

RECITATION 5

Q1. Write a program that reads an angle in degrees and prints the corresponding sine. You can use standard functions.

Q2. Write a program that prints a table with 2 columns. The first column contains all angles from 0 till 360 degrees with steps of 30 degrees. The second column contains the corresponding sine values.

Q3. Write a program that reads the lengths of the sides a and b of a right-angled triangle and prints the length of the hypotenuse c and all of the acute angles. For example;

- **Input:** 2 1 | **Output:** 2.24 63° 27°
- **Input:** 1 1.732 | **Output:** 2.00 60° 30°

Q4. Write a program for a guessing game. First a random number between 1 and 100 is chosen by the program. Afterwards, the user can start guessing. If the guess was too high or too low, the program needs to print “too high” or “too low”. This is repeated until the number was found. In the end, the program prints how many guesses the user needed to find the secret number.

Q5. Write a program that prints a table with 2 columns. The first column contains x values from -5 till +5 with a step of 0.5. The second column contains the corresponding y values according to the equation $y = 2x^2 + 2x - 3$. Make sure the calculation of the y values is done in a separate function.

Q6. Write a function with header:

int readnumber(int lower_boundary, int upper_boundary)

that reads an integer number in the interval [lower_boundary, upper_boundary] and returns that number as function return value. If the number is not in the correct interval, the function needs to ask a new number until a correct value was entered.

Q7. Write a function with header:

double exponentiation(double base, int exponent)

that returns $base^{exponent}$ as function return value. Write a main function that reads a base and exponent, that calls the function exponentiation and that prints the result. Do not use the standard function pow!

Q8. Write a function with header:

int gcd(int number1, int number2)

that returns the greatest common divisor of the numbers number1 and number2 as function return value. Write a main program that reads 3 integer numbers, calculates the gcd of those 3 numbers and prints the result. For example;

- GCD of 20, 50 and 120 = 10
- GCD of 8, 12 and 20 = 4

Hint: $\text{gcd}(a, b, c) = \text{gcd}(a, \text{gcd}(b, c))$

Q9. Write a program with the functions:

- *hello*: that welcomes the user and explains what is expected
- *main*: that asks the user to enter 5 times 2 numbers
- *sum*: that asks the user to enter the sum of the previously entered numbers and gives feedback to the user
- *goodbye*: that thanks the user for his/her cooperation

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Welcome, this program will ask you to solve 5 sums.

enter 2 numbers < 100: 15 16
what is the sum of 15 and 16? 31
according to you, the sum of 15 and 16 equals 31. That
is correct

enter 2 numbers < 100: 26 32
what is the sum of 26 and 32? 50
according to you, the sum of 26 and 32 equals 50. That
is not correct

...
Thanks for your cooperation.
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Q10. Since a year is not exactly 365 days, we have a leap year once every 4 years except if the year is dividable by 100. If the year is dividable by 400, the year is considered as a leap year anyway. Write a function with header:

int isLeapYear(int year)

that determines if a year is a leap year or not and gives a different function return value for both cases. Write also a function with header:

int numberOfDays(int month, int year)

that calculates the number of days in the month of the year given. Write a main function that reads a month and a year and prints the number of days in that month of that year. For example;

- Month 2 of 2000 has 29 days.
- Month 2 of 1900 has 28 days.
- Month 1 of 1950 has 31 days.

Q11. Consider the first quadrant of a circle in a square with side 1. If you generate a large amount of (x, y) coordinates with x and y belonging to the interval [0, 1], you have a collection of points belonging to the square. If you now count all points that belong to the quadrant of the circle with equation $x^2 + y^2 < 1$, and divide this amount by the total amount of points generated, you will find approximately the number $\pi/4$. Write a program that generates 100000 points and uses it to calculate the number π approximately. Run the program several times and compare the results. What if you increase the number of points?

Q12. Write a program that asks the user to choose between 3 options:

1. Draw an empty square
2. Draw a filled square
3. Stop

The program repeats itself until the user chooses the option 3 (Stop). Use the functions “empty_square” and “filled_square”.

The screen dialog should look like:

What do you choose?

1. Draw an empty square
2. Draw a filled square
3. Stop

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Enter a valid choice: 1, 2 or 3!

What do you choose?

1. Draw an empty square
2. Draw a filled square
3. Stop

1



What do you choose?

1. Draw an empty square
2. Draw a filled square
3. Stop

2



What do you choose?

1. Draw an empty square
2. Draw a filled square
3. Stop

3

Thanks for playing with us!■