



[calculatoratoz.com](http://calculatoratoz.com)



[unitsconverters.com](http://unitsconverters.com)

# Turning Operation Formulas

Calculators!

Examples!

Conversions!

Bookmark [calculatoratoz.com](http://calculatoratoz.com), [unitsconverters.com](http://unitsconverters.com)

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**

Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**

Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

[Please leave your feedback here...](#)



# List of 17 Turning Operation Formulas

## Turning Operation

### 1) Basic Setup time given Non-productive Time in Turning

$$fx \quad t_s = (NPT - t_{ln} - (t_{pt} \cdot n_0)) \cdot N_b - (N_t \cdot t_{st})$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b\_img.jpg\)](#)

$$ex \quad 20.507min = (28.169min - 30s - (1.50min \cdot 5)) \cdot 3 - (4 \cdot 10min)$$

### 2) Batch Size given Non-productive Time in Turning

$$fx \quad N_b = \frac{t_s + N_t \cdot t_{st}}{(NPT - t_{ln} - (t_{pt} \cdot n_0))}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d\_img.jpg\)](#)

$$ex \quad 2.999653 = \frac{20.50min + 4 \cdot 10min}{(28.169min - 30s - (1.50min \cdot 5))}$$

### 3) Constant for given Cylindrical Turning

$$fx \quad K = \pi \cdot d \cdot \frac{L_{cut}}{f}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d\_img.jpg\)](#)

$$ex \quad 2393.894mm = \pi \cdot 76.20mm \cdot \frac{9mm}{0.9mm}$$



#### 4) Diameter of Turned Parts given Length-to-Diameter Ratio

[Open Calculator !\[\]\(4729e517bc6a7cd81c8025b9646574fb\_img.jpg\)](#)

$$\text{fx } d = \left( \frac{1.67}{l_r} \right)^{\frac{1}{0.68}}$$

$$\text{ex } 76.36711\text{mm} = \left( \frac{1.67}{0.79} \right)^{\frac{1}{0.68}}$$

#### 5) Diameter of Workpiece given Constant for Cylindrical Turning

[Open Calculator !\[\]\(e474458956c9a37fbf9586ddb60a7fa1\_img.jpg\)](#)

$$\text{fx } d = K \cdot \frac{f}{\pi \cdot L_{\text{cut}}}$$

$$\text{ex } 76.20001\text{mm} = 2393.894\text{mm} \cdot \frac{0.9\text{mm}}{\pi \cdot 9\text{mm}}$$

#### 6) Feed given Constant for Cylindrical Turning

[Open Calculator !\[\]\(4fe57c3593bf1b21d272ae7ac8dfaf77\_img.jpg\)](#)

$$\text{fx } f = \pi \cdot d \cdot \frac{L_{\text{cut}}}{K}$$

$$\text{ex } 0.9\text{mm} = \pi \cdot 76.20\text{mm} \cdot \frac{9\text{mm}}{2393.894\text{mm}}$$

#### 7) Feed Rate for Turning Operation given Machining Time

[Open Calculator !\[\]\(2bae76de5ebbd5c4d7d47162f1673734\_img.jpg\)](#)

$$\text{fx } f_r = \frac{L_{\text{cut}}}{t_m \cdot \omega}$$

$$\text{ex } 0.716197\text{mm/rev} = \frac{9\text{mm}}{0.6\text{s} \cdot 200\text{rev/min}}$$



## 8) Length of Cut using Machining Time

$$fx \quad L_w = f_r \cdot t_m \cdot \omega_w$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95\_img.jpg\)](#)

$$ex \quad 26165.63\text{mm} = 0.7\text{mm/rev} \cdot 62.6224\text{min} \cdot 95\text{rev/min}$$

## 9) Length-to-diameter Ratio given diameter of turned parts

$$fx \quad l_r = \frac{1.67}{d^{0.68}}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2\_img.jpg\)](#)

$$ex \quad 0.791178 = \frac{1.67}{(76.20\text{mm})^{0.68}}$$

## 10) Loading and Unloading Time given Non-productive Time in Turning

$$fx \quad t_{ln} = \text{NPT} - \left( \frac{t_s + N_t \cdot t_{st}}{N_b} \right) - (t_{pt} \cdot n_0)$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7\_img.jpg\)](#)

$$ex \quad 30.14\text{s} = 28.169\text{min} - \left( \frac{20.50\text{min} + 4 \cdot 10\text{min}}{3} \right) - (1.50\text{min} \cdot 5)$$

## 11) Machining Time for Turning Operation

$$fx \quad t_m = \frac{L_{cut}}{f_r \cdot \omega}$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b\_img.jpg\)](#)

$$ex \quad 0.613883\text{s} = \frac{9\text{mm}}{0.7\text{mm/rev} \cdot 200\text{rev/min}}$$



## 12) Non-Productive Time in Turning

$$fx \quad NPT = \left( \frac{t_s + N_t \cdot t_{st}}{N_b} \right) + t_{ln} + (t_{pt} \cdot n_0)$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a\_img.jpg\)](#)

$$ex \quad 28.16667min = \left( \frac{20.50min + 4 \cdot 10min}{3} \right) + 30s + (1.50min \cdot 5)$$

## 13) Number of Operations given Non-productive Time in Turning

$$fx \quad n_0 = \frac{NPT - \left( \frac{t_s + N_t \cdot t_{st}}{N_b} \right) - t_{ln}}{t_{pt}}$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021\_img.jpg\)](#)

$$ex \quad 5.001556 = \frac{28.169min - \left( \frac{20.50min + 4 \cdot 10min}{3} \right) - 30s}{1.50min}$$

## 14) Number of Tools given Non-Productive Time in Turning

$$fx \quad N_t = \frac{(NPT - t_{ln} - (t_{pt} \cdot n_0)) \cdot N_b - t_s}{t_{st}}$$

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd\_img.jpg\)](#)

$$ex \quad 4.0007 = \frac{(28.169min - 30s - (1.50min \cdot 5)) \cdot 3 - 20.50min}{10min}$$



### 15) Set-up Time per Tool Terms of Non-Productive Time in Turning

$$fx \quad t_{st} = \frac{(NPT - t_{ln} - (t_{pt} \cdot n_0)) \cdot N_b - t_s}{N_t}$$

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0\_img.jpg\)](#)

$$ex \quad 10.00175min = \frac{(28.169min - 30s - (1.50min \cdot 5)) \cdot 3 - 20.50min}{4}$$

### 16) Tool Positioning Time per Operation given Non-Productive Time in Turning

$$fx \quad t_{pt} = \frac{NPT - \left( \frac{t_s + N_t \cdot t_{st}}{N_b} \right) - t_{ln}}{n_0}$$

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5\_img.jpg\)](#)

$$ex \quad 1.500467min = \frac{28.169min - \left( \frac{20.50min + 4 \cdot 10min}{3} \right) - 30s}{5}$$

### 17) Turning Length given Constant for Cylindrical Turning

$$fx \quad L_{cut} = K \cdot \frac{f}{\pi \cdot d}$$

[Open Calculator !\[\]\(ab4e2b3fc7e7887b7a72f548aa6f5e60\_img.jpg\)](#)

$$ex \quad 9.000001mm = 2393.894mm \cdot \frac{0.9mm}{\pi \cdot 76.20mm}$$







## Variables Used

- **d** Diameter of Workpiece (Millimeter)
- **f** Feed (Millimeter)
- **f<sub>r</sub>** Feed Rate (Millimeter Per Revolution)
- **K** Constant For Machining Condition (Millimeter)
- **L<sub>cut</sub>** Length of Cut (Millimeter)
- **l<sub>r</sub>** Length to Diameter Ratio
- **L<sub>w</sub>** Length of Cut in Machining (Millimeter)
- **n<sub>0</sub>** Number of Operations
- **N<sub>b</sub>** Batch Size
- **N<sub>t</sub>** Number of Tools Used
- **NPT** Non-Productive Time (Minute)
- **t<sub>ln</sub>** Loading And Unloading Time (Second)
- **t<sub>m</sub>** Turning Time (Second)
- **t<sub>m</sub><sup>o</sup>** Machining Time in Machining (Minute)
- **t<sub>pt</sub>** Tool Positioning Time Per Operation (Minute)
- **t<sub>s</sub>** Basic Setup Time (Minute)
- **t<sub>st</sub>** Setup Time Per Tool (Minute)
- **ω** Angular Velocity of Job or Workpiece (Revolution per Minute)
- **ω<sub>w</sub>** Rotational Frequency of Workpiece (Revolution per Minute)



## Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288  
*Archimedes' constant*
- **Measurement:** **Length** in Millimeter (mm)  
*Length Unit Conversion* 
- **Measurement:** **Time** in Minute (min), Second (s)  
*Time Unit Conversion* 
- **Measurement:** **Angular Velocity** in Revolution per Minute (rev/min)  
*Angular Velocity Unit Conversion* 
- **Measurement:** **Feed** in Millimeter Per Revolution (mm/rev)  
*Feed Unit Conversion* 





## Check other formula lists

- [Milling Operation Formulas](#) 
- [Turning Operation Formulas](#) 

Feel free to SHARE this document with your friends!

## PDF Available in

[English](#) [Spanish](#) [French](#) [German](#) [Russian](#) [Italian](#) [Portuguese](#) [Polish](#) [Dutch](#)

6/14/2024 | 11:11:50 AM UTC

[Please leave your feedback here...](#)

