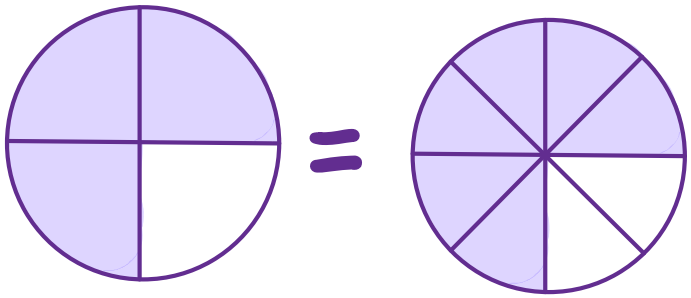
Equivalent Fractions

Some fractions look different, but are actually the same value.



$$\frac{3}{4} = \frac{6}{8}$$

So how can we find equivalent fractions without drawing a picture?

Hint: Multiplying a number by 1 doesn't change its value

There are many different ways to write 1

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

So we can multiply our fraction by <u>any</u> of these and get an equivalent fraction!

$$\frac{3}{4} \times \frac{2}{2} = \frac{6}{8} \quad \text{so} \quad \frac{3}{4} = \frac{6}{8}$$

$\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$ so $\frac{2}{3} = \frac{4}{6}$

$\frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$ so $\frac{2}{3} = \frac{6}{9}$ also equal!

$\frac{4}{7} \times \frac{3}{3} = \frac{12}{21}$ so $\frac{4}{7} = \frac{12}{21}$

$\frac{5}{7} \times \frac{6}{6} = \frac{30}{42}$ so $\frac{5}{7} = \frac{30}{42}$

Comparing Fractions

To compare fractions with different numerators and denominators, we can use equivalent fractions to make the denominator the same.

Which is bigger? $\frac{3}{7}$ or $\frac{16}{35}$?

What form of 1 can we multiply $\frac{3}{7}$ by so that the denominator is 35?

$\frac{3}{7} \times \frac{5}{5} = \frac{15}{35}$ so $\frac{3}{7} = \frac{15}{35}$

Now that we know $\frac{3}{7} = \frac{15}{35}$, we can easily compare it to $\frac{16}{35}$.

$\frac{3}{7} = \frac{15}{35}$ and $\frac{15}{35} < \frac{16}{35}$ so $\frac{3}{7} < \frac{16}{35}$

Practice

$\frac{4}{7} = \frac{28}{49}$ $\frac{3}{5} = \frac{27}{45}$ $\frac{7}{10} = \frac{63}{90}$

$\frac{8}{11} < \frac{56}{66}$ since $\frac{8}{11} = \frac{48}{66}$

$\frac{3}{7} > \frac{11}{28}$ since $\frac{3}{7} = \frac{12}{28}$

How to compare fractions

- If they have the same denominator, simply compare numerators.

  Think: more or less of the same size slice

  Example: $\frac{5}{7} > \frac{4}{7}$

- If they have the same numerator, the one with the smaller denominator is the larger fraction.

  Think: same amount of slices, but one group has bigger slices because we split it less.

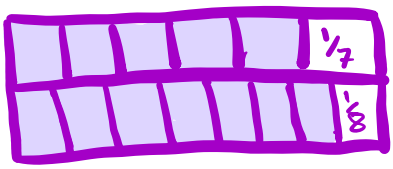
  Example: $\frac{3}{9} < \frac{3}{8}$

- Methods for comparing fractions with different numerators and denominators

  - How far away from 1?

    Example: $\frac{6}{7} < \frac{7}{8}$

    $\frac{1}{7}$ away from 1 ↑ ↑ $\frac{1}{8}$ away from 1



  - Under or over $\frac{1}{2}$?

    Example: $\frac{9}{14} > \frac{3}{8}$

    over $\frac{1}{2}$ since $\frac{9}{14} > \frac{7}{14}$

    under $\frac{1}{2}$ since $\frac{3}{8} < \frac{4}{8}$

Comparing fractions

$\frac{7}{11} \bigcirc \frac{5}{8}$

We can use equivalent fractions to make the denominators the same.

$\frac{7}{11} = \frac{56}{88}$ $\frac{5}{8} = \frac{55}{88}$

$\frac{56}{88} > \frac{55}{88}$

Cross multiplying (shortcut)

45 $\frac{5}{8}$ $\frac{6}{9}$ 48 $\Rightarrow \frac{5}{8} < \frac{6}{9}$

$\frac{3}{5} \bigcirc \frac{5}{8}$ $\frac{6}{9} < \frac{7}{10}$

$\frac{13}{27} \bigcirc \frac{9}{15}$ $\frac{9}{14} < \frac{13}{17}$

How to simplify (reduce) fractions

① Find the GCF of the numerator and denominator

② Divide numerator and denominator by GCF

Example: Reduce $\frac{15}{20}$

GCF of 15 and 20:

15: 1, 3, 5, 15

20: 1, 2, 4, 5, 10, 20

So, 5 is the GCF

$$\frac{15 \div 5}{20 \div 5} = \frac{3}{4}$$

So, $\frac{15}{20} = \frac{3}{4}$

Example: Reduce $\frac{28}{50}$

GCF of 28 and 50:

28: 1, 2, 4, 7, 14, 28

50: 1, 2, 5, 10, 25, 50

So, 2 is the GCF

$$\frac{28 \div 2}{50 \div 2} = \frac{14}{25}$$

So, $\frac{28}{50} = \frac{14}{25}$

How to simplify (reduce) fractions with big numbers

① Find the GCF of the numerator and the denominator.

- If finding the GCF is too challenging, try dividing both numbers by any common factor, and then finding the GCF of those two numbers.

② Divide both numbers by the GCF

Example: $\frac{64}{120}$ } These numbers are really big! Since they are both even, lets divide by 2 first

$\frac{64}{120} = \frac{32}{60}$ } These are still a little big. lets divide by 2 again!

$\frac{32}{60} = \frac{16}{30}$ } The GCF of these numbers is 2, so we divide by 2 one last time.

$\frac{16}{30} = \frac{8}{15}$ ← This fraction is in lowest terms!

So, $\frac{64}{120} = \frac{8}{15}$

Adding/Subtracting Fractions with Different Denominators

$$\frac{5}{8}+\frac{6}{9}=$$

① Find a common multiple between the denominators

$8 \times 9 = 72$

② Find equivalent fractions with that denominator

$$\frac{5}{8}=\frac{45}{72} \qquad \frac{6}{9}=\frac{48}{72}$$

③ Add the two fractions

$$\frac{45}{72}+\frac{48}{72}=\frac{93}{72}$$

$$\frac{5}{8}+\frac{6}{9}=\frac{93}{72}=1\frac{21}{72}=1\frac{7}{24}$$

Multiplying / Dividing Fractions

To multiply or divide fractions, simply multiply or divide the numerators to get the new numerator, then multiply or divide the denominators to get the new denominator

Examples:

$$\frac{3}{5} \times \frac{4}{7} = \frac{12}{35} \qquad \frac{15}{18} \div \frac{5}{9} = \frac{3}{2}$$

It is often helpful to convert mixed numbers to improper fractions first

Examples:

$$3\frac{5}{9} \times \frac{2}{7} = \frac{32}{9} \times \frac{2}{7} = \frac{64}{63} = 1\frac{1}{63}$$

$$1\frac{3}{5} \times 2\frac{4}{7} = \frac{8}{5} \times \frac{18}{7} = \frac{144}{35} = 4\frac{4}{35}$$

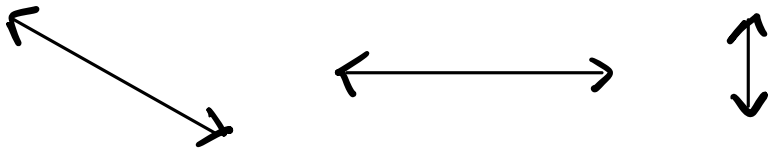
Remember that whole numbers are just fractions with 1 in the denominator!

Examples:

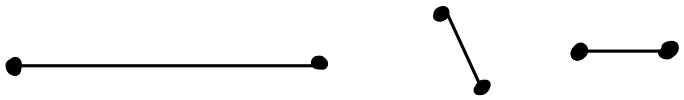
$$\frac{5}{11} \times 6 = \frac{5}{11} \times \frac{6}{1} = \frac{30}{11} = 2\frac{8}{11}$$

Lines, Rays, and Angles

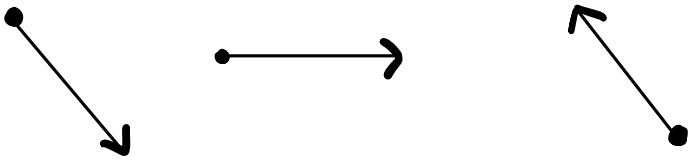
Line: straight, infinite in both directions



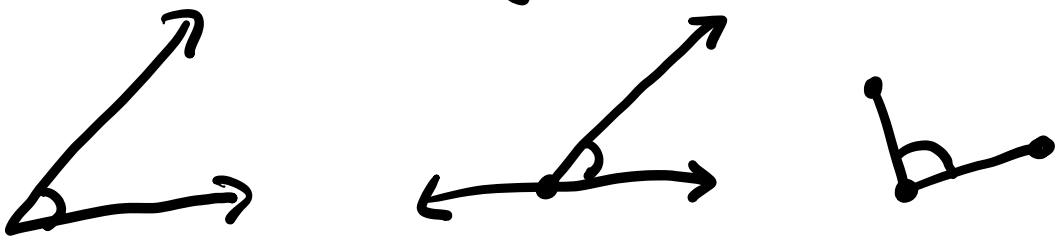
Line segment: a part of a line



Ray: straight, infinite in only one direction

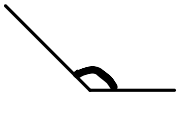


Angle: the space between two lines, rays, or line segments

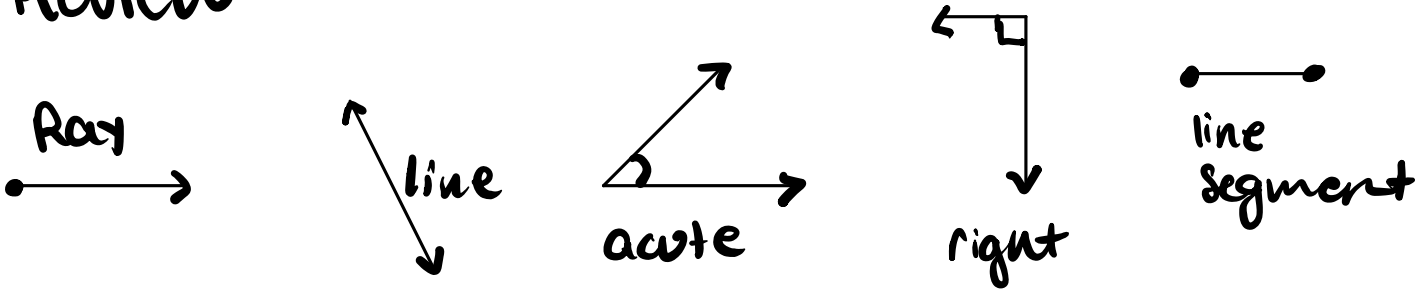


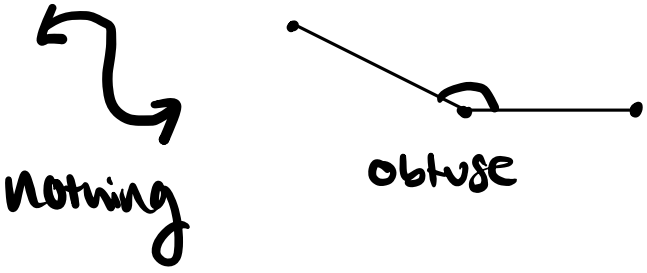
Right angle:  symbol to show right angle — 90°

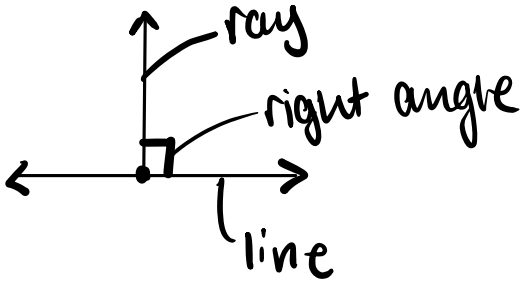
Acute angle:  smaller than right angles

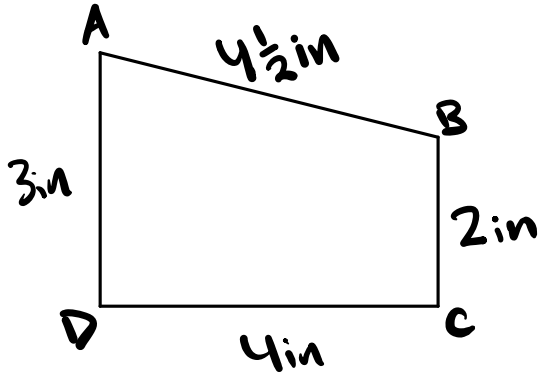
Obtuse angle:  greater than right angles

Review

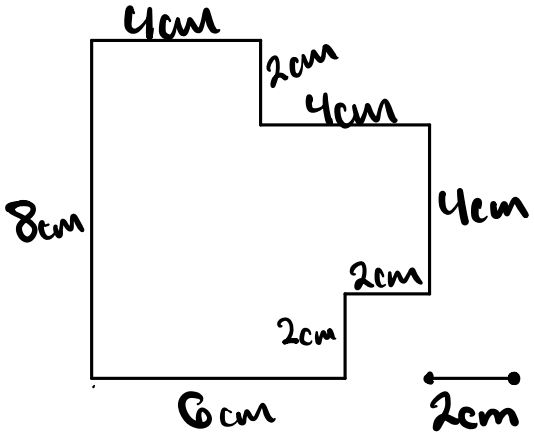








Perimeter = $13\frac{1}{2}$ in



Perimeter : 32cm