Name: _____ Date: _____

The Dome Roman Builders Poured in Concrete

Circle group

You can visit Rome and stand under a big dome. It has stood for almost two thousand years. It is part of the Pantheon, a Roman temple. The roof is made of concrete. Engineers still study how it was built.

Roman concrete was not like ours. Workers mixed lime with a special volcanic ash from near the Bay of Naples. They added water and bits of stone or broken brick. The ash reacted with the lime and water. The mix slowly turned hard like rock. It could even harden underwater. So the Romans could build harbors and piers in the sea.

The builders also thought about weight. The walls at the bottom are thick. The dome gets thinner as it goes up. Near the top they used lighter rock. Rows of sunken square panels inside the dome took away more weight.

At the top is a round opening called the oculus. Sunlight and rain come in. A beam of light moves across the inside during the day. The dome has no steel bars. It lasted because the Romans planned so well.

Questions

1. What is the Pantheon?

_____

_____

2. What did workers mix with lime?

_____

_____

3. What was special about Roman concrete?

_____

_____

4. How did the builders make the dome lighter?

_____

_____

5. Why was hardening underwater useful?

_____

_____

6. What does the long life of the dome tell us?

_____

_____

Words to know

engineers: people who design and build things like bridges and buildings
volcanic: coming from a volcano
harbors: sheltered places where ships can stay safely

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

The Dome Roman Builders Poured in Concrete

Triangle group

A visitor to Rome can still step beneath a great dome that has stood for almost two thousand years. The Pantheon, a temple completed in the early second century, has a roof of solid concrete, and engineers still study how its builders managed such a feat.

Roman concrete was not the same as the concrete poured today. Workers mixed lime with a special volcanic ash found near the Bay of Naples, then added water and chunks of stone or broken brick. The ash reacted with the lime and water and slowly turned the mixture into a rock-like mass. This recipe even hardened underwater, which allowed Romans to build harbors and piers right into the sea.

The Pantheon's builders were also clever about weight. They made the walls at the base very thick and the dome thinner as it rose. Near the bottom they used heavy stone in the mix, but near the top they chose lighter rock, so that the highest part pressed down less on the rest. Rows of sunken square panels inside the dome removed even more weight without weakening it.

At the very top, a round opening called the oculus lets in sunlight and rain. The beam of light moves slowly across the interior as the day passes. Modern builders usually add steel bars to strengthen concrete, yet this dome has no such bars. Its long survival shows how carefully the Romans planned their materials and shapes.

Questions

1. What is the Pantheon?

_____

_____

2. What special material did Roman workers mix with lime?

_____

_____

3. What was unusual about the Roman recipe for concrete?

_____

_____

4. How did the builders keep the dome from being too heavy?

_____

_____

5. Why was the ability to harden underwater useful to the Romans?

_____

_____

6. What does the dome's long life suggest about its builders?

_____

_____

Words to know

engineers: people who design and build things like bridges and buildings
volcanic: coming from a volcano
harbors: sheltered places where ships can stay safely
interior: the inside of a building
survival: continuing to exist for a long time

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

The Dome Roman Builders Poured in Concrete

Square group

A visitor to Rome can still step beneath a vast dome that has endured for nearly two thousand years. The Pantheon, a temple completed in the early second century, is crowned with a roof of solid concrete, and modern engineers continue to investigate how its builders accomplished such an extraordinary feat.

Roman concrete was not identical to the concrete poured today. Workers combined lime with a distinctive volcanic ash gathered near the Bay of Naples, and then they added water along with chunks of stone or broken brick. The ash reacted chemically with the lime and the water, and the mixture slowly transformed into a rock-like mass. This recipe hardened even underwater, which allowed the Romans to construct harbors and piers directly in the sea.

The architects of the Pantheon were equally ingenious about weight. They made the walls at the base extremely thick and the dome progressively thinner as it rose. Near the bottom they included heavy stone in the mix, whereas near the summit they selected lighter rock, so that the highest portion pressed down less upon the structure below. Rows of recessed square panels inside the dome removed still more weight without weakening it.

At the very crown, a circular opening known as the oculus admits sunlight, and occasionally rain. A beam of light drifts slowly across the interior as the hours pass. Builders today usually reinforce concrete with steel bars, yet this dome contains none. Its remarkable survival demonstrates how carefully the Romans planned both their materials and their shapes.

Questions

1. What is the Pantheon, and what covers it?

_____

_____

2. What distinctive material did Roman workers combine with lime?

_____

_____

3. What was unusual about the Roman recipe for concrete?

_____

_____

4. In what ways did the architects reduce the weight of the dome?

_____

_____

5. Why was a concrete that hardens underwater valuable to the Romans?

_____

_____

6. What does the dome's long survival suggest about its builders?

_____

_____

Words to know

engineers: people who design and build things like bridges and buildings
volcanic: coming from a volcano
harbors: sheltered places where ships can stay safely
interior: the inside of a building
survival: continuing to exist for a long time

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: The Dome Roman Builders Poured in Concrete

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: The Dome Roman Builders Poured in Concrete

Easier · 181 words · Flesch-Kincaid grade 3

1. A Roman temple with a big concrete dome.
2. Volcanic ash from near the Bay of Naples.
3. It could harden underwater.
4. It got thinner near the top, they used lighter rock there, and added sunken panels.
5. The Romans could build harbors and piers in the sea.
6. The builders planned very carefully.

Triangle: The Dome Roman Builders Poured in Concrete

This passage · 241 words · Flesch-Kincaid grade 7.7

1. A Roman temple in Rome with a great concrete dome.
2. Volcanic ash from near the Bay of Naples.
3. It could harden even underwater.
4. They made it thinner toward the top, used lighter rock near the top, and added sunken panels.
5. They could build harbors and piers in the sea.
6. They planned their materials and shapes very carefully.

Square: The Dome Roman Builders Poured in Concrete

Harder · 255 words · Flesch-Kincaid grade 10.4

1. A Roman temple in Rome, topped by a great concrete dome.
2. Volcanic ash gathered near the Bay of Naples.
3. It hardened even underwater.
4. They made it thinner toward the top, chose lighter rock near the summit, and added recessed panels.
5. They could build harbors and piers directly in the sea.
6. They planned both their materials and shapes with great care.