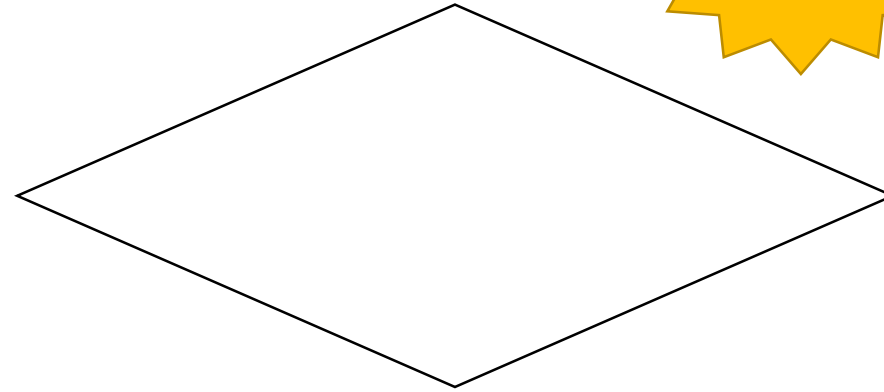


Flowcharts with Decisions

Diamonds and Branches make an appearance

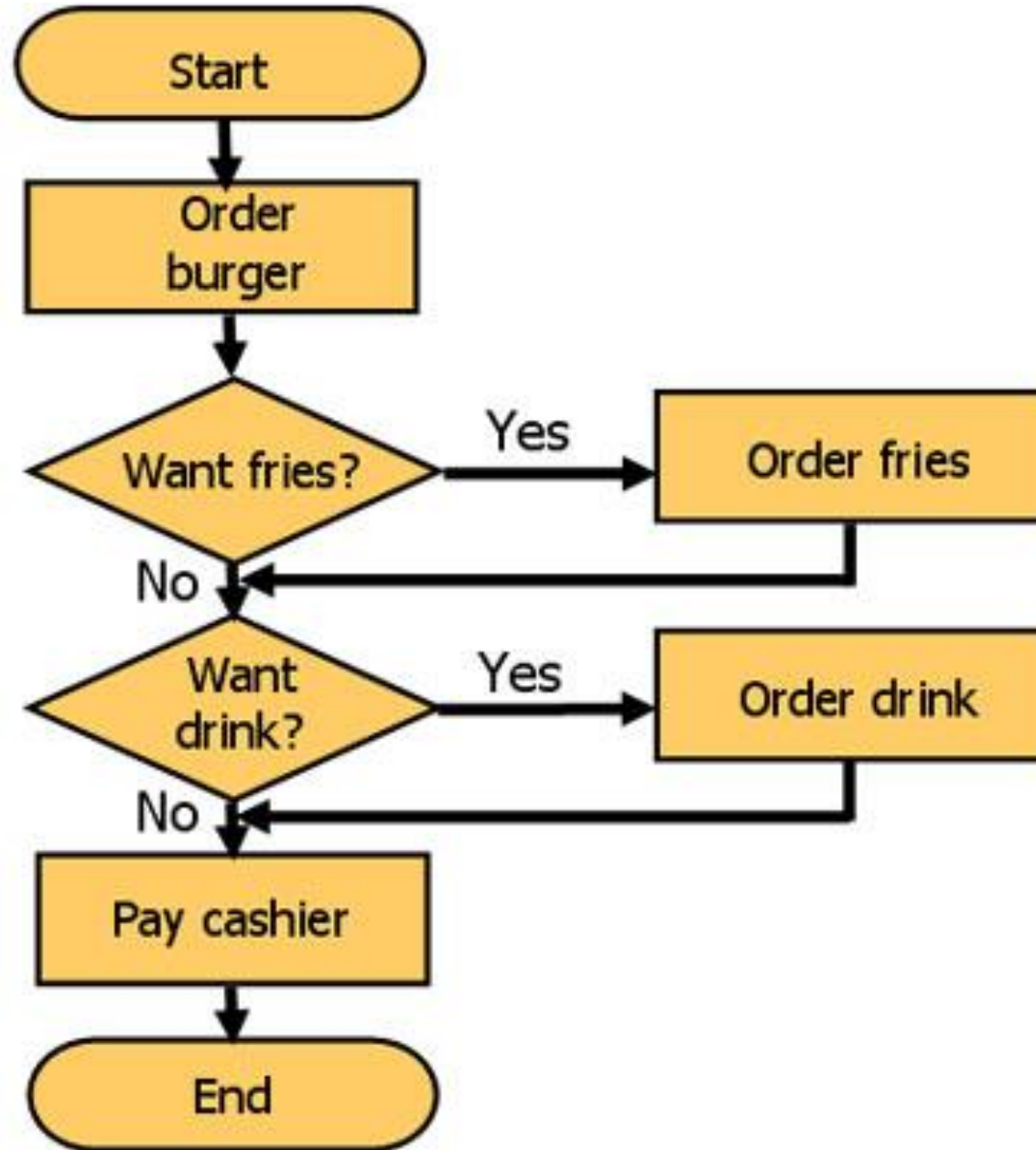
What do each of these flowchart shapes represent?



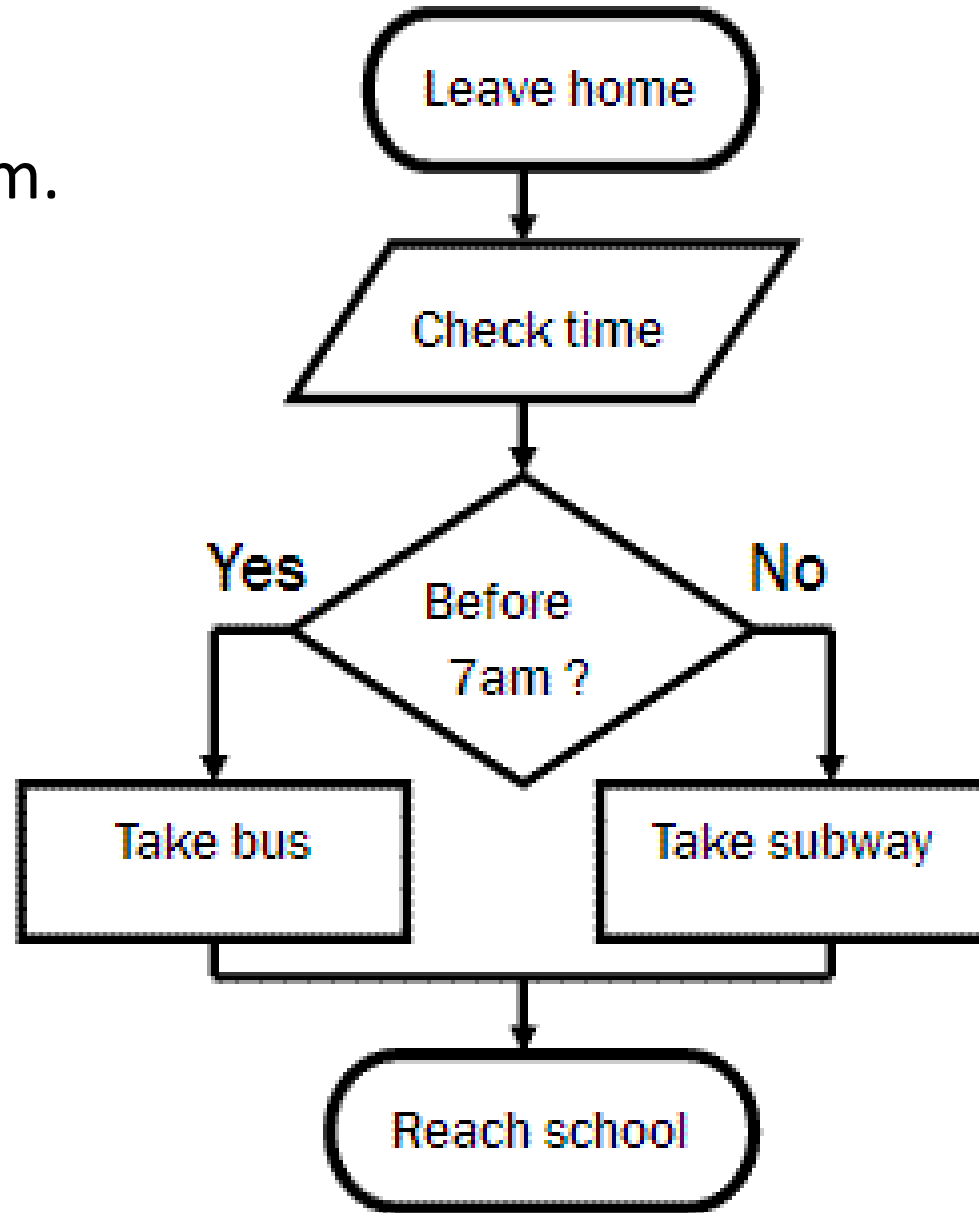


Today, we
have a new
shape.

Diamonds allow choice and decisions, sort of like this informal diagram.



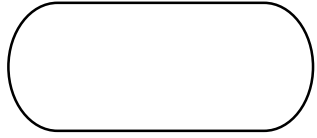
Two lines come out of them.
No more, no less.



Shape

Formal: informal

Rules



Terminal: start, end

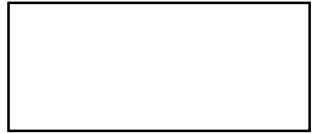
There is only one start and one end.



Input/Output: IO
keyboard input

Arrows connect the pieces.

Flow is up to down
or left to right.



Process: calculations

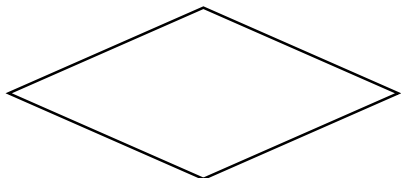
Lines do not cross.

The only shape with can have 2
lines come out of it is a diamond.



Display: output

No shape can have more than 2
lines come out of it.



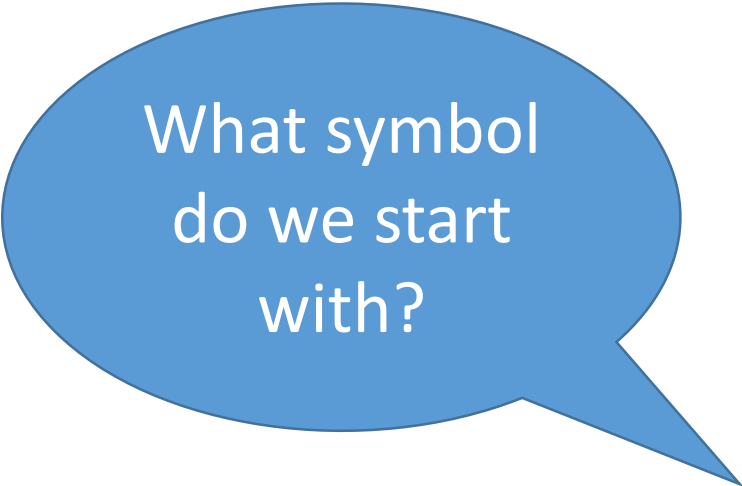
Decision: Boolean expression





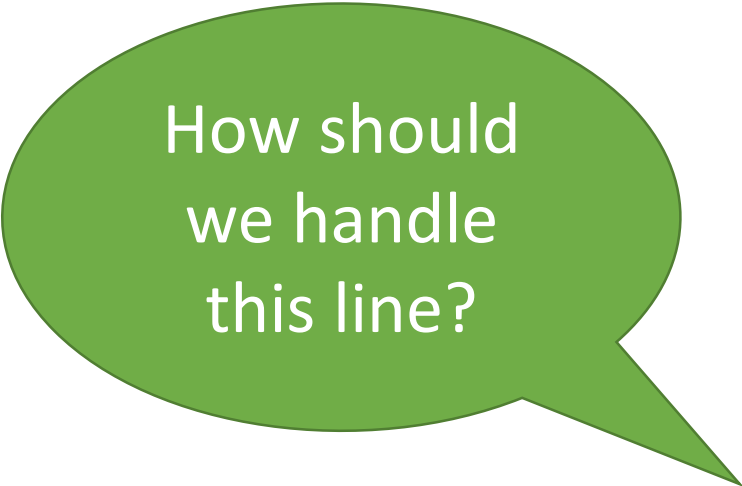
An Example.

```
char ans = IO.inputChar ("T/F: 110 in binary is 6> ");  
if (ans == 't' || ans == 'T')  
    System.out.println ("Correct!");  
else  
    System.out.println ("Wrong.");
```



What symbol
do we start
with?


```
char ans = IO.inputChar ("T/F: 110 in binary is 6> ");  
if (ans == 't' || ans == 'T')  
    System.out.println ("Correct!");  
else  
    System.out.println ("Wrong.");
```

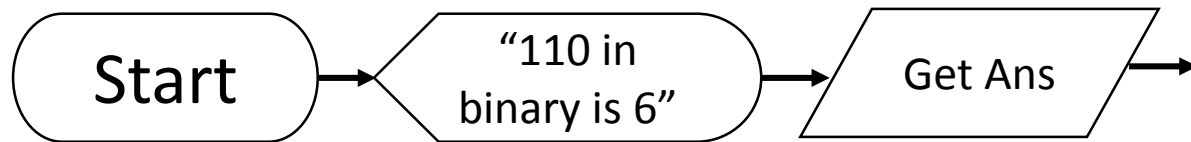


How should
we handle
this line?



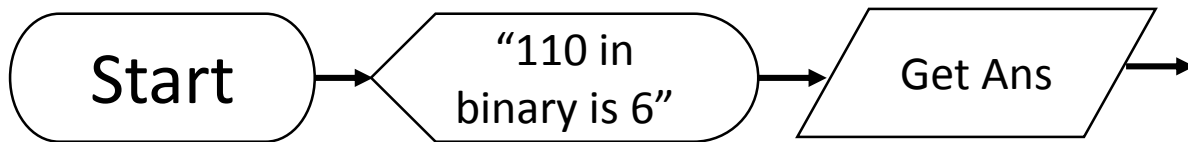
Start →

```
char ans = IO.inputChar ("T/F: 110 in binary is 6> ");  
if (ans == 't' || ans == 'T')  
    System.out.println ("Correct!");  
else  
    System.out.println ("Wrong.");
```

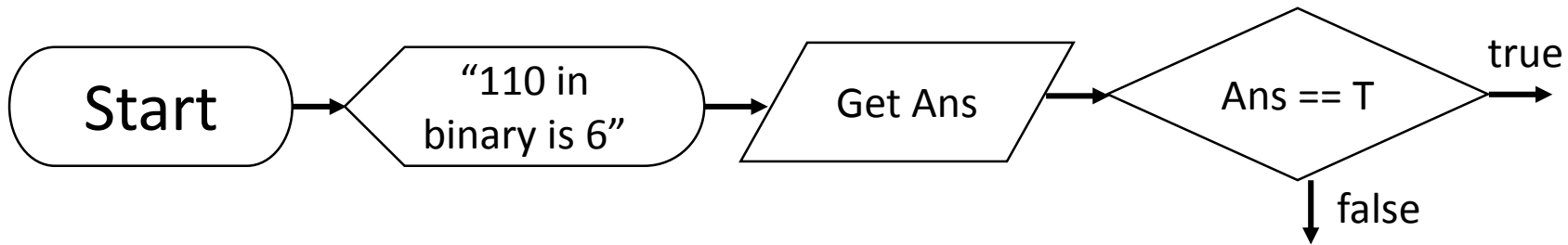


```
char ans = IO.inputChar ("T/F: 110 in binary is 6> ");  
if (ans == 't' || ans == 'T')  
    System.out.println ("Correct!");  
else  
    System.out.println ("Wrong.");
```

How about
this line?

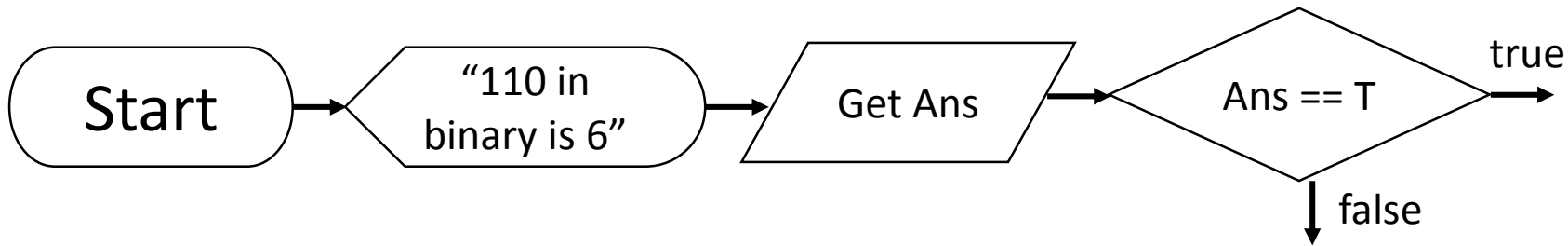


```
char ans = IO.inputChar ("T/F: 110 in binary is 6> ");  
if (ans == 't' || ans == 'T')  
    System.out.println ("Correct!");  
else  
    System.out.println ("Wrong.");
```

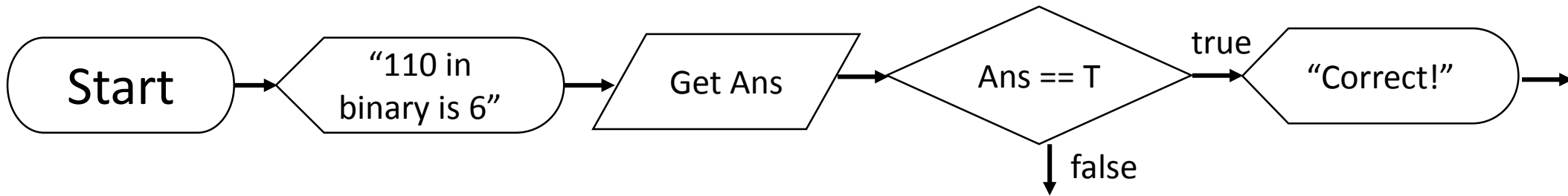


```
char ans = IO.inputChar ("T/F: 110 in binary is 6> ");  
if (ans == 't' || ans == 'T')  
    System.out.println ("Correct!");  
else  
    System.out.println ("Wrong.");
```

What shape is needed here?

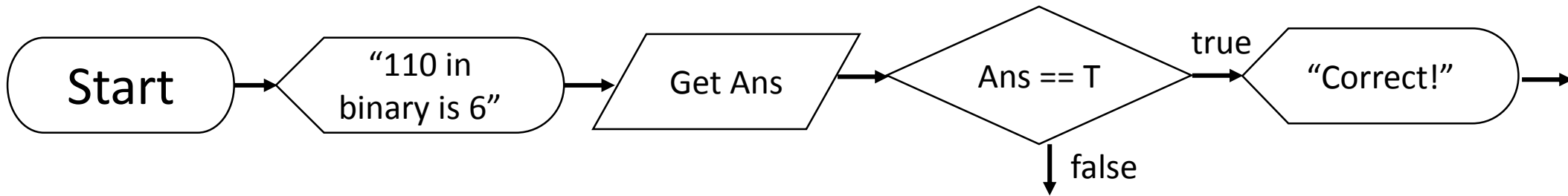


```
char ans = IO.inputChar ("T/F: 110 in binary is 6> ");  
if (ans == 't' || ans == 'T')  
    System.out.println ("Correct!");  
else  
    System.out.println ("Wrong.");
```

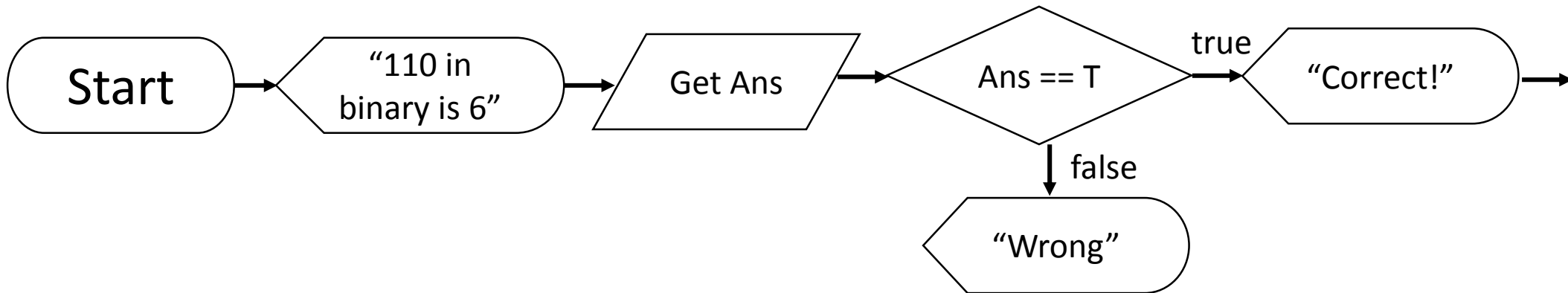


```
char ans = IO.inputChar ("T/F: 110 in binary is 6> ");  
if (ans == 't' || ans == 'T')  
    System.out.println ("Correct!");  
else  
    System.out.println ("Wrong.");
```

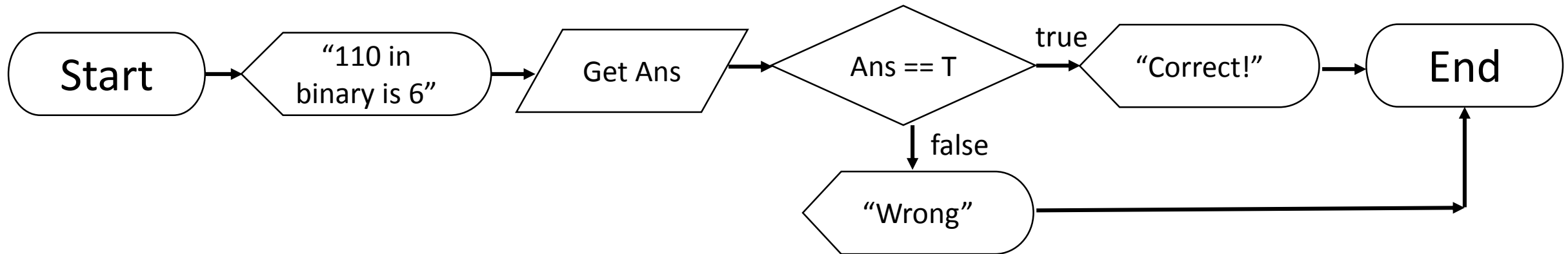
And what shape is needed here?



```
char ans = IO.inputChar ("T/F: 110 in binary is 6> ");  
if (ans == 't' || ans == 'T')  
    System.out.println ("Correct!");  
else  
    System.out.println ("Wrong.");
```




```
char ans = IO.inputChar ("T/F: 110 in binary is 6> ");
if (ans == 't' || ans == 'T')
    System.out.println ("Correct!");
else
    System.out.println ("Wrong.");
```



If, then else example...
Lots of Boolean expressions!



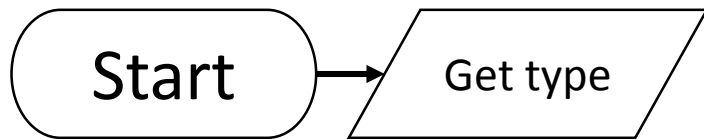
```
System.out.println ("T R U F F L E S");
System.out.println ("(c) caramel");
System.out.println ("(r) orange flavoured");
System.out.println ("(d) dark chocolate");
System.out.println ("(m) milk chocolate");
char type = IO.inputChar ("What type of truffle would you like? (c/r/d/m) ");
if (type == 'm')
    System.out.println("$0.95");
else if (type == 'd')
    System.out.println("$0.85");
else if (type == 'r')
    System.out.println("$0.65");
else
    System.out.println("$0.45");
```

```
System.out.println ("T R U F F L E S");
System.out.println ("(c) caramel");
System.out.println ("(r) orange flavoured");
System.out.println ("(d) dark chocolate");
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    System.out.println("$0.85");
else if (type == 'r')
    System.out.println("$0.65");
else
    System.out.println("$0.45");
```

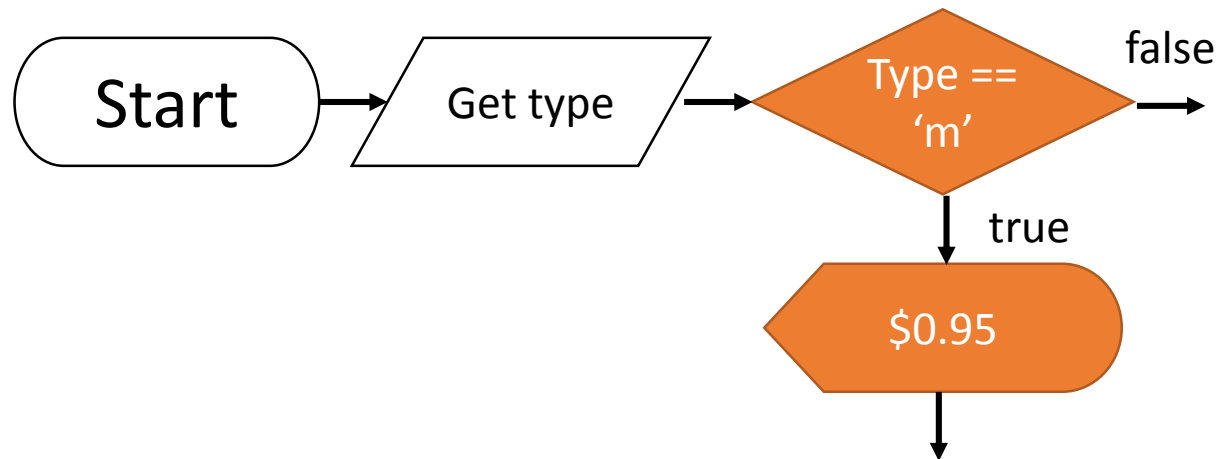


Start

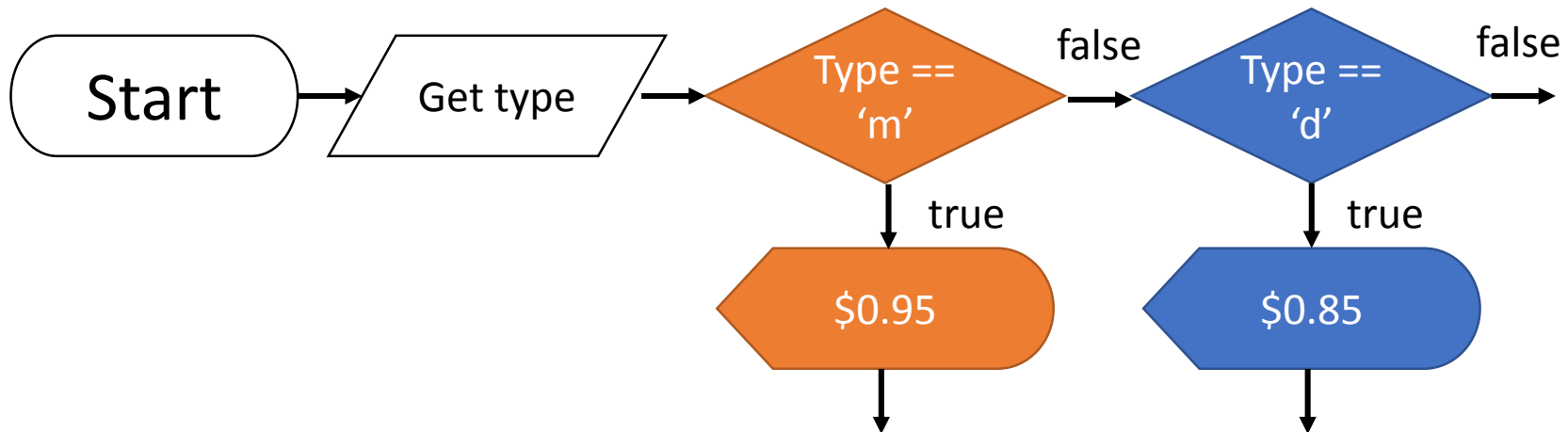
```
System.out.println ("T R U F F L E S");
System.out.println ("(c) caramel");
System.out.println ("(r) orange flavoured");
System.out.println ("(d) dark chocolate");
System.out.println ("(m) milk chocolate");
char type = IO.inputChar ("What type of truffle would you like? (c/r/d/m) ");
if (type == 'm')
    System.out.println("$0.95");
else if (type == 'd')
    System.out.println("$0.85");
else if (type == 'r')
    System.out.println("$0.65");
else
    System.out.println("$0.45");
```



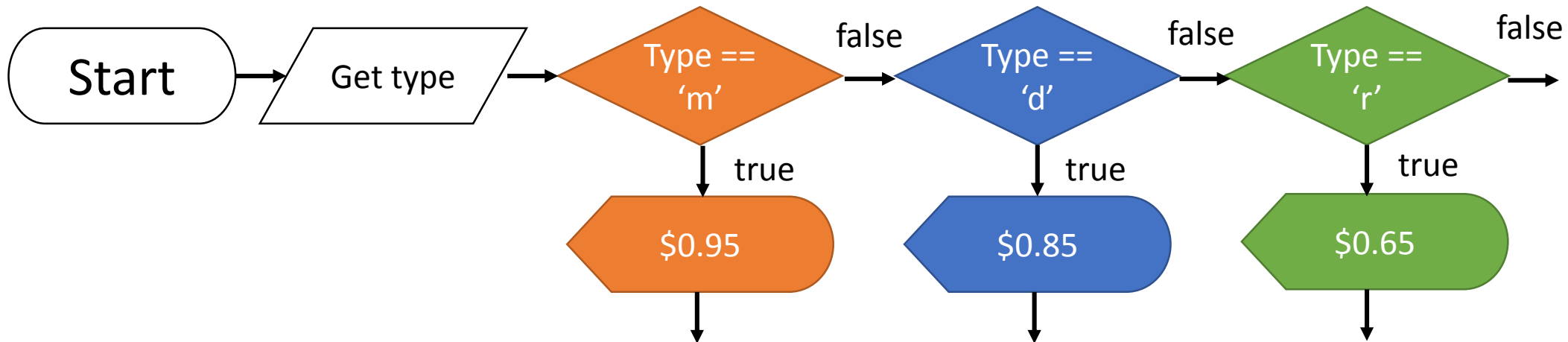
```
System.out.println ("T R U F F L E S");
System.out.println ("(c) caramel");
System.out.println ("(r) orange flavoured");
System.out.println ("(d) dark chocolate");
System.out.println ("(m) milk chocolate");
char type = IO.inputChar ("What type of truffle would you like? (c/r/d/m) ");
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    System.out.println("$0.85");
else if (type == 'r')
    System.out.println("$0.65");
else
    System.out.println("$0.45");
```



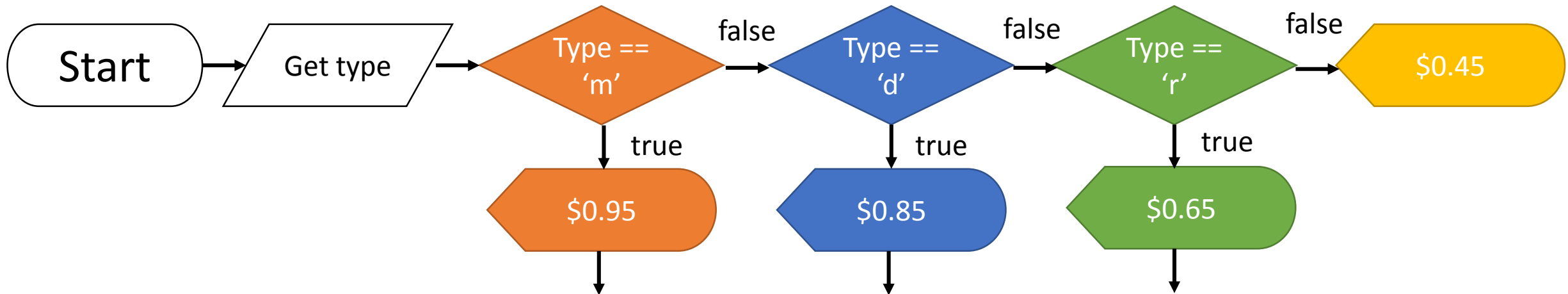
```
System.out.println ("T R U F F L E S");
System.out.println ("(c) caramel");
System.out.println ("(r) orange flavoured");
System.out.println ("(d) dark chocolate");
System.out.println ("(m) milk chocolate");
char type = IO.inputChar ("What type of truffle would you like? (c/r/d/m) ");
if (type == 'm')
    System.out.println("$0.95");
else if (type == 'd')
    System.out.println("$0.85");
else if (type == 'r')
    System.out.println("$0.65");
else
    System.out.println("$0.45");
```



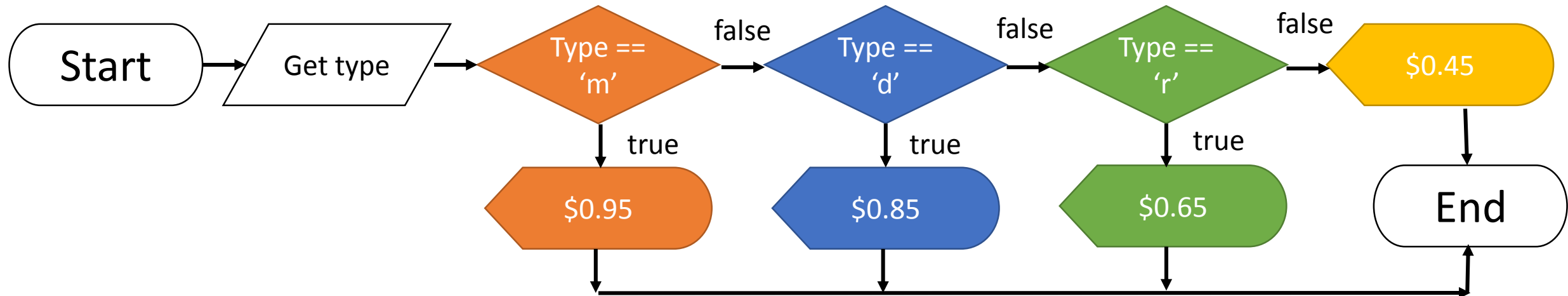
```
System.out.println ("T R U F F L E S");
System.out.println ("(c) caramel");
System.out.println ("(r) orange flavoured");
System.out.println ("(d) dark chocolate");
System.out.println ("(m) milk chocolate");
char type = IO.inputChar ("What type of truffle would you like? (c/r/d/m) ");
if (type == 'm')
    System.out.println("$0.95");
else if (type == 'd')
    System.out.println("$0.85");
else if (type == 'r')
    System.out.println("$0.65");
else
    System.out.println("$0.45");
```




```
System.out.println ("T R U F F L E S");
System.out.println ("(c) caramel");
System.out.println ("(r) orange flavoured");
System.out.println ("(d) dark chocolate");
System.out.println ("(m) milk chocolate");
char type = IO.inputChar ("What type of truffle would you like? (c/r/d/m) ");
if (type == 'm')
    System.out.println("$0.95");
else if (type == 'd')
    System.out.println("$0.85");
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    System.out.println("$0.65");
else
    System.out.println("$0.45");
```



```
System.out.println ("T R U F F L E S");
System.out.println ("(c) caramel");
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    System.out.println("$0.95");
else if (type == 'd')
    System.out.println("$0.85");
else if (type == 'r')
    System.out.println("$0.65");
else
    System.out.println("$0.45");
```

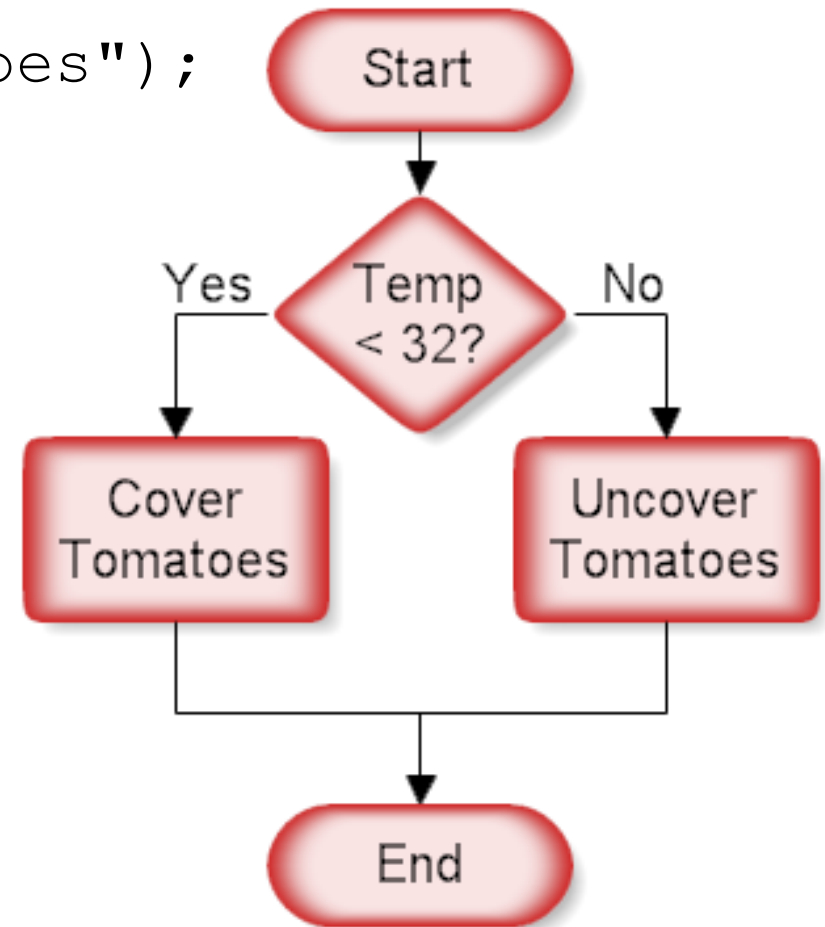




Finding Errors.

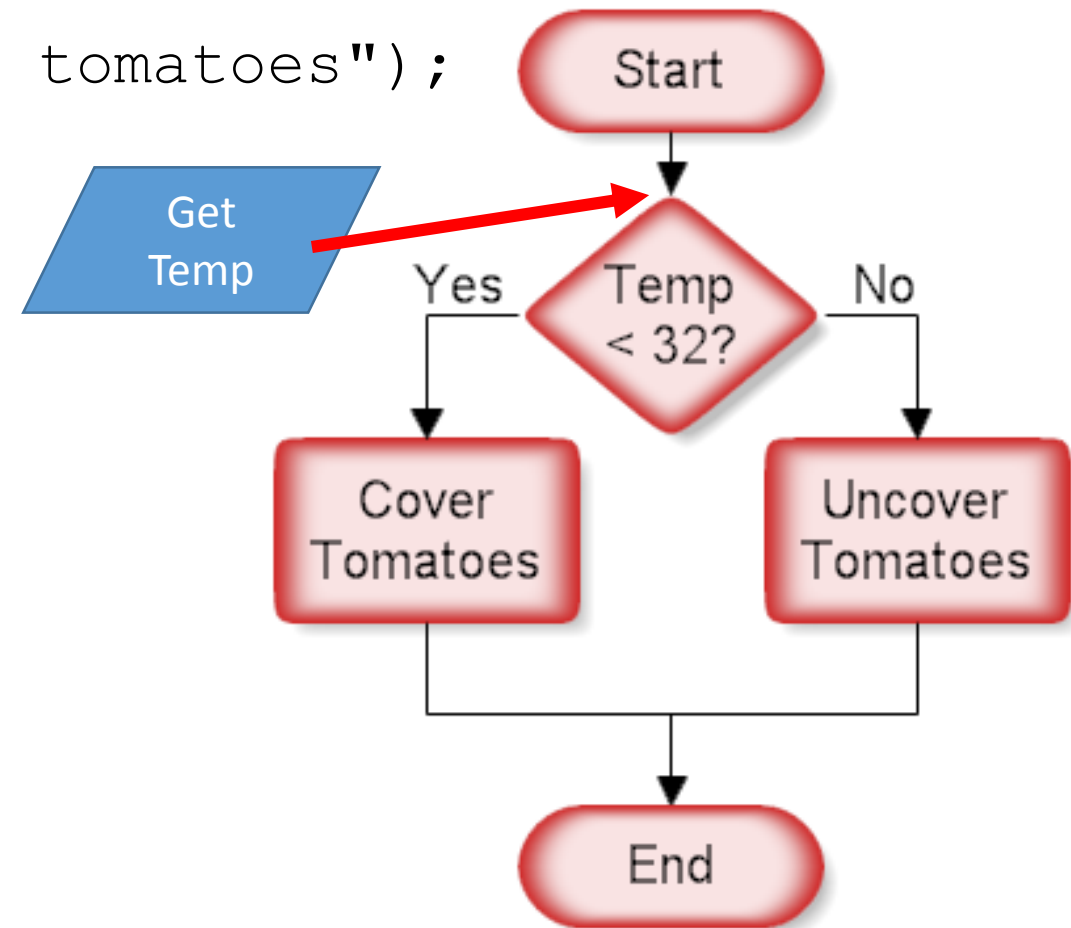
```
public tomatoes ()
{
    int temp = IO.inputInt ("Temperature? ");
    if (temp < 32)
        System.out.println ("Cover tomatoes");
    else
        System.out.println ("Uncover tomatoes");
}
```

What's missing from the code in the flow chart?



```
public tomatoes ()
{
    int temp = IO.inputInt ("Temperature? ");
    if (temp < 32)
        System.out.println ("Cover tomatoes");
    else
        System.out.println ("Uncover tomatoes");
}
```

There is another error. What is it?



```
public tomatoes ()
{
    int temp = IO.inputInt ("Temperature? ");
    if (temp < 32)
        System.out.println ("Cover tomatoes");
    else
        System.out.println ("Uncover tomatoes");
}
```

