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Project report

1. **Problem description:**

The given problem involves writing a Java program to display ASCII stickman which climbs the stairs. The output of the program should be adjusted to the height of stairs and height of the stickman. It means that depending on the number of stairs the stickman should ascend and depending on the size of the stickman itself the displayed output should change correspondingly.

The program output includes every image of the stickman ascending the stairs step by step. The total number of images will depend on the height of the stairs. In this case the total number of images is equivalent to (1+stairHeight) number of images, which is the number of steps the stickman should rise up. Moreover, the number of blank lines at the beginning of each image should be taken into account because as the stickman ascends the number of blank lines decreases. And the height of each image of the ascending stickman must be the same. The total height of each image equals the sum of the height of the stickman and the height of the stairs and 3 blank lines following each image in the frame.

Additionally, it is being assumed that the height of the stickman is always greater than the height of the stairs by 2 (stairHeight + 2 < stickmanHeight). Furthermore, the height of stairs cannot be less than zero(stairHeight>=0). The program should consist of at least two static methods except the main method.

1. **Problem Solution**

In order to write the program 5 static methods and 15 for loops were used. The methods were used in order to print the certain parts of every image. And with a help of for loops repeating patterns were achieved. The static methods that were used are repeatingCharacters(char character, int times), middlePart(int numberOfFrames, int stickmanHeight, int stairHeight), sticksWithStairs(int numberOfFrames, int stairHeight), legsOfStickman(int numberOfFrames, int stairHeight), stairsAfterLegs(int numberOfFrames, int stairHeight).

The “repeatingCharacters (char character, int times)” method has two parameters. The method consists of one for loop, which uses these two parameters, that prints a certain character given number of times. This method is used throughout the program in other methods to eliminate the need to use many for loops again and again. This method is helpful in such way that by setting certain parameters, it can print any character, such as stars and white-spaces, in this program the specified number of times, according to some established pattern.

The “middlePart (int numberOfFrames, int stickmanHeight, int stairHeight)” method is implemented to print the vertical sticks of the body before the stairs, using three parameters. Nested loop is used in this method. The outer loop is used to print the certain number of lines with vertical sticks of the body. This number depends on the height of the stickman, stairs and the number of the frame. The inner for loop, which is used in “repeatingCharacters” method, is included to print certain pattern of white-spaces before the sticks.

The “sticksWithStairs(int numberOfFrames, int stairHeight)” method is implemented to print out the sticks of the body and the corresponding stair, using two parameters(numberOfFrames, stairHeight). Nested loop is used in this method. The outer loop prints the certain number of lines of the stick with a stair depending on the height of the stairs and the number of frames. Inside of this loop “repeatingCharacters” method, which also consists of a for loop, is implemented 3 times differently. It prints the white-spaces and stars of different patterns.

The “legsOfStickman(int numberOfFrames, int stairHeight)” is implemented in order to print the legs part of the stickman with the corresponding stair using two parameters(numberOfFrames, stairHeight). The for loop inside of the “repeatingCharacters” method was used twice to print white-spaces before the legs and stars in the stairs.

The “stairsAfterLegs” method is used in order to print the part which the stickman has already passed(is not displayed on the first frame), using two parameters(numberOfFrames, stairHeight). There is a nested loop. The outer loop counts the number of lines of stairs passed by the stickman in each frame. In each new frame one more line is printed, as the stickman ascends the stairs. Inside of this loop “repeatingCharacters” method, which also consists of a for loop, is implemented 2 times to print white-spaces before the stair and stars in each stair.

The main method includes nested loop to print certain images in every new frame. The outside loop determines the number of frames to be printed. Inner part of the loop prints the changing image as the stickman ascends the stairs. Inner part includes all of the static methods which are mentioned above. The “repeatingCharacters” method is used more than once in the main method.

1. **Implementation**

**package** assignment1;

**public** **class** AM2018400387 {

**public** **static** **void** main(String [] args) {

**int** stickmanHeight = Integer.*parseInt*(args[0]);

**int** stairHeight = Integer.*parseInt*(args[1]);

//this for loop achieves certain number of frames depending on the height of the stairs. The variable "numberOfFrames" indicates the number of images of the ascending stickman in the output

**for**(**int** numberOfFrames=0; numberOfFrames<=stairHeight; numberOfFrames++) {

//this for loop is used for printing different number of empty lines in each frame which depends on the height of the stairs. The "emptyLines" variable indicates the number of empty lines printed in each frame

**for**( **int** emptyLines=stairHeight; emptyLines>numberOfFrames; emptyLines--) {

System.***out***.println();

}

//printing number of spaces before the head(can possibly be 0) by implementing the "repeatingCharacters" method, (numberOfFrames\*3) number of times because the number of white-spaces increases by 3 with every frame

*repeatingCharacters*(' ',numberOfFrames\*3);

// printing the head

System.***out***.println(" O ");

//printing number of white-spaces before the hands(can possibly be 0) implementing "repeatingCharacters" method , (numberOfFrames\*3) number of times because the number of white-spaces increases by 3 with every frame

*repeatingCharacters*(' ',numberOfFrames\*3);

//printing the hands of the stickman

System.***out***.print("/|\\\n");

//printing middle part using the middlePart method

*middlePart*(numberOfFrames, stickmanHeight, stairHeight);

//printing sticks with stairs using the numberOfFrames method

*sticksWithStairs*(numberOfFrames, stairHeight);

//printing legs with the corresponding stairs, using the legsOfStickman method

*legsOfStickman*(numberOfFrames, stairHeight);

//printing the part after the legs, using the stairsAfterLegs method

*stairsAfterLegs*(numberOfFrames, stairHeight);

//printing 3 lines at the end of each image

System.***out***.println("\n\n");

}

}

/\*This method can print a certain character given number of times, using two parameters.

One of the parameters is "character", which is the type of character(could be whitespace, star) needs to be printed and the other parameter is "times",

which indicates how many times it should be printed\*/

**public** **static** **void** repeatingCharacters(**char** character, **int** times) {

//for loop used to print a given character, using the variable "repeat", which increments by one with every iteration, while it is less than the given number of "times"

**for** (**int** repeat = 0; repeat < times; repeat++) {

System.***out***.print(character);

}

}

//This method(middlePart) prints white-spaces with vertical sticks in a new line before the stairs, using three parameters(numberOfFrames, stickmanHeight, stairHeight)

**public** **static** **void** middlePart(**int** numberOfFrames, **int** stickmanHeight, **int** stairHeight) {

//printing sticks of the body above the stairs. The initial number of sticks is given by a relationship((stickmanHeight-2)-(stairHeight+1), which could be zero in some cases.The number of lines with the white-spaces and the stick increases by 1 with every frame as the stickman ascends the stairs.

//the for loop with a "body" variable is used to print the white-spaces and the stick on every new line while the "body" variable is less than ((stickmanHeight-2)-(stairHeight+1)+numberOfFrames).

**for**(**int** body=0; body<(stickmanHeight-2)-(stairHeight+1)+numberOfFrames; body++) {

//implementing the "repeatingCharacters" method in order to print white-spaces before the stick (numberOfFrames\*3) number of times because the number of white-spaces increase by 3 with every frame

*repeatingCharacters*(' ',numberOfFrames\*3);

//printing the vertical stick of the body of the stickman

System.***out***.println(" | ");

}

}

//This method(sticksWithStairs)is implemented in order to print the sticks of the body and the corresponding stair, using two parameters(numberOfFrames, stairHeight)

**public** **static** **void** sticksWithStairs(**int** numberOfFrames, **int** stairHeight) {

//this for loop with a "line" variable is used for printing the vertical stick with a corresponding stair. "Line" variable used indicates how many lines of stick with a stair will be printed in each frame. The number of such lines decrease with every frame as the stickman ascends.

**for**(**int** line=0;line<stairHeight-numberOfFrames; line++) {

//implementing the "repeatingCharacters" method in order to print white-spaces before the stick (numberOfFrames\*3) number of times because the number of white-spaces increase by 3 with every frame

*repeatingCharacters*(' ',numberOfFrames\*3);

//printing the vertical stick of the body of the stickman

System.***out***.print(" | ");

//implementing the "repeatingCharacters" method in order to print white-spaces before the step of the stair, which decrease by 3 with every line and by 3 with each new frame.

*repeatingCharacters*(' ',3\*stairHeight-3\*line-3\*numberOfFrames);

//printing the step of each stair

System.***out***.print("\_\_\_|");

//implementing the "repeatingCharacters" method in order to print stars inside each stair (line\*3) number of times because the number of stars increase in each line by 3

*repeatingCharacters*('\*',line\*3);

//printing the end part of the stair

System.***out***.println("|");

}

}

//This method(legsOfStickman) is implemented in order to print the legs part of the stickman with the corresponding stair using two parameters(numberOfFrames, stairHeight)

**public** **static** **void** legsOfStickman(**int** numberOfFrames, **int** stairHeight) {

//implementing the "repeatingCharacters" method in order to print white-spaces before the legs (numberOfFrames\*3) number of times because the number of white-spaces increase by 3 with every frame

*repeatingCharacters*(' ',numberOfFrames\*3);

//printing legs

System.***out***.print("/ \\\_\_\_|");

//implementing the "repeatingCharacters" method in order to print stars inside each stair (3\*stairHeight-3\*numberOfFrames) number of times because as the stickman ascends the stairs in every frame it gets on a stair with the number of stars decreased by 3.

*repeatingCharacters*('\*',3\*stairHeight-3\*numberOfFrames);

//printing the end part of the stair

System.***out***.println("|");

}

//This method(stairsAfterLegs) is used in order to print the part which the stickman has already passed(is not displayed on the first frame), using two parameters(numberOfFrames,stairHeight)

**public** **static** **void** stairsAfterLegs(**int** numberOfFrames, **int** stairHeight) {

//This for loop is used for increasing number of printed lines of stairs passed by stickman in each frame. The "lines" variable indicates the number of stairs passed by stickman. with every frame one more line is printed, as the stickman ascends the stairs

**for**(**int** lines=0; lines < numberOfFrames; lines++) {

//implementing the "repeatingCharacters" method in order to print white-spaces (3\*numberOfFrames-3\*lines) number of times because the number of white-spaces changes in each frame and line

*repeatingCharacters*(' ', 3\*numberOfFrames-3\*lines);

//printing the the step of the stair

System.***out***.print("\_\_\_|");

//implementing the "repeatingCharacters" method in order to print stars inside each stair (stairHeight\*3-3\*(numberOfFrames-1)+lines\*3) number of times because the number of stars is changing with the frame and line

*repeatingCharacters*('\*', stairHeight\*3-3\*(numberOfFrames-1)+lines\*3);

//printing the end part of the stair

System.***out***.println("|");

}

}

}

1. **Output of the program**

The output for the case when stickmanHeight = 7, stairHeight = 3.





The output for case when stickmanHeight = 5, stairHeight = 2.

Изображение выглядит как снимок экрана

Автоматически созданное описание

1. **Conclusion**

The program functions and gives the output it was expected to give. The stickman ascends the stairs by stepping on each stair one after the other. The output for different cases was the same as in the provided example output files. Overall, the given problem was solved.