

CS Bridge Module 6 Iterative Statements

1. Iterative Statements (Loops)

1.1 CS Bridge: Iterative Statements (Loops)




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CS Bridge: Iterative Statements (Loops)

Module 6
Itay Tal

1.2 Motivation



Motivation

Let's Count

Data	Expressions	Control Flow
<ul style="list-style-type: none">• int• unsigned	<ul style="list-style-type: none">• I/O expressions• Arithmetic expressions	<ul style="list-style-type: none">• Sequential Flow• Branching<ul style="list-style-type: none">- if- if-else• Iterative<ul style="list-style-type: none">- while

Write a program that asks a positive integer *n*, and prints the expression from 1 up to *n*.

Please enter a positive integer:

4
1
2
3
4

Notes:

2. While Loops

2.1 While Loops

While Loops

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Data	Expressions	Control Flow
<ul style="list-style-type: none">• int• unsigned int• float• double• char• bool	<ul style="list-style-type: none">• Arithmetic expressions• Boolean expressions	<ul style="list-style-type: none">• Sequential {• Branching<ul style="list-style-type: none">- if- if-else- if-else if-else• Iterative<ul style="list-style-type: none">- while

```
...  
...  
while (condition)  
...  
...
```

Notes:

2.2 Solve Let's Count Program (using while)

Solve Let's Count Program (using while)

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```
int main() {  
    int n;  
    int counter;  
    cout<<"Please enter a positive integer:";  
    cin>>n;  
    counter = 1;  
    while(counter <= n) {  
        cout<<counter<<endl;  
        counter++;  
    }  
    return 0;  
}
```

Problem
Write a program that reads a positive integer n, and prints the numbers from 1 up to n.

Example
Please enter a positive integer: 5
1
2
3
4
5

output
1
2
3
4
5

Notes:

3. For Loops

3.1 For Loops

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For Loops

Data	Expressions	Control Flow
<ul style="list-style-type: none">• int• unsigned int• float• double• char• bool	<ul style="list-style-type: none">• I/O expressions• Arithmetic expressions• Boolean expressions	<ul style="list-style-type: none">• Sequential• Branching<ul style="list-style-type: none">- if- if else- if-else if-else• Iterative<ul style="list-style-type: none">- while- for

```
for (initialization; condition; increment) {  
    ...  
}
```

Notes:

3.2 Solve Let's Count Program (using for)

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Solve Let's Count Program (using for)

```
int main() {  
    Problem  
    int n;  
    Write a program that reads a positive integer n, and prints the numbers from 1 up to n.  
    int counter;  
  
    Example  
    cout<<"Please enter a positive integer:";  
    Please enter a positive integer:  
    4  
    for (initialization; condition; increment) {  
        1  
        2  
        3  
        4  
        cout<<counter<<endl;  
        counter++;  
    }  
    return 0;  
}
```

n = 4

counter: 1 2 3 4 5

Output:

```
1  
2  
3  
4
```

Notes:

3.3 Let's count Problem - comparing the two solutions

Let's Count Problem - Comparing the Two Solutions

```
int main(){
    int n;
    int counter;
    cout<<"Please enter a positive integer:";
    cin>>n;
    counter = 1;
    while(counter <= 4){
        cout<<counter<<endl;
        counter++;
    }
    return 0;
}
```

```
int main(){
    int n;
    int counter;
    cout<<"Please enter a positive integer:";
    cin>>n;
    for(counter = 1; counter <= 4; counter++){
        cout<<counter<<endl;
    }
    return 0;
}
```

Notes:

4. Counting and Summing Digits (example)

4.1 Counting and Summing Digits

Counting and Summing Digits

Problem
Write a program that reads a positive integer number and prints the number of digits in it and their sum.

Example
Please enter a positive integer: 375
375 has 3 digits and their sum is 15

Mathematical representation:
$$a_n a_{n-1} \dots a_1 a_0 \div 10 = a_n a_{n-1} \dots a_1$$

Notes:

4.2 Counting and Summing Digits continued

Counting and Summing Digits

```
int main(){
    int num;
    int sumDigits, countDigits;
    int currDigit;
    cout<<"Enter a positive integer:"<<endl;
    cin>>num;
    sumDigits = 0;
    countDigits = 0;
    while(num > 0){
        currDigit = num%10;
        countDigits++;
        sumDigits += currDigit;
        num = num/10;
    }
    cout<<num<<"has"<<countDigits<<"Digits";
    cout<<"and their sum is"<<sumDigits<<endl;
    return 0;
}
```

num	375	37	3	0
sumDigits	0	5	12	15
countDigits	0	1	2	3
currDigit	5	7	3	

3 ÷ 10 = 0 R 3

5. Computing the Average (example)

5.1 Computing The Average

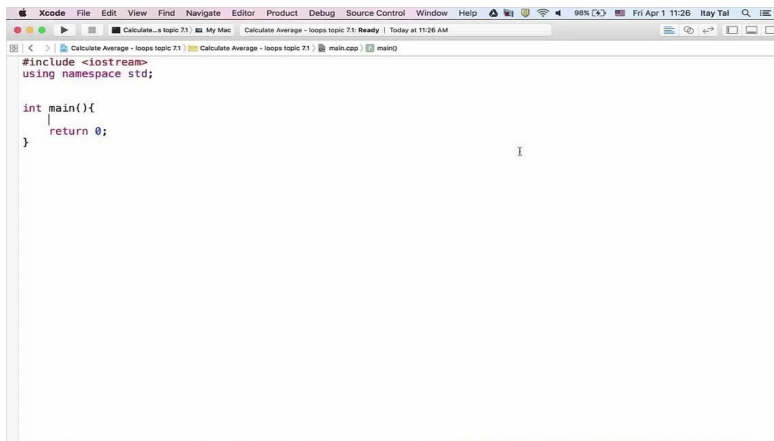
Computing The Average

Problem
Write a program that reads grades of students in a class, and prints the average.

Example
Please enter the number of students in the class:
4
Enter the students' grades (separated by a space):
71 86 68 94
The class average is 79.75

Notes:


5.2 Computing The Average



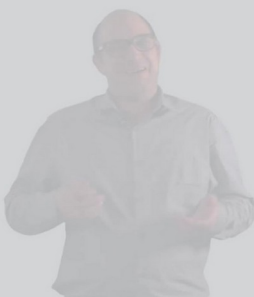
```
#include <iostream>
using namespace std;

int main(){
    return 0;
}
```

5.3 Computing The Average



Computing The Average

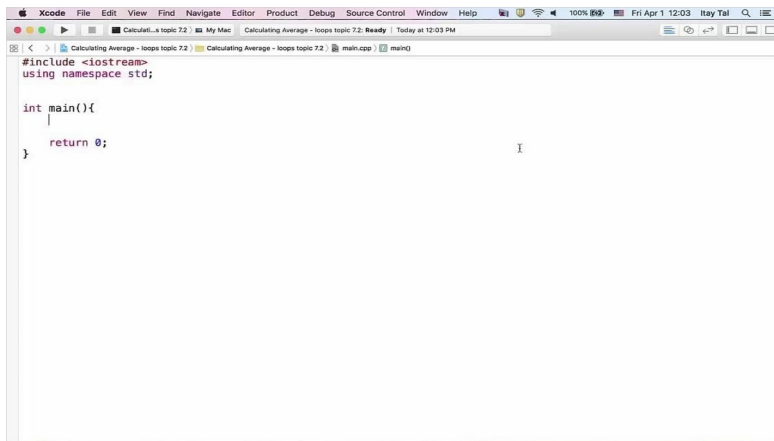


Problem
Write a program that reads grades of students in a class, and prints the average.

Example
Enter the number of students in the class: 4
Enter the grades separated by a space: 71 86 68 94
The class average is 79.75

Notes:

5.4 Computing The Average




```
#include <iostream>
using namespace std;

int main(){
    |
    return 0;
}
```

5.5 Knowledge Check

(Multiple Response, 10 points, unlimited attempts permitted)

Knowledge Check



For the following code for a loop, we want to add the first five positive integers to the sum. Complete the code below. Select all correct answers.

```
int sum = 0;
for(int i=0; i<6; i++){
```

- ☐ sum = i;
- ☒ sum = sum+i;
- ☒ sum +=i;
- ☐ i = sum;

```
}
```


Correct	Choice
	sum = i;
X	sum = sum+i;
X	sum +=i;
	i = sum;

Feedback when correct:

That's right! You selected the correct response.

Correct (Slide Layer)

Knowledge Check



For the following code for a loop, we want to add the first five positive integers to the sum. Complete the code below. Select all correct answers.

```
int sum = 0;
for (int i = 1; i <= 5; i++) {
```

☐ sum = i;

☒ sum = sum + i;

☒ sum += i;

☐ i = sum;

```
}
```


Correct

That's right! You selected the correct response.

Continue

Try Again (Slide Layer)

Knowledge Check



For the following code for a loop, we want to add the first five positive integers to the sum. Complete the code below. Select all correct answers.

```
int sum = 0;
for (int i = 1; i <= 5; i++) {
```

☐ sum = i;

☒ sum = sum + i;

☒ sum += i;

☐ i = sum;

```
}
```

Incorrect

That is incorrect. Please try again.

Try Again

5.6 Knowledge Check

(Fill-in-the-Blank, 10 points, unlimited attempts permitted)

Knowledge Check



What is the sum of the previous code after the loop is finished?

type your text here

Choice

15

Feedback when correct:

That's right! You selected the correct response.

Correct (Slide Layer)

Knowledge Check



What is the sum of the previous code after the loop is finished?

type your text

Correct

That's right! You selected the correct response.

Continue

Try Again (Slide Layer)

Knowledge Check

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What is the sum of the previous code after the loop is finished?

type your text

Incorrect

That is incorrect. Please try again.

Try Again

5.7 Knowledge Check

(True/False, 10 points, unlimited attempts permitted)

Knowledge Check

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Can every for loop be replaced with a while loop and vice versa?

☒ Yes

☐ No

Correct	Choice
X	Yes
	No

Feedback when correct:

That's right! A for loop runs for a specified amount of loops, while a while loop can often run indefinitely if there isn't a certain condition to satisfy.

Correct (Slide Layer)

Knowledge Check

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Can every for loop be replaced with a while loop and vice versa?

☒ Yes
☐ No

Correct

That's right! A for loop runs for a specified amount of loops, while a while loop can often run indefinitely if there isn't a certain condition to satisfy.

Continue

Try Again (Slide Layer)

Knowledge Check

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Can every for loop be replaced with a while loop and vice versa?

☒ Yes
☐ No

Incorrect

Not quite! A while loop runs until a certain condition is satisfied. What would happen if we only need to run a specific number of loops?

Try Again

5.8 For the following while loop, how many iterations are there?

`int a = 0;`

`while (a < 25)`

`a += 2;`

(Multiple Choice, 10 points, 1 attempt permitted)

Knowledge Check



For the following while loop, how many iterations are there?

```
int a = 0;  
while ( a < 25 )  
a += 2;
```

- ☐ 24
☒ 12
☐ 13
☐ 25

Correct	Choice	Feedback
	24	Not quite! Re-read what the question is asking for.
X	12	Correct!
	13	You're on the right track....
	25	Not quite!

24 (Slide Layer)

Knowledge Check



For the following while loop, how many iterations are there?

```
int a =  
while (  
a += 2;
```

Incorrect

Not quite! Re-read what the question is asking for.

Continue

- ☐ 25

12 (Slide Layer)

Knowledge Check

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For the following while loop, how many iterations are there?

```
int a =  
while (  
a += 2;
```

Correct

Correct!

Continue

☐ 25

13 (Slide Layer)

Knowledge Check

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For the following while loop, how many iterations are there?

```
int a =  
while (  
a += 2;
```

Incorrect

You're on the right track....

Continue

☐ 25

25 (Slide Layer)

Knowledge Check

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For the following while loop, how many iterations are there?

```
int a =  
while (  
a += 2;
```

Incorrect

Not quite!


Continue

☐ 25

5.9 Results Slide

(Results Slide, 0 points, 1 attempt permitted)

Results



Your Score:

%Results.ScorePercent%% (%Results.ScorePoints% points)

Passing Score:

%Results.PassPercent%% (%Results.PassPoints% points)

Result:

Retry Quiz

Review Quiz

Results for
5.5 Knowledge Check
5.6 Knowledge Check
5.7 Knowledge Check
5.8 For the following while loop, how many iterations are there? int a = 0; while (a < 25) a += 2;

Result slide properties


Passing

80%

Score

Success (Slide Layer)

Results



Your Score:

%Results.ScorePercent%% (%Results.ScorePoints% points)

Passing Score:

%Results.PassPercent%% (%Results.PassPoints% points)

Result:

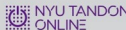
✔ Congratulations, you passed.

Retry Quiz

Review Quiz

Failure (Slide Layer)

Results



Your Score:

%Results.ScorePercent%% (%Results.ScorePoints% points)

Passing Score:

%Results.PassPercent%% (%Results.PassPoints% points)

Result:

✖ You did not pass.

Retry Quiz

Review Quiz

5.10 End of Module

