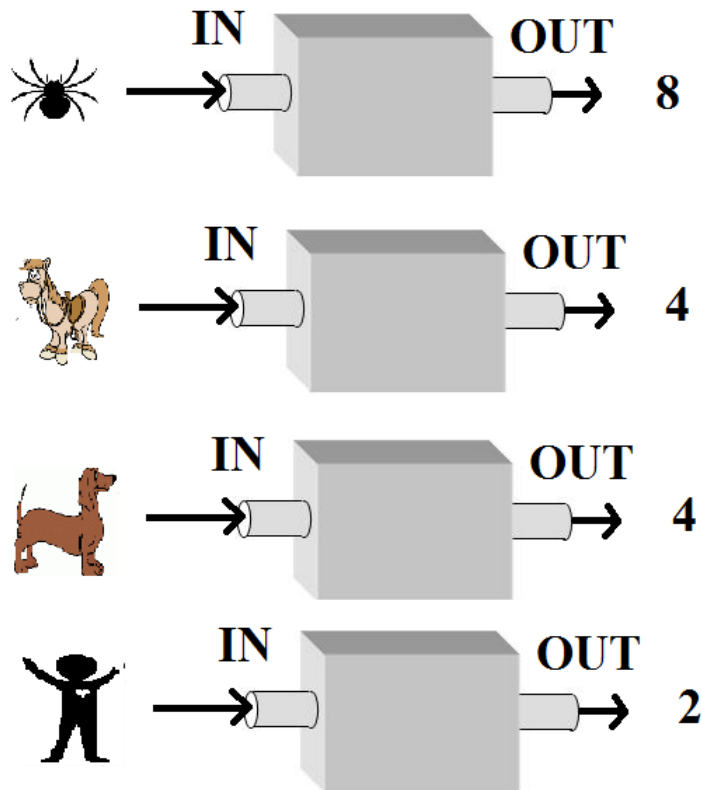


Function Machine

1. A function machine takes something called an *input*, then follows certain rules and produces something new called an *output*. Below are some of the inputs (on the left) and outputs (on the right) of Katja's function machine.

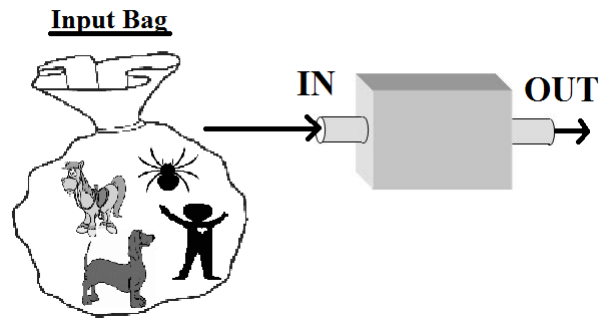


1. Can you figure out what rule Katja's function machine is following?

Solution: The function machine takes in an animal and tells us how many legs that

animal has.

Every function machine takes its inputs from a bag called the *Input* bag. Here are some examples of this function machine's *Input* bag:



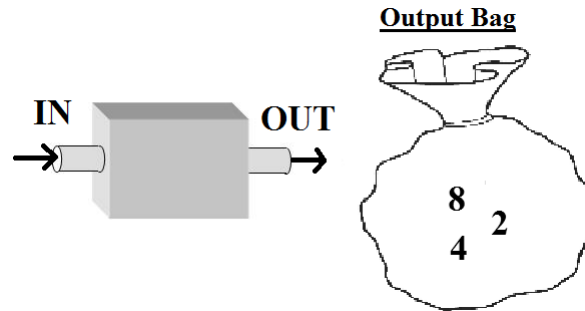
2. In this case, our Input bag is made up of every kind of animal (not just the ones in the picture!). Decide whether the following things could be found in our Input bag:

- a. moose yes
- b. square no
- c. tomato no
- d. mouse yes

3. Give three other examples of things we can put *into* our function machine:

Solution(s): cow, elephant, snake

Every function machine puts its outputs into a bag called the ***Output*** bag. Here are some examples of this function machine's ***Output*** bag:



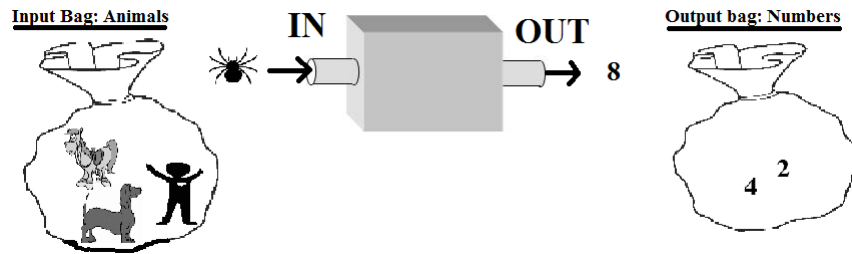
4. In this case, our Output bag is made up of all numbers. Decide whether the following things could be found in our Output bag:

- | | |
|----------|-----|
| a. car | no |
| b. 6 | yes |
| c. 100 | yes |
| d. goose | no |

5. Give three more examples of what we might find in our Output bag:


Solution: 1,000, 2, 50,000,000


When Katja's function machine is changing things from its Input bag into things that go into the Output bag, it looks like this:




6. Decide what Katja's function machine will do to the following things from the Input bag:

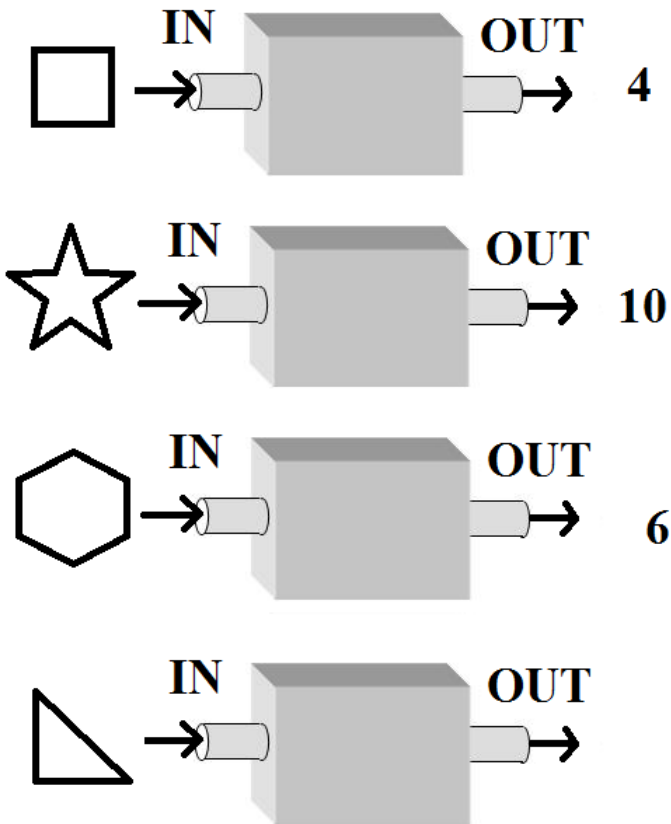
a.  \rightarrow **2**

b.  \rightarrow **6**

c.  \rightarrow **4**

d.  \rightarrow **2**

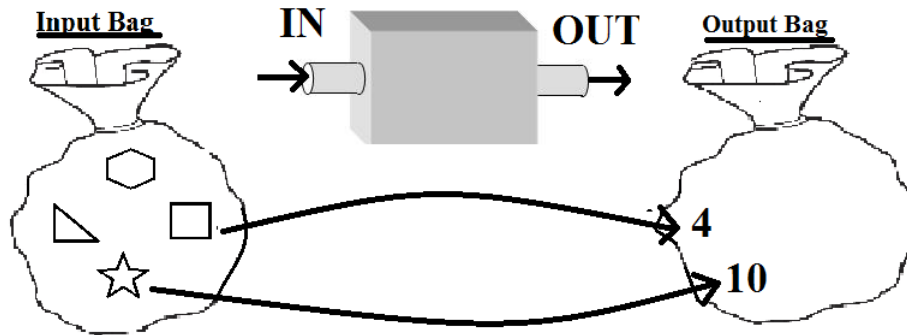
Travis really likes Katja's function machine, so he got one too! Here is what Travis' function machine does. Can you fill in the last output for the machine?



7. What rule is Travis' function machine following?

Solution: Whatever shape is put into the function machine is turned into the number of sides that shape has.

8. Fill in some more examples of what the Output bag will look like for this function machine? Make sure to show which inputs go to which outputs.



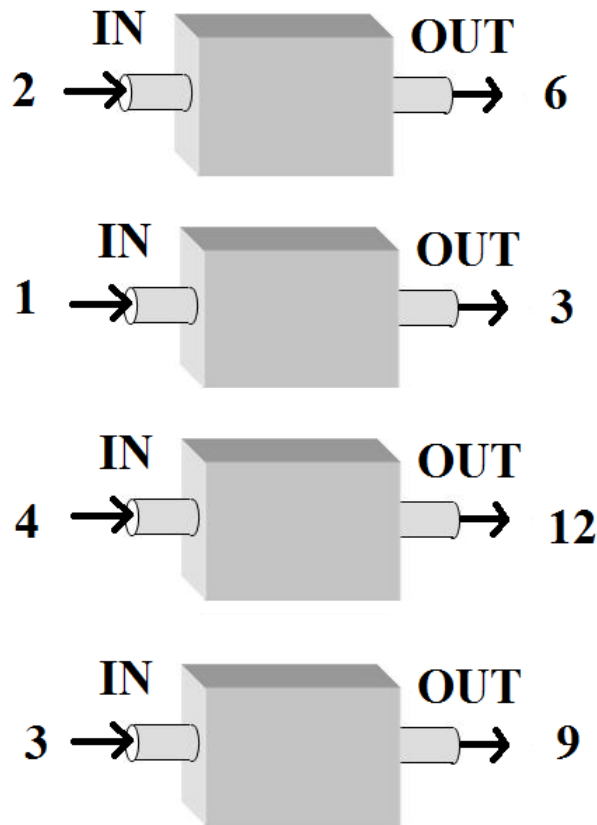
9. What are the type of things we will find in this function machine's Input bag?

Solution: Shapes

10. What types of things will we find in its Output bag?

Solution: Numbers

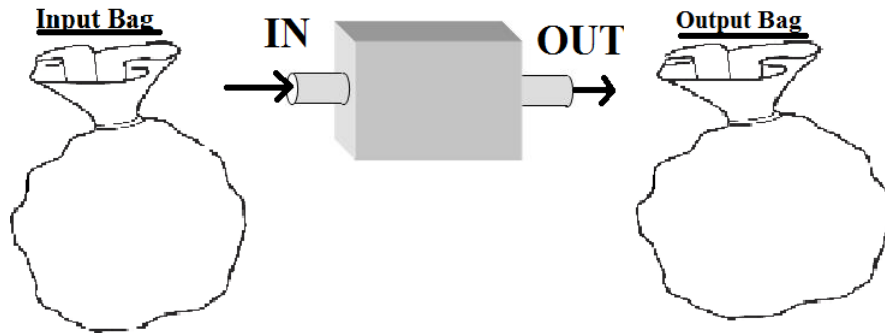
Finally, Katherine got a function machine too!
Here is what Katherine's function machine does
to its inputs:



11. Can you figure out the rule that Katherine's function machine is following?

Solution: Whatever number is put into the function machine is tripled (or "added to itself 3 times")

12. Fill in some examples of what the Input and Output bag for this function machine will look like? Make sure to show which inputs go to which outputs.



13. What are the type of things we will find in this function machine's Input bag?

Solution: Numbers

14. What types of things will we find in its Output bag?

Solution: Numbers

Homework:

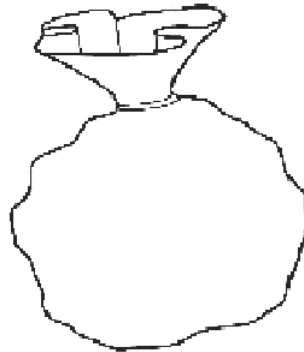
Come up with your own function machine. Be ready to present your function machine, with its rule, its Input Bag, and its Output Bag, to the class next week!

1. What rule does your function machine follow? Give a few examples:



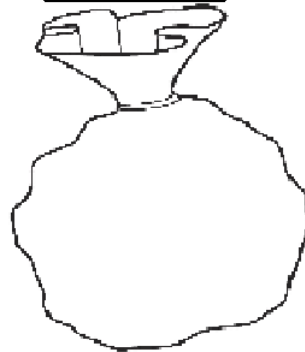
2. Give some examples of what is in your Input bag. What types of things are these?

Input Bag



3. Give some examples of what is in your Output bag. What types of things are these?

Output Bag



Challenge function:



1. Can you figure out what the rule for this function machine is?

Solution: If the input is even, the func-

tion machine doesn't do anything to it, giving out the same input. If the input is odd, the function machine subtracts one from it.

To make function machines easier to work with, we want to have a simple way to describe the machine's rule. Here is one way to do it. For Katherine's function machine, we can write:

$$\mathbf{Output = 3 \times Input}$$

This is telling us that our output will always be our input multiplied by 3.

2. Can you write out what our Challenge Function does, in the same way that I wrote out what Katherine's function does? Remember, even and odd inputs follow different rules!

When input is even: **Output = Input**

When input is odd: **Output = Input - 1**