Model Curriculum

11. Tool and Die Maker

SECTOR:	**CAPITAL GOODS**
SUB-SECTOR:	**MACHINE TOOLS, DIES, MOULDS AND PRESS TOOLS, PLASTICS MANUFACTURING MACHINERY, TEXTILE MANUFACTURING MACHINERY, PROCESS PLANT MACHINERY, ELECTRICAL AND POWER MACHINERY, LIGHT ENGINEERING GOODS**
OCCUPATION:	**FITTING AND ASSEMBLY**
REF ID:	**CSC/Q0306, V1.0**
NSQF LEVEL:	**5**

Skill India
कौशल भारत-कुशल भारत

CGSC
CAPITAL GOODS SKILL COUNCIL

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

CAPITAL GOODS SKILL COUNCIL

for the

MODEL CURRICULAM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: **'Tool and Die Maker'** QP No. **'CSC/ Q0306 NSQF Level 5'**

Date of Issuance: July 12th,2016

Valid up to : Aug 30th,2016

*Valid up to the next review date of the Qualification Pack or the 'Valid up to' date mentioned above (whichever is earlier)

Authorised Signatory
(Capital Goods Skills Council)

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Tool and Die Maker

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Tool and Die maker", in the "Capital Goods" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**MIG/MAG/GMAW Welder**		
Qualification Pack Name & Reference ID. ID	CSC/Q0306, v1.0		
Version No.	1.0	**Version Update Date**	11/8/2016
Pre-requisites to Training	10th Standard pass Minimum 1 year apprenticeship		
Training Outcomes	**After completing this programme, participants will be able to:** • **Plan and coordinate the making of tool and die:** Interpret engineering drawing to understand sequence of operations, material requirement and also prepares a detailed scheduling of the manufacturing process • **Perform fitting operation:** Perform fitting operations as per the instruction sheet/job using hand tools and manually operated machines. The fitting operation may include filing, drilling, chiselling, thread cutting, lapping etc. • **Grind surface using hand and/or handheld power tool:** Grind surface using hand and/or handheld power tools on ferrous and non-ferrous materials and components. • **Operate conventional milling machine**: Perform milling operations on various materials and produce various features using Vertical or Horizontal milling machine. • **Operate conventional turning machine**: Perform turning operation to produce various features using canter or turret lathe. • **Perform assembly operation**: Perform drilling, tapping, reaming, and assembly operations using various machine tools and assembly components. • **Basic health and safety practices at workplace**: identify job site hazards at the work place and apply good housekeeping practices, use required Personal Protective Equipment • **Work effectively with others:** effectively communicate with others and demonstrate good ethical practices and discipline		

This course encompasses 9 out of 9 National Occupational Standards (NOS) of "Tool and Die Maker" Qualification Pack issued by "Capital Goods Skill Council".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction** **Theory Duration** (hh:mm) 02:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** Bridge Module	• State the various opportunities available in tool and die making sector • List the roles and responsibilities of a tool and die make	Training Kit (PowerPoint, Trainer Guide)
2	**Plan and coordinate the making of tool and die** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 60:00 **Corresponding NOS Code** CSC/N0307	• Explain the importance of safe working practices • adhere to safe working practices • list hazards associated with power tools and machine tools • Plan corrective actions to avoid hazards at the work place • Interpret CGS, MKS ,FPS and SI systems of measurement • Convert units from one system of measurement to another • Explain the need for projection • Identify types of projection accurately • Explain 'First angle' and 'Third angle' projections • Interpret engineering drawings with respect to design , sequence of machining activities (dimensions, limits, tolerances, surface texture and operations) • Interpret Geometrical Dimensioning and Tolerancing (GD&T) symbols used in Engineering drawing • Interpret job instruction sheets and job cards • Compare properties of carbon steels, stainless steel, cast iron, tool steel, bronze and alloys, copper and copper alloys • Explain mechanical properties of materials such as plasticity, ductility, malleability, toughness, hardness, tensile strength, compressive strength, shear strength, corrosive resistance etc. • List various types of heat treatment processes • Explain heat treatment process	Training kit (Trainer guide, PowerPoint) Personal Protective Equipment Drawing sheets/instruction sheets, micrometer screw gauge, vernier calliper, surface finish equipment, rules, squares, protractors, bore/hole gauges, slip gauges, radius/profile gauges, thread gauge, height gauge, hardness tester, dial test indicator, surface roughness tester, CMM, profile projector, taps and die set

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Explain cutting, forming, grinding, drilling, threading, reaming, polishing , boring operations • List measuring and marking tools used for fitting operation – micrometer screw gauge, vernier calliper, surface finish equipment, rules, squares, protractors, bore/hole gauges, slip gauges, radius/profile gauges, thread gauge, height gauge, hardness tester, dial test indicator, surface roughness tester, CMM, profile projector etc. • Identify hand tools and power tools used in fitting operation • Explain cutting operation using hacksaw and band saw • Explain tapping and dieing operation • Identify various types of taps and dies • Interpret tap and die specification • Classify files based on the cross section and type of cut • Perform filing operation on flat, square and curved surfaces • Identify parts of drilling machine • Name main parts of a drill and reamer • Interpret specifications of a drill bit and reamer • Explain functions of various machine tools such as Lathe machine, Grinding machine, Sawing machine and drilling machine • List various types of work holding devices used in machine tools • Explain the effect of feed, speed and depth of cut during the cutting operation • Gather all requirements from the blue print in terms of machines, materials, sequence of operations, tolerance limit tools etc. • Prepare a project plan indicating resources required for each activity, responsibility and time lines • Educate machine operators on the machining activity • Perform in process inspection of the tool elements and final assembly • Own job role and responsibilities and sources of information pertaining to employment terms, entitlements, job role and responsibilities • Name relevant authorities in the system for grievance resolution • Follow escalation matrix and reporting	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		structure and employment related issues • Perform documentation as required by the organization • Communicate effectively with supervisors and subordinates • Perform numerical operations / geometrical calculations • Perform basic operations on a computer • Use ERP software and other software specific to quality function • Demonstrate problem solving abilities • Work in a team in order to achieve better result	
3	**Perform fitting operations on metal components for making tools and die using hand tools and manually operated machines** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 60:00 **Corresponding NOS Code** CSC/N0308	• Identify hazards in the fitting area and list measures to eliminate hazards • Identify PPE (Personal Protective Equipment) required for fitting operation • Wear suggested PPE's correctly • Explain various types of fits and tolerances • Compare 'Clearance fit', 'Transition fit' and 'Interference fit' • List various types of Clearance fit, Transition fit and Interference fit • Classify hand tools as holding tools, hitting tools, pulling tools, cutting tools, marking tools and turning tools • Interpret specifications of various tools used in the fitting operation • Explain 'Care and maintenance' of hand tools • Identify various forms of metal components – square/bar, circular/cylindrical, sections (angles, channels, tee section, joists, extrusions), irregular shapes / profiles (casting, forging and odd shaped components) • Explain the function of positioning and work holding devices – belts, braces, clamps, jigs& fixture, bolt straps, blocks &tables, manual lifts, ropes and jacks • Explain various fitting operations like filing, drilling, chiselling, threading, lapping etc. • List fitting sequence based on application • Establish quality parameters from the engineering drawing • Prepare work area for the fitting operation as per the standard operating procedure • Remove any foreign particles from the work piece • Identify suitable marking method such as	Training kit (Trainer guide, PowerPoint) Personal Protective Equipment Micrometer screw gauge, vernier calliper, steel rule, squares, protractor, depth micrometer, vernier height gauge, feeler gauge, bore gauge, slip gauge, radius /profile gauge, thread gauge, hardness tester, dial indicator, profile projector, co ordinate measuring machine (CMM) bench vice, U clamp, C clamp, machine vice, tool makers vice, 3 jaw chuck, 4 jaw chuck, collet chuck, magnetic chuck, drive plate, vee block, ball peen hammer, cross peen hammer, straight peen hammer, various types of files, surface plate, scriber, divider, trammel, jenny calliper, prick punch, center punch, taps and dies, reamers, drill chuck, torque

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		direct marking using instruments, use of templates or transfer method • Select suitable marking tools as per the job requirement • Perform marking on the work piece which may include – datum, lines (parallel / perpendicular), circles, profiles (square/rectangular, radial, angular), hole positions (radial and linear) • Perform fitting operations on various forms metal components using a range of hand tools and manually operated machines – square/rectangular (bar stock, sheet material, machined components),circular/cylindrical (bar stock, tubes, turned components, flat discs), sections (angles, channel, tee section, joists, extrusion),irregular shapes /profiles (casting, forging, odd shaped components) • Operate drilling machine, punching machine and threading machine • Check for quality standards -: components to be free from damage, false tool cuts, burrs, scratches and non-specified sharp edges; general dimensional ,tolerance +/- 0.020mm; flatness and squareness 0.05mm; angles within +/- 0.5 degree; screw threads to fit as per standard; reamed and bored holes within interference: - 0.025mm (hole) + 0.025mm (shaft), transition: - 0.1mm (hole) + 0.1 (shaft) , clearance: 50microns; radius: 0.5 r	wrenches, portable drilling and grinding machine
4	**Grind Surface using hand and /or hand held power tools** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 70:00 **Corresponding NOS Code** CSC/N0302	• Identify work place hazards and list measures to be taken to eliminate hazards • Follow safe working practices • Identify PPE (Personal Protective Equipment) required for grinding operation • Wear suggested PPE's correctly • List various grinding methods and techniques • List functions of a grinding wheel • Explain construction of a grinding wheel • List types of abrasives used in a grinding wheel • Explain various types of bonding techniques used in a grinding wheel to hold abrasive particles together • Identify grade of a grinding wheel depending on the application	Training kit (Trainer guide, PowerPoint) Personal Protective Equipment Various types of grinding wheels, surface finish measuring instrument, marking tools, pedestal grinding machine

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Explain grinding wheel specification • Identify various types of manually operated grinders – angle grinders, bench grinder, straight grinder, rotary die grinder, disc grinder, electronic grinder, electric/ pneumatic or hydraulic grinder, pedestal grinder, cylindrical grinder • Identify job requirement from valid and approved sources • Interpret surface finish specifications accurately • Select suitable grinding wheel based on the material to be grounded • Explain the method to check surface finish using surface roughness measurement instruments • Carryout marking operation on the work piece as per the instruction sheet • Setup , check and adjust grinding machine • Carryout grinding operation using tools or handheld power tools as per standard operating procedure • Check surface finish using surface using appropriate equipment • Perform wheel dressing using a diamond cutter • Perform routine maintenance of pedestal grinding machine • Fill job cards, progress card and incident reports	
5	**Operate conventional milling machine** **Theory Duration** (hh:mm) 30:00 **Practical Duration** (hh:mm) 60:00 **Corresponding NOS Code** CSC/N0108	• Identify work place hazards and list measures to be taken to eliminate hazards • Follow safe working practices • Identify PPE (Personal Protective Equipment) required for milling operation • Wear suggested PPE's correctly • Explain the purpose of milling • Identify types and parts of a milling machine – Knee type milling machine, universal horizontal milling machine, Ram type milling machine, Universal ram type milling machine, universal • Classify milling machines – Horizontal milling machine and vertical milling machine • Identify accessories of milling machine – saddle, compound slide, tailstock, profile attachments, fixed and live stays • Identify accessories of milling machine – saddle, compound slide, tailstock, profile	Training kit (Trainer guide, PowerPoint) Personal Protective Equipment Vertical / Horizontal milling machine, cutting tools, work holding devices, tri square, protractor, vernier calliper, height gauge, go-no – go gauge

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		attachments, fixed and live stays • Explain various milling operations – milling of flat surfaces, gang and straddle milling, milling of sunk and recessed surfaces, face milling, side milling, angular milling, slotting, slitting, key way cutting, face slot cutting, woodruff cutting, dovetail cutting etc., • List the process of milling- up milling, down milling, face milling, end milling • Explain the cutting tool nomenclature, tool material, cutting parameters, chip breaker geometry • Identify different types of cutters used in horizontal and vertical milling machine • Select proper coolant to dissipate heat generated during cutting operation • List work holding devices like – chuck, work holding devices- clamp, vice- block, angle plate etc., • State the method to clamp the work piece in the chuck to avoid distortion during the cutting operation • Establish relationship between metal cutting results, tool nose radius, speed and feed rate • Examine that machine guards are in place. Unguarded machines are unsafe to use • Seek guidance from the machine setter regarding readiness of the machine for operation • Check the components for false tool cuts, burrs, and sharp edges • Operate the machine controls in both hand and power modes • Identify the location of emergency switch to stop the machine in case of emergency • Select right kind of fluid based on the material to be milled • Sequence operations referring to job sheets or drawings • Clamp the work piece securely in a chuck/work holding devices such as vice, V- Block, clamp, angle plate etc., • Perform milling on various materials like steel/ stainless steel, aluminium/aluminium alloys, copper/copper alloys, cast iron and plastic • Perform milling on flat surfaces, gang and saddle milling, milling of sunk and recessed surfaces, face milling, side milling, angular milling, slotting, key way	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		cutting, face slot cutting, woodruff cutting dovetail cutting etc., to an accuracy of 0.020 to 0.030 mm in flatness and squareness within 0.125 mm,surface finish of 63 micro inch and angle within +/- 1 degree • Follow the work schedule to meet production targets • Carryout quality checking using tri square, protractor, vernier calliper, micrometer, height gauge, go-no go gauge for dimensions, squareness, hole size/fit, angles, flatness, surface finish, slots and recesses • Apply correct safe disposal method • Clean the machine using the brush after the work is complete • Carryout documentation as per the standard operating procedure	
6	**Operate conventional turning machines** **Theory Duration** (hh:mm) 30:00 **Practical Duration** (hh:mm) 60:00 **Corresponding NOS Code** CSC/N0110	• Identify work place hazards and list measures to be taken to eliminate hazards • Follow safe working practices • Identify PPE (Personal Protective Equipment) required for turning operation • Wear suggested PPE's correctly • Explain the meaning and purpose of turning • List various types of lathes • Compare Speed lathe, Engine lathe, Tool room lathe, and Turret lathe • Identify main parts of a tool room lathe • List main functions of a tool room lathe • List various operations performed by a lathe • Explain the following operations o Straight turning o Shoulder turning o Taper turning o Chamfering o Eccentric turning o Facing o Grooving o Knurling o Undercutting o Parting- off o Internal thread cutting o Drilling o Reaming o Boring o Counter boring o Taper boring	Training kit (Trainer guide, PowerPoint) Personal Protective Equipment , center/turret lathe, single point cutting tools, steel rule, dial test indicator, depth vernier calliper, slip gauge, bore gauge, thread gauge, plug gauge, ring gauge, protractor, work holding devices

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		○ Tapping • Classify tools as single point cutting tool, two point cutting tool, and multipoint cutting tool • Name applications of single point, two point and multi point cutting tool • Interpret single point cutting tool nomenclature • Use measuring instruments such as external micrometer, vernier calliper, dial test indicator, surface finish equipment, steel rules, micrometers (internal/external),depth vernier calliper, slip gauge, bore gauge, thread gauges, plug gauge, ring gauge, protractors etc. • List tools and equipment used for quality checking • Explain the relationship between 'Feed', 'Speed' and 'Depth of cut' • Explain the impact of backlash in machine slides and method to eliminate back lash • List work holding devices required for various operations • Identify safety features provided in a machine tool • List the uses of cutting fluids • Select a proper cutting fluid for steel/stainless steel, aluminium /aluminium alloys, copper and copper alloys • Analyze impact of depth of cut on chatter and surface finish • Extract information from engineering drawing relating to specifications and standards • Explain critical parameters like parallelism, surface finish, concentricity, ovality, thread fit, straightness and squareness • Check the quality of the incoming material to meet specifications of the end product ○ Free from false tool cuts ○ Free from burrs and sharp edge edges ○ General dimensional tolerance within +/- 0.05 mm ○ Specific dimensional tolerance within +/- 0.1mm ○ Surface finish 1.6 micrometer ○ Reamed holes within H7 ○ Screw threads medium fit ○ Angles within +/- 0.5 degree	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Mount work piece using chucks, face plate or an angle plate based on the operation to be performed • Locate the position of 'Emergency' button • Choose right cutting tool based on the application • Set and adjust machine tool speeds and feeds to achieve the component specification • Perform turning operations to produce flat faces, diameters (parallel, stepped and eccentric), holes (drilled, reamed and bored), chamfers, grooves/undercuts, profile forms, threads (Internal/external), parting off, knurling and special finishes	

7	**Operating grinding machines**
	
	Theory Duration
	(hh:mm)
	10:00
	
	Practical Duration
	(hh:mm)
	50:00
	
	Corresponding NOS Code
	CSC/N0109
		• Identify work place hazards and list measures to be taken to eliminate hazards
		• Follow safe working practices
		• Identify PPE (Personal Protective Equipment) required for grinding operation
		• Wear suggested PPE's correctly
		• Check that all the measuring instruments are calibrated
		• Identify various types of materials which may include low carbon/ mild steel, cast iron, plastic/ nylon/ composite, high carbon steel, brass/brass alloys, aluminium/aluminium alloys and other specific materials
		• Mount the work piece safely and securely
		• Set and adjust machine tool speeds and feeds
		• Prepare grinding wheels through various methods
		  ○ Dressing and 'Trueing up'
		  ○ Wheel forming
		  ○ Relieving the wheel sides
		• Carryout grinding operation on various features
		  ○ Faces (Flat, parallel, vertical, angular)
		  ○ Steps and shoulders
		  ○ Bores (Counter bores, tapered, parallel
		  ○ Slots
		  ○ Faces square to each other
		  ○ Diameter (Parallel, stepped ,tapered)
		  ○ Profile forms
		• Check the quality of output using appropriate measuring equipment
			Training kit (Trainer guide, PowerPoint)
			Personal Protective Equipment
			Bench grinding machine, measuring instruments

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		○ Free from false grinding cuts, wheel marks, burrs and sharp edges ○ General dimensional tolerances as per the job sheet ○ Squareness and flatness as applicable ○ Surface texture as per requirement	
8	**Perform assembly operations on metal components to make tool and dies** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 40:00 **Corresponding NOS Code** CSC/N0204	• Identify work place hazards and list measures to be taken to eliminate hazards • Follow safe working practices • Identify PPE (Personal Protective Equipment) required for grinding operation • Wear suggested PPE's correctly • Interpret CGS, MKS ,FPS and SI systems of measurement • Interpret engineering drawings with respect to design , sequence of machining activities (dimensions, limits, tolerances, surface texture and operations) • Interpret Geometrical Dimensioning and Tolerancing (GD&T) symbols used in Engineering drawing • Interpret job instruction sheets and job cards • Establish job requirements from the job specification document accurately • Compare various types of joints • Select right assembly method such as cutting using saws, cutting a screw thread, filing, drilling holes and tapping • List various mechanical fastening devices • Choose right kind of work holding device – bench vice, machine vice, chuck, collet, and clamps • Carryout marking operation to include features such as datum lines, cutting lines, square and rectangular profiles, circular and radial profiles, angles, holes linearly positioned, boxed and on pitch radius • Select a right method to mount and secure cutting tools • Identify production tools such as jigs, fixtures, dies, moulds etc. • Select cutting feeds, speeds and depth of cut as per the job instruction sheet • Select measuring tools based on tolerances required and application • Obtain appropriate tools and equipment for the general machining, fitting or	Training kit (Trainer guide, PowerPoint) Personal Protective Equipment , Surface plate, scriber, divider, trammel, jenny calliper, prick punch, center punch, vee – block, try square, steel rule, marking tools, hacksaw blade with frame, various types of files, work holding devices, taps and dies, bench mounted drilling machine. taps, drill bits, soldering gun, brazing equipment, work piece securing devices, autocollimator and reflector, roundness measuring machine, micrometer screw gauge, vernier calliper, steel rule, squares, protractor, depth micrometer, vernier height gauge, feeler gauge, bore gauge, slip gauge, radius /profile gauge, thread gauge, hardness tester, dial indicator, profile projector, coordinate measuring machine (CMM)

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		assembly operation and parts used in producing assemblies **Parts** o Assembly structure o Shafts o Lever/linkages o Springs o Fabricated components o Chains o Keys o Belts o Bearing o Couplings o Pulleys o Gaskets o Seals o Sprockets o Gears o Bushes o Cams and followers **Heavy Equipment** o Rollers and skates o Crowbar o Pull lifts o Lubricated plates **Assembling Accessories** o Hooks o Slings o Eyebolts o Shackles o Chains o Rings o Trolleys **Machine Tools** o Lathe (Centre and turret) o Milling machine o Drilling machine o Grinding machine o ECM – Electro Chemical Machining o Laser machining o Welding machine o Polishing machine • Perform drilling, tapping and reaming operations • Produce mechanical assemblies o Assembling of components having interference fit o Securing components using threaded fasteners o Securing components using	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		spring clips ○ Securing components using rivets ○ Applying sealing compound or adhesives ○ Setting and adjusting components to give correct working parameters ○ Torque setting of nuts and bolts • Dismantle mechanical assemblies without damage to components or subassemblies • Carryout dimensional checking using appropriate measuring instruments • Check for quality standards ○ Components to be free from false tool cuts, burrs and sharp edges ○ Dimensional tolerance +/- 0.020mm; flatness and squareness 0.05mm ○ Angles within +/- 1 degree ○ Screw threads to fit as per standard ○ Reamed and bored holes within interference :-0.25 mm (hole), +0.25 mm (shaft), transition -0.1 mm (hole), clearance- 50 microns, surface finish 1.6 micrometer	
9	**Health and safety** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 08:00 **Corresponding NOS Code** CSC/ N 1335	• Explain the importance of PPE required for welding operation • State the causes of accidents • Identify job site hazardous work and state possible causes of risk or accident at the workplace • Keep the work area clean and tidy. Ensure that the work area is free from hazards • Check that the tools and equipment are in good working condition • State the importance '5S' at workplace	Training kit (Trainer guide, PowerPoint) Leather gloves; leather apron; welding screen – helmet types; hand screen welding and, safety shoes
10	**Fire safety** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS**	• Explain the types of fires - Class A, B, C and D • Select appropriate fire extinguisher to control the fire • Use the PASS method to operate a fire extinguisher • Follow fire safety signs and safe evacuation method in case of a fire • Identify the location of assembly point, fire exit, and fire alarm • Follow proper reporting procedure in case	Training kit (Trainer guide, PowerPoint) Class A, B, C, D and K fire extinguishers

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Code CSC/ N 1335	of a fire	
11	**Emergencies, rescue and first aid procedure** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** CSC/ N 1335	• Follow electrical safety procedures • Explain the method to rescue a person from electrocution • State the importance of first aid • Identify the contents of a first aid kit and their application • Administer first aid in case of bleeding, burns, choking, electrical shock, poisoning etc. • Use CPR process • Bandage wounds • State the stages of crisis and crisis management • Prepare an incident report	Training kit (Trainer guide, PowerPoint) First aid kit with all contents
12	**Work effectively with others** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 60:00 **Corresponding NOS Code** CSC/N 1336	• Explain the importance of team work and team dynamics • State 4Cs of working in a team • Maintain effective working relationship within own working group, line management and outside of the group • State types of communication • Apply effective communication technique • Overcome barriers to effective communication • Demonstrate active listening skills	Training kit (Trainer guide, PowerPoint)
13	**Final Assessment** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 06:00 **Corresponding NOS Code**	• To test skills and knowledge	
	Total Duration **Theory Duration** **186:00** **Practical Duration**	**Machine Tools:** Vertical/ Horizontal milling machine, center/turret lathe, handheld grinding machine, soldering gun, brazing equipment, taps and dies, drill bits, reamers, milling tool, single point cutting tools, power hacksaw	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	534:00	**Measuring Tools:** Micrometer screw gauge, vernier calliper, surface finish equipment, rules, squares, protractors, bore/hole gauges, slip gauges, radius/profile gauges, thread gauge, height gauge, hardness tester, dial test indicator, surface roughness tester, CMM, profile projector, vernier height gauge, feeler gauge, bore gauge, slip gauge, radius /profile gauge, thread gauge, hardness tester **Marking Tools:** Surface plate, scriber, divider, trammel, jenny calliper, prick punch, center punch, vee – block, try square, steel rule **Work holding Devices:** C clamp, machine vice, tool makers vice, 3 jaw chuck, 4 jaw chuck, collet chuck, magnetic chuck, drive plate, vee block **General Tools** Surface plate - standard size; scriber - 15 cm; dividers - 20 cm; calliper outside 15 cm; prick punch; chisel cold flat - 19 mm; centre punch – 9 mm x 127 mm; rule 60 cm; two fold; brass tooped to read inches and mm; hammer scaling 0.25 kg with handle; steel rule - 30 cm to read inch and millimetre; vernier calliper - digital - 0-150 mm; ball peen hammer with handle - 0.25 kg; cross peen hammer with handle - 0.25 kg; holding tongs - 30 cm; wire brush – 15 cm x 3.7 cm; double ended spanner - 6 mm to 15 mm; hacksaw frame with blade - adjustable 30 cm; hammer sledge double faced – 3 kg; bench vice - 10 cm jaw, file - half round; flat; bastard; file half round bastard - 30 cm; file flat rough - 35 cm; number punch; letter punch - 6 mm; clamps – 10 cm, 15 cm, 20 cm, 30 cm; pipe wrench 25 cm, 35 cm and tinman's square – 60 cm x 30 cm,	

Grand Total Course Duration: **720 Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **Capital Goods Skill Council)***

Trainer Prerequisites for Job role: "Tool and Die Maker" mapped to Qualification Pack: "CSC/Q0306 v1.0"

Sr. No.	Area	Details
1	**Description**	It involves identifying the various operations required to make the tool or die and further sequence the same. Organise for these operations to be performed either by self or others. Must have a complete understanding of all the processes and operations required for tool and die making
2	**Personal Attributes**	Basic communication, numerical and computational abilities. Openness to learning, ability to plan and organize own work and identify and solve problems in the course of working. Understanding the need to take initiative and manage self and work to improve efficiency and effectiveness.
3	**Minimum Educational Qualifications**	Diploma /Degree in Mechanical Engineering
4a	**Domain Certification**	Certified for Job Role: "Tool and Die Maker" mapped to QP: "CSC/Q0306, v1.0". Minimum accepted score is 80%
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted 70 % as per respective SSC guidelines is 70%.
5	**Experience**	• 3-4 years of industry experience in the relevant field • 3-4 years of teaching experience

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Tool and Die Maker
Qualification Pack	CSC/Q0306, v1.0
Sector Skill Council	Capital Goods Skill Council

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training canter based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 60% in aggregate and 40% in each NOS
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
1.CSC/ N 0307 : Plan and co-ordinate the making of tools and die	PC1.adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations	**100**	4	1	3
	PC2.ensure that all hand tools and equipment used are in a safe and useable condition		2	1	1
	PC3.ensure that all machine tools are correctly guarded at all times		2	0	2
	PC4.obtain sample parts/ blueprints/ drawings of tools/ dies and other engineering information as per company procedures		4	1	3
	PC5.ensure that all machines and machine tools are secured at all times		5	2	3
	PC6.plan sequence of operations for tools & dies making		5	2	3
	PC7. report and rectify cases of inappropriate information in design documents as per organizational procedures		2	0	2
	PC8.compute dimensions, sizes, shapes and tolerances of sub-assemblies of the tools and dies as per specifications and as per company procedures		5	2	3
	PC9. determine information such as number of parts to make, engineered components and material to be used, and machines to be used		5	2	3
	PC10.identify the operations that will be required for tools & dies making based on design and blueprints		5	2	3
	PC11.identify the operations that will be required for tools & dies making based on design requirements		5	2	3
	PC12.identify type of equipment required for tools & dies making based on the operations selected		5	2	3
	PC13.estimate timelines for each task accurately		2	0	2
	PC14.establish milestones by determining a schedule of operations		3	0	3
	PC15.obtain necessary approvals for the plan		3	0	3
	PC16.allocate responsibilities to machine operators as per the operations selected		3	0	3
	PC17.ensure that the machine operators are clear about the sequence of activities, priorities and considerations		3	0	3
	PC19.release drawings and machining specifications to machine operators		4	1	3
	PC20.identify and select tools for tools & dies making based on design and blueprints		5	2	3
	PC21.identify and select lifting and rigging equipment based on design and blueprints		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC22.select and procure appropriate metals to be used for tools & dies making as per design requirement		5	2	3
	PC23.hand over tools, equipment and metal components to be machined to the machine operators		2	0	2
	PC24.handle all clarifications sought by the operators		4	2	2
	PC25. collect job from all operators		2	0	2
	PC26. check the jobs as per drawing/instruction		5	2	3
	PC27. Ensure in-process inspection of the tool elements and final assembly		5	2	3
Total		**100**	**100**	**30**	**70**
2.CSC/ N 0308 : Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work	**100**	4	1	3
	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fitting operations		4	1	3
	PC3.work following laid down procedures and instructions		3	1	2
	PC4.ensure work area is clean and safe from hazards		2	0	2
	PC5.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC6.obtain job specification from a valid and approved source		2	0	2
	PC7.read and establish job requirements from the job specification document accurately		2	0	2
	PC8.report and rectify incorrect and inconsistent information in job specification documents as per organization procedures		2	0	2
	PC9.prepare the work area for the fitting operations as per procedure or operational specification		3	1	2
	PC10.ensure that all measuring equipment is calibrated and approved for usage		2	0	2
	PC11.ensure that the components used are free from foreign objects, dirt or other contamination		2	0	2
	PC12.obtain correct work pieces/raw materials and consumables as per job requirements		3	1	2
	PC13.obtain appropriate tools and equipment as per job requirements		3	1	2
	PC14. set work pieces as per job requirements using appropriate positioning and/or holding devices and support mechanisms		4	1	3
	PC15. mark out specified features on the work pieces as per job specification using appropriate measuring and marking out tools and equipment		4	1	3
	PC16.mark out templates for tracing/transferring		4	1	3

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
	the specified features on the work pieces as per job specification				
	PC17.trace/transfer the specified features from the templates onto the work pieces as per job specification		4	1	3
	PC18.perform fitting operations on various forms of metal components using a range of hand tools and manually operated machines		5	2	3
	PC19. follow the specified fitting sequence and procedure as per job specifications		4	1	3
	PC20. interpret in-built fault indicators and error codes of equipment and respond to the same as per operating manual/organizational guidelines		5	2	3
	PC21. check the fitted products to ensure completeness of work		5	2	3
	PC22.check the quality of the output as per required standards, using visual checks and measurement of dimensional parameters		5	2	3
	PC23.produce components as per standards applicable to the process		5	2	3
	PC24.work to achieve production targets		3	0	3
	PC25.report conditions and seek appropriate assistance in a timely manner to address risk of failure to comply with necessary targets and specifications		4	1	3
	PC26.deal with finished components as per organizational guidelines		4	1	3
	PC27.complete documentation during and post operations as per organizational procedures		4	1	3
	PC28.return all tools and equipment to the correct location on completion of the fitting activities		3	0	3
	PC29.leave the work area in a safe and tidy condition on completion of job activities		3	0	3
	Total		**100**	**24**	**76**
3.CSC/ N 0108 : Operate conventional milling machines	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work	**100**	3	1	2
	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fabrication and fitting operations		4	1	3
	PC3.work following laid down procedures and instructions		3	1	2
	PC4.ensure work area is clean and safe from hazards		3	1	2
	PC5.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC6.check that all measuring equipment is within		3	0	3

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
	calibration date				
	PC7.ensure that the components used are free from foreign objects, dirt or other contamination		2	0	2
	PC8.ensure availability of job specification from a valid source		2	0	2
	PC9.read and establish job requirements from the job specification document		3	0	3
	PC10.prepare and maintain the work area as per procedure or operation specification		4	1	3
	PC11.confirm with the machine setter that the machine is ready for production		3	0	3
	PC12.seek any necessary instruction/training on the operation of the machine, where appropriate		3	0	3
	PC13.ensure that machine guards are in place and are correctly adjusted		2	0	2
	PC14.identify different types of cutters used in horizontal and vertical milling machines		2	0	2
	PC15.identify different parts of the vertical and horizontal milling machine		2	0	2
	PC16. hold components securely, without distortion		4	0	4
	PC17. ensure that machine settings are adjusted as and when required to maintain the required accuracy		3	0	3
	PC18. obtain the component drawings, specifications and/or job instructions required for the components to be machined		2	0	2
	PC19. use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate ISO standards in relation to work undertaken)		3	0	3
	PC20. operate the machine controls in both hand and power modes		3	0	3
	PC21. stop the machine in both normal and emergency situations, and use correct procedure for restarting after an emergency		3	0	3
	PC22. use imperial and metric systems of measurement		2	0	2
	PC23. perform milling operations with use of various methods and equipment		6	2	4
	PC24. produce components as per given quality standards		5	1	4
	PC25. achieve given production targets		3	0	3
	PC26. overcome the effects of backlash in machine slides and screws		4	0	4
	PC27. apply roughing and finishing cuts considering the effect on tool life, surface finish and dimensional accuracy		5	1	4

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC28. apply cutting fluids with regard to a range of different materials		3	0	3
	PC29. clamp the work piece securely and without distortion in a chuck/work holding device such as vice, V-block, clamp, angle plate, etc.		4	0	4
	PC30. ensure that the quality control procedures are used on the equipment		4	1	3
	PC31.use range of equipment to check quality parameters		5	1	4
	Total		**100**	**11**	**89**
4.CSC/ N 0110 : Operate conventional turning machines	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work	**100**	6	2	4
	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations		6	2	4
	PC3.work following laid down procedures and instructions		6	0	6
	PC4.ensure work area is clean and safe from hazards		6	0	6
	PC5.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		6	0	6
	PC6.check that all measuring equipment are within calibration date		5	1	4
	PC7.obtain and prepare the appropriate materials, tools and equipment		7	2	5
	PC8.mount the work-piece safely and securely, in line with instructions		7	2	5
	PC9.set and adjust the machine tool speeds and feeds, in line with instructions		7	2	5
	PC10.use the machine tool controls safely and correctly, in line with operational procedures		7	2	5
	PC11.check that the finished components meet the standard required		7	2	5
	PC12.report any difficulties or problems that may arise with the grinding activities, and carry out any agreed actions		7	3	4
	PC13.shut down the equipment to a safe condition on completion of the grinding activities		6	2	4
	PC18.refer the problem to a competent specialist if it cannot be resolved		6	3	3
	PC19.obtain help or advice from specialist if the problem is outside candidate's area of competence or experience		6	3	3
	PC20.comply with relevant legislation, standards, policies and procedures		5	2	3
	Total		**100**	**28**	**72**
	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
5.CSC/ N 0110 : Operate conventional turning machines	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing turning operations	100	3	1	2
	PC3.ensure work area is clean and safe from hazards		2	0	2
	PC4.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC5.ensure that machine guards are in place and are correctly adjusted		2	0	2
	PC6.read and understand safety instructions, warning signs on the machine		3	1	2
	PC7.check that all measuring equipment is within calibration date		3	0	3
	PC8.ensure availability of job specification from a valid source		2	0	2
	PC9.read and establish job requirements from the job specification document		3	0	3
	PC10.ensure that the incoming components used are free from foreign objects, dirt or other contamination		2	0	2
	PC11.prepare and maintain the work area as per procedure or operation specification		3	1	2
	PC12.plan to carry out the required turning activities and the sequence of operations as per specifications		4	1	3
	PC13.apply safe working practices and procedures at all times		4	1	3
	PC14. obtain all the appropriate materials, tools and equipment required for the turning operation		2	0	2
	PC15.confirm with the machine setter that the machine is ready for production		2	0	2
	PC16. prepare for the turning activities by mounting, positioning and correctly setting a range of work holding devices and cutting tools		3	0	3
	PC17.seek any necessary instruction/training on the operation of the machine, where required		2	0	2
	PC18.hold components securely, without distortion		2	0	2
	PC19.ensure that machine settings are adjusted as and when required to maintain the required accuracy		2	0	2
	PC20.obtain the component drawings, specifications and/or job instructions required for the components to be machined		2	0	2
	PC21.use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate IS or ISO standards in relation to work		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
	undertaken)				
	PC22.set and adjust the machine tool speeds and feeds to achieve the component specification		2	0	2
	PC23. mount and set the required work holding devices, work piece and cutting tools		2	0	2
	PC24. operate the machine tool controls safely and correctly, in line with operational procedures		3	1	2
	PC26. stop the machine in both normal and emergency situations correctly, and follow right procedure for restarting after an emergency		2	0	2
	PC27.use lathes and the accessories that consists of saddle, capstan/turret head, compound slide, tailstock, taper turning attachments, profile attachments, fixed and travelling steadies		2	0	2
	PC28.position and secure work holding devices to the machine spindle		2	0	2
	PC29.perform turning operations using various equipment to produce components with various features		4	0	4
	PC30.produce components as per given quality standards		4	1	3
	PC31. achieve given production targets		2	0	2
	PC32.overcome the effects of backlash in machine slides and screws		3	0	3
	PC33.perform the technique of trial cut for checking dimensional accuracy		3	0	3
	PC34.apply roughing and finishing cuts, considering the effect on tool life, surface finish and dimensional accuracy		3	0	3
	PC35.use cutting fluids for different materials		2	0	2
	PC36.use range of equipment to check critical parameters		3	0	3
	PC37.clamp the work piece in a chuck/work holding device		2	0	2
	PC38.perform the checks to be carried out on the components before removing them from the machine, and the equipment needed for this activity		3	0	3
	PC39.ensure that the quality control procedures are used while operating the equipment		2	0	2
	Total		**100**	**9**	**91**
	PC1.work safely at all times, complying with health and safety, environmental and other relevant regulations and guidelines		6	2	4
	PC2.check that all safety mechanisms are in place and that the equipment is set correctly for the required operations		3	0	3
	PC3.adhere to procedures or systems in place for		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
6.CSC/ N 0309 : Perform assembly operations on metal components to make tools and dies	health and safety, including personal protective equipment and other relevant safety regulations and procedures to contribute to a safe work environment	100			
	PC4.wear the appropriate protective clothing and equipment, and keep the work area clean and tidy		3	0	3
	PC5.follow safe practice/approved setting up procedures at all times		3	0	3
	PC6.select measuring instruments based on tolerances required and application such as internal and external measurements		4	1	3
	PC7. take measurements using standard and specialized measuring instruments		4	1	3
	PC8. compare measurements to drawings and sketches to ensure conformity, fits and clearances		4	1	3
	PC9. record critical dimensions as required by work place procedures		3	0	3
	PC10.determine job requirement using appropriate sources		4	1	3
	PC11.establish the procedures to complete the general machining, fitting or assembling operations		4	1	3
	PC12.obtain the appropriate tools and equipment for the general machining, fitting or assembling operation		4	1	3
	PC13.check that all measuring equipment is within calibration date		3	0	3
	PC14.fasten or clamp production tool components temporarily as required for final assembly		3	0	3
	PC15.drill, tap and ream locating holes as required t o permanently locate components		6	2	4
	PC16.fasten components permanently using method s such as using engineered fasteners, applying adhesives, soldering and brazing		6	2	4
	PC17. appropriate methods and techniques to assemble and secure the components in their correct positions		6	2	4
	PC18. produce mechanical assemblies as per job specifications		6	2	4
	PC19.dismantle mechanical assemblies without damage to components and/or subassemblies		6	2	4
	PC20.deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve		3	0	3
	PC21.leave the work area in a safe and tidy condition on completion of the		2	0	2

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
	manufacturing activities				
	PC22.return all tools and equipment to the correct location on completion of the fitting activities support the customer remotely over the internet to test potential solutions		2	0	2
	PC23.perform the necessary checks for dimensional accuracy and functioning of the tool and die		4	1	3
	PC24.use the appropriate measuring equipment for checking activities		3	1	2
	PC25.produce components within all of the applying standards		3	0	3
	Total		**100**	**22**	**78**
7.CSC/ N 1335 : Use basic health and safety practices at the workplace	PC1.use protective clothing/equipment for specific tasks and work conditions	**100**	5	2	3
	PC2.state the name and location of people responsible for health and safety in the workplace		3	1	2
	PC3.state the names and location of documents that refer to health and safety in the workplace		3	1	2
	PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace		5	2	3
	PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others state methods of accident prevention in the work environment of the job role		4	2	2
	PC6.state location of general health and safety equipment in the workplace		3	2	1
	PC7.inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC8.work safely in and around trenches, elevated places and confined areas		5	2	3
	PC9.lift heavy objects safely using correct procedures		5	2	3
	PC10. apply good housekeeping practices at all times		4	2	2
	PC11.identify common hazard signs displayed in various areas		5	2	3
	PC12.retrieve and/or point out documents that refer to health and safety in the workplace		3	1	2
	PC13.use the various appropriate fire extinguishers on different types of fires correctly		4	1	3
	PC14.demonstrate rescue techniques applied during fire hazard		4	1	3
	PC15.demonstrate good housekeeping in order to prevent fire hazards		3	1	2
	PC16.demonstrate the correct use of a fire extinguisher		4	1	3
	PC17.demonstrate how to free a person from electrocution		4	1	3
	PC18.administer appropriate first aid to victims where		4	1	3

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
	required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.				
	PC19.demonstrate basic techniques of bandaging		3	1	2
	PC20.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		4	1	3
	PC21.perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC22.administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	PC23.demonstrate the artificial respiration and the CPR Process		3	1	2
	PC24.participate in emergency procedures		3	2	1
	PC25.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		4	1	3
	PC26.demonstrate correct method to move injured people and others during an emergency		4	1	3
	Total		**100**	**36**	**64**
8.CSC/ N 1336 : Work effectively with others	PC1.accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	**100**	10	3	7
	PC2.accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7
	PC3.give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7
	PC4.display helpful behaviour by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5.consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7
	PC6.display appropriate communication etiquette while working		10	3	7
	PC7.display active listening skills while interacting with others at work		10	3	7
	PC8.use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	3	7
	PC9.demonstrate responsible and disciplined behaviors at the workplace		10	3	7
	PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
	Total		**100**	**30**	**70**
	Grand Total	**800**	**800**	**190**	**610**

Assessable Outcome	Assessment Criteria	Total Mark (800)	Out Of	Marks Allocation	
				Theory	Skills Practical
	Percentage Weightage:			**24**	**76**
	Minimum Pass% to qualify (aggregate):			**60**	