# Division by Tens

## Overview

The shortcut of removing zeros when dividing by 10, 100 and 1,000 is extremely important in a society that uses decimal (10-based) systems of currency and measurement. It is also very useful for approximation of calculations, and for in the head methods of calculating 10%. This is a skill which may need specific attention for adult numeracy students.

This activity introduces these important skills for division in gradual steps using an approach that allows adult students to recognise the patterns then apply the shortcuts to a range of whole number calculations.

It also extends the skills to division by numbers such as 20 and 200 by combining halving with the division by tens, and to 30, 40, 300, 400 ... for students comfortable with other short divisions.

## Skills and Knowledge

Shortcut division by
- 10 & 100
- 20 & 200
- 30, 40 & 300, 400 (optional)

## Preparation and Materials

Photocopy Practice Sheet 1 (1 per student) cut into sets of 10 questions.

Practice Sheet 2 as required

Set of basic calculators

## Suggested Procedure

**Division by 10**

Begin by setting the skill in a meaningful context.

Ask:
- *I pay $20 for a packet of 10 pencils*
- *How much am I paying for each pencil?*

Allow time for students to consider their own method for working this out before discussing it with the group.

Strategies may include:
- Guessing and checking by repeated addition
- Guessing and checking by multiplication
- Repeated subtraction
- Use of a calculator

All of these alternative strategies are valid.

*Adults whose numeracy is not strong often avoid division, instead using their own idiosyncratic but creative methods. These should be respected and shared at the same time as the new much quicker skills are developed.*

It is important for the purpose of this activity that students realise that this is a division calculation and is represented by the ÷ symbol. So write prominently on the board:

$$\$20 \div 10$$

This could also be highlighted by asking all students to check their answer using the division button on the calculator.

Record the answer on the board before repeating the procedure with a couple of other questions.

$$\$20 \div 10 = \$2$$

For example, ask:
- *10 people who work together share a lottery ticket*
- *It wins $80.*
- *How much should they each get?*

With 3 or 4 examples on the board, for instance:

$$\$20 \div 10 = \$2$$
$$\$80 \div 10 = \$8$$
$$\$60 \div 10 = \$6$$

Ask:
- *Can you see a pattern?*
- *Can you answer these using the pattern?*

    - *$70 ÷ 10 =*
    - *$50 ÷ 10 =*
    - *$30 ÷ 10 =*

**Multiplication and division as opposites**

This would be a good time to discuss the relationship between multiplication and division: that they are the opposites (inverses) of each other.

To highlight this ask:
- *Pick any number you like ending in 0*
- *Write it down*
- *Divide it by 10 using the shortcut*
- *Now multiply it by 10 using the shortcut*
- *What happened?*

Ask:
- *Do the calculations again using the calculator*
- *Is the result the same?*
- *Try again using another number*

The inverse nature of the operations is important because multiplication is the best means of checking division calculations. The relationship can be illustrated using a diagram:

$$\div 10$$

90       9

$$\times 10$$
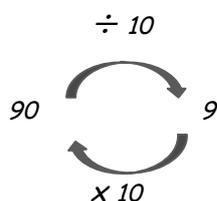
## Extending the shortcut to larger numbers

Discuss with students whether they think this shortcut will work for bigger numbers, for example, numbers with more zeros such as 200, or 3,000.

Ask:
- *Use the shortcut to do these calculations*
- *Test your answer using a calculator:*

   - *200 ÷ 10*
   - *400 ÷ 10*
   - *3,000 ÷ 10*
   - *7,000 ÷ 10*
   - *80,000 ÷ 10*

Keep going until students are confident that the rule applies for all of these whole numbers.

*Practice Sheet 1* contains sets of short questions for students to practise this shortcut. Set 1 focuses on division by 10. These are best cut into sets and used at different times as revision, rather than all done at one time.

Five quick questions on half A4 paper, at the beginning of follow up sessions is also a very effective way to reinforce this skill.

## Division by 100

This could be approached as an extension of the pattern of dividing by 10 with students predicting the answers and checking on calculators.

Alternatively, it could be put into a context that allows students to think through the process first. This also reinforces the concept of division and situations in which it is used.

Pose the question:
- *Roger receives a payment of $400 at the bank*
- *He asks to be paid in $100 notes*
- *How many notes will he get?*

Take a few minutes for students to reflect on their answers and individual methods. Discuss these then go on to frame this as a division calculation if this has not already come from students.

Ask:

- *How would we write this as a calculation?*
- *What symbols would I have to use?*

On the board record:

     *$400 how many $100*

     → *$400 ÷ $100 = 4*

Get students to check that a calculator would give the same result.

To build the pattern, vary the question with different amounts of money.

For example:

- *$500 ÷ $100*
- *$700 ÷ $100*
- *$300 ÷ $100*

Again, record these with answers on the board until the pattern of removing two zeros is established.

*Practice Sheet 2,* Sets 4 & 5 provides practice questions for this skill. Further examples can be generated as Quick Questions on flashcards to revise at the beginning of future sessions.

## Dividing by 20

Division by 20 can be seen as a two-step process, first halve then divide by 10 or vice versa.

To make sense of this an example in context may help.

Pose the question:

- *A $600 food or drink bill for a party is shared between 20 people*
- *How much does each person pay?*

Explain:

*The calculation can be split into something easy to do in the head by first splitting the group in half: 10 people in each group and $300 to divide between them*

                             *$300 shared by 10 people → $300 ÷ 10 = $30*

*$600* ⟨

                             *$300 shared by 10 people → $300 ÷ 10 = $30*
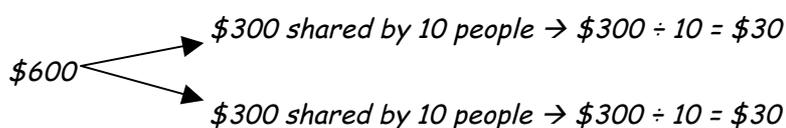
     *Each person pays $30*

*So    $600 ÷ 20 = $30*

To consolidate the idea, ask students to use this 2 step method to calculate:

- *How much would each of the 20 people pay if the bill was:*
    - *$800*
    - *$600*
    - *$700*
    - *$500*

## Changing the order of the steps

In some calculations it is more convenient to divide by 10 prior to halving if students are not yet comfortable with decimals.

*For example 150 ÷ 20:*

Halving first → 75 which is then difficult to divide by 10 if students are not yet comfortable with decimals.

Dividing by 10 first → 15 which can be split into 10 and 5 for halving
→ ½ of 10 = 5 and ½ of 5 = 2 ½
Result is 5 + 2½  = 7½

To get students comfortable with the idea that the steps can be done either way, explore the idea with them by experimenting.

Ask:
- *When we calculated $600 ÷ 20 we halved the $600 first*
- *Do you think you would get the same result if you divide by 10 before you halve?*
- *Can you try it to find out?*

Encourage students to try all the examples they have done so far by reversing the procedure. Explain that sometimes it is easier to do one way first, sometimes the other.

## Dividing by 200

Division by 200 can be done using the same two-step process, using examples such as:
- *How many payments of $200 could be made from $400;  $800; $1,200.*

These of course translate as:
- *$400 ÷ $200*
- *$800 ÷ $200*
- *$1200 ÷ $200*

Create a set of 10 practice questions for students if they want to practice this skill further.

**Division by 30, 40 … 300, 400 …**

These skills are, on the whole, most useful for estimation and approximations of calculations involving large numbers. So if students will be progressing to higher levels of numeracy it is worth extending the activity to include them.

Although division by 20 could be done by the simple process of halving and then dividing by 10, division by other tens numbers relies on students being able to divide by single digit numbers, a skill less easily developed than halving.

The process is similar to that outlined above. To avoid tricky situations with decimals and/or remainders it is better that the division by 100 step is done first.

*Practice Sheet 2* provides some examples in which the division is easily recognisable. These should give students confidence with the method, even if they have yet to develop their divisions skills.

# ÷ by 10

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

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Set 1

Write answers to these using shortcuts only. When you have finished check answers with a calculator.

1. 70 ÷ 10
2. 700 ÷ 10
3. 7,000 ÷ 10
4. 8,000 ÷ 10
5. 900 ÷ 10

6. 30 ÷ 10
7. 300 ÷ 10
8. 3,000 ÷ 10
9. 320 ÷ 10
10. 3,200 ÷ 10

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Set 2

Write answers to these using shortcuts only. When you have finished check answers with a calculator.

1. 80 ÷ 10
2. 900 ÷ 10
3. 60 ÷ 10
4. 4,000 ÷ 10
5. 1,200 ÷ 10

6. 3,040 ÷ 10
7. 720 ÷ 10
8. 1,020 ÷ 10
9. 15,000 ÷ 10
10. 1,560 ÷ 10

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Set 3

Write answers to these using shortcuts only. When you have finished check answers with a calculator.

1. 40 ÷ 10
2. 4,000 ÷ 10
3. 600 ÷ 10
4. 50 ÷ 10
5. 1,20 ÷ 10

6. 1,030 ÷ 10
7. 6,100 ÷ 10
8. 620 ÷ 10
9. 1,400 ÷ 10
10. 3,250 ÷ 10

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# ÷ by Multiples of 10

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

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Set 4

Write answers to these using shortcuts only. When you have finished check answers with a calculator.

1. $900 ÷ $10
2. $900 ÷ $100
3. $300 ÷ $100
4. $2,000 ÷ $100
5. $14,000 ÷ 10

6. $1,200 ÷ $10
7. 12,000 ÷ 100
8. 4,300 ÷ $100
9. 500 ÷ 100
10. 10,200 ÷ 100

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Set 5

Write answers to these using shortcuts only. When you have finished check answers with a calculator.

1. $500 ÷ $100
2. $3,500 ÷ $1000
3. 700 ÷ 100
4. 6,000 ÷ 100
5. $2,900 ÷ $100

6. 102,000 ÷ 100
7. $40,000 ÷ 100
8. 50,100 ÷ 100
9. $2,000,000 ÷ $100
10. $10,100 ÷ 100

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Set 6

Write answers to these using shortcuts only. When you have finished check answers with a calculator.

1. $600 ÷ $10
2. $600 ÷ $20
3. $300 ÷ $100
4. $1,600 ÷ $20
5. $4.000 ÷ 20

6. $1,800 ÷ $100
7. 12,000 ÷ 20
8. 4,300 ÷ $20
9. 500 ÷ 100
10. 10,200 ÷ 200

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

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**Set 7**

Write answers to these using shortcuts only. When you have finished check answers with a calculator.

1. 900 ÷ 10
2. 900 ÷ 30
3. 1,200 ÷ 10
4. 1,200 ÷ 40
5. 1,200 ÷ 60

6. 1,500 ÷ 30
7. 1,500 ÷ 50
8. 2,400 ÷ 30
9. 2,400 ÷ 40
10. 6,000 ÷ 30

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**Set 8**

Write answers to these using shortcuts only. When you have finished check answers with a calculator.

1. 800 ÷ 400
2. 2,700 ÷ 900
3. 2,000 ÷ 500
4. 2,500 ÷ 500
5. 2,100 ÷ 300

6. 2,100 ÷ 700
7. 3,200 ÷ 400
8. 3,200 ÷ 800
9. 14,000 ÷ 700
10. 16,000 ÷ 800

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