The Power of Halving

Overview

The skill of halving numbers is very useful for a range of in the head calculations, including division by 2, 4, and 8.

Since many students find division one of the most difficult skills to master, this can be extremely helpful to them. Like doubling, halving relies on only a few number facts, so these strategies can make a powerful contribution to building students' confidence at in the head calculations.
Halving is also particularly useful for finding ½, ¼, and ¾ and calculating 50%, 25% and 75%

This activity should be done after *Doubling Up.* It links directly to the activities *Sorting Fractions of ..* and *Shortcut Percentages 50%, 25% & 75%.*

Skills and Knowledge

- Halving even numbers
- Halving odd numbers
- Division by 2, 4 & 8
- Halving prices

Preparation and Materials

- Write the even numbers as dollars from 0 – $20 on pieces of paper the size of flashcards.
- Make a similar set of prices using odd numbers from $1 - $19.
- Photocopy Practice Sheet 1(1 per student)
- Prepare sets of 10 Questions as needed

Suggested Procedure

Revisiting the doubles of single digit numbers

Write all the numbers from 0 – 10 in a column on the board

Ask: *What are the doubles of all these numbers?*

Record the doubles on the board beside the numbers.

Number	Double
0	0
1	2
2	4
3	6
.	.
.	.
.	.

Halving numbers from 0 – 20

Ask:

- *Imagine you are sharing a snack with a friend and you want to pay half each.*
- *It costs $8*
- *How much is a half of $8?*

Record this on the board beside 'double 4 = 8':

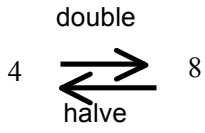
Double 4 = 8 *½ of 8 = 4*

Emphasise the relationship between these two opposite (inverse) operations:

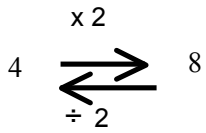
- *Halving is just going backwards from the double numbers*

Diagrams can also be helpful to emphasise this relationship.

Either:



or:



Using
flashcards prepared with the even numbers from 0 to $20 hold them up one at a time in random order.

Because doubling is the opposite of halving it should always be used as a checking strategy. The sooner students are introduced to this way of thinking the better.

Ask:

- *Write down half of these prices as I hold them up*

Keep going until you are confident that students have a good recall of the halves of the even numbers.

The flashcards could be used at other times as revision.

Halving odd numbers

Ask: *If you share $3 between two people how much would each person get?*

If students are not sure of this then act out the process with three dollar coins.

- *Each person gets one whole dollar*
- *What about the dollar left over?*
- *Yes you change it into two 50 cent pieces*
- *How much does each person get?*

Together try a few more examples, such as sharing $5, $7, $11, then use the second set of flashcards until students are confident about the extra 50 cents in all of these examples.

Halving tens and hundreds

The halving process of the even numbers such as 40, 60, 80 … and 200, 400, 600 … can be introduced as the reverse process of doubling tens and hundreds and should require only a little practice. Use sets of numbers on flashcards or the board, making sure the number in the front (leading digit) is even.

Numbers such as 30, 50, 70 and 300, 500, 700, with odd leading digits may need to be looked at separately. SEE BELOW.

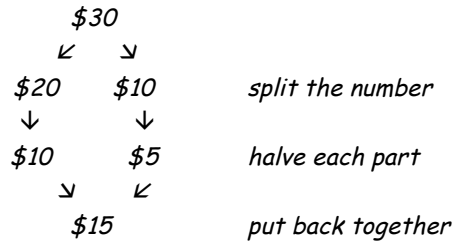
Again, imagine the sharing process, beginning with:

- *Two people get half of $10 – how much do they each get?*
- *Two people get half of $30 – how much do they each get?*

Explain:

- *We can split the $30 into $20 and $10 – these are both easy to halve*

Draw the diagram of the process



Try several more examples together until students realise that they all end in 5 and can do the process quite quickly.

Slip in a few examples of hundreds, such as, *$500, $300, $700* as you do these examples.

Sets of *10 Questions* on paper, or flashcards of *Quick Questions* at the beginning of following sessions will help students to master and recall these processes.

Once students are confident with the single digit numbers described above, they should be able to combine them to halve many digit numbers.

For example, try these together:

Find a half of: $25, $63, $92, $230; $365

Practice Sheet 1: Halving money provides some student practice.

Halving and halving again (÷ 4)

Just as the doubling process can be used twice to multiply by 4, halving twice is the equivalent of dividing by 4.

Since many students find division one of the most difficult skills to master, this may be greeted quite enthusiastically.

To introduce this, start with a number easily halved twice in the head, such as 8.

Ask:

- *What is half of 8?*
- *What happens if halve it again?*
- *What's half of 4?*

Demonstrate that you would get the same result by dividing by 4 since *8 ÷ 4 = 2.*

Students could check this with a calculator or compare it with its opposite 4 x 2 = 8.

Encourage students to experiment with a few more numbers which are straightforward to halve twice.
Ask:

- *Use the method of splitting and halving the parts to find half of:*
  36; 48; 100; 288; 1,012

Model the strategies for students and compare any variations suggested by them.

Encourage students to check by using the opposite process of multiplying by 4 or doubling twice.
For example, if halving 288 twice gives the answer 72, they should check by going backwards with 72 X 4 = 288 or double 72 = 144 and double 144 = 288.

Try some slightly more complex examples which require re combining and/or re-splitting during the two halving steps, such as:

52; 132; 304

Further Practice is available as sets of 10 questions in *Practice Sheet 2.*

Practice Sheets 1 and 2 of the activity *Sorting Fractions of…* provide further practice examples of finding ½ and ¼ of assorted prices.

Halving Money

Practice Sheet 1

Half Price Sale!!

Calculate the costs of these items.

1.  *$7* New price:
2.  *$18* New price:
3.  *$60* New price:
4.  *$400* New price:
5.  *$70* New price:
6.  *$900* New price:

Anya goes out for the day with her flatmate. They pay half each of their costs.
What does she pay for these?

			Anya's share
7.	The taxi	$16	
8.	Snacks	$23	
9.	Drinks	$31	
10.	A birthday present for a friend	$52	
11.	A new dining table for their flat	$270	

Jake and a friend run a part-time mowing business.
They split the takings half-half.
How much did Jake make each day?

		Total takings	Jake's half
12.	Monday	$250	
13.	Tuesday	$165	
14.	Wednesday	$233	
15.	Thursday	$507	
11.	Friday	$391	

Halving twice

Practice Sheet 2

✂ Cut these and give to students as single sets of examples.

Set 1

Use the method of half then half again to do these divisions.

1. 32 ÷ 4
2. 64 ÷ 4
3. 120 ÷ 4
4. 320 ÷ 4
5. 820 ÷ 4
6. 848 ÷ 4
7. 460 ÷ 4
8. 500 ÷ 4
9. 684 ÷ 4
10. 160 ÷ 4

Check your answers by doubling twice.

Set 2

Use the method of half then half again to do these divisions.

1. 36 ÷ 4
2. 100 ÷ 4
3. 360 ÷ 4
4. 204 ÷ 4
5. 240 ÷ 4
6. 484 ÷ 4
7. 640 ÷ 4
8. 300 ÷ 4
9. 416 ÷ 4
10. 108 ÷ 4

Check your answers by doubling twice.

Set 3

Use the method of half then half again to do these divisions.

1. 108 ÷ 4
2. 52 ÷ 4
3. 280 ÷ 4
4. 128 ÷ 4
5. 816 ÷ 4
6. 600 ÷ 4
7. 804 ÷ 4
8. 700 ÷ 4
9. 150 ÷ 4
10. 250 ÷ 4

Check your answers by doubling twice.