Important Formulas of Cyclic Quadrilateral PDF

Formulas
Examples
with Units

List of 23
Important Formulas of Cyclic Quadrilateral

1) Angles of Cyclic Quadrilateral Formulas

1.1) Angle A of Cyclic Quadrilateral Formula

Evaluate Formula

Formula

$$\angle A = \arccos\left(\frac{S_a^2 + S_d^2 - S_b^2 - S_c^2}{2 \cdot \left(\left(S_a \cdot S_d\right) + \left(S_b \cdot S_c\right)\right)}\right)$$

Example with Units

$$94.7017° = \arccos\left(\frac{10\,m^2 + 5\,m^2 - 9\,m^2 - 8\,m^2}{2 \cdot \left(\left(10\,m \cdot 5\,m\right) + \left(9\,m \cdot 8\,m\right)\right)}\right)$$

1.2) Angle B of Cyclic Quadrilateral Formula

Evaluate Formula

Formula

$$\angle B = \pi - \angle D$$

Example with Units

$$70° = 3.1416 - 110°$$

1.3) Angle between Diagonals of Cyclic Quadrilateral Formula

Evaluate Formula

Formula

$$\angle_{Diagonals} = 2 \cdot \arctan\left(\sqrt{\frac{\left(s - S_b\right) \cdot \left(s - S_d\right)}{\left(s - S_a\right) \cdot \left(s - S_c\right)}}\right)$$

Example with Units

$$103.4148° = 2 \cdot \arctan\left(\sqrt{\frac{\left(16\,m - 9\,m\right) \cdot \left(16\,m - 5\,m\right)}{\left(16\,m - 10\,m\right) \cdot \left(16\,m - 8\,m\right)}}\right)$$

1.4) Angle C of Cyclic Quadrilateral Formula

Evaluate Formula

Formula

$$\angle C = \pi - \angle A$$

Example with Units

$$85° = 3.1416 - 95°$$

1.5) Angle D of Cyclic Quadrilateral Formula

Evaluate Formula

Formula

$$\angle D = \arccos\left(\frac{S_d^2 + S_c^2 - S_a^2 - S_b^2}{2 \cdot \left(\left(S_d \cdot S_c\right) + \left(S_b \cdot S_a\right)\right)}\right)$$

Example with Units

$$110.7227° = \arccos\left(\frac{5\,m^2 + 8\,m^2 - 10\,m^2 - 9\,m^2}{2 \cdot \left(\left(5\,m \cdot 8\,m\right) + \left(9\,m \cdot 10\,m\right)\right)}\right)$$

2) Area of Cyclic Quadrilateral Formulas

2.1) Area of Cyclic Quadrilateral given Angle A Formula

Evaluate Formula

Formula

$$A = \frac{1}{2} \cdot \left(\left(S_a \cdot S_d\right) + \left(S_b \cdot S_c\right)\right) \cdot \sin\left(\angle A\right)$$

Example with Units

$$60.7679\,m^2 = \frac{1}{2} \cdot \left(\left(10\,m \cdot 5\,m\right) + \left(9\,m \cdot 8\,m\right)\right) \cdot \sin\left(95°\right)$$

2.2) Area of Cyclic Quadrilateral given Angle B Formula

Evaluate Formula

Formula

$$A = \frac{1}{2} \cdot \left(\left(S_a \cdot S_b\right) + \left(S_c \cdot S_d\right)\right) \cdot \sin\left(\angle B\right)$$

Example with Units

$$61.08\,m^2 = \frac{1}{2} \cdot \left(\left(10\,m \cdot 9\,m\right) + \left(8\,m \cdot 5\,m\right)\right) \cdot \sin\left(70°\right)$$

2.3) Area of Cyclic Quadrilateral given Angle between Diagonals Formula

Evaluate Formula

Formula

$$A = \frac{1}{2} \cdot \left(\left(S_a \cdot S_c\right) + \left(S_b \cdot S_d\right)\right) \cdot \sin\left(\angle_{Diagonals}\right)$$

Example with Units

$$60.3704\,m^2 = \frac{1}{2} \cdot \left(\left(10\,m \cdot 8\,m\right) + \left(9\,m \cdot 5\,m\right)\right) \cdot \sin\left(105°\right)$$

2.4) Area of Cyclic Quadrilateral given Circumradius Formula

Evaluate Formula

Formula

$$A = \frac{\sqrt{\left(\left(S_a \cdot S_b\right) + \left(S_c \cdot S_d\right)\right) \cdot \left(\left(S_a \cdot S_c\right) + \left(S_b \cdot S_d\right)\right) \cdot \left(\left(S_a \cdot S_d\right) + \left(S_c \cdot S_b\right)\right)}}{4 \cdot r_c}$$

Example with Units

$$58.6672\,\text{m}^2 = \frac{\sqrt{\left(\left(10\,\text{m} \cdot 9\,\text{m}\right) + \left(8\,\text{m} \cdot 5\,\text{m}\right)\right) \cdot \left(\left(10\,\text{m} \cdot 8\,\text{m}\right) + \left(9\,\text{m} \cdot 5\,\text{m}\right)\right) \cdot \left(\left(10\,\text{m} \cdot 5\,\text{m}\right) + \left(8\,\text{m} \cdot 9\,\text{m}\right)\right)}}{4 \cdot 6\,\text{m}}$$

2.5) Area of Cyclic Quadrilateral given Semiperimeter Formula

Evaluate Formula

Formula

$$A = \sqrt{\left(s - S_a\right) \cdot \left(s - S_b\right) \cdot \left(s - S_c\right) \cdot \left(s - S_d\right)}$$

Example with Units

$$60.7947\,\text{m}^2 = \sqrt{\left(16\,\text{m} - 10\,\text{m}\right) \cdot \left(16\,\text{m} - 9\,\text{m}\right) \cdot \left(16\,\text{m} - 8\,\text{m}\right) \cdot \left(16\,\text{m} - 5\,\text{m}\right)}$$

3) Diagonals of Cyclic Quadrilateral Formulas

3.1) Diagonal 1 of Cyclic Quadrilateral Formula

Evaluate Formula

Formula

$$d_1 = \sqrt{\frac{\left(\left(S_a \cdot S_c\right) + \left(S_b \cdot S_d\right)\right) \cdot \left(\left(S_a \cdot S_d\right) + \left(S_b \cdot S_c\right)\right)}{\left(S_a \cdot S_b\right) + \left(S_c \cdot S_d\right)}}$$

Example with Units

$$10.8309\,\text{m} = \sqrt{\frac{\left(\left(10\,\text{m} \cdot 8\,\text{m}\right) + \left(9\,\text{m} \cdot 5\,\text{m}\right)\right) \cdot \left(\left(10\,\text{m} \cdot 5\,\text{m}\right) + \left(9\,\text{m} \cdot 8\,\text{m}\right)\right)}{\left(10\,\text{m} \cdot 9\,\text{m}\right) + \left(8\,\text{m} \cdot 5\,\text{m}\right)}}$$

3.2) Diagonal 1 of Cyclic Quadrilateral using Ptolemy's Second Theorem Formula

Evaluate Formula

Formula

$$d_1 = \left(\frac{\left(S_a \cdot S_d\right) + \left(S_b \cdot S_c\right)}{\left(S_a \cdot S_b\right) + \left(S_c \cdot S_d\right)}\right) \cdot d_2$$

Example with Units

$$11.2615\,\text{m} = \left(\frac{\left(10\,\text{m} \cdot 5\,\text{m}\right) + \left(9\,\text{m} \cdot 8\,\text{m}\right)}{\left(10\,\text{m} \cdot 9\,\text{m}\right) + \left(8\,\text{m} \cdot 5\,\text{m}\right)}\right) \cdot 12\,\text{m}$$

3.3) Diagonal 1 of Cyclic Quadrilateral using Ptolemy's Theorem Formula

Evaluate Formula

Formula

$$d_1 = \frac{\left(S_a \cdot S_c\right) + \left(S_b \cdot S_d\right)}{d_2}$$

Example with Units

$$10.4167\,\text{m} = \frac{\left(10\,\text{m} \cdot 8\,\text{m}\right) + \left(9\,\text{m} \cdot 5\,\text{m}\right)}{12\,\text{m}}$$

3.4) Diagonal 2 of Cyclic Quadrilateral Formula

Evaluate Formula

Formula

$$d_2 = \sqrt{\frac{\left(\left(S_a \cdot S_b\right) + \left(S_c \cdot S_d\right)\right) \cdot \left(\left(S_a \cdot S_c\right) + \left(S_b \cdot S_d\right)\right)}{\left(S_a \cdot S_d\right) + \left(S_c \cdot S_b\right)}}$$

Example with Units

$$11.5411\,\text{m} = \sqrt{\frac{\left(\left(10\,\text{m} \cdot 9\,\text{m}\right) + \left(8\,\text{m} \cdot 5\,\text{m}\right)\right) \cdot \left(\left(10\,\text{m} \cdot 8\,\text{m}\right) + \left(9\,\text{m} \cdot 5\,\text{m}\right)\right)}{\left(10\,\text{m} \cdot 5\,\text{m}\right) + \left(8\,\text{m} \cdot 9\,\text{m}\right)}}$$

4) Other Formulas of Cyclic Quadrilateral Formulas

4.1) Circumradius of Cyclic Quadrilateral Formula

Evaluate Formula

Formula

$$r_c = \frac{1}{4} \cdot \left(\sqrt{\frac{\left(\left(S_a \cdot S_b\right) + \left(S_c \cdot S_d\right)\right) \cdot \left(\left(S_a \cdot S_c\right) + \left(S_b \cdot S_d\right)\right) \cdot \left(\left(S_a \cdot S_d\right) + \left(S_b \cdot S_c\right)\right)}{\left(s - S_a\right) \cdot \left(s - S_b\right) \cdot \left(s - S_c\right) \cdot \left(s - S_d\right)}}\right)$$

Example with Units

$$5.79\,\text{m} = \frac{1}{4} \cdot \left(\sqrt{\frac{\left(\left(10\,\text{m} \cdot 9\,\text{m}\right) + \left(8\,\text{m} \cdot 5\,\text{m}\right)\right) \cdot \left(\left(10\,\text{m} \cdot 8\,\text{m}\right) + \left(9\,\text{m} \cdot 5\,\text{m}\right)\right) \cdot \left(\left(10\,\text{m} \cdot 5\,\text{m}\right) + \left(9\,\text{m} \cdot 8\,\text{m}\right)\right)}{\left(16\,\text{m} - 10\,\text{m}\right) \cdot \left(16\,\text{m} - 9\,\text{m}\right) \cdot \left(16\,\text{m} - 8\,\text{m}\right) \cdot \left(16\,\text{m} - 5\,\text{m}\right)}}\right)$$

4.2) Circumradius of Cyclic Quadrilateral given Area Formula

Evaluate Formula

Formula

$$r_c = \frac{\sqrt{\left(\left(S_a \cdot S_b\right) + \left(S_c \cdot S_d\right)\right) \cdot \left(\left(S_a \cdot S_c\right) + \left(S_b \cdot S_d\right)\right) \cdot \left(\left(S_a \cdot S_d\right) + \left(S_c \cdot S_b\right)\right)}}{4 \cdot A}$$

Example with Units

$$5.8667\,\text{m} = \frac{\sqrt{\left(\left(10\,\text{m} \cdot 9\,\text{m}\right) + \left(8\,\text{m} \cdot 5\,\text{m}\right)\right) \cdot \left(\left(10\,\text{m} \cdot 8\,\text{m}\right) + \left(9\,\text{m} \cdot 5\,\text{m}\right)\right) \cdot \left(\left(10\,\text{m} \cdot 5\,\text{m}\right) + \left(8\,\text{m} \cdot 9\,\text{m}\right)\right)}}{4 \cdot 60\,\text{m}^2}$$

4.3) Perimeter of Cyclic Quadrilateral Formula

Evaluate Formula

Formula

$$P = S_a + S_b + S_c + S_d$$

Example with Units

$$32\,\text{m} = 10\,\text{m} + 9\,\text{m} + 8\,\text{m} + 5\,\text{m}$$

4.4) Semiperimeter of Cyclic Quadrilateral Formula

Evaluate Formula

Formula

$$s = \frac{P}{2}$$

Example with Units

$$16\,\text{m} = \frac{32\,\text{m}}{2}$$

5) Sides of Cyclic Quadrilateral Formulas

5.1) Side A of Cyclic Quadrilateral given both Diagonals Formula

Evaluate Formula

Formula

$$S_a = \frac{\left(d_1 \cdot d_2\right) - \left(S_b \cdot S_d\right)}{S_c}$$

Example with Units

$$10.875\,\text{m} = \frac{\left(11\,\text{m} \cdot 12\,\text{m}\right) - \left(9\,\text{m} \cdot 5\,\text{m}\right)}{8\,\text{m}}$$

5.2) Side A of Cyclic Quadrilateral given other Sides and Perimeter Formula

Evaluate Formula

Formula

$$S_a = P - \left(S_b + S_d + S_c\right)$$

Example with Units

$$10\,\text{m} = 32\,\text{m} - \left(9\,\text{m} + 5\,\text{m} + 8\,\text{m}\right)$$

5.3) Side B of Cyclic Quadrilateral given both Diagonals Formula

Evaluate Formula

Formula

$$S_b = \frac{\left(d_1 \cdot d_2\right) - \left(S_a \cdot S_c\right)}{S_d}$$

Example with Units

$$10.4\,\text{m} = \frac{\left(11\,\text{m} \cdot 12\,\text{m}\right) - \left(10\,\text{m} \cdot 8\,\text{m}\right)}{5\,\text{m}}$$

5.4) Side C of Cyclic Quadrilateral given both Diagonals Formula

Evaluate Formula

Formula

$$S_c = \frac{\left(d_1 \cdot d_2\right) - \left(S_b \cdot S_d\right)}{S_a}$$

Example with Units

$$8.7\,\text{m} = \frac{\left(11\,\text{m} \cdot 12\,\text{m}\right) - \left(9\,\text{m} \cdot 5\,\text{m}\right)}{10\,\text{m}}$$

5.5) Side D of Cyclic Quadrilateral given both Diagonals Formula

Evaluate Formula

Formula

$$S_d = \frac{\left(d_1 \cdot d_2\right) - \left(S_a \cdot S_c\right)}{S_b}$$

Example with Units

$$5.7778\,\text{m} = \frac{\left(11\,\text{m} \cdot 12\,\text{m}\right) - \left(10\,\text{m} \cdot 8\,\text{m}\right)}{9\,\text{m}}$$

Variables used in list of Important Formulas of Cyclic Quadrilateral above

- $\angle_{Diagonals}$ Angle Between Diagonals of Cyclic Quadrilateral *(Degree)*
- $\angle A$ Angle A of Cyclic Quadrilateral *(Degree)*
- $\angle B$ Angle B of Cyclic Quadrilateral *(Degree)*
- $\angle C$ Angle C of Cyclic Quadrilateral *(Degree)*
- $\angle D$ Angle D of Cyclic Quadrilateral *(Degree)*
- **A** Area of Cyclic Quadrilateral *(Square Meter)*
- d_1 Diagonal 1 of Cyclic Quadrilateral *(Meter)*
- d_2 Diagonal 2 of Cyclic Quadrilateral *(Meter)*
- **P** Perimeter of Cyclic Quadrilateral *(Meter)*
- r_c Circumradius of Cyclic Quadrilateral *(Meter)*
- **s** Semiperimeter of Cyclic Quadrilateral *(Meter)*
- S_a Side A of Cyclic Quadrilateral *(Meter)*
- S_b Side B of Cyclic Quadrilateral *(Meter)*
- S_c Side C of Cyclic Quadrilateral *(Meter)*
- S_d Side D of Cyclic Quadrilateral *(Meter)*

Constants, Functions, Measurements used in list of Important Formulas of Cyclic Quadrilateral above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **arccos**, arccos(Number) *Arccosine function, is the inverse function of the cosine function.It is the function that takes a ratio as an input and returns the angle whose cosine is equal to that ratio.*
- Functions: **arctan**, arctan(Number) *Inverse trigonometric functions are usually accompanied by the prefix - arc. Mathematically, we represent arctan or the inverse tangent function as tan-1 x or arctan(x).*
- Functions: **cos**, cos(Angle) *Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.*
- Functions: **ctan**, ctan(Angle) *Cotangent is a trigonometric function that is defined as the ratio of the adjacent side to the opposite side in a right triangle.*
- 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.*
- Functions: **tan**, tan(Angle) *The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.*
- Measurement: **Length** in Meter (m) *Length Unit Conversion*
- Measurement: **Area** in Square Meter (m²) *Area Unit Conversion*
- Measurement: **Angle** in Degree (°) *Angle Unit Conversion*

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