(3 \div 52\)          c) \(2 \div 56\)

   b) \(4 \div 98\)          d) \(7 \div 91\)

6. Draw a picture to show that \(64 \div 4\) is twice as much as \(64 \div 8\).

7. What are some numbers that can be used to complete this sentence?
   \(\square \div \square = 14\)

8. Nabil divided a two-digit number by a one-digit number. The remainder was 4. \(\square \div \square = \square \text{ R} 4\)
   What might he have divided?
Grace says you can use a multiplication table to figure out answers to a lot of division questions.

For example, you can figure out how to share 24 granola bars among different numbers of students by looking for 24 in the multiplication table.

• How can you use the multiplication table to share 24?
  Give as many examples as you can.

• How can you use the table to divide 26 by a number?

• What other quotients can you use the table to figure out?
Devon has $47 to buy 5 presents for his friends. He wants to spend the same amount on each present. You can divide using different strategies to figure out the amount for each present.

- You can divide using counters.
  For example, make 5 equal piles of counters. Keep putting the same number of counters in each pile until all 47 counters are used up.

\[
\begin{align*}
47 \div 5 &= 9 \text{ Remainder } 2, \text{ or } R2 \\
\text{Devon has } $9 \text{ for each present. He will have } $2 \text{ left over.}
\end{align*}
\]

- You can divide by choosing an estimate and then adjusting it.
  For example, suppose you choose $5 for each present.
  \[
  5 \times $5 = $25 \\
  $47 = $25 + $22 \\
  \text{There is } $22 \text{ left to spend.}
  \]
  If you use $4 more for each present, you will spend
  \[
  5 \times $4 = $20 \text{ more.} \\
  $5 + $4 = $9
  \]
  So each present could cost $9 and Devon would have $2 left over.

Remember

- Sometimes there is an amount left over when you divide. Write R to show the remainder. e.g., \( 13 \div 4 = 3 \text{ R1} \) means that there is a remainder of 1 when you share 13 among 4 people.
• You can divide using backwards multiplication.

If you figure out $5 \times \square = 47$, you will have the answer.
Since 5 tens is 50, you know the answer is a little less than 10.

$5 \times 9 = 45$
$47 - 45 = 2$
So each present could cost $9, and Devon would have $2 left over.

**Try These**

1. Solve each sharing problem. Explain your thinking.
   
   a) 6 people are sharing $36.

   b) 7 people are sharing $28.

   c) 9 people are sharing $45.
2. Use counters to divide. Sketch a picture of your counters.

a) \( 36 \div 9 = \underline{\phantom{0}} \)

b) \( 44 \div 7 = \underline{\phantom{0}} \)

c) \( 59 \div 8 = \underline{\phantom{0}} \)

3. How can you use \( 5 \times 6 = 30 \) to complete each equation?

a) \( 30 \div 5 = \underline{\phantom{0}} \)

b) \( 31 \div 5 = \underline{\phantom{0}} \)
4. Calculate.
   a) $54 \div 6 = \underline{\phantom{000}}$
   d) $29 \div 7 = \underline{\phantom{000}}$
   b) $63 \div 9 = \underline{\phantom{000}}$
   e) $46 \div 5 = \underline{\phantom{000}}$
   c) $38 \div 6 = \underline{\phantom{000}}$
   f) $83 \div 9 = \underline{\phantom{000}}$

5. Draw a picture to show that each statement is true.
   a) $42 \div 6$ is the same as $30 \div 6 + 12 \div 6$.

   b) $54 \div 9$ is double $27 \div 9$.

6. a) Fill in the blanks to make the sentence true. Explain your thinking.
   If you know how to multiply one-digit numbers by ________,
   it is easy to figure out questions like $26 \div \underline{\phantom{000}}$.

   b) Fill in the blanks a different way. Explain your thinking.
   If you know how to multiply one-digit numbers by ________,
   it is easy to figure out questions like $26 \div \underline{\phantom{000}}$.

   FYI
   You can use different division strategies depending on the situation.
4. Calculate.
   a) ______
   b) ______
   c) ______
   d) ______
   e) ______
   f) ______

5. Draw a picture to show that each statement is true.
   a) 42 ______
   b) 54 ______

6. a) Fill in the blanks to make the sentence true.
   Explain your thinking.
   If you know how to multiply one-digit numbers by ________,
   it is easy to figure out questions like 26 ________.

   b) Fill in the blanks a different way.
   Explain your thinking.
   If you know how to multiply one-digit numbers by ________,
   it is easy to figure out questions like 26 ________.
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