

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

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

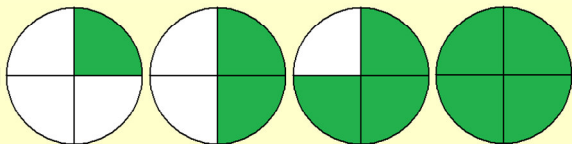


$$\frac{1}{3}$$

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

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

FOR PREVIEW

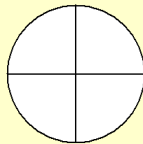


$$\frac{1}{4}$$

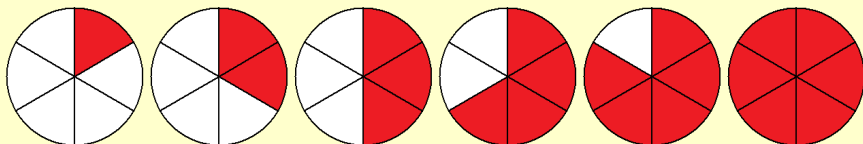
$$\frac{2}{4}$$

$$\frac{3}{4}$$

$$\frac{4}{4}$$



$$\frac{0}{4}$$



$$\frac{1}{6}$$

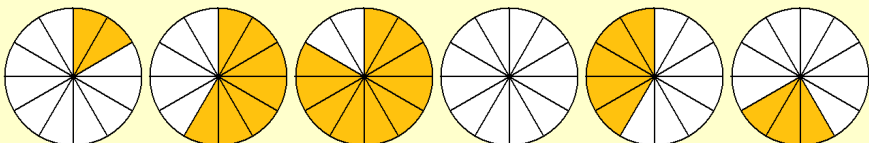
$$\frac{2}{6}$$

$$\frac{3}{6}$$

$$\frac{4}{6}$$

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

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



$$\frac{2}{12}$$

$$\frac{7}{12}$$

$$\frac{10}{12}$$

$$\frac{0}{12}$$

$$\frac{5}{12}$$

$$\frac{3}{12}$$

RETURN TO

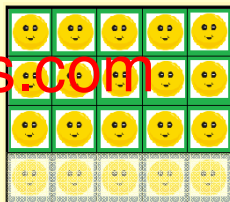
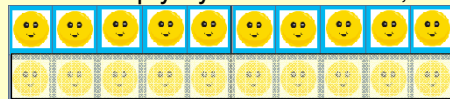
$1/2$ of 20 is 10.

$3/4$ of 20 is 15.

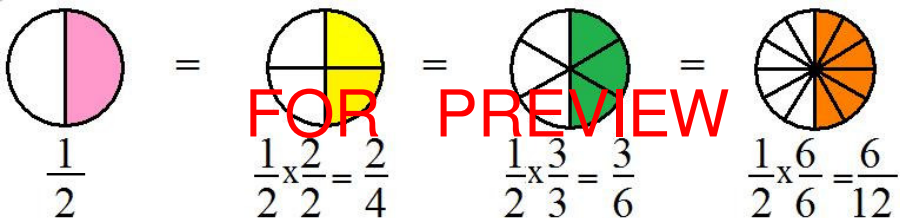
Divide 20 by the denominator, 2.
Then multiply by the numerator,

Divide 20 by the denominator, 4,
multiply by the numerator, 3.

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Multiplying both numerator and denominator by the same number gives equivalent fractions:



Dividing both numerator and denominator by the same number gives equivalent fractions:

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

1/2				1/2			
1/4		1/4		1/4		1/4	
1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8

SIMPLIFYING FRACTIONS (reducing to simplest terms)

If the numerator divides evenly into the denominator, use it:	$\frac{6}{18} = \frac{1}{3}$	$\frac{9}{36} = \frac{1}{4}$
Sometimes using the denominator minus the numerator works best:	$\frac{18}{24} = \frac{3}{4}$	$\frac{45}{54} = \frac{5}{6}$
If both are even, you can use 2, but it might need more "reducing":	$\frac{20}{72} = \frac{10}{36} = \frac{5}{18}$	$\frac{30}{160} = \frac{15}{80} = \frac{3}{16}$
The greatest common factor makes it a one-step process:	$\frac{27}{45} = \frac{3}{5}$	$\frac{12}{20} = \frac{3}{5}$
If the numerator is 1, if the denominator is a prime, or if the denominator is 1 more than the numerator, it can't be reduced.		

COMPARING FRACTIONS

Pie graphs allow comparisons.

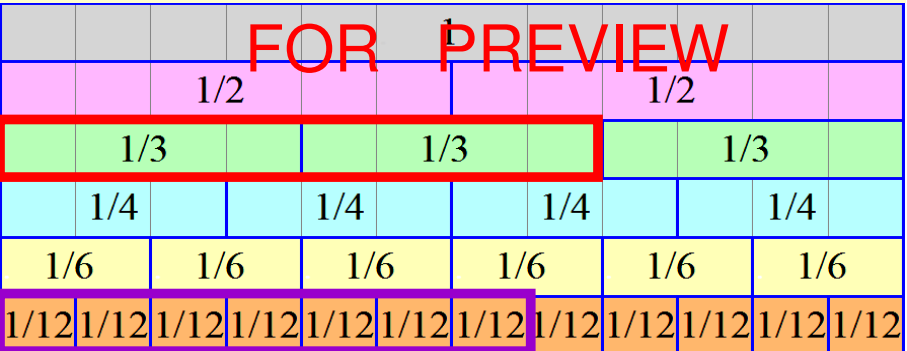
Below you can see $2/3 > 7/12$.



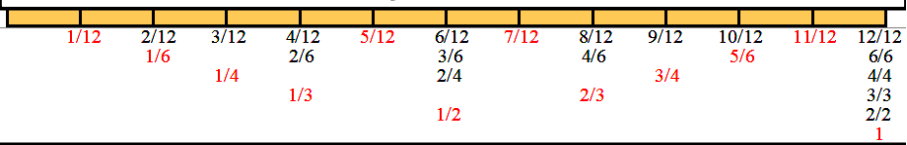
$$\frac{2}{3} < \frac{3}{4}$$

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

FOR PREVIEW



On the number line, you can see that $2/3 < 3/4$.



LEAST COMMON DENOMINATOR for COMPARING FRACTIONS
 To compare fractions, both must have the same denominator.
 If they don't, find equivalent fractions with the same denominator.

If the small denominator fits into the large, use the larger.

$$\frac{3}{8} ? \frac{3}{4} \text{ or } \frac{3}{8} < \frac{6}{8}$$

If the denominators are one number apart, multiply them.

$$\frac{2}{3} ? \frac{2}{4} \text{ or } \frac{8}{12} < \frac{9}{12}$$

Otherwise use their first common multiple.
 Multiples of 3: 3, 6, 9, 12, 15 Of 5: 5, 10, 15

$$\frac{2}{3} ? \frac{3}{5} \text{ or } \frac{10}{15} > \frac{9}{15}$$

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Adding Fractions: $1/4 + 1/3 = ?$

Visually: Put $1/4$ at the left end and then $1/3$. You "see" $1/4 + 1/3 = 7/12$.

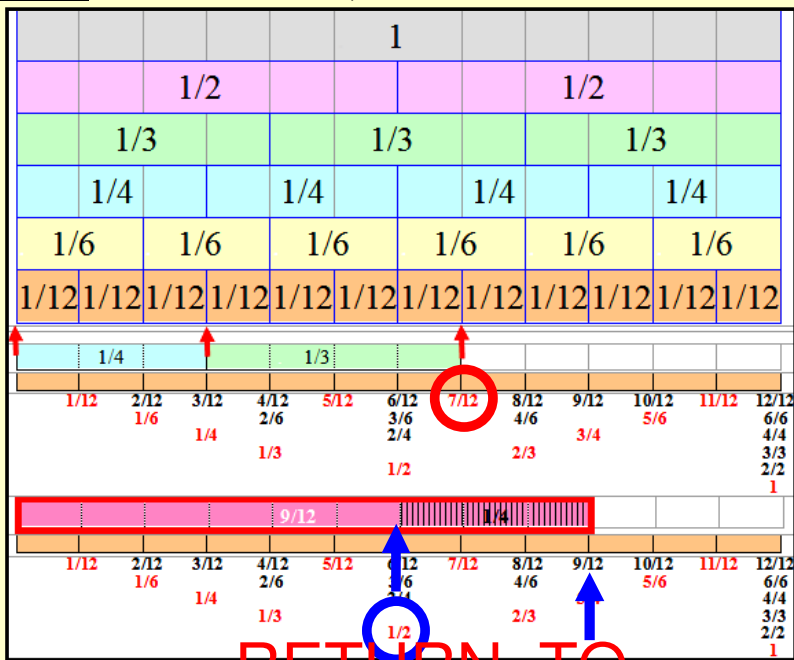
Calculation: The l. c. d. of 4 and 3 is 12. So, $1/4 + 1/3 = 3/12 + 4/12 = 7/12$.

Subtracting fractions: $9/12 - 1/4 = ?$

Visually: Put $9/12$ at the left end and cover the right end of $9/12$ with $1/4$.

You "see" $9/12$ less $1/4$ ends at $1/2$. (Simplest form is in red.)

Calculation: The l. c. d. is 12. So, $9/12 - 1/4 = 9/12 - 3/12 = 6/12 = 1/2$.



To add or subtract fractions, both must have the same denominator. If they don't, use equivalent fractions with the same denominator.

If the small denominator fits into the large, use the larger.

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If the denominators are one number apart, multiply them.

$$\frac{2}{3} + \frac{1}{6} = \frac{4}{6} + \frac{1}{6} = \frac{5}{6}$$
$$\frac{3}{4} + \frac{2}{5} = \frac{15}{20} + \frac{8}{20} = \frac{23}{20} = 1\frac{3}{20}$$

Otherwise use their first common multiple. Multiples of 3: 3, 6, 9, 12, 15 Of 5: 5, 10, 15

$$\frac{1}{3} + \frac{3}{5} = \frac{5}{15} + \frac{9}{15} = \frac{14}{15}$$

$$\begin{array}{r} \frac{3}{8} + \frac{2}{8} \\ \hline \frac{5}{8} \end{array} \quad \begin{array}{r} \frac{5}{6} - \frac{2}{6} \\ \hline \frac{3}{6} = \frac{1}{2} \end{array}$$

same denominator & reduce to simple terms

$$\begin{array}{r} \frac{2}{3} - \frac{1}{6} \\ \hline \frac{4}{6} - \frac{1}{6} \\ \hline \frac{3}{6} = \frac{1}{2} \end{array}$$

small denom. fits into larger

$$\begin{array}{r} \frac{1}{5} + \frac{2}{4} \\ \hline \frac{2}{20} + \frac{10}{20} \\ \hline \frac{12}{20} = \frac{3}{5} \end{array}$$

denom. 1 apart, so multiply

$$\begin{array}{r} \frac{3}{4} - \frac{1}{6} \\ \hline \frac{9}{12} - \frac{2}{12} \\ \hline \frac{7}{12} \end{array}$$

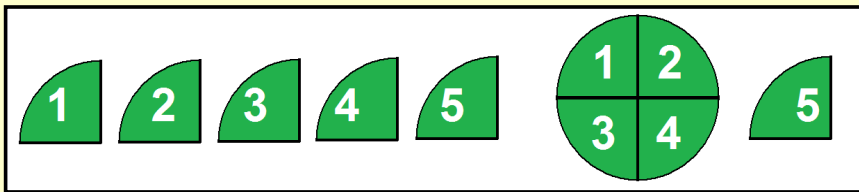
use least common multiple

$$\begin{array}{r} \frac{5}{8} + \frac{4}{8} \\ \hline \frac{9}{8} = 1\frac{1}{8} \end{array}$$

answer improper fraction

FOR REVIEW

In an improper fraction, the numerator is larger than the denominator. Thus the number is greater than 1. Divide the denominator into the numerator and any remainder is the leftover fraction. $\frac{5}{4} = 1 \frac{1}{4}$



improper fraction	$\frac{9}{4}$	$\frac{8}{3}$	$\frac{6}{3}$	$\frac{19}{4}$	$\frac{13}{2}$	$\frac{10}{4}$
mixed number	$2\frac{1}{4}$	$2\frac{2}{3}$	2	$4\frac{3}{4}$	$6\frac{1}{2}$	$2\frac{1}{2}$

RETURN TO

Adding and subtracting with regrouping:

$$\begin{array}{r} 2\frac{6}{9} + 1\frac{4}{9} \\ \hline 3\frac{10}{9} = 4\frac{1}{9} \end{array}$$

$$\begin{array}{r} 1\frac{6}{6} - \frac{1}{6} \\ \hline 1\frac{5}{6} \end{array}$$

$$\begin{array}{r} 3\frac{1}{5} - 1\frac{3}{5} \\ \hline 2\frac{6}{5} - 1\frac{3}{5} \\ \hline 1\frac{3}{5} \end{array}$$

$$\begin{array}{r} 2\frac{1}{3} + 1\frac{32}{24} \\ \hline 2\frac{8}{24} + 1\frac{32}{24} \\ \hline 3\frac{40}{24} = 4\frac{10}{6} = 4\frac{5}{3} = 5\frac{2}{3} \end{array}$$

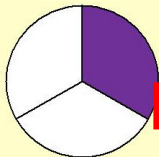
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What is $\frac{1}{2} \times \frac{1}{3}$?

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

In a picture, take $\frac{1}{2}$ of $\frac{1}{3}$.

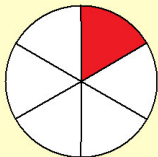
Start with $\frac{1}{3}$.



Take half of it.



That equals $\frac{1}{6}$.



FOR PREVIEW

To multiply fractions, multiply numerators and denominators:

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

$$\frac{7}{9} \times \frac{2}{3} = \frac{14}{27}$$

$$\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$$

Divide common factors into a numerator and denominator:

$$\frac{\cancel{2}}{\cancel{3}_1} \times \frac{\cancel{3}^1}{5} = \frac{2}{5}$$

$$\frac{\cancel{2}}{\cancel{9}_3} \times \frac{\cancel{3}^1}{5} = \frac{2}{15}$$

$$\frac{\cancel{12}^2}{\cancel{3}_1} \times \frac{\cancel{3}^1}{\cancel{4}_2} = \frac{1}{2}$$

To multiply a fraction by a whole number, multiply the whole number by the numerator and then divide by the denominator.

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

$$\frac{2}{3} \times 9 = 6$$

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

$$\frac{3}{5} \times 9 = 5\frac{2}{5}$$

RETURN TO

To divide by a fraction, invert that fraction and multiply.

$$8 \div \frac{1}{2} = 8 \times \frac{2}{1} = 16$$

$$\frac{3}{7} \div \frac{2}{6} = \frac{3}{7} \times \frac{6}{2} = \frac{18}{14} = 1\frac{2}{7}$$

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PROBABILITY: The probability of flipping a head is $1/2$.
The probability of two heads in a row is $1/2 \times 1/2$ or $1/4$.
The probability of 3 heads in a row: $1/2 \times 1/2 \times 1/2 = 1/8$.
This equals one combination in eight possible outcomes.



The probability of drawing a heart (one of four suits) is $1/4$.
The probability of two hearts in a row is $1/4 \times 1/4$ or $1/16$.
The probability of 3 hearts in a row: $1/4 \times 1/4 \times 1/4 = 1/64$.
This assumes that the card is replaced in the deck each time. These are independent drawings.



**THE PROBABILITY OF
INDEPENDENT EVENTS
IS EQUAL TO THE
PRODUCT OF THEIR
SEPARATE LIKELIHOODS.**



RETURN TO

- What is the probability when one die is tossed it will be a 5? $1/6$
What is the probability when one die is tossed it will be even? $3/6 = 1/2$
What is the probability that two dice will be "boxcars" (6 and 6)? $1/6 \times 1/6 = 1/36$
What is the probability that two dice will add up to a total of 7? $6/36 = 1/6$

(One way to solve the last one: No matter what number comes up on the first die, there is a one chance in six that the second will add up to seven.)