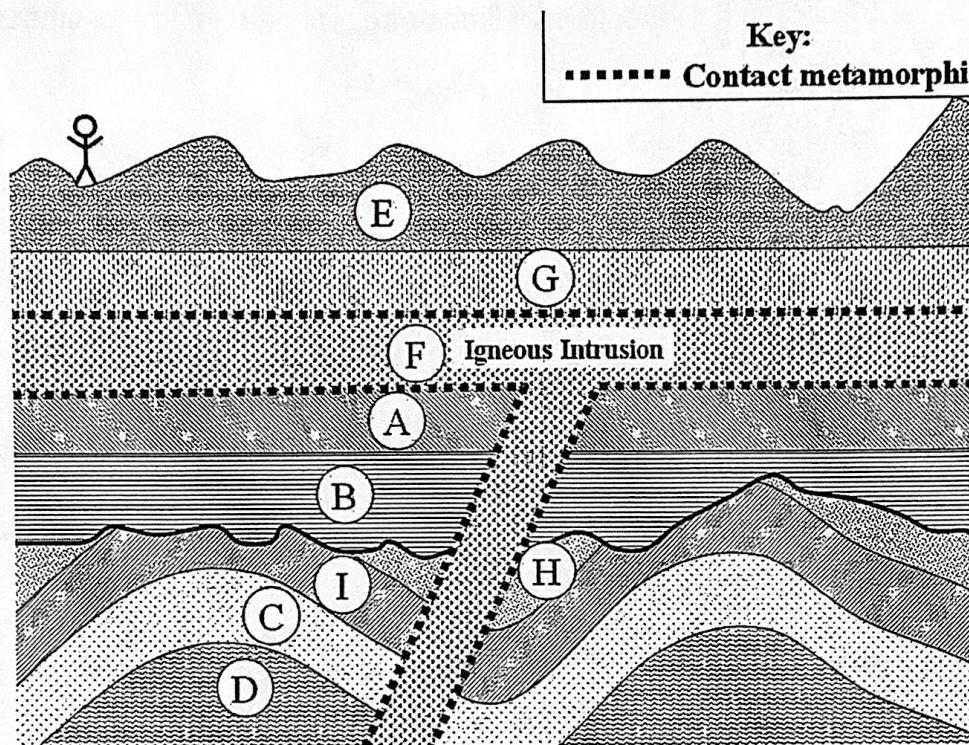


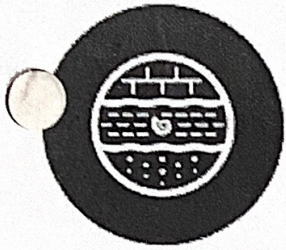
Sequence of Events Practice #2

List the events needed to make the pattern of rock layers shown below in order from first (oldest) to last (youngest). Assume that sedimentary rocks are deposited under water and that erosion happens above water. Use your Earth Science Reference Tables to identify the names of the rocks.



(Oldest)

1. Deposit D	9. Deposit A
2. Deposit C	10. Igneous Intrusion
3. Deposit I	11. Formation of F
4. Deposit H	12. Deposit G
5. Cyncline *	13. Deposit E
6. Weathering + Erosion H	14. W + E of E
7. W + E of I	15. (Newest)
8. Deposit B	



Unit 4 Performance Task: Does This Fossil Exist in New York State?

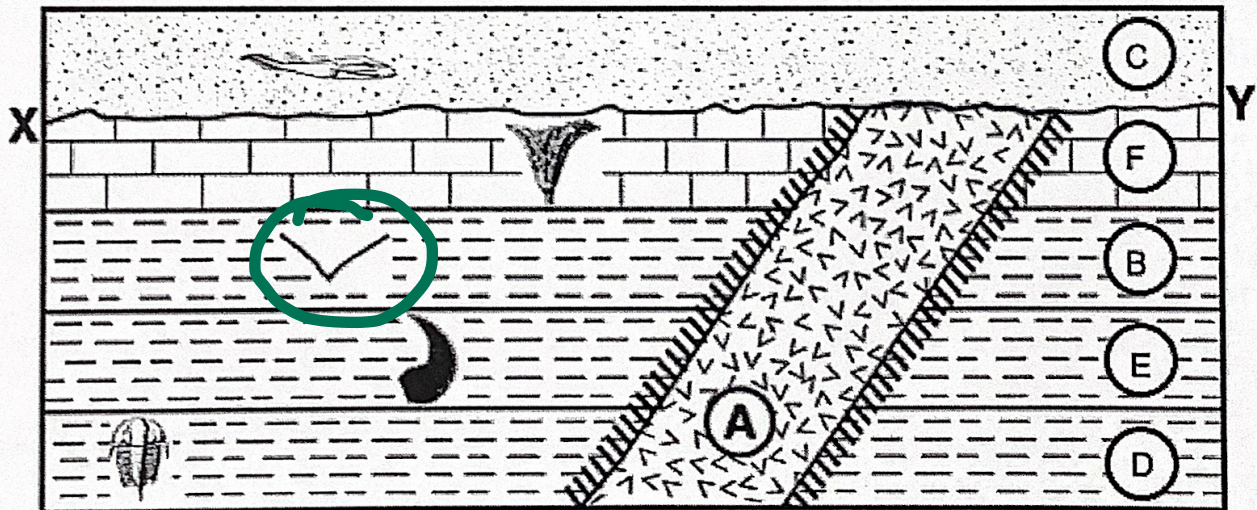
Task:

The fossil in layer B is very important to scientists trying to reconstruct a part of Earth's history and they would like to find more fossils like it. We have been asked to figure out whether this fossil can be found in New York State in order to help scientists narrow down their search.

Product: You will organize your data about the fossil with the aid of a variety of questions. Based on the data provided and your *Earth Science Reference Table*, write a scientific explanation using evidence determining if your fossil could have existed in New York State.

ESRT
↓

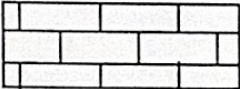


Below is a stratigraphic section from an unknown area thanks to poor record keeping. The stratigraphic section contains the bones of a fossil from layer B. Your goal is to determine if this fossil could have been found in New York State.



Stratigraphy 5E Plan

Rock type: In order to know if the fossil could have been found in New York State, you must determine whether the type of rock it was found in exists in New York State.

1. Using your ESRT identify the different rock types and letters based on the symbol.

Symbol	Letter(s) on Diagram	Type of Rock
	F	Limestone
	B, E, D	Shale
	C	Sandstone

pg 7

How did the fossil get there? Use the stratigraphic column diagram and your understanding of geologic principles to get a more complete picture of how the fossil was preserved in the rock record.

1. In the table below, order the **events** that occurred in this stratigraphic section from oldest to youngest. Include both the rock type and letter when applicable. Use the word bank to help determine the sequence of events.

Deposition of Shale

Deposition of Shale

Uplift and Erosion

Deposition of Shale

Deposition of Limestone

Deposition of Sandstone

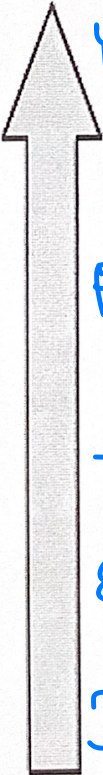
~~Subsidence~~

Igneous Intrusion

sudden sinking of the ground

	Event	What is your evidence?	What law of stratigraphy supports your thinking?
C	Deposition of Sandstone	Top Layer	Law of Superposition
X Y	Uplift & Erosion	Above A (D, E, B, F)	Law of Superposition
A	Igneous Intrusion	Cut through D, E, B, & F	Law of Cross-Cutting
F	Deposition of Limestone	On top of B	Law of Superposition
B	Deposition of Shale	On top of E	Law of Superposition
E	Deposition of Shale	On top of D	Law of Superposition
D	Deposition of Shale	Bottom Layer	Law of Superposition

Youngest Event



Oldest Event

g
q
p

Snapshot: Complete these questions!

2. Explain how the Laws of Stratigraphy you indicated helped you sequence the events in the order they occurred.

Law of Superposition \Rightarrow layers at the bottom (coldest)
layers at the top (youngest)

Law of Cross-cutting \Rightarrow an earthquake (fault-line) and/or igneous intrusion are younger than the layers they cut.

3. Between which two events did the species you are focussing on die and become a fossil? Be sure to explain your thinking.

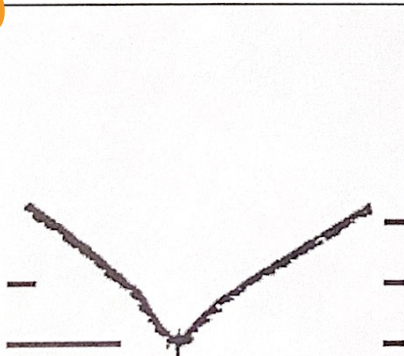
explain your thinking.

(First) Deposit of E
Deposit of B \Rightarrow where fossil is found
Deposit of F

Absolute Dating 5E Plan

What species did the fossil come from and when did it die? Records indicate that the species from which the fossil was formed was determined by examining the fossil bone structure, but due to a lack of technology, the fossil was never dated to ensure that its age matched the time period in which the species existed. Thanks to technological advances in radiometric dating, you can now determine the age of your fossil.

1. Records indicate that the fossil found in the stratigraphic section belongs to the species shown in the image below. Using your ESRT, determine the following information about your fossil.



Letter on the ESRT:	K
Organism Name:	Dicellograptus
Organism Group:	Graptolites
Epoch:	Late
Period:	Ordovician
Era:	Paleozoic
Eon:	Precambrian / Archean
Approximate Age:	~ 444 million years
	Ordovician

2. What Period did this fossil exist in? Ordovician

* Relative Dating *

Snapshot: Complete these questions!

2. Explain how the Laws of Stratigraphy you indicated helped you sequence the events in the order they occurred.

Law of Superposition \Rightarrow layers at the bottom (oldest)
layers at the top (youngest)

* Law of Cross-cutting \Rightarrow an earthquake (fault line) or igneous intrusion is always younger than the rock it cuts through


3. Between which two events did the species you are focussing on die and become a fossil? Be sure to explain your thinking.

Deposit of E
Deposit of B \Rightarrow where fossil is found
Deposit of F

Absolute Dating 5E Plan

What species did the fossil come from and when did it die? Records indicate that the species from which the fossil was formed was determined by examining the fossil bone structure, but due to a lack of technology, the fossil was never dated to ensure that its age matched the time period in which the species existed. Thanks to technological advances in radiometric dating, you can now determine the age of your fossil.

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	Letter on the ESRT: K
	Organism Name: Dicellograptus
	Organism Group: Graptolites
	Epoch: Late
	Period: Ordovician
	Era: Paleozoic (Early)
	Eon: Precambrian or Archean
	Approximate Age: ~444 million years

2. What Period did this fossil exist in? **Ordovician**

3. Below is radiometric decay data from your fossil, produced by a team of scientists that specialize in absolute dating. The table shows the radioactive decay of radioactive isotope X. Part of the table has been left blank. Use your understanding of nuclear decay and the Radioactive decay Data ESRT to fill in the missing information in the table.

Absolute Dating

Half-Life	Original radioactive isotope X Remaining (%)	Number of Years
0	100	0
1	50	125,000,000
2	25	250,000,000
3	12.5	375,000,000
4	6.25	400,000,000

Isotope \Rightarrow
atom w/ a
change in
neutron

atomic #
 \Rightarrow protons

4. If 6 % of the original radioactive isotope X remains in a sample of your fossil, approximately how old is the fossil?

$\sim 400,000,000$

$$\frac{6.25}{400,000,000} = \frac{6}{x}$$

$$x = 384,000,000$$

5. Does the age you determined support the claim about what species your fossil came from? Be sure to explain your thinking.

Yes, the age from the data table (relative dating)
+ the radiometric dating (absolute dating)
are very close.

3. Below is radiometric decay data from your fossil, produced by a team of scientists that specialize in absolute dating. The table shows the radioactive decay of radioactive isotope X. Part of the table has been left blank. Use your understanding of nuclear decay and the Radioactive decay Data ESRT to fill in the missing information in the table.

Half-Life	Original radioactive isotope X Remaining (%)	Number of Years
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4. If 6 % of the original radioactive isotope X remains in a sample of your fossil, approximately how old is the fossil?

~ 400,000,000 years

5. Does the age you determined support the claim about what species your fossil came from? Be sure to explain your thinking.

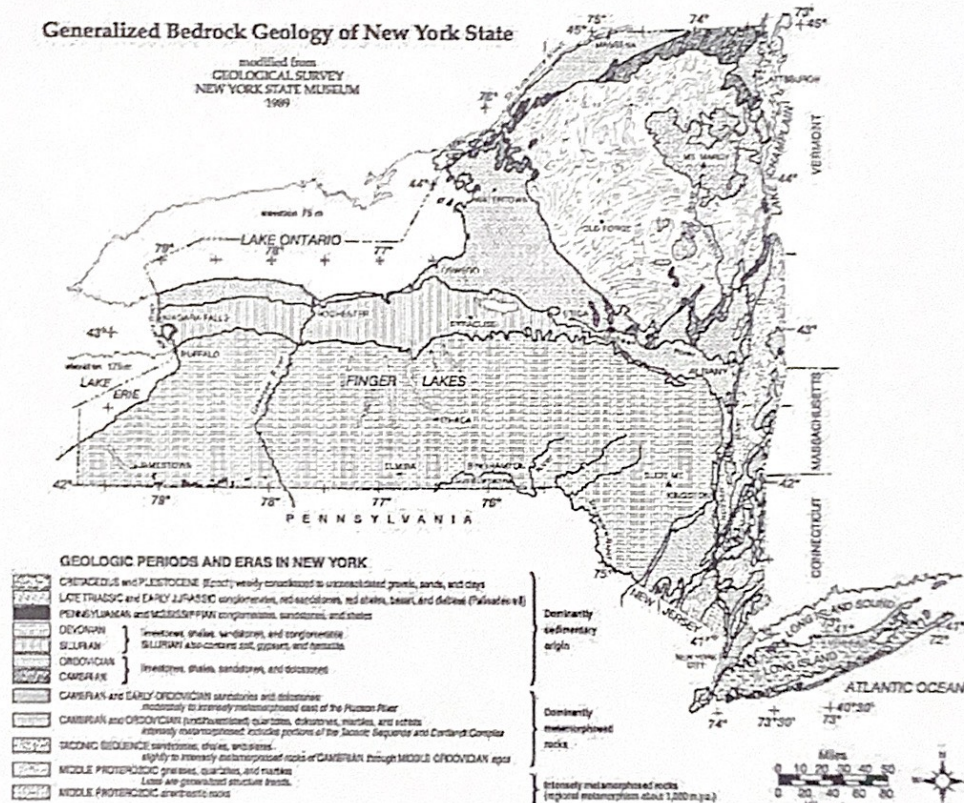
Yes, the absolute + relative dating ages are very close w/ 400M + 444M, respectively.

Based on the age of the fossil, could it have been found in New York State? In order to have been found in New York State, the fossil has to have been formed before the the rock layer was formed.

1. Did bedrock in New York State form during this time period? Circle one: **YES** or NO

If your answered yes, make sure to answer the questions below.

- What type of bedrock formed during this period? limestone, shale, sandstone, dolostone
- What city could you find this fossil in? _____
- Color or shade the area in New York state where you could find this fossil in the map below.

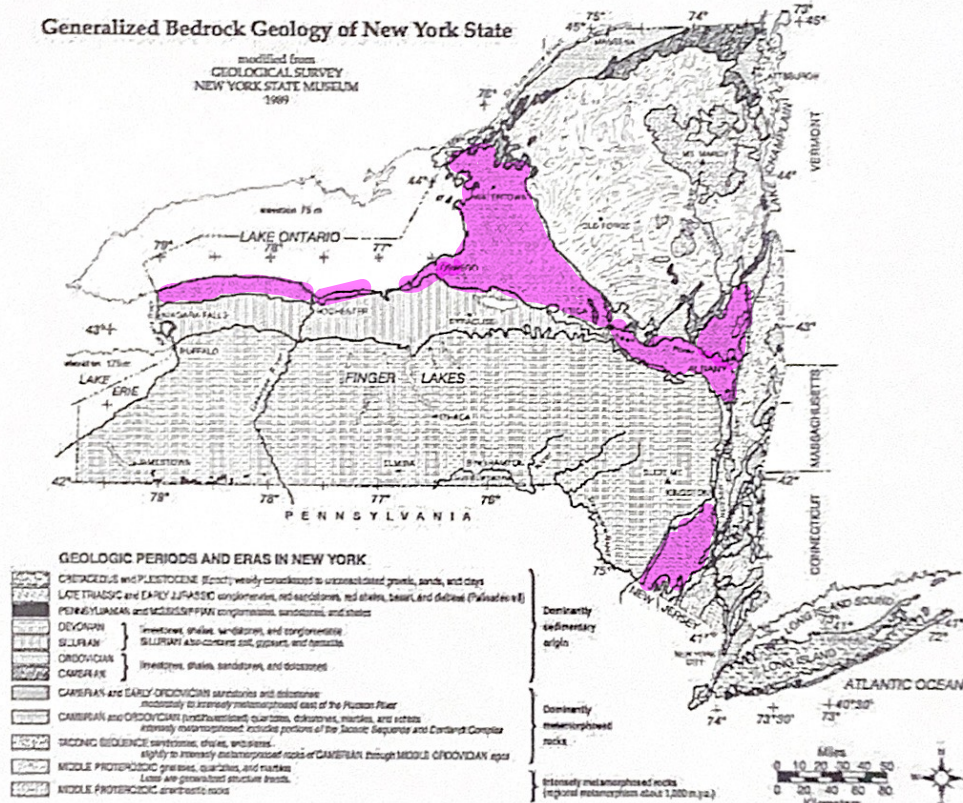


Based on the age of the fossil, could it have been found in New York State? In order to have been found in New York State, the fossil has to have been formed before the the rock layer was formed.

1. Did bedrock in New York State form during this time period? Circle one: **YES** or NO

If your answered yes, make sure to answer the questions below.

- a. What type of bedrock formed during this period? sandstone + dolostone, limestones
- b. What city could you find this fossil in? Watertown, Oswego, or Albany shales
- c. Color or shade the area in New York state where you could find this fossil in the map below.



Final Response

Bring all the evidence together: Do you think this fossil could be found in New York State?

Q Explain why or why not you would expect to find the fossil in New York State. You should write at least one paragraph with evidence and reasoning to support your claim. Remember evidence can come from data or your observations. Make sure that you answer the following to help support your claim.

- Name and age of fossil
- Type of rocks fossils form in
- If the age of the fossil correlates to a time period of bedrock in New York State
- Age and type of bedrock that the fossil would be found in in New York State ESRT Pg 3
- What city or cities the fossil could be found in.

All of the answers are on previous pages of the packet

Question

What is the scientific question you are investigating?

Would fossil (K) be found in NY state?

Background Knowledge

What do you already know related to your question?

Prediction

Based on what you already know, what is your prediction?

I predict that

HW

↖ HW ↗

Evidence <i>What are the relevant science observations or data that address the research question?</i>	Claim <i>What claim can be made based on the evidence? Does the evidence support your prediction?</i>	Science Concepts <i>What scientific concepts are connected to the evidence and help explain the claim?</i>
The evidence is <i>*Data we collected</i>	The claim is <i>*Our prediction</i>	The science concepts that support the claim are <i>*What laws of stratigraphy?</i>

(HW)

Scientific Reasoning

How do the evidence and scientific concepts link to support the claim?

Because of (evidence) and (science concepts), then (claim)

Construct a Scientific Explanation

Using the steps below and the information in the boxes you have completed, write a scientific explanation.

Scientific Explanation = Claim + Evidence + Scientific Reasoning

1. Restate the scientific question, your prediction and the reasons for your prediction

2. State whether your prediction is supported by the evidence
3. State your claim
4. Explain the evidence that supports your claim
5. Explain the science concepts that support the evidence
6. Explain the scientific reasoning that links the evidence and science concepts to the claim

Scientific Explanation

(HW)