# GTR 45

READING PASSAGE 1

## Timekeeper: Invention of Marine Chronometer

**A.**

Up to the middle of the 18th century, the navigators were still unable to exactly identify the position at sea, so they might face a great number of risks such as the shipwreck or running out of supplies before arriving at the destination. Knowing one's position on the earth requires two simple but essential coordinates, one of which is the longitude.

**B.**

The longitude is a term that can be used to measure the distance that one has covered from one's home to another place around the world without the limitations of naturally occurring baseline like the equator. To determine longitude, navigators had no choice but to measure the angle with the naval sextant between Moon centre and a specific star— lunar distance—along with the height of both heavenly bodies. Together with the nautical almanac, Greenwich Mean Time (GMT) was determined, which could be adopted to calculate longitude because one hour in GMT means 15-degree longitude. Unfortunately, this approach laid great reliance on the weather conditions, which brought great inconvenience to the crew members. Therefore, another method was proposed, that is, the time difference between the home time and the local time served for the measurement. Theoretically, knowing the longitude position was quite simple, even for the people in the middle of the sea with no land in sight. The key element for calculating the distance travelled was to know, at the very moment, the accurate home time. But the greatest problem is: how can a sailor know the home time at sea?

**C.**

The simple and again obvious answer is that one takes an accurate clock with him, which he sets to the home time before leaving. A comparison with the local time (easily identified by checking the position of the Sun) would indicate the time difference between the home time and the local time, and thus the distance from home was obtained. The truth was that nobody in the 18th century had ever managed to create a clock that could endure the violent shaking of a ship and the fluctuating temperature while still maintaining the accuracy of time for navigation.

**D.**

After 1714, as an attempt to find a solution to the problem, the British government offered a tremendous amount of £20,000, which were to be managed by the magnificently named 'Board of Longitude'. If timekeeper was the answer (and there could be other proposed solutions, since the money wasn't only offered for timekeeper), then the error of the required timekeeping for achieving this goal needed to be within 2.8 seconds a day, which was considered impossible for any clock or watch at sea, even when they were in their finest conditions.

**E.**

This award, worth about £2 million today, inspired the self-taught Yorkshire carpenter John Harrison to attempt a design for a practical marine clock. In the later stage of his early career, he worked alongside his younger brother James. The first big project of theirs was to build a turret clock for the stables at Brockelsby Park, which was revolutionary because it required no lubrication. Harrison designed a marine clock in 1730, and he travelled to London in seek of financial aid. He explained his ideas to Edmond Halley, the Astronomer Royal, who then introduced him to George Graham, Britain's first-class clockmaker. Graham provided him with financial aid for his early-stage work on sea clocks. It took Harrison five years to build Harrison Number One or HI. Later, he sought the improvement from alternate design and produced H4 with the giant clock appearance. Remarkable as it was, the Board of Longitude wouldn't grant him the prize for some time until it was adequately satisfied.

**F.**

Harrison had a principal contestant for the tempting prize at that time, an English mathematician called John Hadley, who developed sextant. The sextant is the tool that people adopt to measure angles, such as the one between the Sun and the horizon, for a calculation of the location of ships or planes. In addition, his invention is significant since it can help determine longitude.

**G.**

Most chronometer forerunners of that particular generation were English, but that doesn't mean every achievement was made by them. One wonderful figure in the history is the Lancastrian Thomas Earnshaw, who created the ultimate form of chronometer escapement—the spring detent escapement—and made the final decision on format and productions system for the marine chronometer, which turns it into a genuine modem commercial product, as well as a safe and pragmatic way of navigation at sea over the next century and half.

**Questions 1-5**

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Reading Passage 1 has seven paragraphs, A-G.

Which paragraph contains the following information?

Write the correct letter, A-G, on your answer sheet.

**NB** You may use any letter more than once.

_____1. a description of Harrison's background

_____2. problems caused by poor ocean navigation

_____3. the person who gave financial support to Harrison

_____4. an analysis of the long-term importance of sea clock invention

_____5. the practical usage of longitude

**Questions 6-8**

Do the following statements agree with the information given in Reading Passage 1?

In boxes 6-8 on your answer sheet, write

| | |
|---|---|
| **TRUE** | **if the statement is true** |
| **FALSE** | **if the statement is false** |
| **NOT GIVEN** | **if the information is not given in the passage** |

6. In theory, sailors can easily calculate their longitude position at sea.
7. To determine longitude, the measurement of the distance from the Moon to the given star is a must.
8. Greenwich Mean Time was set up by the English navigators.

**Questions 9-14**

Complete the sentences below.

Write **NO MORE THAN TWO WORDS AND/OR A NUMBER** on your answer sheet.

9. Sailors were able to use the position of the Sun to calculate _____
10. An invention that could win the competition would lose no more than _____every day.
11. John and James Harrison's clock worked accurately without _____
12. Harrison's main competitor's invention was known as _____
13. Hadley's instrument can use _____ to make a calculation of location of ships or planes.
14. The modem version of Harrison's invention is called _____

READING PASSAGE 2

## Ancient People in Sahara

# GTR 45

On Oct. 13, 2000, Paul Sereno, a professor from the University of Chicago, guided a team of palaeontologists to climb out of three broken Land Rovers, contented their water bottles and walked across the toffee-coloured desert called Tenere Desert. Tenere, one of the most barren areas on the Earth, is located on the southern flank of Sahara. According to the turbaned nomads Tuareg who have ruled this infertile domain for a few centuries, this California-size ocean of sand and rock is a ‘desert within a desert’. In the Tenere Desert, massive dunes might stretch a hundred miles, as far as the eyes can reach. In addition, 120-degree heat waves and inexorable winds can take almost all the water from a human body in less than a day.

Mike Hettwer, a photographer in the team, was attracted by the amazing scenes and walked to several dunes to take photos of the amazing landscape. When reaching the first slope of the dune, he was shocked by the fact that the dunes were scattered with many bones. He photographed these bones with his digital camera and went to the Land Rover in a hurry. ‘I found some bones,’ Hettwer said to other group members, ‘to my great surprise, they do not belong to the dinosaurs. They are human bones.’

One day in the spring of 2005, Paul Sereno got in touch with Elena Garcea, a prestigious archaeologist at the University of Cassino in Italy, asking her to return to the site with him together. After spending 30 years in researching the history of Nile in Sudan and of the mountains in the Libyan Desert, Garcea got well acquainted with the life of the ancient people in Sahara. But she did not know Sereno before this exploration, whose claim of having found so many skeletons in Tenere desert was unreliable to some archaeologists, among whom one person considered Sereno just as a ‘moonlighting palaeontologist’. However, Garcea was so obsessive with his perspective as to accept his invitation willingly.

In the following three weeks, Sereno and Garcea (along with five excavators, five Tuareg guides, and five soldiers from Niger’s army) sketched a detailed map of the destined site, which was dubbed Gobero after the Tuareg name for the area, a place the ancient Kiffian and Tuareg nomads used to roam. After that, they excavated eight tombs and found twenty pieces of artefacts for the above mentioned two civilisations. From these artefacts, it is evidently seen that Kiffian fishermen caught not only the small fish, but also some huge ones: the remains of Nile perch, a fierce fish weighing about 300 pounds, along with those of the alligators and hippos, were left in the vicinity of dunes.

Sereno went back with some essential bones and artefacts, and planned for the next trip to the Sahara area. Meanwhile, he pulled out the teeth of skeletons carefully and sent them to a researching laboratory for radiocarbon dating.

The results indicated that while the smaller ‘sleeping’ bones might date back to 6,000 years ago (well within the Tenerian period), the bigger compactly tied artefacts were approximately 9,000 years old, just in the heyday of Kiffian era. The scientists now can distinguish one culture from the other.

In the fall of 2006, for the purpose of exhuming another 80 burials, these people had another trip to Gobero, taking more crew members and six extra scientists specialising in different areas. Even at the site, Chris Stojanowski, bio-archaeologist in Arizona State University, found some clues by matching the pieces. Judged from the bones, the Kiffian could be a people of peace and hardworking. ‘No injuries in heads or forearms indicate that they did not fight too much,’ he said. ‘And they had strong bodies.’ He pointed at a long narrow femur and continued, ‘From this muscle attachment, we could infer the huge leg muscles, which means this individual lived a strenuous lifestyle and ate much protein. Both of these two inferences coincide with the lifestyle of the people living on fishing.’ To create a striking contrast, he displayed a femur of a Tenerian male. This ridge was scarcely seen. ‘This individual had a less laborious lifestyle, which you might expect of the herder.’

Stojanowski concluded that the Tenerian were herders, which was consistent with the other scholars’ dominant view of the lifestyle in Sahara area 6,000 years ago, when the dry climate favoured herding rather than hunting. But Sereno proposed some confusing points: if the Tenerian was herders, where were the herds? Despite thousands of animal bones excavated in Gobero, only three cow skeletons were found, and none of goats or sheep found. ‘It is common for the herding people not to kill the cattle, particularly in a cemetery.’ Elena Garcea remarked, ‘Even the modem pastoralists such as Niger’s Wodaabe are reluctant to slaughter the animals in their herd.’ Sereno suggested, ‘Perhaps the Tenerian in Gobero were a transitional group that had still relied greatly on hunting and fishing and not adopted herding completely.’

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**Questions 15-18**

Do the following statements agree with the information given in Reading Passage 2?

In boxes 15-18 on your answer sheet, write

| | |
|---|---|
| **TRUE** | **if the statement is true** |
| **FALSE** | **if the statement is false** |
| **NOT GIVEN** | **if the information is not given in the passage** |

15. The pictures of rock engravings found in. Green Sahara is similar to those in other places.
16. Tenere Desert was quite a fertile area in Sahara Desert.
17. Hettwer found human remains in the desert by chance.
18. Sereno and Garcea have cooperated in some archaeological activities before studying ancient Sahara people.

**Questions 19 - 21**

Answer the questions below.

Write **NO MORE THAN THREE WORDS AND/OR A NUMBER** on your answer sheet.

19. What did Sereno and Garcea produce in the initial weeks before digging work?
20. What did Sereno send to the research centre?
21. How old were the bigger tightly bundled burials having been identified estimated to be?

**Questions 22-27**

Complete the notes below.

Write **ONE WORD ONLY** on your answer sheet.

## A Comparative Study of Two Ancient Cultures

**the Kiffian**

—They seemed to be peaceful and industrious since the researcher did not find 22 _____ on their heads and forearms.

—Their lifestyle was 23 _____—Through the observation on the huge leg muscles, it could be inferred that their diet had plenty of 24 _____

**the Tenerian**

—Stojanowski presumed that the Tenerian preferred herding to 25_____—But only the bones of individual animals such as 26_____ were found.

—Sereno supposed the Tenerian in Gobero lived in a 27_____ group at that time

# GTR 45

READING PASSAGE 3

## Quantitative Research in Education

Many education researchers used to work on the assumption that children experience different phases of development, and that they cannot execute the most advanced level of cognitive operation until they have reached the most advanced forms of cognitive process. For example, one researcher Piaget had a well-known experiment in which he asked the children to compare the amount of liquid in containers with different shapes. Those containers had the same capacity, but even when the young children were demonstrated that the same amount of fluid could be poured between the containers, many of them still believed one was larger than the other. Piaget concluded that the children were incapable of performing the logical task in figuring out that the two containers were the same size even though they had different shapes, because their cognitive development had not reached the necessary phase. Critics on his work, such as Donaldson, have questioned this interpretation. They point out the possibility that the children were just unwilling to play the experimenter's game, or that they did not quite understand the question asked by the experimenter. These criticisms surely do state the facts, but more importantly, it suggests that experiments are social situations where interpersonal interactions take place. The implication here is that Piaget's investigation and his attempts to replicate it are not solely about measuring the children's capabilities of logical thinking, but also the degree to which they could understand the directions for them, their willingness to comply with these requirements, how well the experimenters did in communicating the requirements and in motivating those children, etc.

The same kinds of criticisms have been targeted to psychological and educational tests. For instance, Mehan argues that the subjects might interpret the test questions in a way different from that meant by the experimenter. In a language development test, researchers show children a picture of a medieval fortress, complete with moat, drawbridge, parapets and three initial consonants in it: D, C, and G. The children are required to circle the correct initial consonant for 'castle'. The answer is C, but many kids choose D. When asked what the name of the building was, the children responded 'Disneyland'. They adopted the reasoning line expected by the experimenter but got to the wrong substantive answer. The score sheet with the wrong answers does not include in it a child's lack of reasoning capacity; it only records that the children gave a different answer rather than the one the tester expected.

Here we are constantly getting questions about how valid the measures are where the findings of the quantitative research are usually based. Some scholars such as Donaldson consider these as technical issues, which can be resolved through more rigorous experimentation. In contrast, others like Mehan reckon that the problems are not merely with particular experiments or tests, but they might legitimately jeopardise the validity of all researches of this type.

Meanwhile, there are also questions regarding the assumption in the logic of quantitative educational research that causes can be identified through physical and/or statistical manipulation of the variables. Critics argue that this does not take into consideration the nature of human social life by assuming it to be made up of static, mechanical causal relationships, while in reality, it includes complicated procedures of interpretation and negotiation, which do not come with determinate results. From this perspective, it is not clear that we can understand the pattern and mechanism behind people's behaviours simply in terms of the casual relationships, which are the focuses of quantitative research. It is implied that social life is much more contextually variable and complex.

Such criticisms of quantitative educational research have also inspired more and more educational researchers to adopt qualitative methodologies during the last three or four decades. These researchers have steered away from measuring and manipulating variables experimentally or statistically. There are many forms of qualitative research, which is loosely illustrated by terms like 'ethnography', 'case study', 'participant observation', 'life history', 'unstructured interviewing', 'discourse analysis' and so on. Generally speaking, though, it has characteristics as follows:
Qualitative researches have an intensive focus on exploring the nature of certain phenomena in the field of education, instead of setting out to test hypotheses about them. It also inclines to deal with 'unstructured data', which refers to the kind of data that have not been coded during the collection process regarding a closed set of analytical categories. As a result, when engaging in observation, qualitative researchers use audio or video devices to record what happens or write in detail open-ended field-notes, instead of coding behaviour concerning a predetermined set of categories, which is what quantitative researchers typically would do when conducting 'systematic observation'. Similarly, in an interview, interviewers will ask open-ended questions instead of ones that require specific predefined answers of the kind typical, like in a postal questionnaire. Actually, qualitative interviews are often designed to resemble casual conversations.

The primary forms of data analysis include verbal description and explanations and involve explicit interpretations of both the meanings and functions of human behaviors. At most, quantification and statistical analysis only play a subordinate role. The sociology of education and evaluation studies were the two areas of educational research where-criticism of quantitative research and the development of qualitative methodologies initially emerged in the most intense way. A series of studies conducted by Lacey, Hargreaves and Lambert in a boys' grammar school, a boys' secondary modem school, and a girls' grammar school in Britain in the 1960s marked the beginning of the trend towards qualitative research in the sociology of education. Researchers employed an ethnographic or participant observation approach, although they did also collect some quantitative data, for instance on friendship patterns among the students. These researchers observed lessons, interviewed both the teachers and the students, and made the most of school records. They studied the schools for a considerable amount of time and spent plenty of months gathering data and tracking changes over all these years.

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**Questions 28-32**

Look at the following statements or descriptions (Questions 28-32) and the list of people below.

Match each statement or description with the correct person or people, A, B, C or D.

Write the correct letter, **A, B, C or D,** on your answer sheet.

**NB** You may use any letter more than once.

**28.** A wrong answer indicates more of a child's different perspective than incompetence in reasoning.

**29.** Logical reasoning involving in the experiment is beyond children's cognitive development.

**30.** Children's reluctance to comply with the game rules or miscommunication may be another explanation.

**31.** There is an indication of a scientific observation approach in research.

**32.** There is a detail of flaw in experiments on children's language development.

**Lists of People**

- Piaget
- Mehan
- Donaldson
- Lacey, Hargreaves and Lambert

**Questions 33-36**

Complete the sentences below.

Write **NO MORE THAN TWO WORDS** on your answer sheet.

**33.** In Piaget's experiment, he asked the children to distinguish the amount of …… in different containers.

**34.** Subjects with the wrong answer more inclined to answer '……' instead of their wrong answer D in Mehan's question.

**35.** Some people criticized the result of Piaget experiment, but Donaldson thought the flaw could be rectified by ……

**36.** Most qualitative researches conducted by Lacey, Hargreaves and Lambert were done in a ……

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**Questions 37-39**

Choose **THREE** letters, A-F. Write the correct letters on your answer sheet.

The list below includes characteristics of the ‘qualitative research’.

Which **THREE** are mentioned by the writer of the passage?

- **A.** Coding behavior in terms of predefined set of categories
- **B.** Designing an interview as an easy conversation
- **C.** Working with well-organized data in a closed set of analytical categories
- **D.** Full of details instead of loads of data in questionnaires
- **E.** Asking to give open-ended answers in questionnaires
- **F.** Recording the researching situation and applying note-taking

**Question 40**

Choose the correct letter, **A, B, C or D.**

Write the correct letter on your answer sheet.

What is the main idea of the passage?

- **A.** to prove that quantitative research is most applicable to children’s education
- **B.** to illustrate the society lacks of deep comprehension of educational approach
- **C.** to explain the ideas of quantitative research and the characteristics of the related criticisms
- **D.** to imply qualitative research is a flawless method compared with quantitative one