BIOLOGY

Topic: Growth and Development

Introduction

By the end of this topic, you should be able to conduct an experiment on plant growth over time. You should also be able to plot a growth-time graph on the growth observed.

You can easily determine the growth in plants by using a germinating seedling. The rate at which a seedling grows shows the availability of nutrients in the soil and the overall health of the plant.

Activity: Determining the growth rate of a seedling

In the activity below, you will germinate seeds and take measurements on the shoot of the seedlings to determine the rate of growth.

Things you will need: Maize grains, empty plastic water bottle, water, knife or razor blade, ruler, pen / pencil, graph paper

Procedure

1. Half way the length of the water bottle, make a mark with pencil / pen.
2. Cut the bottle using a knife or razor blade from the marked part.
3. Remove the top part of the bottle.
4. Put soil in the remaining part of the bottle.
5. Put maize grains in the soil but on the side nearer the wall of the bottle where you can see.
6. Sprinkle water onto the soil. Why is this so? Keep checking on the seeds.
7. Note down when the shoot appears. Record this as day 0 in the table.

Time (days)	Length of shoot (cm)
Day shoot appears (day 0)	0
Day 2	
Day 4	
Day 6	
Day 8	
Day 10	

8. Then after two days, measure the height of the shoot in millimeters. Continue with measurement and record the result after every two days for the next 5 days.
9. From the records obtained, plot a graph of growth rate against time (number of days).

Follow-up activity

During germination and growth of maize, the dry weight of the endosperm, the weight of the embryo and the total dry weight were determined at two-day intervals. The results are shown in the table below.

Time after planting (days)	Dry weight of endosperm (mg)	Weight of embryo (mg)	Total dry weight (mg)
0	43	2	45
2	40	2	42
4	33	7	40
6	20	16	37
8	10	25	35
10	6	33	39

1. On the same axes, draw a graph of the dry weight of the endosperm, weight of the embryo and the total dry weight against time.
2. Determine the total dry weight on day 5
3. Explain:
    i) the decrease in dry weight of the endosperm from days O to 10.
    ii) the increase in dry weight of embryo from days O to 10.
    iii) the decrease in total dry weight from day O to 8.
    iv) the increase in total dry weight after 8 days.

MATHEMATICS

Class: SENIOR FOUR

Mathematics
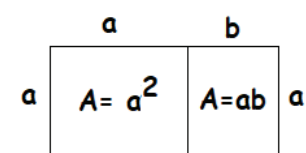
Topic: Algebra

Introduction: By the end of the topic you will be able to expand, factorise and solve quadratic equations with degree polynomial of 3.

In S.2 and S.3 you learnt how to expand algebraic expressions, we will begin by revising what we did.

Lesson 1

Let us review how to expand a(a+b)

We shall use a rectangle with length (a+b) and width a

Learning Tip: To find the area of the rectangle, you need to divide it into a square of length a and rectangle of width b and length of a+b.

Total area of Rectangle= Area of square + Area of Rectangle

$$a(a+b) = a^2 + ab$$

Learning Tip: Finding the area of the rectangle has enabled us to expand a(a+b) to obtain a^2+ab. The process introduces us to expansion by opening the brackets

Using the same approach let us expand (a+b) (a+b)
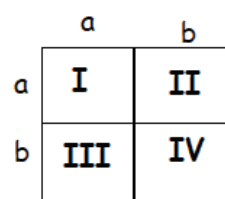
Learning tips: The dimensions of the four-sided figure are (a+b) and (a+b)

The area of the four-sided figure= Area of (I+II+III+IV)

$$= (a^2+ab+ab+b^2)$$

Area of the four-sided figure $= a^2+2ab+b^2$

Hence Expanding (a+b) (a+b) $=a^2+2ab+b^2$

IDENTITY 1: $(a+b) (a+b) =a^2+2ab+b^2$

Activity 1

Expand the following

a. **(a+2) (a+3)**
b. **(a+1) (a+2)**
c. **(a+1)²**
d. **(a+2)²**

Lesson 2: Let us now expand (a-b)(a-b)

We use a four- sided square of dimension a, to find the area of the shaded part.
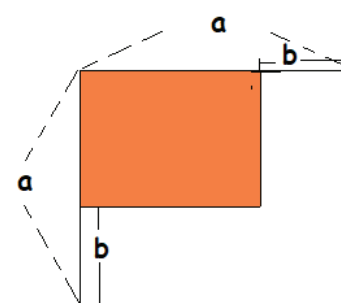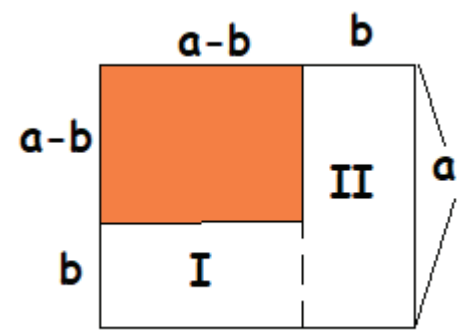

Learning Tip:*dimension of the square is a-b*

Find the Area of shaded Part = (a-b) (a-b)

Area of Shaded part = Area of big square- Area of Un shaded part

Let us find the area of the shaded part

Learning Tips: The unshaded part is further sub divided into two portions to enable us find the area

Area of (I+II)

$A=b(a-b)+a\times b$

$A=ab-b^2+ab$

The Area of the Unshaded area is $2ab-b^2$

$A=2ab-b^2$

Therefore, the area of the unshaded part =Area of the big square- The area of the Unshaded part

We have been able to expand (a-b) (a-b) to obtain the answer as $a^2+2ab-b^2$
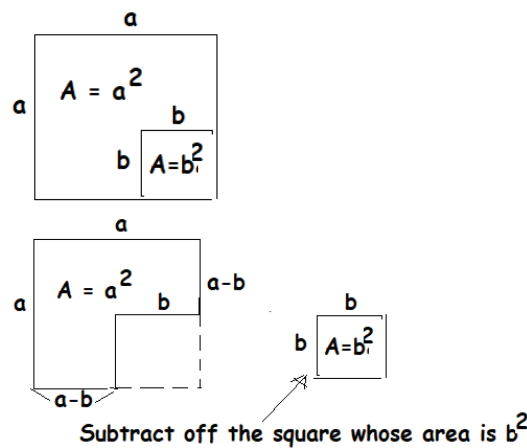
$(a-b)(a-b) =a^2+2ab-b^2$

Activity 2

Expand the following

   e. **(a-2) (a-3)**
   f. **(a-1) (a-2)**
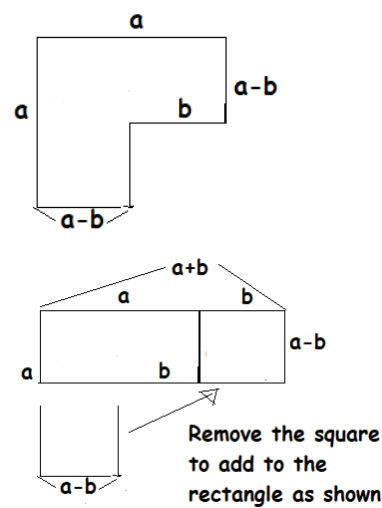   g. **(a-1)²**
   h. **(a-2)²**

Lesson 3: Let us expand (a+b) (a-b)

If we consider two squares whose dimensions are a and b respectively.

Then we take cut out the square whose Area is b^2 we shall be left with a^2

The remaining area is a^2-b^2 represented by the shape

Clearly from the figure; $(a+b)(a-b)=a^2-b^2$

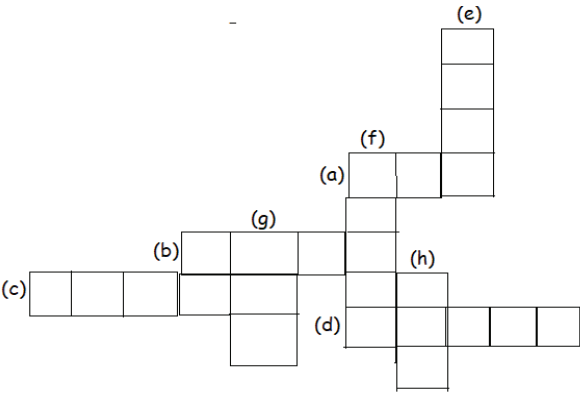**IDENTITY 3**: $a^2-b^2 =(a+b)(a-b)$

ACTIVITY

  1. Expand the following
    a) (a+3) (a-3)
    b) (b+4) (b-4)
    c) (d+5) (d-5)

Cross Number Puzzle

You have to solve the given cross number puzzle to qualify for thenext round ofMathematics quiz competition. Evaluate the values of given expression at x = 0, y = 1, z = 2. Fill the cross number along Across and Downward with the help ofgiven clues, (Numbers to be written in words)

Across(a) $xy + yz + zx$

(b) $x^2y^2 + z^2 − 2xyz$

(c) $8 − (x+y)$

(d) $x^2y^3 + y^2z^3 + z^2x^3$

Down

(e) $x^2 − 2xy (y–z)$

(f)

(g) $x^3 + y^3 + z^3 − 2yz^2$

(h) $2x + 2y + 2$