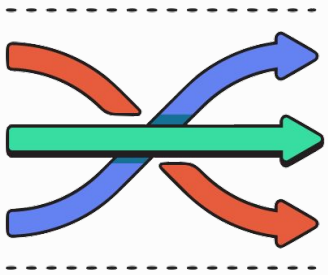
Thinking Nation

Formative Assessment:

Continuity and Change over Time

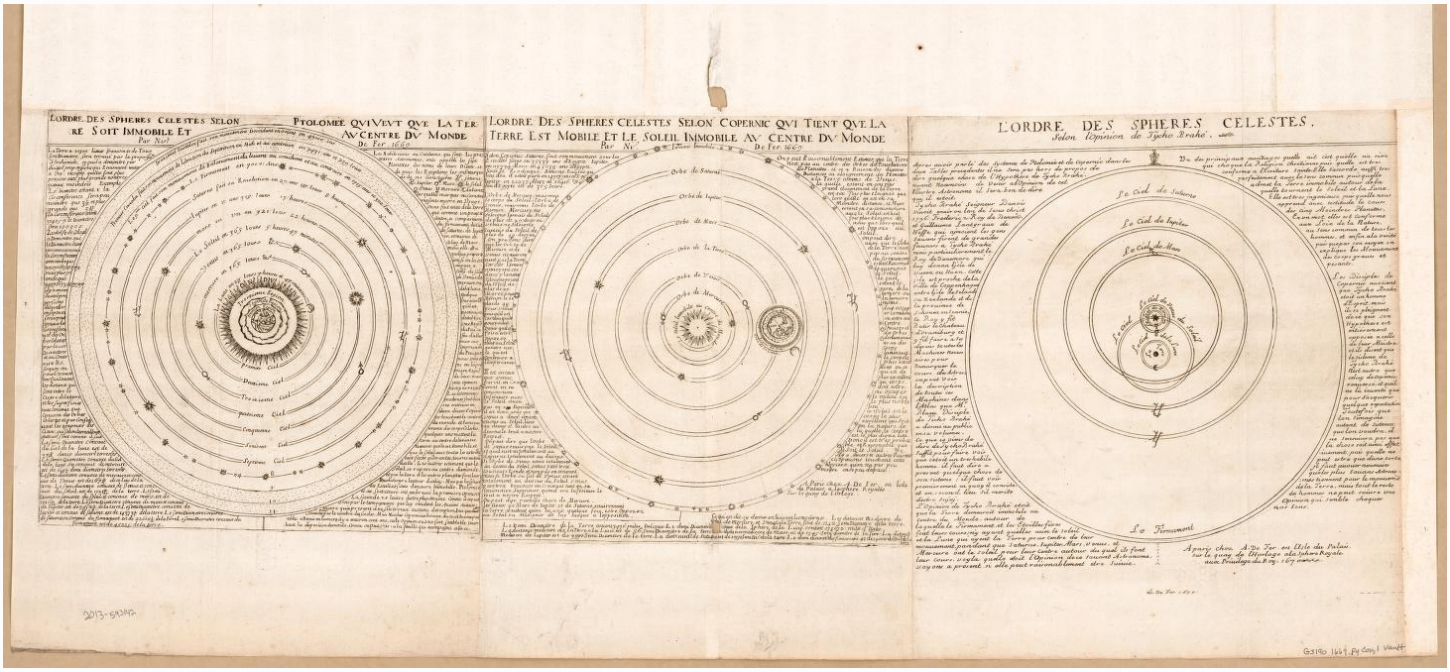


Thinking historically means identifying and exploring the reasons behind both what has changed and what has stayed the same within a given time period or around a specific historical event.

Directions: Read the following source(s). Then, answer the questions on continuity and change over time that follow. The multiple choice questions for this formative assessment are Weighted Multiple Choice (WMC) Questions. This means that there is only one *incorrect* answer, but the other 3 choices are weighted. The *best* answer is 3 points, the *second-best* answer is 2 points, and the *third-best* answer is 1 point. The *incorrect* answer is 0 points.

Formative Assessment: Continuity and Change Over Time

Source: Nicolas De Fer, *Three maps of the cosmological systems of Ptolemy, Copernicus, and Brahe*, 1669. Library of Congress.



Model by Ptolemy, ca. 150	Model by Copernicus, 1543	Model by Brahe, 1588
The Egyptian* astronomer Claudius Ptolemy (c. 100-160s/70s) published this geocentric model of the universe in his 13-volume work the *Almagest* around 150 C.E. His model positioned the Earth at the center of the universe with the Sun, Moon, and other planets orbiting it. This model was almost universally accepted until the Scientific Revolution. It was also the only model promoted by the Catholic Church. *At the time of Ptolemy, Egypt was part of the Roman Empire, and given his Latin name "Claudius," Ptolemy was likely a Roman citizen.	The Polish astronomer Nicolaus Copernicus (1473-1543) published this heliocentric model in 1543, challenging the geocentric model of Ptolemy that had prevailed for centuries, which had placed Earth at the center of the universe. This model positioned the Sun near the center of the universe, motionless, with Earth and the other planets orbiting around it in circular paths and at uniform speeds. His model retained several false Ptolemaic assumptions, such as the planets' circular orbits and uniform speeds.	The Danish astronomer Tycho Brahe (1546-1601) devised this geo-heliocentric model, which reflected a compromise between the systems of Ptolemy and Copernicus by permitting the Earth to remain immobile at the center of the universe but accounting for some of the newly recorded observations on how the planets moved. It has the Sun and Moon revolving around the Earth and the other planets orbiting the Sun. Despite issues like Mars' orbit intersecting with the sun's, Tycho's hybrid system was favored during most of the 17th century.

Formative Assessment: Continuity and Change Over Time

1. Which observation about the three cosmological models is the best example of a **continuity** in how Europeans understood the structure of the universe between 150 and 1669 C.E.?

   A. Brahe's hybrid model maintained Earth's central position, reflecting an attempt to preserve continuity with Ptolemy's framework.

   B. All three models position the Sun at the center of the universe, reflecting a continuous European belief in the Sun's central role in the cosmos.

   C. All three models depict planetary orbits as circular, suggesting that even as Europeans challenged who or what was at the center of the universe, the assumption of circular orbits remained unchanged.

   D. All three models show the Moon in proximity to Earth, showing a continuity in how Europeans understood the Moon's relationship to Earth, regardless of other structural changes.

2. Justify your answer in the space below.

3. Which observation about the three cosmological models is the best example of a change in how Europeans understood the structure of the universe between 150 and 1669 C.E.?

   A. Brahe's hybrid model reflects a change from Ptolemy's purely geocentric system, incorporating new astronomical observations while stopping short of fully accepting Copernicus's heliocentric model.

   B. The position of the Sun shifted across the three models, demonstrating how Europeans gradually reconsidered its location in the universe.

   C. Copernicus replaced the Earth with the Sun at the center, representing a fundamental shift in how Europeans understood humanity's place in the cosmos.

   D. By 1669, all European astronomers had fully abandoned the geocentric model, reflecting a complete shift away from Ptolemy's understanding of the universe's structure.

4. Justify your answer in the space below.

Formative Assessment: Continuity and Change Over Time

1. Which observation about the three cosmological models is the best example of a **continuity** in how Europeans understood the structure of the universe between 150 and 1669 C.E.?

   A. Brahe's hybrid model maintained Earth's central position, reflecting an attempt to preserve continuity with Ptolemy's framework. **(1 point)**

   B. All three models position the Sun at the center of the universe, reflecting a continuous European belief in the Sun's central role in the cosmos. **(0 points)**

   C. All three models depict planetary orbits as circular, suggesting that even as Europeans challenged who or what was at the center of the universe, the assumption of circular orbits remained unchanged. **(3 points)**

   D. All three models show the Moon in proximity to Earth, showing a continuity in how Europeans understood the Moon's relationship to Earth, regardless of other structural changes. **(2 points)**

2. Justify your answer in the space below.

Both the image and the overviews clearly show that all three models depict planetary orbits as circular, making Choice C worth 3 points. Choice D is also supported by all three models but reflects a more specific observational continuity rather than a fundamental assumption, worth 2 points. Choice A is accurate, but shows an attempt at realignment in between Copernicus' model, rather than continuity across all three models, worth 1 point. Choice D is directly contradicted by the image, as Ptolemy and Brahe both position Earth rather than the Sun at the center, worth 0 points.

3. Which observation about the three cosmological models is the best example of a change in how Europeans understood the structure of the universe between 150 and 1669 C.E.?

   A. Brahe's hybrid model reflects a change from Ptolemy's purely geocentric system, incorporating new astronomical observations while stopping short of fully accepting Copernicus's heliocentric model. **(2 points)**

   B. The position of the Sun shifted across the three models, demonstrating how Europeans gradually reconsidered its location in the universe. **(1 point)**

   C. Copernicus replaced the Earth with the Sun at the center, representing a fundamental shift in how Europeans understood humanity's place in the cosmos. **(3 points)**

   D. By 1669, all European astronomers had fully abandoned the geocentric model, reflecting a complete shift away from Ptolemy's understanding of the universe's structure. **(0 points)**

4. Justify your answer in the space below.

Both the image and the overviews clearly show that Copernicus's displacement of Earth from the center represents the most fundamental shift in European understanding of the universe, making Choice C worth 3 points. Choice A is also supported by the image and overviews, but reflects a partial rather than complete shift away from Ptolemy's framework, worth 2 points. Choice B is accurate but only identifies the Sun's shifting position without connecting it to a deeper change in European understanding, worth 1 point. Choice D is directly contradicted by the overviews, which state that Brahe's geocentric hybrid was favored during most of the 17th century, worth 0 points.

Rubric for Formative Assessment: Continuity and Change over Time

1. Weighted Multiple Choice – Continuity

3 points (Choice C)	2 points (Choice D)	1 point (Choice A)	0 points (Choice B)
Subtotal: _____/ 3			

2. Short Answer: Justify Your Answer

3 points	2 points	1 point	0 points
Student thoroughly justifies their choice of the *best* example of a continuity—which is worth three points as shown on the teacher key.	Student thoroughly justifies their choice of either the 1 or 2 point option from the WMC question. OR Student's justification of the 3 point option needs deeper analysis.	Student's justification of their choice (either the 1 or 2 point option) lacks deep analysis.	Student either makes no attempt to justify their choice OR try to justify the 0 point option.
Subtotal: _____/ 3			

3. Weighted Multiple Choice – Change

3 points (Choice C)	2 points (Choice A)	1 point (Choice B)	0 points (Choice D)
Subtotal: _____/ 3			

4. Short Answer: Justify Your Answer

3 points	2 points	1 point	0 points
Student thoroughly justifies their choice of the *best* example of a change—which is worth three points as shown on the teacher key.	Student thoroughly justifies their choice of either the 1 or 2 point option from the WMC question. OR Student's justification of the 3 point option needs deeper analysis.	Student's justification of their choice (either the 1 or 2 point option) lacks deep analysis.	Student either makes no attempt to justify their choice OR try to justify the 0 point option.
Subtotal: _____/ 3			

Total: _____/12