Algorithm performance

Counting operations

By the end of this video you will be able to…

- Count the number of operations executed when running a code snippet on given input

How many operations get executed?

Search for the letter

a

in the word

"San Diego"

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

```java
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   for (int i = 0; i < word.length(); i++)
   {
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      {
         return true;
      }
   }
   return false;
}
```

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    {
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        {
            return true;
        }
    }
    return false;
}
```

Linear search

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

Linear search

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

Linear search

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

Total so far: 1

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

Total so far: 2

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

Total so far: 3

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

Total so far: 4

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

Total so far: 5

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

Total so far: 6

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

Total so far: 7

Is the number of operations the same every time we run

```
hasLetter(String word, char letter)?
```

IVQ

```java
public static boolean hasLetter (String word  char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

IVQ

```java
public static boolean hasLetter (String word, char letter)
{
   for (int i = 0; i < word.length(); i++)
   {
     if (word.charAt(i) == letter)
     {
        return true;
     }
   }
   return false;
}
```

How many operations get executed?

Search for the letter

in the word

'x'

"San Diego"

```java
public static boolean hasLetter (String word, char letter)
{
   for (int i = 0; i < word.length(); i++)
   {
     if (word.charAt(i) == letter)
     {
         return true;
     }
   }
   return false;
}
```

How many operations get executed?

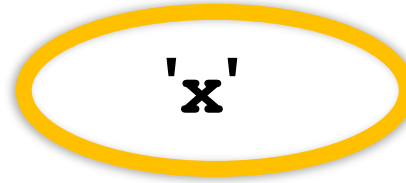## For a single iteration:

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

How many operations get executed?

For a single iteration:

```java
public static boolean hasLetter (String word, char letter)
{
  for (int i = 0; i < word.length(); i++)
  {
    if (word.charAt(i) == letter)
    {
      return true;
    }                        3
  }
  return false;
}
```

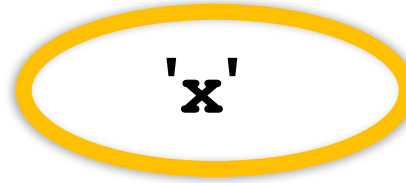| 0	1	2	3	4	5	6	7	8
S	a	n		D	i	e	g	o

```java
public static boolean hasLetter (String word, char letter)
{
    for (int i = 0; i < word.length(); i++)
    {
        if (word.charAt(i) == letter)
        {
            return true;
        }
    }
    return false;
}
```

2 iterations when look for 'a'

Search for the letter

in the word

'x'

"San Diego"

```java
public static boolean hasLetter (String word, char letter)
{
   for (int i = 0; i < word.length(); i++)
   {
     if (word.charAt(i) == letter)
     {
         return true;
     }
   }
   return false;
}
```

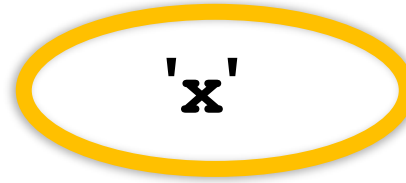# How many iterations of loop?

Search for the letter

in the word

'x'

9 iterations

"San Diego"

```java
public static boolean hasLetter (String word, char letter)
{
   for (int i = 0; i < word.length(); i++)
   {
     if (word.charAt(i) == letter)
     {
         return true;
     }
   }
   return false;
}
```

How many iterations of loop?

Search for the letter

in the word

'x'

"San Diego"

9 iterations

so

29 operations

```java
public static boolean hasLetter (String word, char letter)
{
   for (int i = 0; i < word.length(); i++)
   {
     if (word.charAt(i) == letter)
     {
         return true;
     }
   }
   return false;
}
```

Thought question

- What counts as an operation?