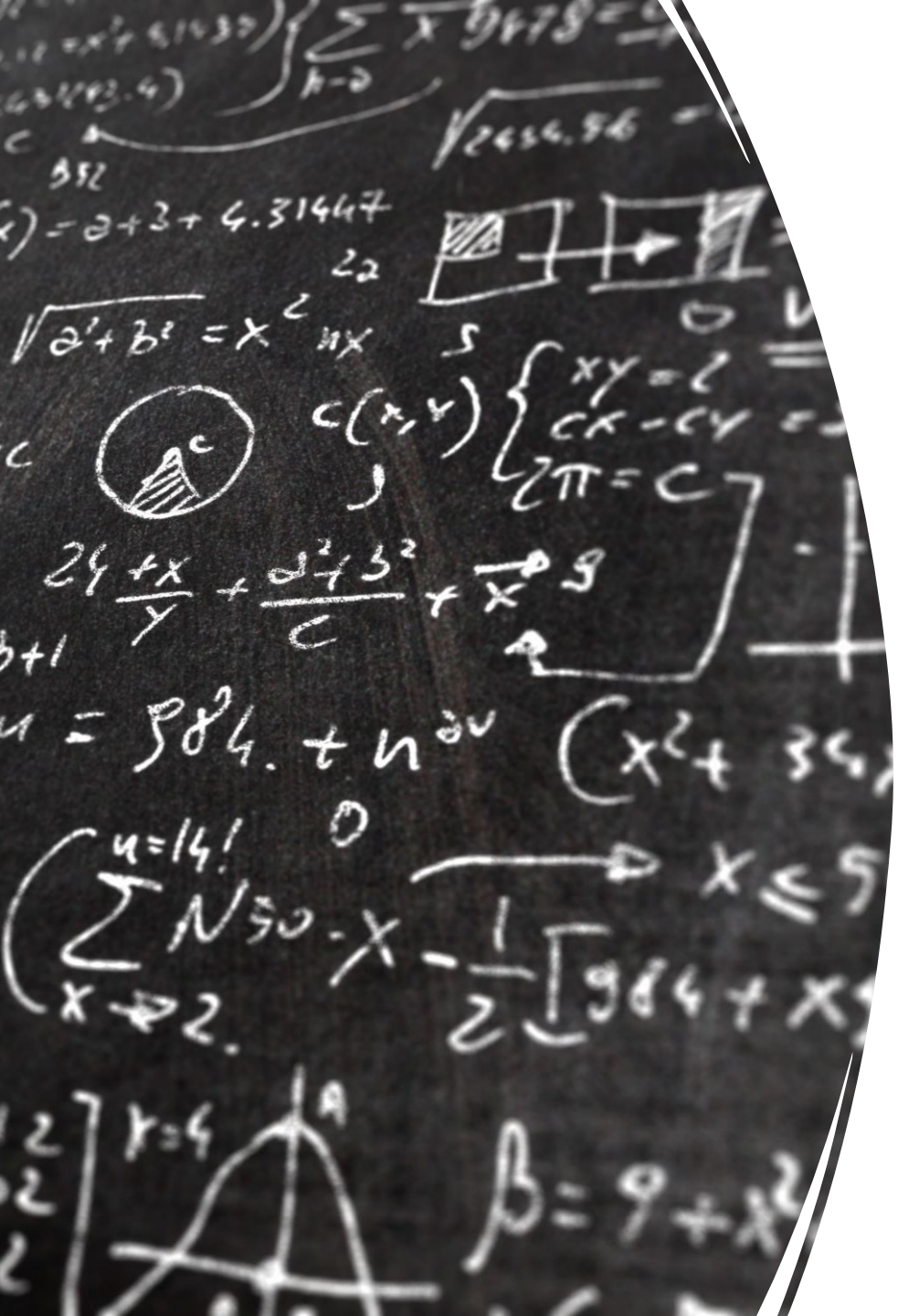

CS 113 – Computer Science I

Lecture 6 – Booleans, Conditionals

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02/02/2023

Announcements 1

- Assignment 02 – due 02/08
  - Released this morning

- Great participation on Piazza!

printf

At least two parameters:

template

variables that go into the template

Don’t use string concatenation:

```
printf(“This is some string “ + variable + “ that we concatenated”);
```

Absolute vs relative paths (scp)

scp <username>@<domain>:<absolute path>

scp apoliak@goldengate.cs.brynmawr.edu:/home/apoliak/cs113/README.txt

What's wrong here:
scp -r johndoe@goldengate.cs.brynmawr.edu:~/home/johndoe/CS113/hw09

"~/home/username" doesn't make sense
this is the same as "/home/johndoe/home/johndoe"

Agenda

- Announcements
- Booleans
- Boolean operators & Expressions
- Conditionals

A new data type: Booleans

- Contains two possible values:
  - `true; false;`
  - `bool isWet = true;`
- Conditional expression

Conditional Expressions & Relational Operators

- Conditional expression produces either `true` or `false`

- Relational Operators:
  - `>`
  - `>=`
  - `<`
  - `<=`
  - `==`
  - `!=`
- Watch out about `==` vs `=`

Exercise: relational expressions

```
int temp = 68;
double val = 10.5;
boolean raining = true;
```

Expression	Value	Type
temp > 80		
val != 5.6		
val >= 10.1		
raining == true		
raining		
raining == false		

Logical Operators

- Way to combine Boolean expressions

- logical Operators:
  - && - and
  - || - or
  - ! - not

Rules of logical operators

1. `X && Y` is true when
    1. Both `X` and `Y` are true

2. `X || Y` is true when
    1. `X` is true or `Y` is true

3. `!X` is true when
    1. `X` is false

4. `!X` false when
    1. `X` is true

Exercise: logical expressions

```
boolean isHappy = true;
boolean knowIt = false;
int temp = 40;
```

Expression	Value	Type
isHappy && knowIt		
isHappy		
isHappy || temp > 80		
isHappy || knowIt		
!knowIt		
isHappy && (temp < 80 || !knowIt)		

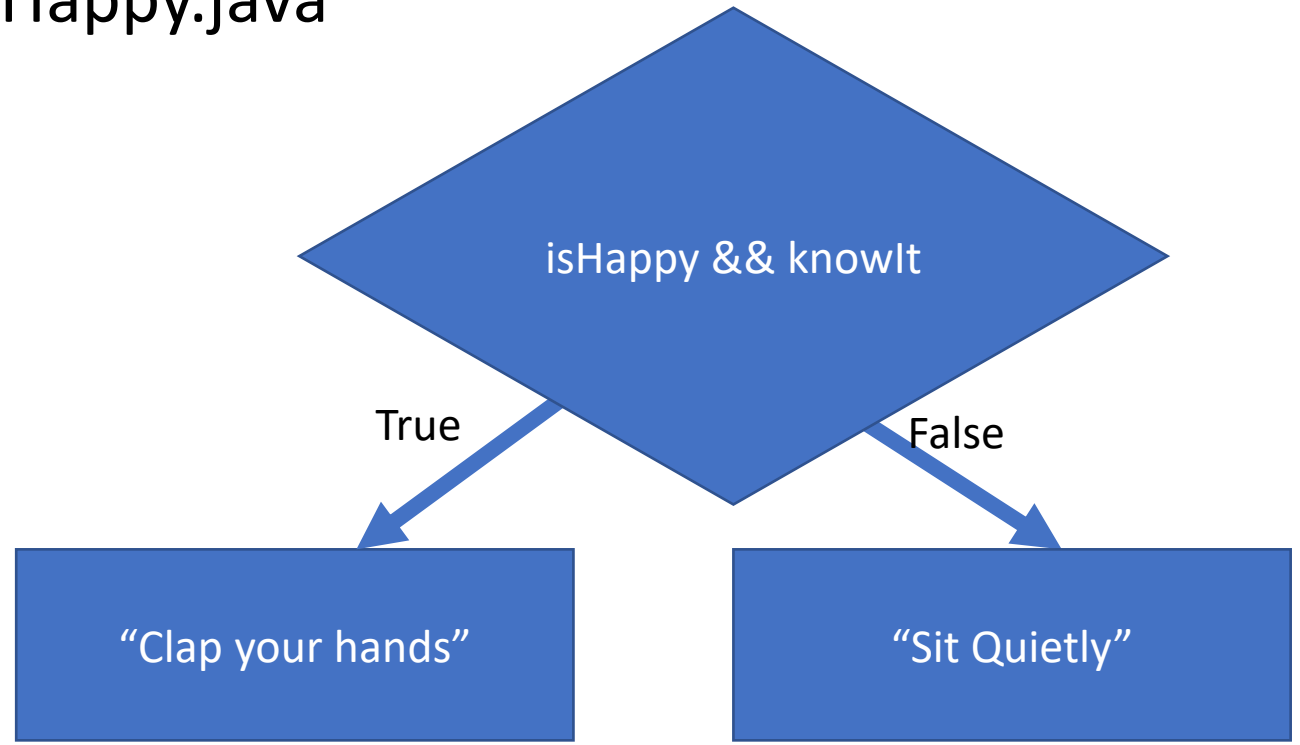
Decision making: if/else

Idea: Branching decision-making based on Boolean expressions

- Example: A **decision tree** for Happy.java

```
if (isHappy && knowIt) {
    System.out.println("Clap your hands!");

} else {
    System.our.println("Sit quietly.");
}
```



Exercise: IsEven

Write a program IsEven which asks the user for an integer and prints whether it is even or not

```
$ java IsEven
Enter an integer: 4
4 is even!

$ java IsEven
Enter an integer: -1
-1 is odd!

$ java IsEven
Enter an integer: 0
0 is even!
```

Decision making: multi-way if statements

```
if (<condition1>) {
  <stmts>
} else if (<condition2>) {
   <stmts>
}
….
else {
   <stmts>
}
```

NOTES:

- Conditions evaluated in order
- First true condition executes
- Only **one** of the conditions can execute!
- the final else statement is optional

Example: Height.java

- Write a program (called Height.java) that determines if a user can ride a rollercoaster.

- Make sure to ask the user for height in inches.
- Prints out a message if they are taller than 5, 4, 3 feet or are too short for the ride

Exercise: Height.java

```
class CheckHeight2 {
  public static void main(String[] args) {
    System.out.print("Enter a height (inches): ");
    int h = Integer.parseInt(System.console().readLine());

    if (h > 36) {
      println("Taller than 3 ft");
    }
    else if (h > 60) {
      println("Taller than 5 ft");
    }
    else if (h > 48) {
      println("Taller than 4 ft");
    }
    else {
      println("Too small for this ride");
    }
  }
}
```

What is the output of this program:

- if the user enters 62 inches?
- if the user enters 10 inches?

Draw the decision tree for this if statement

Draw the decision tree for this if statement

Exercise: Height.java

```
class CheckHeight2 {
  public static void main(String[] args) {
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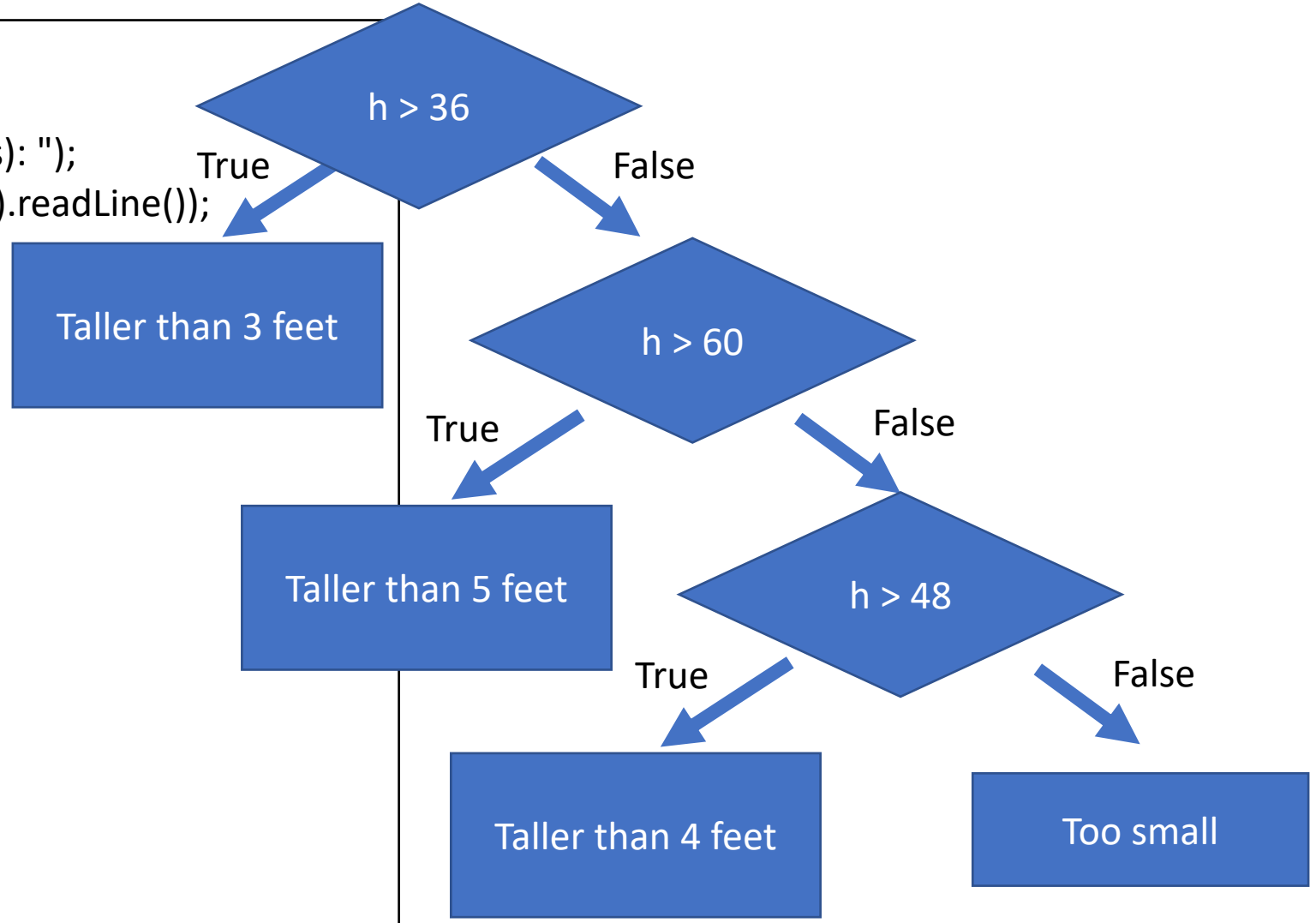
    }
    else if (h > 60) {
      println("Taller than 5 ft");
    }
    else if (h > 48) {
      println("Taller than 4 ft");
    }
    else {
      println("Too small for this ride");
    }
  }
}
```



Exercise: Height.java

Draw the decision tree for this if statement

What is the output of this program

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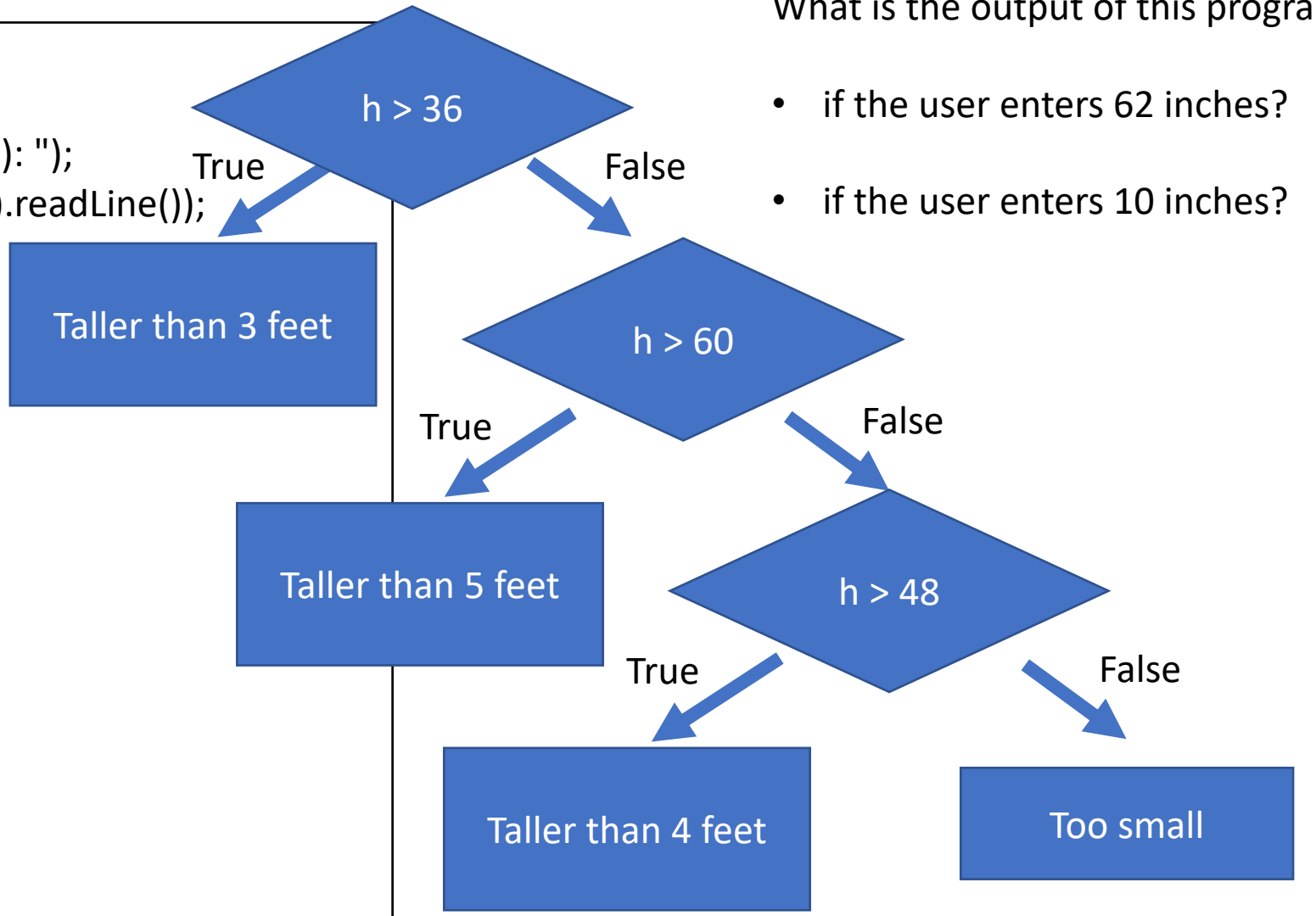
    }
    else if (h > 48) {
      println("Taller than 4 ft");
    }
    else {
      println("Too small for this ride");
    }
  }
}
```



Exercise: Blackjack

Write a program Blackjack.java which generates a random value between 2 and 21

- If the value is 21, print the value and “Blackjack” to the console
- If the value is between 17 and 20, print the value and “Stand” to the console
- If the value is less than 17, print the value and “Hit me!” to the console

Style

- How we format our programs is **very** important
  - Like rules of etiquette around eating and keep a clean appearance
  - Like punctuation rules, it helps make text more readable
- Variable names should be descriptive
- Indentation is **very** important
  - Every statement inside a pair of braces must be indented
- Braces should be placed consistently

Comparing strings

- In Java, you cannot directly compare strings: use **compareTo**
  - Javadocs: https://docs.oracle.com/javase/7/docs/api/java/lang/String.html

compareTo

```
public int compareTo(String anotherString)
```

Compares two strings lexicographically. The comparison is based on the Unicode value of each character in the strings. The character sequence represented by this `String` object is compared lexicographically to the character sequence represented by the argument string. The result is a negative integer if this `String` object lexicographically precedes the argument string. The result is a positive integer if this `String` object lexicographically follows the argument string. The result is zero if the strings are equal; `compareTo` returns `0` exactly when the `equals(Object)` method would return `true`.

This is the definition of lexicographic ordering. If two strings are different, then either they have different characters at some index that is a valid index for both strings, or their lengths are different, or both. If they have different characters at one or more index positions, let *k* be the smallest such index; then the string whose character at position *k* has the smaller value, as determined by using the < operator, lexicographically precedes the other string. In this case, `compareTo` returns the difference of the two character values at position `k` in the two string -- that is, the value:

```
this.charAt(k)-anotherString.charAt(k)
```

If there is no index position at which they differ, then the shorter string lexicographically precedes the longer string. In this case, `compareTo` returns the difference of the lengths of the strings -- that is, the value:

```
this.length()-anotherString.length()
```

Specified by:

`compareTo` in interface `Comparable<String>`

Parameters:

`anotherString` - the `String` to be compared.

Returns:

the value `0` if the argument string is equal to this string; a value less than `0` if this string is lexicographically less than the string argument; and a value greater than `0` if this string is lexicographically greater than the string argument.

compareTo

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- the value 0 if the argument string is equal to this string;
- a value less than 0 if this string is lexicographically less than the string argument;
- and a value greater than 0 if this string is lexicographically greater than the string argument.

Comparing strings

- In Java, you cannot directly compare strings: use **compareTo**

```
String a = “apple”;
String b = “banana”;
if (a.compareTo(b) == 0) {
   System.out.println(“a and b match!”);
}
if (a.compareTo(b) != 0) {
 System.out.println(“a and b DO NOT match!”);
}
```

Lexicographic Values/Order

- Strings are **ordered lexicographically**
  - Generally, the same order as alphabetical order, with some caveats
  - The characters of a string each correspond to a number

ASCII

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL (null)	32	20	040		Space	64	40	100	@	@	96	60	140	`	`
1	1	001	SOH (start of heading)	33	21	041	!	!	65	41	101	A	A	97	61	141	a	a
2	2	002	STX (start of text)	34	22	042	"	"	66	42	102	B	B	98	62	142	b	b
3	3	003	ETX (end of text)	35	23	043	#	#	67	43	103	C	C	99	63	143	c	c
4	4	004	EOT (end of transmission)	36	24	044	$	$	68	44	104	D	D	100	64	144	d	d
5	5	005	ENQ (enquiry)	37	25	045	%	%	69	45	105	E	E	101	65	145	e	e
6	6	006	ACK (acknowledge)	38	26	046	&	&	70	46	106	F	F	102	66	146	f	f
7	7	007	BEL (bell)	39	27	047	'	'	71	47	107	G	G	103	67	147	g	g
8	8	010	BS (backspace)	40	28	050	(	(	72	48	110	H	H	104	68	150	h	h
9	9	011	TAB (horizontal tab)	41	29	051	)	)	73	49	111	I	I	105	69	151	i	i
10	A	012	LF (NL line feed, new line)	42	2A	052	*	*	74	4A	112	J	J	106	6A	152	j	j
11	B	013	VT (vertical tab)	43	2B	053	+	+	75	4B	113	K	K	107	6B	153	k	k
12	C	014	FF (NP form feed, new page)	44	2C	054	,	,	76	4C	114	L	L	108	6C	154	l	l
13	D	015	CR (carriage return)	45	2D	055	-	-	77	4D	115	M	M	109	6D	155	m	m
14	E	016	SO (shift out)	46	2E	056	.	.	78	4E	116	N	N	110	6E	156	n	n
15	F	017	SI (shift in)	47	2F	057	/	/	79	4F	117	O	O	111	6F	157	o	o
16	10	020	DLE (data link escape)	48	30	060	0	0	80	50	120	P	P	112	70	160	p	p
17	11	021	DC1 (device control 1)	49	31	061	1	1	81	51	121	Q	Q	113	71	161	q	q
18	12	022	DC2 (device control 2)	50	32	062	2	2	82	52	122	R	R	114	72	162	r	r
19	13	023	DC3 (device control 3)	51	33	063	3	3	83	53	123	S	S	115	73	163	s	s
20	14	024	DC4 (device control 4)	52	34	064	4	4	84	54	124	T	T	116	74	164	t	t
21	15	025	NAK (negative acknowledge)	53	35	065	5	5	85	55	125	U	U	117	75	165	u	u
22	16	026	SYN (synchronous idle)	54	36	066	6	6	86	56	126	V	V	118	76	166	v	v
23	17	027	ETB (end of trans. block)	55	37	067	7	7	87	57	127	W	W	119	77	167	w	w
24	18	030	CAN (cancel)	56	38	070	8	8	88	58	130	X	X	120	78	170	x	x
25	19	031	EM (end of medium)	57	39	071	9	9	89	59	131	Y	Y	121	79	171	y	y
26	1A	032	SUB (substitute)	58	3A	072	:	:	90	5A	132	Z	Z	122	7A	172	z	z
27	1B	033	ESC (escape)	59	3B	073	;	;	91	5B	133	[	[	123	7B	173	{	{
28	1C	034	FS (file separator)	60	3C	074	<	<	92	5C	134	\	\	124	7C	174			|
29	1D	035	GS (group separator)	61	3D	075	=	=	93	5D	135	]	]	125	7D	175	}	}
30	1E	036	RS (record separator)	62	3E	076	>	>	94	5E	136	^	^	126	7E	176	~	~
31	1F	037	US (unit separator)	63	3F	077	?	?	95	5F	137	_	_	127	7F	177	&#127;	DEL

Source: www.LookupTables.com

https://www.asciitable.com/

StringCompare.java

```
String first = "a";
String second = "A";
int asciia = (int) first.charAt(0);
int asciib = (int) second.charAt(0);
System.out.println("ASCII Code for "+first+" is " + asciia);
System.out.println("ASCII Code for "+second+" is " + asciib);

if (first.compareTo(second) == 0) {
   System.out.println(first+" is equal to "+second);
}
else if (first.compareTo(second) < 0) {
   System.out.println(first+" is less than "+second);
}
else if (first.compareTo(second) > 0) {
   System.out.println(first+" is greater than "+second);
}
```

```
$ java StringCompare
ASCII Code for a is 97
ASCII Code for A is 65
a is greater than A
```

Exercise: IsPrimary

Write a program that asks the user for a color and prints whether the color is primary or not.

- The primary colors are “red”, “green”, “blue”
- All other inputs are non-primary

```
$ java IsPrimary
Enter a color: green
green is not primary

$ java IsPrimary
Enter a color: blue
blue is primary
```