**Calculating the Area of a Rhombus: Programming with C**

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A rhombus is a quadrilateral with four sides of equal length. It is characterized by having opposite sides that are parallel and opposite angles that are congruent. There are two parameters used to calculate the area of a rhombus that is, use of diagonals, side and height, and internal angles .Using diagonals $A=\frac{1}{2}\*d\_{1}\*d\_{2}$ where d1=length of diagonal 1, d2=diagonal 2.The area of the rhombus is calculated by multiplying the lengths of its diagonals and dividing by2. This formula is derived from the fact that a rhombus can be divided into four congruent triangles. The product of the lengths of the diagonals represents the combined area of these triangles and dividing it by 2 gives us the area of the rhombus. Using base and height A=b\*h where b=length of any side, h=height of rhombus. Using trigonometry A=b2\*Sin (a)

**C Program to Calculate the Area of a Rhombus using Trigonometry**

In order to calculate the area of a rhombus, we can employ a C Program. By taking the user’s input for the lengths of the diagonals, the program can perform the necessary calculation and output the results.

To calculate the area of a rhombus using trigonometry, you can use the formula:

Area of a Rhombus = (side^2) \_ sin (angle)\*

Where:

- \*side\* is the length of any side of the rhombus.

- \*angle\* is the measure of the included angle between two adjacent sides.

Here's an example of how to calculate the area of a rhombus using this formula in a C program:

```c

#include <stdio.h>

#include <math.h>

int main() {

 float side, angle, area;

 // Input the side length and angle

 printf("Enter the length of a side: ");

 scanf("%f", &side);

 printf("Enter the measure of the included angle in degrees: ");

 scanf("%f", &angle);

 // Convert angle from degrees to radians

 angle = angle \* M\_PI / 180;

 // Calculate the area using the formula: Area = (side^2) \* sin(angle)

 area = (side \_ side) \_ sin(angle);

 // Output the area of the rhombus

 printf("The area of the rhombus is: %.2f\n", area);

 return 0;

}

```

In this program, we first declare the variables `side`, `angle`, and `area` as floating-point numbers. These variables are of the float data type because length of the diagonals can be decimal values. These variables will store the side length, angle, and calculated area, respectively.

Then, we prompt the user to enter the length of a side and the measure of the included angle using `printf` and `scanf` functions. The `%f` format specifier (statements) is used to read and write floating-point numbers.it uses`scanf` to read these values and store them in variable length of a side and angle in degrees.

Next, we convert the angle from degrees to radians by multiplying it by `M\_PI / 180`. The `M\_PI` constant is defined in the `math.h` library and represents the value of pi.

After that, we calculate the area of the rhombus using the formula `(side \_ side) \_ sin(angle)` and store the result in the `area` variable.

Finally, we display the calculated area using `printf` with the `%f` format specifier. The `.2` after `%` specifies that we want to display the output with 2 decimal places.

Remember to include the `math.h` library at the beginning of the program to access the `sin` function and the `M\_PI` constant.

This program assumes that the user enters valid values for the side length and angle.

**C Program to Calculate the Area of a Rhombus using Diagonals**.

1. Include the necessary header files:

```c

#include <stdio.h>//Function to find area

#include <math.h>

```

2. Define a function to calculate the area of a rhombus:

```c

float calculateArea(float d1, float d2) {

 float area = (d1 \* d2) / 2;//It is a formula for calculating area of rhombus

 return area;

}

```

3. Define the main function:

```c

int main() {

 float diagonal1, diagonal2, area;

 // Prompt the user to enter the diagonals

 printf("Enter the length of the first diagonal: ");//Enter the first diagonal of the rhombus

 scanf("%f", &diagonal1);

 printf("Enter the length of the second diagonal: ");// Enter the second diagonal of the rhombus

 scanf("%f", &diagonal2);

 // Calculate the area

 area = calculateArea(diagonal1, diagonal2);

 printf("The area of the rhombus is %.2f square units.\n", area);

 return 0;

}

```

4. Compile and run the program.

```

Sample program two.

```c

#include <stdio.h>

#include <math.h>

int main() {

 float diagonal1, diagonal2, area;

 printf("Enter the length of the first diagonal: ");

 scanf("%f", &diagonal1);

 printf("Enter the length of the second diagonal: ");

 scanf("%f", &diagonal2);

 // Calculate the area using the formula: area = (diagonal1 \* diagonal2) / 2

 area = (diagonal1 \* diagonal2) / 2;

 printf("The area of the rhombus is: %.2f\n", area);

 return 0;

}

```

In this program, we first declare three variables: `diagonal1`, `diagonal2`, and `area`. These variables will store the lengths of the diagonals and the calculated area, respectively.

We then prompt the user to enter the length of the first diagonal and store it in the variable `diagonal1`. Similarly, we prompt the user to enter the length of the second diagonal and store it in the variable `diagonal2`.

Next, we calculate the area of the rhombus using the formula `(diagonal1 \* diagonal2) / 2` and store the result in the variable `area`.

Finally, we print the calculated area using the `printf` function with the format specifier `%.2f` to display the result with two decimal places.

Note: This program assumes that the user will enter valid positive values for the lengths of the diagonals.

In conclusion, calculating the area of a rhombus is a straightforward process that involves using the lengths of its diagonals. By applying the formula `(diagonal1 \* diagonal2) / 2`, we can determine the area of a rhombus accurately.

Through the C program provided, we demonstrated how to calculate the area of a rhombus by taking user input for the lengths of the diagonals. This program serves as a practical example that showcases the application of the formula in a programming context.

Understanding how to calculate the area of a rhombus is valuable knowledge in various fields, including mathematics, geometry, engineering, and architecture. It enables us to accurately measure and describe the space enclosed by rhombus-shaped objects, aiding in the design and construction of structures that incorporate rhombus elements.

By mastering the concept and utilizing the formula, we can analyze and solve problems related to rhombus areas efficiently. Whether it's in academic pursuits, professional projects, or everyday scenarios, the ability to calculate the area of a rhombus can be a valuable tool.

In conclusion, the process of determining the area of a rhombus provides us with a fundamental understanding of geometric calculations and their practical applications

References

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