Adding Like Fractions

1. Check the denominators.
2. If the fractions have like denominators, add the numerators
3. Denominator stays the same because you are adding the same kind of thing.
4. Write the sum in simplest form.

Example:

$$\frac{3}{8} + \frac{1}{8} = \frac{4}{8}$$

$$\frac{4}{8} = \frac{1}{2} \quad \text{(after simplification)}$$

Another example (trick!)

$$\frac{3}{8} + \frac{1}{8} = \frac{24+8}{64} = \frac{32}{64}$$

(after simplifying) $\frac{1}{2}$

Adding Unlike fractions

1. Rewrite the fractions with like denominators

$$\frac{2\cdot 1}{2\cdot 2} + \frac{1}{4} \rightarrow \frac{2}{4} + \frac{1}{4} \rightarrow \text{like denominators}$$

2. Add the numerators.

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

3. Write the sum in simplest form.

$\frac{3}{4}$ is already in simplest form.

Another Trick

$$\frac{1}{2} + \frac{1}{4} = \frac{\cancel{6}^{\,3}}{\cancel{8}_{\,4}} = \frac{3}{4}$$

Adding Mixed Numbers

1. Rewrite the numbers as fractions with like denominators.

$$1\frac{1}{2} \rightarrow \frac{1+1}{\times 2} \rightarrow \frac{3\cdot 2}{2\cdot 2} \rightarrow \frac{6}{4}$$

$$+\ 1\frac{3}{4} \rightarrow +\ \frac{1+3}{\times 4} \rightarrow +\ \frac{7\cdot 1}{4\cdot 1} \rightarrow +\ \frac{7}{4}$$

(2) Add the numerators.

$$\frac{6}{4}+\frac{3}{4}=\frac{9}{4}$$

(3) Write the sum in simplest form.

$\frac{9}{4}$ is in simplest form. It can also be written as

$$9 \div 4 = 2\frac{1}{4}$$

Subtracting Like Fractions

(1) The fractions have like denominators. Write that denominator.

$$\frac{5}{8}-\frac{3}{8}=\frac{}{8}$$

(2) Subtract the numerators.

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

(3) Write the difference in simplest form.

$$\frac{2}{8} \rightarrow \frac{2\div 2}{8\div 2}=\frac{1}{4}$$

Subtracting Unlike denominators

(1) Rewrite the fractions with like denominators.

$$\frac{1}{2} \rightarrow \frac{1\cdot 2}{2\cdot 2} \rightarrow \frac{2}{4}$$

$$\frac{3}{4}-\frac{1}{2}$$

$$\frac{3}{4} \rightarrow \frac{3\cdot 1}{4\cdot 1} \rightarrow \frac{3}{4}$$

(2) Subtract the fractions (numerators)

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

(3) Write the difference in simplest form.

$\frac{1}{4}$ is already in simplest form

Changing mixed number to fraction: $1\frac{1}{3} \rightarrow 1 \overset{+}{} \frac{1}{\times 3} \rightarrow \frac{4}{3}$

(denominator stays the same)

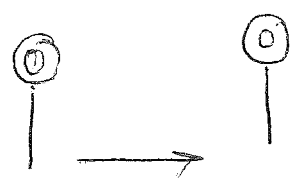
Translation, Transformation, and Rotations

Transformation

When you transform something, you change it. In geometry, when you move a figure, you make a transformation of it.

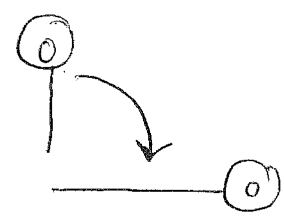
Case 1

You can slide a figure.
This is translation.



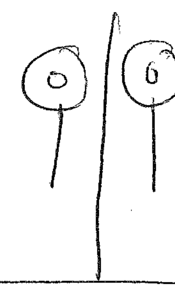
Case 2

You can turn a figure around a point.
This is rotation.



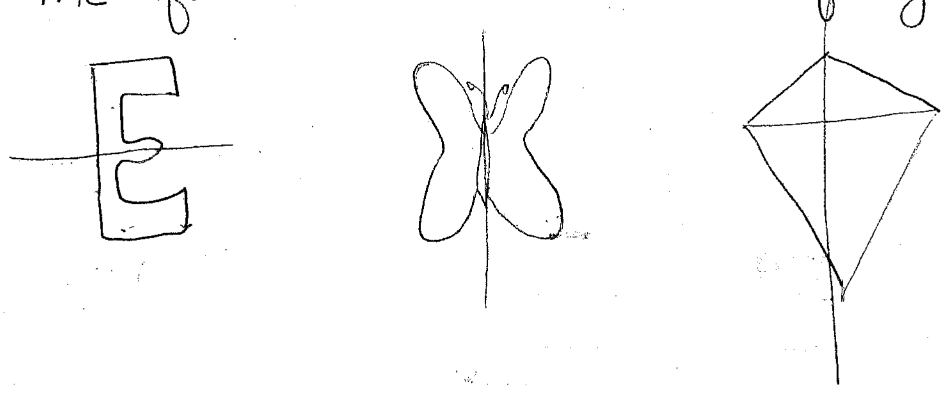
Case 3

You can flip a figure across a line.
This is a reflection.



Line Symmetry

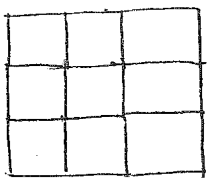
If you can fold a figure so that it has two parts that match exactly, that figure has line symmetry. The fold line is called line of symmetry.

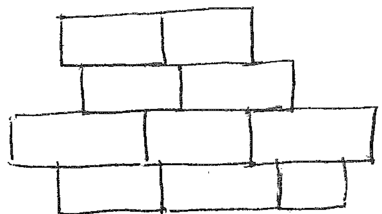


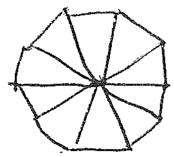
Tessellation

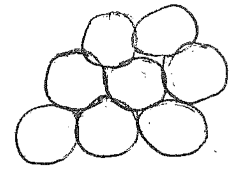
In a tessellation, a figure or pattern of figures is repeated to cover a flat surface.

→ Figures must fit together so that none of them overlap and there are no gaps.


Squares


Rectangles


Triangles


Octagon

Commutative Property of Addition

You can add numbers in <u>any</u> order.

Example: $49 + 86 + \overset{\text{addend}}{321} = \overset{\text{sum}}{456}$

$321 + 49 + 86 = 456$

Associative Property of Addition

You can group addends different ways and the sum will not change. Addends are grouped with parenthesis.

Example: $(183 + 12) + 26 = 221$

$183 + (12 + 26) = 221$

Identity Property of Addition

When you add 0 to any number, the sum is that number.

Ex. $29 + 0 = 29$

Distributive Property of Addition

$3(4 + 5) \rightarrow 12 + 15 = 27$

$6(7 + 2) \rightarrow (6 \cdot 7) + (6 \cdot 2) = 42 + 12 = 54$

Mean, Median, Mode, and Range

First, arrange the numbers in order by size.

Example: 3, 5, 5, 6, 8, 10, 12

- Mean: Average of the numbers
  - i) Add the numbers together
  - ii) Divide by how many numbers were added.
  - iii) $\frac{3 + 5 + 5 + 6 + 8 + 10 + 12}{7}$
  - iv) Mean is 7

- Median: Middle number of a sequence

  Median is the middle number when numbers are arranged in order by size.

- Mode: The number that occurs the most

- Range: difference between the highest and lowest value.
  - i) Subtract the lowest number from the highest number.

    $12 - 3 = 9$

    The range is 9.

How to make a Box-and-Whisker Plot:

First, draw a number line that extends far enough to include all numbers in your data.

12 13 17 21 27 30 32

(2) Next, draw a line on your median as well as the upper quartiles you calculated before drawing your number line.

12 13 17 21 27 30 32

(3) Proceed to simply drawing a

easurement

(Metric)

K	H	Da	U	deci	centi	milli
1000	100	10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$

ule {Move the decimal to the right if you move to right. →
{Move the decimal to the left if you move to left. ←

Customary Measurement of Length

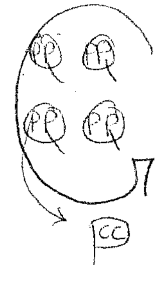
$$\begin{tikzcd} \text{inches (in)} \arrow[r, bend left, "\div 12"] & \text{feet (ft)} \arrow[l, bend left, "\times 12"] \arrow[r, bend left, "\div 3"] & \text{yard (yd)} \arrow[l, bend left, "\times 3"] \arrow[r, bend left, "\div 1760"] & \text{miles (mi)} \arrow[l, bend left, "\times 1760"] \end{tikzcd}$$

1 mile = 1760 yards
1 mile = 5280 feet
1 foot = 12 inches
1 yard = 3 feet

Customary Units of Weight

$$\begin{tikzcd} \text{ounce (oz)} \arrow[r, bend left, "\div 16"] & \text{pounds (lbs)} \arrow[l, bend left, "\times 16"] \arrow[r, bend left, "\div 2000"] & \text{tons (T)} \arrow[l, bend left, "\times 2000"] \end{tikzcd}$$

1 pound = 16 ounces and 1 ton = 2000 pounds

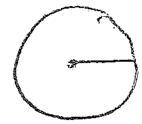


Customary Units of Volume

$$\begin{tikzcd} \text{ounce (oz) fluid} \arrow[r, bend left, "\div 8"] & \text{cups (c)} \arrow[l, bend left, "\times 8"] \arrow[r, bend left, "\div 2"] & \text{pint (pt.)} \arrow[l, bend left, "\times 2"] \arrow[r, bend left, "\div 2"] & \text{quart (qt)} \arrow[l, bend left, "\times 2"] \arrow[r, bend left, "\div 4"] & \text{gallon (gal)} \arrow[l, bend left, "\times 4"] \end{tikzcd}$$

find the circumference of a circle when the radius is known, multiply the radius by 2. Then, multiply by π.

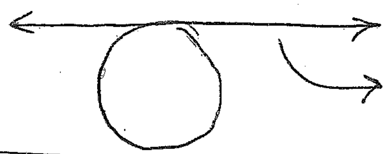
$$C = 2 \times \pi \times r$$
$$= (2 \times 3.14 \times 4)\ \cancel{\text{inches}}\ \text{ft}$$
$$= 3.14 \times 8\ \text{ft}$$
$$= 25.12\ \text{ft}.$$



4 ft (radius)

Tangent

A straight line that touches a curve or curved surface at a point.



tangent

Steam and Leaf Plot

'Stem' is the left column which contains the tens digits.
'Leaves' are the list in the right hand column showing all the ones digits for each of the tens.

Example: Create a stem and leaf plot for the following set of data:

73, 42, 67, 78, 99, 84, 91, 82, 86, 94

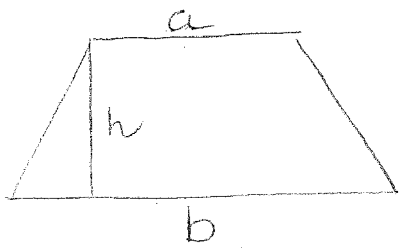
Step 1: Put them in increasing order

42, 67, 73, 78, 82, 84, 86, 91, 94, 99

Step 2: Plot

Stem	Leaves
4	2
5	
6	7
7	3 8
8	2 4 6
9	1 4 9

Area of a Trapezoid



$$\text{Area} = \frac{a+b}{2} \times \text{height}$$

Example, $a = 3\text{ cm}$, $b = 6\text{ cm}$, $h = 4\text{ cm}$

$$A = \frac{a+b}{2} \times \text{height}$$

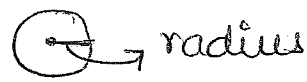
$$= \frac{3\text{cm} + 6\text{cm}}{2} \times 4\text{ cm}$$

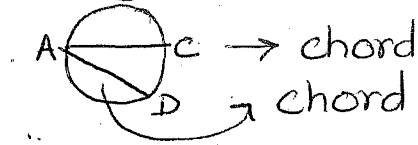
$$= \frac{9\text{ cm}}{2} \times 4\text{ cm}$$

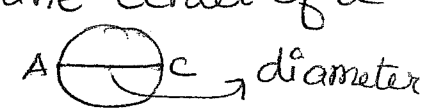
$$= 4.5\text{ cm} \times 4\text{ cm}$$

$$= 18\text{ cm}^2$$

Circumference

1) Circle is a closed curved figure 
2) A radius is a line segment that connects a point on a circle with center. 

3) A chord is a line segment that connects any two points on a circle. 

4) A diameter is a chord that passes through the center of a circle. It is twice the length of a radius. 

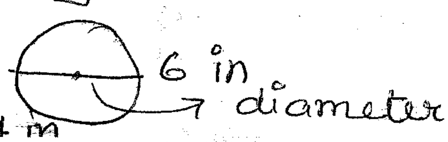
5) Circumference is the distance around a circle.

To find the circumference of a circle when the diameter is known, multiply the diameter by π.

$C = \pi \times d$

$= \pi \times 6\text{ in}$

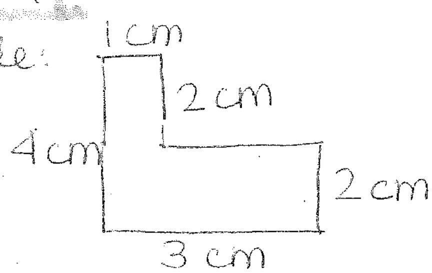
$= 3.14 \times 6\text{ in} \rightarrow 18.84\text{ in}$



PeRIMeter

Perimeter - total distance around a field.

Example:

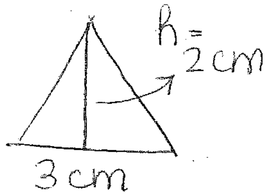


Perimeter $= (1 + 2 + 2 + 3 + 4)$ cm

Area of a Triangle

$\frac{1}{2} \times$ base $\times$ height *

Example 1 :



$= \frac{1}{2} \times \frac{3\text{cm}}{1} \times \frac{2\text{cm}}{1}$

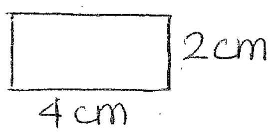
$= \frac{6}{2}\ \text{cm}^2$

$= 3\ \text{cm}^2$

Area of a rectangle

length $\times$ width

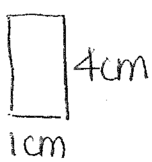
Example 1)



$= 4\ \text{cm} \times 2\ \text{cm}$

$= 8\ \text{cm}^2$

Example 2)



$= 4\ \text{cm} \times 1\ \text{cm}$

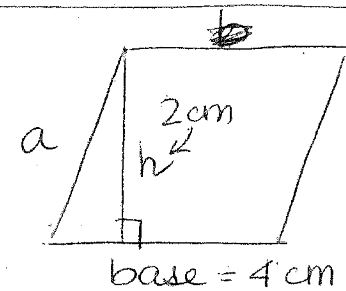
$= 4\ \text{cm}^2$

Area of a parallelogram

A = base $\times$ height

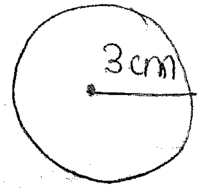
$= 4\ \text{cm} \times 2\text{cm}$

$= 8\text{cm}^2$



Area of a circle

Area of a circle is the amount of space inside the circle. Formula : πr^2



Area $= \pi \times (3\text{cm}) \times (3\ \text{cm})$

$= 3.14 \times 9\ \text{cm}^2$

$= 28.26\ \text{cm}^2$

Order of Operations

PEMDAS

Parenthesis Exponents Multiplication Division Addition Subtraction

Multiplication, Division (from left to right)

Addition, Subtraction (from left to right)

( ) parenthesis   { } Curley brackets/braces

[ ] square brackets

Example:

$$[2-(4+5)\times 3]\div 5$$
$$[2-(9)\times 3]\div 5$$
$$[2-27]\div 5$$
$$-25\div 5$$
$$-5$$

$$15-(4\times 2\div 2)+5$$
$$15-(8\div 2)+5$$
$$15-4+5$$
$$11+5$$
$$16$$

Rules for Order of Operation

1. Do operation in parenthesis
2. Calculate all exponential expressions
3. Do multiplication and division in order from left to right.
4. Do additions and subtractions in order from left to right.

Different types of angles

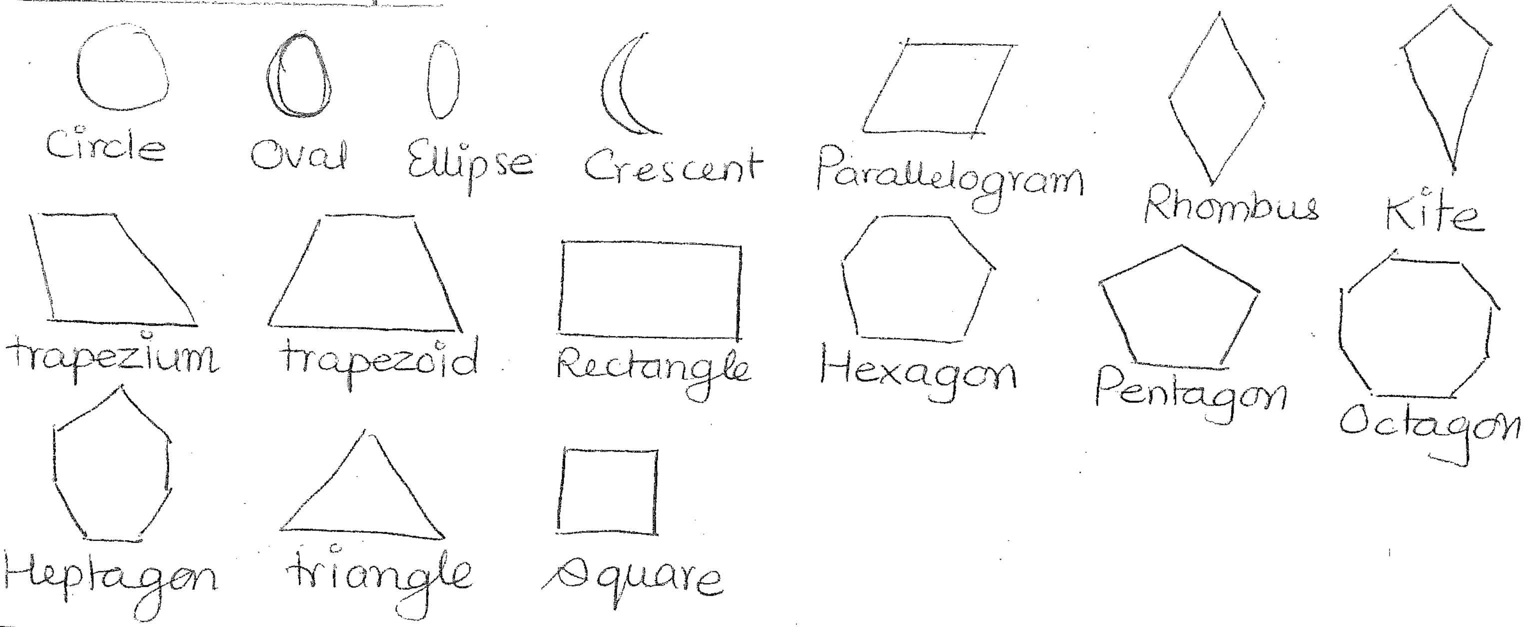
right angle   obtuse angle

straight angle   complimentary angles

acute angle   supplementary angles

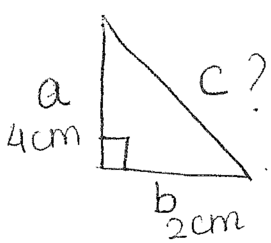
4 Addend	4 minuend	4 factor
+ 3 Addend	− 3 subtrahend	× 3 factor
7 sum	1 difference	12 product

Geometric Shape



Value of pi is always 3.14 (π)

Pythagorean theorem



$$a^2 + b^2 = c^2$$
$$(4\,cm)^2 + (2\,cm)^2 = c^2$$
$$16 + 4 = c^2$$
$$\sqrt{20} = \sqrt{c^2}$$
$$\sqrt{20}\ cm = c$$

Prime Number

A number that has exactly two different positive factors, itself and 1 (Example : 7)

Composite Number

A number that has more than 2 factors.
Example: 8

ntegers

Whole numbers and their opposites.

Examples: −2, −1, 0, 1, 2

Rational Number

A number that can be expressed as a ratio of two non-zero integers.

Irrational number

Number that cannot be written as a ratio of two integers. The digits in an irrational number never terminate and never repeat.

Example: π

Changing percent to fraction

$63\% \rightarrow \frac{63}{100}$

$46\% \rightarrow \frac{46}{100}$

$32\% \rightarrow \frac{32}{100}$

$63.\cancel{6}\% \rightarrow \frac{63.\cancel{6}}{1\cancel{0}0} \rightarrow \frac{63\cancel{6}}{1\cancel{0}00}$

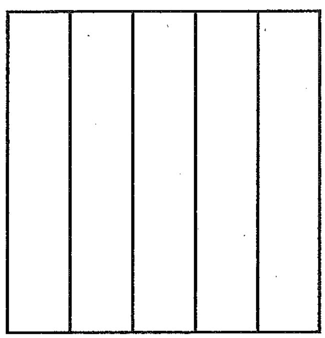
Place Values

millions	hundred thousands	ten thous	thousands	hundreds	tens	ones		tenths	hundredths	thousandths	ten thousandths	hundred thousandths	millionths
7	6	5	4	3	2	1	.	1	2	3	4	5	6

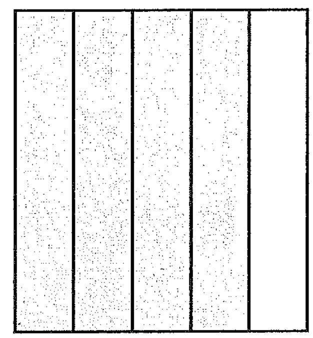
Dividing Fractions by Whole Numbers with Visual Models

Example: 4/5 ÷ 3

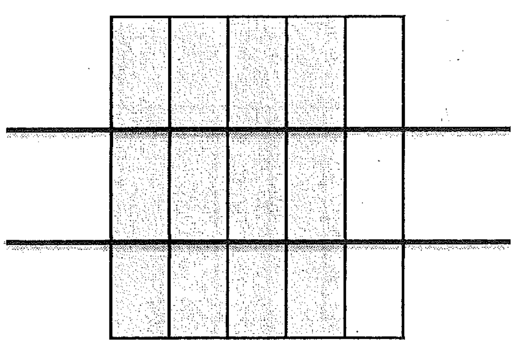
Step 1: Draw a rectangle and make the same amount of columns as the denominator in the fraction.



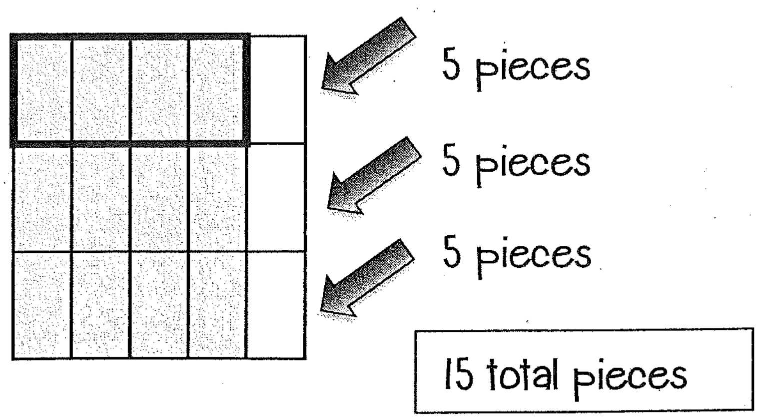
Step 2: Shade the amount of columns as the numerator in the fraction. This is a visual model of the fraction 4/5.



Step 3: Take the fraction model and cut it into as many parts as the whole number in the problem. Imagine that this is 4/5 of a chocolate bar being shared by 3 people.



Step 4: The shaded part of one of the groups will be the numerator of your answer , and all of the pieces (added together) will be the denominator. Your answer ends up being 4/15. Each person would get 4/15 of the chocolate bar.



Dividing Fractions by Fractions

To divide a fraction by a fraction, you leave the first fraction the same, change the division sign to a multiplication sign, and write the inverse of the second fraction. Multiply across and you have your answer.

Example: $2/7 \div 3/4$

You can write it as: $\frac{2}{7} \div \frac{3}{4} =$

Step 1: Keep the first fraction the same: $\frac{2}{7}$

Step 2: Change the division sign to a multiplication sign: $\frac{2}{7} \times$

Step 3: Write the inverse of the second fraction (this means that you switch the numerator and the denominator, or "flip" it):

**3/4 becomes 4/3 $\frac{2}{7} \times \frac{4}{3}$

Step 4: Multiply across and you have your answer.

$\frac{2}{7} \times \frac{4}{3} = \frac{8}{21}$ Answer: 8/21

Dividing Fractions - Word Problems

How do I know when to divide...

A whole number by a fraction?: One way to figure this out is if a problem is asking how many of a fraction of something is in a whole number of something else.

- *Example*: How many ¼ cups are in 5 cups of milk?
- You have to take the 5 cups and divide them into ¼.

$$5 \div \frac{1}{4} = 20 \text{ quarter cups}$$

Another way to figure this out is if a whole number of something is being divide up into fractional pieces and you need to figure out how many pieces there will be.

- *Example*: Joanna had 3 feet of fabric. She cut it into strips that were 1/3 feet long. How many strips did she have after she cut the fabric?
- You have to take the 3 feet and divide into thirds.

$$3 \div 1/3 = 9 \text{ strips}$$

A fraction by whole number?: One way to figure this out is if a problem is asking how much of a fraction of something is being cut into whole pieces.

- *Example*: Susan had a piece of fabric that was 5/8 of a yard long. If she separated it into 4 equal pieces, how many yards was each piece?
- You have to take the 5/8 of a yard of fabric and divide it by 4 pieces.

$$5/8 \div 4 = 5/32 \text{ yards}$$

A fraction by a fraction?: One way to figure this out is if a problem gives you a fraction of something and ask you how many of something can be made if they are a certain fraction in size.

- *Example*: Sarah has 2/3 pounds of chocolate. If she breaks it up into pieces that are 1/9 pounds, how many pieces will she have?
- You have to take the 2/3 pounds of chocolate and divide it by the 1/9 pound pieces to get the amount of pieces.

$$2/3 \div 1/9 = 6 \text{ pieces}$$