

9

# Dividing by changing both numbers

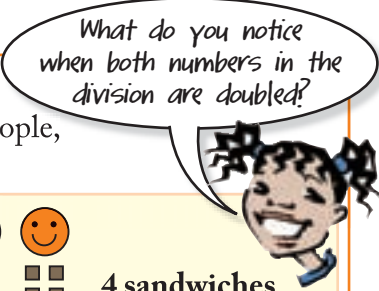
We are learning to solve division problems by changing them to simpler problems that have the same answer.



Counters, a calculator.

**Example**

Sam takes lots of sandwiches on a picnic. If there are 48 sandwiches to share with 12 people, how many does each person get?



4 sandwiches

How many sandwiches does he need for 24 people to share if they are to all get 4 sandwiches too?

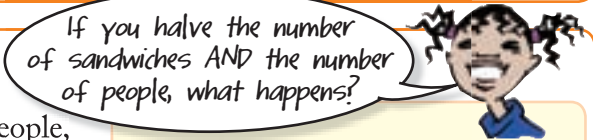


$$\begin{array}{r}
 48 \div 12 = 4 \\
 \downarrow \quad \downarrow \\
 \text{Double the} \quad \text{Double the} \quad \text{Get the same} \\
 \text{number of} \quad \text{number of} \quad \text{number of} \\
 \text{sandwiches} \quad \text{people} \quad \text{sandwiches each} \\
 \downarrow \quad \downarrow \\
 96 \div 24 = 4
 \end{array}$$

He would need **96** sandwiches.

**Example**

- a If 48 sandwiches were shared with 12 people, how many did each person get?
- b What if 24 sandwiches were shared with six people? How many did each person get?
- c What if 12 sandwiches were shared with three people? How many did each person get?




$$\begin{array}{l}
 \text{a } 48 \div 12 = 4 \quad \text{or} \quad 4 \times 12 = 48 \\
 \quad \downarrow \div 2 \quad \downarrow \div 2 \\
 \text{b } 24 \div 6 = 4 \quad \text{or} \quad 4 \times 6 = 24 \\
 \quad \downarrow \div 2 \quad \downarrow \div 2 \\
 \text{c } 12 \div 3 = 4 \quad \text{or} \quad 4 \times 3 = 12
 \end{array}$$

**Activity**



- 1 Nine people share 18 sweets. How many does each person get if they all get the same number of sweets? Which two of these equations describe this sharing?

- A**  $18 \times 9 = 162$       **B**  $18 \div 9 = 2$       **C**  $18 \div 2 = 9$       **D**  $9 \times 2 = 18$

- 2 a Two people share 32 peanuts.  
How many does each person get?
- b What if 64 peanuts are shared with 4 people?  
How many does each person get?
- c Eight people share 128 peanuts.  
How many does each person get?
-  d Write an equation for **a, b and c**.  
Explain the relationship between the equations.  
Compare yours with a classmate's explanation.

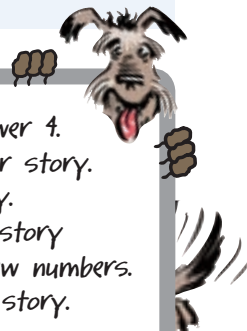


### 3 Challenge

I wrote  
"14 people in my class  
shared 56 sweets"



Write a division story that has the answer 4.  
Use **even** numbers larger than 10 in your story.  
Write the division equation for your story.  
Now halve both of the numbers in your story  
and write a similar story using these new numbers.  
Write the division equation for your new story.  
Is the answer still 4? Explain.



**Example**  $80 \div 16$

8 is a factor of 80 *and* 16 (it is a common factor).

$$\begin{array}{r} 80 \div 16 \\ \downarrow \div 8 \quad \downarrow \div 8 \\ 10 \div 2 = 5 \end{array}$$

$10 \div 2$  is an easy  
division to do and has the same  
answer as  $80 \div 16$ . Why?



If the two  
numbers have  
a common factor  
what does this  
mean you  
can do?

4 **Did you know...** Copy this diagram.

12	<b>A</b> 7	31	11		12	<b>A</b> 7	3	31	
31	<b>A</b> 7	11	31	5	11	21	6	<b>A</b> 7	8

Look for  
common factors of  
both numbers.



Work these out by halving or thirding both numbers. Record your thinking.  
Write the letter next to the division above its answer.

<b>A</b> $126 \div 18 = 7$	<b>N</b> $81 \div 27$	<b>R</b> $120 \div 15$	<b>T</b> $186 \div 6$	<b>U</b> $168 \div 8$
<b>E</b> $120 \div 24$	<b>S</b> $132 \div 12$	<b>G</b> $108 \div 18$	<b>C</b> $192 \div 16$	

Show how you could work out the answers to **questions 5 to 7** by changing both numbers?

- 5** If 162 minutes of speaking time is shared equally by 18 people, how many minutes does each person get?
- 6** The Portage Bay Boating Club has a fishing contest every Labour weekend. Last year 84 fish were entered in total. Once weighed, the fish were cooked and made into 14 different dishes for dinner. How many fish on average were used for each dish?
- 7 a** At a zoo there were 144 school children visiting. They were divided up into groups of 18 for feeding time. How many groups were there?
- b** There were 112 different animal enclosures (pens) at the zoo. There were 16 different feeding times. At each feeding time the same number of pens were fed. How many pens were fed at each time?



**Example** The \$512 prize in a raffle was shared equally by 16 people. How much did each person get?

$$512 \div 16 = 256 \div 8 = 128 \div 4 = 64 \div 2 = 32$$

Diagram showing the simplification process with arrows labeled 'halve' between each step.

Remember - halving both numbers in a division gives the same answer.



**Example**  $225 \div 9$

$$225 \div 9 = 75 \div 3 \text{ (thirding both numbers)} \\ = 25$$

- 8** Work these out mentally. Record your thinking
- |                        |                        |                        |                        |
|------------------------|------------------------|------------------------|------------------------|
| <b>a</b> $176 \div 16$ | <b>b</b> $108 \div 36$ | <b>c</b> $144 \div 48$ | <b>d</b> $135 \div 15$ |
| <b>e</b> $324 \div 27$ | <b>f</b> $216 \div 12$ | <b>g</b> $390 \div 15$ | <b>h</b> $264 \div 88$ |
| <b>i</b> $324 \div 18$ | <b>j</b> $368 \div 16$ | <b>k</b> $288 \div 36$ | <b>l</b> $432 \div 24$ |

Look for common factors.



- 9** Explain how you did two of the divisions from **question 8** to a classmate.

For questions 10 to 13 work out the answers mentally and record your thinking.

- 10 Ruben won a huge bag of sweets in a skateboarding competition. He counted them and there were 408 sweets. He shared them equally amongst all of the 24 competitors. How many sweets did each person get?



- 11 Marie's school is raising money with a bicycle challenge. The school enters a team of 32 students who have to take it in turns to cycle a total of 608 kms. If each student cycles the same distance, how far will they each cycle?

- 12 A total of 16 buses took 432 people to a rugby test. The same number of people went on each bus. How many people went on each bus?



- 13 A television producer had exactly five hours and 24 minutes of a programme. She divided this up into 27-minute episodes. How many episodes did she get?

- 14 Sam wanted to know if he could use the changing both numbers strategy to find the answer to decimal divisions. He wrote these two decimal divisions:

$$\begin{array}{l} 1.2 \div 4 = 0.6 \div 2 \\ \quad \quad = 0.3 \end{array} \qquad \begin{array}{l} 2.4 \div 0.5 = 4.8 \div 1 \\ \quad \quad = 4.8 \end{array}$$

Check the answers Sam got using your calculator.

Do you think the strategy works for decimal divisions? Explain your answer.

- 15 Find the answer to these divisions. Record your thinking.

a  $4.8 \div 4$       b  $8.4 \div 4$       c  $12 \div 0.5$       d  $4.1 \div 0.5$       e  $4.5 \div 1.5$

- 16 Millee says the changing both numbers strategy reminds her of the "equal additions" strategy for subtracting.



- a Explain how division and subtraction are linked.  
b Explain what this strategy has in common with the "equal additions" strategy.

## 17 Challenge



- 1 Use all of the digits from the box just once to make a division that can be solved by halving both numbers. Show all your attempts.
- 2 Use all of the digits from the box just once to make a division that can be solved by thirding both numbers. Show all your attempts.

1 2 2 3 9

? ? ? ÷ ? ? =

1 1 8 8 9

? ? ? ÷ ? ? =