



MATH APPLICATION ACTIVITY: EARTH'S HEAT BUDGET

OBJECTIVE: Students will:

- + Describe the Earth's heat budget and how the Sun's energy is utilized;
- + Describe how the Earth's heat budget can be balanced;
- + Calculate the input and output of energy and how it effects Earth's temperature.

MATERIALS:

- + Calculator
- + **Student Sheets**
- + Paper/pencil

PROCEDURE:

On the **REPORT SHEET** students will find a statement of monthly deposits and withdrawals from November of one year to November of the next year. Assume there was a previous balance of 210 energy units. In November 100 energy units were received (deposited) and 120 energy units were re-radiated (withdrawn). This results in a loss of 20 energy units (-20 units withdrawn). Since the balance for the previous month was 210 energy units this leaves a balance of 190 energy units.

(Make the steps for creating and completing the data sheets available to students in the format you choose.)

1. Calculate the difference between the deposit and withdrawal of energy for December. Record the difference in the appropriate column on the **REPORT SHEET**.
2. Next, determine the new balance for December and record the value in balance column for December.
3. In a similar manner, calculate the balances for each month for the remaining months and record the data in the **REPORT SHEET**.

Teacher Sheet 2

- Note that because the values represent averages and this is a cyclic change, if your calculations are correct the balance for November at the bottom of the table should be 190 energy units.
- Construct a line graph for the following data on the graph grid.

- ✚ Label the X- axis **TIME (MONTHS)**
- ✚ Label the Y-axis **ENERGY UNITS** (Deposits, Withdrawals and Balance)
- ✚ Use a different color for each line and provide a key.

ENERGY ABSORBED (Deposited)
ENERGY RE-RADIATED (Withdrawn)
SURFACE TEMPERATURE (Balance)

- By comparing the lines for the deposit and withdrawal:
 - ✓ Shade the region between the lines that represents months during which an *energy surplus* exists.
 - ✓ Shade the region between the lines that represents months during which an *energy deficit* exists.
 - ✓ Draw arrows to the locations on the graph where a *radiative balance* exists.
- Complete the activities in the **ANALYSIS** section.