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# Fastner Geometry Formulas

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# List of 38 Fastner Geometry Formulas

## Fastner Geometry

### 1) Core Diameter of Bolt

$$fx \quad (d_c') = \frac{P}{\pi \cdot \tau \cdot h_n}$$

Open Calculator 

$$ex \quad 8.500321\text{mm} = \frac{28200\text{N}}{\pi \cdot 120\text{N/mm}^2 \cdot 8.8\text{mm}}$$

### 2) Core Diameter of Bolt given Nominal Diameter

$$fx \quad (d_c') = 0.8 \cdot d_b$$

Open Calculator 

$$ex \quad 8\text{mm} = 0.8 \cdot 10\text{mm}$$

### 3) Core Diameter of Bolt given Pitch

$$fx \quad (d_c') = d_b - (1.22687 \cdot p_b)$$

Open Calculator 

$$ex \quad 8.466412\text{mm} = 10\text{mm} - (1.22687 \cdot 1.25\text{mm})$$



#### 4) Core diameter of Bolt given Tensile Stress

$$\text{fx } (d_c') = \sqrt{4 \cdot \frac{P}{\pi \cdot \sigma_t}}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235\_img.jpg\)](#)

$$\text{ex } 15.73605\text{mm} = \sqrt{4 \cdot \frac{28200\text{N}}{\pi \cdot 145\text{N/mm}^2}}$$

#### 5) Height of Basic Profile of Screw Threads

$$\text{fx } h = 0.640327 \cdot p$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0\_img.jpg\)](#)

$$\text{ex } 2.554905\text{mm} = 0.640327 \cdot 3.99\text{mm}$$

#### 6) Height of Fundamental Triangle of Screw Threads

$$\text{fx } H = 0.960491 \cdot p$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f\_img.jpg\)](#)

$$\text{ex } 3.832359\text{mm} = 0.960491 \cdot 3.99\text{mm}$$

#### 7) Height of Fundamental Triangle of Screw Threads given Minor Diameter of External Thread

$$\text{fx } H = \frac{12}{17} \cdot (d - d_c)$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754\_img.jpg\)](#)

$$\text{ex } 3.465882\text{mm} = \frac{12}{17} \cdot (29.8\text{mm} - 24.89\text{mm})$$



### 8) Height of Fundamental Triangle of Screw Threads given Minor Diameter of Internal Thread

$$fx \quad H = \frac{D - D_c}{1.25}$$

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

$$ex \quad 3.464mm = \frac{30mm - 25.67mm}{1.25}$$

### 9) Height of Fundamental Triangle of Screw Threads given Pitch Diameter of External Thread

$$fx \quad H = \frac{d - d_p}{0.75}$$

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

$$ex \quad 3.466667mm = \frac{29.8mm - 27.2mm}{0.75}$$


### 10) Height of Fundamental Triangle of Screw Threads given Pitch Diameter of Internal Thread

$$fx \quad H = \frac{D - D_p}{0.75}$$

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

$$ex \quad 3.466667mm = \frac{30mm - 27.4mm}{0.75}$$



11) Height of nut 

$$fx \quad h_n = \frac{P}{\pi \cdot \tau \cdot (d_c')}$$

Open Calculator 


$$ex \quad 8.800332\text{mm} = \frac{28200\text{N}}{\pi \cdot 120\text{N/mm}^2 \cdot 8.5\text{mm}}$$

12) Major Diameter of External Thread given Height of Fundamental Triangle 

$$fx \quad d = d_p + (0.75 \cdot H)$$

Open Calculator 


$$ex \quad 29.795\text{mm} = 27.2\text{mm} + (0.75 \cdot 3.46\text{mm})$$

13) Major Diameter of External Thread given Minor Diameter of External Thread 

$$fx \quad d = d_c + \left( \frac{17}{12} \cdot H \right)$$

Open Calculator 

$$ex \quad 29.79167\text{mm} = 24.89\text{mm} + \left( \frac{17}{12} \cdot 3.46\text{mm} \right)$$

14) Major Diameter of External Thread given Pitch and Pitch Diameter of External Thread 

$$fx \quad d = d_p + (0.650 \cdot p)$$

Open Calculator 

$$ex \quad 29.7935\text{mm} = 27.2\text{mm} + (0.650 \cdot 3.99\text{mm})$$



### 15) Major Diameter of Internal Thread given Height of Fundamental triangle

$$fx \quad D = D_c + (1.25 \cdot H)$$

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

$$ex \quad 29.995\text{mm} = 25.67\text{mm} + (1.25 \cdot 3.46\text{mm})$$

### 16) Major Diameter of Internal Thread given Pitch and Minor Diameter of External Thread

$$fx \quad D = d_c + (1.227 \cdot p)$$

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

$$ex \quad 29.78573\text{mm} = 24.89\text{mm} + (1.227 \cdot 3.99\text{mm})$$

### 17) Major Diameter of Internal Thread given Pitch and Minor Diameter of Internal Thread

$$fx \quad D = (1.083 \cdot p) + D_c$$

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

$$ex \quad 29.99117\text{mm} = (1.083 \cdot 3.99\text{mm}) + 25.67\text{mm}$$

### 18) Major Diameter of Internal Thread given Pitch Diameter of Internal Thread

$$fx \quad D = D_p + (0.75 \cdot H)$$

[Open Calculator !\[\]\(5abce1a84a655b073239ab33e1199487\_img.jpg\)](#)

$$ex \quad 29.995\text{mm} = 27.4\text{mm} + (0.75 \cdot 3.46\text{mm})$$



## 19) Minor Diameter of External Thread given Height of Fundamental Triangle

$$\text{fx } d_c = d - \left( \frac{17}{12} \cdot H \right)$$

[Open Calculator !\[\]\(9dfdaff1d86ba3c1f8353b4d1b61b8c5\_img.jpg\)](#)

$$\text{ex } 24.89833\text{mm} = 29.8\text{mm} - \left( \frac{17}{12} \cdot 3.46\text{mm} \right)$$

## 20) Minor Diameter of External Thread given Pitch and Major Diameter of Internal Thread

$$\text{fx } d_c = D - (1.227 \cdot p)$$

[Open Calculator !\[\]\(2b376d1a92330ab09dad2665d2f89bf5\_img.jpg\)](#)

$$\text{ex } 25.10427\text{mm} = 30\text{mm} - (1.227 \cdot 3.99\text{mm})$$

## 21) Minor Diameter of Internal Thread given Height of Fundamental Triangle

$$\text{fx } D_c = D - (1.25 \cdot H)$$

[Open Calculator !\[\]\(c444627dab9fee9a1550c053ffaaaae2\_img.jpg\)](#)

$$\text{ex } 25.675\text{mm} = 30\text{mm} - (1.25 \cdot 3.46\text{mm})$$

## 22) Minor Diameter of Internal Thread given Pitch and Major Diameter of Internal Thread

$$\text{fx } D_c = D - (1.083 \cdot p)$$

[Open Calculator !\[\]\(06a315363e7801bba8c7489a6694af19\_img.jpg\)](#)

$$\text{ex } 25.67883\text{mm} = 30\text{mm} - (1.083 \cdot 3.99\text{mm})$$



### 23) Minor Diameter of Internal Thread given Pitch and Pitch Diameter of Internal Thread

$$\text{fx } D = D_p + (0.650 \cdot p)$$

[Open Calculator !\[\]\(6605b201d6f14d9b3bcb8ab5f274d107\_img.jpg\)](#)

$$\text{ex } 29.9935\text{mm} = 27.4\text{mm} + (0.650 \cdot 3.99\text{mm})$$

### 24) Nominal Diameter of Bolt

$$\text{fx } d_b = (d_c') + (1.22687 \cdot p_b)$$

[Open Calculator !\[\]\(e8fb589d58dad1692debababa5e928b6\_img.jpg\)](#)

$$\text{ex } 10.03359\text{mm} = 8.5\text{mm} + (1.22687 \cdot 1.25\text{mm})$$

### 25) Nominal Diameter of Bolt given Core Diameter

$$\text{fx } d_b = \frac{d_c'}{0.8}$$

[Open Calculator !\[\]\(4688aadfd656ded00cd6bdfae55089a9\_img.jpg\)](#)

$$\text{ex } 10.625\text{mm} = \frac{8.5\text{mm}}{0.8}$$

### 26) Pitch Diameter of External Thread given Height of Fundamental Triangle

$$\text{fx } d_p = d - (0.75 \cdot H)$$

[Open Calculator !\[\]\(4146d17f71dced09c6ad789cacceaa6d\_img.jpg\)](#)

$$\text{ex } 27.205\text{mm} = 29.8\text{mm} - (0.75 \cdot 3.46\text{mm})$$

### 27) Pitch Diameter of External Thread given Pitch

$$\text{fx } d_p = d - (0.650 \cdot p)$$

[Open Calculator !\[\]\(08ff79f060f3543d9ed549cc693d8b98\_img.jpg\)](#)

$$\text{ex } 27.2065\text{mm} = 29.8\text{mm} - (0.650 \cdot 3.99\text{mm})$$





## 28) Pitch Diameter of Internal Thread given Height of Fundamental Triangle

$$\text{fx } D_p = D - (0.75 \cdot H)$$

[Open Calculator !\[\]\(c3d993ca47bfe2a953c700506ce31fa0\_img.jpg\)](#)

$$\text{ex } 27.405\text{mm} = 30\text{mm} - (0.75 \cdot 3.46\text{mm})$$

## 29) Pitch Diameter of Internal Thread given Pitch

$$\text{fx } D_p = D - (0.650 \cdot p)$$

[Open Calculator !\[\]\(17413706fd4997a1a4bdf85c6864eee1\_img.jpg\)](#)

$$\text{ex } 27.4065\text{mm} = 30\text{mm} - (0.650 \cdot 3.99\text{mm})$$

## 30) Pitch of bolt thread

$$\text{fx } p_b = \frac{d_b - (d_c')}{1.22687}$$

[Open Calculator !\[\]\(4b7a79268f6ba26c1471d4232fffa85a\_img.jpg\)](#)

$$\text{ex } 1.222623\text{mm} = \frac{10\text{mm} - 8.5\text{mm}}{1.22687}$$


## 31) Pitch of Screw Threads given Radius of Root

$$\text{fx } p = \frac{r}{0.137329}$$

[Open Calculator !\[\]\(3342c215b2a8b663596a81468d5dc314\_img.jpg\)](#)

$$\text{ex } 2.912713\text{mm} = \frac{0.4\text{mm}}{0.137329}$$



32) Pitch of Threads given Height of Basic Profile 

$$fx \quad p = \frac{h}{0.640327}$$

[Open Calculator !\[\]\(0f848bbd71cef6b345273b16f905912a\_img.jpg\)](#)


$$ex \quad 3.98234mm = \frac{2.55mm}{0.640327}$$

33) Pitch of Threads given Height of Fundamental Triangle 

$$fx \quad p = \frac{H}{0.960491}$$

[Open Calculator !\[\]\(3211b5d1d968fc1665909b34f9f16010\_img.jpg\)](#)


$$ex \quad 3.602324mm = \frac{3.46mm}{0.960491}$$

34) Pitch of Threads given Major Diameter of Internal Thread 

$$fx \quad p = \frac{D - d_c}{1.227}$$

[Open Calculator !\[\]\(9c2e8d1b5bd77cb5c9f83b7a9cff79fd\_img.jpg\)](#)

$$ex \quad 4.164629mm = \frac{30mm - 24.89mm}{1.227}$$

35) Pitch of Threads given Minor Diameter of Internal Thread 

$$fx \quad p = \frac{D - D_c}{1.083}$$

[Open Calculator !\[\]\(235bfe13ebf007ce2eea9e689707fac7\_img.jpg\)](#)

$$ex \quad 3.998153mm = \frac{30mm - 25.67mm}{1.083}$$



**36) Pitch of Threads given Pitch Diameter of External Thread** 

$$\text{fx } p = \frac{d - d_p}{0.650}$$

[Open Calculator](#) 

$$\text{ex } 4\text{mm} = \frac{29.8\text{mm} - 27.2\text{mm}}{0.650}$$

**37) Pitch of Threads given Pitch Diameter of Internal Thread** 

$$\text{fx } p = \frac{D - D_p}{0.650}$$

[Open Calculator](#) 

$$\text{ex } 4\text{mm} = \frac{30\text{mm} - 27.4\text{mm}}{0.650}$$

**38) Radius of Root of Threads** 

$$\text{fx } r = 0.137329 \cdot p$$

[Open Calculator](#) 

$$\text{ex } 0.547943\text{mm} = 0.137329 \cdot 3.99\text{mm}$$






## Variables Used

- **d** Major Diameter of External Thread (*Millimeter*)
- **D** Major Diameter of Internal Thread (*Millimeter*)
- **d<sub>b</sub>** Nominal Diameter of Threaded Bolt (*Millimeter*)
- **d<sub>c</sub>** Minor Diameter of External Thread (*Millimeter*)
- **d<sub>c</sub>'** Core Diameter of Threaded Bolt (*Millimeter*)
- **D<sub>c</sub>** Minor Diameter of Internal Thread (*Millimeter*)
- **d<sub>p</sub>** Pitch Diameter of External Thread (*Millimeter*)
- **D<sub>p</sub>** Pitch Diameter of Internal Thread (*Millimeter*)
- **h** Height of Basic Profile (*Millimeter*)
- **H** Height of Fundamental Triangle (*Millimeter*)
- **h<sub>n</sub>** Height of Nut (*Millimeter*)
- **p** Pitch of Threads (*Millimeter*)
- **P** Tensile Force on Bolt (*Newton*)
- **p<sub>b</sub>** Pitch of Bolt Threads (*Millimeter*)
- **r** Radius of Root of Thread (*Millimeter*)
- **σ<sub>t</sub>** Tensile Stress in Bolt (*Newton per Square Millimeter*)
- **τ** Shear Stress in Bolt (*Newton per Square Millimeter*)



## Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288  
*Archimedes' constant*
- **Function:** **sqrt**, sqrt(Number)  
*A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.*
- **Measurement:** **Length** in Millimeter (mm)  
*Length Unit Conversion* 
- **Measurement:** **Force** in Newton (N)  
*Force Unit Conversion* 
- **Measurement:** **Stress** in Newton per Square Millimeter (N/mm<sup>2</sup>)  
*Stress Unit Conversion* 



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