



**CERTIFIED MANUFACTURING
ASSOCIATE
BODY OF KNOWLEDGE**



sme.org/cmfga

MANUFACTURING ASSOCIATE

BODY OF KNOWLEDGE 2020

Topics	Competency	Importance	Weightings
1. Shop Essentials (Applied Mathematics)			14%
1.1 Mathematics	Understand & Apply	High	
1.1.1 Perform calculations involving addition			
1.1.2 Perform calculations involving subtraction			
1.1.3 Perform calculations involving multiplication			
1.1.4 Perform calculations involving division			
1.1.5 Read measurements taken on a tape measure			
1.2 System of Measurement	Understand & Apply	High	
1.2.1 Perform calculations involving common English units			
1.2.1 Perform calculations involving metric units			
1.2.2 Perform conversions between the metric units and English units			
1.3 Fractions and Decimals	Understand & Apply	High	
1.3.1 Perform calculations involving fractions			
1.3.2 Perform calculations involving decimals			
1.3.3 Perform conversions between the two types			
1.3.4 Perform calculations involving percentages			
2. Safety			26%
2.1 Safely assembling components	Understand & Apply	High	
2.1.1 Describe best practices for safely assembling components			
2.1.2 Describe proper ergonomics and use of personal protective equipment (PPE)			
2.2 Intro to OSHA	Understand & Apply	High	
2.2.1 A basic awareness of standards, rights, and responsibilities for workplace safety and keeping the workplace legally compliant			
2.3 OSHA Regulations (PPE)	Understand & Apply	High	
2.3.1 Regulations for personal protective equipment (PPE)			
2.3.2 Impact on day-to-day operations in the workplace			
2.4 OSHA Regulations (Lockout/Tagout)	Understand & Apply	High	

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2.4.1 Describe OSHA regulations regarding lockout/tagout procedures			
2.4.2 Describe OSHA regulations regarding energy isolation			
2.4.3 Describe the impact on day-to-day operations in the workplace			
2.5 OSHA Regulations (Hazardous Materials)	Remember & Understand	High	
2.5.1 Describe OSHA regulations regarding hazardous materials			
2.5.2 Describe Safety Data Sheets (SDS) and how they impact day-to-day operations in the workplace			
2.6 OSHA Regulations (Fires and Safety)	Remember & Understand	High	
2.6.1 Describe OSHA regulations regarding fire safety and how they impact day-to-day operations in the workplace			
2.7 OSHA Regulations (Bloodborne Pathogens)	Remember & Understand	Medium	
2.7.1 Describe OSHA regulations regarding bloodborne pathogens and how they impact day-to-day operations in the workplace			
2.8 Hand and Power Tools	Understand & Apply	High	
2.8.1 Describe the safe use of hand and power tools used on the job			
2.9 Basic Equipment Safety	Understand & Apply	High	
2.9.1 Describe and identify machine guarding on manufacturing equipment			
2.9.2 Describe the type of e-stops that may be in place (e.g. light curtains)			
2.9.3 Describe safety practices for working around forklifts, trucks and other vehicles			
3. Quality			4%
3.1 Quality Overview	Understand & Apply	High	
3.1.1 Describe the importance of quality throughout different departments of an organization			
3.1.2 Describe the use of different quality management systems and tools in manufacturing processes and products			

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4. Lean/Continuous Improvement			15%
4.1 5S Principles (Sort, Set in Order, Sweep, Standardize, Sustain)	Understand & Apply	Medium	
4.1.1 Understand and apply the 5S principles (sort, set in order, sweep, standardize, sustain)			
4.1.2 Restate examples for each term specific to the person's working environment			
4.2 Lean Manufacturing Overview	Understand & Apply	Medium	
4.2.1 Understand the basic principles and terminology of lean			
4.2.2 Describe the seven forms of waste			
4.2.3 Describe the concept of value-added			
4.2.4 Describe push and pull systems			
4.2.5 Describe the importance of continuous improvement			
4.3 Troubleshooting	Understand & Apply	High	
4.3.1 Understand various methods and tools used to troubleshoot problems			
4.3.2 Describe tools that are used to collect and interpret data including:			
4.3.2.1 Check Sheets			
4.3.2.2 Fishbone diagrams			
4.3.2.3 Pareto Charts			
4.4.3 Understand common troubleshooting methods for gathering troubleshooting data including:			
4.4.3.1 The 5 Why's technique			
4.4.3.2 Brainstorming			
4.4.3.3 Documentation			
4.4.3.4 Troubleshooting teams			

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5. Inspection			9%
5.1 Inspection Instruments and Gages	Understand & Apply	High	
5.1.1 Describe the use and care of common inspection instruments and gages used in the shop			
5.2 Part Tolerancing	Understand & Apply	Medium	
5.2.1 Describe common methods used for part tolerancing			
5.2.2 Describe the impact that tolerances have on part production and quality			
5.3 Print Reading	Understand & Apply	High	
5.3.1 Read an assembly print with an exploded view describe how key assemblies of the component are joined together			
5.3.2 Understand the different type of prints used in manufacturing operation			
6. Fasteners			13%
6.1 Identify common assembly and late-stage processes that take place in industrial facilities	Remember & Understand	Medium	
6.2 Safety for Assembling Components	Understand & Apply	High	
6.2.1 Describe best practices for safely assembling components, including proper ergonomics and use of personal protective equipment (PPE)			
6.3 Identify fastener types and installation methods	Remember & Understand	Medium	
6.3.1 Tools for threaded fasteners			
6.3.1.1 Identify different types of tools used with threaded fasteners			
6.3.1.2 Identify the advantages and disadvantages of the different types of tools			
6.3.1.3 Identify factors that go into selecting a tool for a threaded fastener application			
6.4.1 Tools for non-threaded fasteners			
6.4.1.1 Identify different types of tools used with non-threaded fasteners			
6.4.1.2 Identify the advantages and disadvantages of the different types of tools			
6.4.1.3 Identify factors that go into selecting a tool for a non-threaded fastener application			

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7. CNC			5%
7.1 CNC machine tools and controls	Remember & Understand	Medium	
7.1.1 Describe common components of CNC machine tools and controls			
7.1.1.1 Identify the major assemblies of a lathe			
7.1.1.2 Identify the major assemblies of a mill			
8. Robotics			8%
8.1 Industrial robots	Remember & Understand	High	
8.1.1 Describe the basic types of industrial robotics			
8.1.2 Describe applications for industrial robots			
8.1.3 Describe the programming methods for industrial robots			
8.2 Understand and apply safety protocols for working with industrial robots	Understand & Apply	High	
8.2.1 Identify methods for preventing robot accidents			
8.2.2 Understand the safeguarding systems that protect employees from injury when working with robots			
9. Additive Manufacturing			6%
9.1 Overview of AM	Remember & Understand	Medium	
9.1.1 Identify the basic additive manufacturing processes			
9.1.2 Identify materials used in additive manufacturing			
9.1.3 Identify the advantages and disadvantages of AM			
9.1.4 Identify uses of AM			