

**Benchmarks – Indicators -- Mapping  
Metals II**

1. **Review the Introduction to metalworking. (I, II, III, IV, V, VI, VII)** (January) **CE, GE, CS, LS**
  - A. List the occupations associated with metalworking. **(ws, wt)**
  - B. List the possible educational requirements for a career in metalworking. **(ws, wt)**
  - C. List the possible skills needed for a career in metalworking. **(ws, wt)**
  - D. List, explain, and demonstrate safety in metalworking. **(ws, wt, pt, to)**
  
2. **Understand, explain, and demonstrate care of equipment. (I, II, VI)**  
(January/February/March/April/May) **CS, HOTS, LS**
  - A. Understand, explain, and demonstrate the use of oils and cutting fluids. **(ws, wt, pt)**
  - B. Understand, explain, and demonstrate the use of belts. **(ws, wt, pt)**
  - C. Understand, explain, and demonstrate the care of boring tools and sharpening. **(ws, wt, pt)**
  - D. Understand, explain, and demonstrate the care of cutting tools and sharpening. **(ws, wt, pt)**
  - E. Understand, explain, and demonstrate the care of grinding tools and grinding stones. **(ws, wt, pt)**
  - F. Understand, explain, and demonstrate the care of welders and welding equipment. **(ws, wt, pt)**
  - G. Understand, explain, and demonstrate the care of oxy/acetylene stations. **(ws, wt, pt)**
  - H. Understand, explain, and demonstrate the care of the metal lathe. **(ws, wt, pt)**
  - I. Understand, explain, and demonstrate the care of the foundry and forge equipment. **(ws, wt, pt)**
  
3. **Understand, explain, and demonstrate the foundry. (I, II, III, IV, V, VI)**  
(February/March/April/May) **CS, HOTS, LS**
  - A. Explain and demonstrate the making and use of molds and molding. **(ws, wt, pt)**
  - B. Explain and demonstrate the process of casting a product with aluminum. **(ws, wt, pt)**
  - C. Explain and demonstrate the process of finishing and inspecting a casting product. **(pt)**
  
4. **Understand, explain and demonstrate advanced sheet metal working. (I, II, III, IV, VI)**  
(February/March/April/May) **CS, HOTS, LS**
  - A. Design an advanced project that utilizes at least one drawer. **(pt)**
  - B. Layout and cutout the product pieces. **(pt)**
  - C. Assemble the product pieces. **(pt)**
  - D. Add any hardware. **(pt)**
  - E. Finish and inspect the final product. **(pt)**

**Infused Areas**

**CE = career education**  
**GE = global education**  
**CS = communication skills**  
**HOTS = higher order thinking skills**  
**MCGF = multicultural gender fair**  
**LS = learning skills**  
**TI = technology integration**

**Assessments**

**ws = worksheet**  
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## Metals II (continued)

5. **Explain and demonstrate the lathe and lathing operations. (I, II, III, IV, V, VI)**  
(February/March/April/May) **CS, HOTS, LS**
- A. Understand and explain why the lathe is important. **(ws, wt)**
  - B. Understand and explain what type of person runs a lathe. **(ws, wt)**
  - C. Understand and point out the lathe and its parts. **(ws, wt, pt)**
  - D. Understand and explain lathe size ranges. **(ws, wt)**
  - E. Understand, explain, and demonstrate oiling the lathe. **(ws, wt, pt)**
  - F. Explain and demonstrate cutting speeds and RPM. **(ws, wt, pt)**
  - G. Explain and demonstrate carriage feed, depth of cut, and the threading mechanism. **(ws, wt, pt)**
  - H. Explain and demonstrate the lathe chucks. **(ws, wt, pt)**
  - I. Explain and demonstrate lathe cutting tools. **(ws, wt, pt)**
  - J. Explain and demonstrate lathe tool holders. **(ws, wt, pt)**
  - K. Explain and demonstrate setting the cutting tool. **(ws, wt, pt)**
  - L. Explain and demonstrate facing. **(ws, wt, pt)**
  - M. Explain and demonstrate centerdrilling. **(ws, wt, pt)**
  - N. Explain and demonstrate lathe centers and setover screws. **(ws, wt, pt)**
  - O. Explain and demonstrate lathe dogs. **(ws, wt, pt)**
  - P. Explain and demonstrate straight turning. **(ws, wt, pt)**
  - Q. Explain and demonstrate taper turning. **(ws, wt, pt)**
  - R. Explain and demonstrate boring in a lathe. **(ws, wt, pt)**
  - S. Explain and demonstrate knurling. **(ws, wt, pt)**
  - T. Explain and demonstrate mounting work on a mandrel. **(ws, wt, pt)**
  - U. Explain and demonstrate using a cutoff tool. **(ws, wt, pt)**
  - V. Explain and demonstrate cutting threads on a lathe. **(ws, wt, pt)**
  - W. Produce a ball peen hammer using the lathe. **(pt)**

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## Metals II (continued)

### 6. Explain threads. (I, II, III, IV, V, VI) (April/May) CS, LS

- A. Explain screw threads. (ws, wt)
- B. Explain right-hand and left-hand threads. (ws, wt)
- C. Explain single, double, triple, and quadruple threads. (ws, wt)
- D. Explain the major diameter of a thread. (ws, wt)
- E. Explain the minor diameter of a thread. (ws, wt)
- F. Explain thread depth. (ws, wt)
- G. Explain double depth of a thread. (ws, wt)
- H. Explain pitch diameter. (ws, wt)
- I. Explain and demonstrate how to find number of threads per inch with a steel rule. (ws, wt, pt)
- J. Explain and demonstrate how to find the number of threads per inch with a screw-pitch gage. (ws, wt, pt)
- K. Explain the pitch of thread. (ws, wt)
- L. Explain the lead of thread. (ws, wt)
- M. Explain a sharp V-thread. (ws, wt)
- N. Explain the United States form thread. (ws, wt)
- O. Explain the American (national) standard screw thread. (ws, wt)
- P. Explain the fits of threads. (ws, wt)
- Q. Explain the Unified (national) form thread. (ws, wt)
- R. Explain a square thread. (ws, wt)
- S. Explain an acme thread. (ws, wt)

### 7. Explain and demonstrate Threading Dies and threading. (I, II, III, IV, V, VI) (April/May) CS, LS

- A. Explain what a threading die is. (ws, wt)
- B. Explain and demonstrate using right and left hand threading dies. (ws, wt, pt)
- C. Explain the various sizes of dies. (ws, wt)
- D. Explain and use a collet and guide. (ws, wt, pt)
- E. Explain and use a diestock. (ws, wt, pt)
- F. Demonstrate how to thread with a stock and die. (pt)
- G. Explain and use cutting fluids for threading. (ws, wt, pt)
- H. Explain and demonstrate proper external thread measurement. (ws, wt, pt)

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## Metals II (continued)

7. **Explain and demonstrate taps and tapping (I, II, III, IV, V, VI) (April/May) CS, LS**
- A. Explain what a tap is. (ws, wt)
  - B. Explain right-hand and left-hand taps. (ws, wt)
  - C. Explain the sizes of taps. (ws, wt)
  - D. Explain and demonstrate tap drills. (ws, wt, pt)
  - E. Explain and demonstrate tapping. (ws, wt, pt)
  - F. Explain changing taps to prevent breakage. (ws, wt, pt)
  - G. Explain how to tap a blind hole. (ws, wt)
  - H. Explain and use cutting fluids for tapping. (ws, wt, pt)
  - I. Explain the various causes for broken taps. (ws, wt)
  - J. Explain how to remove a broken tap from a hole. (ws, wt)
  - K. Explain how to remove a broken bolt from a hole. (ws, wt)
  - L. Explain the tap size limits. (ws, wt)
  - M. Explain internal thread measurement. (ws, wt)
8. **Demonstrate the processes for producing a metal project with welding techniques. (I, II, III, IV, V, VI) (February/March/April/May) CS, HOTS, LS**
- A. Demonstrate the proper design and drawing of a metal project that requires welding to produce. (pt)
  - B. Demonstrate the proper layout and cutting of pieces for the project. (pt)
  - C. Demonstrate the proper assembling of pieces utilizing the various welding methods. (pt)
  - D. Demonstrate the proper finishing techniques. (pt)
  - E. Complete a product evaluation. (to)

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**Resources:** Handouts, tests, welders and equipment, oxy/acetylene equipment, metal band saw, metal, round plastic lathe stock, lathe, tap and die set, micrometer, lathe cutters, cutting oil, sheet metal, sheet metal equipment and tools, spot welder, sheet metal hardware, aluminum, foundry, material for forms, foundry equipment and tools and supplies.