



Growing Degree Days (At Home)

Middle School / High School

Introduction

Do farmers make a random guess as to when to plant corn? NO! There's a whole lot of science behind knowing when to plant corn, when to expect different stages of growth, and when to harvest – it's called growing degree days (GDD). This activity requires some mathematical calculations to find out when is the optimum time to plant corn.

Materials

- Calculator
- Growing Degree Days Worksheet

Activity

Take a look at the table below labeled, Growing Degree Days: An A"maize"ing Harvest Calculation. As you can see the temperature plays an important part in the growth of healthy corn. The formula for calculating the GDD is as follows. We are using F for Fahrenheit in this activity.

$$\text{GDD } ^\circ\text{F} = \frac{\text{Max Temp F} + \text{Min Temp F}}{2} - 50 \text{ (Lower Base Temperature in F for Corn)}$$

(subtract)

There are two rules to follow:

- Rule 1: If the daily minimum temperature is (less than) $< 50^\circ\text{F}$, set it equal to 50°F as the *Lower Base Temperature* in the equation. (For example, if the temperature is 38°F , we bump it up to 50°F in the calculation.)
- Rule 2: If the daily maximum temperature is (greater than) $> 86^\circ\text{F}$, set it equal to 86°F in the equation. This is the *Upper Limit Temperature*.

Example:

If on a beautiful May day, the high (maximum temperature) was 80°F and the low (minimum temperature) was 56°F , then:

The average temperature for the day is = $(80^\circ\text{F} + 56^\circ\text{F})$ divided by $/ 2 = 68^\circ\text{F}$

And that day's Corn GDD ($^\circ\text{F}$) = $68^\circ\text{F} - 50^\circ\text{F}$ (this is the lower base temperature) = 18 GDD ($^\circ\text{F}$)

Growing Degree Days: An A"maize"ing Harvest Calculation

Temperature Impact on Corn	Temperature
Little to no growth	Below 50°F
Ideal growth conditions	Between 50°F and 86°F
Some negative impacts on growth	Above 93°F
Heat stress and harm to growth	Above 110°F

Growing Degree Days Worksheet

Directions

1. Answer the Questions
2. Calculate the GGD's for each day from the following tables.
3. Add up the GGD's for the entire week in Table 1 and Table 2
4. Add the totals from Table 1 and Table 2 together.

Questions

1. List the three most important factors that are needed for corn to grow.

2. What are some of the other factors, (not listed above) that a farmer must consider before planting corn.

Growing Degree Table 1

	Monday	Tuesday	Wednesday	Thursday	Friday
Maximum Temperature	68°F	72°F	60°F	69°F	69°F
Minimum Temperature	52°F	54°F	50°F	54°F	55°F
GDD's Totals					

Totals for the week_____

Growing Degree Table 2

	Monday	Tuesday	Wednesday	Thursday	Friday
Maximum Temperature	78°F	80°F	80°F	90°F	79°F
Minimum Temperature	59°F	60°F	45°F	58°F	59°F
GDD's Totals					

Totals for the week_____

Totals from both tables_____

Growing Degree Days Worksheet

ANSWER KEY

Directions

1. Answer the Questions
2. Calculate the GGD's for each day from the following tables.
3. Add up the GGD's for the entire week in Table 1 and Table 2
4. Add the totals from Table 1 and Table 2 together.

Pre-Activity Questions

1. List the three most important factors that are needed for corn to grow.

Air, sunlight and water

2. What are some of the other factors, (not listed above) that a farmer must consider before planting corn.

Quality of soil, air temperature, soil temperature, time of the year, nutrients, location of field, known pest.

Growing Degree Table 1

	Monday	Tuesday	Wednesday	Thursday	Friday
Maximum Temperature	68°F	72°F	60°F	69°F	69°F
Minimum Temperature	52°F	54°F	50°F	54°F	55°F
GDD's Totals	10	13	5	11.5	12

Totals for the week: The table above shows us that..... $10+13+5+11.5+12 = 51.5$ GDD's

Growing Degree Table 2

	Monday	Tuesday	Wednesday	Thursday	Friday
Maximum Temperature	78°F	80°F	80°F	*90°F	79°F
Minimum Temperature	59°F	60°F	**45°F	58°F	59°F
GDD's Totals	18.5	20	15	22	19

Totals for the week: The table above shows us that..... $18.5+20+15+22+19 = 94.5$ GDD's

*Adjusted to 86 **Adjusted to 50

Totals from both tables: 146 GDD's

Conclusion

Most corn varieties require 100 GDDs to emerge. Based on your calculations would the corn in this example accumulate enough GDDs to emerge? **Yes**