Notes:

M9

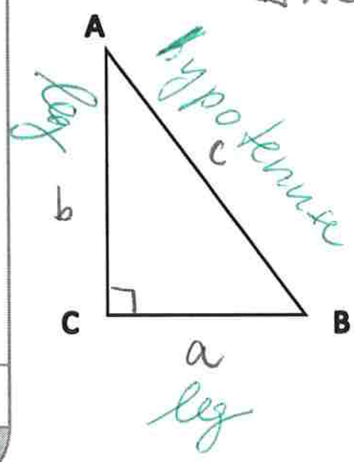
Review I

Pythagorean Theorem

The Pythagorean Theorem states that for every right-angled triangle the following is true:
The area of the square drawn above the hypotenuse is equal to the sum of the areas of the two smaller squares drawn above the legs of the triangle.

This can be simplified as follows:

ΔACB



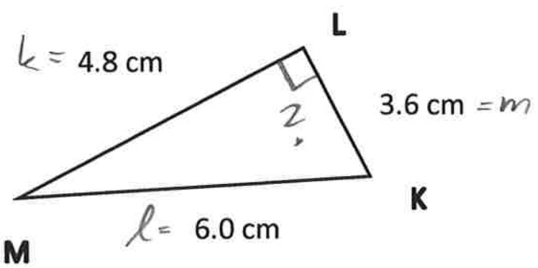
$$\boxed{c^2 = a^2 + b^2}$$

$$\text{Hypotenuse}^2 = \text{leg}^2 + \text{leg}^2$$

Note, it is possible to apply the Pythagorean Theorem to determine whether a given triangle has a 90° angle.

How does it work?

Example 1: Determine whether triangle KLM is a right-angled triangle. Justify your answer.



$l^2 \stackrel{?}{=} k^2 + m^2$

$6.0^2 = 4.8^2 + 3.6^2$

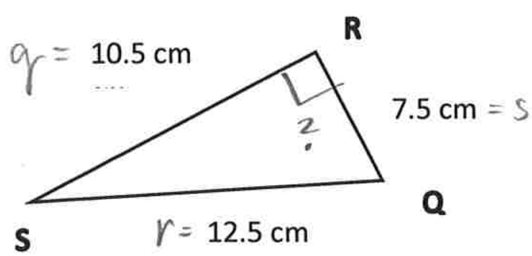
$36 = 23.04 + 12.96$

$36 = 36$

LS = RS ✓

$\therefore$ Δ KLM is a right-angled Δ.

Example 2: Determine whether triangle QRS is a right-angled triangle. Justify your answer.



$r^2 \stackrel{?}{=} s^2 + q^2$

$12.5^2 = 7.5^2 + 10.5^2$

$156.25 = 56.25 + 110.25$

$156.25 \neq 166.5$

LS $\neq$ RS ✗

$\therefore$ ΔQRS is not a right-angled Δ.

Fractions

Label the three parts of a fraction:

fraction line

numerator

denominator

Q: What number is never allowed to be at the bottom of any fraction?

A: zero is not allowed at the bottom of any fraction.

Q: How do you express a fraction as a decimal number?

A: To express a fraction as a decimal number one has to divide the numerator of the fraction by its denominator.

Express the following fractions as decimal numbers:

$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{2}{3}$	$\frac{3}{4}$
0.5	$0.\overline{3}$	0.25	0.2	$0.\overline{6}$	0.75

Q: What do we call a fraction that has 100 as its denominator?

A ratio that expresses percentage

For example:

$\frac{13}{100} = 0.13 = 13\%$

Q: What do we call a fraction that has 1 as its denominator?

An integer,

For example:

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

Q: Can a fraction have a negative number as its denominator?

Yes.

However, it is preferred to move the negative symbol up:

! $\frac{5}{-7} = -\frac{5}{7}$ OR $\frac{-5}{7}$

Q: What do you do when comparing fractions?

For example:

common denominator

Is $\frac{14}{25}$ greater or smaller than $\frac{12}{23}$?

Recall that we use symbols: __$>$__ for "greater than" and __$<$__ for "less than"

A:

$\frac{23 \times 14}{23 \times 25} \ ? \ \frac{12 \times 25}{23 \times 25}$

$\frac{322}{575} > \frac{300}{575} \Rightarrow \frac{14}{25} > \frac{12}{23}$

$\therefore \frac{14}{25} > \frac{12}{23}$

Operations with Fractions

Recall the appropriate mathematical terms for basic operations and their symbols:

Name of the operation	Symbol	Name of the result of the operation
addition	$+$	sum
subtraction	$-$	difference
multiplication	$\times$ | $\cdot$ | $(\ )(\ )$	product
division	$\div$ | $\frac{\square}{\square}$	quotient

Reducing Fractions

To reduce a fraction is to express it in its lowest terms. That is divide the numerator and the denominator by their largest common factor.

Example: Express given fractions in lowest terms:

$\frac{4 \div 2}{6 \div 2}$	$\frac{7 \div 7}{28 \div 7}$	$\frac{2}{13}$	$\frac{18 \div 2}{32 \div 2}$	$\frac{-9 \div 3}{15 \div 3}$
$\frac{2}{3}$	$\frac{1}{4}$	$\frac{2}{13}$	$\frac{9}{16}$	$\frac{-3}{5}$

Multiplying Fractions

To multiply fractions, follow these steps:

Ex. $\frac{10}{15} \times \frac{12}{72}$

1. Reduce each fraction if possible.

$\frac{\cancel{10}^{2}}{\cancel{15}_{3}} \times \frac{\cancel{12}^{1}}{\cancel{72}_{6}} \rightarrow \frac{2}{3} \times \frac{1}{6}$

2. Reduce fractions diagonally if possible.

$\frac{\cancel{2}^{1}}{3} \times \frac{1}{\cancel{6}_{3}} \longrightarrow \frac{1}{3} \cdot \frac{1}{3}$

3. Multiply all numerators.

$1 \times 1 = 1$

4. Multiply all denominators.

$3 \times 3 = 9$

$\frac{1}{9}$

5. Double check that the numerator and denominator do not have a common factor other than 1.

$\boxed{\frac{1}{9}}$

Example: Multiply. Remember to show your work and clearly identify the final answer.

1	$\frac{3}{7} \times \frac{2}{11}$	$\frac{3 \times 2}{7 \times 11} = \boxed{\frac{6}{77}}$

2	$\frac{\cancel{6}^{2}}{7}\times\frac{5}{\cancel{21}_{7}}$	$\frac{2}{7}\times\frac{5}{7}=\boxed{\frac{10}{49}}$
3	$\frac{\cancel{2}^{1}}{\cancel{8}_{4}}\times\frac{\cancel{3}^{1}}{\cancel{6}_{2}}$	$\frac{1}{4}\times\frac{1}{2}=\boxed{\frac{1}{8}}$
4	$\frac{\cancel{24}^{4}}{\cancel{6}_{1}}\times\frac{5}{16}$	$\frac{\cancel{4}^{1}}{1}\times\frac{5}{\cancel{16}_{4}}=\frac{1}{1}\times\frac{5}{4}=\boxed{\frac{5}{4}}$
5	$\frac{\cancel{3}^{1}}{\cancel{7}_{1}}\times\frac{2}{\cancel{9}_{3}}\times\frac{\cancel{14}^{2}}{5}$	$\frac{1}{1}\times\frac{2}{3}\times\frac{2}{5}=\boxed{\frac{4}{15}}$
6	$\frac{\cancel{10}^{5}}{\cancel{12}_{6}}\times\frac{3}{5}\times\frac{11}{23}$	$\frac{\cancel{5}^{1}}{\cancel{6}_{2}}\times\frac{\cancel{3}^{1}}{\cancel{5}_{1}}\times\frac{11}{23}=\frac{1}{2}\times\frac{1}{1}\times\frac{11}{23}=\boxed{\frac{11}{46}}$
7	$\frac{\cancel{15}^{5}}{\cancel{6}_{2}}\times\frac{\cancel{10}^{2}}{\cancel{5}_{1}}\times\frac{\cancel{32}^{4}}{\cancel{8}_{1}}$	$\frac{5}{\cancel{2}_{1}}\times\frac{\cancel{2}^{1}}{1}\times\frac{4}{1}=\frac{5\times1\times4}{1\times1\times1}=\frac{20}{1}=\boxed{20}$
8	$\frac{\cancel{14}^{7}}{\cancel{16}_{8}}\times\frac{12}{11}\times\frac{\cancel{21}^{3}}{\cancel{7}_{1}}$	$\frac{7}{\cancel{8}_{2}}\times\frac{\cancel{12}^{3}}{11}\times\frac{3}{1}=\frac{7\times3\times3}{2\times11}=\boxed{\frac{63}{22}}$