

4th GRADE MATH SKETCH NOTES



PLACE VALUE BASICS 1

Place Value
The value of the position, of a digit in a number; each position has a different value

Digits
Ten single numbers used to represent values or worth; 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Value
The worth of a digit in a number; Digit $\times$ Place Value (e.g., $7 \times 100,000 = 700,000$)

Period
A group of three-digit numbers separated by a comma

Thousands			Ones		
Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
8	0	6	1	7	2

Find the Value
To find the value of each digit in 32,879, multiply each digit by its place value.

3	2	8	7	9
$3 \times 10,000$	$2 \times 1,000$	8×100	7×10	9×1

EXPRESSING NUMBER VALUE 2

Standard Form
a number expressed using digits 0-9
806,172

Word Form
a number expressed by spelling it out in words

1 Write the three-digit number in the thousands period.
① eight hundred six

2 When you get to the comma, write the period.
② thousand

3 Write the three-digit number in the ones period.
③ one hundred seventy-two

④ Don't use and for whole numbers. And is only for decimal numbers.

Hyphenating Numbers
Use a hyphen when writing out compound numbers. E.g., 21 = twenty-one 56 = fifty-six

Expanded Form
a number expressed using the values of each digit added together
 $(8 \times 100,000) + (6 \times 1,000) + (1 \times 100) + (7 \times 10) + (2 \times 1)$
 $800,000 + 6,000 + 100 + 70 + 2$

BASE 10 PLACE VALUE PATTERNS 3

When you move to the left one place, the value increases by 10.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
$100,000 = 100,000 \times 10$ $100,000 \div 10 = 10,000$ 100 cubes	$10,000 = 1,000 \times 10$ $1,000 \div 10 = 100$ 10 cubes	$1,000 = 100 \times 10$ $100 \div 10 = 10$ 1 cube	$100 = 10 \times 10$ $10 \div 10 = 1$ flat	$10 = 1 \times 10$ $1 \div 10 = 0.1$ long	1

When you move to the right one place, the value decreases by 10.

COMPARE & ORDER NUMBERS 4

Compare
Comparing two numbers determines which one is less than <, greater than >, or if they are equal =.
 $4 > 2$ $3 < 5$ $8 = 8$

Order
G to L greatest to least located right to left on the number line
L to G least to greatest located left to right on the number line

Ordering from greatest to least

1 Line 'em up and look left. Start at the greatest place.

T	H	T	O
23,777	25,770	21,870	23,779

2 The values are equal; look right for different values.

T	H	T	O
23,777	25,770	21,870	23,779

3 5 (5,000) is the greatest, so 25,770 is the greatest #.

T	H	T	O
23,777	25,770	21,870	23,779

4 The values are equal; look right for different values.

T	H	T	O
23,777	25,770	21,870	23,779

5 $9 > 7$, so 23,779 > 23,777. Leaving us with 21,870 as the least of all four.

T	H	T	O
23,777	25,770	21,870	23,779

6 Order the numbers

$25,770 > 23,779 > 23,777 > 21,870$

4th GRADE MATH SKETCH NOTES

ESTIMATION WITH ROUNDING (+/-) 9

Key Vocabulary

Estimation
The process of finding an approximate (close) value

Accuracy
How close a calculation is to the actual answer

"Friendly" Numbers
"Round" numbers that are easier to work with (300, 90, 8,000)

When to Estimate:

- ★ When an exact answer is not needed
- ★ When you need to compute a problem quickly
- ★ To check if your work/answers is reasonable

Cue Words:
approximately, about, around, almost, near

The Friendly Scale

	1,000s	100s	10s
3,458 →	3,000	3,500	3,460
+2,920 →	3,000	2,900	2,920
6,378 →	6,000	6,400	6,380
	-378	-22	-2
	1,000s	100s	10s
7,642 →	8,000	7,600	7,640
-2,394 →	2,000	2,400	2,390
5,248 →	6,000	5,200	5,250
	-752	-48	-2

The Accuracy Scale



The **lower** you round, the **harder** the problem is, but your estimate will be **more accurate**.



MULTIPLICATION FACTS 0-12

0 It's always 0
 $0 \times 7 = 0$

1 It's always the number
 $1 \times 9 = 9$

2 Double it
 $2 \times 4 \rightarrow 4 + 4 = 8$

3 Double it & add a group
 $3 \times 6 \rightarrow 6 + 6 = 12$
 $\rightarrow 12 + 6 = 18$

4 Double, double
 $4 \times 7 \rightarrow 7 + 7 = 14$
 $\rightarrow 14 + 14 = 28$

5 Count by 5s as many times
 $5 \times 6 \rightarrow 5, 10, 15, 20, 25, 30$

6 Multiply by 5 & add a group
 $6 \times 4 \rightarrow 5, 10, 15, 20$
 $\rightarrow 20 + 4 = 24$

7 Multiply by 5 & add a double
 $7 \times 6 \rightarrow 5, 10, 15, 20, 25, 30$
 $\rightarrow 30 + 12 = 42$

8 Double, double, double
 $8 \times 7 \rightarrow 7 + 7 = 14$
 $\rightarrow 14 + 14 = 28 \rightarrow 28 + 28 = 56$

9 Multiply by 10 & subtract a group
 $9 \times 6 \rightarrow 10 \times 6 = 60$
 $\rightarrow 60 - 6 = 54$

10 Count by 10 or add a 0
 $10 \times 4 \rightarrow 10, 20, 30, 40$

11 Multiply by 10 & add a group
 $11 \times 4 \rightarrow 10, 20, 30, 40$
 $\rightarrow 40 + 4 = 44$

12 Multiply by 10 & add a double
 $12 \times 5 \rightarrow 10, 20, 30, 40, 50$
 $\rightarrow 50 + 10 = 60$

	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100
11	0	11	22	33	44	55	66	77	88	99	110
12	0	12	24	36	48	60	72	84	96	108	120

FACTORS

Key Vocabulary

Factor A number which is multiplied with another:
 $7 \times 3 = 21$
7 and 3 are factors

Product The result of two or more numbers that are multiplied together: $7 \times 3 = 21$
21 is the product of 7 and 3

Square Units & Factors

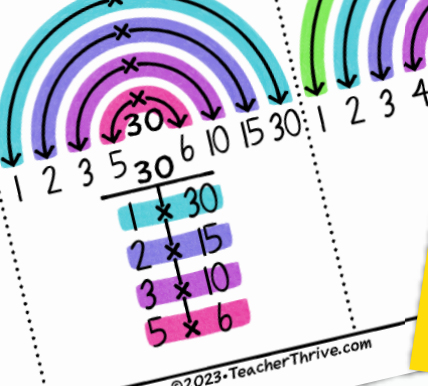
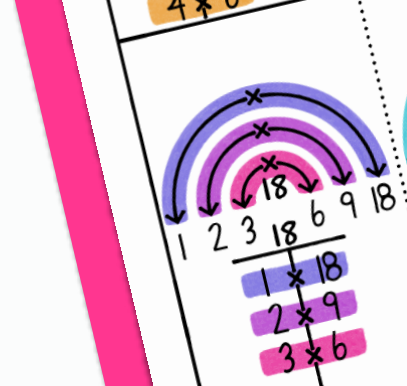
Factor Rainbow



T-Chart 1 Draw a "T-Chart" with the number on top.
24
1 x 24
2 x 12
3 x 8
4 x 6

2 List multiplication facts (factor pairs), beginning with 1. Go in order from least to greatest.

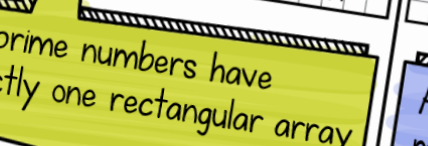
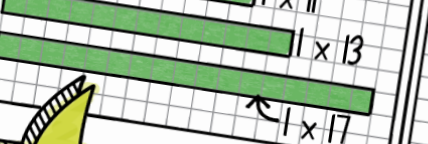
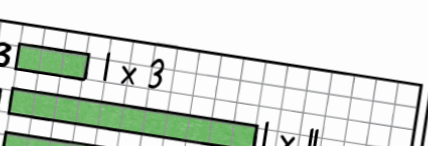
3 Continue listing multiplication facts until math facts listed.



PRIME & COMPOSITE NUMBERS 12

Prime Numbers

A prime number is a number which has exactly two factors, 1 and the number itself.

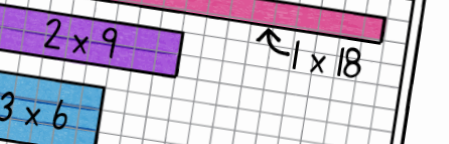


All prime numbers have exactly one rectangular array

One is the Loneliest Number
One is neither prime or composite

Composite Numbers

A composite number has more than two factors.



All composite numbers have multiple rectangular arrays

I'm not prime because I don't have exactly two different factors.

I'm not composite because I don't have more than two factors.

4th GRADE MATH SKETCH NOTES



PRIME NUMBERS TO 100

The Sieve of Eratosthenes

Create a color key for marking the numbers.

2s
3s
5s
7s

1. Cross out 1; It's not prime.
2. Circle 2 then skip count by 2s.
3. Circle 3 then skip count by 3s.
4. Circle 5 then skip count by 5s.
5. Circle 7 then skip count by 7s.
6. Circle all unmarked numbers.

List all of the prime numbers from 1-100.

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

True or False:
All prime numbers are odd.
False. Two is the only even prime number.

Prime Facts

- Except for 2 and 5, all prime numbers end with 1, 3, 7 or 9
- The largest prime number known has around 13 million digits!

Let's Geek Out!

Emirp is the word "prime" spelled backwards, and it refers to a prime number that becomes a new prime number when you reverse its digits. For example, 17 & 71, 37 & 73, 79 & 97

MULTIPLES

Multiples are the products you get when you multiply two factors.

Skip-Counting Multiples of 3

Multiples of 3: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102

Area Model Multiples of 6

Multiples of 6: 6, 12, 18, 24, 30

$6 \times 1 = 6$ $6 \times 2 = 12$ $6 \times 3 = 18$ $6 \times 4 = 24$ $6 \times 5 = 30$

Multiplication Chart Multiples of 8

1. Use a multiplication chart to find multiples.
2. Read down the 8's column.
3. Read across the 8's row.
4. Multiples of 8: 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96

PROPERTIES OF MULTIPLICATION

Commutative Property

The order in which the factors are multiplied does not change the product.

$4 \times 2 = 2 \times 4$

Associative Property

The way factors are grouped does not change the product.

$(2 \times 3) \times 4 = 2 \times (3 \times 4)$

Identity Property

The product of any number and one is that number.

$9 \times 1 = 9$

Distributive Property

You can break up a number into the sum of multiplication facts.

$4 \times 7 = 28$

Zero Property

The product of any number and zero is zero.

$8 \times 0 = 0$

AREA MODEL MULTIPLICATION [1-DIGIT]

$7 \times 28 = 196$

$140 + 56 = 196$

$7 \times 20 = 140$ $7 \times 8 = 56$

1. Write the 1-digit factor on the left of the model.
2. Write the 2-digit factor in expanded form above the model.
3. Find the area of each section of the model.
4. Add all the areas of each section in the model.

$6 \times 149 = 894$

$600 + 240 + 54 = 894$

$6 \times 100 = 600$ $6 \times 40 = 240$ $6 \times 9 = 54$

$8 \times 1,257 = 2,056$

$8,000 + 1,600 + 400 + 56 = 2,056$

$8 \times 1,000 = 8,000$ $8 \times 200 = 1,600$ $8 \times 50 = 400$ $8 \times 7 = 56$

4th GRADE MATH SKETCH NOTES



AREA MODEL MULTIPLICATION [2-DIGIT] 17

$14 \times 26 = 364$

$200 + 60 + 80 + 24 = 364$

$10 \times 20 = 200$

$10 \times 6 = 60$

$4 \times 20 = 80$

$4 \times 6 = 24$

1 Write one factor in expanded form on the left of the model.

2 Write the other factor in expanded form above the model.

3 Find the area of each section of the model.

4 Add all the areas in the model.

$24 \times 57 = 1,368$

$1,000 + 140 + 200 + 28 = 1,368$

$20 \times 50 = 1,000$

$20 \times 7 = 140$

$4 \times 50 = 200$

$4 \times 7 = 28$

PARTIAL PRODUCTS [2-DIGIT FACTORS] 18

$27 \times 14 = 378$

$10 \times 20 = 200$

$10 \times 7 = 70$

$4 \times 20 = 80$

$4 \times 7 = 28$

1 27×14
4 ones $\times$ 7 ones
 $7 \times 4 = 28$

2 27×14
4 ones $\times$ 2 tens
 $20 \times 4 = 80$

3 27×14
1 ten $\times$ 7 ones
 $10 \times 7 = 70$

4 27×14
1 ten $\times$ 2 tens
 $10 \times 20 = 200$

$46 \times 28 = 1,288$

$57 \times 94 = 5,358$

MULTIPLICATION ALGORITHM [1-DIGIT] 19

The fish pond holds 2,476 gallons of water. The frog pond holds 3 times as much water. How many gallons are in the frog pond?

1 Multiply the ones by 3

$2,476 \times 3 = 7,428$

2 Multiply the tens by 3

$3 \times 60s = 180s$
(Regroup: 1 T 8 0s)

3 Multiply the hundreds by 3

$3 \times 400s = 1,200s$
Add the hundreds:
 $1200s + 200s = 1,400s$
(Regroup: 1 TH 4 Hs)

4 Multiply the thousands by 3

$3 \times 2000s = 6000s$
Add the thousands:
 $6000s + 1000s = 7000s$
(Regroup: 7 THs)

MULTIPLICATION ALGORITHM [2-DIGIT] 20

Review

Partial Products

Area Model

$25 \times 37 = 925$

$25 \times 37 = (7 \times 5) + (7 \times 20) + (30 \times 5) + (30 \times 20)$

1 7×5 ones
 $= 35$ ones
 $= 3$ tens
& 5 ones

2 7×2 tens
 $= 14$ tens
 $+ 3$ tens
 $= 17$ tens
 $= 1$ hundred
& 7 tens

3 30×5 ones
 $= 150$ ones
 $= 15$ tens
 $= 1$ hundred
& 5 tens

4 30×2 tens
 $= 60$ tens
 $= 6$ hundreds
 $+ 1$ hundred
 $= 7$ hundreds

5 Add: 175 + 750 = 925

4th GRADE MATH SKETCH NOTES



ESTIMATING PRODUCTS (21)

Rounding Poem
Find your number.
Look right next door.
4 or less, just ignore.
5 or more, add 1 more.

Review

1. Round the factors to the highest place.
2. Find and solve the basic math fact.
3. Count the zeros in the factors.
4. Place the same number of zeros in the product.

Don't miscount zeros when a math fact contains zero in the product.

Estimate

83 × 384 ≈ 32,000

865 → 900
× 43 → x
is about → 36,000

5,327 → 5,000
× 78 → x
is about → 400,000

6,000 × 50 = 300,000

DISTRIBUTIVE PROPERTY

Over Addition: $3 \times 28 = (3 \times 20) + (3 \times 8)$

Over Subtraction: $3 \times 28 = (3 \times 30) - (3 \times 2)$

formula
 $a \times (b + c) = (a \times b) + (a \times c)$
 $a \times (b - c) = (a \times b) - (a \times c)$

MULTIPLY BY POWERS OF 10 (23)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
$23 \times 1 = 23$					
$23 \times 10 = 230$					
$23 \times 100 = 2,300$					
$23 \times 1,000 = 23,000$					

1,000: Move each digit of the number 3 places to the left.
100: Move each digit of the number 2 places to the left.
10: Move each digit of the number 1 place to the left.

formula
 $a \times 10 = a0$
 $a \times 100 = a00$
 $a \times 1,000 = a000$

256 × 10 = 2,560
256 × 100 = 25,600
256 × 1,000 = 256,000

35 × 10 = 350
35 × 100 = 3,500
35 × 1,000 = 35,000

127 × 10 = 1,270
127 × 100 = 12,700
127 × 1,000 = 127,000

MULTIPLICATIVE COMPARISONS (24)

Product Unknown: $4 \times ? = 24$
Factor Unknown: $4 \times ? = 24$
Group size unknown: $24 \div 4 = ?$

Factor Unknown: $? \times 6 = 24$
Factor Unknown: $24 \div 6 = ?$
of groups unknown: $24 \div 6 = ?$

Model it!

hat: \$6
bag: \$24
The bag costs 4 times as much as a hat. How much does a hat cost?

hat: \$6
bag: \$24
A bag costs \$24 which is 4 times as much as a hat. How much does a hat cost?

hat: \$6
bag: \$24
A bag costs \$24. A hat costs \$6. How many times as much does the bag cost as the hat?

hat: \$6
bag: \$24
A hat costs \$6. A bag costs \$24. How many times as much does the bag cost as the hat?

Times as many: 12 is 2 times as many as 6.
Times as much: 15 is 5 times as much as 3.
Times greater: 10 is 2 times greater than 5.
Times more: 20 is 4 times more than 5.

18 is 3 times as many as 6
30 is 10 times as many as 3
16 is 2 times as many as 8

6 is 2 times as much as 3
24 is 8 times as much as 3
42 is 7 times as much as 6

14 is 7 times greater than 2
36 is 9 times greater than 4
28 is 4 times greater than 7

32 is 4 times more than 8
21 is 7 times more than 3
22 is 2 times more than 11

4th GRADE MATH SKETCH NOTES



LONG DIVISION and PLACE VALUE (25)

Key Vocabulary

- divisor**: The number that divides a given number.
- dividend**: The number that is divided by the divisor.
- quotient**: The result of the dividend being divided by the divisor.

$245 \div 3 = 81 \text{ R } 2$

$3 \overline{) 735}$

$\text{divisor} \mid \text{dividend} = \text{quotient}$

Hundreds	Tens	Ones
2	4	5
3	7	3
	0	0
	1	3
	1	2
		1
		5
		0

- Divide the hundreds by 3: $1 \text{ hundred} \div 3 = 2 \text{ hundreds}$ with 1 hundred left over.
- Ungroup the hundred: 1 hundred = 10 tens.
- Add the tens: 10 tens + 3 tens = 13 tens.
- Divide the tens by 3: $13 \text{ tens} \div 3 = 4 \text{ tens}$ with 1 ten left over.
- Ungroup the ten: 1 ten = 10 ones.
- Add the ones: 10 ones + 5 ones = 15 ones.
- Divide the ones by 3: $15 \text{ ones} \div 3 = 5 \text{ ones}$.

ESTIMATING QUOTIENTS

Compatible Numbers & Division

When dividing, compatible numbers are divisors and dividends that are easy to solve because they contain a basic math fact.

$4,200 \div 6 = 700$

Look for Patterns!

Dividend	Divisor	Quotient
32	8	4
320	8	40
3,200	8	400
32,000	8	4,000
320,000	8	40,000
3,200	6	533
54	6	9
540	6	90
5,400	6	900
54,000	6	9,000
540,000	6	90,000

Using Compatible Numbers to Estimate Quotients

$5,365 \div 7$

$5,600 \div 7 = 800$

53 is closest to 56.

$49 \div 7 = 7$

$74,526 \div 8$

$72,000 \div 8 = 9,000$

74 is closest to 72.

$72 \div 8 = 9$

$73 \div 8 = 9 \text{ R } 1$

$74 \div 8 = 9 \text{ R } 2$

$75 \div 8 = 9 \text{ R } 3$

$76 \div 8 = 9 \text{ R } 4$

$77 \div 8 = 9 \text{ R } 5$

$78 \div 8 = 9 \text{ R } 6$

$79 \div 8 = 9 \text{ R } 7$

$80 \div 8 = 10$

- Look at the divisor & the first two digits of the dividend.
- Find the math fact that is closest to these numbers.
- Use the math fact to change the dividend and divisor into compatible numbers and solve.

LONG DIVISION and AREA MODEL (27)

$735 \div 3 = 245$

$\text{dividend} \div \text{divisor} = \text{quotient}$

For the area model of a division problem, the **dividend** is the area. The **quotient** is the length, and the **divisor** is the width.

Let's see how the area model we used for multiplication can also be used to solve $8,679 \div 3$.

Divisor: 3

Dividend: 8,679

Area Model

245

3

735

quotient

divisor

dividend

Add the partial quotients.

$2,000 + 800 + 90 + 3 = 2,893$

Divide: $8,000 \div 3 = 2,666 \text{ R } 2$

Multiply: $2,666 \times 3 = 7,998$

Subtract: $8,000 - 7,998 = 2$

Bring Over: 2

Divide: $2,600 \div 3 = 866 \text{ R } 2$

Multiply: $866 \times 3 = 2,598$

Subtract: $2,600 - 2,598 = 2$

Bring Over: 2

Divide: $270 \div 3 = 90$

Multiply: $90 \times 3 = 270$

Subtract: $279 - 270 = 9$

Bring Over: 9

PARTIAL QUOTIENTS & EASY MULTIPLES (28)

Easy Multiples

Stop when you reach a multiple that is greater than the dividend.

$2\text{s } 6 \times 2 = 12$

$5\text{s } 6 \times 5 = 30$

$10\text{s } 6 \times 10 = 60$

$6 \times 100 = 600$

$6 \times 1,000 = 6,000$

$6 \times 200 = 1,200$

$6 \times 10 = 60$

$6 \times 2 = 12$

$6 \times 1,000 = 6,000$

$6 \times 200 = 1,200$

$6 \times 20 = 120$

$6 \times 10 = 60$

$6 \times 2 = 12$

- List easy multiples of the divisor. Begin with 2s, 5s, 10s. Then multiply these by 10.
- Find an easy multiple that is close to the dividend as possible and subtract.
- Keep subtracting with easy multiples until the difference is 0 or less than the divisor.
- Add the partial quotients on the right side to get your final answer.

4th GRADE MATH SKETCH NOTES

PARTIAL QUOTIENTS & COMPATIBLE #s (29)

Compatible Numbers Review

$$\begin{array}{r} 2,735 \div 7 \\ \underline{2,800} \\ 35 \\ \underline{35} \\ 0 \end{array}$$

$$\begin{array}{r} 4,200 \div 7 \\ \underline{4,200} \\ 0 \end{array}$$

$$\begin{array}{r} 4,200 \div 7 \\ \underline{4,200} \\ 0 \end{array}$$

$$\begin{array}{r} 2,367 \div 7 \\ \underline{2,100} \\ 267 \\ \underline{210} \\ 57 \\ \underline{56} \\ 17 \\ \underline{14} \\ 3 \end{array}$$

$$\begin{array}{r} 3,254 \div 7 \\ \underline{3,500} \\ 254 \\ \underline{210} \\ 44 \\ \underline{42} \\ 24 \\ \underline{21} \\ 3 \end{array}$$

$$\begin{array}{r} 4,685 \div 7 \\ \underline{4,900} \\ 685 \\ \underline{630} \\ 55 \\ \underline{56} \\ 15 \\ \underline{14} \\ 1 \end{array}$$

Compatible Numbers

$$\begin{array}{r} 7 \overline{) 3,500} \\ \underline{7 \times 500 = 3,500} \\ 0 \end{array}$$

$$\begin{array}{r} 7 \overline{) 4,200} \\ \underline{7 \times 600 = 4,200} \\ 0 \end{array}$$

$$\begin{array}{r} 7 \overline{) 28} \\ \underline{7 \times 4 = 28} \\ 0 \end{array}$$

1 Subtract the compatible number that is closest to, but not greater than, the dividend.

2 Keep subtracting with compatible numbers until the difference is 0 or less than the divisor.

3 Add the partial quotients on the right side to find the final quotient.

LONG DIVISION STANDARD ALGORITHM

How many groups of 8 are in 40? 5, so place a 5 in the quotient.
How many groups of 8 are in 45? 5, so place a 5 in the quotient.

D ÷ Divide

M × Multiply

S - Subtract

B ↓ Bring Down

R ⇄ Repeat

$$\begin{array}{r} 057 \\ 8 \overline{) 4,592} \\ \underline{40} \\ 59 \\ \underline{56} \\ 32 \\ \underline{32} \\ 0 \end{array}$$

LONG DIVISION WITH REMAINDERS (31)

A baker has 2,987 cookies that he must pack equally into boxes. Each box can hold 6 cookies.

$$\begin{array}{r} 497 \text{ R}5 \\ 6 \overline{) 2,987} \\ \underline{12} \\ 18 \\ \underline{18} \\ 87 \\ \underline{72} \\ 15 \\ \underline{12} \\ 37 \\ \underline{36} \\ 7 \end{array}$$

What is the fewest number of boxes needed to hold all 2,987 cookies? All the cookies must be packed in a box, so round the quotient up 1 to make 498. 498 boxes are needed.

Round it!

D ÷ Divide
M × Multiply
S - Subtract
B ↓ Bring Down
R ⇄ Repeat or Remainder

DIVIDE BY POWERS OF 10 (32)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
23,000	2	3	0	0	0
÷ 1 = 23,000	2	3	0	0	0
÷ 10 = 2,300		2	3	0	0
÷ 100 = 230			2	3	0
÷ 1,000 = 23				2	3

Shift Patterns

÷ 10: 23,000 ÷ 10 = 2,300
10: Move each digit 1 place to the right.

÷ 100: 23,000 ÷ 100 = 230
100: Move each digit 2 places to the right.

÷ 1,000: 23,000 ÷ 1,000 = 23
1,000: Move each digit 3 places to the right.

	Ten Thousands	Thousands	Hundreds	Tens	Ones
83,000 ÷ 1 = 83,000	8	3	0	0	0
83,000 ÷ 10 = 8,300		8	3	0	0
83,000 ÷ 100 = 830			8	3	0
83,000 ÷ 1,000 = 83				8	3

	Ten Thousands	Thousands	Hundreds	Tens	Ones
256,000 ÷ 1 = 256,000	2	5	6	0	0
256,000 ÷ 10 = 25,600		2	5	6	0
256,000 ÷ 100 = 2,560			2	5	6
256,000 ÷ 1,000 = 256				2	5

90,000 ÷ 10 = 9,000	160,000 ÷ 10 = 16,000	5,000 ÷ 1 = 5,000
90,000 ÷ 100 = 900	160,000 ÷ 100 = 1,600	5,000 ÷ 10 = 500
90,000 ÷ 1,000 = 90	160,000 ÷ 1,000 = 160	5,000 ÷ 100 = 50
90,000 ÷ 10,000 = 9	160,000 ÷ 10,000 = 16	5,000 ÷ 1,000 = 5

4th GRADE MATH SKETCH NOTES



REPRESENTING FRACTIONS 33

1 Numerator (Part)
The number of equal parts that are counted or shaded. It goes above the fraction bar.

4 Denominator (Whole)
The total number of equal parts that make up the whole. It goes below the fraction bar.

Parts of a Whole

What fraction of the whole is shaded?

5/8

Strip Diagram

What fraction of the strip is shaded?

Number Line

Where is the fraction located on the number line?

COMPOSE and DECOMPOSE FRACTIONS 34

Composing
Joining two or more fractions to make a larger fraction

Decomposing
Separating a larger fraction into smaller fractions or unit fractions

How many different ways can you compose $\frac{5}{8}$?

Decompose the pattern block fractions into unit fractions.

Number Bonds

EQUIVALENT FRACTIONS 35

one whole

Use the fraction strips to find equivalent fractions.

Use the fraction strips to find fractions that equal one whole.

When the numerator & the denominator are equal, the fraction equals one whole.

Any number $\times 1$ or $\div$ by 1 is equal to the original number.

BENCHMARK FRACTIONS 36

Common fractions that are easy to identify and visualize. They are handy reference points for comparing fractions.

1/3 is closer to $\frac{1}{4}$ than it is to $\frac{1}{2}$.

2/3 is closer to $\frac{3}{4}$ than it is to $\frac{1}{2}$.

3/4 is farther from $\frac{1}{4}$ than it is from $\frac{1}{3}$.

4/4 is farther from 1 than it is from $\frac{2}{3}$.

4th GRADE MATH SKETCH NOTES



COMPARE TO BENCHMARK FRACTIONS (37)

less than < equal to = greater than >

1	4	1	3	1	2	2	3	4
$\frac{1}{5}$	$\frac{2}{9}$	$\frac{3}{10}$	$\frac{2}{8}$	$\frac{2}{6}$	$\frac{4}{8}$	$\frac{6}{10}$	$\frac{3}{5}$	$\frac{6}{9}$
$\frac{2}{9}$	$\frac{3}{10}$	$\frac{2}{8}$	$\frac{2}{6}$	$\frac{4}{8}$	$\frac{6}{10}$	$\frac{3}{5}$	$\frac{6}{9}$	$\frac{6}{9}$
$\frac{3}{10}$	$\frac{2}{8}$	$\frac{2}{6}$	$\frac{4}{8}$	$\frac{6}{10}$	$\frac{3}{5}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$
$\frac{2}{8}$	$\frac{2}{6}$	$\frac{4}{8}$	$\frac{6}{10}$	$\frac{3}{5}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$
$\frac{2}{6}$	$\frac{4}{8}$	$\frac{6}{10}$	$\frac{3}{5}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$
$\frac{4}{8}$	$\frac{6}{10}$	$\frac{3}{5}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$
$\frac{6}{10}$	$\frac{3}{5}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$
$\frac{3}{5}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$
$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$	$\frac{6}{9}$

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STRATEGIES for COMPARING FRACTIONS

- Same Denominator?**
YES: $\frac{3}{5} > \frac{2}{5}$
Same size parts, so the more parts, the greater the fraction.
NO: $\frac{3}{5} < \frac{2}{5}$
Same number of parts, so the fraction with bigger parts is greater.
- Same Numerator?**
YES: $\frac{5}{9} < \frac{5}{8}$
Same number of parts, so the fraction with bigger parts is greater.
NO: $\frac{3}{4} < \frac{5}{6}$
The smaller unit fraction is closer to the whole, so that fraction is greater.
- One unit fraction from a whole?**
YES: $\frac{3}{4} < \frac{5}{6}$
The smaller unit fraction is closer to the whole, so that fraction is greater.
NO: $\frac{7}{12} > \frac{4}{10}$
7 is more than half of 12, and 4 is less than half of 10, so $\frac{7}{12}$ is greater.
- Use a benchmark fraction?**
YES: $\frac{7}{12} > \frac{4}{10}$
7 is more than half of 12, and 4 is less than half of 10, so $\frac{7}{12}$ is greater.
NO: $\frac{2}{3} < \frac{7}{9}$
 $\frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$ is equivalent to $\frac{6}{9}$ which is less than $\frac{7}{9}$.
- Create an equivalent fraction with a common denominator?**
YES: $\frac{2}{3} < \frac{7}{9}$
 $\frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$ is equivalent to $\frac{6}{9}$ which is less than $\frac{7}{9}$.

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SIMPLIFY FRACTIONS

Simplest Form
Expressing a fraction with the fewest number of parts/pieces possible

Ladder Method
 $\frac{8}{12} \div \frac{4}{4} = \frac{2}{3}$
GCF: $2 \times 2 = 4$

Greatest Common Factor (GCF)
Factors of 8: 1, 2, 4, 8
Factors of 12: 1, 2, 3, 4, 6, 12
 $\frac{8}{12} \div \frac{4}{4} = \frac{2}{3}$

- List all the factors of the numerator and denominator.
- Find and circle the greatest factor that they have in common.
- Divide the numerator and denominator by the GCF.

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ADD and SUBTRACT FRACTIONS (40)

ADDITION [Like Denominators]

Model: Fraction Strips
1. Add the numerators. $\frac{3}{8} + \frac{1}{8} = \frac{4}{8}$
2. Keep the denominator. $\frac{4}{8}$
3. Simplify, if possible. $\frac{4}{8} \div \frac{4}{4} = \frac{1}{2}$

Model: Number Line
 $\frac{3}{8} + \frac{1}{8} = \frac{4}{8} \div \frac{4}{4} = \frac{1}{2}$

SUBTRACTION [Like Denominators]

Model: Fraction Strips
1. Subtract the numerators. $\frac{7}{9} - \frac{4}{9} = \frac{3}{9}$
2. Keep the denominator. $\frac{3}{9}$
3. Simplify, if possible. $\frac{3}{9} \div \frac{3}{3} = \frac{1}{3}$

Model: Number Line
 $\frac{7}{9} - \frac{4}{9} = \frac{3}{9} \div \frac{3}{3} = \frac{1}{3}$

- Subtract the numerators.
- Keep the denominator.
- Simplify, if possible.

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4th GRADE MATH SKETCH NOTES

FRACTIONS GREATER THAN ONE (41)

MIXED NUMBERS

A whole number and a fraction that are combined

How many wholes are there?

What fraction remains?

Mixed to Improper

$$5 \times 2 = 10$$

- ① denominator $\times$ whole #
- ② product + numerator
- ③ sum = numerator
- ④ denominator remains

Improper to Mixed

- ① numerator $\div$ denominator
- ② quotient = whole #
- ③ remainder = numerator
- ④ denominator remains

IMPROPER FRACTIONS

$\frac{13}{5}$

A fraction with a numerator that is greater than the denominator

How many pieces are there?

How many pieces make one whole?

$$17 \div 3 = 5 \text{ r } 2$$

$$\frac{17}{3} = 5 \frac{2}{3}$$

ADDITION with MIXED NUMBERS (42)

Sums Greater Than One

- ① Add the numerators; denominator remains
- ② Convert the improper fraction into a mixed #
- ③ Simplify, if possible.

$$\frac{3}{4} + \frac{3}{4} = \frac{6}{4} = 1 \frac{2}{4}$$

Adding Mixed Numbers

$$1 \frac{3}{8} + 2 \frac{7}{8} = 3 \frac{10}{8} = 4 \frac{2}{8} = 4 \frac{1}{4}$$

① Add the whole numbers

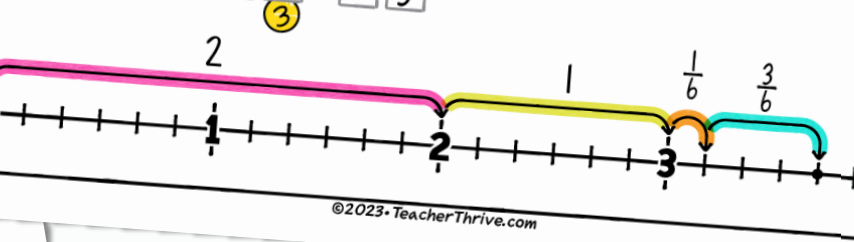
② Add the fractions

③ Improper fraction?

④ Simplify, if possible

Number Line Model

$$2 \frac{1}{6} + 1 \frac{3}{6} = 3 \frac{4}{6} = 3 \frac{2}{3}$$



SUBTRACTION with MIXED NUMBERS (43)

- ① Subtract the whole numbers
- ② Subtract the fractions; Numerators only, denominator remains
- ③ Simplify the fraction, if possible.

Fraction Strips Model

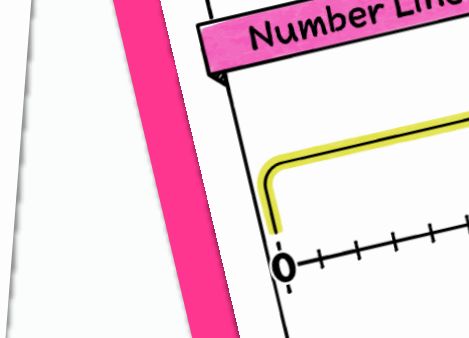
$$2 \frac{7}{9} - 1 \frac{4}{9} = 1 \frac{3}{9} = 1 \frac{1}{3}$$

Fraction Circles Model

$$4 \frac{5}{6} - 2 \frac{2}{6} = 2 \frac{3}{6} = 2 \frac{1}{2}$$

Number Line Model

$$2 \frac{5}{8} - 1 \frac{3}{8} = 1 \frac{2}{8} = 1 \frac{1}{4}$$



MULTIPLY FRACTIONS & WHOLE NUMBERS (44)

Multiplication Problem

$$5 \times \frac{1}{4}$$

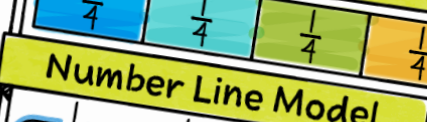
Repeated Addition

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{5}{4}$$

Improper Fraction

Mixed Number

Fraction Strips Model



Number Line Model



Multiplication Problem

$$4 \times \frac{2}{3}$$

Repeated Addition

$$\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{8}{3}$$

Improper Fraction

Mixed Number



Area Model

$$4 \times \frac{2}{3} = 8 \times \frac{1}{3}$$

Number Line Model

4th GRADE MATH SKETCH NOTES



FRACTION OF A SET (45)

1 There are 16 cubes in a set.
2 The set is divided into 4 equal groups.
3 3 out of the 4 groups are orange.
4 12 out of the 16 cubes are orange.

What is $\frac{3}{4}$ of 16?
4 units $\rightarrow 16$
1 unit $\rightarrow 16 \div 4 = 4$
3 units $\rightarrow 3 \times 4 = 12$
4 $\frac{3}{4}$ of 16 = 12

Standard Algorithm
Divide the whole number by the denominator:
 $16 \div 4 = 4$

What is $\frac{2}{3}$ of 15?
6 units $\rightarrow 15$
1 unit $\rightarrow 15 \div 3 = 5$
2 units $\rightarrow 2 \times 5 = 10$
 $\frac{2}{3}$ of 15 = 10

What is $\frac{3}{5}$ of 18?
3 units $\rightarrow 18$
1 unit $\rightarrow 18 \div 3 = 6$
3 units $\rightarrow 3 \times 6 = 18$
 $\frac{3}{5}$ of 18 = 10.8

Additional Algorithm
 $\frac{3}{5} \times 20 = 12$

UNDERSTANDING TENTHS (46)

FRACTION: $\frac{1}{10}$ DECIMAL: 0.1 WORD FORM: one tenth

one whole $\rightarrow$ Fraction $\rightarrow \frac{3}{10}$ Decimal $\rightarrow 0.3$ Word Form $\rightarrow$ three tenths
one whole $\rightarrow$ Fraction $\rightarrow \frac{7}{10}$ Decimal $\rightarrow 0.7$ Word Form $\rightarrow$ seven tenths

Whole Numbers
Tens 10
Ones 1
Tenths 0.1

Numbers < 1
Tens 0
Ones 0
Tenths 0.1

When reading a decimal number greater than one, you say "and" at the decimal point.

Find the Value
To find the value of each digit in 73.2, multiply each digit by its place value.
 7×10 (7 tens)
 3×1 (3 ones)
 2×0.1 (2 tenths)

UNDERSTANDING HUNDREDTHS (47)

TENTHS
Fraction $\rightarrow \frac{1}{10}$
Decimal $\rightarrow 0.1$
Word Form $\rightarrow$ one tenth

HUNDREDTHS
Fraction $\rightarrow \frac{1}{100}$
Decimal $\rightarrow 0.01$
Word Form $\rightarrow$ one hundredth

Place Values Get Larger
Hundreds 100
Tens 10
Ones 1

Place Values Get Smaller
Tenths 0.1
Hundredths 0.01

Find the Value
To find the value of each digit in 581.64, multiply each digit by its place value.
 5×100 (5 hundreds)
 8×10 (8 tens)
 1×1 (1 ones)
 6×0.1 (6 tenths)
 4×0.01 (4 hundredths)

EXPRESSING DECIMAL PLACE VALUE (48)

Word Form
0.7 seven tenths
0.04 four hundredths
0.29 twenty-nine hundredths
0.17 seventeen hundredths

Hyphens
Hyphenate compound numbers.
Eg, 21 = twenty-one
56 = fifty-six

Standard Form
1 Write the three-digit number in the ones period.
2 When you get to the decimal point, write and.
3 Write the number as if a whole number.
4 Write the place of the last digit.

Expanded Form
a number expressed using the values of each digit added together
 $(6 \times 100) + (4 \times 10) + (2 \times 1) + (8 \times 0.1) + (7 \times 0.01)$
 $600 + 40 + 2 + 0.8 + 0.07$

4th GRADE MATH SKETCH NOTES

DECIMAL PLACE VALUE PATTERNS (49)

If you move to the left one place, the value increases by 10.

Hundreds	Tens	Ones	Tenths	Hundredths
100 is 10×10	10 is 1×10	1 is 0.1×10	0.1 is 0.01×10	0.01 is 0.001×10
Fraction part $\rightarrow \frac{100}{100}$ whole $\rightarrow 1$	Fraction part $\rightarrow \frac{10}{10}$ whole $\rightarrow 1$	Fraction part $\rightarrow \frac{1}{1}$ whole $\rightarrow 1$	Fraction part $\rightarrow \frac{1}{10}$ whole $\rightarrow 10$	Fraction part $\rightarrow \frac{1}{100}$ whole $\rightarrow 100$
 100-dollar bill	 10-dollar bill	 dollar bill	 dime	 penny
one tenth of 100 is 10	one tenth of 10 is 1	one tenth of 1 is 0.1	one tenth of 0.1 is 0.01	one tenth of 0.01 is 0.001
$100 \div 10$ is 10	$10 \div 10$ is 1	$1 \div 10$ is 0.1	$0.1 \div 10$ is 0.01	$0.01 \div 10$ is 0.001

If you move to the right one place, the value decreases by 10.

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DECIMAL FRACTIONS

Fractions with a power of 10 (10, 100) in the denominator

TENTHS
 $\frac{4}{10} = 0.4$
 $\frac{7}{100} = 0.07$
 $\frac{9}{10} = 0.9$

HUNDREDTHS
 $\frac{83}{100} = 0.83$
 $\frac{21}{100} = 0.21$
 $\frac{4}{10} + \frac{7}{100} = \frac{47}{100}$
 $\frac{1}{10} + \frac{9}{100} = \frac{19}{100}$
 $\frac{9}{10} + \frac{3}{100} = \frac{93}{100}$

Equivalent Decimal Fractions

part $\rightarrow \frac{6}{10}$ whole $\rightarrow 10$ = part $\rightarrow \frac{60}{100}$ whole $\rightarrow 100$

Adding Decimal Fractions

Using Common Denominators

$\frac{3}{100} + \frac{10}{100} = \frac{13}{100}$
 $\frac{4}{100} + \frac{50}{100} = \frac{54}{100}$
 $\frac{9}{100} + \frac{20}{100} = \frac{29}{100}$

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MORE or LESS: DECIMAL NUMBERS (51)

Q What is 0.1 more than 0.6?
A 0.7 is 0.1 more than 0.6

Q What is 0.1 less than 0.6?
A 0.5 is 0.1 less than 0.6

Q What is 0.01 more than 0.06?
A 0.07 is 0.01 more than 0.06

Q What is 0.01 less than 0.06?
A 0.05 is 0.01 less than 0.06

USE NUMBER LINES

A 0.1 more than 2.3 is 2.4
C 0.2 more than 2.9 is 3.1

E 0.01 more than 0.52 is 0.53
G 0.02 more than 0.01 more than 0.30 is 0.33

F 0.01 less than 0.6 is 0.59
H 0.03 less than 0.49 is 0.46

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COMPARE & ORDER DECIMAL NUMBERS (52)

COMPARE Comparing two numbers determines which one is less than <, greater than >, or if they are equal =.

ORDER Ordering three or more numbers in order of least to greatest or greatest to least

Order from least to greatest

1. Line up the numbers by place value.

2. Add place holder zeros. Remember: 0.6 = 0.60

3. Look left! Start comparing at the greatest place.

4. The values are equal; look right for different values.

5. 6 (0.6) is greater than 2 (0.2), so 0.23 is the least.

6. The values (0.6 - 6 tenths) are equal; look right.

7. 0 hundredths < 2 hundredths, so 0.6 < 0.62

8. Order in the original form: 0.23 < 0.6 < 0.62

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4th GRADE MATH SKETCH NOTES

...and more
on
the way!!!