Section 7-1 Terminating Decimals

One of the first encounters we have with decimals is money. The word decimal comes from the Latin word decem meaning ten. So, any number written in base 10 can be referred to as a decimal.

Decem ⇒ decade (10yrs) & December (originally 10th month)

In the number 3.14, the dot is the decimal point. Not everyone uses a decimal point that looks like ours.
England uses $3 \cdot 14$
Germany & France uses $3,14$

$$371.4286 = 3 \cdot 10^{2} + 7 \cdot 10^{1} + 1 \cdot 10^{0} + 4 \cdot 10^{-1} + 2 \cdot 10^{-2} + 8 \cdot 10^{-3} + 6 \cdot 10^{-4}$$

$10^{-1} = 1/10$ So, 4 is in the tenths place value
$10^{-2} = 1/100$ 2 " " " hundredths "
$10^{-3} = 1/1000$ 8 " " thousandths "
$10^{-4} = 1/10{,}000$ 6 " " ten thousandths "

* The number of necessary digits to the right of the decimal point is the # of decimal places.

Since base 10 blocks represent powers of 10, we can use them for decimals.

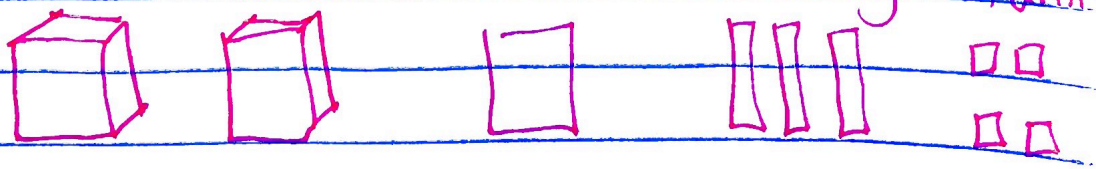
1 flat = 1		1 cube = 1
1 long = 1/10	or	1 flat = 1/10
1 unit = 1/100		1 long = 1/100
		1 unit = 1/1000

ex 1 Describe the base 10 blocks for:

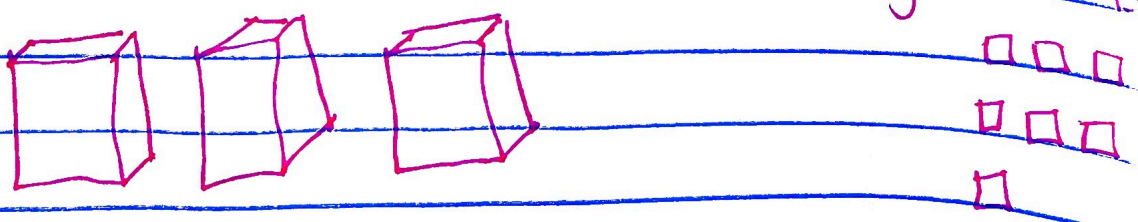
a) 3.14 — 3 flats, 1 long, 4 units

b) 1.02 — 1 flat, 0 longs, 2 units

c) 2.134 — 2 cubes, 1 flat, 3 longs, 4 units



d) 3.007 — 3 cubes, 0 flats, 0 longs, 7 units



ex 2 Use base 10 blocks to show that $0.3 = 0.30$ and $0.3 \neq 0.03$.

1 flat = 1
1 long = 1/10
1 unit = 1/100

0.3 = 3 longs
0.30 = 30 units
} same

0.3 = 3 longs
0.03 = 3 units
} not the same

ex 3 Convert the decimals to fractions.

a) $3.4 = 3\frac{4}{10}$ or $\frac{34}{10}$

tenths

b) $0.15 = \frac{15}{100}$

hundredths

c) $0.02 = \frac{2}{100}$

hundredths

d) $23.009 = 23\frac{9}{1000}$ or $\frac{23,009}{1000}$

thousandths

ex 4 Convert the fractions to decimals.

a) $53/100 = 0.53$

b) $53/10 = 5.3$

c) $281/1000 = 0.281$

d) $6/1000 = 0.006$

ex 5 Convert to a decimal.

a) $2/5$

Division

$$5\overline{)2.0} = 0.4$$
$$-20$$
$$0$$

or Rewrite with Denom of 10^n

$$\frac{2}{5} \xrightarrow{\times 2} \frac{4}{10} = 0.4$$

b) $1/4$

Division

$$4\overline{)1.00} = 0.25$$
$$-8\downarrow$$
$$20$$
$$20/0$$

or

$$\frac{1}{4} \xrightarrow{\times 25} \frac{25}{100} = 0.25$$

c) $\frac{7}{8}$

$$8\overline{)7.000} = 0.875$$

-64

60

-56

40

-40

0

The fractions in the above example convert to be terminating decimals.
(finite # of decimal places)

* A rational number a/b (in simplest form) can be written as a terminating decimal if b has only 2s and/or 5s in its prime factorization. (reduced)

* A rational number that is not a terminating decimal, must be a repeating decimal. The only numbers that are non-terminating and non-repeating are irrational. (like $\sqrt{2}$)

ex 6 Does the rational number $33/750$ convert to a terminating or repeating decimal?

$\frac{33 \div 3}{750 \div 3} = \frac{11}{250}$ ← simplest form

$250 = 25 \cdot 10$

$(5)(5)(2)(5)$

it will be a terminating decimal

As with whole numbers, place value decreases as you move to the right. This can be confusing for children.

Let's look at 0.32 and 0.109

Some kids would say $0.109 > 0.32$ bc $109 > 32$.

You can relate back to comparing whole #s by comparing the largest place value first.

0.109
0.32
↑ ↑ ↑ ↑

largest place value

You could also use base ten blocks.
1 cube = 1
0.109 = 1 flat, 0 longs, 9 units
0.32 = 3 flats, 2 longs

* Rant about how 99¢ ≠ 0.99¢ ☺ (video)

end 7-1