Important Hypocycloid Formulas PDF

Formulas
Examples
with Units

List of 14
Important Hypocycloid Formulas

1) Area and Number of Cusps of Hypocycloid Formulas

1.1) Area of Hypocycloid Formula

Evaluate Formula

Formula

$$A = \pi \cdot \frac{\left(N_{Cusps} - 1\right) \cdot \left(N_{Cusps} - 2\right)}{N_{Cusps}^{2}} \cdot r_{Large}^{2}$$

Example with Units

$$150.7964\,\text{m}^2 = 3.1416 \cdot \frac{\left(5 - 1\right) \cdot \left(5 - 2\right)}{5^{2}} \cdot 10\,\text{m}^{2}$$

1.2) Area of Hypocycloid given Chord Length Formula

Evaluate Formula

Formula

$$A = \pi \cdot \frac{\left(N_{Cusps} - 1\right) \cdot \left(N_{Cusps} - 2\right)}{N_{Cusps}^{2}} \cdot \left(\frac{l_c}{2 \cdot \sin\left(\frac{\pi}{N_{Cusps}}\right)}\right)^{2}$$

Example with Units

$$157.129\,\text{m}^2 = 3.1416 \cdot \frac{\left(5 - 1\right) \cdot \left(5 - 2\right)}{5^{2}} \cdot \left(\frac{12\,\text{m}}{2 \cdot \sin\left(\frac{3.1416}{5}\right)}\right)^{2}$$

1.3) Area of Hypocycloid given Perimeter Formula

Evaluate Formula

Formula

$$A = \frac{\pi}{64} \cdot \frac{N_{Cusps} - 2}{N_{Cusps} - 1} \cdot P^{2}$$

Example with Units

$$155.5457\,\text{m}^2 = \frac{3.1416}{64} \cdot \frac{5 - 2}{5 - 1} \cdot 65\,\text{m}^{2}$$

1.4) Number of Cusps of Hypocycloid Formula

Evaluate Formula

Formula

$$N_{Cusps} = \frac{r_{Large}}{r_{Small}}$$

Example with Units

$$5 = \frac{10\,m}{2\,m}$$

2) Chord Length of Hypocycloid Formulas

2.1) Chord Length of Hypocycloid Formula

Evaluate Formula

Formula

$$l_c = 2 \cdot \sin\left(\frac{\pi}{N_{Cusps}}\right) \cdot r_{Large}$$

Example with Units

$$11.7557\,m = 2 \cdot \sin\left(\frac{3.1416}{5}\right) \cdot 10\,m$$

2.2) Chord Length of Hypocycloid given Area Formula

Evaluate Formula

Formula

$$l_c = 2 \cdot \sin\left(\frac{\pi}{N_{Cusps}}\right) \cdot N_{Cusps} \cdot \sqrt{\frac{A}{\pi \cdot \left(N_{Cusps} - 1\right) \cdot \left(N_{Cusps} - 2\right)}}$$

Example with Units

$$11.7246\,m = 2 \cdot \sin\left(\frac{3.1416}{5}\right) \cdot 5 \cdot \sqrt{\frac{150\,m^2}{3.1416 \cdot \left(5 - 1\right) \cdot \left(5 - 2\right)}}$$

2.3) Chord Length of Hypocycloid given Perimeter Formula

Evaluate Formula

Formula

$$l_c = \sin\left(\frac{\pi}{N_{Cusps}}\right) \cdot \frac{P \cdot N_{Cusps}}{4 \cdot \left(N_{Cusps} - 1\right)}$$

Example with Units

$$11.9394\,m = \sin\left(\frac{3.1416}{5}\right) \cdot \frac{65\,m \cdot 5}{4 \cdot \left(5 - 1\right)}$$

3) Perimeter of Hypocycloid Formulas

3.1) Perimeter of Hypocycloid Formula

Evaluate Formula

Formula

$$P = \frac{8 \cdot r_{Large} \cdot \left(N_{Cusps} - 1\right)}{N_{Cusps}}$$

Example with Units

$$64\,m = \frac{8 \cdot 10\,m \cdot \left(5 - 1\right)}{5}$$

3.2) Perimeter of Hypocycloid given Area Formula

Evaluate Formula

Formula

$$P = 8 \cdot \sqrt{\frac{A \cdot \left(N_{Cusps} - 1 \right)}{\pi \cdot \left(N_{Cusps} - 2 \right)}}$$

Example with Units

$$63.8308\,\text{m} = 8 \cdot \sqrt{\frac{150\,\text{m}^2 \cdot \left(5 - 1 \right)}{3.1416 \cdot \left(5 - 2 \right)}}$$

3.3) Perimeter of Hypocycloid given Chord Length Formula

Evaluate Formula

Formula

$$P = \frac{4 \cdot l_c}{\sin\left(\frac{\pi}{N_{Cusps}} \right)} \cdot \frac{N_{Cusps} - 1}{N_{Cusps}}$$

Example with Units

$$65.33\,\text{m} = \frac{4 \cdot 12\,\text{m}}{\sin\left(\frac{3.1416}{5} \right)} \cdot \frac{5 - 1}{5}$$

4) Radius of Large Circle of Hypocycloid Formulas

4.1) Larger Radius of Hypocycloid given Area Formula

Evaluate Formula

Formula

$$r_{Large} = N_{Cusps} \cdot \sqrt{\frac{A}{\pi \cdot \left(N_{Cusps} - 1 \right) \cdot \left(N_{Cusps} - 2 \right)}}$$

Example with Units

$$9.9736\,\text{m} = 5 \cdot \sqrt{\frac{150\,\text{m}^2}{3.1416 \cdot \left(5 - 1 \right) \cdot \left(5 - 2 \right)}}$$

4.2) Larger Radius of Hypocycloid given Chord Length Formula

Evaluate Formula

Formula

$$r_{Large} = \frac{l_c}{2 \cdot \sin\left(\frac{\pi}{N_{Cusps}} \right)}$$

Example with Units

$$10.2078\,\text{m} = \frac{12\,\text{m}}{2 \cdot \sin\left(\frac{3.1416}{5} \right)}$$

4.3) Larger Radius of Hypocycloid given Perimeter Formula

Evaluate Formula

Formula

$$r_{Large} = \frac{P \cdot N_{Cusps}}{8 \cdot \left(N_{Cusps} - 1 \right)}$$

Example with Units

$$10.1562\,\text{m} = \frac{65\,\text{m} \cdot 5}{8 \cdot \left(5 - 1 \right)}$$

4.4) Larger Radius of Hypocycloid given Smaller Radius Formula

Evaluate Formula

Formula

$$r_{Large} = N_{Cusps} \cdot r_{Small}$$

Example with Units

$$10\,\text{m} = 5 \cdot 2\,\text{m}$$

Variables used in list of Hypocycloid Formulas above

- **A** Area of Hypocycloid *(Square Meter)*
- l_c Chord Length of Hypocycloid *(Meter)*
- N_{Cusps} Number of Cusps of Hypocycloid
- **P** Perimeter of Hypocycloid *(Meter)*
- r_{Large} Larger Radius of Hypocycloid *(Meter)*
- r_{Small} Smaller Radius of Hypocycloid *(Meter)*

Constants, Functions, Measurements used in list of Hypocycloid Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **sin**, sin(Angle) *Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.*
- Functions: **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 Meter (m) *Length Unit Conversion*
- Measurement: **Area** in Square Meter (m²) *Area Unit Conversion*

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