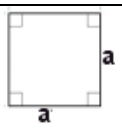
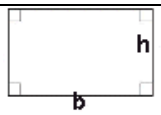
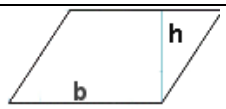
BA01 - Mathematics for Technicians
FORMULAS

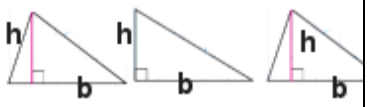
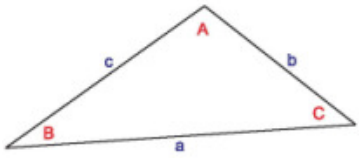
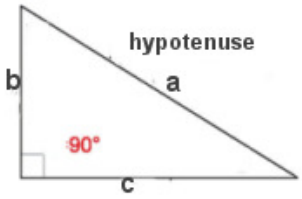
$a^2 = a \times a$
$\sqrt{a^2} = a$

1% = 0.01 = 1/100

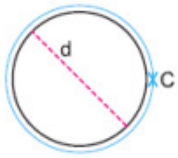
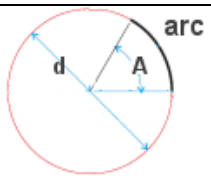
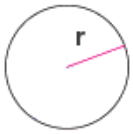
$\frac{a}{b} = \frac{c}{d} \Leftrightarrow a \times d = b \times c$

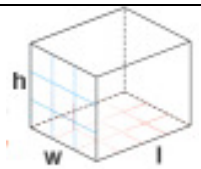
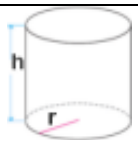
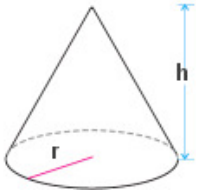
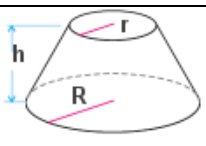
GEOMETRY

Area of a Square	a x a	
Area of a Rectangle	b x h	
Area of a Parallelogram	b x h	

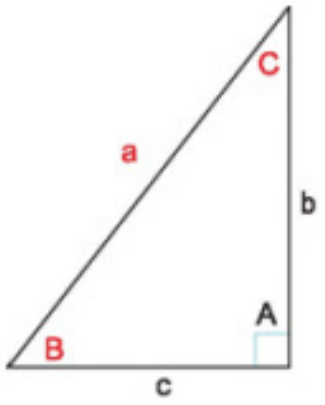
Area of a Triangle	$\frac{b \times h}{2}$	
Angles of a Triangle	A + B + C = 180º	
Pythagorean Theorem	$a^2 = b^2 + c^2$	

Pi = π ≈ 3.1416. ≈ 3.14

Circumference of a Circle	$2 \pi r$	
Arc Length	$\frac{\pi \times d \times A}{360}$	
Area of a Circle	πr^2 or $\frac{\pi d^2}{4}$	

Volume of a Cube	$w \times l \times h$	
Volume of a Cylinder	$\pi r^2 h$	
Volume of a Sphere	$\frac{4 \pi r^3}{3}$	
Volume of a Cone	$\frac{\pi r^2 \times h}{3}$	
Volume of a Conical Section (Frustum)	$\frac{\pi \times h \times (R^2 + [Rxr] + r^2)}{3}$	

TRIGONOMETRY

Sin = $\frac{\text{opposite side}}{\text{hypotenuse}}$	Sin B = $\frac{b}{a}$ Sin C = $\frac{c}{a}$	
Cos = $\frac{\text{adjacent side}}{\text{hypotenuse}}$	Cos B = $\frac{c}{a}$ Cos C = $\frac{b}{a}$	
Tan = $\frac{\text{opposite side}}{\text{adjacent side}}$	Tan B = $\frac{b}{c}$ Tan C = $\frac{c}{b}$	

PREFIXES IN THE METRIC SYSTEM

Prefix	Factor	Example	Description
giga	10^{9}	gigahertz	one billion hertz
mega	10^{6}	megaton	one million tons
kilo	10^{3}	kilometer	one thousand meters
hecto	10^{2}	hectometer	one hundred meters
deka	10^{1}	dekaliter	ten liters
deci	10^{-1}	decigram	one *tenth* of a gram
centi	10^{-2}	centimeter	one *hundredth* of a meter
milli	10^{-3}	milliliter	one *thousandth* of a liter
micro	10^{-6}	microgram	one *millionth* of a gram
nano	10^{-9}	nanosecond	one *billionth* of a second

CONVERSION FACTORS

DISTANCE, WEIGHT AND VOLUME CONVERSION FACTORS

Multiply	By	To get
inches	2.54	centimeters
centimeters	.3937	inches
feet	.3048	meters
meters	3.2808	feet
yards	.9144	meters
meters	1.0936	yards
miles	1.6094	kilometers
kilometers	.6214	miles
pounds	.4536	kilograms
kilograms	2.2046	pounds
quarts	.9463	liters
liters	1.0568	quarts

TEMPERATURE CONVERSIONS

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

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

$$\text{deg K} = \text{deg C} + 273.2$$

PRESSURE CONVERSIONS

Pressure (Pa) = Pressure (psi) x 6,895

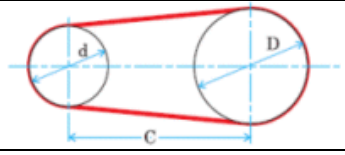
Pressure (psi) = Pressure (kiloPa) x 0.14503

$$\text{Pressure (bars)} = \frac{\text{Pressure (kiloPa)}}{100}$$

MECHANICS

BELT LENGTH

$$\text{Length} = L = (2 \times C) + 1.57 \times (D + d) + \frac{(D - d)^2}{4 \times C}$$



CHAIN LENGTH IN NUMBER OF LINKS

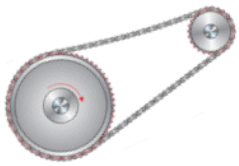
$$L = \frac{N + n}{2} + \frac{2C}{P} + \left(\frac{N - n}{2\pi}\right)^2 \left(\frac{P}{C}\right)$$

P = the pitch of the chain (inches or mm per link)

C = the distance between the centers of the drive and driven sprockets (in inches or mm)

N = number of teeth on the large sprocket

n = number of teeth on the small sprocket



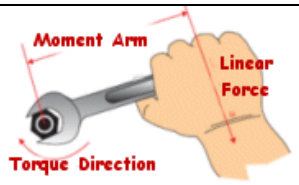
SHAFT SPEED

Driven Speed = Drive Diameter x Drive Speed (RPM) / Driven Diameter

Drive Speed = Driven Diameter x Driven Speed (RPM) / Drive Diameter

TORQUE

Torque = Moment Arm x Linear Force



SPEED AND ANGULAR VELOCITY

distance = speed x time

$$\text{Angular Velocity} = \frac{\text{Angle (in degrees, revolutions or radians)}}{\text{Time (in seconds or minutes)}}$$

1 revolution = 360degrees
= 2π radians

Number of revolutions = rpm x time (min)

$$\text{Linear speed (ft or m/s)} = \frac{\text{rpm} \times 2\ r\ \text{(ft or m)}}{60\ \text{(s/min)}}$$

DISTANCE, SPEED AND ACCELERATION

$$\text{speed}_{\text{final}} = \text{speed}_{\text{initial}} + \text{acceleration} \times t$$

$$t = \frac{\text{speed}_{\text{final}} - \text{speed}_{\text{initial}}}{\text{acceleration}}$$

$$\text{distance} = \text{speed}_{\text{average}} \times t$$

$$\text{speed}_{\text{average}} = \tfrac{1}{2} (\text{speed}_{\text{final}} + \text{speed}_{\text{initial}})$$

$$\text{distance} = \frac{\tfrac{1}{2} (\text{speed}_{\text{final}} - \text{speed}_{\text{initial}})^2}{\text{acceleration}}$$

$$\text{acceleration} = \frac{\tfrac{1}{2} (\text{speed}_{\text{final}} - \text{speed}_{\text{initial}})^2}{\text{distance}}$$

Gravity acceleration	G = 32 ft/sec = 9.8 m/sec

FORCE, WORK/ENERGY AND POWER

Force = Mass x Acceleration
Work = Force x Distance

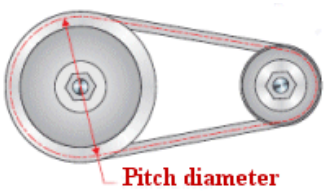
Energy = Work
Kinetic Energy = ½ Mass x Velocity^2
Power = Work /Time

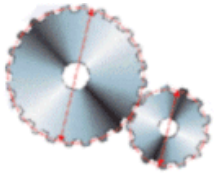
DRIVE RATIOS

$$\text{output speed} = \frac{\text{input speed X input pitch diameter}}{\text{output pitch diameter}}$$

$$\text{output torque} = \frac{\text{input torque X output pitch diameter}}{\text{input pitch diameter}}$$

output speed X output torque = input speed X input torque





OHM'S LAW

E = I x R	E is Electric potential (Volts) I is Current (Amperes) R is Resistance (Ohms)

HYDRAULICS

$F = P \times A$	F is total force due to pressure P is pressure A is area

$$\text{Pressure (Pa)} = \text{Pressure (psi)} \times 6{,}895$$

$$\text{Pressure (psi)} = \text{Pressure (kiloPa)} \times 0.14503$$

$$\text{Pressure (bars)} = \frac{\text{Pressure (kiloPa)}}{100}$$

$$\text{Head} = \frac{\text{Fluid density}}{\text{water density}} \times \text{Fluid height}$$