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# Precision Machining

## General Assessment Information

### Blueprint Contents

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**Test Type:** The Precision Machining industry-based credential is included in NOCTI's Job Ready assessment battery. Job Ready assessments measure technical skills at the occupational level and include items which gauge factual and theoretical knowledge. Job Ready assessments typically offer both a written and performance component and can be used at the secondary and post-secondary levels. Job Ready assessments can be delivered in an online or paper/pencil format.

**Revision Team:** The assessment content is based on input from secondary, post-secondary, and business/industry representatives from the states of Idaho, Indiana, Kentucky, Maine, New York, and Pennsylvania.



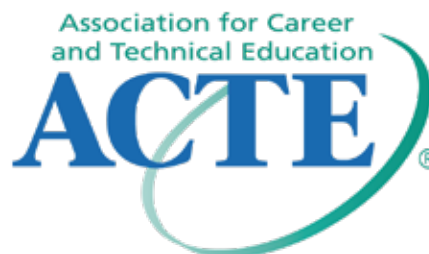
48.0501- Machine Tool  
Technology/Machinist



Career Cluster 13- Manufacturing



51-4034.00- Lathe and Turning Machine  
Tool Setters, Operators, and Tenders,  
Metal and Plastic



The Association for Career and Technical Education (ACTE), the leading professional organization for career and technical educators, commends all students who participate in career and technical education programs and choose to validate their educational attainment through rigorous technical assessments. In taking this assessment you demonstrate to your school, your parents and guardians, your future employers and yourself that you understand the concepts and knowledge needed to succeed in the workplace. Good Luck!

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## General Assessment Information (continued)



**NATIONAL COLLEGE CREDIT RECOMMENDATION SERVICE**  
University of the State of New York - Regents Research Fund

In the lower division  
baccalaureate/associate degree  
category, 1 semester hour in  
Introduction to Engineering  
Technology.

## Written Assessment

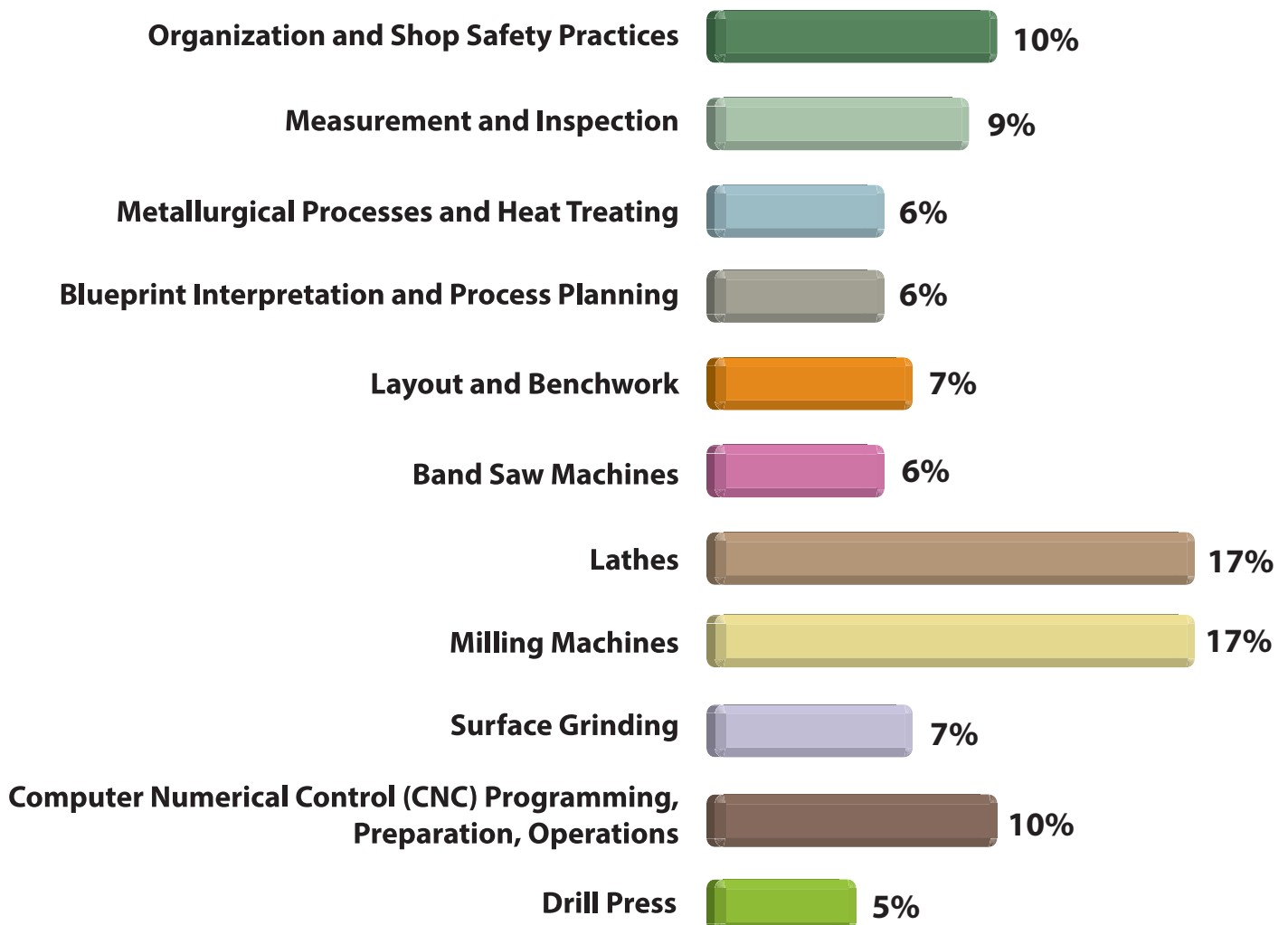
NOCTI written assessments consist of questions to measure an individual's factual theoretical knowledge.

**Administration Time:** 3 hours

**Number of Questions:** 174

**Number of Sessions:** This assessment may be administered in one, two, or three sessions.

### Areas Covered



## Specific Standards and Competencies Included in this Assessment

### Organization and Shop Safety Practices

- Demonstrate safe work habits and operating procedures
- Clean and maintain personal work area and equipment
- Select and appropriately use cutting fluids
- Identify and appropriately use Personal Protective Equipment (PPE)
- Identify environmental and safety considerations established by the EPA, OSHA, and listed in SDS publications

### Measurement and Inspection

- Identify, select, and calibrate precision and semi-precision measuring tools
- Measure workpiece to verify compliance with print specifications
- Display knowledge of quality control standards and process improvement, including SPC

### Metallurgical Processes and Heat Treating

- Identify the properties and characteristics of common metals and their effect on machinability
- Identify the AISI/SAE and UNS steel identification systems
- Identify heat treating processes and objectives

### Blueprint Interpretation and Process Planning

- Interpret blueprints including geometric dimensioning and tolerancing (GD&T) symbols
- Develop an order of operations (process plan) based on blueprint specifications



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## Specific Standards and Competencies (continued)

### Layout and Benchwork

- Identify and appropriately use hand tools
- Identify and safely use power hand tools
- Grind and shape tools using a pedestal/bench grinder
- Perform semi-precision and precision layout

### Band Saw Machines

- Identify parts and preventive maintenance of a band saw
- Explain safe principles of operation
- Set up and perform band saw machine operations

### Lathes

- Identify parts and preventive maintenance of a lathe
- Explain safe principles of operation
- Select and maintain appropriate tools
- Calculate appropriate cutting speed, feed rate, and depth of cut
- Grind and form lathe tools
- Demonstrate knowledge of various workholding methods (e.g., independent and universal chucks, collets, faceplate, between centers, steady and follower rests)
- Set up and perform lathe machine operations (e.g., turning, boring, threading, taper turning, knurling, grooving and cut-off, drilling and tapping, filing, polishing)
- Identify appropriate uses for carbide inserts



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## Specific Standards and Competencies (continued)

### Milling Machines

- Identify parts and preventive maintenance of a mill
- Explain safe principles of operation
- Select and maintain appropriate tools
- Calculate appropriate cutting speed, feed rate, and depth of cut
- Explain various workholding methods (e.g., mill vise, table set-ups, angle plates, indexing heads, v-blocks)
- Set up milling machines (e.g., head alignment, vise alignment, tool holder selection, establishing a part zero, set DRO use)
- Perform milling operations (e.g., pocketing, slotting, hole-making, peripheral and face milling)

### Surface Grinding

- Identify parts and preventive maintenance of a surface grinder
- Select appropriate grinding wheel
- Explain safe principles of operation (e.g., wheel mounting and dressing, ring testing, workholding, grinding parallel and perpendicular surfaces)

### Computer Numerical Control (CNC) Programming, Preparation, Operations

- Demonstrate knowledge of the axis and coordinate systems
- Read and write basic G and M codes
- Perform basic setup and operation for CNC lathe (e.g., work offset, tool offset, workholding devices, toolholding devices)
- Perform basic setup and operation for CNC mill (e.g., work offset, tool offset, workholding devices, toolholding devices)

### Drill Press

- Identify parts and preventive maintenance of a drill press
- Determine appropriate tooling and workholding devices
- Explain safe principles of operation (e.g., drilling, reaming, countersinking, counterboring, tapping)

## Sample Questions

**The purpose of OSHA is to**

- A. enforce employee benefits
- B. establish right-to-know programs
- C. publish machining standards
- D. regulate safety in the workplace

**The thimble on an inch micrometer has \_\_\_\_\_ graduations.**

- A. 4
- B. 10
- C. 25
- D. 100

**Hot-rolled steel has a/an**

- A. absence of outer scale
- B. smooth bright finish
- C. gray outer scale
- D. smooth ground finish

**Examine the \_\_\_\_\_ to verify modifications to an original design.**

- A. revision block
- B. material requirements plan
- C. material specifications sheet
- D. title block

**When tapping a blind hole, use a \_\_\_\_\_ tap to maximize thread depth.**

- A. bottoming
- B. plug
- C. starting
- D. taper

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### Sample Questions (continued)

**Blade pitch refers to the**

- A. width of the blade
- B. thickness of the blade
- C. distance between the teeth
- D. depth of the tooth

**Titanium nitride coating on cutting tools**

- A. increases tool life
- B. decreases tool life
- C. leaves tool life unchanged
- D. prevents breakage

**What is the rpm of a 1/2 inch drill at 90 sfpm?**

- A. 207 rpm
- B. 305 rpm
- C. 720 rpm
- D. 815 rpm

**The coarsest grain size below is**

- A. 36
- B. 46
- C. 60
- D. 80

**The two basic axes on a CNC lathe are**

- A. X and Y
- B. X and Z
- C. Y and Z
- D. C and Z

## Performance Assessment

NOCTI performance assessments allow individuals to demonstrate their acquired skills by completing actual jobs using the tools, materials, machines, and equipment related to the technical area.

**Administration Time:** 2 hours and 30 minutes

**Number of Jobs:** 2

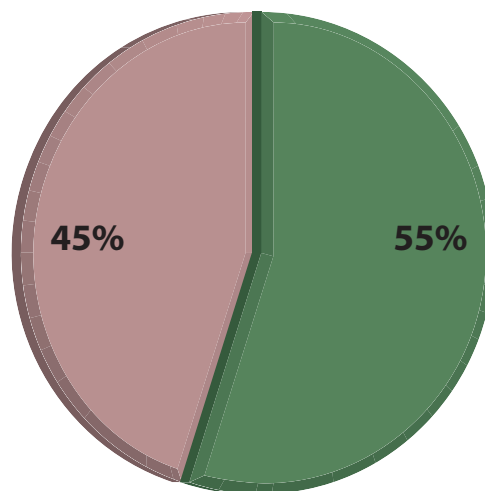
### Areas Covered:

#### 55% Milling Operations

Participants will receive a piece of cold-rolled steel to perform a milling operation using the provided drawing. Steps will include aligning vise parallel, machining the block on the milling machine according to specifications, and deburring the part.

#### 45% Lathe Operations

Participants will perform a lathe operation using the provided drawing and a piece of cold-rolled steel. Steps will include machining the part according to specifications, and deburring the part.



## Sample Job

### Lathe Operations

**Maximum Time:** 1 hour and 30 minutes

**Participant Activity:** The participant will receive a piece of cold-rolled steel, machine the part on the lathe according to the specifications provided on a drawing, deburr the part and break all edges, notify the evaluator to inspect the work is in customer ready condition, and clean up the machines and work area.

