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# Egyptian Fractions

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# Ancient Egyptians liked to do things their own way...

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The Egyptian method for fractions seems strange today, but only when you try to think like a modern person rather than thinking like an ancient Egyptian.

# Basic Egyptian Numerals

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Ancient Egyptians used a modified tally system for counting.

1	=		4	=	
10	=	∩	23	=	∩ ∩
100	=	☉	112	=	☉ ∩

# Ancient Egyptian Fraction Notation

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Based on parts (unit fractions), like  $\frac{1}{2}$  or  $\frac{1}{4}$  or  $\frac{1}{5}$  .

The unit fraction is made by writing the number with a “mouth” symbol over the top –

$$\frac{1}{2} = \text{𐍌}$$

$$\frac{1}{4} = \text{𐍎}$$

$$\frac{1}{5} = \text{𐍈}$$

# Modern Egyptian Fraction Notation

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To avoid having to use hieroglyphs, there is a modern shorthand for Egyptian fractions:

$$\frac{1}{2} = \bar{2}$$

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

$$\frac{1}{5} = \bar{5}$$

*Although we call them unit fractions today, Egyptian fractions do not have numerators and aren't really fractions based on modern definitions.*

# Writing Non-Unit Fractions

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We must find sums of unit fractions that are equivalent:

$$\frac{2}{5} = \frac{6}{15} = \frac{5}{15} + \frac{1}{15} = \frac{1}{3} + \frac{1}{15} = \overline{3} \overline{15}$$

Now you try one! How would you represent  $\frac{3}{5}$  ?

# Connections to place value

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When we approximate  $\pi$ , we typically use 3.14, which is a sum of 3 parts: a unit, a tenths, and a hundredths part.

$$3.14 = 3 + \frac{1}{10} + \frac{4}{100}$$

But this can be simplified to get the Egyptian fraction notation:

$$3 + \frac{1}{10} + \frac{4}{100} = 3 + \frac{1}{10} + \frac{1}{25} = 3 + \overline{10} + \overline{25} = 3 \overline{10} \overline{25}$$

# Quick estimations can be made

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When you see  $3 \overline{10} \overline{25}$ , you can quickly determine that the number is close to  $3 \frac{1}{10}$  because you see that the portion is quite small.

Try to guess the rough value of  $\frac{4586}{1310}$  - it's difficult!

Now guess the rough value of the same number in the Egyptian notation:  $3 \overline{2} \overline{1310}$  - easy, right?  $\approx 3.5$



# Interesting tidbit

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The Egyptian system doesn't allow for the same fraction to be written within the same number.

$$4 \bar{4} \bar{4} = 4 + \frac{1}{5} + \frac{1}{5} = 4 + 0.2 + 0.2 = 4.4$$

$$= 4 + \frac{1}{3} + \frac{1}{15} = 4 \bar{3} \bar{15}$$

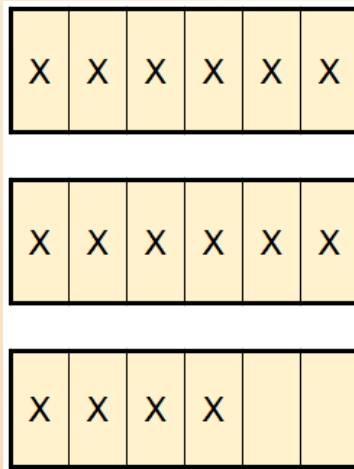
This makes sense, because 4.4 is closer to  $4\frac{1}{3}$  than  $4\frac{1}{4}$ .

# Fractions and food

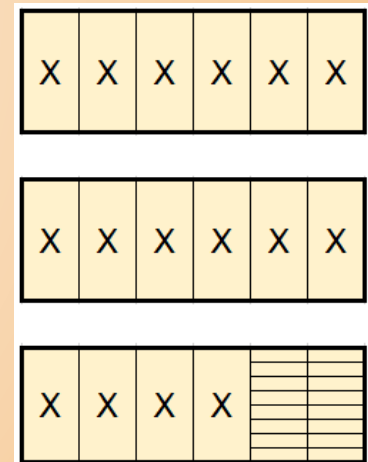
Egyptian fractions are great for dividing food into equal portions!

Divide 3 loaves of bread to give 16 people equal portions:

*First, divide each loaf into 6 pieces & give each person one piece.*



*Second, divide the remaining 2 pieces into 8 pieces each & give each person one small piece.*



$$\overline{6} \overline{48}$$

# Now you try one!

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Divide 2 by 5 using the loaves of bread approach.

*How do you divide 2 loaves of bread to give 5 people equal portions?*

What would be the Egyptian fraction notation for your answer?

# Reference

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Reimer, D. (2014). *Count Like an Egyptian*.  
Princeton, New Jersey: Princeton University Press.

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