

Machining

Study Guide

Assessments:

280 I CNC Machining Center Operator**

2802 Vertical Milling Operator**

2803 Lathe Operator**

2804 Basic Machining*

* For use by CareerTech Skills Centers only

**Aligned with the National Institute
for Metalworking Skills (NIMS)



Overview

This study guide is designed to help students prepare for the Machining assessments. It includes information about the assessments, the skills standards upon which the assessments are based, resources that can be used to prepare for the assessments, and test taking strategies.

Each of the four sections in this guide provides useful information for students preparing for the Machining assessments.

- CareerTech and Competency-Based Education: A Winning Combination
- Machining assessments
 - ▶ Assessment Information
 - ▶ Standards and Test Content
 - ▶ Sample Questions
 - ▶ Abbreviations, Symbols, and Acronyms
- Strategies for Test Taking Success
- Notes

The Basic Machining assessment was developed as an end-of-program assessment for students enrolled in the CareerTech Skills Centers School System.

The CNC Machine Center Operator, Vertical Milling and the Lathe Operator assessments are aligned with the National Institute for Metalworking Skills (NIMS) standards. NIMS was formed in 1995 by the metalworking trade associations to develop and maintain a globally competitive American workforce. NIMS sets skills standards for the industry, certifies individual skills against the standards and accredits training programs that meet NIMS quality requirements. The assessments are designed to measure a student's ability to apply knowledge of the skills necessary for success in the Machining sector.

National Institute for Metalworking Skills (NIMS): **www.nims-skills.org**

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CareerTech and Competency-Based Education: A Winning Combination

Competency-based education uses learning outcomes that emphasize both the application and creation of knowledge and the mastery of skills critical for success. In a competency-based education system, students advance upon mastery of competencies, which are measurable, transferable outcomes that empower students.

Career and technology education uses industry professionals and certification standards to identify the knowledge and skills needed to master an occupation. This input provides the foundation for development of curriculum, assessments and other instructional materials needed to prepare students for wealth-generating occupations and produce comprehensively trained, highly skilled employees demanded by the work force.

Tools for Success

CareerTech education relies on three basic instructional components to deliver competency-based instruction: skills standards, curriculum materials, and competency assessments.

Skills standards provide the foundation for competency-based instruction and outline the knowledge and skills that must be mastered in order to perform related jobs within an industry. Skills standards are aligned with national skills standards and/or industry certification requirements; therefore, a student trained to the skills standards is equally employable in local, state and national job markets.

Curriculum materials and textbooks contain information and activities that teach students the knowledge and skills outlined in the skills standards. In addition to complementing classroom instruction, curriculum resources include supplemental activities that enhance learning by providing opportunities to apply knowledge and demonstrate skills.

Certification Assessments test the student over material outlined in the skills standards and taught using the curriculum materials and textbooks. When used with classroom performance evaluations, certification assessments provide a means of measuring occupational readiness.

Each of these components satisfies a unique purpose in competency-based education and reinforces the knowledge and skills students need to gain employment and succeed on the job.

Measuring Success

Evaluation is an important component of competency-based education. Pre-training assessments measure the student's existing knowledge prior to receiving instruction and ensure the student's training builds upon this knowledge base. Formative assessments administered throughout the training process provide a means of continuously monitoring the student's progress towards mastery.

Certification assessments provide a means of evaluating the student's mastery of knowledge and skills. Coaching reports communicate assessment scores to students and provide a breakdown of assessment results by standard area. The coaching report also shows how well the student has mastered skills needed to perform major job functions and identifies areas of job responsibility that may require additional instruction and/or training.

Machining

Assessment Information

What are the Machining assessments?

The Basic Machining, CNC Machine Center Operator, Vertical Milling Operator, and Lathe Operator assessments are end-of-program assessments for students in Machining education programs. The assessments provide an indication of student mastery of knowledge and concepts necessary for success in careers in these areas.

How were the assessments developed?

The assessments were developed by the CareerTech Testing Center. The Basic Machining assessment and standards were developed exclusively for the students in the CareerTech Skills Centers. The assessments and standards for CNC Machine Center Operator, Vertical Milling Operator, and Lathe Operator align with the NIMS standards. All items were developed and reviewed by a committee of subject matter experts.

Frequency: represents how often the task is performed on the job. Frequency rating scales vary for different occupations. The rating scale used in this publication is presented below:

1 = less than once a week 2 = at least once a week 3 = once or more a day

Criticality: denotes the level of consequence associated with performing a task incorrectly. The rating scale used in this publication is presented below:

1 = slight 2 = moderate 3 = extreme

What do the assessments cover?

Specifically, the tests include multiple-choice test items over the following areas:

2801 — CNC Machining Center Operator (55 questions)

Perform Bench Work	11%
Inspect Parts	9%
Perform General Maintenance	11%
Ensure Industrial Safety and Environmental Protection	11%
Operate Milling Machine (horizontal and vertical)	18%
Operate CNC Machining Center	40%

2802 — Vertical Milling Operator (55 questions)

Perform Bench Work	26%
Inspect Parts	9%
Perform General Maintenance	9%
Ensure Industrial Safety and Environmental Protection	7%
Operate Drill Press	49%

2803 — Lathe Operator (55 questions)

Perform Bench Work	24%
Inspect Parts	16%
Perform General Maintenance	13%
Ensure Industrial Safety and Environmental Protection	11%
Operate Lathes	49%

2804 — Basic Machining (55 questions)

General Safety, Lean Production and Problem Solving	9%
Measuring Devices	4%
Drill Press Operations	7%
Turning Operations	5%
Milling Operations	7%
Grinding Operations	9%
CNC (Computer Numerical Control) Machining	9%
Fabrication and Welding	5%
Basic Math	34%
Blueprint Reading	11%

What are the benefits of using these assessments?

Students receive a certificate for each assessment they pass. This certificate may be included in the student's portfolio and used to communicate the student's mastery of the subject matter to potential employers.

When should the assessments be taken?

The CareerTech Testing Center recommends that students take these assessments as soon as possible after receiving all standards-related instruction, rather than waiting until the end of the school year.

Are the assessments timed?

No. However, most students finish the assessment within one hour.


What resources can students use on these assessments?

Students are allowed to use calculators and scratch paper on CTTC assessments; however, these items must be provided by the testing proctor and returned to the proctor before the student's exam is submitted for scoring. Calculator apps and cell phones and other devices may not be used on these assessments. Also, students may use a Machinist's Ready Reference on these assessments.

Students taking these assessments may also use the following during testing: Machinist's Ready Reference.

What accommodations can be made for students with Individualized Education Plans (IEPs)?

Accommodations are allowed for students with an Individualized Education Plan. Examples of allowable accommodations include:

- Extended time — This assessment is not timed; therefore, students may take as much time as needed to finish. The assessment must be completed in one testing session.
- Readers — A reader may be used to read the assessment to a student who has been identified as needing this accommodation.
- Enlarged text — Students needing this accommodation can activate this feature by clicking the  icon in the upper right corner of the screen.

What can students expect on Test Day?

All CTTC assessments are web-based and delivered exclusively by a proctor in the school's assessment center. The proctor **cannot** be an instructor or anyone who was involved with the students during instruction.

Assessments are delivered in a question-by-question format. When a question is presented, the student can select a response or leave the question unanswered and advance to the next question. Students may also flag questions to revisit before the test is scored. All questions must be answered before the test can be submitted for scoring.

After the assessment is scored, the student will receive a score report that not only shows the student's score on the assessment, but also how the student performed in each standard area.

Can students retake the test?

Students may retake the test unless their school or state testing policies prohibit retesting. Students who can retest must wait at least three days between test attempts.

Standards and Test Content 280I CNC Machining Center Operator

Duty A: Perform Bench Work (6 questions)

CODE	TASK	F	C
A.01	Read blueprints. • Demonstrate relevant math skills • Orthographic views • Isometric views • Tolerancing • Basic geometric tolerancing • Title block information • ISO (1st and 3rd angle) projections • Basic G, D, and T symbols • Alphabet of lines • Section views • Finish symbols	3	3
A.02	Deburr sharp edges. • Files • Deburr knives • Scrapers • Coated abrasives	3	3

Duty B: Inspect Parts (5 questions)

CODE	TASK	F	C
B.01	Follow an inspection plan.	3	3
B.02	Select proper measuring instruments.	3	3
B.03	Conduct and document inspection to determine the conformity of part.	3	3

Duty C: Perform General Maintenance (6 questions)

CODE	TASK	F	C
C.01	Maintain work station. • Clean and safe for work • Tools • Workbenches • Check lists and verbal instructions • Manual equipment clean, maintained, and safe for work	3	3
C.02	Maintain machine tools. • Report problems • History forms • General condition of assigned machine tool • Daily, weekly, and/or monthly routine upkeep	3	3

Duty D: Ensure Industrial Safety and Environmental Protection

(6 questions)

CODE	TASK	F	C
D.01	Adhere to safe practices. <ul style="list-style-type: none"> • OSHA/EPA requirements • Handling of tools • Adhere to local shop safety requirements • Handling and application of coolants, cutting fluids, and lubricants • Material handling • Machine operations 	3	3
D.02	Handle and store hazardous materials. <ul style="list-style-type: none"> • OSHA • Identification • EPA • SDS forms 	3	3

Duty E: Operate Milling Machine (horizontal and vertical)

(10 questions)

CODE	TASK	F	C
E.01	Describe job planning and management for milling. <ul style="list-style-type: none"> • Sequencing • Work holding device • Fixtures • Complete an operation detail sheet • Speeds • Specialized tooling • Cutting fluids • Feeds • Jigs 	3	3
E.02	Operate horizontal and vertical milling machines. <ul style="list-style-type: none"> • Indicate milling vise • Measuring instruments • Edge finder • Tapping • Rough cut • Tolerances • Magnetic base for indicators • Parallels • Mill tooling (facing, milling, drilling, reaming, and boring) • Angular milling • Finish cut 	3	3



Duty F: Operate a CNC Machining Center (22 questions)

CODE	TASK	F	C
F.01	Demonstrate understanding of the Cartesian Coordinates (absolute or incremental)	3	3
F.02	Operate the control (manual and auto).	3	3
F.03	Set up fixture and tool offset. • Polar coordinates	3	3
F.04	Set tool preset.	3	3
F.05	Understand and apply industry standard G and M codes to write point-to-point program. • Canned cycles	3	3
F.06	Perform MDI operations.	3	3
F.07	Make program edits.	3	3
F.08	Test run programs.	3	3
F.09	Monitor and adjust tool wear offset.	3	3



Standards and Test Content 2802 Vertical Milling Operator

Duty A: Basic Mathematics (17 questions)

CODE	TASK	F	C
A.01	Label and place values of a whole number.	2	2
A.02	Add whole numbers.	3	3
A.03	Subtract whole numbers.	3	3
A.04	Multiply whole numbers.	3	2
A.05	Divide whole numbers.	3	2
A.06	Distinguish among types of fractions.	3	3
A.07	Reduce fractions to lowest terms.	3	3
A.08	Convert mixed numbers to improper fractions.	2	2
A.09	Convert improper fractions to mixed numbers.	2	2
A.10	Add fractions.	3	3
A.11	Subtract fractions.	3	3
A.12	Multiply fractions.	2	2
A.13	Label the place values of a decimal number.	3	3
A.14	Add decimal numbers.	3	3
A.15	Subtract decimal numbers.	3	3
A.16	Multiply decimal numbers.	2	2
A.17	Divide decimal numbers.	2	2
A.18	Convert decimal fractions to common fractions.	3	3
A.19	Convert common fractions to decimal numbers and percentages.	3	3
A.20	Identify decimal and fractional equivalents.	3	3
A.21	Convert percentages to fractions and decimal numbers.	2	2
A.22	Solve percentage problems.	2	2
A.23	Solve basic ratio and proportion problems.	1	1
A.24	Review useful shop formulas.	3	3
A.25	Calculate the missing side of a triangle.	2	3
A.26	Calculate the missing angle of a triangle.	2	3
A.27	Calculate Cartesian coordinates.	3	3

Duty B: Safety Practices (5 questions)

CODE	TASK	F	C
B.01	Adhere to safe practices. <ul style="list-style-type: none"> • OSHA/EPA requirements • Machine operations • Handling and application of coolants, cutting fluids, and lubricants • Adhere to local shop safety requirements • Material handling • Handling of tools 	3	3
B.02	Handle and store hazardous materials. <ul style="list-style-type: none"> • OSHA • Identification • EPA • SDS forms 	2	2
B.03	Demonstrate basic first aide.	1	2

Duty C: Milling Setup and Operations (14 questions)

CODE	TASK	F	C
C.01	Deburr holes and sharp edges. <ul style="list-style-type: none"> • Files • Coated abrasives • Scrapers • Deburr knives 	3	3
C.02	Maintain work station. <ul style="list-style-type: none"> • Clean and safe for work • Manual equipment clean, maintained, and safe for work • Check lists and verbal instructions • Tools • Workbenches 	3	2
C.03	Maintain machine tools. <ul style="list-style-type: none"> • General condition of assigned machine tool • Daily, weekly, and/or monthly routine upkeep • Report problems • History forms 	3	3
C.04	Drill holes. <ul style="list-style-type: none"> • Blind holes • Center drilled • Through holes • Center punched 	3	3
C.05	Spot face part.	1	2
C.06	Counterbore holes.	1	2

Duty D: Vertical Milling Machine Components (11 questions)

CODE	TASK	F	C
D.01	Job planning and management for vertical milling operations. • Complete an operation detail sheet ✓ Sequencing ✓ Speeds ✓ Feeds ✓ Work holding devices ✓ Specialized tooling ✓ Jigs ✓ Fixtures ✓ Cutting fluids	2	2
D.02	Ream holes.	2	3
D.03	Countersink holes.	2	3
D.04	Tap holes. • Tapping attachments • Go/no go gage	3	3

Duty E: Measurement and Inspection (8 questions)

CODE	TASK	F	C
E.01	Read blueprints. • Demonstrate relevant math skills • Orthographic views • Isometric views • Basic geometric tolerancing • Title block information • Tolerancing • ISO (1st and 3rd angle) projections • Basic G, D, and T symbols • Alphabet of lines • Section views • Finish symbols	3	3
E.02	Follow an inspection plan. • Go/no go gage • Inspection gages/measuring instruments	3	3
E.03	Conduct and document self-inspection.	3	3
E.04	Tap holes. • Hand tapping • Go/no go gage • Cutting fluids	3	3
E.05	Layout job. • Layout ink • Scribe • Surface gage • Layout height gage • Steel rule • Ball peen hammer and prick punch	1	2

Standards and Test Content 2803 Lathe Operator

Duty A: Perform Bench Work (13 questions)

CODE	TASK	F	C
A.01	Read blueprints. • Demonstrate relevant math skills • Basic geometric tolerancing • ISO (1st and 3rd angle) projections • Alphabet of lines • Finish symbols • Isometric views • Orthographic views • Title block information • Basic G, D, and T symbols • Section views • Tolerancing	3	3
A.02	Deburr sharp edges. • Files • Scrapers • Coated abrasives • Deburr knives	3	3

Duty B: Inspect Parts (9 questions)

CODE	TASK	F	C
B.01	Follow an inspection plan.	3	3
B.02	Select proper measuring instruments.	3	3
B.03	Conduct and document inspection to determine the conformity of part.	3	3

Duty C: Perform General Maintenance (7 questions)

CODE	TASK	F	C
C.01	Maintain work station. • Clean and safe for work • Tools • Workbenches • Check lists and verbal instructions • Manual equipment clean, maintained, and safe for work	3	3
C.02	Maintain machine tools. • Report problems • History forms • General condition of assigned machine tool • Daily, weekly, and/or monthly routine upkeep	3	3

Duty D: Ensure Industrial Safety and Environmental Protection

(6 questions)

CODE	TASK	F	C
D.01	Adhere to safe practices. • OSHA/EPA requirements • Material handling • Handling of tools • Machine operations • Adhere to local shop safety requirements • Handling and application of coolants, cutting fluids, and lubricants	3	3
D.02	Handle and store hazardous materials • OSHA • EPA • Identification • SDS forms	3	3

Duty E: Operate Lathes (20 questions)

CODE	TASK	F	C
E.01	Job planning and management for turning. • Sequencing • Speeds • Feeds • Specialized tooling • Jigs • Fixtures • Cutting fluids • Work holding devices	3	3
E.02	Turn and face parts. • Three-jaw universal chuck • Four-jaw independent chuck • Turn between centers • Collets • External threads • Internal threads • Boring bar/tool • Center drill/drill • Lathe tooling • Thread pitch gages • Center gage • Pitch micrometer • Thread ring gage • Thread plug gages • Telescope gage • Outside micrometer • Use indicators (dial) • Thread wires • Steady rests • Knurl parts with lathe • Perform grooving and cut-off ► Width/depth of cut • Turn tapers ► Taper attachment) ► Compound) • Tap holes	3	3

Standards and Test Content 2804 Basic Machining (Skills Centers only)

Duty A: General Safety, Lean Production and Problem Solving (5 questions)

CODE	TASK
A.01	Describe factors in creating a safe workplace.
A.02	Identify common items of personal protective equipment (PPE).
A.03	Explain fire safety.
A.04	Compare hazard categories.
A.05	Explain the safety color code.
A.06	State safety rules for using hand tools, power tools, and machinery equipment.
A.07	List the steps in an eight-step problem solving process.
A.08	State the basic principles of lean production.

Duty B: Measuring Devices (2 questions)

CODE	TASK
B.01	Identify types of measuring devices.
B.02	Explain how to read a standard and metric micrometer.
B.03	Read a micrometer.

Duty C: Drill Press Operations (4 questions)

CODE	TASK
C.01	Identify the major parts of a drill press.
C.02	Describe common operations performed on a drill press.
C.03	Identify cutting tools used for drill press operations.
C.04	Identify work-holding and set-up devices used in drill press operations.

Duty D: Turning Operations (3 questions)

CODE	TASK
D.01	Identify types of lathes.
D.02	Describe common lathe operations.
D.03	Identify types of work-holding devices.

Duty E: Milling Operations (4 questions)

CODE	TASK
E.01	Read blueprints. • Demonstrate relevant math skills • Isometric views • Basic geometric tolerancing • ISO (1st and 3rd angle) projections • Alphabet of lines • Finish symbols • Orthographic views • Tolerancing • Title block information • Basic G, D, and T symbols • Section views
E.02	Follow an inspection plan. • Go/no go gage • Inspection gages/measuring instruments
E.03	Conduct and document self-inspection
E.04	Tap holes. • Hand tapping • Go/no go gage • Cutting fluids
E.05	Layout job. • Layout ink • Scribe • Surface gage • Layout height gage • Steel rule • Ball peen hammer and prick punch

Duty F: Grinding Operations (5 questions)

CODE	TASK
F.01	List the purposes of grinding.
F.02	Recognize common grinding operations.
F.03	Describe the composition of grinding wheels.
F.04	State reasons for truing and balancing grinding wheels.
F.05	Identify major parts of a surface grinder.
F.06	Identify major parts of a cylindrical grinder.

Duty G: CNC (Computer Numerical Control) Machining (5 questions)

CODE	TASK
G.01	List the advantages of CNC machining.
G.02	Describe the "language" of a CNC machine tool.
G.03	Explain the Cartesian coordinate system.
G.04	List the common information on a work order.
G.05	Describe the items to check during a visual inspection of a CNC first run.
G.06	Describe the items to check during a dimensional inspection of a CNC first run.
G.07	Describe preventative maintenance procedures.
G.08	List routine preventative maintenance tasks.

Duty H: Fabrication and Welding (3 questions)

CODE	TASK
H.01	Identify fabrication operations in manufacturing.
H.02	State the uses of a punch press.
H.03	State the uses of a power press brake.
H.04	Describe the basic concepts of welding.



Duty I: Basic Math (18 questions)

CODE	TASK
I.01	Match terms associated with basic math to their correct definitions.
I.02	Match the symbols used in math problems to their correct names.
I.03	Label and place values of a whole number.
I.04	Add whole numbers.
I.05	Subtract whole numbers.
I.06	Multiply whole numbers.
I.07	Divide whole numbers.
I.08	Distinguish among types of fractions.
I.09	Reduce fractions to lowest terms.
I.10	Convert mixed numbers to improper fractions.
I.11	Convert improper fractions to mixed numbers.
I.12	Add fractions.
I.13	Subtract fractions.
I.14	Multiply fractions.
I.15	Label the place values of a decimal number.
I.16	Add decimal numbers.
I.17	Subtract decimal numbers.
I.18	Multiply decimal numbers.
I.19	Divide decimal numbers.
I.20	Convert decimal fractions to common fractions.
I.21	Convert common fractions to decimal numbers and percentages.
I.22	Identify decimal and fractional equivalents.
I.23	Convert percentages to fractions and decimal numbers.
I.24	Solve percentage problems.
I.25	Match terms used in geometry to their correct descriptions.
I.26	Match types of geometric figures to their correct descriptions.
I.27	Match units of measure to their correct equivalents.
I.28	Calculate the area of geometric figures.
I.29	Calculate the volume of solid figures.
I.30	Solve basic ratio and proportion problems.
I.31	Review useful shop formulas.

Duty J: Blueprint Reading (6 questions)

CODE	TASK
J.01	Identify terms associated with blueprints.
J.02	Select title block, note, and revision information.
J.03	Identify abbreviations found on blueprints.
J.04	Identify the types of lines used on blueprints.
J.05	Distinguish views of a drawing.
J.06	Identify dimensioning and tolerancing methods.
J.07	Interpret specifications and processes on blueprints.
J.08	Identify views.
J.09	Sketch orthographic projection drawings.
J.10	Read industrial blueprints.



Sample Questions

- _____ 1. Which instruments are used to check the concentricity of a part on a surface plate?
- a. height gage and angle plate
 - b. sine bar and indicator
 - c. V-blocks and indicator
 - d. V-blocks and micrometer
- _____ 2. When drilling blind holes, unless otherwise specified, the hole depth measurement is taken from what part of the drill bit?
- a. drill flats
 - b. drill point
 - c. tang
 - d. web
- _____ 3. Which is used to countersink for a flat-head screw?
- a. 35° countersink
 - b. 41° countersink
 - c. 50° countersink
 - d. 82° countersink
- _____ 4. A program is written to use cutter compensation to contour the outside of a part. A smaller diameter cutting tool is substituted for the tool originally used for the job. What needs to be changed for the part to be machined correctly?
- a. both tool value in the control offset page and program
 - b. program
 - c. spindle speed
 - d. tool offset value in the control offset page
- _____ 5. When machining a part, spot-facing a hole ensures the surface around the hole is:
- a. elevated.
 - b. flat.
 - c. higher than the surface around the top.
 - d. lower than the surface around the top.

- _____ 6. The best way to turn short, steep tapers on a lathe is to use the:
- a. compound.
 - b. guide bar.
 - c. power feed.
 - d. tail stock.
- _____ 7. What is the included angle on metric threads?
- a. 14.5°
 - b. 29°
 - c. 45°
 - d. 60°
- _____ 8. What is used to cut a snap-ring groove at the mid-point of a long shaft?
- a. counter weight
 - b. lathe dog
 - c. steady rest
 - d. taper attachment
- _____ 9. What is used to square or align a vise jaw within a tolerance of 0.001”?
- a. combination square
 - b. dial indicator
 - c. drill
 - d. edge finder
- _____ 10. Tool length offsets are related to which axis on a CNC milling machine?
- a. A
 - b. X
 - c. Y
 - d. Z

Sample Questions — Key

1. Which instruments are used to check the concentricity of a part on a surface plate?
 - a. height gage and angle plate Wrong, but plausible
 - b. sine bar and indicator Wrong, but plausible
 - c. V-blocks and indicator Correct
 - d. V-blocks and micrometer Wrong, but plausible
2. When drilling blind holes, unless otherwise specified, the hole depth measurement is taken from what part of the drill bit?
 - a. drill flats Correct
 - b. drill point Wrong, but plausible
 - c. tang Wrong, but plausible
 - d. web Wrong, but plausible
3. Which is used to countersink for a flat-head screw?
 - a. 35° countersink Wrong, but plausible
 - b. 41° countersink Wrong, but plausible
 - c. 50° countersink Wrong, but plausible
 - d. 82° countersink Correct
4. A program is written to use cutter compensation to contour the outside of a part. A smaller diameter cutting tool is substituted for the tool originally used for the job. What needs to be changed for the part to be machined correctly?
 - a. both tool value in the control offset page and program Wrong, but plausible
 - b. program Wrong, but plausible
 - c. spindle speed Wrong, but plausible
 - d. tool offset value in the control offset page Correct
5. When machining a part, spot-facing a hole ensures the surface around the hole is:
 - a. elevated. Wrong, but plausible
 - b. flat. Correct
 - c. higher than the surface around the top. Wrong, but plausible
 - d. lower than the surface around the top. Wrong, but plausible

6. The best way to turn short, steep tapers on a lathe is to use the:

- a. compound. Correct
- b. guide bar. Wrong, but plausible
- c. power feed. Wrong, but plausible
- d. tail stock. Wrong, but plausible

7. What is the included angle on metric threads?

- a. 14.5° Wrong, but plausible
- b. 29° Wrong, but plausible
- c. 45° Wrong, but plausible
- d. 60° Correct

8. What is used to cut a snap-ring groove at the mid-point of a long shaft?

- a. counter weight Wrong, but plausible
- b. lathe dog Wrong, but plausible
- c. steady rest Correct
- d. taper attachment Wrong, but plausible

9. What is used to square or align a vise jaw within a tolerance of 0.001”?

- a. combination square Wrong, but plausible
- b. dial indicator Correct
- c. drill Wrong, but plausible
- d. edge finder Wrong, but plausible

10. Tool length offsets are related to which axis on a CNC milling machine?

- a. A Wrong, but plausible
- b. X Wrong, but plausible
- c. Y Wrong, but plausible
- d. Z Correct

Abbreviations, Symbols and Acronyms

When abbreviations, symbols or acronyms are more commonly used in written and verbal communications within the machining industry than the words they represent, they will also be used on the written examination required for competency. The following is a list of abbreviations, symbols and acronyms used on the machining examinations.

°	Degrees
"	Inches
%	Percent
+/-	Plus or minus
Ø	Diameter
ACLU	American Civil Liberties Union
cm ³	cubic centimeters
CNC	Computer Controlled Cutting
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GD & T	Geometric Dimensioning and Tolerancing
HSS	high-speed steel
in	inches
in ²	square inches
IPM	inches per minute
ISO	International Organization for Standardization
MDI	manual data input
mm	millimeter
mm ²	square millimeter
OSHA	Occupational Safety and Health Administration
NPT	national pipe thread taper
RPM	revolutions per minute
SDS	Safety Data Sheet
SFM	surface feet per minute
TPF	taper per foot
UNC	unified coarse
VMC	vertical machining center

Test Taking Strategies

This section of the study guide contains valuable information for testing success and provides a common-sense approach for preparing for and performing well on any test.

General Testing Advice

1. Get a good night's rest the night before the test — eight hours of sleep is recommended.
2. Avoid junk food and “eat right” several days before the test.
3. Do not drink a lot or eat a large meal prior to testing.
4. Be confident in your knowledge and skills!
5. Relax and try to ignore distractions during the test.
6. Focus on the task at hand — taking the test and doing your best!
7. Listen carefully to the instructions provided by the exam proctor. If the instructions are not clear, ask for clarification.

Testing Tips

1. Read the entire question before attempting to answer it.
2. Try to answer the question before reading the choices. Then, read the choices to determine if one matches, or is similar, to your answer.
3. Do not change your answer unless you misread the question or are certain that your first answer is incorrect.
4. Answer questions you know first, so you can spend additional time on the more difficult questions.
5. Check to make sure you have answered every question before you submit the assessment for scoring — unanswered questions are marked incorrect.

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