

# Terminating, recurring and rounding decimals

Sunday, 12 April 2020 10:48 am

Note: These notes will be different from the ones which relate to the video on [www.maffsguru.com](http://www.maffsguru.com) as I recorded the lesson before I presented it to my own class. I forgot to download the notes ... sorry! The good news is that these notes are **much better** than the ones for the recorded lesson :)

★ By the end of the lesson I would hope that you have an understanding and be able to apply to questions the following concepts:

- What a terminating decimal is
- What a recurring decimal is
- How to round decimals to a given number of decimal places

## RECAP

When we place certain calculations into my calculator we get some pretty interesting results. We can't always be expected to write every number the calculator shows. How would we express each of the following?

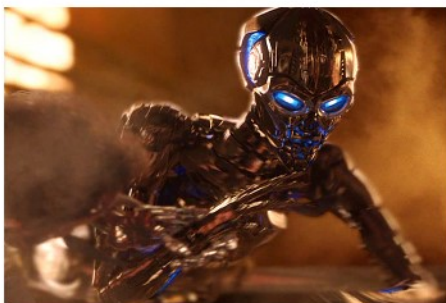
Edit Action Interactive	
$\frac{0.5}{1 \rightarrow 2}$	$\frac{f dx}{f dx}$
$\frac{1}{2}$	Simp
$\frac{1}{4}$	$\frac{f dx}{f dx}$
$\frac{1}{8}$	$\frac{f dx}{f dx}$
$\frac{1}{11}$	$\frac{f dx}{f dx}$
$\frac{1}{9}$	$\frac{f dx}{f dx}$
$\square$	$\frac{f dx}{f dx}$

$\frac{1}{2}$	0.5
$\frac{1}{4}$	0.25
$\frac{1}{8}$	0.125
$\frac{1}{11}$	0.09090909091
$\frac{1}{9}$	0.1111111111
$\square$	

Alg   Decimal   Real   Deg    $\frac{f dx}{f dx}$

## A terminating decimal

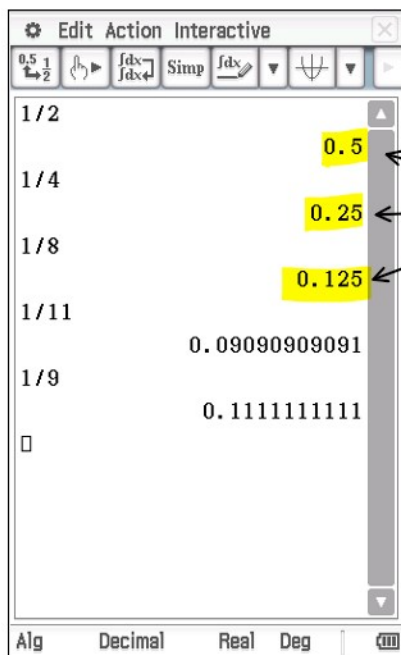


The Terminator was a pretty scary piece of machinery. It was sent to Terminate someone.

Hence, terminate means to end.

A terminating decimal is one which has a finite number of decimal places.

Basically, it doesn't go on and on and on and one.



0.5

0.25

0.125

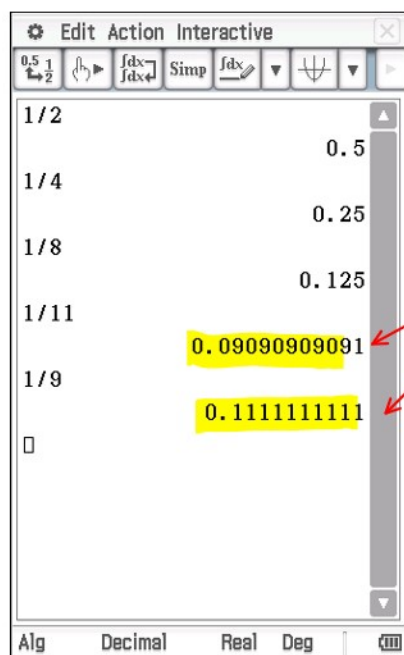
0.09090909091

0.1111111111

These are terminating decimals

### A recurring decimal

These are decimals which have an infinite number of decimal places.



0.5

0.25

0.125

0.09090909091

0.1111111111

These decimal numbers are recurring.  
They appear to be going off to infinity and beyond.

0.0909090909090909...

0.1111111111111111...

We need to find a way to write these numbers so we can tell the person reading our work that the number is recurring **without having to write the whole number!**

Welcome to the **dot and line notation**.

$$0.11111111 = 0.\dot{1}$$

$$0.22222222 = 0.\dot{2}$$

$$0.04111111 = 0.04\dot{1}$$

$$0.04111111 = 0.04\dot{1}$$

$$0.09090909 \dots = 0.\overline{09} = 0.\dot{0}\dot{9}$$

$$0.123123123 \dots = 0.\overline{123} = 0.\dot{1}\dot{2}\dot{3}$$

### Rounding decimal numbers



We wouldn't be expected to write numbers which go on to infinity with all their decimal places.  
That would be very time consuming.  
In fact, you'd die trying to complete the first number!

Hence, we have a mathematical way of "Rounding" decimal numbers.

What we need to know is:

- How many decimal places the question wishes us to round the number to
- Where the decimal point is in a number

It really is that simple.

Let's round the following number to a differing number of decimal places

3.58360347582047385629

1 2 3 4 5 ...  
3.58360...

1 dp  
3.58360  
3.6  
3.6

5 or more +1  
before dotted line.

2 dp  
3.58360...  
3.58

leave the number  
alone!

3 dp

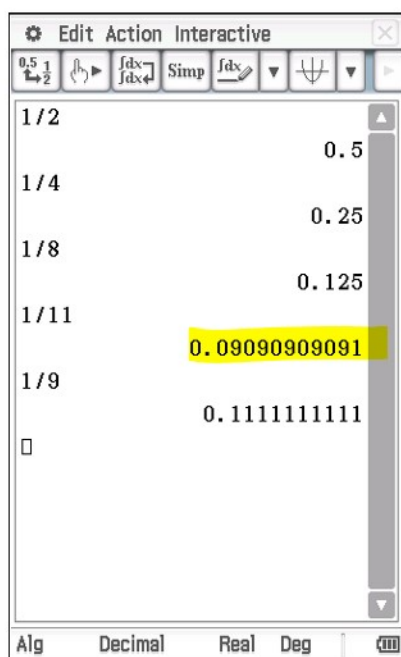
$$3.58 \underline{3} \underline{6} 0 \dots$$

$$\underline{\underline{3.584}}$$

### Rounding recurring decimals

Remember that we can round recurring decimals too!

In this case we wouldn't need to place the dot or line anywhere as we would treat it like a normal number.



$$0.0 \underline{9} \underline{0} \overline{90909} \quad 2 \text{ dp.}$$

$$0.09$$

$$0. \underline{1} \underline{1} \underline{1} \underline{1} \overline{1} \quad 4 \text{ dp}$$

$$\underline{\underline{0.1111}}$$

### Examples

The following examples have been extracted, with permission, from the Cambridge Essentials Series of textbooks (Year 8 in this case).

Convert the following fractions to decimals using pencil and paper methods.

$$\frac{1}{4} = 0.25$$

$$\frac{1}{4} = 1 \div 4$$

$$4 \overline{) 1.000}$$

$$0.25$$

$$= 0.25 \quad \frac{1}{4} = 1 \div 4 \quad 1 \div 4 = 0.25$$

$$\frac{7}{8} \quad 7 \div 8 = 0.875$$

$$\begin{array}{r} 0.875 \\ 8 \overline{) 7.000} \\ \underline{56} \phantom{00} \\ 40 \phantom{0} \\ \underline{32} \phantom{0} \\ 80 \\ \underline{72} \\ 80 \\ \underline{72} \\ 80 \end{array}$$

Express the following fractions as recurring decimals.

$$\frac{2}{3} \quad 2 \div 3 = 0.6666$$

$$\begin{array}{r} 0.6666 \\ 3 \overline{) 2.0000} \\ \underline{6} \phantom{000} \\ 0 \phantom{000} \\ \underline{0} \phantom{000} \\ 0 \phantom{000} \\ \underline{0} \phantom{000} \\ 0 \phantom{000} \end{array}$$

$$= 0.\dot{6}$$

$$3\frac{5}{7} = 3 \times 7 + 5 = 26$$

$$\begin{array}{r} 26 \\ 7 \overline{) 26.0000} \\ \underline{21} \phantom{0000} \\ 50 \phantom{000} \\ \underline{49} \phantom{000} \\ 10 \phantom{000} \\ \underline{7} \phantom{000} \\ 30 \phantom{000} \\ \underline{28} \phantom{000} \\ 20 \phantom{000} \\ \underline{14} \phantom{000} \\ 60 \phantom{000} \\ \underline{56} \phantom{000} \\ 40 \phantom{000} \\ \underline{35} \phantom{000} \\ 50 \phantom{000} \\ \underline{49} \phantom{000} \\ 10 \phantom{000} \end{array}$$

$$3.714285714285 \dots$$

$$3.\overline{714285}$$

$$3.\dot{7}1428\dot{5}$$

Round each of the following to the specified number of decimal places.

- 15.35729 (3 decimal places)
- 4.86195082 (4 decimal places)

$$15.35729$$

$$15.357$$

$15 \cdot 357$   
 $\leftarrow$   
 $4 \cdot 8619 \cdot 5 \cdot 82$   
 $\underline{4 \cdot 8620}$

Write  $\frac{3}{7}$  as a decimal correct to two decimal places

$$\frac{3}{7} = 3 \div 7$$

$$\begin{array}{r} 0.428571 \\ \hline 7 \overline{) 3.0000000} \end{array} \left\{ \begin{array}{l} 0 \\ 3 \\ 0 \end{array} \right.$$

↓

$$0.428571 \dots$$

0.43