MODELS FOR DECIMALS

Technically, **decimals** are just fractions whose denominators are powers of 10. Think about how 0.3 is read: three tenths. Sounds just like 3/10, right? That's not a coincidence. An older name for decimals is "decimal fractions" because decimals are just a subset of fractions. People are often more comfortable working with decimals than fractions, however. It may (or may not) surprise you that models for operations with decimals are very similar to models for operations with fractions.

Base 10 blocks

One common model for decimals is the standard **Base 10 block**. In order to represent numbers less than a whole, we redefine what the whole stands for. We'll use our simplified versions of the blocks again for ease of drawing.

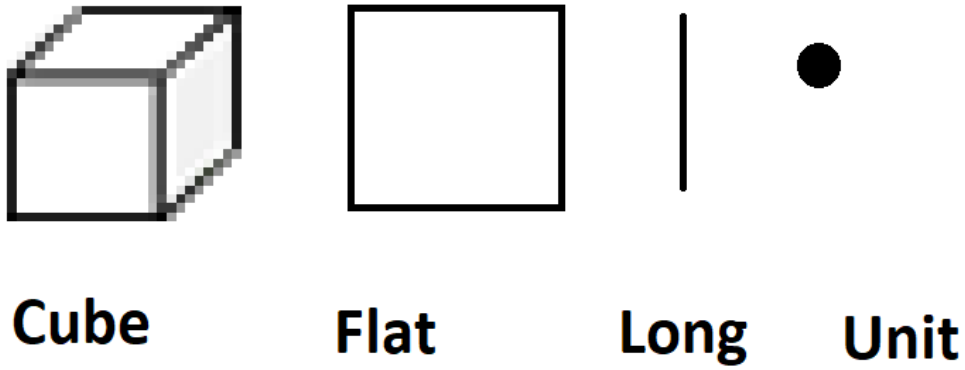


Figure 1: Simplified base blocks

Some possibilities:

CUBE	FLAT	LONG	UNIT
1000	100	10	1
100	10	1	0.1
10	1	0.1	0.01
1	0.1	0.01	0.001

If you use base ten blocks to represent decimals, make sure to clearly define what each piece represents.

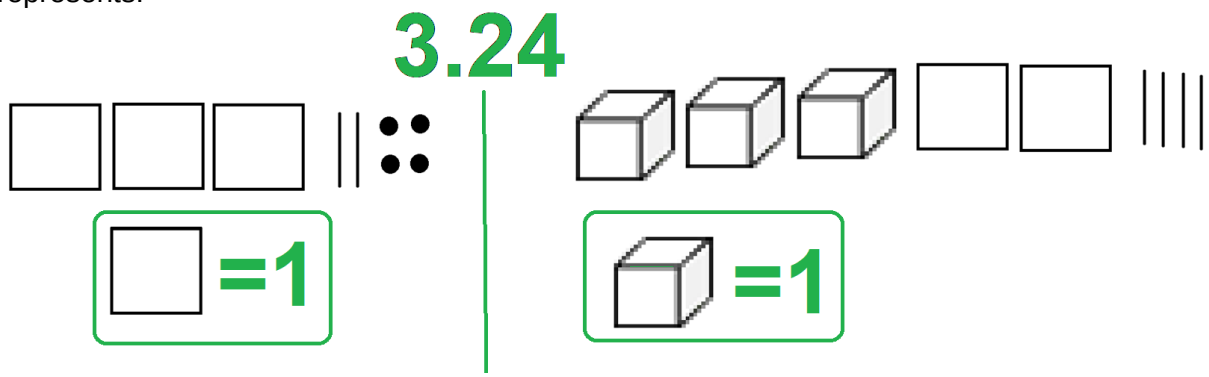


Figure 2: Two representations of 3.24

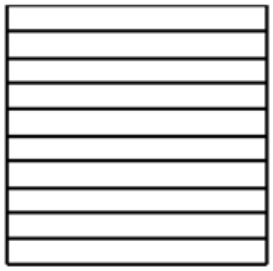
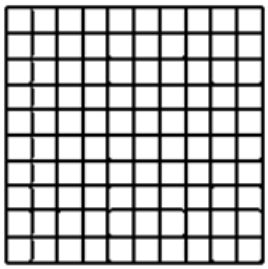
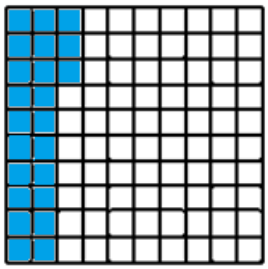
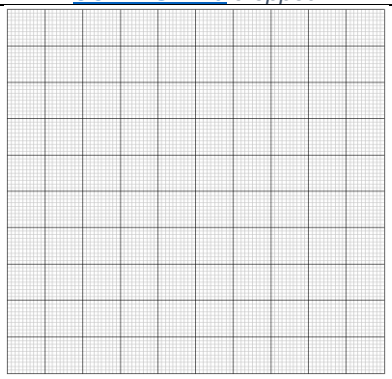
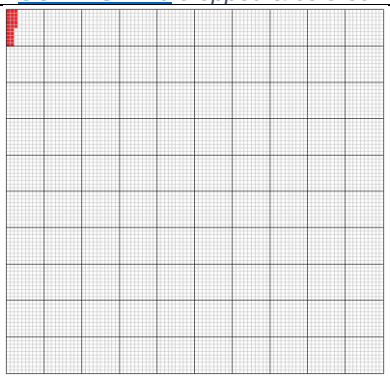
Money

Another common model for decimals is **money.** It's usually something people can relate to fairly easily. You do have to be careful and only use money that represents powers of 10, however.

DENOMINATION	PLACE VALUE
 *Figure 3: $100 bill* *https://upload.wikimedia.org/wikipedia/commons/5/55/United-states-dollar-usd.jpg* *CC BY-SA 4.0*	100
 *Figure 4: $10 bill https://www.stockvault.net/photo/163443/ten-dollar-bill* *CC0 1.0*	10
 *Figure 5: $1 bill* *https://picryl.com/media/dollar-money-bill-business-finance-0be985* *CC0 1.0*	1
 *Figure 6: Dime* *https://commons.wikimedia.org/wiki/File:1_Dime_%28United_States%29.jpg* *CC BY-SA 4.0*	0.1
 *Figure 7: Penny* *https://garystockbridge617.getarchive.net/amp/media/2005-penny-uncirculated-obverse-cropped-a526ad* *https://garystockbridge617.getarchive.net/amp/media/2005-penny-rev-unc-d-843aa7* *Public Domain*	0.01

Decimal Squares

A third model is **decimal squares** or a **decimal grid.** It can get complicated to draw your own decimal squares; it may be easier to provide blank squares for your students to fill in and work with.

BLANK SQUARE	EXAMPLE
 *Figure 8: Blank Tenth* *https://commons.wikimedia.org/wiki/File:ENTERO_REPRESENTACION.png* *CC BY-SA 4.0 cropped*	 *Figure 9: 0.4* *https://commons.wikimedia.org/wiki/File:ENTERO_REPRESENTACION.png* *CC BY-SA 4.0 cropped & colored*
 *Figure 10: Blank hundredth* *https://commons.wikimedia.org/wiki/File:ENTERO_REPRESENTACION.png* *CC BY-SA 4.0 cropped*	 *Figure 11: 0.23* *https://commons.wikimedia.org/wiki/File:ENTERO_REPRESENTACION.png* *CC BY-SA 4.0 cropped & colored*
 *Figure 12: Blank thousandth* *https://upload.wikimedia.org/wikipedia/commons/f/f1/Grafiekraster1.png* *CC BY-SA 3.0*	 *Figure 13: 0.025* *https://upload.wikimedia.org/wikipedia/commons/f/f1/Grafiekraster1.png* *CC BY-SA 3.0 colored*

Using decimal square models, it's easy to see that you can find equivalent decimals by subdividing your square by another power of 10. This has the same effect as adding a 0 to the end of your decimal. **0.2=0.20=0.200**

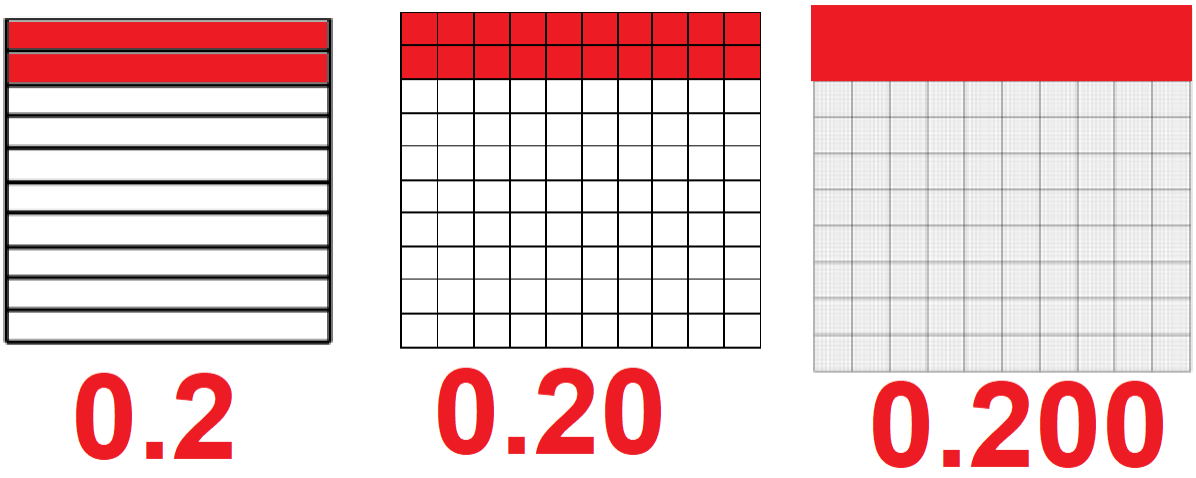


Figure 14: Equivalent decimals