Student Name

Mathematics Stage 4

FRACTIONS DECIMALS PERCENTAGES

Book 3 Identify terminating and recurring decimals

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CONTENTS

OVERVIEW

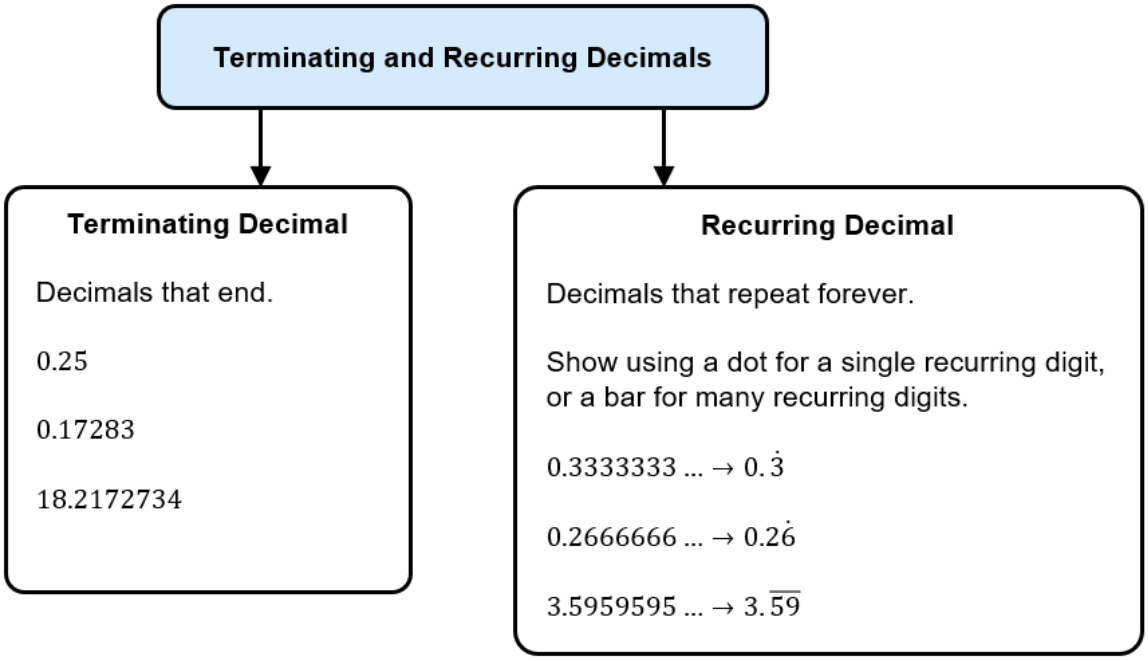
SYLLABUS CONTENT

MA4-FRC-C-01 represents and operates with fractions, decimals and percentages to solve problems

Identify terminating and recurring decimals

- Use either dot or vinculum notation for recurring (repeating) decimals
- Classify decimals as recurring or terminating

SUMMARY



TERMINATING AND RECURRING DECIMALS

Investigation Recurring decimals

1 One quarter can be thought of as one whole divided into four equal parts.

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

Using the division algorithm, work out $1 \div 4$ to express $\frac{1}{4}$ as a decimal:

$$4\overline{)1}$$

2 One third can be thought of as one whole divided into three equal parts.

$$\frac{1}{3} = 1 \div 3$$

Using the division algorithm, work out $1 \div 3$ to express $\frac{1}{3}$ as a decimal:

$$3\overline{)1}$$

What do you notice?

.....

3 Using a calculator, find the result of the following:

a $1 \div 2$	**b** $1 \div 3$	**c** $1 \div 4$
d $1 \div 5$	**e** $1 \div 6$	**f** $1 \div 7$
g $1 \div 8$	**h** $1 \div 9$	**i** $1 \div 10$

TERMINATING AND RECURRING DECIMALS

- **Terminating** decimals **end**, for example: 0.25
- **Recurring** decimals **repeat forever**, for example: 0.333333333333333333333333333333…
- Recurring digits are shown as:
  - a dot for a single recurring digit. $0.666666\ldots = 0.\dot{6}$
  - a bar for many recurring digits. $0.686868\ldots = 0.\overline{68}$

Example Express recurring decimals using dot or bar notation.

$0.2666666666666\ldots = 0.2\dot{6}$	What is a recurring decimal? *A recurring decimal has digits that ……. forever.*
$0.345345345345\ldots = 0.\overline{345}$	When do we use a dot, and when do we use a bar? *Use a dot for a ……. repeated digit. Use a bar for ……. repeated digits.*

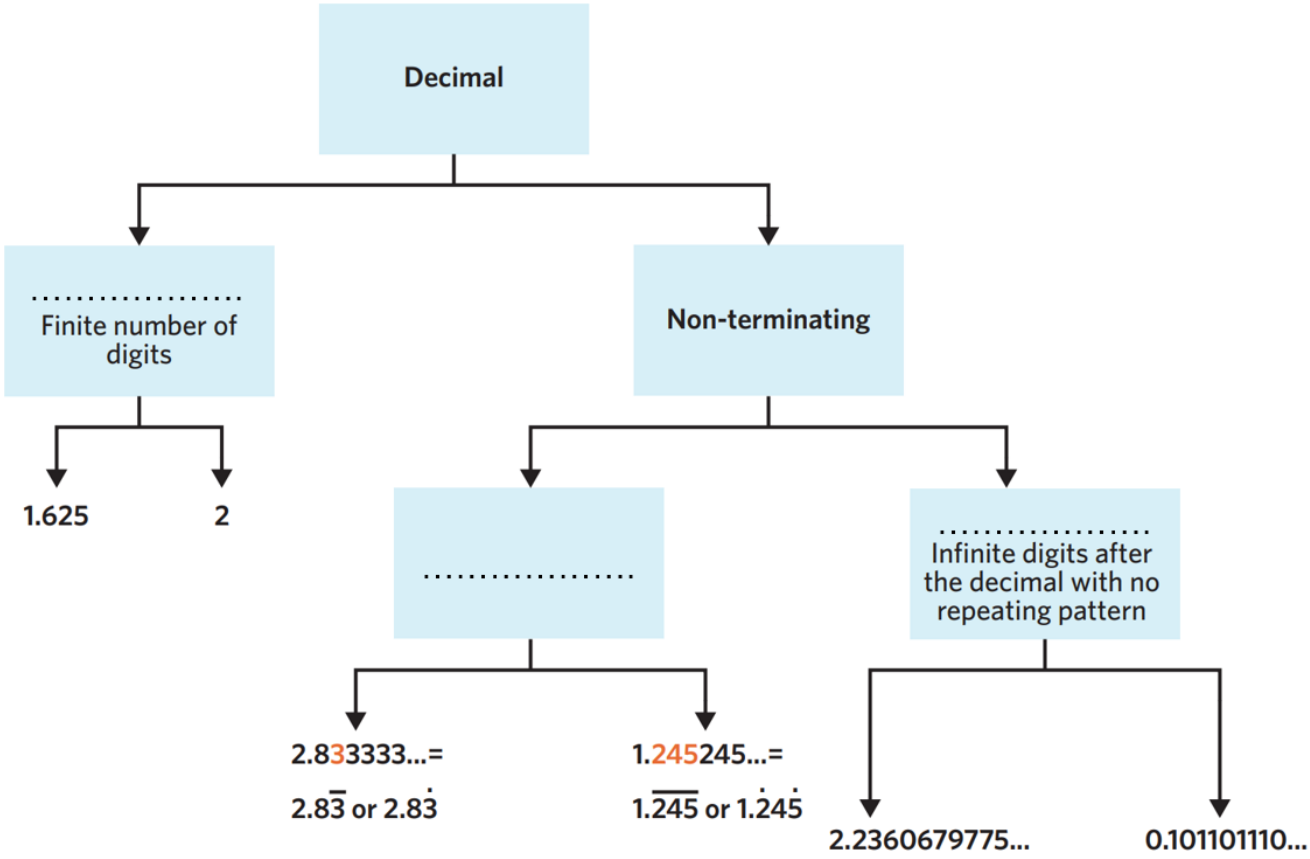
Express these recurring decimals using the appropriate notation.

a	0.555555555555…	**b**	0.57777777777777…	**c**	0.17171717171717…
	$0.\dot{5}$		$0.5\dot{7}$		$0.\overline{17}$
d	0.5959595959595…	**e**	0.8214821482148214…	**f**	0.109421094210942…
	$0.\overline{59}$		$0.\overline{8214}$		$0.\overline{19092}$

Use a calculator to express these as decimals. Classify them as terminating or recurring.
If it is a recurring decimal, show it using the correct notation.

a	$\frac{1}{8}$	**b**	$\frac{2}{7}$	**c**	$\frac{5}{6}$
	0.125 terminating		$0.\overline{285714}$ recurring		$0.8\dot{3}$ recurring
d	$\frac{12}{18}$	**e**	$\frac{2}{15}$	**f**	$\frac{18}{55}$
	$0.\dot{6}$ recurring		$0.1\dot{3}$ recurring		$0.3\overline{27}$ recurring

1 Fill in the missing words in the diagram.



From left to right: Terminating, Recurring, Non-Recurring

2 Classify these decimals as terminating, recurring, or non-recurring

		Terminating	Recurring	Non-recurring
a	$0.277777\ldots$	☐	☐	☐
b	$6.40312436\ldots$	☐	☐	☐
c	$0.234234234\ldots$	☐	☐	☐
d	1.625	☐	☐	☐

recurring

non-recurring

recurring

terminating

3 Classify these decimals as terminating or recurring.

a	0.5 t	**b**	$0.555555555\ldots$ r	**c**	$0.\dot{5}$ r	**d**	$0.5555555555\ldots$ r
e	0.85 t	**f**	$0.\overline{85}$ r	**g**	$0.8585858585\ldots$ r	**h**	0.8585858585 t
i	$0.\overline{76}$ r	**j**	$0.\overline{325}$ r	**k**	$0.1555555555\ldots$ r	**l**	$0.00\overline{291}$ r

4 Write the following recurring decimals using the appropriate notation.

a	0.777777777…	**b**	0.355555555…	**c**	0.28282828…
	$0.\dot{7}$		$0.3\dot{5}$		$0.\overline{28}$
d	0.325325325…	**e**	0.678678678…	**f**	1.444444444…
	$0.\overline{325}$		$0.\overline{678}$		$1.\dot{4}$
g	6.922222222…	**h**	0.033333333…	**i**	0.9090909090…
	$6.92\dot{2}$		$0.0\dot{3}$		$0.\overline{90}$
j	0.536666666…	**k**	3.217777777…	**l**	8.1818181818…
	$0.53\dot{6}$		$3.21\dot{7}$		$8.\overline{18}$

5

a Use a calculator to convert $\frac{1}{3}$ to a recurring decimal and write using the correct notation.

$0.\dot{3}$

b Use a calculator to convert $\frac{2}{3}$ to a recurring decimal.
Explain why the calculator is not entirely correct.

The calculator says 0.6666666667, it has rounded the answer when it ran out of digits.

c What would $1\frac{2}{3}$ be as a decimal?

$1.\dot{6}$

d What would $\frac{7}{3}$ be as a decimal?

$2.\dot{3}$

6 Use a calculator to determine whether these fractions represent terminating or recurring decimals. If they are recurring decimal, write using the correct notation.

a $\frac{4}{3}$ $1.\dot{3}$	**b** $\frac{3}{3}$ 1	**c** $\frac{1}{6}$ $0.1\dot{6}$	**d** $\frac{2}{6}$ $0.\dot{3}$
e $\frac{11}{30}$ $0.3\dot{6}$	**f** $\frac{18}{15}$ 1.2	**g** $\frac{5}{9}$ $0.\dot{5}$	**h** $\frac{7}{45}$ $0.1\dot{5}$
i $\frac{7}{8}$ 0.875	**j** $\frac{4}{9}$ $0.\dot{4}$	**k** $1\frac{5}{12}$ $1.41\dot{6}$	**l** $1\frac{2}{3}$ $1.\dot{6}$
m $\frac{11}{18}$ $0.6\dot{1}$	**n** $\frac{22}{33}$ $0.\dot{6}$	**o** $1\frac{13}{22}$ $0.5\overline{909}$	**p** $\frac{11}{24}$ $0.458\dot{3}$

7 The number π (pi) can be represented as a never-ending decimal. The first 100 digits of pi are:

3.141 592 653 589 793 238 462 643 383 279 502 884 197 169 399 375 105 820 974 944 592 307 816 406 286 208 998 628 034 825 342 117 067 …

Would you classify π as a terminating or recurring decimal, or neither? Explain your reasoning.

Neither. It is a non-terminating, non-recurring decimal.