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Geometry of Turning Process Formulas

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List of 10 Geometry of Turning Process Formulas

Geometry of Turning Process ↗

1) Back Rake Angle for Orthogonal Cutting ↗

$$fx \quad \alpha_b = a \tan(\tan(\alpha_s) \cdot \tan(\Psi_s))$$

[Open Calculator ↗](#)

$$ex \quad 33.34737^\circ = a \tan(\tan(10^\circ) \cdot \tan(75^\circ))$$

2) Cutting Speed ↗

$$fx \quad V_{\text{cutting}} = \pi \cdot d \cdot N$$

[Open Calculator ↗](#)

$$ex \quad 0.032463 \text{m/s} = \pi \cdot 31 \text{mm} \cdot 20 \text{r/min}$$

3) Feed Force ↗

$$fx \quad F_f = P_{\text{axial}} \cdot \cos(\Psi_s)$$

[Open Calculator ↗](#)

$$ex \quad 388.2286 \text{N} = 1500 \text{N} \cdot \cos(75^\circ)$$

4) Initial Diameter of Job in Turning ↗

$$fx \quad d = \frac{V_{\text{cutting}}}{\pi \cdot N}$$

[Open Calculator ↗](#)

$$ex \quad 63693.81 \text{mm} = \frac{66.7 \text{m/s}}{\pi \cdot 20 \text{r/min}}$$



5) Machine Feed ↗

$$fx \quad f = \frac{t_1}{\cos(\Psi_s)}$$

[Open Calculator ↗](#)

$$ex \quad 4.636444\text{mm}/1 = \frac{1.20\text{mm}}{\cos(75^\circ)}$$

6) Number of Jobs Revolution per Unit Time ↗

$$fx \quad N = \frac{V_{\text{cutting}}}{\pi \cdot d}$$

[Open Calculator ↗](#)

$$ex \quad 41092.78\text{r/min} = \frac{66.7\text{m/s}}{\pi \cdot 31\text{mm}}$$

7) Radial Force ↗

$$fx \quad F_B = P_{\text{axial}} \cdot \sin(\Psi_s)$$

[Open Calculator ↗](#)

$$ex \quad 1448.889\text{N} = 1500\text{N} \cdot \sin(75^\circ)$$

8) Side Cutting Edge Angle for Orthogonal Cutting ↗

$$fx \quad \Psi_s = a \cos\left(\frac{d_{\text{cut}}}{\omega}\right)$$

[Open Calculator ↗](#)

$$ex \quad 89.62757^\circ = a \cos\left(\frac{13\text{mm}}{2\text{rad/s}}\right)$$



9) Side Rake Angle for Orthogonal Cutting ↗

fx $\alpha_s = a \tan \left(\frac{\tan(\alpha_b) \cdot \cos(\Psi_s)}{\sin(\Psi_s)} \right)$

[Open Calculator ↗](#)

ex $33.55224^\circ = a \tan \left(\frac{\tan(68^\circ) \cdot \cos(75^\circ)}{\sin(75^\circ)} \right)$

10) Uncut Chip Thickness ↗

fx $t_1 = F_{\text{cutter}} \cdot \cos(\Psi_s)$

[Open Calculator ↗](#)

ex $3.105829\text{mm} = 12\text{mm} \cdot \cos(75^\circ)$

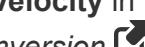


Variables Used

- d Diameter of Rod (*Millimeter*)
- d_{cut} Depth of Cut (*Millimeter*)
- f Feed Rate (*Millimeter Per Revolution*)
- F_B Corresponding Radial Force Required at Each Ball (*Newton*)
- F_{cutter} Feed (*Millimeter*)
- F_f Feed Force (*Newton*)
- N Number of Jobs Revolutions (*Revolution per Minute*)
- P_{axial} Axial Thrust (*Newton*)
- t_1 Uncut Chip Thickness (*Millimeter*)
- V_{cutting} Cutting Speed (*Meter per Second*)
- α_b Back Rake Angle (*Degree*)
- α_s Side Rake Angle (*Degree*)
- Ψ_s Side Cutting Edge Angle (*Degree*)
- ω Angular Velocity (*Radian per Second*)



Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **acos**, $\text{acos}(\text{Number})$
Inverse trigonometric cosine function
- **Function:** **atan**, $\text{atan}(\text{Number})$
Inverse trigonometric tangent function
- **Function:** **cos**, $\text{cos}(\text{Angle})$
Trigonometric cosine function
- **Function:** **sin**, $\text{sin}(\text{Angle})$
Trigonometric sine function
- **Function:** **tan**, $\text{tan}(\text{Angle})$
Trigonometric tangent function
- **Measurement:** **Length** in Millimeter (mm)
Length Unit Conversion 
- **Measurement:** **Speed** in Meter per Second (m/s)
Speed Unit Conversion 
- **Measurement:** **Force** in Newton (N)
Force Unit Conversion 
- **Measurement:** **Angle** in Degree ($^{\circ}$)
Angle Unit Conversion 
- **Measurement:** **Frequency** in Revolution per Minute (r/min)
Frequency Unit Conversion 
- **Measurement:** **Angular Velocity** in Radian per Second (rad/s)
Angular Velocity Unit Conversion 
- **Measurement:** **Feed** in Millimeter Per Revolution (mm/1)
Feed Unit Conversion 



Check other formula lists

- **Geometry of Turning Process Formulas** ↗
- **Metal Cutting and Tools Formulas** ↗
- **Merchant Force Circle (Mechanics of Orthogonal metal cutting)**

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