Navigation Technology in the 1500s and the Age of Exploration

By National Park Service, adapted by Newsela staff on 06.26.17
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A 1608 sailing handbook, showing the tools of the time, including an hourglass, astrolabe and globes. Photo from Wikimedia.

By the beginning of the 1500s, technology used for sailing was developing quickly. European explorers were crossing the oceans and visiting new continents. They needed new tools to find their positions without using landmarks. Scientists used their growing knowledge of stars and math to help them. Without this knowledge, the discovery of new lands would not have been possible.

Sailing is based largely on the coordinates of latitude and longitude. Coordinates are numbers that show a person's position. Latitude refers to how far north or south someone is. Longitude refers to east or west.

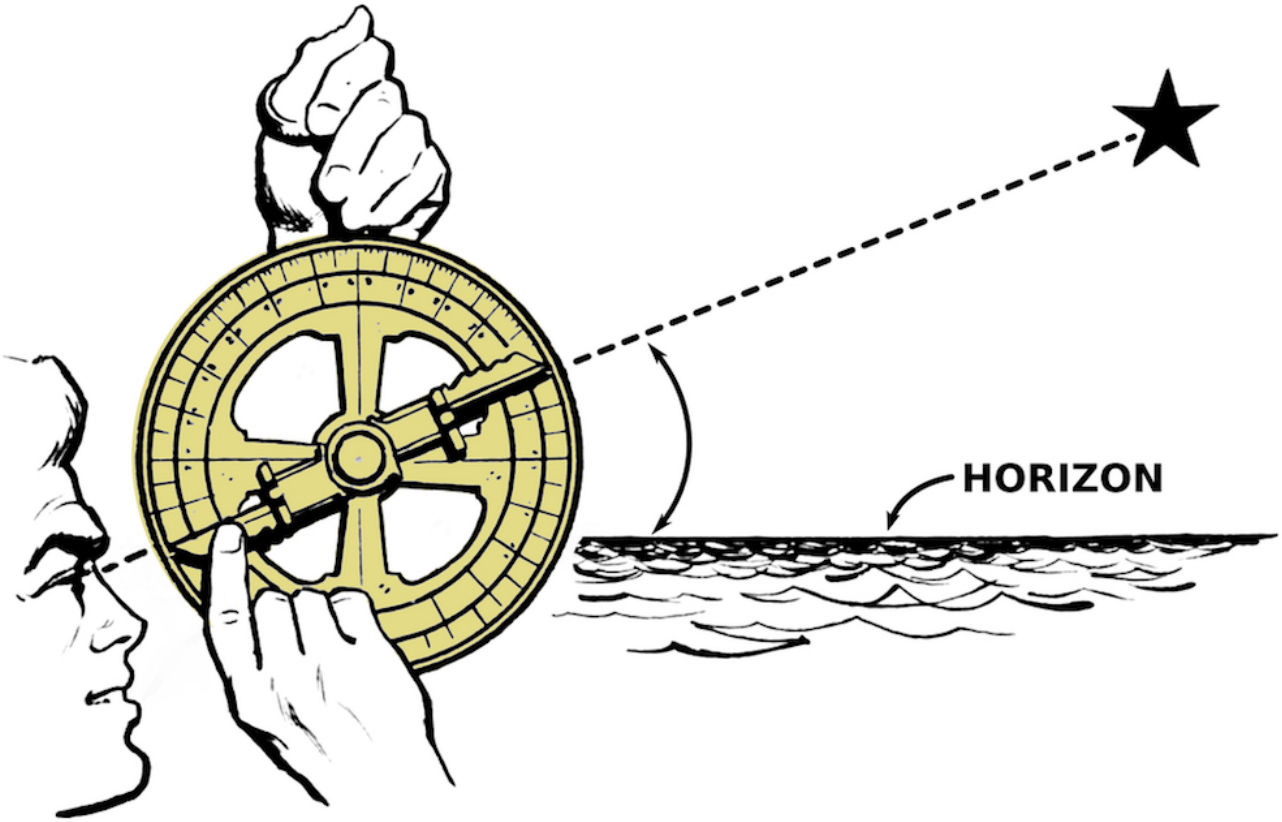
Knowing the latitude, distance important for sailing

In the 1500s, finding longitude was hard to do. Latitude, on the other hand, could be determined fairly accurately thanks to new instruments. Latitude was therefore very important for sailing during this period.

In addition to measuring latitude, sailors had found a way of measuring distance. They measured the speed of the ship and the speeds of the ocean currents. From this information they could find out how far they had traveled. This system of measuring is known as dead reckoning. For dead reckoning to be accurate, sailors need to have precise instruments.

Instruments for measuring latitude

One instrument sailors used was the map of the Earth and its seas. In 1569, Gerardus Mercator invented a map where sailors could read latitude and longitude easily.



Another important instrument was the astrolabe. This tool was used to determine latitude by measuring the position of the North Star. When looking at this star, a person is always looking north. The astrolabe showed sailors how far north or south their position was.

Another tool sailors used to measure latitude was the quadrant. This tool was shaped like a quarter of a circle. The user measured how high the North Star was by looking through a peephole.

The cross-staff was a square staff about four feet in length. It had a scale and sliding pieces of various lengths. Users held the end of the staff to their eye, then slid the pieces to measure where the observed objects were in the sky. The location of the pieces on the scale were then used to find the latitude.

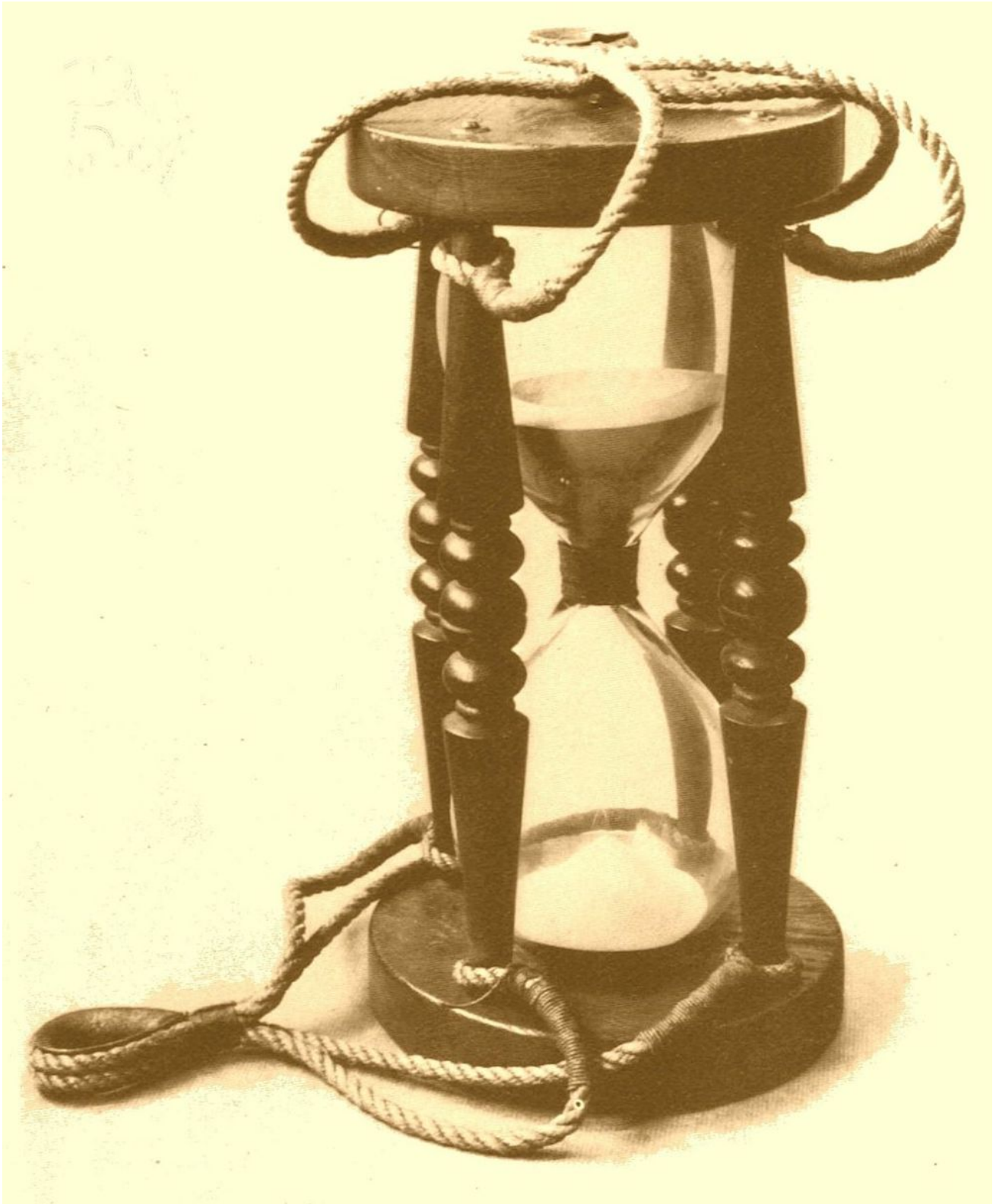
Guided by the magnetic compass

The instruments described above relied on the stars being visible. When these could not be seen, sailors used a magnetic compass instead. The compass works day or night, in good weather or bad. A needle inside the compass is able to swing freely and always points north.

Christopher Columbus was the sailor who traveled to the Americas when Europeans still did not know they existed. He said that the compass "always seeks the truth."

Navigational clocks

For dead reckoning to work, it is necessary to measure time. To do this, sailors usually used an hourglass, which was made of two glass cups. The sand in the top cup gradually fell into the bottom cup. When the sand had fallen completely to the bottom, sailors knew a certain amount of time had passed. The most common glasses were the four-hour and half-hour sizes. A ship's boy carefully tended the half-hour glass, turning it as soon as the sand had run through.



The glass was used together with the log. This was a piece of wood attached to a long rope that had knots placed at equal spacing. A sailor threw the log into the water and felt the rope as the ship pulled away. When the sailor felt the first knot pass through his fingers, he shouted a signal. Then another sailor turned a one-minute glass. The first sailor counted aloud the number of knots that passed until the sand ran out. From there, simple math could be used to find the speed of the ship.

Sailors also used maps

Many other tools were used as well. Sailors also used maps to keep track of where they were going. However, mapmakers in the 1500s did not have the right longitudes. Most maps of the time were not very accurate compared to today.

Quiz

1 Read the section "Instruments for measuring latitude."

Which sentence from the section is BEST illustrated by the image in that section?

(A) In 1569, Gerardus Mercator invented a map where sailors could read latitude and longitude easily.

(B) This tool was used to determine latitude by measuring the position of the North Star.

(C) Users held the end of the staff to their eye, then slid the pieces to measure where the observed objects were in the sky.

(D) The location of the pieces on the scale were then used to find the latitude.

2 Read the section "Navigational clocks."

Based on the photograph and information in that section, HOW did sailors measure time when they were at sea?

(A) Sailors used the hourglass to measure how long it took for changes in latitude to occur.

(B) Sailors measured time by emptying out an hourglass either every half hour or every four hours.

(C) Sailors used an hourglass to keep track of time so they could use this information to determine their speed.

(D) Sailors measured time by using complex math equations to figure out how long it took the hourglass to run out.

3 Read the section "Instruments for measuring latitude."

Select the paragraph that introduces a tool that helped sailors measure BOTH longitude and latitude.

4 According to the section "Guided by the magnetic compass," what is the advantage of using a compass to navigate?

(A) A compass can be used even when the stars are not visible and the weather is bad.

(B) A compass is the most accurate tool for navigation because the needle is always pointing north.

(C) A compass was the preferred tool of famous explorers like Christopher Columbus.

(D) A compass is more reliable than other tools because it is magnetic.

Answer Key

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Paragraph 4:
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