# Machines

### Section A

1. A machine takes an input, divides it by 2 and then adds 5.
   1. Find the output if the input is: 2 -6 7   
   2. Find the input if the output is: 15 1.5  
2. A machine takes an input, multiplies it by 4, subtracts 3, multiplies by 2 and then adds 1.
   1. Find the output when the input is 2
   2. Find what the output is when the input is . Simplify your answer.
   3. Hence describe a machine that does the same thing in only 2 steps.
   4. Find what the input is when the output is .
   5. Hence describe a machine that does the same thing in only 2 steps.
3. A machine takes an input, squares it and adds 7.
   1. Find the output if the input is: 5 -3  *d* + 1
   2. Find the input if the output is: 16 107 
   3. Is there another answer to the questions in part b?

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1. A machine can be written as .
   1. What does the machine do to the input? (as a chain of operations, like it was given in Q1-3)
   2. What is the input is the output is *b*?
   3. Show that, if the input is *c* – 3, that the output is 4*c* – 17
   4. Show that
   5. Show that 
2. A machine takes an input, multiplies by one more than the input, and then divides by 2.
   1. What is the output if the input is 7?
   2. What is the output if the input is -4?
   3. By guessing and checking, find an input which gives an output of 55.
   4. What is the output if the input is *x*?
   5. Explain why, if the output is 10, the input must solve the equation 
   6. Solve this equation to find *both* possible inputs for an output of 10.
   7. Use this method to find both inputs that give an output of 36.

### Section B

For each of the following machines:

1. Write the machine as a chain of operations
2. Find which input would give an output of 16.
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10. 

For each of the following machines:

1. Write the machine as a chain of operations
2. Hence write down the inverse machine as a chain
3. Hence write down the inverse machine in the form 
4. 
5. 
6. 
7. 
8. 

**Machines - Homework**

1. A machine takes an input, subtracts 8, then multiplies by 3.
   1. Find the output if the input is: 10 4 *p*
   2. Find and simplify the output if the input is 
   3. Find the input if the output is: 24 -9 0
   4. Find and simplify the input if the output is 
2. A machine takes an input, multiplies it by 4, subtracts 2 and then divides by 5.
   1. Find the output if the input is: 8 -2 0
   2. Find and simplify the output if the input is 
   3. Find the input if the output is: 1 0 -3
   4. Find and simplify the input if the output is 
3. \*A machine takes an input, multiplies it by 5, subtracts 3, multiplies by 2 and then adds 1.
   1. Find **and simplify** the output when the input is .
   2. Hence describe a machine that does the same thing in only 2 steps.

Answer box:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 6 | -12 |  |  | 16 | 5 | 8 |
|  | 6 | -2 | -2/5 |  | 7/4 | 1/2 |
| -13/4 |  |  |  |  |  |  |

**Machines – Homework Mark Scheme**

Answers correct and self-marked [2]

Machines are shown clearly with arrows [2]

Bonus question complete and correct [1]