Algebraic Substitution Sheet 1 – Calculators NOT allowed.

1. A function machine has the rule: OUTPUT = INPUT x 3 + 9. Find the OUTPUT if the INPUT is
   a. 5 b. 2 c. 7 d. 6 e. 8 f. 9 g. 4 h. 11 i. 23 j. 231

2. A function machine has the rule OUTPUT = INPUT x 8 – 5. Find the OUTPUT if the INPUT is:
   a. 5 b. 2 c. 7 d. 6 e. 8 f. 9 g. 4 h. 11 i. 23 j. 231

3. A function machine has the rule OUTPUT = INPUT + 6. Find the **INPUT** if the OUTPUT is:
   a. 5 b. 12 c. 7 d. 6 e. 8 f. 9 g. 14 h. 11 i. 23 j. 231

4. A function machine has the rule OUTPUT = INPUT x 2 + 3. Find the **INPUT** if the OUTPUT is
   a. 15 b. 11 c. 27 d. 19 e. 7 f. 9 g. 16 h. 28 i. 47 j. 52

5. In algebra we use letters to stand for numbers. We have the rule: B = A x 6 – 2.
   Find B if A equals:
   a. 5 b. 2 c. 7 d. 6 e. 8 f. 9 g. 4 h. 11 i. 23 j. 231

6. We have the rule: B = A x 2 + 4. Find A if B equals:
   a. 14 b. 12 c. 22 d. 16 e. 8 f. 28 g. 9 h. 11 i. 53 j. 231

7. In algebra, we often write, for example, A x 2 as 2A. This avoids confusion between the multiply sign and the letter x. We have the rule: B = 4A + 1. Find B if A equals:
   a. 6 b. 2 c. 7 d. 1 e. 8 f. 23 g. 19 h. 11 i. 53 j. 231

8. Copy and complete the following tables.

A	3A - 1
0	
1	
2	
3	
4	

A	12 - A
0	
2	
4	
6	
8	

A	$A^2 + 3$
1	
2	
3	
4	
5	

A	50 – 5A
3	
6	
2	
9	
7	

9. Copy and complete the following tables.

A	½A - 1
0	
2	
4	
9	
13	

A	$3A^2 +1$
0	
1	
2	
3	
4	

A	$½ A^2$
0	
2	
10	
11	
7	

A	$100 – A^2$
3	
6	
2	
9	
7	

Challenge

10. Copy and complete the following tables.

A	4A – 7
	5
	13
	11
	6

A	$A^2 +2$
	27
	38
	3
	83

A	$2A^2 +3$
	21
	5
	11
	101

Algebraic Substitution Sheet II – Calculators NOT allowed.

1. A function machine has the rule: OUTPUT = INPUT x 5 - 2. Find the OUTPUT if the INPUT is
   a. 5 b. 2 c. 7 d. 6 e. 8 f. 9 g. 4 h. 11 i. 23 j. 123

2. In algebra, we often write, for example, A x 2 as 2A. This avoids confusion between the multiply sign and the letter x. We have the rule: B = 3A – 4. Find B if A equals:
   a. 6 b. 2 c. 7 d. 1 e. 8 f. 23 g. 19 h. 11 i. 53 j. 123

3. We have the rule: $B = A^2 + 1$. Find B if A equals:
   a. 6 b. 2 c. 7 d. 1 e. 8 f. 3 g. 9 h. 4 i. 10 j. 100

4. We have the rule: $B = 2A^2 – 2$. Find B if A equals:
   a. 6 b. 2 c. 7 d. 1 e. 8 f. 3 g. 9 h. 4 i. 10 j. 100

5. We have the rule: $B = 2(A^2 – 2)$. Find B if A equals:
   a. 6 b. 2 c. 7 d. 1 e. 8 f. 3 g. 9 h. 4 i. 10 j. 100

6. Copy and complete the following tables.

A	6A - 1
0	
1	
2	
3	
4	

A	23 - A
0	
2	
4	
6	
8	

A	$A^2 + 5$
1	
2	
3	
4	
5	

A	60 – 7A
3	
6	
2	
9	
7	

7. Copy and complete the following tables.

A	½A +1
0	
2	
4	
9	
13	

A	$3A^2 +1$
0	
1	
2	
3	
4	

A	½ A^2
2	
4	
6	
7	
9	

A	$100 – A^2$
4	
5	
3	
10	
11	

Working Backwards

8. We have the rule: T = N + 9. Find the value of N if T equals:
   a. 15 b. 16 c. 14 d. 11 e. 18 f. 32 g. 92 h. 24 i. 10 j. 101

9. We have the rule: T = 2N + 3. Find the value of N if T equals:
   a. 15 b. 13 c. 19 d. 21 e. 33 f. 8 g. 24 h. 57 i. 101 j. 100

10. Copy and complete the following tables.

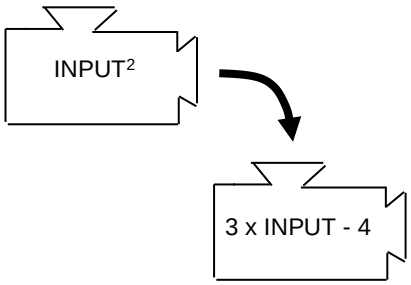
A	3A – 6
	3
	11
	14
	62

A	$A^2 + 5$
	14
	30
	6
	69

A	$2A^2 - 2$
	16
	48
	0
	160

Algebraic Substitution III – Calculators NOT allowed.

1. It is possible to link function machines. In the diagram alongside, the output from the first function machine becomes the input for the second. What is the final output from the second machine if the input is
   a. 2 b. 5 c. –1 d. 0



2. Copy and complete the following tables.

A	2A - 1
0	
1	
2	
3	
4	

A	18 - A
0	
2	
4	
6	
8	

A	$A^2 + 1$
1	
2	
3	
4	
5	

A	45 – 6A
3	
6	
2	
9	
7	

3. Copy and complete the following tables.

A	½A +1
0	
2	
4	
9	
13	

A	$2A^2 - 3$
0	
1	
2	
3	
4	

A	$½A^2$
0	
1	
5	
9	
7	

A	$100 – 2A^2$
3	
6	
2	
0	
7	

Working Backwards

4. We have the rule: T = N + 6. Find the value of N if T equals:
   a. 15 b. 16 c. 14 d. 11 e. 18 f. 32 g. 92 h. 24 i. 10 j. 101

5. We have the rule: T = 2N - 5 . Find the value of N if T equals:
   a. 15 b. 13 c. 19 d. 21 e. 33 f. 8 g. 24 h. 57 i. 101 j. 100

6. Copy and complete the following tables.

A	2A – 6
	4
	8
	18
	40

A	$A^2 + 5$
	14
	30
	6
	86

A	$2A^2 - 2$
	16
	30
	0
	160

Challenge!

7. For the linked function machines in question 1, what is the initial input if the final output is
   a. 23 b. -1 c. 44

8. What number must ***y*** be if the following algebraic equation is true:
   a. $2y - 1 = y + 6$
   b. $2(y + 1) = 8 – 2y$