

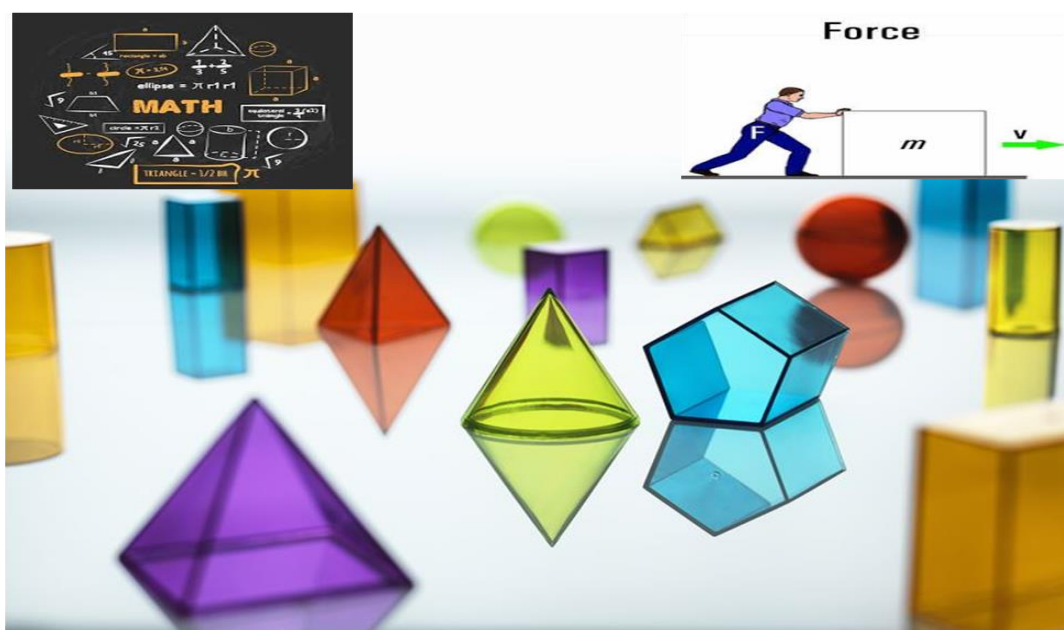


GOVERNMENT OF INDIA  
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP  
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

# WORKSHOP CALCULATION & SCIENCE

FOR CRAFTSMEN TRAINING SCHEME (CTS)



Designed in 2019

Developed By

**CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE**

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# WORKSHOP CALCULATION & SCIENCE – I

(Common for CTS Engineering trades during 1st year)

Sl. No.	Syllabus	Time in hrs.
<b>I.</b>	<b>Unit, Fractions</b>	<b>4</b>
1	Classification of Unit System	
2	Fundamental and Derived Units F.P.S, C.G.S, M.K.S and SI Units	
3	Measurement Units and Conversion	
4	Factors, HCF, LCM and Problems	
5	Fractions – Addition, Subtraction, Multiplication and Division	
6	Decimal Fractions - – Addition, Subtraction, Multiplication and Division	
8	Solving Problems by using calculator	
<b>II.</b>	<b>Square Root: Ratio and Proportions, Percentage</b>	<b>6</b>
1	Square and Square Root	
2	Simple problems using calculator	
3	Application of Pythagoras Theorem and related problems	
4	Ratio and Proportions	
5	Direct and Indirect proportion	
6	Percentage	
7	Changing percentage to decimal	
<b>III.</b>	<b>Material Science</b>	<b>8</b>
1	Types of metals	
2	Physical and Mechanical Properties of metals	
3	Types of ferrous and non-ferrous metals	
4	Introduction of iron and cast iron	
5	Difference between iron and steel, alloy steel and carbon steel	
6	Properties and uses of rubber, timber and insulating materials	
<b>IV.</b>	<b>Mass, Weight, Volume, and Density</b>	<b>4</b>
1	Mass, volume, density, weight & specific gravity	
2	Related problems for mass, volume, density, weight & specific gravity	
<b>V.</b>	<b>Speed and Velocity, Work Power and Energy</b>	<b>12</b>
1	Rest, motion, speed, velocity, difference between speed and velocity, acceleration and retardation	
2	Related problems on speed and velocity	
3	Potential energy, Kinetic Energy and related problems with related problems	
4	Work, power, energy, HP, IHP, BHP and efficiency	
<b>VI.</b>	<b>Heat &amp; Temperature and Pressure</b>	<b>12</b>

1	Concept of heat and temperature, effects of heat, difference between heat and temperature	
2	Scales of temperature, Celsius, Fahrenheit, Kelvin and Conversion between scales of temperature	
3	Temperature measuring instruments, types of thermometer, pyrometer and transmission of heat - Conduction, convection and radiation	
4	Co-efficient of linear expansion and related problems with assignments	
5	Problem of Heat loss and heat gain with assignments	
6	Thermal conductivity and insulators	
7	Boiling point and melting point of different metals and Nonmetals	
8	Concept of pressure and its units in different system	
<b>VII.</b>	<b>Basic Electricity</b>	<b>12</b>
1	Introduction and uses of electricity, molecule, atom, how electricity is produced, electric current AC, DC and their comparison, voltage, resistance and their units	
2	Conductor, Insulator, types of connections- Series and Parallel, Ohm's Law, relation between VIR & related problems	
3	Electrical power, energy and their units, calculation with assignments	
4	Magnetic induction, self and mutual inductance and EMF generation	
5	Electrical Power, HP, Energy and units of electrical energy	
<b>VIII.</b>	<b>Mensuration</b>	<b>10</b>
1	Area and perimeter of square, rectangle and parallelogram	
2	Area and Perimeter of Triangle	
3	Area and Perimeter of Circle, Semi-circle, circular ring, sector of circle, hexagon and ellipse	
4	Surface area and Volume of solids- cube, cuboids, cylinder, sphere and hollow cylinder	
5	Finding lateral surface area, total surface area and capacity in liters of hexagonal, conical and cylindrical shaped vessels	
<b>IX.</b>	<b>Levers and Simple Machines</b>	<b>6</b>
1	Simple machines, Effort and load, mechanical advantage, velocity ratio, efficiency of machine, relation between efficiency, velocity ratio and mechanical advantage	
2	Lever and its types	
<b>X.</b>	<b>Trigonometry</b>	<b>6</b>
1	Measurement of Angle, Trigonometrical Ratios, Trigonometric Table	
2	Trigonometry-Application in calculating height and distance (Simple Applications)	
<b>Total</b>		<b>80</b>

# WORKSHOP CALCULATION & SCIENCE – I

(Common for CTS Engineering trades during 2<sup>nd</sup>Year)

Sl. No.	Title of Syllabus	Time in hrs.
<b>I.</b>	<b>Friction</b>	<b>10</b>
1	Advantages and disadvantages, Laws of friction, co-efficient of friction, angle of friction, simple problems related to friction	
2	Friction – Lubrication	
3	Co-efficient of friction, application and effects of friction in workshop practice	
<b>II.</b>	<b>Centre of Gravity</b>	<b>6</b>
1	Centre of gravity and its practical application	
<b>III.</b>	<b>Area of cut – out regular surfaces and area of irregular surfaces</b>	<b>14</b>
1	Area of cut – out regular surfaces – circle, segment and sector of circle	
2	Related problems of area of cut – out regular surfaces – circle, segment and sector of circle	
3	Area of irregular surfaces and application related to shop problems	
<b>IV.</b>	<b>Algebra,</b>	<b>12</b>
1	Addition, Subtraction, Multiplication & Divisions	
2	Algebra – Theory of indices, Algebraic formula, related problems	
<b>V.</b>	<b>Elasticity</b>	<b>8</b>
1	Elastic, plastic materials, stress, strains and their units and young modulus	
2	Ultimate stress and working stress	
<b>VI.</b>	<b>Heat Treatment</b>	<b>8</b>
1	Heat treatment and advantages	
2.	Different heat treatment process – Hardening, Tempering, Annealing, Normalising, Case Hardening	
<b>VII.</b>	<b>Profit and Loss</b>	<b>12</b>
1	Simple problems on profit & loss	
2	Simple and compound interest	
<b>VIII.</b>	<b>Estimation and Costing</b>	<b>10</b>
1	Simple estimation of the requirement of material etc., as applicable to the trade	
2	Problems on estimation and costing	
<b>Total</b>		<b>80</b>