

# Course Study Guide

## Units of Measure Used in Canada

Metric units			Other units		
<i>unit</i>	<i>measure of</i>	<i>symbol</i>	<i>unit</i>	<i>measure of</i>	<i>abbreviation or symbol</i>
ampere	electric current	A	acre	area	–
becquerel	radioactivity	Bq	degree Fahrenheit	temperature	°F
coulomb	electric charge	C	foot	length	ft. or ′
degree Celsius	temperature	°C	fluid ounce	volume or capacity	fl. oz.
hectare	area	ha	gallon	volume or capacity	gal.
hour	time	h	inch	length	in. or ″
joule	energy	J	mile	length	mi.
kilogram	mass	kg	parts per million by volume	gas concentration	ppmv
litre	volume or capacity	L	pint	volume or capacity	pt.
metre	length	m	pounds per square inch	pressure	psi
minute	time	min	quart	volume or capacity	qt.
newton	force	N	yard	length	yd.
ohm	electric resistance	Ω			
pascal	pressure	Pa			
second	time	s			
tonne	mass	t			
volt	electric potential	V			
watt	power	W			
watt hour	electrical energy	Wh			

## Conversion Factors

### Metric prefixes

<i>name</i>	<i>symbol</i>	<i>multiply by...</i>
micro-	μ	0.000 001
milli-	m	0.001
centi-	c	0.01
kilo-	k	1000
mega-	M	1 000 000
exa-	E	10 <sup>18</sup>

### Units of length

#### Metric conversions

1 cm = 10 mm	1 mm = 0.1 cm
1 m = 100 cm	1 cm = 0.01 m
1 km = 1000 m	1 m = 0.001 km

#### Imperial conversions

1 foot = 12 inches	
1 yard = 3 feet	1 yard = 36 inches
1 mile = 1760 yards	1 mile = 5280 feet

#### Imperial to metric

1 inch = 2.54 cm
1 foot = 30.48 cm
1 foot = 0.3048 m
1 mile = 1.6093 km

#### Metric to imperial

1 cm = 0.3937 inch
1 m = 39.37 inches
1 m = 3.2808 feet
1 km = 0.6214 mile

## Units of volume or capacity

### Metric conversions

1 mL = 1 cm <sup>3</sup>
1 L = 1000 cm <sup>3</sup>
1 m <sup>3</sup> = 1000 L

### Imperial conversions

1 gallon = 277.42 cubic inches
1 cubic foot = 6.2288 gallons

#### Imperial to metric

1 fluid ounce = 28.4131 mL
1 pint = 0.5683 L
1 quart = 1.1365 L
1 gallon = 4.5461 L
1 gallon = 4546.1 cm <sup>3</sup>
1 U.S. gallon = 3.785 L

#### Metric to imperial

1 mL = 0.0352 fluid ounce
1 L = 1.7598 pints
1 L = 0.8799 quart
1 L = 0.2200 gallon

## Other units

### Area

1 ha = 10 000 m <sup>2</sup>
1 acre = 43 560 square feet

### Mass

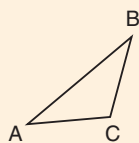
1 mg = 1000 μg	
1 kg = 1000 g	1 g = 0.001 kg
1 t = 1000 kg	

### Time

1 h = 60 min
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## Sum of the Angles in a Triangle

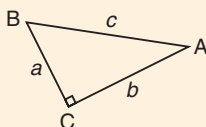
In any  $\triangle ABC$ :



$$\angle A + \angle B + \angle C = 180^\circ$$

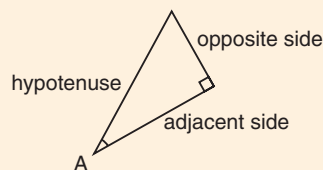
## Pythagorean Theorem

In right  $\triangle ABC$  with hypotenuse  $c$ :  
 $c^2 = a^2 + b^2$



## Primary Trigonometric Ratios

When  $\angle A$  is an acute angle in a right triangle:



$$\sin A = \frac{\text{length of side opposite } \angle A}{\text{length of hypotenuse}}$$

$$\cos A = \frac{\text{length of side adjacent to } \angle A}{\text{length of hypotenuse}}$$

$$\tan A = \frac{\text{length of side opposite } \angle A}{\text{length of side adjacent to } \angle A}$$

## Trigonometric Ratios of Supplementary Angles

For an acute angle,  $A$ , and its supplementary obtuse angle,  $(180^\circ - A)$ :

$$\sin A = \sin (180^\circ - A)$$

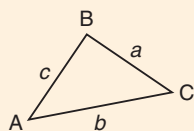
$$\cos A = -\cos (180^\circ - A)$$

$$\tan A = -\tan (180^\circ - A)$$

## Sine Law

In any  $\triangle ABC$ :

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$



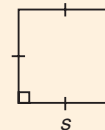
## Cosine Law

In any  $\triangle ABC$ :

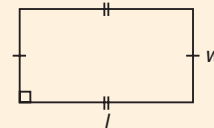
$$c^2 = a^2 + b^2 - 2ab \cos C$$

## Area and Perimeter (Circumference)

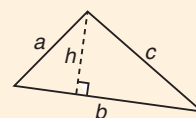
Square:  $A = s^2$   
 $P = 4s$



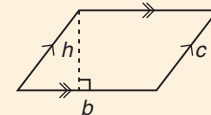
Rectangle:  $A = \ell w$   
 $P = 2\ell + 2w$



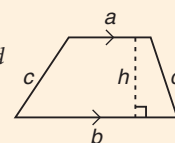
Triangle:  $A = \frac{1}{2}bh$   
 $P = a + b + c$



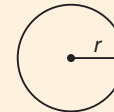
Parallelogram:  $A = bh$   
 $P = 2b + 2c$



Trapezoid:  $A = \frac{1}{2}(a + b)h$   
 $P = a + b + c + d$

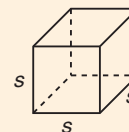


Circle:  $A = \pi r^2$   
 $C = 2\pi r$

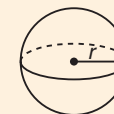


## Volume and Surface Area

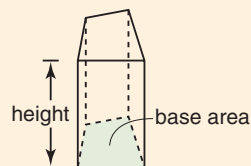
Cube:  $V = s^3$   
 $SA = 6s^2$



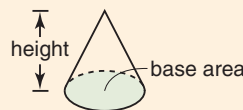
Sphere:  $V = \frac{4}{3}\pi r^3$



Prism or cylinder:  $V = \text{base area} \times \text{height}$



Pyramid or cone:  $V = \frac{1}{3} \times \text{base area} \times \text{height}$



## Statistical Measures

For a set of numbers:

$$\text{Mean: } \frac{\text{sum of values}}{\text{number of values}}$$

Median or second quartile: middle value or average of two middle values

Mode: most common value

Range: greatest value – least value

Lower quartile or first quartile: median of values less than second quartile

Upper quartile or third quartile: median of values greater than second quartile

Percentile: tells the approximate percent of numbers less than a given value

## Properties of Lines and Curves

$$\text{Slope of a line} = \frac{\text{rise}}{\text{run}}$$

$$\text{Average rate of change} = \frac{\text{Change in dependent variable}}{\text{Change in independent variable}}$$

## Equations

$$\text{Linear: } y = mx + b$$

$$\text{Quadratic: } y = ax^2 + bx + c$$

$$\text{Exponential: } y = ab^x$$

## Exponents

### Definitions

Positive integer exponents:

$$a^n = \frac{a \times a \times a \times \dots \times a}{n \text{ factors}}$$

Zero exponents:

$$a^0 = 1, a \neq 0$$

Negative exponents:

$$a^{-n} = \frac{1}{a^n}, a \neq 0$$

Rational exponents:

$$a^{\frac{1}{n}} = \sqrt[n]{a}, a > 0 \text{ if } n \text{ is even}$$

$$a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m = \sqrt[n]{a^m}, a > 0 \text{ if } n \text{ is even}$$

### Laws of Exponents

Multiplication law:

$$a^m \times a^n = a^{m+n}$$

Division law:

$$a^m \div a^n = a^{m-n}, a \neq 0$$

Power of a power law:

$$(a^m)^n = a^{mn}$$

## Common Payment Periods

Frequency	Meaning	Number of payments in one year
Annually	every year	1
Semi-annually	every 6 months	2
Quarterly	every 3 months	4
Bi-monthly	every 2 months	6
Monthly	every month	12
Semi-monthly	twice a month	24
Bi-weekly	every 2 weeks	26
Weekly	every week	52
Daily	every day	365

## Ordinary Simple Annuity

$$\text{Amount: } A = \frac{R[(1+i)^n - 1]}{i}$$

$$\text{Present value: } PV = \frac{R[1 - (1+i)^{-n}]}{i}$$

- $A$  is the amount in dollars
- $PV$  is the present value in dollars
- $R$  is the regular payment in dollars
- $i$  is the interest rate per compounding period as a decimal
- $n$  is the number of compounding periods

## Mortgages

In Canada, the interest rate on mortgages can be compounded at most semi-annually. However, mortgage payments are usually made monthly or bi-weekly.

Accelerated bi-weekly payment:

$$\frac{1}{2} \text{ of the monthly payment}$$

Accelerated weekly payment:

$$\frac{1}{4} \text{ of the monthly payment}$$

## TVM Solver

### Variables

N	Total number of payments
I%	Annual interest rate as a percent
PV	Principal or present value
PMT	Regular payment
FV	Amount or future value
P/Y	Number of payments per year
C/Y	Number of compounding periods per year
PMT:	Indicates whether payments are made at the beginning or end of the payment period

Use the  $\Sigma\text{Int}$  command to determine the total interest paid or earned.