

## **Mathematics Lesson Plan for Introducing Algebra**

*Strand: Algebra*

**Focus:** *At the end of this lesson students should be able to create their own 'code' for representing repeated addition and multiplication of variables and also to learn and use the accepted 'code' or method for writing these representations.*

**Preparatory work, Homework checking/marking, prerequisite questions etc:** *5-10 Minutes*

**Mini Lesson 1:** *10-15 Minutes:*

*Introduce the idea of breaking codes and writing information using codes. Challenge the students to become 'code-breakers'. Have students complete Set A, B and C in Stage 1 from the teacher notes. The teacher can put these problems on a board or on an OHT.*

**Small Group/ Independent Work:** *15-20 Minutes*

*Students are encouraged to invent their own codes to write the given problems in a shorter way.*

**Share:** *10 Minutes*

*Students share their different methods of representing the given problems. The teacher summarizes the different methods*

**Mini Lesson 2:** *10-15 minutes:*

*The teacher introduces the 'accepted' and therefore 'correct' method for writing these problems.*

**Small Group/ Independent Work:** *10 Minutes*

*Students use the 'accepted' code to write the given questions in a shorter way.*

*In a follow-up lesson students also try all the Stage 2 questions where they use the accepted code to 'decode' questions and also to discover how to simplify expressions with like terms.*

*Stage 3 can be done at this time or later when you wish to introduce power notation.*

**Share:** *10 Minutes*

*Discuss students' answers.*

**Journal Writing/ Reflection:** *10 Minutes*

*Students summarize their findings in their 'Algebra Code-Breaker' Handout.*

# Introducing Algebra

## Stage 1

Tell students that they are going to be given some secret codes and that they are going to be code-breakers.

Challenge students to break these codes:

### Set A

**Say:** Let the secret code for 2 be 'a' and let the secret code for 3 be 'b' and the code for 1 is 'c'. Write the following on the board or on an OHT.

Let  $a = 2$ ,  $b = 3$ ,  $c = 1$

1.  $a + a + a + a + a$
2.  $b + b + b + b + b + b$
3.  $c + c + c$
4.  $a + a + a + b + b + b + b + c + c$
5.  $a + a + a + a + b + b + b + c + c + c + c + c$

### Set B

Repeat the above questions for  $a = 1$ ,  $b = 4$ ,  $c = 5$

### Set C

Repeat the above questions for  $a = 7$ ,  $b = 1$ ,  $c = 10$

### Set D

Ask students to invent a code to write the following in a shorter way:

$$a + a + a + a + a + a + a + a$$

Now students use their code to write the above 5 questions in a shorter way. Get some feedback from students on their use of their own codes for this activity.

**Now ask students to imagine that they are all very clever mathematicians and that they have all come up with a way to write the above expressions in a shorter way. The problem is that the public needs to be given only one way for writing such expressions.**

**Tell students that mathematicians have chosen a code for writing the above types of problems. The chosen and now accepted code for writing:**

$$a + a + a + a + a + a + a + a \quad \text{is} \quad 8a$$

and for writing

$$b + b + b + b + b + b \quad \text{is} \quad 6b$$

and so on.

### **Set E**

Now ask students to use the **accepted** code to write the above 5 questions in a shorter way.

## **Stage 2 ( To introduce like and unlike terms )**

### **Set A**

Ask students to now see if they can break these codes:

Let  $a = 2$ ,  $b = 3$ ,  $c = 1$

1.  $3a + 5$
2.  $4a + 1$
3.  $5b + 2$
4.  $3b + 2a$
5.  $5a - c$
6.  $4c + 5a$
7.  $8b - 3a$
8.  $2a + 4b - 2c$

### **Set B**

Repeat the above questions for  $a = 4$ ,  $b = 5$ ,  $c = 2$

### **Set C**

Now they need to find a way of writing these sums and differences in a shorter way:

1.  $3a + 2a$
2.  $5b + b$
3.  $3c + 7c$
4.  $2a + 4a + 7a$
5.  $6d + 2d + 3d$
6.  $3m + 2m + 5m$
7.  $2y + 8y + 5y + y$
8.  $6p + p + 9p$

After this introduce the idea of like terms and unlike terms and the rule that you can only add or subtract terms if they are like terms. Show this by considering that  $3a + 4b = a+a+a+b+b+b+b$  which cannot be simplified by adding terms together.

At this point also introduce the word variable. Give them the definition. ( A variable is a letter or symbol that stands for a number. Its value can change or 'vary'.)

Give some examples (such as simplify:  $2d + 4f + 5d$  ) and then have students do this set of problems.

### Set D

Simplify by collecting like terms:

1.  $2m + 3n + 4m$
2.  $7p + 2q - 4p$
3.  $3d + 4e + 5d + e$
4.  $5c + 7 + 3c$
5.  $6r + 9 + r + 2$
6.  $8t + 4s - 3t - s$
7.  $7g - 6g + 4h + 3 - 2h - 1$
8.  $10 + 8f + 4 + j + 5j - 7f + 3$

### Stage 3

Now ask students to break these codes:

#### Set A

Let  $a = 2$ ,  $b = 3$ ,  $c = 10$

1.  $a x a x a x a$
2.  $b x b x b$
3.  $c x c x c x c x c$
4.  $a x a x b x b x b x c x c$
5.  $a x a x a x b x b x c x c x c$

#### Set B

Invent a code to write the following in a shorter way:

$a x a x a x a x a x a$

#### Set C

Now use your code to write the above 5 questions in a shorter way.

**Note:**

After this lesson you can introduce a variety of vocabulary words such as:

Variable  
Like Terms  
Expression  
Coefficient  
Constant  
Power  
Base  
Exponent

What you introduce will depend on your students.