1. Given:
   - Side Edge cutting angle (degrees) and
   - Feed (mm/rev)

Calculate:
   - uncut chip thickness (mm)

Given:
side edge angle 10 degrees 0.174533 radians
feed 3 mm/rev

Calculate:
uncut chip thickness 2.954423 mm
2. Given:
   - Uncut chip thickness (mm),
   - Chip thickness (mm), and
   - Rake angle (degrees)

Calculate:
   - Shear angle (degrees)

Given:
Uncut chip thickness 12 mm
Chip thickness 15 mm
Rake angle 10 degrees 0.174533 radians

Intermediate:

\[ r = 0.8 \]
\[ \tan(\text{shear angle}) = 0.91495 \]
\[ \text{shear angle} = 0.741013 \text{ radians} \]

Calculate:
Shear angle 42.45694 degrees
3. Given:
   - Friction Force and
   - Normal Force

Calculate

   - Friction angle (degrees)

Given:
Friction Force  200 pounds
Normal Force 275 pounds

Calculate:
Friction angle 0.628796 radians  36.02737 degrees
4. **Given:**
   - Rake angle (degrees),
   - Shear angle (degrees),
   - Uncut chip thickness (in),
   - Cutting force (lbs),
   - Thrust force (lbs),

**Calculate:**

- Dynamic shear stress (psi)

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**Given:**
- Rake angle: 10 degrees, 0.174533 radians
- Shear angle: 15 degrees, 0.261799 radians
- Uncut chip thickness: 0.3 in
- Cutting force: 250 lbs
- Thrust force: 150 lbs
- Width of cut: 0.2 in

**Intermediate:**
- Area: 0.231822 square inch
- Fs: 202.6586 lbs

**Calculate:**
- Dynamic shear stress: 874.1984 psi
Given:

Original diameter 1 in
Final diameter 0.75 in
Feed 0.3 in/rev
Spindle speed 5000 rpm

Intermediate:

DoC 0.25 in
V 981.7477 fpm

Calculate:

Material removal rate 883.5729 (in^3)/minute
6. Given: (for a turning operation with no tailstock)
   - Original Diameter (in)
   - Depth of cut (in)
   - Total cutting force (lbs-ft)
   - Workpiece elastic modulus

   Calculate:
   - Final diameter of the part as a function of distance from the chuck

<table>
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<th>Distance (in)</th>
<th>Final Diameter</th>
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<tr>
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<tr>
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</table>
7. Given:
   - Original Diameter (in)
   - Final Diameter (in)
   - Spindle Speed (rpm)

Calculate:
   - Surface Speed at the cutting edge of the tool (sfm)

Given:
Original Diameter 1 in
Final diameter 0.75 in
Spindle speed 6000 rpm

Calculate:
Surface Speed (at cutting edge) 1374.447 sfm
Given:
- Clamping force 7000 N
- Friction coefficient between chuck jaws and part 0.8 unitless
- Spindle speed 4000 rpm
- Mass of Chuck Jaws 0.5 kg
- Diameter of Workpiece 125 mm or 0.125 m

Intermediate:
- \( v \) 1570.796327 m/min or 26.17994 m/sec
- \( a \) 10966.22711 m/sec^2
- \( F_a \) 5483.113556 N
- \( F_n \) 1516.886444 N

Calculate:
- \( F_{c_{\text{max}}} \) 1213.509155
9. Given
   - Measured Power to the spindle
   - Spindle type
   - Measured thrust force
   - Surface Speed
   - Rake angle

   Calculate

   - Friction coefficient

Given:
Measured Power to the spindle 40 horsepower
Efficiency of Spindle type 0.9 unitless
Measured thrust force 70 lbs
Surface Speed 597 sfm
Rake angle 15 degrees

Intermediate:
Efficient power 1188000 in*lbs/min
Calculated cutting force 165.829 lbs
Rake angle 0.2618 radians

Calculate:
Friction coefficient 0.77808 unitless
10. Given:
   - Clamping force
   - Dimensions of stock material
   - Material's elastic modulus
   - Dimensions of a rectangular pocket to be machined through the part

Calculate
   - Dimensions of the finished pocket after the part is released from the fixture.

Given:
- Clamping Force: 140 lbs
- Stock Width (original): 3 in
- Stock Length (original): 3 in
- Stock Height (original): 0.75 in
- Material's elastic modulus: 10.4 Mpsi
- Pocket Width (during cut): 1.5 in
- Pocket Length (during cut): 1 in

Calculate:
- Pocket Width (final): 1.500009 in
- Pocket Length (final): 1 in