

CCTM, Denver 2018

Building Numbers from Primes



MATH 5280
*challenging math
for **adventurous** learners*

Jerry Burkhart
5280math.com

@5280math

5280math.com >>

5280 Math Resources >>

Math Building Blocks

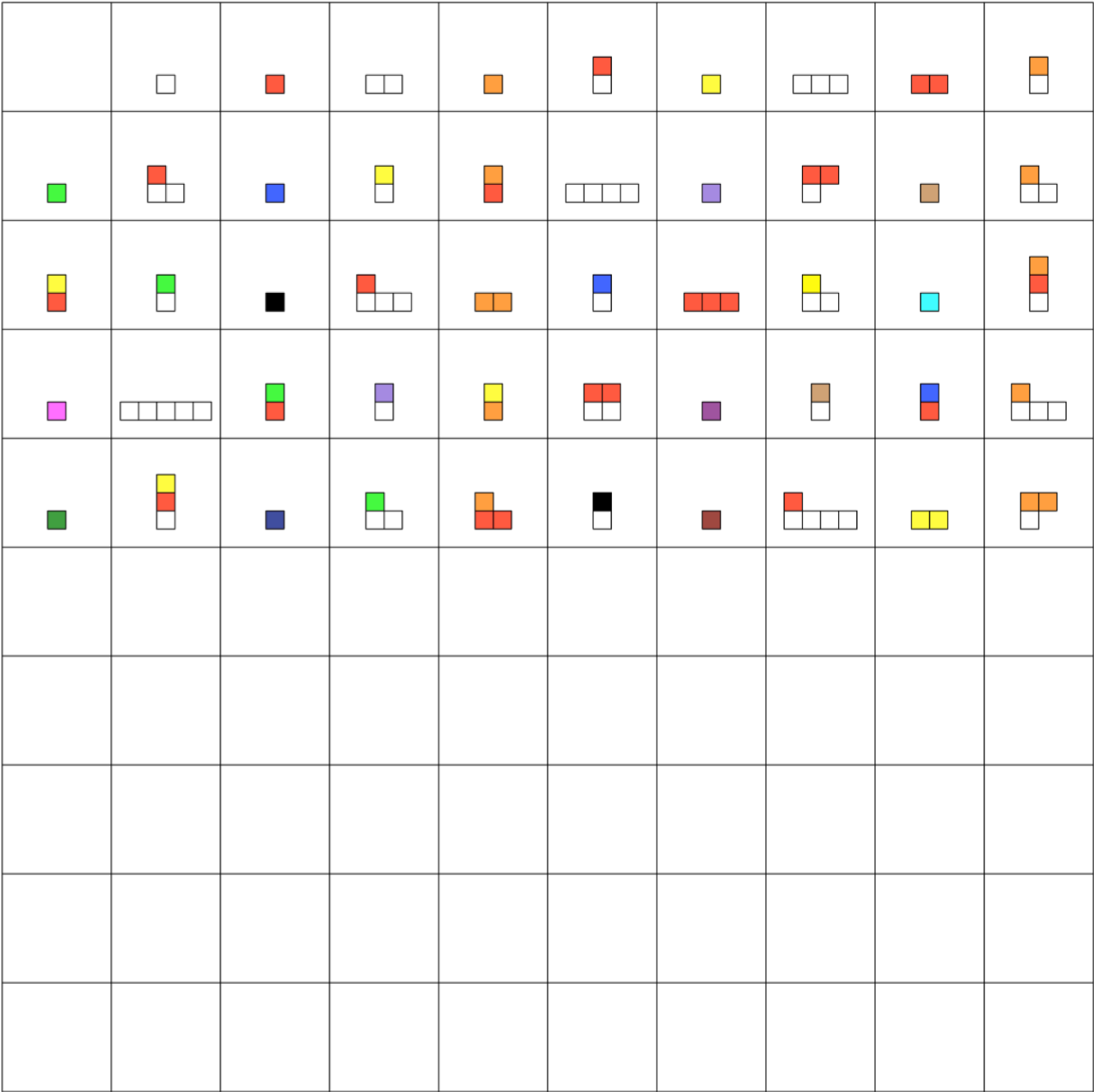


MATH
challenging math
for *adventurous* learners















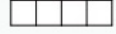















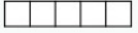















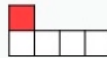















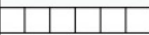















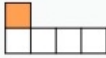




















5280

What do you notice?







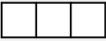







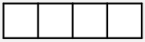







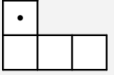


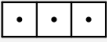




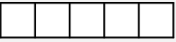







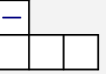







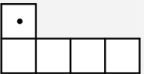


What do you wonder?



Introducing the Blocks: Method 1

1	2	3	4	5	6	7	8	9	10
									
11	12	13	14	15	16	17	18	19	20
									
21	22	23	24	25	26	27	28	29	30
									
31	32	33	34	35	36	37	38	39	40
									
41	42	43	44	45	46	47	48	49	50
									
51	52	53	54	55	56	57	58	59	60
									
61	62	63	64	65	66	67	68	69	70
									
71	72	73	74	75	76	77	78	79	80
									
81	82	83	84	85	86	87	88	89	90
									
91	92	93	94	95	96	97	98	99	100
									

A Color-free Version

Introducing the Blocks: Method 2

Give students enough colored blocks to build 1 - 20.
Each color represents a different number.
Joining blocks stands for multiplication.

- Build the numbers 2 - 20 in order.
- Use a new color only when necessary.

5280math.com >> 5280 Math Resources >> Math Building Blocks: More Resources

<https://www.nctm.org/Publications/Mathematics-Teaching-in-Middle-School/2009/Vol15/Issue3/Building-Numbers-from-Primes/>

see Burkhart, Jerry (2009). Building Numbers from Primes.
Mathematics Teaching in the Middle School, 15, 156–167.

1	2 <div>2</div>	3 <div>3</div>	4 <div>22</div>	5 <div>5</div>
6 <div>23</div>	7 <div>7</div>	8 <div>2 22</div>	9 <div>33</div>	10 <div>25</div>
11 <div>11</div>	12 <div>3 22</div>	13 <div>13</div>	14 <div>27</div>	15 <div>35</div>
16 <div>22 22</div>	17 <div>17</div>	18 <div>3 23</div>	19 <div>19</div>	20 <div>5 22</div>

Introducing the Building Blocks model
Method 3

Math Building Blocks

by Jerry Burkhart

Introducing the Building Blocks model
Method 3

Building Blocks

modified Sieve of Eratosthenes
with numbers

by Jerry Burkhart

Number Theory Reasoning

Why is the first cell blank?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100















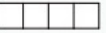















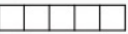















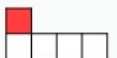















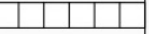















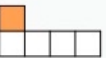




















Number Theory Reasoning

What can you say about blocks in consecutively numbered cells?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Number Theory Reasoning















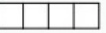















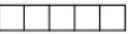















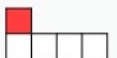















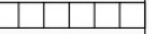















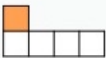















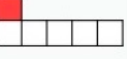




If a number has a factor of 4, then...

1	2	3	4	5	6	7	8	9	10
									
11	12	13	14	15	16	17	18	19	20
									
21	22	23	24	25	26	27	28	29	30
									
31	32	33	34	35	36	37	38	39	40
									
41	42	43	44	45	46	47	48	49	50
									
51	52	53	54	55	56	57	58	59	60
									
61	62	63	64	65	66	67	68	69	70
									
71	72	73	74	75	76	77	78	79	80
									
81	82	83	84	85	86	87	88	89	90
									
91	92	93	94	95	96	97	98	99	100
									

Number Theory Reasoning

If a number has a factor of 4, then...

If a number does not have a factor of 3, then...

1	2	3	4	5	6	7	8	9	10
									
11	12	13	14	15	16	17	18	19	20
									
21	22	23	24	25	26	27	28	29	30
									
31	32	33	34	35	36	37	38	39	40
									
41	42	43	44	45	46	47	48	49	50
									
51	52	53	54	55	56	57	58	59	60
									
61	62	63	64	65	66	67	68	69	70
									
71	72	73	74	75	76	77	78	79	80
									
81	82	83	84	85	86	87	88	89	90
									
91	92	93	94	95	96	97	98	99	100
									

The Next Step

Build the numbers.

101 128 196 201 999 1000 1001 etc.

What strategies might students use?

1. Test one color (prime number) at a time.
2. Find one or more factors that appear on the grid.
3. Use a factor tree.

An Extension



Multiplication and Division

$$6 \cdot 15$$

$$21 \div 3$$

$$14 \cdot 35$$

$$98 \div 14$$

$$8 \cdot 125$$

$$64 \div 32$$

$$7 \cdot 1$$

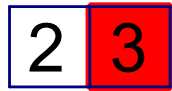
$$5 \div 5$$

$$12 \cdot 18$$

$$210 \div 42$$

Multiplication Examples

$6 \cdot 15$



$9 \cdot 10$



90



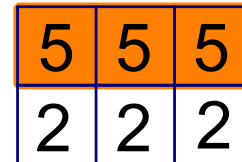
$8 \cdot 125$



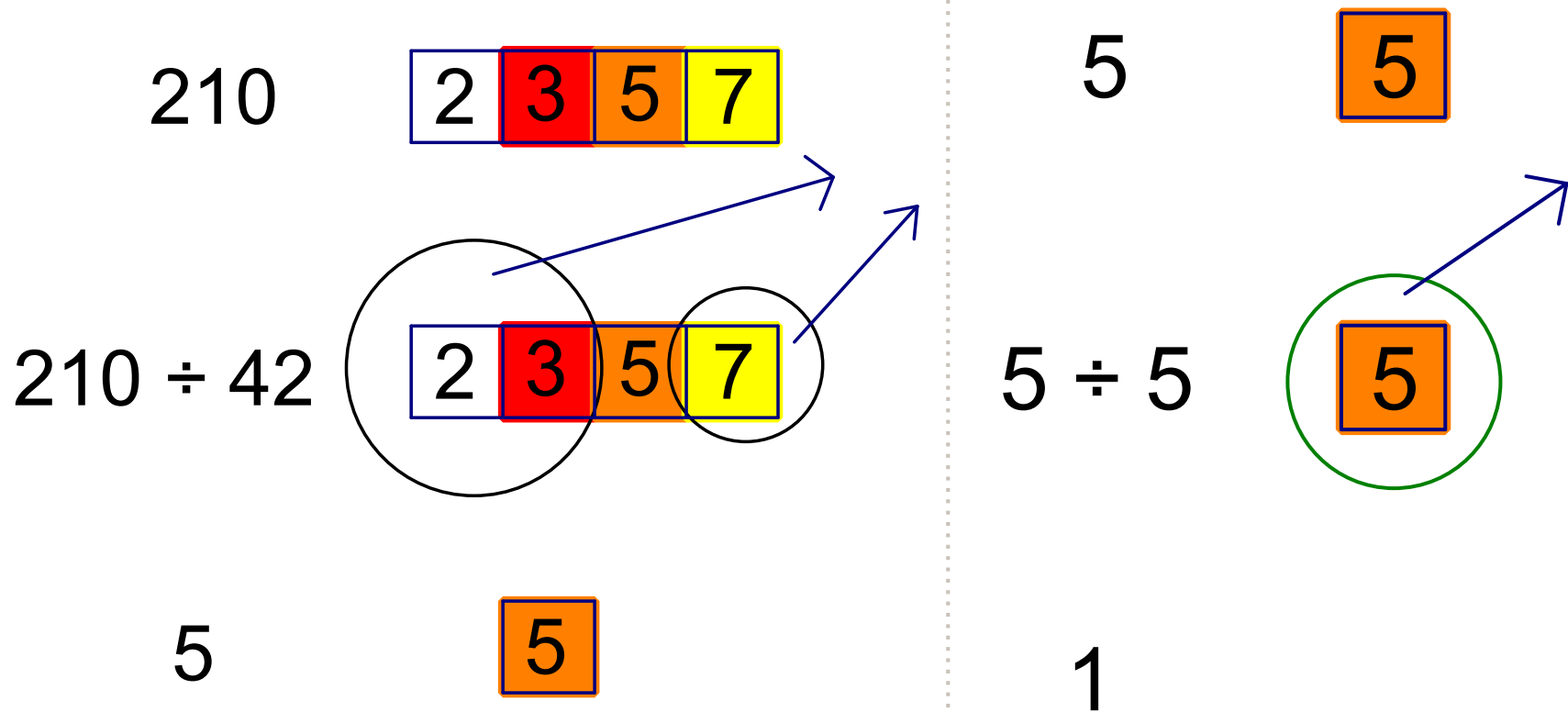
$10 \cdot 10 \cdot 10$



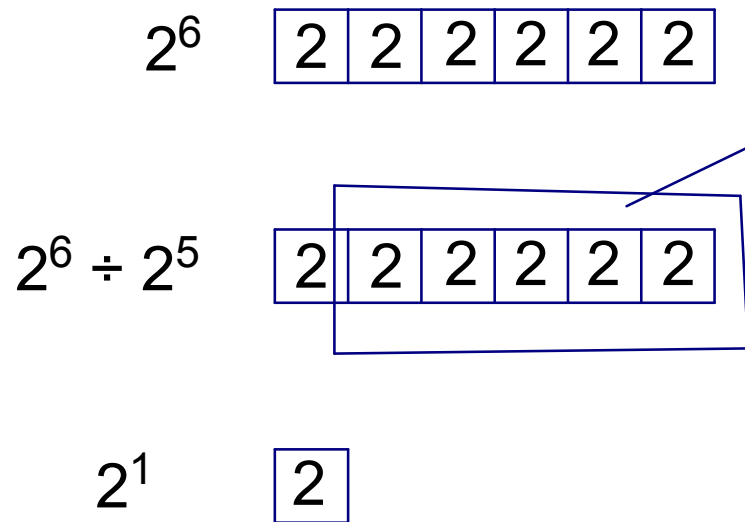
1000



Division Examples



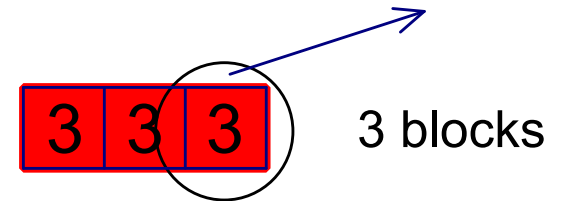
Exponent Examples



$$2^6 \div 2^5 = 2^{6-5}$$

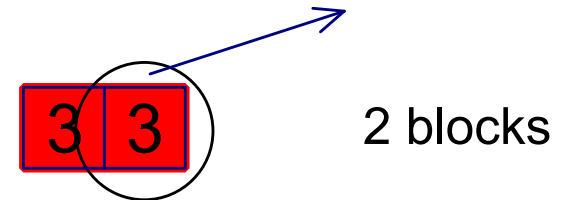
$$64 \div 32 = 2$$

$$3^3 = 27$$



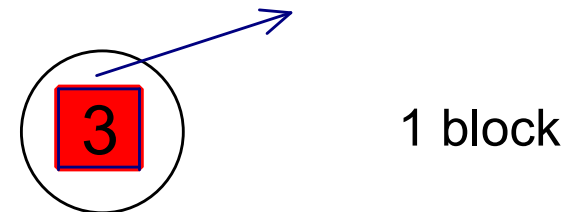
$\div 3$

$$3^2 = 9$$



$\div 3$

$$3^1 = 3$$

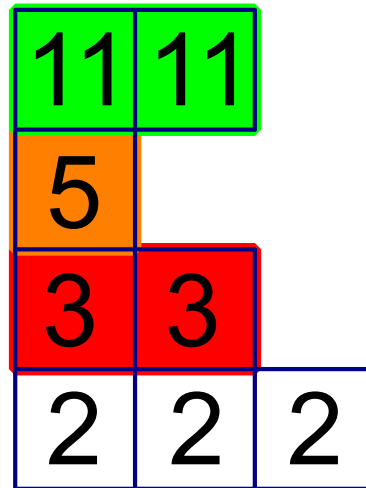


$\div 3$

$$3^0 = 1$$

0 blocks

Factors



Is _____ a factor of this number?

2 6 22 7 8 16 44 35 27 36 1210

Finding all factors of a number

$$24 \quad \boxed{2} \boxed{2} \boxed{2} \boxed{3}$$

Factors

$$4 \cdot 6 \quad \boxed{2} \boxed{2} \quad \boxed{2} \boxed{3}$$

$$2 \cdot 12 \quad \boxed{2} \quad \boxed{2} \boxed{2} \boxed{3}$$

$$8 \cdot 3 \quad \boxed{2} \boxed{2} \boxed{2} \quad \boxed{3}$$

$$1 \cdot 24 \quad \boxed{2} \boxed{2} \boxed{2} \boxed{3}$$

$$770 \quad \boxed{2} \boxed{5} \boxed{7} \boxed{11}$$

Factors

$$2 \cdot 385 \quad \boxed{2} \quad \boxed{5} \boxed{7} \boxed{11}$$

$$5 \cdot 154 \quad \boxed{5} \quad \boxed{2} \boxed{7} \boxed{11}$$

$$7 \cdot 110 \quad \boxed{7} \quad \boxed{2} \boxed{5} \boxed{11}$$

$$11 \cdot 70 \quad \boxed{11} \quad \boxed{2} \boxed{5} \boxed{7}$$

$$10 \cdot 77 \quad \boxed{2} \boxed{5} \quad \boxed{7} \boxed{11}$$

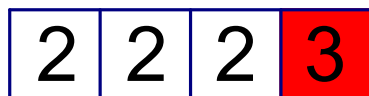
$$14 \cdot 55 \quad \boxed{2} \boxed{7} \quad \boxed{5} \boxed{11}$$

$$22 \cdot 35 \quad \boxed{2} \boxed{11} \quad \boxed{5} \boxed{7}$$

$$1 \cdot 770 \quad \boxed{2} \boxed{5} \boxed{7} \boxed{11}$$

Factors in Exponential Form

$2^3 \cdot 3^1$



Factors

$2^2 \cdot 3^0$



$2^1 \cdot 3^1$

$2^1 \cdot 3^0$



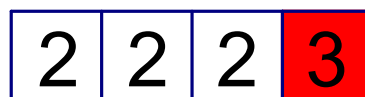
$2^2 \cdot 3^1$

$2^3 \cdot 3^0$



$2^0 \cdot 3^1$

$2^0 \cdot 3^0$



$2^3 \cdot 3^1$

Counting Factors

$2^0 \cdot 3^0$ 1	$2^1 \cdot 3^0$ <div>2</div> 2	$2^2 \cdot 3^0$ <div>22</div> 4	$2^3 \cdot 3^0$ <div>222</div> 8
$2^0 \cdot 3^1$ <div>3</div> 3	$2^1 \cdot 3^1$ <div>3</div> <div>2</div> 6	$2^2 \cdot 3^1$ <div>3</div> <div>22</div> 12	$2^3 \cdot 3^1$ <div>3</div> <div>222</div> 24

Counting Factors: a formula

$$n = p^x \cdot q^y$$

p and q are distinct prime numbers.
 N represents the number of factors of n .

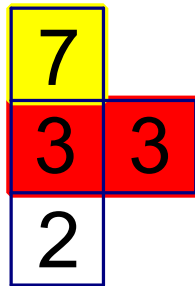
$$N = (x + 1) \cdot (y + 1)$$

adapted from Advanced Common Core Math Explorations: Factors and Multiples

by Jerry Burkhart
Prufrock Press, 2014

Greatest Common Factor

126



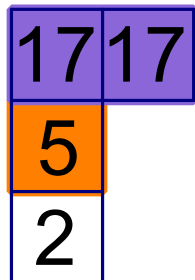
273



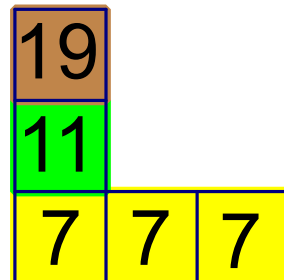
GCF: 21



2890



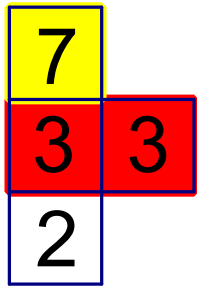
71687



GCF: 1

GCF with Exponents

$$2^1 \cdot 3^2 \cdot 7^1$$



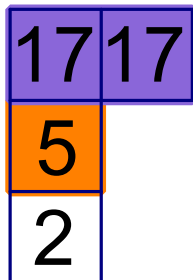
$$3^1 \cdot 7^1 \cdot 13^1$$



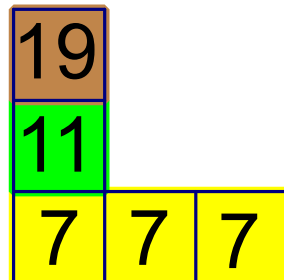
$$\text{GCF: } 3^1 \cdot 7^1$$



$$2^1 \cdot 5^1 \cdot 17^2$$



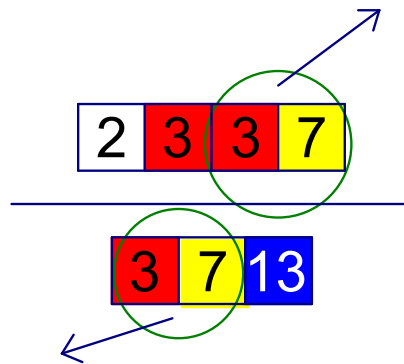
$$7^3 \cdot 11^1 \cdot 19^1$$



$$\text{GCF: } 1$$

Simplifying Fractions

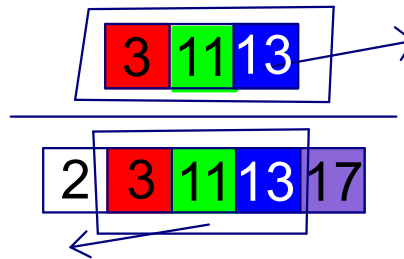
$$\frac{126}{273}$$



$$\frac{2 \times 3}{13}$$

$$\frac{6}{13}$$

$$\frac{429}{14586}$$

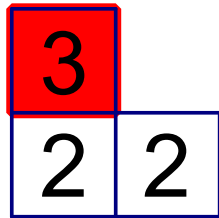


$$\frac{2 \times 17}{13}$$

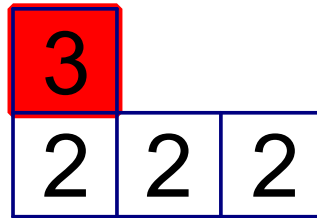
$$\frac{1}{34}$$

Multiples

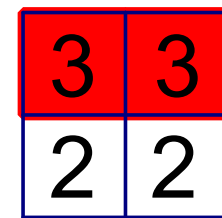
12



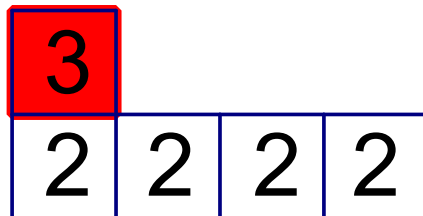
24



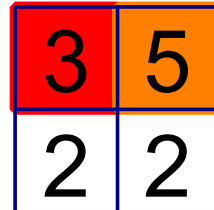
36



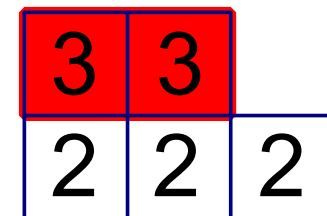
48



60

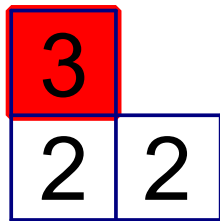


72

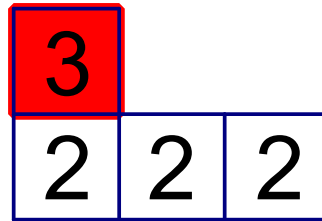


Multiples in Exponential Form

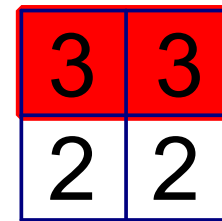
$$2^2 \cdot 3^1$$



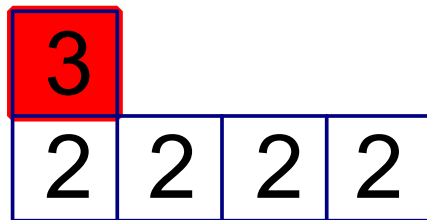
$$2^3 \cdot 3^1$$



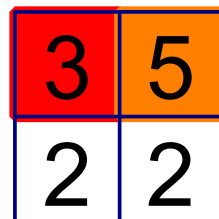
$$2^2 \cdot 3^2$$



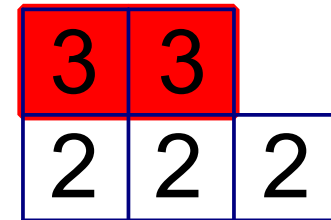
$$2^4 \cdot 3^1$$



$$2^2 \cdot 3^1 \cdot 5^1$$

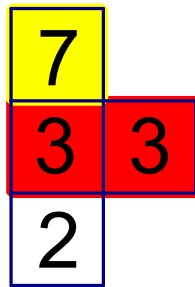


$$2^3 \cdot 3^2$$



Least Common Multiple

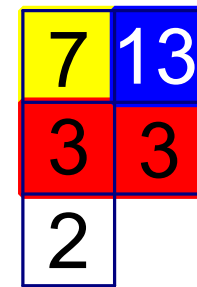
126



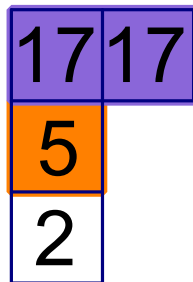
273



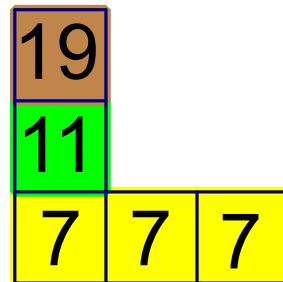
LCM: 1638



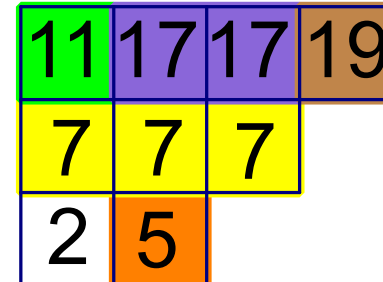
2890



71687



LCM: 207,175,430



LCM Strategy 1

The numbers

126



273



1. **Choose** a factor.

273



2. **Find** the missing blocks.

273



6



3. **Join** the blocks.

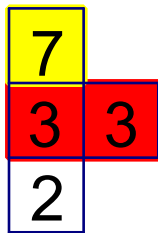
LCM: $273 \cdot 6 = 1638$



LCM Strategy 2

The numbers

126

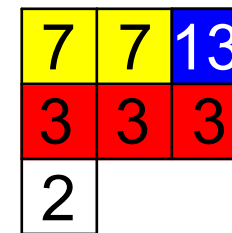


273



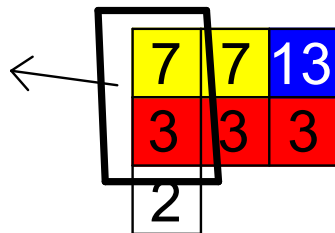
1. **Join** the blocks.

$$126 \cdot 273 = 34398$$



2. **Remove** the common blocks.

$$34398 \div 21$$



The answer

LCM: 1638



LCM Strategy 3

The numbers

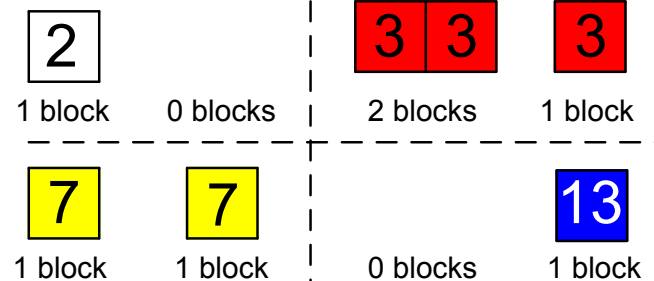
126



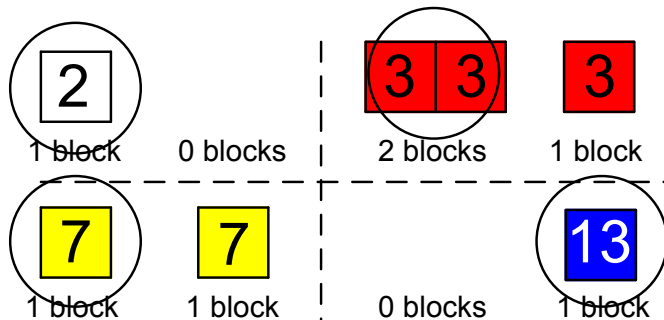
273



1. **Count** same-colored blocks.



2. **Choose** the greater number.



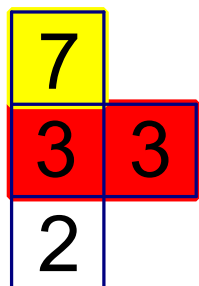
3. **Join** the blocks.

$$\text{LCM: } 2 \cdot 9 \cdot 7 \cdot 13 = 1638$$

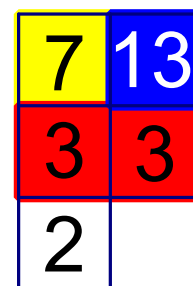


LCM with Exponents

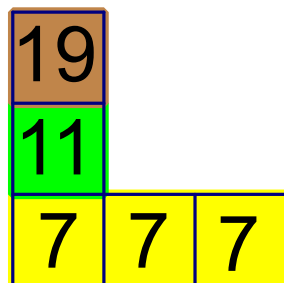
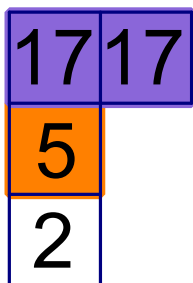
$$2^1 \cdot 3^2 \cdot 7^1 \quad 3^1 \cdot 7^1 \cdot 13^1$$



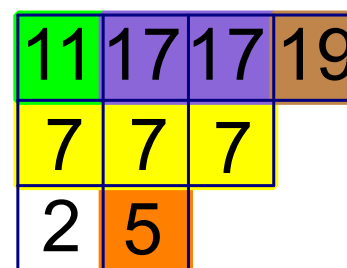
$$\text{LCM: } 2^1 \cdot 3^2 \cdot 7^1 \cdot 13^1$$



$$2^1 \cdot 5^1 \cdot 17^2 \quad 7^3 \cdot 11^1 \cdot 19^1$$

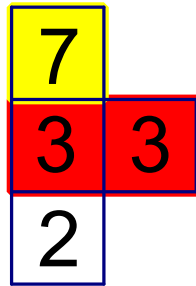


$$\text{LCM: } 2^1 \cdot 5^1 \cdot 7^3 \cdot 11^1 \cdot 17^2 \cdot 19^1$$



Connecting GCF and LCM

126



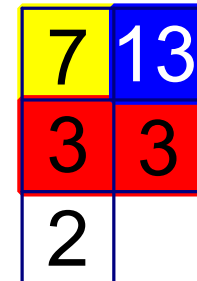
GCF: 21



273

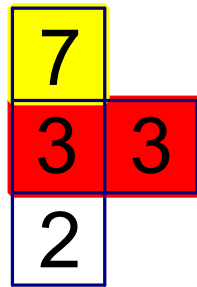


LCM: 1638



Connecting GCF and LCM with Exponents

$$2^1 \cdot 3^2 \cdot 7^1$$



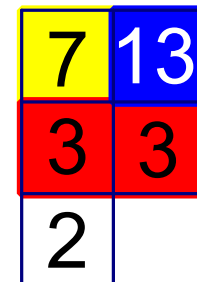
$$3^1 \cdot 7^1 \cdot 13^1$$



$$\text{GCF: } 3^1 \cdot 7^1$$

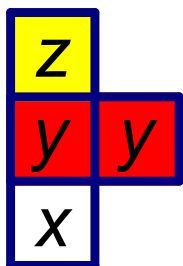


$$\text{LCM: } 2^1 \cdot 3^2 \cdot 7^1 \cdot 13^1$$



GCF and LCM with Variables

$$xy^2z$$



$$yzw$$



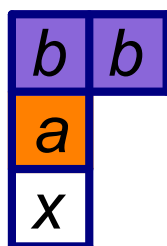
$$\text{GCF: } yz$$



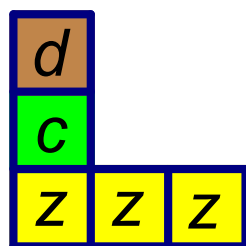
$$\text{LCM: } xy^2zw$$



$$xab^2$$

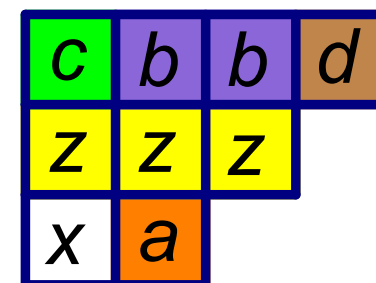


$$z^3cd$$



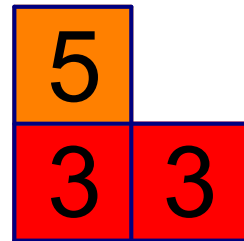
$$\text{GCF: } 1$$

$$\text{LCM: } xaz^3cb^2d$$



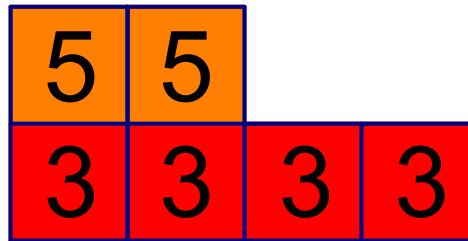
Squaring a number

$$45$$



$$3^2 \cdot 5^1$$

$$45^2$$



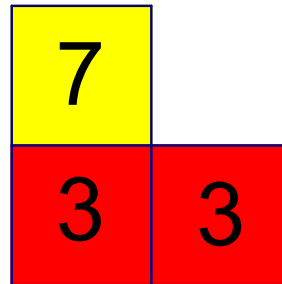
$$3^4 \cdot 5^2$$

How can we recognize square numbers from their block diagrams?

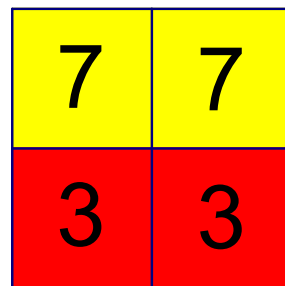
How can we recognize square numbers from the exponents in their prime factorizations?

- Even number of blocks of each color
- Exponents are all even

What is the smallest square number greater than 63?



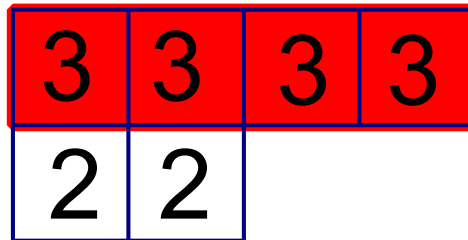
Strategy: Join the fewest blocks so that there is an even number of blocks of each color.



$$63 \cdot 7 \text{ or } 3^2 \cdot 7^2$$
$$441$$

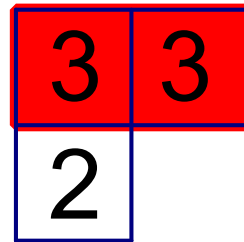
Square Roots

$$324$$



$$2^2 \cdot 3^4$$

$$\sqrt{324}$$



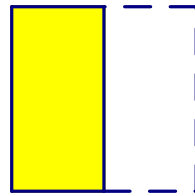
$$2^1 \cdot 3^2$$

What happens to the blocks when you form the square root of a number?

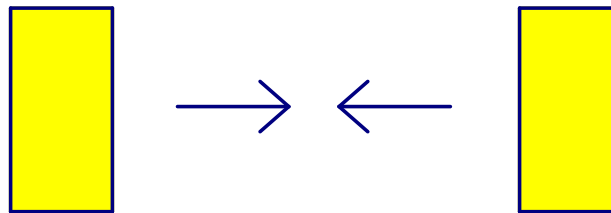
What happens to the exponents when you form the square root of a number?

- Half as many blocks of each color
- Exponents are halved

What does this represent?

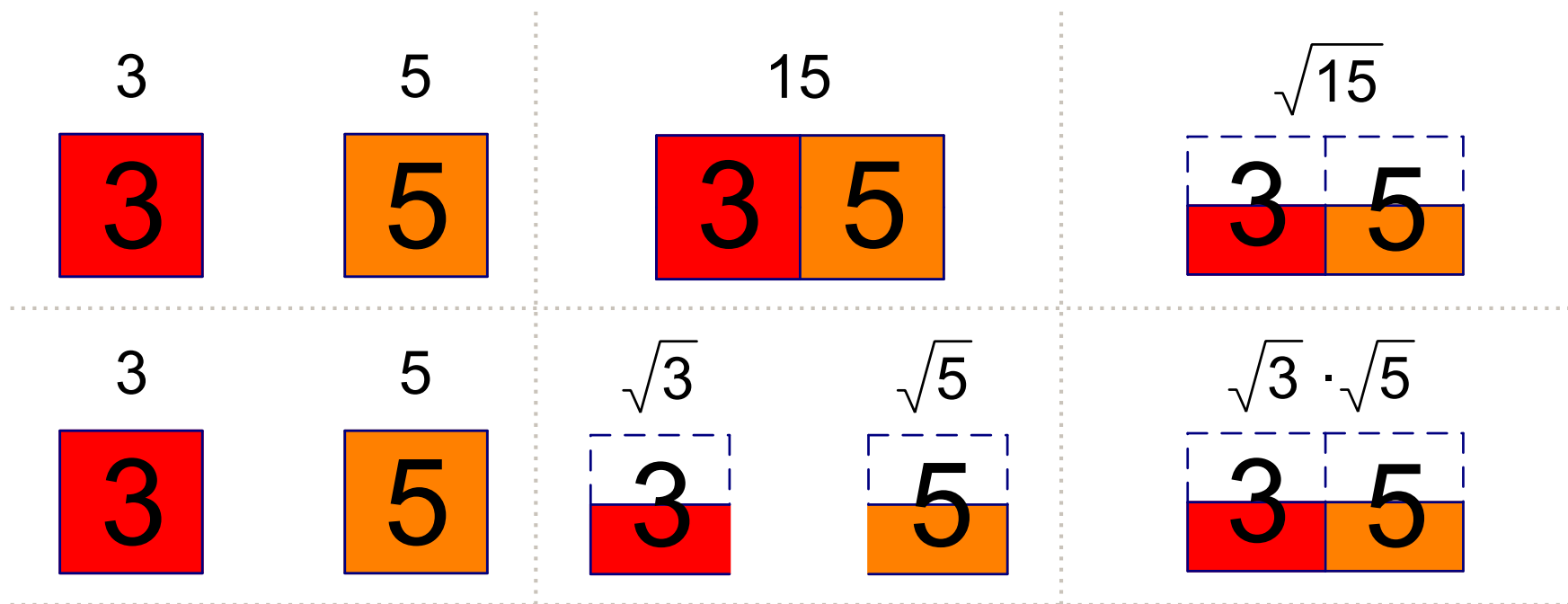


$$7\frac{1}{2}$$



$$\sqrt{7} \cdot \sqrt{7}$$

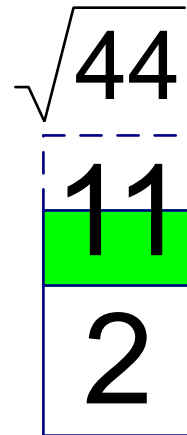
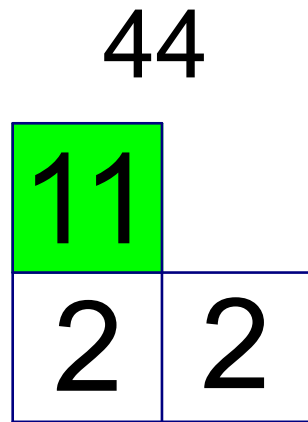
What property is illustrated?



$$\sqrt{15} = \sqrt{3} \cdot \sqrt{5}$$

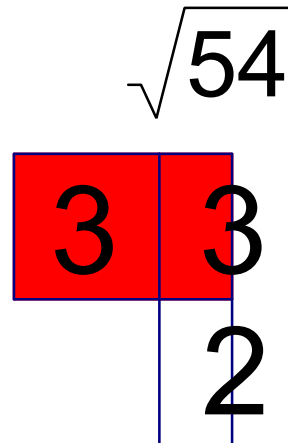
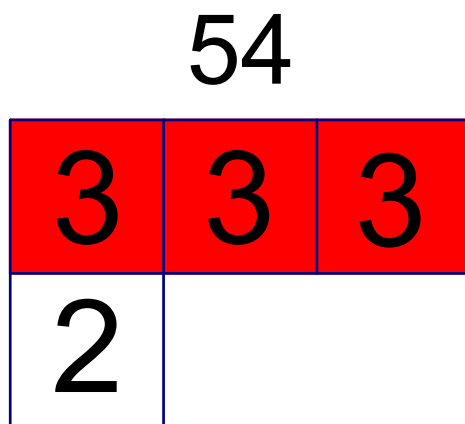
$$15^{\frac{1}{2}} = 3^{\frac{1}{2}} \cdot 5^{\frac{1}{2}}$$

Simplifying Radicals



$$2 \cdot \sqrt{11}$$

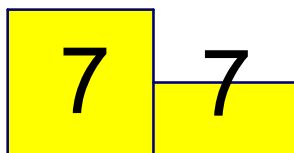
$$2 \cdot 11^{\frac{1}{2}}$$



$$3 \cdot \sqrt{6}$$

$$3 \cdot 6^{\frac{1}{2}}$$

How many ways can you name this?



$7\sqrt{7}$

$7 \cdot 7^{\frac{1}{2}}$

$7^{1\frac{1}{2}}$

$\sqrt{343}$

$343^{0.5}$

$\left(7^{\frac{1}{2}}\right)^3$

$49^{\frac{1}{2}} \cdot 7^{\frac{1}{2}}$

$(49 \cdot 7)^{\frac{1}{2}}$

$\left(7^3\right)^{0.5}$

$\sqrt{7^3}$

$49 \div \sqrt{7}$

$117,649^{\frac{1}{4}}$

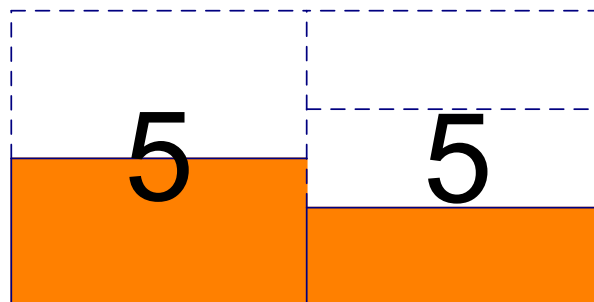
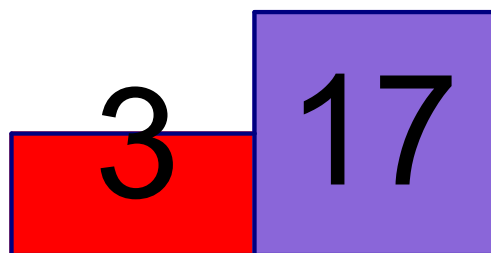
$49^{\frac{3}{4}}$

$\left(\left(7^2\right)^{0.25}\right)^3$

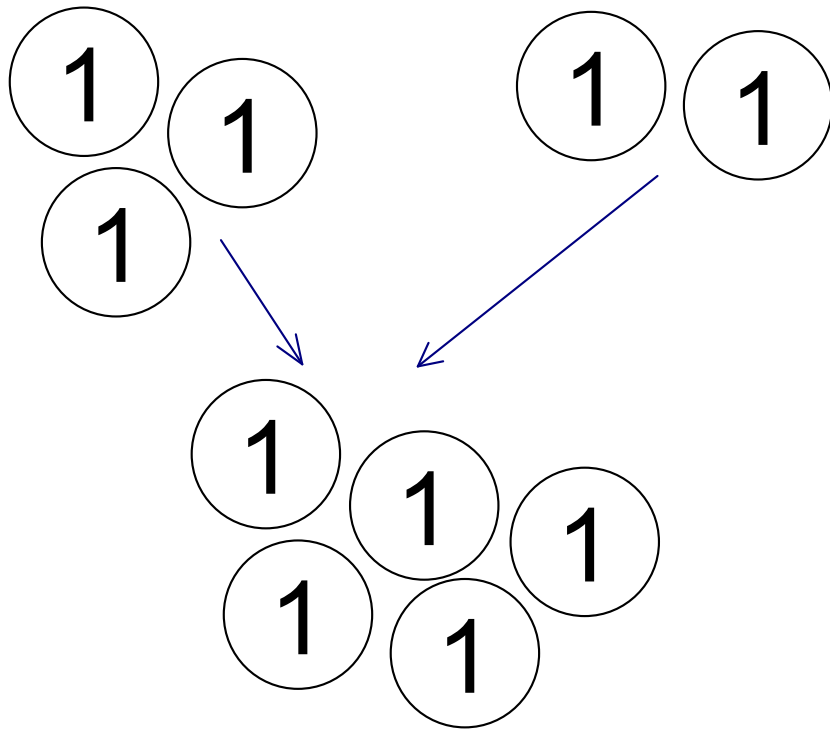
$\left(7^{\frac{1}{4}}\right)^6$

$\sim 18.520259\dots$

Some other pictures to name...

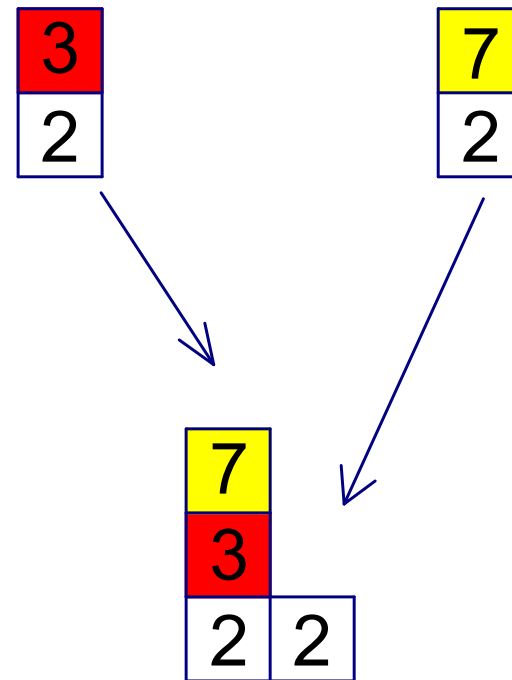


Counters and Blocks



Counters

Joining represents addition: $3 + 2 = 5$

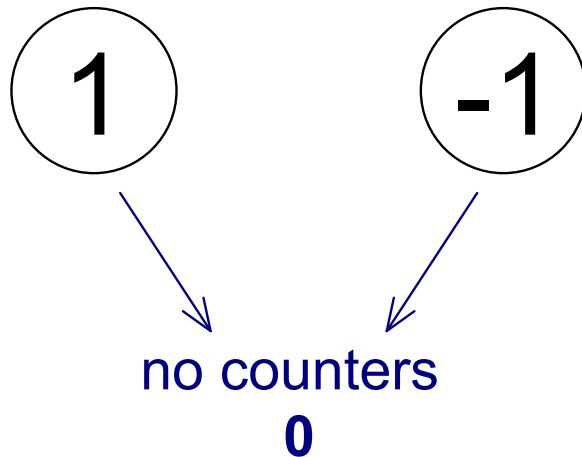


Building Blocks

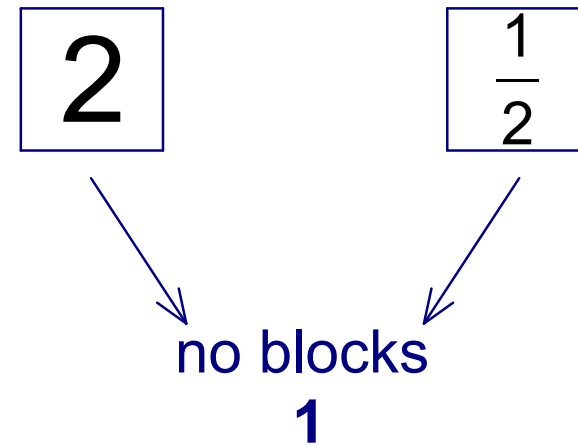
Joining represents multiplication:
 $6 \cdot 14 = 84$

Inverses and Identities

What happens when you join additive **inverses** (opposites)?



What happens when you join multiplicative **inverses** (reciprocals)?



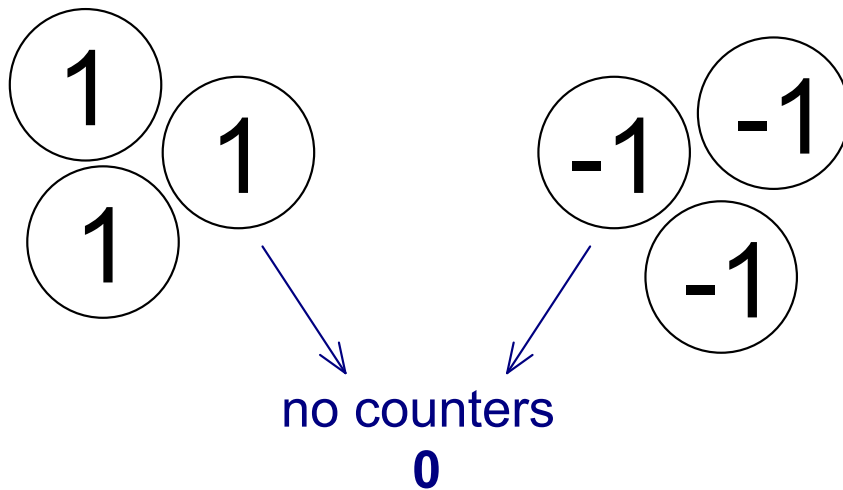
In both cases, you get the **identity**, which is
“no counters” or “no blocks.”

$$1 + -1 = 0$$

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

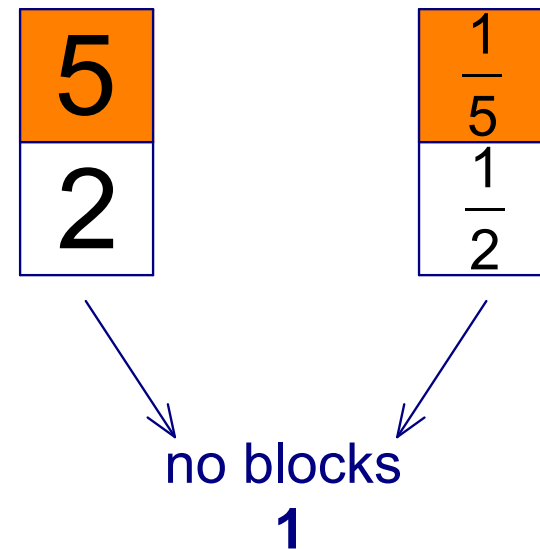
More Inverses

You can use 1 and its opposite to form other inverses.



$$3 + -3 = 0$$

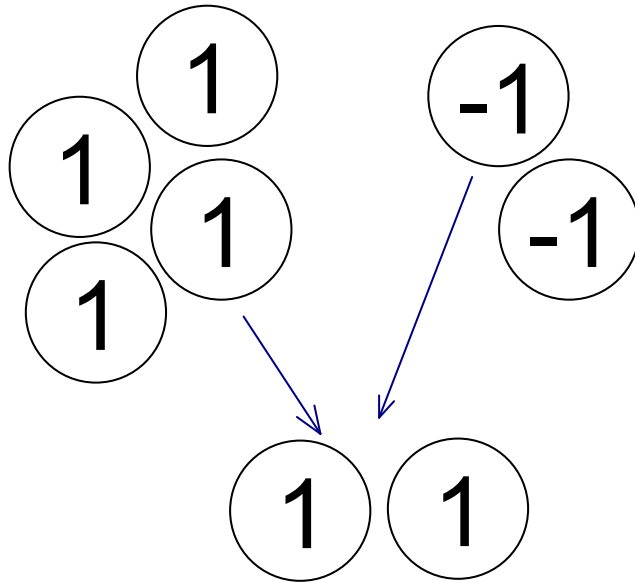
You can use primes and their reciprocals to form other inverses.



$$10 \cdot \frac{1}{10} = 1$$

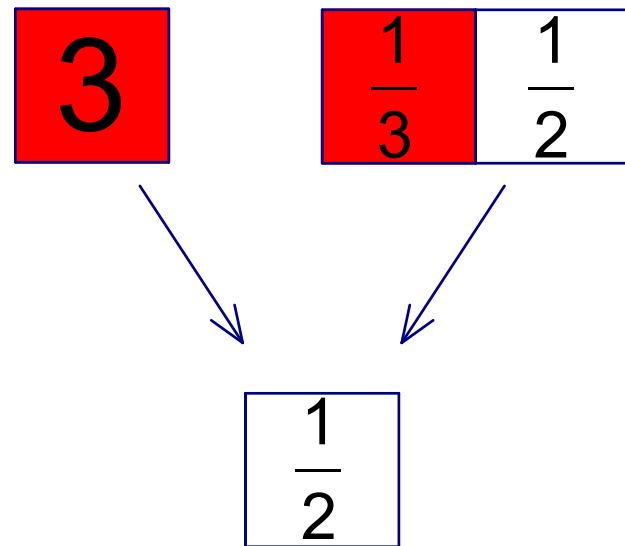
Addition and Multiplication

You can use opposite pairs to help you add.



$$4 + -2 = 2$$

You can use reciprocal pairs to help you multiply.

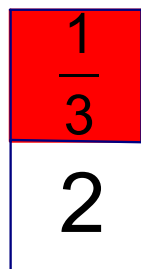


$$3 \cdot \frac{1}{6} = \frac{1}{2}$$

No new rules are needed!

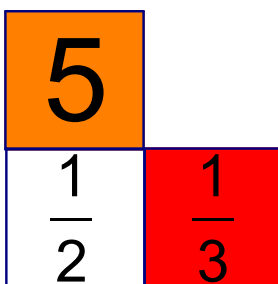
Forming Other Fractions

$$\frac{2}{3}$$



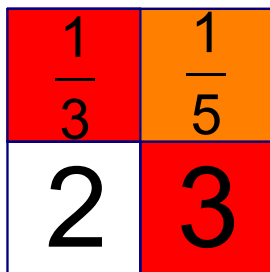
$$2 \cdot \frac{1}{3} = \frac{2}{3}$$

$$\frac{5}{6}$$



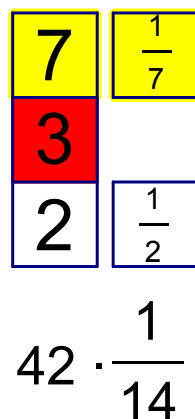
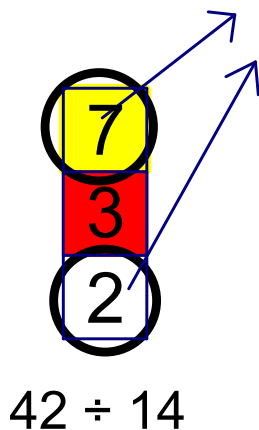
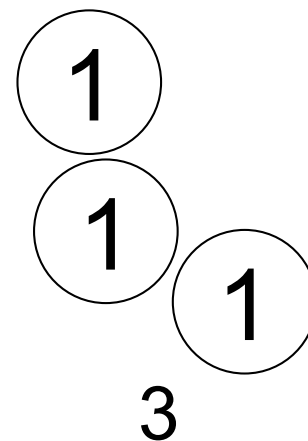
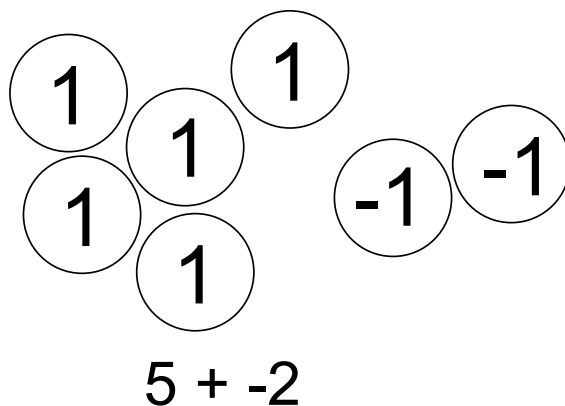
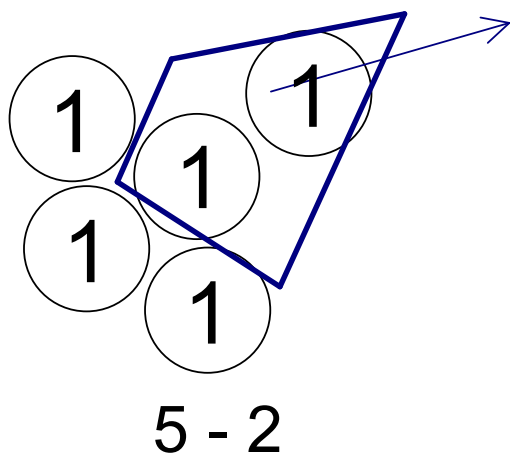
$$5 \cdot \frac{1}{6} = \frac{5}{6}$$

$$\frac{6}{15}$$

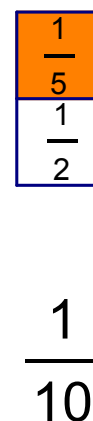
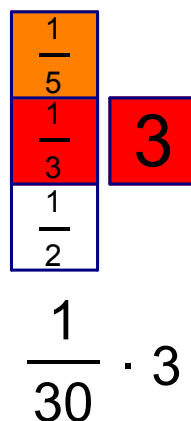
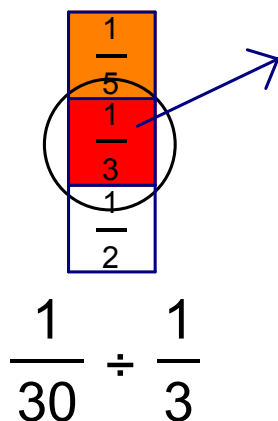
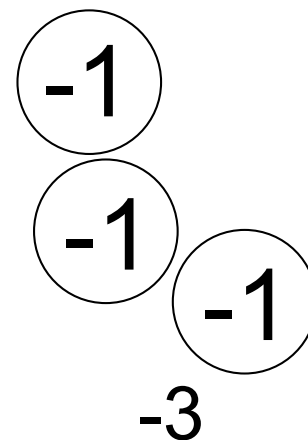
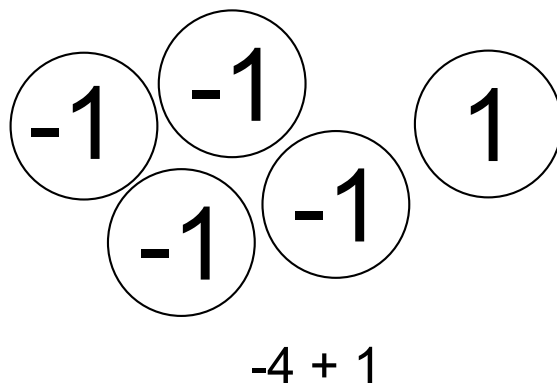
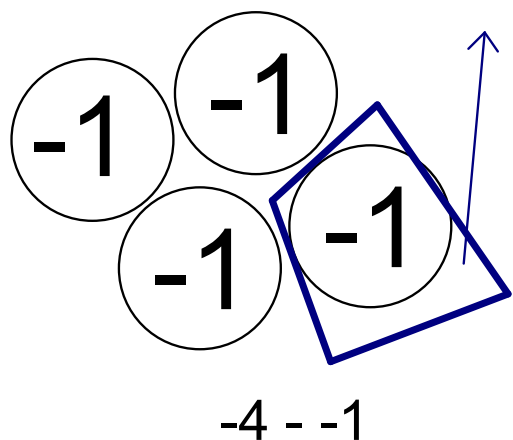


$$6 \cdot \frac{1}{15} = \frac{6}{15}$$

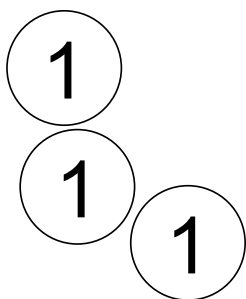
Using Inverses to Calculate



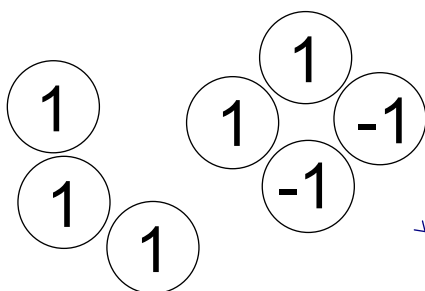
Using Inverses to Calculate (2)



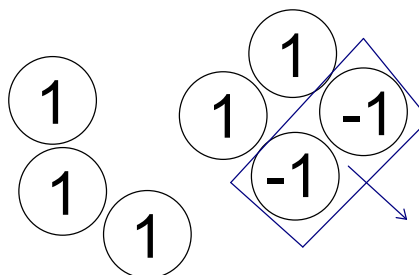
Convenient Pairs of Inverses



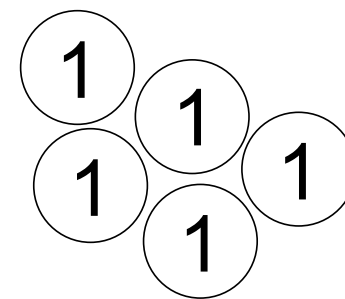
$3 - -2$
(start with 3)



join opposite pairs



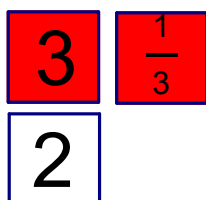
remove -2



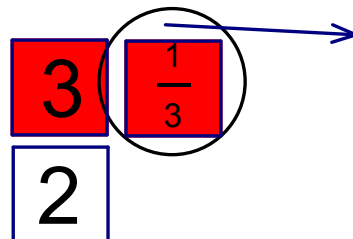
$3 + 2$



$2 \div \frac{1}{3}$
(start with 2)



join reciprocal pair



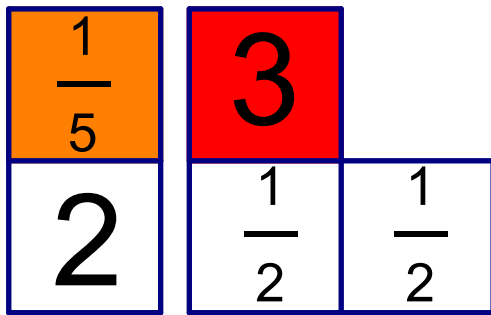
remove $\frac{1}{3}$



$2 \cdot 3$

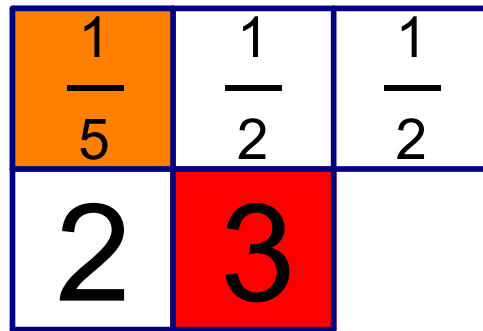
A Rule for Multiplying Fractions

$$\frac{2}{5} \cdot \frac{3}{4}$$



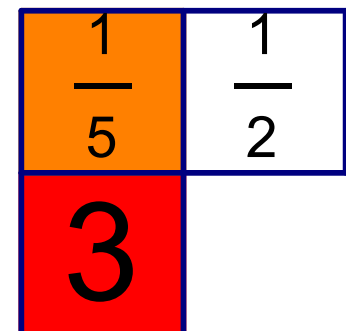
$$\frac{2}{5} \cdot \frac{3}{4}$$

build



$$\frac{6}{20}$$

join



$$\frac{3}{10}$$

simplify

A Rule for Dividing Fractions

$$\frac{2}{7} \div \frac{3}{5}$$

1.

2
$\frac{1}{7}$

begin with $\frac{2}{7}$

2.

2	3	5
$\frac{1}{7}$	$\frac{1}{3}$	$\frac{1}{5}$

join reciprocal pairs

3.

2	3	5
$\frac{1}{7}$	$\frac{1}{3}$	$\frac{1}{5}$

remove $\frac{3}{5}$

4.

2	5
$\frac{1}{7}$	$\frac{1}{3}$

$$\frac{2}{7} \cdot \frac{5}{3}$$

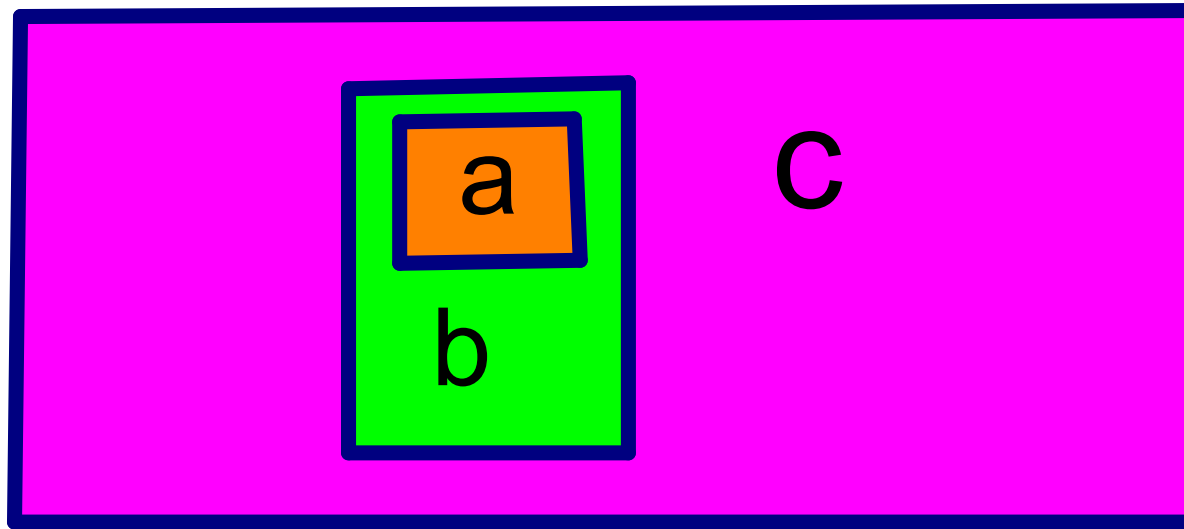


Number Theorems (1)

Hypothesis: $a|b$ and $b|c$

Conclusion: $a|c$

True or false?



True!

Number Theorems (2)

Determine if each conclusion is True or False. Justify your answer with a block diagram. a , b , c , d , and n are natural numbers.

Hypothesis: a is a factor of b and b is a factor of a .
Conclusion: $a = b$

Hypothesis: a is a factor of b and c is a factor of d .
Conclusion: $a \cdot c$ is a factor of $b \cdot d$.

Hypothesis: a is not factor of b .
Conclusion: $n \cdot a$ is not a factor of b .

Number Theorems (3)

Hypothesis: $n \bullet a$ is a factor of b

Conclusion: a is a factor of b .

What is the connection to the previous statement?

Hypothesis: a and b are factors of c and $\text{GCF}(a, b) = 1$

Conclusion: $a \bullet b$ is a factor of c .

Why is the GCF condition needed?

Hypothesis: a is a factor of $b \bullet c$ and $\text{GCF}(a, b) = 1$

Conclusion: a is a factor of c .

Why is the GCF condition needed?

Number Theorems (4)

Statement: $\text{GCF}(a, b)$ is a factor of $\text{LCM}(a, b)$.

Hypothesis: $\text{GCF}(a, b) = n$

Conclusion: $\text{GCF}(a/n, b/n) = 1$

Hypothesis: $\text{GCF}(a, b) = 1$

Conclusion: $\text{GCF}(a^n, b^n) = 1$

Resources

5280math.com >> 5280 Math Resources >> Math Building Blocks

Building Numbers from Primes (October 2009)

by Jerry Burkhart

Mathematics Teaching in the Middle School, 15, 156 – 167

Advanced Common Core Math Explorations: Factors and Multiples

by Jerry Burkhart, Prufrock Press, 2014

copies of slides

5280math.com >> 5280 Math Resources >>

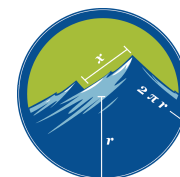
Presentations

Jerry Burkhart

5280math.com

jburkhart@5280math.com

@5280math



MATH 5280
challenging math
for *adventurous* learners