

Comparing & Contrasting

- mathematically

Ways of comparing mathematical and
scientific quantities

Comparison by Division

Applications
of



RATIOS

in

Finance,

Commerce,

Biology,

Geometry,

Geology,

Sports,

and Meteorology!

Mathematicians like to think that, if you can solve
one ratio problem, you can solve them all
but whether you understand them is quite another thing.

RATIOS

A ratio is a relative magnitude.

Definition of Ratio:

A ratio is an expression that compares quantities relative to each other.

This means that ratios compare the sizes, quantities, or magnitudes of two or more objects without giving their actual sizes, quantities, or magnitudes.

Notation and Terminology

To say that two quantities are in **the ratio of a to b** , where neither can be **0**, is generally expressed mathematically using the colon statement notation **$a : b$** .

There is also a fractional notation **a / b** which is used to denote the same ratio. I call it a 'ratio fraction'. If both **a** and **b** are integers, it behaves in much the same way as the rational number **a / b** .

The quantities on either side of the colon in the ratio are sometimes called '**terms**' of the ratio, even though they are divided one into the other, not added together.

RATIOS

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Definition of Ratio:

A ratio is an expression that compares quantities relative to each other.

Various Interpretations of a Given Ratio

Suppose we are given that a farmer has **cattle** and **sheep** in a **ratio of a to b**.

1. The said ratio may be expressed as **$a : b$** or **a / b** .
2. The said ratio may also be changed to an equivalent ratio by using the Fundamental Law of Fractions.
3. The ratio states that the farmer has **a** cattle for every **b** sheep OR **b** sheep for every **a** cattle.
4. The ratio states that the farmer has **a / b** as many cattle as sheep OR has **b / a** as many sheep as cattle.
5. The ratio states that **$a / (a+b)$** of the entire herd is cattle OR that **$b / (a+b)$** of the entire herd is sheep.

Note that **$a + b$** will represent the whole of herd, relatively speaking.

Comparison by Division

Applications
of



RATIOS

in

Finance

RATIOS in FINANCE

A ratio is a relative magnitude.

Currency Exchange Rates

- the rate or price per unit at which the currency of one country may be exchanged for the currency of another.

When you see the words, 'price per unit', you should immediately think of ratios with different units of measurement.

Table of Currency Exchange in US dollars		Rate or Ratio of Exchange
Canadian dollar	0.85985	Canadian to US dollars Cdn \$1 / US \$0.85985
British Pound	1.62153	Pounds to US dollars 1 £ / US \$1.6253
Japanese Yen	0.01082	Yen to US dollars 1 ¥ / US \$0.01082
Mexican Peso	0.07306	Pesos to US dollars Mex \$1 / US \$0.07306

as of July 11, 2009

RATIOS in FINANCE

A ratio is a relative magnitude.

Currency Exchange Rates

- the rate or price per unit at which the currency of one country may be exchanged for the currency of another.

Table of Currency Exchange in US dollars		Rate or Ratio of Exchange
Canadian dollar	0.85985	Canadian to US dollars Cdn \$1 / US \$0.85985

Interpretation

3. The ratio states that for every **\$ 1.00 Canadian** you will get about **86 cents** in American money
OR **86 cents in American money** will buy you **\$ 1 Cdn** .

If you wanted to know how many Canadian dollars it would take to buy 1 US dollar, you would write an equivalent ratio fraction with 1 in the denominator, by dividing both numerator and denominator by **0.85985** .

This would give you the ratio fraction **Cdn \$1.16299 / US \$1** , which means that a little over **\$1.16 Cdn** will buy **\$1 US** .

RATIOS in FINANCE

A ratio is a relative magnitude.

Currency Exchange Rates

- the rate or price per unit at which the currency of one country may be exchanged for the currency of another.

Table of Currency Exchange in US dollars		Rate or Ratio of Exchange
British Pound	1.62153	Pounds to US dollars $1 \text{ £} / \text{US } \$1.6253$

Interpretation

3. The ratio states that for every **British pound note** you will get almost **\$1.63** in American money
OR **\$1.63 in American money** will buy you **1 £** .

The ratio also states that you will get $1 / 1.6253 \sim 0.615$
British pounds per American dollar
OR $1.6253 / 1 \sim 1.63$ American dollars per British pound.

This means that a little under **\$1.63 US** will buy **1 £** .

Note that ratios $a / 1$ with different units of measurement may be read **a units of numerator per 1 unit of denominator**.

RATIOS in FINANCE

A ratio is a relative magnitude.

Currency Exchange Rates

- the rate or price per unit at which the currency of one country may be exchanged for the currency of another.

Table of Currency Exchange in US dollars		Rate or Ratio of Exchange
Japanese Yen	0.01082	Yen to US dollars $1 \text{ ¥} / \text{US } \$0.01082$
Mexican Peso	0.07306	Pesos to US dollars $\text{Mex } \$1 / \text{US } \$0.07306$

Interpretation

The Yen ratio states that you will get $1 / .01082 \sim 92.42$
Japanese Yen per American dollar
OR $0.01082 / 1 \sim 1.1 \text{ cents}$ American per Japanese Yen.

The Peso ratio states that you will get $1 / .07306 \sim 13.69$
Mexican pesos per American dollar
OR $0.07306 / 1 \sim 7.3 \text{ cents}$ American per Mexican peso.

Comparison by Division

Applications
of



RATIOS
in

Commerce

Mathematicians like to think that, if you can solve
one ratio, you can solve them all
but whether you understand them is quite another thing.

RATIOS in COMMERCE

A ratio is a relative magnitude.

Accounting and Marketing Ratios

Numerous ratios crop up in the world of commerce. Profitability, liquidity, stability, and growth ratios are the concerns of most businesses. Here are a few more well-known ratios with their abbreviated handles.

Variable-Cost Ratio: $VCR = \frac{V}{S}$

Contribution Margin Ratio: $CMR = \frac{S - V}{S}$

Accounting Rate of Return: $ARR = \frac{O - D}{I}$

Compound Interest Rate: $i = \sqrt[n]{\frac{FV}{PV}} - 1$

Note the use of the word 'rate' when talking about some ratios.

RATIOS in COMMERCE

A ratio is a relative magnitude.

Accounting and Marketing Ratios

Without knowing anything about the meaning behind each of these ratios, as long as **all but one** of the ingredients in these formulas are known, the remaining unknown may be calculated using techniques we have already discussed.

Variable-Cost Ratio: $VCR = \frac{V}{S}$ Find: S

Contribution Margin Ratio: $CMR = \frac{S - V}{S}$ Find: V

Accounting Rate of Return: $ARR = \frac{O - D}{I}$ Find: O

Compound Interest Rate: $i = \sqrt[n]{\frac{FV}{PV}} - 1$ Find: FV

Note the use of the word 'rate' when talking about some ratios.

RATIOS in COMMERCE

A ratio is a relative magnitude.

Rules of Ratios

By using the rules for finding equivalent equations, one may solve ratios for the unknown quantity.

See the tutorial on 'Equality, Equivalence, & Order' for techniques on solving numerical equations.

Interpretation of Ratios

Given: $V = \text{variable costs} = \$200,000$
 $S = \text{total sales} = \$2,000,000$

$$\text{Variable-Cost Ratio: } VCR = \frac{V}{S} = \frac{\$200,000}{\$2,000,000} = \frac{1}{10}$$

3. The ratio states that the business has $\$200,000$ in variable costs V for every $\$2,000,000$ in sales S ;

OR

5. The ratio states that the business has $10/1 = 10$ times as many sales as variable costs.

RATIOS in COMMERCE

A ratio is a relative magnitude.

Variable-Cost Ratio: $VCR = \frac{V}{S}$ **Find: S**

Suppose that the variable-cost ratio is normally 2/12.
This year the business accumulated \$30 in variable costs
per item manufactured in their plant. What should be the
sale price per item if they wanted to keep that ratio stable?

$$\text{LHS} = \frac{1}{6} = \frac{2}{12} = VCR = \frac{V}{S} = \frac{\$30 \text{ per item}}{\$ S \text{ per item}} = \text{RHS}$$

$$\text{LHS} = \frac{1}{6} = \frac{30}{S} = \text{RHS}$$

$$\cancel{6}^1 \cdot S \cdot \frac{1}{\cancel{6}_1} = \frac{30}{\cancel{S}_1} \cdot \cancel{6}^1 \cdot \cancel{S}_1 \quad \text{multiply by}$$
$$N = 6 \cdot S \neq 0$$

$$S = 180$$

ANSWER: Sale price per item should be **\$180**.

RATIOS in COMMERCE

A ratio is a relative magnitude.

Contribution Margin Ratio: $CMR = \frac{S - V}{S}$ Find: **CMR**

Suppose a company has sold 50,000 items this year for a total of 3 million dollars. Executives know that their per item variable costs were \$15. What is their **CMR** this year?

We know that quantities to be compared by ratio must both be expressed in the **same units** of measure.

$$V = \$ 15 \text{ per item}$$

$$S = \frac{\$ 3,000,000}{50,000 \text{ items}} = \frac{\$ 60}{1 \text{ item}} = \$ 60 \text{ per item}$$

$$CMR = \frac{S - V}{S} = \frac{\$ 45 \text{ per item}}{\$ 60 \text{ per item}} = \frac{3}{4} \quad \text{ANSWER}$$

RATIOS in COMMERCE

A ratio is a relative magnitude.

Contribution Margin Ratio: $CMR = \frac{S - V}{S}$ **Find: CMR**

Suppose a company has sold 50,000 items this year for a total of 3 million dollars. Executives know that their per item variable costs were \$15. What is their **CMR** this year?

ANSWER $CMR = \frac{S - V}{S} = \frac{\$45 \text{ per item}}{\$60 \text{ per item}} = \frac{3}{4}$

Interpretation of the CMR Ratio

3. The ratio states that **\$ 3** out of every **\$ 4** in sales goes towards non-variable or fixed costs.

RATIOS in COMMERCE

A ratio is a relative magnitude.

Accounting Rate of Return: $ARR = \frac{O - D}{I}$ Find: O

This time, we will be given values for I , D , and ARR .
Then, without knowing their meanings, we will find O ,
whatever that is, and interpret the result.

Given: $ARR = \frac{7.9}{100}$ $I = \$6075$ $D = \$1520$ Find: O

$$\text{LHS} = \frac{7.9}{100} = ARR = \frac{O - D}{I} = \frac{\$O - \$1520}{\$6075} = \text{RHS}$$

$$6075 \cdot \frac{7.9}{100} = \frac{(O - 1520)}{6075} \cdot 6075^1 \quad \begin{array}{l} \text{multiply by} \\ N = 6075 \end{array}$$

$$479.925 + 1520 = O - 1519 + 1520 \quad \begin{array}{l} \text{add} \\ N = 1520 \end{array}$$

$$1999.925 = O$$

ANSWER: $O = \$1999.93$

RATIOS in COMMERCE

A ratio is a relative magnitude.

Accounting Rate of Return: $ARR = \frac{O - D}{I}$ Find: O

This time, we will be given values for I , D , and ARR .
Then, without knowing their meanings, we will find O ,
whatever that is, and interpret the result.

Given: $ARR = \frac{7.9}{100}$ $I = \$6075$ $D = \$1520$ Find: O
 $O = \$1999.93$

Interpretation of the ARR Ratio $ARR = \frac{7.9}{100}$

3. The ratio states that the company has a return of $\$7.90$
for every $\$100$ of $\$1$ of investment ,

OR

for every $\$100$ of $\$1$ of investment the company
gets a return of $\$7.90$.

RATIOS in COMMERCE

A ratio is a relative magnitude.

Compound Interest Rate: $i' = \sqrt[n]{\frac{FV}{PV}} - 1$ **Find: FV**

Suppose you want to invest \$10,000 (PV) this year. You have been offered an interest rate of 4.5% on your investment annually, but you must keep the money invested for 5 years.

What will your investment be worth (FV) at that time?

Given: $i' = \frac{4.5}{100}$ **PV = \$ 10,000** $n = 5$ **Find: FV**

LHS = $\frac{4.5}{100} = \sqrt[5]{\frac{FV}{10000}} - 1$ = RHS

$1 + \frac{4.5}{100} = \left(\frac{FV}{10000} \right)^{\frac{1}{5}} - 1 + 1$ add
N = 1

RATIOS in COMMERCE

A ratio is a relative magnitude.

Compound Interest Rate: $i' = \sqrt[n]{\frac{FV}{PV}} - 1$ Find: **FV**

Given: $i' = \frac{4.5}{100}$ $PV = \$10,000$ $n = 5$ Find: **FV**

$$1 + \frac{4.5}{100} = \left(\frac{FV}{10000} \right)^{\frac{1}{5}} - 1 + 1$$

add
 $N = 1$

$$1.045 = \frac{104.5}{100} = \left(\frac{FV}{10000} \right)^{\frac{1}{5}}$$

and
simplify

$$(1.045)^5 = \left(\frac{104.5}{100} \right)^5 = \left(\left(\frac{FV}{10000} \right)^{\frac{1}{5}} \right)^5$$

apply
exponential
 $N = 5$

RATIOS in COMMERCE

A ratio is a relative magnitude.

Compound Interest Rate: $i' = \sqrt[n]{\frac{FV}{PV}} - 1$ Find: **FV**

Given: $i' = \frac{4.5}{100}$ $PV = \$10,000$ $n = 5$ Find: **FV**

$$(1.045)^5 = \left(\frac{104.5}{100}\right)^5 = \left(\left(\frac{FV}{10000}\right)^{\frac{1}{5}}\right)^5$$

$$1.246182 = (1.045)^5 = \frac{FV}{10000}$$

rounded to 6 decimal places

and simplify

$$1.246182 \cdot 10000 = \frac{FV}{\cancel{10000}^1} \cdot \cancel{10000}^1$$

multiply by
 $N = 10000$

$$12461.82 = FV$$

ANSWER: **FV = \$12,461.82**

RATIOS in COMMERCE

A ratio is a relative magnitude.

Compound Interest Rate: $i' = \sqrt[n]{\frac{FV}{PV}} - 1$ Find: **FV**

Given: $i' = \frac{4.5}{100}$ $PV = \$10,000$ $n = 5$ Find: **FV**
FV = \$12,461.82

Interpretation of the Compound Interest Ratio

$$\frac{FV}{PV} = \frac{\$12,461.82}{\$10,000}$$

The ratio states that the investor wants to make **\$2461.82** over and above the initial investment of **\$10,000**.

The length of the time period n over which the investor wants that kind of return will determine the value of interest rate i' required for the investment to yield that return.

Comparison by Division

Applications
of



RATIOS

in

Biology

RATIOS in BIOLOGY

A ratio is a relative magnitude.

Dilution and Concentration Factors

- both are ratios of volumes of the solid, liquid, or gaseous materials involved in solutions. Each factor is the reciprocal (or the multiplicative inverse) of the other.

Because chemical solutions in science are often more concentrated than desired or even necessary, they must be diluted to achieve a lower level of concentration. To dilute a solution means adding a solvent to it.

A dilution then consists of a measured amount (the **aliquot**) of a specified material (the material to be diluted) being added to an appropriate volume of a solvent liquid (the **diluent**) to achieve a desired concentration level of the resulting solution.

Dilution Factor: $DF = \frac{\text{final volume of the solution}}{\text{aliquot volume}}$

Concentration Factor: $CF = \frac{\text{aliquot volume}}{\text{final volume of the solution}}$

RATIOS in BIOLOGY

A ratio is a relative magnitude.

Dilution Factor: $DF = \frac{\text{final volume of the solution}}{\text{aliquot volume}}$

Concentration Factor: $CF = \frac{\text{aliquot volume}}{\text{final volume of the solution}}$

Suppose you add 0.2 mL (milliliters) of a specimen to 0.98 mL of a diluent. What are the dilution and concentration factors?

Given: aliquot volume = 0.2 mL **Find:** DF
 diluent volume = 9.8 mL and CF

Then: final volume = 10 mL
 = aliquot volume + diluent volume

$$DF = \frac{10 \text{ mL}}{0.2 \text{ mL}} = \frac{50}{1} \quad \text{or} \quad 50 : 1$$

Ratio Fraction Colon Notation

$$CF = \frac{0.2 \text{ mL}}{10 \text{ mL}} = \frac{1}{50} \quad \text{or} \quad 1 : 50$$

Both factors are dimensionless.

RATIOS in BIOLOGY

A ratio is a relative magnitude.

What would you need to prepare 20 mL (milliliters) of a 1:100 dilution?

Remember that, as long as **all but one** of the ingredients in a formula are known, the remaining unknown may be calculated using techniques we have already discussed.

Note that the terminology " 1:100 dilution " means a solution with a concentration ratio of 1:100.

Concentration Factor: $CF = \frac{\text{aliquot volume}}{\text{final volume of the solution}}$

Given: final volume = 20 mL **Find:** aliquot volume in mL

$$CF = \frac{1}{100} \quad \text{concentration ratio written as a ratio fraction}$$

Then:

$$\frac{1}{100} = CF = \frac{\text{aliquot volume}}{\text{final volume}}$$

See the tutorial on 'Equality, Equivalence, & Order' for techniques on solving numerical equations.

RATIOS in BIOLOGY

A ratio is a relative magnitude.

What would you need to prepare 20 mL (milliliters) of a 1:100 dilution?

Given: **final volume** = 20 mL
CF = $\frac{1}{100}$

Find: **aliquot volume**
in mL

We solve the following numerical equation:

$$\frac{1}{100} = \text{CF} = \frac{\text{aliquot volume}}{\text{final volume}} = \frac{\text{aliquot volume in mL}}{20 \text{ mL}}$$

$$\text{expression 1} = \frac{1}{100} = \frac{\text{aliquot volume}}{20 \text{ mL}} = \text{expression 2}$$

$$\frac{1}{100} = \frac{\text{aliquot volume}}{20 \text{ mL}} \quad \text{multiply by } N = 20 \text{ mL}$$

$$20 \text{ mL} \cdot \frac{1}{100} = \frac{\text{aliquot volume}}{\cancel{20 \text{ mL}}^1} \cdot \cancel{20 \text{ mL}}^1$$

$$0.2 \text{ mL} = \text{aliquot volume}$$

ANSWER:

$$\text{aliquot volume} = 0.2 \text{ mL}$$

$$\text{diluent volume} = \text{final} - \text{aliquot} = 20 - 0.2 = 19.8 \text{ mL}$$

Comparison by Division

Applications
of



RATIOS

in

Geometry

RATIOS in GEOMETRY

A ratio is a relative magnitude.

Geometric Ratios

In geometry, relationships between lengths, areas, volumes, and other physical quantities of objects are common methods of comparison.

For example, the relationships which exist between the lengths of the sides of triangles play quite an important role in Euclidean spaces. In particular, Pythagorum's Theorem about the lengths of the sides of a right triangle is used in remarkably many instances.

Other significant applications of geometry in architecture, engineering and electronics involve the ratios of the lengths of the sides of a right triangle. The study of these ratios comprise part of the domain of Trigonometry.

RATIOS in GEOMETRY

A ratio is a relative magnitude.

Geometric Ratios

In this tutorial, we will discuss only two of them.

Similar Triangles: The **ratios** of corresponding sides of similar triangles are the same even though their respective lengths may be quite different.

Trigonometric Measure of Angles: One way to measure an angle is by taking **ratios** of the lengths of the sides of a **right** triangle containing it. This rather unintuitive way of measurement turned out to have an amazing array of real world applications.

For more information, please check out either of the topics 'Measurement of Angles' or 'Trigonometry of Angles'.

RATIOS in GEOMETRY

A ratio is a relative magnitude.

Geometric Ratios

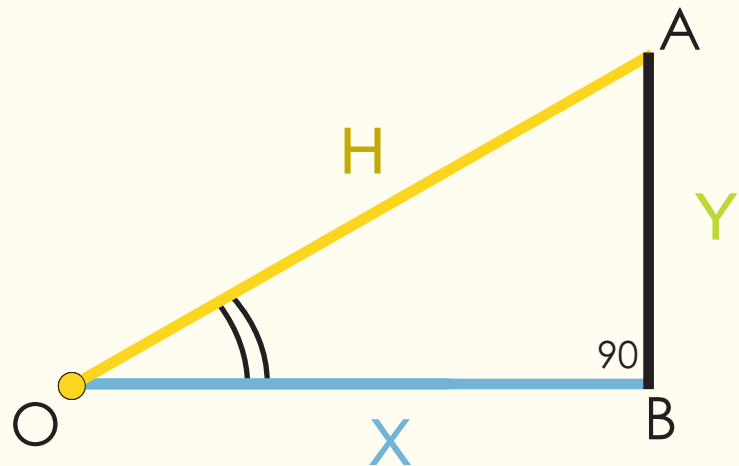
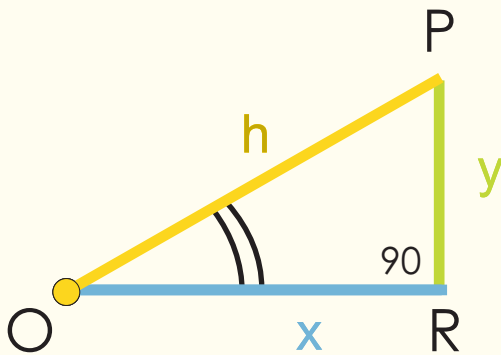
Similar Triangles: The **ratios** of corresponding sides of similar triangles are the same even though their respective lengths may be quite different.

Similar Triangles

Figures are said to be similar if they have the same shape but not necessarily the same size.

Corresponding Sides

Sides in two triangles are said to correspond if they are opposite equal angles.



— POR is similar to AOB

$$\frac{y}{h} = \frac{Y}{H}$$

$$\frac{x}{h} = \frac{X}{H}$$

$$\frac{y}{x} = \frac{Y}{X}$$

RATIOS in GEOMETRY

A ratio is a relative magnitude.

Geometric Ratios

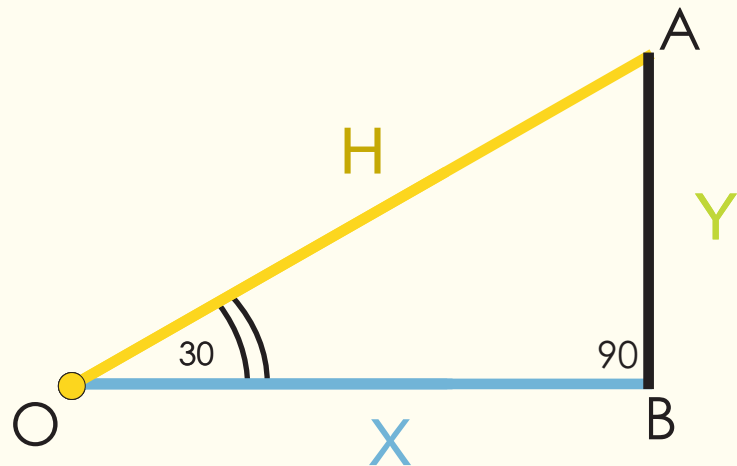
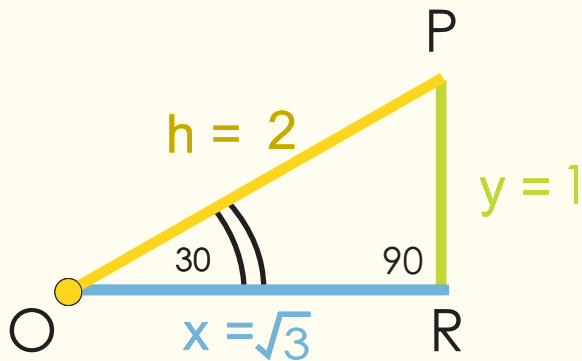
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Sides in two triangles are said to correspond if they are opposite equal angles.



— POR is similar to AOB

$$\frac{1}{2} = \frac{Y}{H}$$

$$\frac{\sqrt{3}}{2} = \frac{X}{H}$$

$$\frac{1}{\sqrt{3}} = \frac{Y}{X}$$

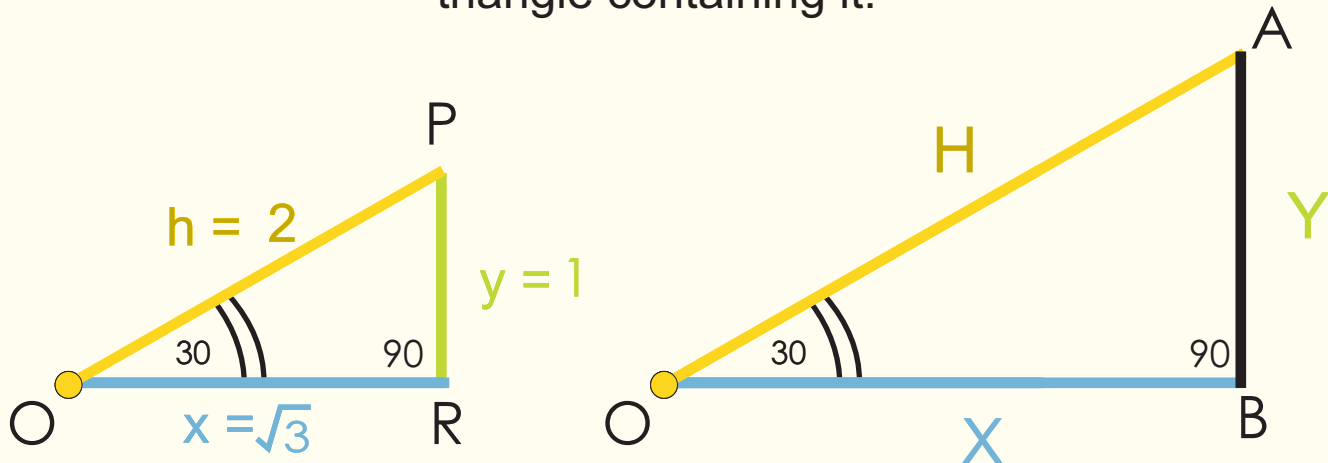
RATIOS in GEOMETRY

A ratio is a relative magnitude.

Geometric Ratios

Trigonometric Measure of Angles:

One way to measure an angle is by taking **ratios** of the lengths of the sides of a **right** triangle containing it.



— POR is similar to AOB

$$\frac{1}{2} = \frac{Y}{H}$$

$$\frac{\sqrt{3}}{2} = \frac{X}{H}$$

$$\frac{1}{\sqrt{3}} = \frac{Y}{X}$$

Because any 30° angle in a right triangle will have the lengths of corresponding sides always in the same ratio, this becomes a property of the angle itself. For this reason, the ancient Greek geometers used it as a defining measure of the angle.

RATIOS in GEOMETRY

A ratio is a relative magnitude.

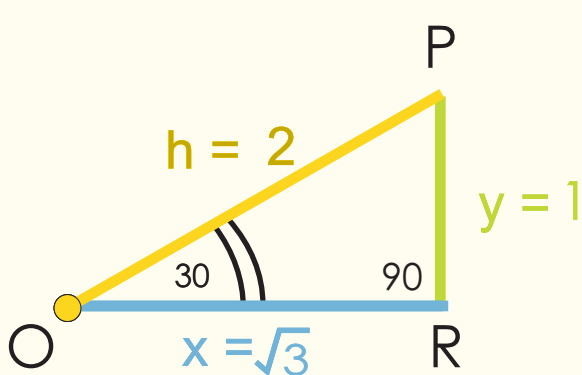
Geometric Ratios

Trigonometric Measure of Angles:

One way to measure an angle is by taking **ratios** of the lengths of the sides of a **right** triangle containing it.

Each one of these ratios gave a relative measure of any 30° degree angle. Taken together, they define it.

These measures were called trigonometric measures of the angle because they were derived from a triangle.



$$\frac{1}{2} = \frac{y}{h} \quad \text{called the sine of } 30^{\circ}.$$

$$\frac{\sqrt{3}}{2} = \frac{x}{h} \quad \text{called the cosine of } 30^{\circ}.$$

$$\frac{1}{\sqrt{3}} = \frac{y}{x} \quad \text{called the tangent of } 30^{\circ}.$$

These triangle ratio measures may be applied to any size of angle up to 90° .
Of course, the lengths of the sides will differ for each of the them.

Comparison by Division

Applications
of



RATIOS

in

Geology

RATIOS in GEOLOGY

A ratio is a relative magnitude.

Ratios in Geology

When we say that an earthquake has a magnitude of 7 on the Richter scale, we are talking about a relative magnitude or a **ratio** of amplitude measures.

FORMULA for the Richter magnitude scale

$$M_L = \log_{10} \left(\frac{A}{A_0} \right) = \log_{10} A - \log_{10} A_0$$

where:

A is the maximum amplitude in meters of the waves recorded by a Wood-Anderson seismometer reading 100 km from the epicentre of the earthquake in question;

A₀ is the normalized amplitude of a 'standard' earthquake taken to be 1.0×10^{-6} or $1 / 10^6$ or one millionth of a meter.

See the topic "Logarithms" for more on the definition, the properties, and the application of logarithms.

RATIOS in GEOLOGY

A ratio is a relative magnitude.

Ratios in Geology

When we say that an earthquake has a magnitude of 7 on the Richter scale, we are talking about a relative magnitude or a **ratio** of amplitude measures.

FORMULA for the Richter magnitude scale

$$M_L = \log_{10} \left(\frac{A}{A_0} \right) = \log_{10} A - \log_{10} A_0$$

If we look at the ratio by itself, $\frac{A}{A_0} = \frac{A}{(1/10^6)} = A \cdot 10^6$

it can turn out to be rather large. Therefore, the measure is uniformly 'squashed' so-to-speak by applying the common logarithm.

Note that any units of amplitude measure are cancelled out in the ratio of the two amplitudes.

RATIOS in GEOLOGY

A ratio is a relative magnitude.

Ratios in Geology

When we say that an earthquake has a magnitude of 7 on the Richter scale, we are talking about a relative magnitude or a **ratio** of amplitude measures.

FORMULA for the Richter magnitude scale

$$M_L = \log_{10} \left(\frac{A}{A_0} \right) = \log_{10} A - \log_{10} A_0$$

Once the logarithm is applied to the ratio $\frac{A}{A_0}$,

the earthquake magnitude comparison may be made both by the ratio (a process of division) and by an inequality (a process of subtraction) because of the properties of logs.

See the topic “Logarithms” for more on the definition, the properties, and the application of logarithms.

Comparison by Division

Applications
of



RATIOS

in

Sports

RATIOS in SPORTS

A ratio is a relative magnitude.

Ratios in Sports

Numerous ratios also drive decisions in the world of sports. If you have ever read the American Major League Baseball Statistics pages online, you cannot help but see batting and pitching ratios for players, teams, and leagues.

Here are some examples:

The Toronto Blue Jays, thus far during the 2009 season, have the highest **at bats per strikeout ratio** of the entire league. It is 6.1.

Mathematically, it would look like this:

$$\frac{\text{\# of at bats}}{\text{\# of strikeouts}} = \frac{6.1}{1} .$$

Interpretation

3. The ratio states that the team has **6.1** chances at bat for each strikeout they make.
4. The ratio states that the team has **$6.1/1 = 6.1$** as many chances at bat as strikeouts.

RATIOS in SPORTS

A ratio is a relative magnitude.

Ratios in Sports

The Kansas City Royals, on the other hand, have the highest **ground balls to fly balls ratio** of the entire league, thus far in 2009. It is 0.9.

The mathematical version of that statement is:

$$\frac{\text{\# of ground balls hit}}{\text{\# of fly balls hit}} = \frac{0.9}{1} = \frac{9}{10}$$

by multiplying both numerator
and denominator by 10

Interpretation

3. The ratio states that the team hits **9** ground balls for every **10** fly balls they hit.
4. The ratio states that the team hits **10/9 ~ 1.1** as many as fly balls as ground balls.

Comparison by Division

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of



RATIOS

in

Meteorology

RATIOS in CANADIAN WEATHER

A ratio is a relative magnitude.

Ratios in Temperature

In Canada, at least officially, we use both Celsius (a 'minor' revision of the Centigrade temperature scale) and Fahrenheit measures to broadcast our weather forecasts.

If you live here long enough, you will eventually realize that 30 degrees C is warm and that -30 degrees C is a tad 'cooler'.

Conversion Formulae:
from Celsius to Fahrenheit

$$F = \frac{9}{5} C + 32$$

from Fahrenheit to Celsius and

$$C = \frac{5}{9} (F - 32)$$

where **F** is the temperature in Fahrenheit degrees
and **C** is the temperature in Celsius degrees.

From the 'C' formula, we derive the definitive ratio for Canadian temperatures.

THE RATIO for Canadian Weather is $\frac{C}{(F - 32)} = \frac{5}{9} .$

RATIOS in CANADIAN WEATHER

It's all relative.

Ratios in Temperature

This is a ratio to remember!

THE RATIO for Canadian Weather is $\frac{C}{(F - 32)} = \frac{5}{9} \cdot$

Now you know that temperatures in Canada are all relative because they are related by a ratio and ratios measure relative magnitudes.

However, rather than expecting our meteorologists to spend precious time converting from one temperature measure to another so that everyone across all of Canada (the metric people and the Imperial ones) could understand the weather forecast, some brilliant Canadians (wishing to remain anonymous) decided to create an official conversion chart.

We think that it will give you a reasonably accurate top-down picture of how Canadians have come to understand their weather - at least, relatively speaking.

The 'Official' Canadian Temperature Conversion Chart

50° F (10° C)	Californians shiver uncontrollably. Canadians plant gardens.
35° F (1.6° C)	Certain European-made cars refuse to start. Canadians drive with their windows open.
0° F (-17.9° C)	New York City landlords finally turn on the heat. Canadians have the last cook-out of the season.
-60° F (-51° C)	Mount St. Helens freezes. Canadian girl guides sell cookies door-to-door.
-100° F (-73° C)	Santa Claus abandons the North Pole. Canadians pull down their ear flaps.
-173° F (-114° C)	Ethyl alcohol freezes. Canadians get a bit frustrated when the beer keg doesn't thaw.
-460° F (-273° C)	Absolute zero; all atomic motion stops. Canadians start saying "Whhh.. Pretty cold, eh?"
-500° F (-295° C)	Hell freezes over. YAHOO!! That blankety-blank Canadian hockey team has finally won the Stanley Cup.

Remember
every thing is relative
when it comes to



RATIOS

