~~4.4~~ 4.5 #9

38×60

4×6 is 24. so 40×60 is 2400.
2×6 is 12. so $2400 - 120 = 2280$.

Use same idea on this.

$$
\begin{aligned}
47 \times 80 &= \\
&= (50-3) \times 80 \\
&= (50 \times 80) - (3 \times 80) \\
&= 4000 - 240 \\
&= 4000 - 300 + 60 \\
&= 3760
\end{aligned}
$$

#15

4.5 $\frac{2}{5} \times 1260$

use $\frac{2}{5} = \frac{4}{10} = \frac{5}{10} - \frac{1}{10}$

$40\% = 50\% - 10\%$

$\frac{1}{2}$ of $1260 = 630$

$\frac{1}{10}$ of $1260 = 126$

Subtracts

$$\begin{array}{r} 630 \\ -126 \\ \hline 504 \end{array}$$

$\frac{3}{5}$ of $2480 = ?$

$60\% = 50\% + 10\%$

$= 1240 + 248$

$= 1488$

easy

$\frac{2480}{5} = \frac{2\cdot(2480)}{10} = \frac{4960}{10}$

$= \boxed{496}$

$\frac{3}{5}(2480) = 3\cdot(496)$

$= 1500 - 12 = 1488$

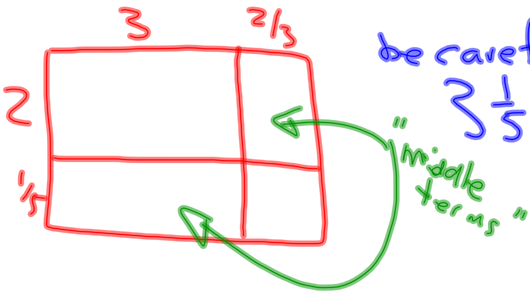
5.1 #14

$$3\tfrac{2}{3} \times 2\tfrac{1}{5} = 3\times 2 + \tfrac{2}{3}\times\tfrac{1}{5}$$

almost but not right.

(left out middle terms in FOIL)

$$3\tfrac{2}{3} \times 2\tfrac{1}{5} = (3\times 2) + \left(\tfrac{2}{3}\times\tfrac{1}{5}\right) + \left(3\times\tfrac{1}{5}\right) + \left(2\times\tfrac{2}{3}\right)$$

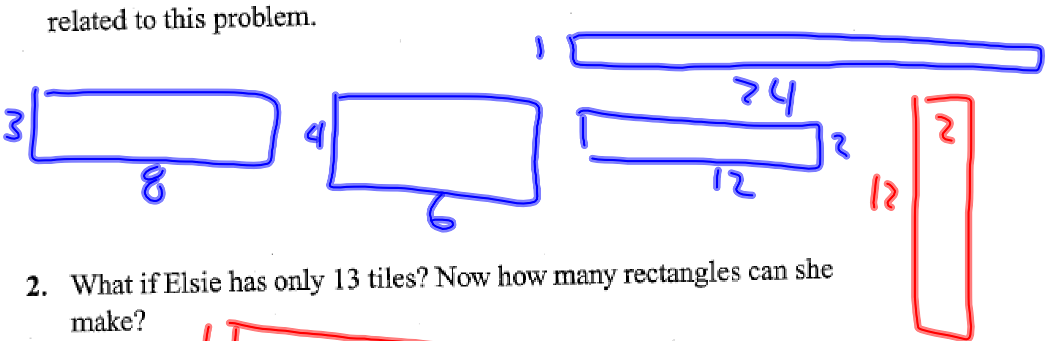


be careful $3\frac{1}{5}$ could be multiplication or mixed numbers

Class Activity 8A:
Factors, Multiples, and Rectangles

1. Elsie has 24 square tiles that she wants to arrange in the shape of a rectangle in such a way that the rectangle is completely filled with tiles. How many different rectangles can Elsie make? Consider this question from two perspectives on the rectangles: (a) the abstract case, and (b) the rectangles representing gardens that have one side along the wall of a house.

   Write one or more statements about factors or multiples that are related to this problem.



2. What if Elsie has only 13 tiles? Now how many rectangles can she make?

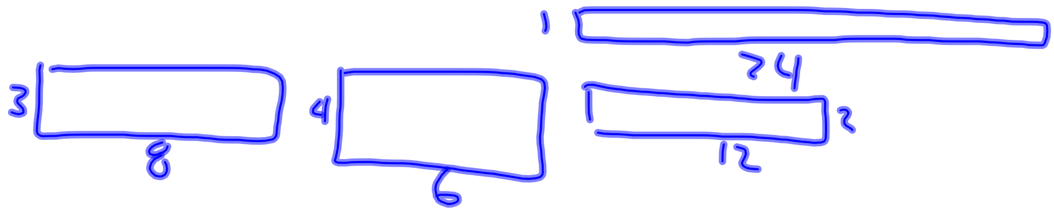
Prime

3. If Elsie has more than 24 square tiles, will she necessarily be able to make more rectangles than she could in part 1? Try some experiments.

Not necessarily....

Two examples

with 48 total



3. Consider the following problem:

A rectangular garden has an area of 64 square feet. What could its length and width be?

Why can you not solve the problem just by finding all the factors of 64? What must you add to the statement of the problem so that it *can* be solved by finding the factors of 64?

Class Activity 8C: Finding All Factors

2. Find all the factors of 198 in an efficient way.

1. Tyrese is looking for all the factors of 156. So far, Tyrese has divided 156 by all the counting numbers from 1 to 13, listing those numbers that divide 156 and listing the corresponding quotients. Here is Tyrese's work so far:

1, 156	$1 \times 156 = 156$
2, 78	$2 \times 78 = 156$
3, 52	$3 \times 52 = 156$
4, 39	$4 \times 39 = 156$
6, 26	$6 \times 26 = 156$
12, 13	$12 \times 13 = 156$
13, 12	$13 \times 12 = 156$

Should Tyrese keep checking to see if numbers larger than 13 divide 156, or can Tyrese stop dividing at this point? If so, why? What are all the factors of 156?

Class Activity 8D: Do Factors Always Come in Pairs?

The number 48 has 10 factors that come in 5 pairs. Carmina wants to know if every counting number always has an even number of factors. Investigate Carmina's question carefully. When does a counting number have an even number of factors, and when does it not?

1. Find the 5 pairs of factors of 48.

Class Activity 8E: Finding Commonality

2. You have 24 pencils, 30 stickers, and plenty of goodie bags.

   a. List all the ways you could distribute the pencils to goodie bags so that each goodie bag has the same number of pencils and there are no pencils left over.

   b. List all the ways that you could distribute the stickers to goodie bags so that each goodie bag has the same number of stickers and there are no stickers left over.

c. Now suppose you want to use the same set of goodie bags for both the pencils—as in part (a)—and the stickers—as in part (b). List all your options. What is the largest number of goodie bags you could use?

d. Describe the options in part (c) in mathematical terms. Describe the largest number of goodie bags in part (c) in mathematical terms.

Class Activity 8F: The Slide Method

1. Examine the initial and final steps of a "slide," which was used to find the GCF and LCM of 900 and 360. Try to determine how it was made. Then make another slide to find the GCF and LCM of 900 and 360.

A Slide

initially:

$$\begin{array}{c|c} & 900, 360 \\ \hline \end{array}$$

final:

$$\begin{array}{c|c} 10 & 900, 360 \\ \hline 2 & 90,\ 36 \\ \hline 3 & 45,\ 18 \\ \hline 3 & 15,\ 6 \\ \hline & 5,\ 2 \end{array}$$

GCF $= 10 \times 2 \times 3 \times 3 = 180$

LCM $= 10 \times 2 \times 3 \times 3 \times 5 \times 2 = 1800$

Find GCF and LCM with "slide" method

2	20	64
2	10	32
	5	16

common factors

$\frac{3}{20} + \frac{7}{64}$

$\frac{3 \cdot 64}{20 \cdot 64} + \frac{7 \cdot 20}{64 \cdot 20}$

Not smallest common denominator

GCF = 2 × 2 = 4

LCM = 2 × 2 × 5 × 16 = 320

Other way

20 = 2 × 2 × 5 → 4 is GCF

64 = 2 × 2 × 2 × 2 × 2 × 2

Other way

20 = 2 × 2 × 5 Least Common Multiple

64 = 2 × 2 × 2 × 2 × 2 × 2

only need one of each of these

2. Use the slide method to find the GCF and LCM of 1080 and 1200 and to find the GCF and LCM of 675 and 1125.

3. Why does the slide method work?

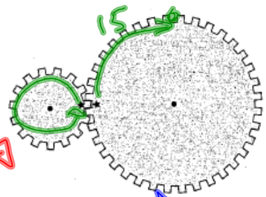
Class Activity 8G:

Problems Involving Greatest Common Factors and Least Common Multiples

1. Pencils come in packages of 18; erasers that fit on top of these pencils come in packages of 24. What is the smallest number of pencils and erasers that you can buy so that each pencil can be matched with an eraser? How many packages of pencils will you need and how many packages of erasers? (Assume that you must buy whole packages—you can't buy partial packages.)

   Solve the problem, explaining your solution. Does this problem involve the GCF or the LCM? Explain.

6. Two gears are meshed, as shown in the next figure, with the stars on each gear aligned. The large gear has 36 teeth, and the small gear has 15 teeth. Each gear rotates around a pin through its center. How many revolutions will the large gear have to make and how many revolutions will the small gear make in order for the stars to be aligned again? How is this question related to GCFs or LCMs?

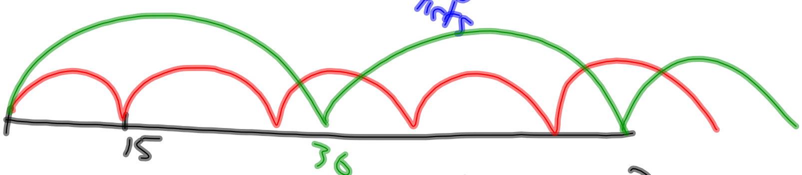


3	36	15
	12	5

12 revolutions
15×12=180 ticks

5 revolutions
5×36=180 ticks

GCF = 3
LCM = 180



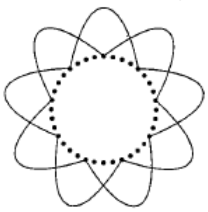
When do they first meet?
180

Class Activity 8H: Spirograph Flower Designs

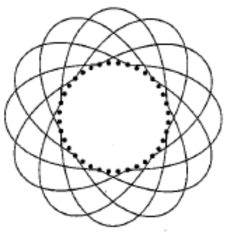
If you're ever had a Spirograph drawing toy, you know it can make designs similar to the flower designs on the next page. This activity explores some of the mathematics of these "spirograph designs."

Examine the flower designs on the next page. Each flower design is created by starting with a number of dots in a circle. Then a fixed "jump number," N, is chosen. Starting at one dot, petals are formed by connecting each subsequent Nth dot until returning to the starting dot, at which point the flower design closes up.

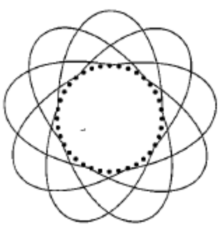
1. Examine the first four flower designs in Figure 8H.1. Try to find relationships between the number of dots at the center of the flower, the jump number, which describes how the petals were made (e.g., by connecting every 8th dot or every 15th dot), and the number of petals in the flower design. These numbers are listed in the following table:



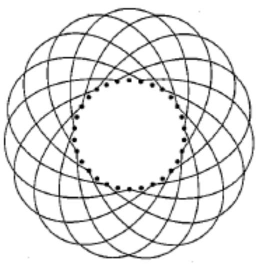
36 dots
jump #8, a petal connects every 8th dot, 9 petals



36 dots
jump #15, a petal connects every 15th dot, 12 petals



36 dots
jump #16, a petal connects every 16th dot, 9 petals



30 dots
jump #14, a petal connects every 14th dot, 15 petals

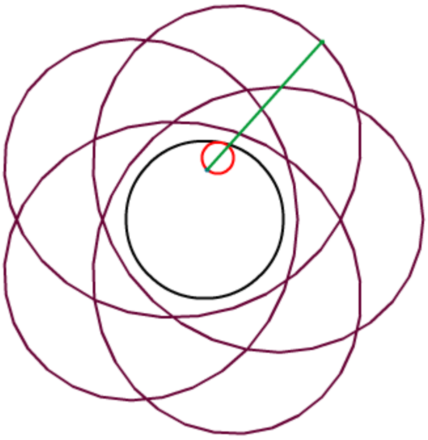
design	number of dots	"Jump Number" a petal connects every ____th dot	number of petals
design 1	36	8	9
design 2	36	15	12
design 3	36	16	9
design 4	30	14	15
design 5	30	4	
design 6	30	12	

Spirograph-type game

http://www.mathplayground.com/games.html

Vi Hart video on Factoring and Drawing Stars

http://www.youtube.com/watch?v=CfJzrmS9UfY



urnal of Combinatorial Theory, Series B **72**, 136–139 (1998)
ticle No. TB971800

A Splitter for Graphs with No Petersen Family Minor

John Maharry*

Department of Mathematics, The Ohio State University, Columbus, Ohio 43210-1174
E-mail: maharry@math.ohio-state.edu

Received December 2, 1996

The Petersen family consists of the seven graphs that can be obtained from the Petersen Graph by $Y\Delta$- and ΔY-exchanges. A splitter for a family of graphs is a maximal 3-connected graph in the family. In this paper, a previously studied graph, $Q_{13,3}$, is shown to be a splitter for the set of all graphs with no Petersen family minor. Moreover, $Q_{13,3}$ is a splitter for the family of graphs with no K_6-minor, as well as for the family of graphs with no Petersen minor.

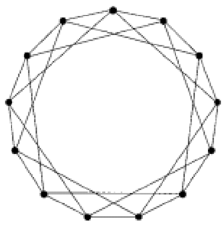


Fig. 2. The graph $Q_{13,3}$.

found that the toroidal embedding found by Randby is a minimal 3-representative toroidal embedding as a corollary to a theorem of Schrijver [5].

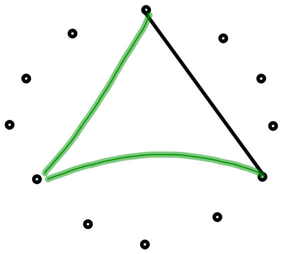
A 4-connected graph with no triangles is said to be *Tutte-4-connected.* A graph which has a vertex, the deletion of which results in a planar graph, is called an *apex graph.* Robertson [4] had conjectured that there was a unique Tutte-4-connected graph that was not apex and had no member of the Petersen family as a minor, namely the graph obtained by deleting a perfect matching from $K_{5,5}$. It turns out that $Q_{13,3}$ is a second graph of this type. Moreover, $Q_{13,3}$ contains ($K_{5,5}$ minus a perfect matching) as a minor.

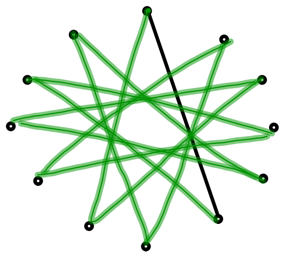
Draw Stars by skippping.
In the figures on the left, start at the top and draw lines that skip 3 dots and land on the 4th.

In the figures on the right, start at the top and draw lines that skip 4 dots and land on the 5th.

LCM (5,12)

12 dots





13 dots