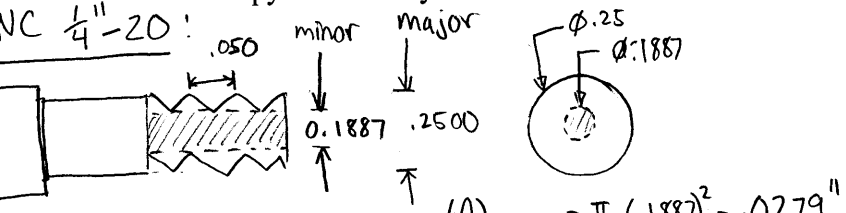
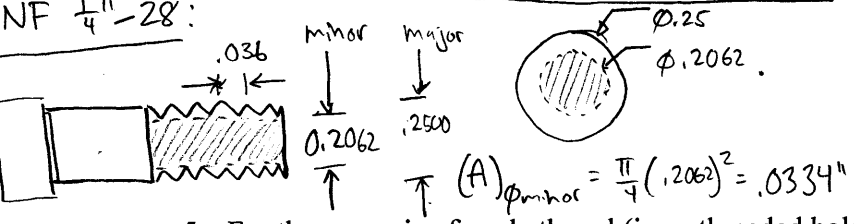
4. For the same size fastener, is a coarse thread (UNC) stronger than a fine thread (UNF)? *Most fasteners are made from high strength alloy steels with threads that are rolled after heat treatment to obtain the strength required to function effectively. Typical fastener failures occur under excessive tensile load by breaking at the minor diameter (since this is the weakest area of the fastener's geometry). Therefore, whichever thread has the larger minor diameter will be stronger.* For each case (UNC & UNF) draw a cross section of the threaded fastener, dimension the major and minor thread diameters with actual values off the tap table and highlight the area of the fastener that would fail. Use these illustrations to answer the original question by explaining which fastener has a greater cross sectional area. Answer in your own words; do not copy an answer you don't understand out of the notes.

UNC $\frac{1}{4}$"-20:



$(A)_{\phi minor} = \frac{\pi}{4}(.1887)^2 = .0279"$

UNF $\frac{1}{4}$"-28:



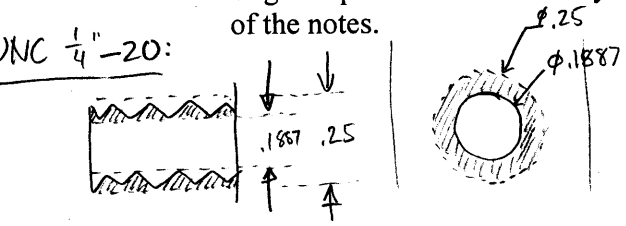
$(A)_{\phi minor} = \frac{\pi}{4}(.2062)^2 = .0334"$

When comparing UNC and UNF fasteners of the same size and material, UNF fasteners will have a greater minor diameter thus having a greater cross sectional area of the weakest area of bolt. This allows the shear area of the minor dia to withstand greater loads and stresses than a smaller dia UNC bolt.

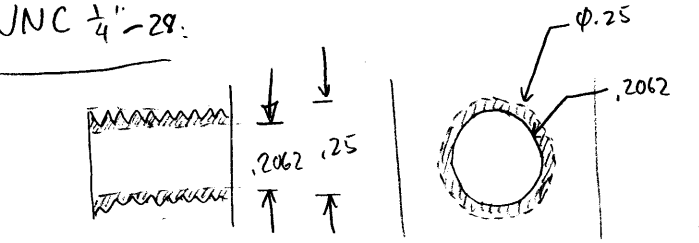
Very good

5. For the same size female thread (i.e. a threaded hole) in a soft material like aluminum, is a coarse thread (UNC) stronger than a fine thread (UNF)? Assume the same number of engaged threads. *Typical female thread failures occur under excessive tensile load by shearing the cross-sectional area (CSA) of the threads at the major thread diameter. Therefore, whichever thread has the smaller minor diameter will have greater shear area and thus be stronger.* For each case (UNC & UNF) draw a cross section of the thread, dimension the major and tap drill thread diameters with the correct values off the tap table and highlight the area where the failure would occur. Also show which thread has greater cross-sectional area. Use these illustrations to answer the original question. Answer in your own words; do not copy an answer you don't understand out of the notes.

UNC $\frac{1}{4}$"-20:



UNC $\frac{1}{4}$"-28:



For female threads, UNC threads will be stronger because there is more area engaged by the bolt and threads. This is because the UNF's larger minor diameter cause the C.S.A. of the threads to be less, thus being weaker.

Very good

6. [pp.42-43] How are the threads on most commercial fasteners made and why are they made this way? ***Hint: they are not cut on a lathe because that would create stress risers which result in weak threads that fail prematurely.***

Thread rolling process. This process hardens the threads similar to forging. The result is strength and resistance to fatigue.