

MILL REVIEW

1. Define *milling* in your own words and differentiate it from *drilling*.
2. What type of manual milling machines do we have in the lab? How many axes of motion do they have? Which axis is aligned with the spindle axis?
 - A.
 - B.
 - C.
3. From what type of material are the milling cutters and drills used in lab made?
4. What is the purpose of an edge finder? What are the two mechanical types used in lab?

purpose of edge finder:
two mechanical types used in lab: ***cylindrical and conical***
5. List the *cutting tool* sequence used to create a #10 threaded hole in an aluminum workpiece on a manual milling machine (assume the machine is already in position to commence drilling).
 - 1.
 - 2.
 - 3.
6. What is the limiting factor (not the 0.100" limit) for how deep you can cut per pass with an endmill in a particular material (assuming sufficient tool strength and flute length)?

machine stiffness, cutting tool stiffness and/or workpiece stiffness
7. List one physical (not functional) difference between endmills and drill bits.
8. TRUE / FALSE: Drill bits can only cut with their ends (or "lips") whereas endmills can cut with both their ends and their sides?
9. List one physical difference and one functional difference between drill bits and reamers. For what type of applications are reamers used instead of drill bits?

physical difference:

functional difference:

when are reamers used:
10. What is the purpose of a tap handle and a tap guide (be specific about each)?

FASTENERS & THREADING REVIEW

1. Why are center drills used, and what is physically different about them compared to other drills?
2. What is the purpose of a tap drill (i.e. when is it used)? Is it physically different than any other drill? Why is its size important?
3. What is the purpose of a clearance drill (i.e. when is it used)? Is it physically different than any other drill?
4. What is the purpose of a countersink?
5. What type of internal thread is better for softer materials and why? Discuss minor thread diameter and cross sectional thread area in your answer.
6. TRUE / FALSE: Bolt holes are always clearance holes?
7. Once working in industry, if upon receipt or review of a detail drawing, what should you do if you see a thread note that is not listed on the thread chart?
 - A. smack your co-worker
 - B. talk to the designer about the mistake
8. Why is it important to only specify the exact thread sizes listed on a thread chart?
 - A. so you don't have to smack your co-worker
 - B. because these are the only options
9. How many TPI (threads per inch) do 1/4" UNC and UNF fasteners have? What is the thread pitch for M10 coarse and fine fasteners?

TPI for 1/4" UNC fasteners:	M10 coarse thread pitch (mm):
TPI for 1/4" UNF fasteners:	M10 fine thread pitch (mm):
10. List the correct hole note for specifying one 3/8" threaded hole 1" deep in an aluminum workpiece. Repeat for three 10mm threaded holes thru a steel workpiece.

APPLICATION QUESTIONS

1. What is the quickest way to drill one accurate hole through the center of a cylindrical workpiece?
2. Explain how you would drill an accurate bolt pattern (rectangular or polar) into a part using a manual machine. What type of machine would you use and what feature(s) of this machine allow it to locate holes accurately?
3. Since a material's machinability (its ability to be quickly and easily machined) strongly affects part manufacturing cost, how should engineers select materials for their designs?
4. Since a material's machinability and strength are inversely related, should good design engineers select the strongest material that fits the budget requirement or the weakest material that meets the strength requirement?
5. If very small tools are less productive (i.e. they remove material slower because of their reduced size and strength) how should engineers design cost effective part features with regard to the tool size(s) required to produce them?
6. Assuming comparable precision and accuracy, what are the two general categories of parts for which CNC machines are better suited than manual machines?
 - 1.
 - 2.
7. What are two mistakes that can cause dial calipers to measure incorrectly?
 - 1.
 - 2.
8. What is the typical tolerance range for features machined on milling machines and lathes?

A. $\pm 0.0001''$ to $\pm 0.0005''$	C. $\pm 0.005''$ to $\pm 0.020''$
B. $\pm 0.001''$ to $\pm 0.005''$	D. $\pm 0.050''$ to $\pm 0.100''$
9. What do the following acronyms and abbreviations stand for?

1. I.D. =	3. D.R.O. =
2. O.D. =	4. "thou" =