Traverse the Ol'
CONDITIONAL CANYON

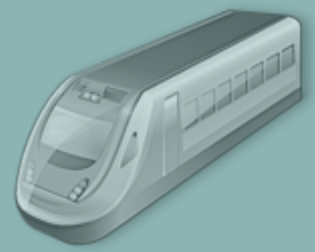
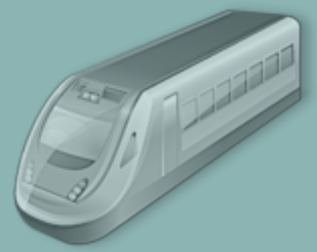
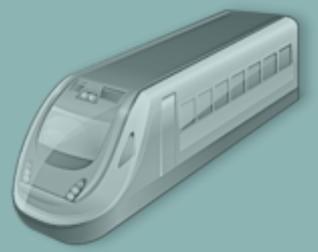
LEVEL 2

CONDITIONAL CANYON

THE CURRENT BUILD FOR OUR TRAIN STATUS SYSTEM

Our system currently prints both operational and non-operational trains

1	2	3	4	5	6
✓	✓	✓	✓	✓	✓

7	8	9	10	11	12
					
✓	✓	✗	✗	✗	✗

OUR CURRENT SYSTEM USES TWO LOOPS...

trains.js

```
var totalTrains = 12;
var trainsOperational = 8;

var trainNumber = 1;
while(trainNumber <= trainsOperational){
        console.log("Train #" + trainNumber + " is running.");
        trainNumber++;
}

for(var stoppedTrain = trainsOperational + 1; stoppedTrain <= totalTrains; stoppedTrain++){
        console.log("Train #" + stoppedTrain + " is not operational.");
}
```

We want to merge these loops into one loop that DECIDES which trains are running and which aren't.

LETS USE ONE LOOP INSTEAD OF TWO

So how do we run different lines of code based on specific conditions?

trains.js

```
...
for (var trainNumber = 1; trainNumber <= totalTrains; trainNumber++){

    *if the train is currently running, we want:*
        console.log("Train #" + trainNumber + " is running.");

    *otherwise, if it's not, we want:*
        console.log("Train #" + trainNumber + " is not operational.");
}
```

Notice now that we're now using only one variable to identify the train's number.

IF, AND HER BUDDY, ELSE

If and Else allow us to execute certain code based on specific conditions

If the conditional evaluates to true, the code block is executed.

```
if (*some condition is true*) {

 *do this code!*

} else {

  *OTHERWISE, do this code instead!*

}
```

Else follows up with code to execute ONLY when the If conditional is not satisfied. It is ignored otherwise.

IF, AND HER BUDDY, ELSE

A basic example of conditional execution

```
var value1 = 4;
var value2 = 9;

if ( value1 < value2 ) {

    console.log(value1 + " is less than " + value2);

} else {

    console.log(value1 + " is greater than or equal to " + value2);

}
```

We aren't sure whether it's strictly greater than, only that it is not less than.

→ 4 is less than 9

IF, AND HER BUDDY, ELSE

A basic example of conditional execution

```
var value1 = 12;
var value2 = 9;

if ( value1 < value2 ) {

    console.log(value1 + " is less than " + value2);

} else {

    console.log(value1 + " is greater than or equal to " + value2);

}
```

Now, this conditional will evaluate to false, and so the 'else' block will trigger.

```
→ 12 is greater than or equal to 9
```

Trust us on this.

CAN IF AND ELSE MAKE OUR TRAINS.JS BETTER?

Using conditionals for efficiency

trains.js

```
var totalTrains = 12;
var trainsOperational = 8;


var trainNumber = 1;
while (trainNumber <= trainsOperational){
        console.log("Train #" + trainNumber + " is running.");
        trainNumber++;
}
for (var stoppedTrain = trainsOperational + 1; stoppedTrain <= totalTrains; stoppedTrain++) {
        console.log("Train #" + stoppedTrain + " is not operational.");
}
```

BUILDING OUR NEW SYSTEM STATUS LOOP

Looping with If and Else controls

trains.js

```
...
for (var trainNumber = 1; trainNumber <= totalTrains; trainNumber++){

      *if the train is currently running, we want:*
            console.log("Train #" + trainNumber + " is running.");

      *otherwise, if it's not, we want:*
            console.log("Train #" + trainNumber + " is not operational.");
}
```

BUILDING OUR NEW SYSTEM STATUS LOOP

Looping with If and Else controls

trains.js

```
...
for (var trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {

    if (trainNumber <= operationalTrains) {
        console.log("Train #" + trainNumber + " is running.");
    } else {
        console.log("Train #" + trainNumber + " is not operational.");
    }
}
```

As soon as trainNumber is no longer within the amount of operational trains, the If block is skipped and the Else block begins printing in each new loop.

RUNNING OUR NEW SINGLE LOOP!

trainNumber	LOOP: trainNumber<=12?	Is trainNumber<=8?	OUTPUT
1	TRUE	YES -> IF	Train #1 is running.
2	TRUE	YES -> IF	Train #2 is running.
3	TRUE	YES -> IF	Train #3 is running.
4	TRUE	YES -> IF	Train #4 is running.
5	TRUE	YES -> IF	Train #5 is running.
6	TRUE	YES -> IF	Train #6 is running.
7	TRUE	YES -> IF	Train #7 is running.
8	TRUE	YES -> IF	Train #8 is running.
9	TRUE	NO -> ELSE	Train #9 is not operational.
10	TRUE	NO -> ELSE	Train #10 is not operational.
11	TRUE	NO -> ELSE	Train #11 is not operational.
12	TRUE	NO -> ELSE	Train #12 is not operational.
13	FALSE	STOP THE LOOP!	

ADDING A SPECIAL TRAIN THAT STARTS LATER

Let’s add a train that isn’t operational yet, but starts at noon.

1 ✓

2 ✓

3 ✓

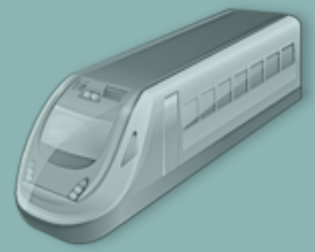
4 ✓

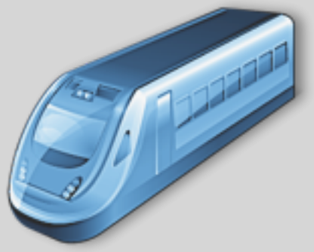
5 ✓

6 ✓

7 ✓

8 ✓

9  ✗

10  ✓

11 ✗

12 ✗

THE ELSE-IF SYNTAX

When two conditions just isn't enough!

```
if (*some condition is true*) {

  *do this code!*

} else if (*some OTHER condition is true*) {

   *do something for this condition!*

} else {

   *IN ALL OTHER CASES, do this code instead!*

}
```

Remember that as soon as a condition is met in any block, the rest will be skipped entirely!

CHECKING MULTIPLE CONDITIONS

“Else If” can be used when many specific scenarios need attention

```
if (trainNumber <= operationalTrains) {

     console.log("Train #" + trainNumber + " is running.");

} *otherwise, first check if the train is the express train*{

     console.log("Train #10 begins running at noon.");

} else {

     console.log("Train #" + trainNumber + " is not operational.");

}
```

CHECKING MULTIPLE CONDITIONS

“Else If” can be used when many specific scenarios need attention

```
if (trainNumber <= operationalTrains) {

      console.log("Train #" + trainNumber + " is running.");

} else if (trainNumber == 10) {

      console.log("Train #10 begins running at noon.");

} else {

      console.log("Train #" + trainNumber + " is not operational.");

}
```

This condition is checked ONLY when a train is NOT an operational train. Thus, train 10 only starts at noon if it is not ALREADY an operational train.

Triggers only when a train is neither regular NOR express

UPDATING OUR SYSTEM STATUS LOOP

Now we can print based on multiple conditions!

trains.js

```
...
for (trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {

  if (trainNumber <= operationalTrains) {
        console.log("Train #" + trainNumber + " is running.");
  } else if (trainNumber == 10) {
        console.log("Train #10 begins running at noon.");
  } else {
        console.log("Train #" + trainNumber + " is not operational.");
  }

}
```

SO WHAT DOES THIS GET US?

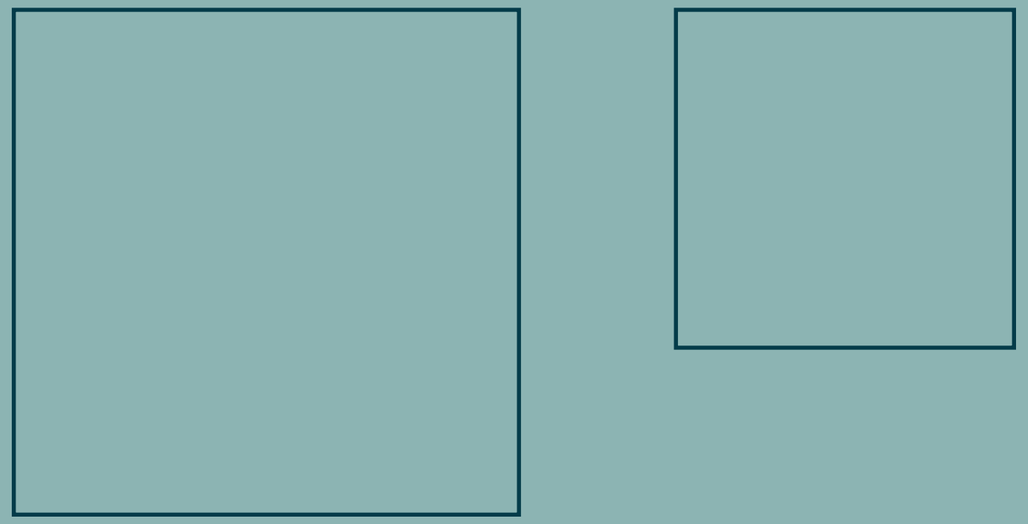
trainNumber	LOOP: trainNumber<=12?	Is trainNumber<=8?	Is trainNumber ==10?	OUTPUT
1	TRUE	YES -> IF	IGNORE	Train #1 is running.
2	TRUE	YES -> IF	IGNORE	Train #2 is running.
3	TRUE	YES -> IF	IGNORE	Train #3 is running.
4	TRUE	YES -> IF	IGNORE	Train #4 is running.
5	TRUE	YES -> IF	IGNORE	Train #5 is running.
6	TRUE	YES -> IF	IGNORE	Train #6 is running.
7	TRUE	YES -> IF	IGNORE	Train #7 is running.
8	TRUE	YES -> IF	IGNORE	Train #8 is running.
9	TRUE	NO	NO -> ELSE	Train #9 is not operational.
10	TRUE	NO	YES -> ELSE-IF	Train #10 begins running at noon.
11	TRUE	NO	NO -> ELSE	Train #11 is not operational.
12	TRUE	NO	NO -> ELSE	Train #12 is not operational.
13	FALSE	STOP THE LOOP!		

NESTED CONDITIONALS

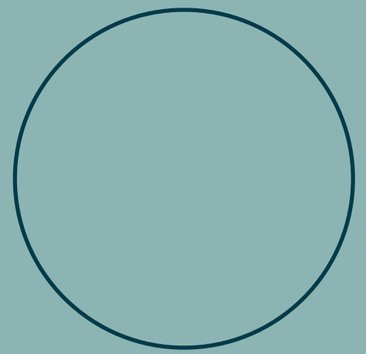
Splitting results for a single condition

Let’s say we had some shapes.

We have two sizes for squares...



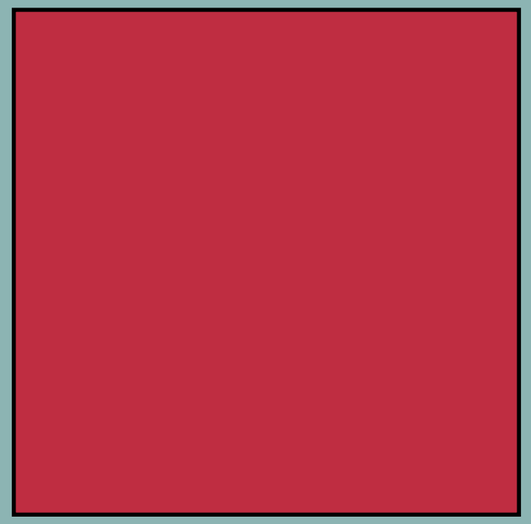
...but only one size for circles.

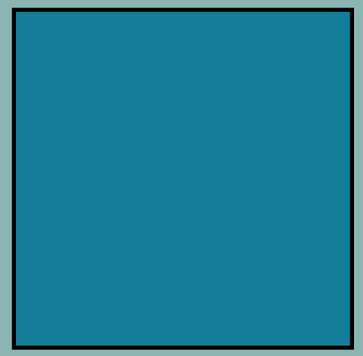


NESTED CONDITIONALS

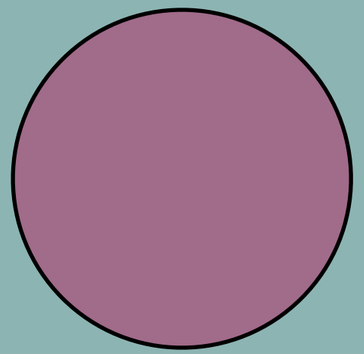
Splitting results for a single condition

We want to color big squares red,
and small squares blue...





...while all circles are purple.



NESTED CONDITIONALS

Splitting results for a single condition

```
if ( *it's a square* ) {

      if (*it's big*) {

         *make it red!*

      } else {

         *it must be a small square, so make it blue!*

      }

} else {

      *since its not a square, it must be a circle, so make it purple!*

}
```

This Else ONLY reacts to a failure of the most recently encountered If statement

This Else ONLY triggers if the very first If does not.

NESTED CONDITIONALS

Splitting results for a single condition

```
if (*there are ANY running trains*) {

      if (*the amount of running trains equals the amount of total trains*) {
         *print out to passengers that all trains are running!*
      } else {
         *just execute our existing loop code covering the status of trains*
      }

} else {
     *there must be no running trains, so print that out!*
}
```

NESTED CONDITIONALS

Splitting results for a single condition

```
if (trainsOperational > 0) {
    if (trainsOperational == totalTrains) {
        console.log("All trains are running at the JavaScript Express!");
    } else {
        for (var trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {
            ...
        }
    }
} else {
        console.log("No trains are operational today. Bummer!");
}
```

Our already existing status conditionals from trains.js go here

UPDATING TRAINS.JS WITH NEW CONDITIONS

Now passengers will know if all trains are running, or if none are.

trains.js

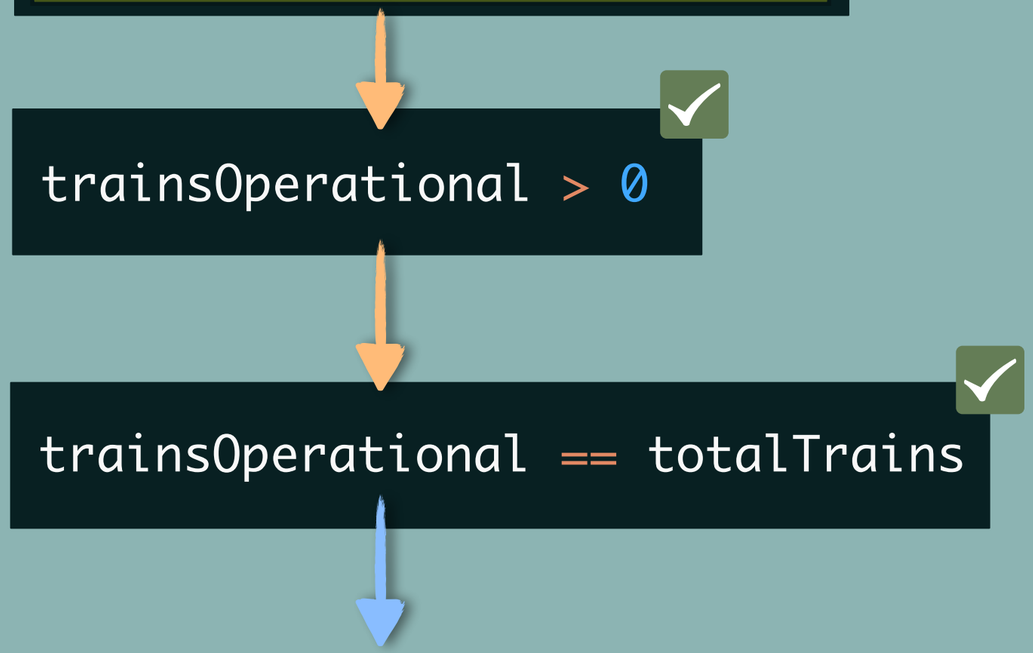
Every possible message is still controlled by these two values!

```
var totalTrains = 12;
var trainsOperational = 8;

if ( trainsOperational > 0 ) {

    if (trainsOperational == totalTrains) {

        console.log("All trains are running at the JavaScript Express!");

    } else {

        for (var trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {

            ...

        }

    }

} else {

    console.log("No trains are operational today. Bummer!");

}
```

ALL TRAINS, OR NONE

Let's look at how we'd get these situations...

```
var totalTrains = 12;
var trainsOperational = 12;
```



```
trainsOperational > 0
```

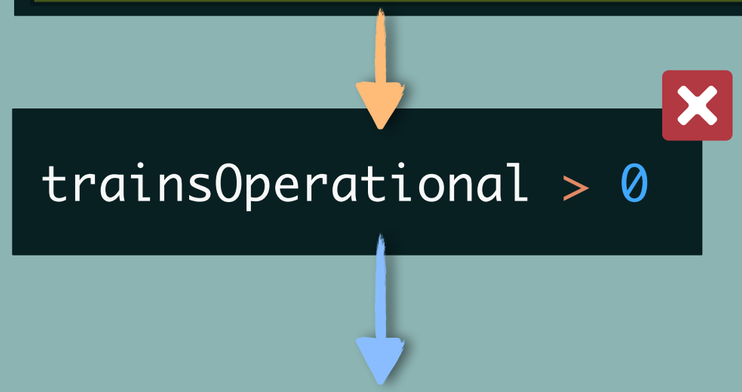
```
trainsOperational == totalTrains
```

```
All trains are running at the JavaScript Express!
```

ALL TRAINS, OR NONE

Let's look at how we'd get these situations...

```
var totalTrains = 12;
var trainsOperational = 0;
```



```
trainsOperational > 0
```

```
No trains are operational today. Bummer!
```

ADDING TO OUR LIST OF SPECIAL TRAINS

Another train that will start running at noon on its non-operational days

1 ✓

2 ✓

3 ✓

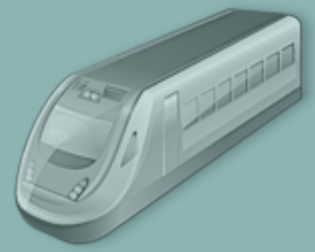
4 ✓

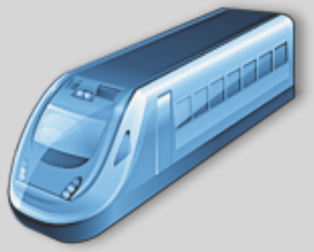
5 ✓

6 ✓

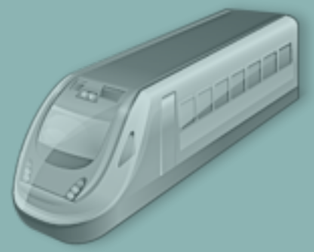
7 ✓

8 ✓

9  ✗

10  ✓

11 ✗

12  ✗

ADDING TO OUR LIST OF SPECIAL TRAINS

Another train that will start running at noon on its non-operational days

1 ✓

2 ✓

3 ✓

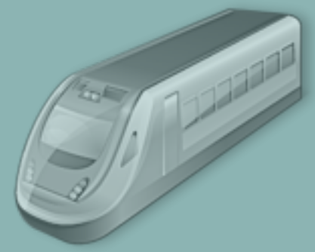
4 ✓

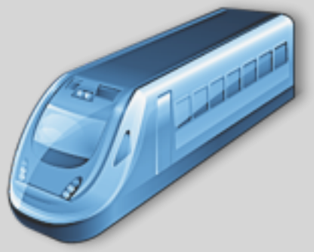
5 ✓

6 ✓

7 ✓

8 ✓

9  ✗

10  ✓

11 ✗

ADDING TO OUR LIST OF SPECIAL TRAINS

Another train that will start running at noon on its non-operational days

1 ✓

2 ✓

3 ✓

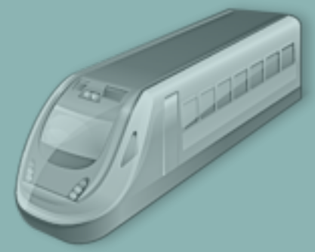
4 ✓

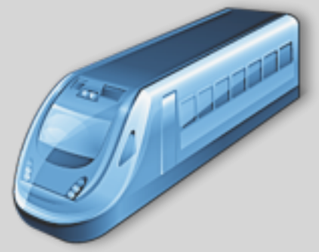
5 ✓

6 ✓

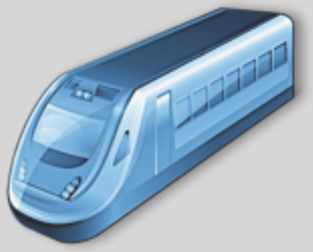
7 ✓

8 ✓

9  ✗

10  ✓

11 ✗

12  ✓

ADDING A SECOND CONDITION

Printing based on multiple conditions

trains.js

```
...
for (trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {
     if (trainNumber <= operationalTrains) {
            console.log("Train #" + trainNumber + " is running.");
     } else if (trainNumber == 10   *we want something else here*) {
            console.log("Train #10 begins running at noon.");
     } else {
            console.log("Train #" + trainNumber + " is not operational.");
     }
}
```

COMPLEX CONDITIONALS

&& **Binary ‘And’ returns true if BOTH values are true**

|| **Binary ‘Or’ returns true if EITHER value is true**

```
> true && false
```
→ false

```
> true && true
```
→ true

```
> false && false
```
→ false

```
> false || true
```
→ true

```
> false || false
```
→ false

```
> true || true
```
→ true

COMPLEX CONDITIONALS

&& **Binary ‘And’ returns true if BOTH values are true**

|| **Binary ‘Or’ returns true if EITHER value is true**

```
> ( 11 >= 11 ) && ( -7 < 6 )
```

true && true

→ true

```
> ( 2 >= 0 ) && ( 9 < 4 )
```

true && false

→ false

```
> ( 5 < 7 ) || ( 8 > 10 )
```

true || false

→ true

```
> ( 3 > 8 ) || ( 7 < 3 )
```

false || false

→ false

ADDING A SECOND CONDITION

Printing based on multiple conditions

trains.js

```
...
for (trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {
     if (trainNumber <= operationalTrains) {
            console.log("Train #" + trainNumber + " is running.");
     } else if (trainNumber == 10    *we want something else here*) {
            console.log("Train #10 begins running at noon.");
     } else {
            console.log("Train #" + trainNumber + " is not operational.");
     }

}
```

ADDING A SECOND CONDITION

Printing based on multiple conditions

trains.js

```
...
for (trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {
     if (trainNumber <= operationalTrains) {
             console.log("Train #" + trainNumber + " is running.");
     } else if (trainNumber == 10 || trainNumber == 12 ) {
             console.log("Train #" + trainNumber + " will begin running at noon.");
     } else {
             console.log("Train #" + trainNumber + " is not operational.");
     }

}
```

Now we use the trainNumber variable instead of hard-coding the values.

OUR UPDATED STATUS LOOP

All trains that begin running at noon are now printed!

trainNumber	LOOP: trainNumber<=12?	Is trainNumber<=8?	Is trainNumber ==10?	OUTPUT
1	TRUE	YES -> IF	IGNORE	Train #1 is running.
2	TRUE	YES -> IF	IGNORE	Train #2 is running.
3	TRUE	YES -> IF	IGNORE	Train #3 is running.
4	TRUE	YES -> IF	IGNORE	Train #4 is running.
5	TRUE	YES -> IF	IGNORE	Train #5 is running.
6	TRUE	YES -> IF	IGNORE	Train #6 is running.
7	TRUE	YES -> IF	IGNORE	Train #7 is running.
8	TRUE	YES -> IF	IGNORE	Train #8 is running.
9	TRUE	NO	NO -> ELSE	Train #9 is not operational.
10	TRUE	NO	YES -> ELSE-IF	Train #10 begins running at noon.
11	TRUE	NO	NO -> ELSE	Train #11 is not operational.
12	TRUE	NO	YES -> ELSE-IF	Train #12 begins running at noon.
13	FALSE	STOP THE LOOP!		

ADDING TO OUR LIST OF SPECIAL TRAINS

Using && for unique conditions

1

✓

2

✓

3

✓

4

✓

5

✓

6

✓

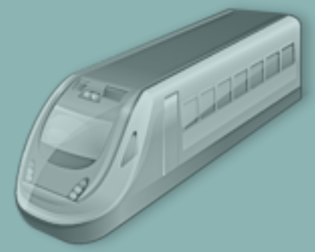
7

✓

8

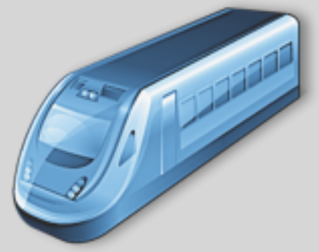
✓

9



✗

10

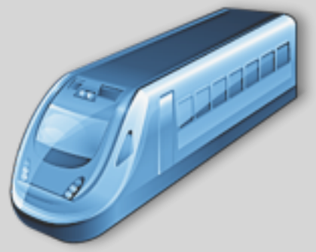


✓

11

✗

12



✓

ADDING TO OUR LIST OF SPECIAL TRAINS

Using && for unique conditions

1

✓

2

✓

4

✓

5

✓

6

✓

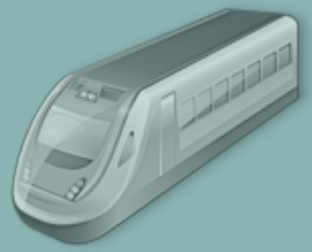
7

✓

8

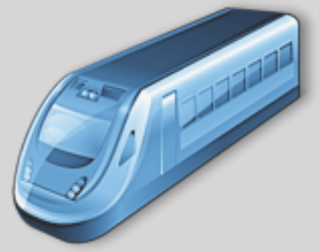
✓

9



✗

10



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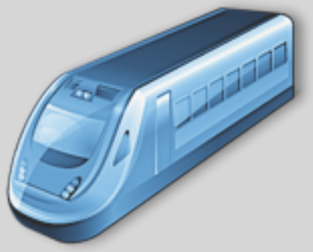

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ADDING TO OUR LIST OF SPECIAL TRAINS

Using && for unique conditions

1

✓

2

✓

3

✓

4

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5

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6

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7

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8

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9

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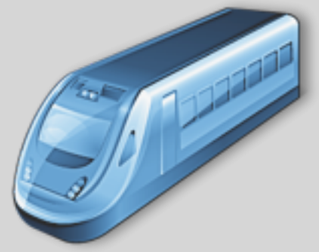
10



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11

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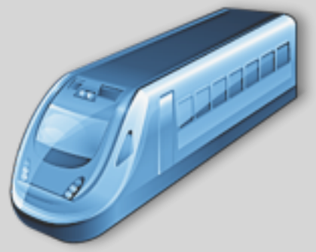
12



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INSERTING NEW CONDITIONS

We want to make sure Train 3 runs only on Sunday

```
var dayOfWeek = "Friday";
```

trains.js

```
...
for (trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {
     if (trainNumber <= operationalTrains) {
            console.log("Train #" + trainNumber + " is running.");
     } else if (trainNumber == 10 || trainNumber == 12 ) {
            console.log("Train # " + trainNumber + " will begin running at noon.");
     } else if (    *trainNumber is 3 AND its Sunday*    ) {
           *print that train 3 is running*
     } else {
            console.log("Train #" + trainNumber + " is not operational.");
     }
}
```

INSERTING NEW CONDITIONS

We want to make sure Train 3 runs only on Sunday

```
var dayOfWeek = "Friday";
```

trains.js

```
...
for (trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {
     if (trainNumber <= operationalTrains) {
            console.log("Train #" + trainNumber + " is running.");
     } else if (trainNumber == 10 || trainNumber == 12 ) {
            console.log("Train # " + trainNumber + " will begin running at noon.");
     } else if ( trainNumber == 3 && dayOfWeek == "Sunday"  ) {
            console.log("Train #3 is running.");
     } else {
            console.log("Train #" + trainNumber + " is not operational.");
     }
}
```

LETS RUN IT!

```
Train #1 is running.
Train #2 is running.
Train #3 is running.
Train #4 is running.
Train #5 is running.
Train #6 is running.
Train #7 is running.
Train #8 is running.
Train #9 is not operational.
Train #10 will begin running at noon.
Train #11 is not operational.
Train #12 will begin running at noon.
```

WHY DIDN'T WE GET THE RIGHT STATUS?

Tracing our loop logic

```
var dayOfWeek = "Friday";
var totalTrains = 12;
var trainsOperational = 8;
```

```
trainsOperational > 0
```

```
trainsOperational == totalTrains
```

```
trainNumber = 3
```

In our status loop, trainNumber eventually becomes 3

```
trainNumber <= operationalTrains
```

```
Train #3 is running.
```

But it shouldn't be running, because it's Friday!

HOUSTON, WE HAVE A PROBLEM...

Our logic doesn't work! What do we need...?

```
var dayOfWeek = "Friday";
```

trains.js

```
...
for (trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {
    if (trainNumber <= operationalTrains) {
            console.log("Train #" + trainNumber + " is running.");
    } else if (trainNumber == 10 || trainNumber == 12 ) {
            console.log("Train # " + trainNumber + " will begin running at noon.");
    } else if ( trainNumber == 3 && dayOfWeek == "Sunday" ) {
            console.log("Train #3 is running.");
    } else {
            console.log("Train #" + trainNumber + " is not operational.");
    }
}
```

If there are 3 or more operational trains, then the later Else-If will never be checked when the trainNumber is 3. Thus, our system says that Train 3 is running when it isn't!

HOUSTON, WE HAVE A PROBLEM...

Our logic doesn't work! What do we need...?

```
var dayOfWeek = "Friday";
```

trains.js

```
...
for (trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {
     if (trainNumber <= operationalTrains *AND trainNumber is NOT 3* ) {
              console.log("Train #" + trainNumber + " is running.");
     } else if (trainNumber == 10 || trainNumber == 12 ) {
              console.log("Train # " + trainNumber + " will begin running at noon.");
     } else if ( trainNumber == 3 && dayOfWeek == "Sunday" ) {
              console.log("Train #3 is running.");
     } else {
              console.log("Train #" + trainNumber + " is not operational.");
     }


}
```

HOUSTON, WE HAVE A PROBLEM...

Our logic doesn't work! What do we need...?

```
var dayOfWeek = "Friday";
```

trains.js

```
...
for (trainNumber = 1; trainNumber <= totalTrains; trainNumber++) {
     if (trainNumber <= operationalTrains && trainNumber != 3       ) {
               console.log("Train #" + trainNumber + " is running.");
     } else if (trainNumber == 10 || trainNumber == 12 ) {
               console.log("Train # " + trainNumber + " will begin running at noon.");
     } else if ( trainNumber == 3 && dayOfWeek == "Sunday" ) {
               console.log("Train #3 is running.");
     } else {
               console.log("Train #" + trainNumber + " is not operational.");
     }
}
```

If we have made sure that trainNumber is NOT 3 before printing out for a regular running train, this later Else-If will trigger correctly if both conditions are met!

NOW WE GET CORRECT PRINTOUTS!

```
var dayOfWeek = "Friday";
```

```
Train #1 is running.
Train #2 is running.
Train #3 is not operational.
Train #4 is running.
Train #5 is running.
Train #6 is running.
Train #7 is running.
Train #8 is running.
Train #9 is not operational.
Train #10 will begin running at noon.
Train #11 is not operational.
Train #12 will begin running at noon.
```

NOW WE GET CORRECT PRINTOUTS!

```
var dayOfWeek = "Sunday";
```

```
Train #1 is running.
Train #2 is running.
Train #3 is running.
Train #4 is running.
Train #5 is running.
Train #6 is running.
Train #7 is running.
Train #8 is running.
Train #9 is not operational.
Train #10 will begin running at noon.
Train #11 is not operational.
Train #12 will begin running at noon.
```

TRACING OUR COMPLEX CONDITIONAL

How do we arrive at the different printouts for Train 3?

```
var dayOfWeek = "Friday";
var totalTrains = 12;
var trainsOperational = 8;
```

```
trainsOperational > 0
```

```
trainsOperational == totalTrains
```

```
trainNumber = 3
```

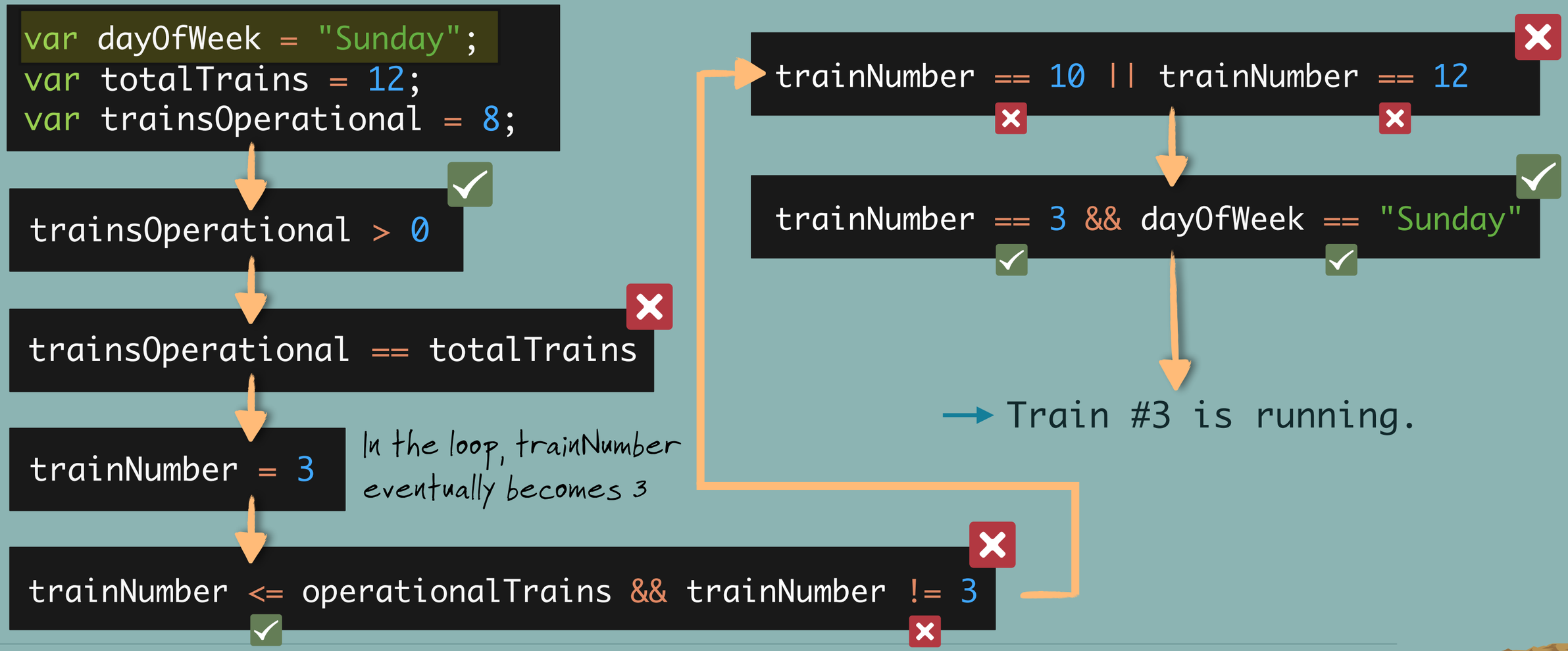
In the loop, trainNumber eventually becomes 3

```
trainNumber <= operationalTrains && trainNumber != 3
```

```
trainNumber == 10 || trainNumber == 12
```

```
trainNumber == 3 && dayOfWeek == "Sunday"
```

→ Train #3 is not operational.

TRACING OUR COMPLEX CONDITIONAL

How do we arrive at the different printouts for Train 3?