

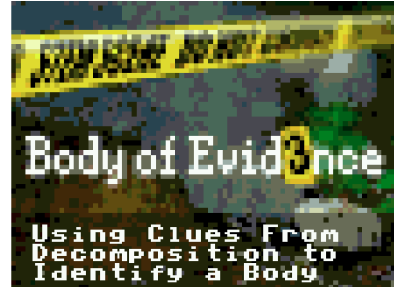


Body of Evidence

Adapted from an activity © 2014 Texas Instruments

Background

In this activity you will play the role of a forensic anthropologist tasked with determining the identity of a decomposed body found in a field outside the city. The activity contains information about the five stages of decomposition, the effects of temperature and humidity on decomposition, and information about other factors that contribute to the decomposition process. You will use information embedded throughout the activity to eventually determine the identity of the body.



What Page Am I On?

When you see the ?
(question mark) symbol
above **GRAPH** key, you can
press it to find out what
page you're on.

Send files to your TI-84 Plus C Silver Edition

Using TI-Connect 4.0 or higher, or a classmate's calculator, send the program BODYEVDC (BODYEVDC.8xp) and the AppVar BOETD (BOETD.8xv) to your TI-84 Plus C Silver Edition. Both files should go to your calculator's Archive.

- **Using TI-Connect:** Open TI DeviceExplorer and select your calculator. Drag BODYEVDC.8xp into the item labeled "Flash/Archive" and wait for the transfer to complete. Drag BOETD.8xv into "Flash/Archive" as well.
- **From another calculator:** Put the receiving calculator in Receive mode by pressing **2nd** **XTN** **▶** **ENTER**. On the sending calculator, go to the Link menu with **2nd** **XTN**, choose 2: All-..., then find "BODYEVDC PRGM" and "BOETD AVAR" and press **ENTER** next to each one. Each one should be marked with a square, indicating that it will be sent. Press **▶** **ENTER** to send the files over.

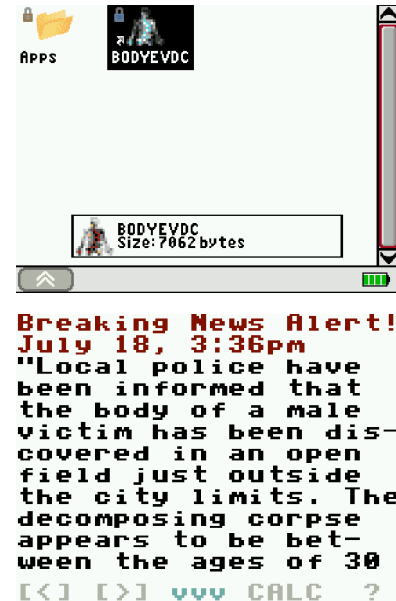
You will also need Doors CSE 8.1 or higher, which can be found at <http://dcs.cemetech.net>. The process of sending Doors CSE to your calculator is the same as above, and is also detailed in the Doors CSE readme document.



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Run the BODYEVDC program; move to pages 2-4.

1. Run Doors CSE 8 from the Apps menu of your calculator, select BODYEVDC, and run the program. You should see the Body of Evidence title screen. Throughout the Body of Evidence activity, you can press the arrow keys (◀ ▶) to move between pages, or **ENTER** to advance to the next page.
2. On a text page, press the ▼ and ▲ arrows to scroll down and up, and **ZOOM** or **ENTE** to scroll down.
3. Read the scenario about a dead body found in a field outside the city. You are playing the role of a forensic anthropologist called to the scene to help investigators determine the identity of the victim.



Move to pages 5. Answer the following question here, in the space provided.

- Q1. Based on what you've read so far, match the following terms-**skeleton**, **insects**, **cause of death** to the following occupations-**forensic anthropologist**, **forensic pathologist**, **forensic entomologist** in the space below.

Move to pages 6-9.

4. Page 6 shows the dialog between the officer and you, the forensic anthropologist, about the concepts being used to determine the postmortem interval.

As you are examining the body, a nearby officer notices and comes over...
Officer: "What are you both doing?"
You: "There are 5 stages of decomposition. We are determining which of the stages this body has gone through."
[◀] [▶] vvv CALC ?

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5. The postmortem interval can be determined by considering the five stages of decomposition. Once Stage 5, "Dry Decay", is reached, the skeleton will remain in this condition unless disturbed. Over time, the skeleton may become fossilized.

Five Stages of Decomposition:
1. Fresh: Begins at death and ends with bloated stage.
2. Bloated: Swollen abdomen from bacterial activity, stiff limbs, discoloration, blow flies lay eggs in the mouth, nostrils,
[<] [>] vvv CALC ?

6. You will see images and dates of the four missing persons on page 9. You will need this information later to solve the case.



Move to pages 10 and 11. Answer the following questions here, in the space provided.

- Q2. What information will be necessary to determine which of the four missing persons the body may belong to? Check all that apply.
- A. average daily temperature and humidity
 - B. current stage of decomposition
 - C. dates that each person went missing and number of days that have passed
- Q3. The decomposition rate of a body depends on many factors, including the air temperature. Check all that may also play a role in the rate of decomposition.
- A. humidity of the air
 - B. the sex of the victim
 - C. how much of the skin is exposed
 - D. the presence of scavengers in the area

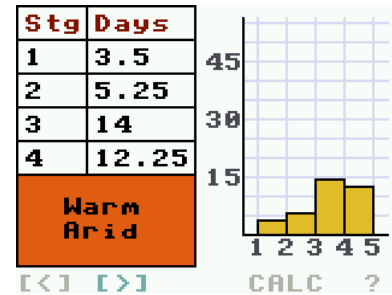
Move to pages 12-15.

7. Using the simulation on page 13, you will now explore the effect of temperature and humidity on the rate of decomposition. Be sure to explore all combinations, and observe the effect on the rate of decomposition. You will also see blow flies, maggots, and odor represented throughout the various stages of decomposition.

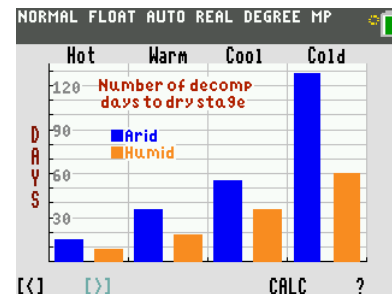


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8. Pages 14 and 15 contain a graph and table with the data that are available from the simulation. The graph displays the number of days the body spends in each stage. Note that Stage 5 is not represented on the graph. If a body is found in stage 5, other data (such as DNA analysis) will be necessary to determine how much time has passed since the person died, as the time spent in stage 5 doesn't have a finite end.



9. The chart on page 15 shows the number of decomposition days until reaching Stage 5 based on various temperature and humidity settings.



Move to pages 16-24. Answer the following questions here, in the space provided.

Q4. What environmental conditions were present where this body was found?

- A. hot and arid
- B. warm and humid
- C. cool and arid
- D. cold and humid

Q5. Based on what you have seen in the simulation and graphs, what can you conclude about the relationship between decomposition and temperature?

- A. Temperature and decomposition rate are inversely related.
- B. Temperature and decomposition rate are directly related.

Q6. What likely happened to the fingers and ribs?

- A. They dissolved away.
- B. Scavengers, such as coyotes, ate them.
- C. A maggot ate them.





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Q7. Based on body position and which parts are clothed or protected from the elements, which of the following statements would you predict is true?

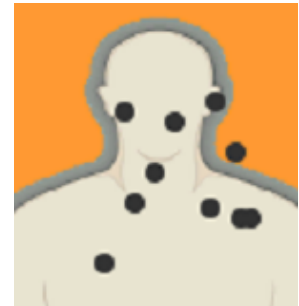
- A. Different parts of the body could decompose at different rates.
- B. All parts of the body would decompose at the same rate.

Q8. Think about the "big picture" of the cycle of life and death in the environment. Although maggots may be disgusting to many people, they serve a very important purpose. What is their role (niche) in the environment?

Q9. Because the blow fly lifecycle (egg, larva, pupa, adult) is so consistent with the various decomposition stages of a human, it is a reliable data source for investigators to determine PMI of the deceased.

- A. true
- B. false

Q10. Blowflies tend to lay their eggs in the eyes, nostrils, mouth, and open wounds of dead bodies. Why is this?



Q11. Occasionally, incredibly well-preserved, mummified, remains of mammals (such as mammoths or humans) are found in areas that have varying temperatures. How is it possible that you can find mummified animals or humans in hot or warm climates?

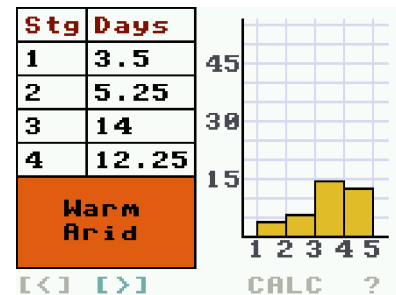
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Move to pages 25-32.

10. From the clues in this case, now choose the correct temperature and humidity settings for the simulation and explore the decomposition rate.



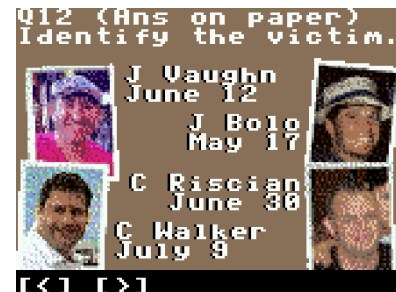
11. Page 27 contains a graph and table with the data that are available from the simulation. Remember that the “days” column represents the time the body was in that stage.



12. On page 30, you are asked to identify the correct missing person based on the facts from the case. When considering the data and clues, assume the person died shortly after they went missing.

Q12. Identify the correct missing person.

- A. Jobie Vaughn
- B. Cy Walker
- C. John Bolo
- D. Cal Riscian



- Q13. To determine identity in this case, you used the PMI from recent weather and dates from a missing persons report. What are some other ways to determine identification? Choose all that apply.

- A. markers on the skeleton, such as healed injuries, compared to medical records
- B. DNA fingerprinting
- C. clues at the scene such as clothing & tattoos
- D. dental records



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Move to pages 33-40: Extension Questions & Background Notes

EQ1. What would happen if a dead body were wrapped in a sheet or a tarp or some other material? Defend your answer.

EQ2. A body has been found in "The Bloat Stage" of decomposition. What are some things that might be done at this point to determine the actual identity of the victim?

EQ3. Why do dead organisms undergo decomposition but living organisms do not?



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Background Notes:

- **Accumulated Degree Days** - In this case, the PMI is fictitious since the case is not real. In fact, although forensic anthropologists use temperature, humidity, and other factors to determine PMI, they also use a concept called Accumulated Degree Days (ADD), which is the sum of the average temperatures for each day the person has been dead. They determine ADD and eventually PMI by first starting with Total Body Score (TBS). TBS is determined by giving each section of the body a score (often different scores) that relates to a stage of decomposition. The TBS is used to determine ADD, which is then used to determine PMI.
- **Bones Tell a Story** - Although this case was fictitious, in reality forensic anthropologists spend a large amount of time studying the bones of corpses found in many different places. The information from these bones can help determine a person's sex, approximate age, approximate stature, ancestry, previously healed fractures, evidence of infection, and many other characteristics.
- **Mummification** - One of the conditions of a body not called out in this activity is the process of mummification. Typically in arid climates, a body never fully decomposes. Instead, it rapidly dries out, losing so much moisture that blow flies may not lay their eggs in the tissue. Skin and muscle are preserved, leaving a mummified body typically "stuck" in stages 3 or 4 of decomposition for months, years, or even hundreds of thousands of years.

Image Credits: Texas Instruments. See readme.txt for more acknowledgements.