Name: _____ Date: _____

Why Arches Hold Up Bridges

Circle group

Some of the oldest bridges are made of stone. Some still stand. Many have the same shape, a curve called an arch. Why is an arch so strong?

Think of a flat stone slab laid over a gap. Its weight pulls the middle down. The slab can crack. An arch works in a different way. Its stones are shaped like wedges, thick at the top and thin at the bottom. They lean on one another. Weight on the arch does not push straight down. It travels along the curve to the two ends.

At each end is a block of stone or ground called an abutment. It pushes back. This keeps the ends from spreading apart. At the top is the keystone. It is the last stone put in. It locks the others in place.

Builders used wooden frames to hold the stones up until the keystone went in. Then the arch held itself up. The Romans built many arches for bridges and for channels that carried water. Some are still used.

Questions

1. What is the curved shape of many old stone bridges called?

_____

_____

2. What can happen to a flat slab over a gap?

_____

_____

3. Where does weight on an arch travel?

_____

_____

4. What is the stone at the top called?

_____

_____

5. What held the stones up until the keystone went in?

_____

_____

6. Why do abutments matter to an arch?

_____

_____

Words to know

arch: a curved shape that holds up weight over an open space
slab: a thick, flat piece of stone or other hard material
abutment: a solid support at the end of an arch or bridge
keystone: the center stone at the top of an arch that locks the others in place
frames: structures made of pieces joined together to hold something up

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: _____

Why Arches Hold Up Bridges

Triangle group

Some of the oldest bridges in the world are made of stone, and some of them are still standing. Many have the same shape. They rise in a curve, called an arch. Why is an arch so strong?

Think about how a flat stone slab works. If you lay it across a gap, its weight and anything on top pulls the middle downward, and the slab can crack. An arch solves the problem in a different way. The stones in an arch are shaped a little like wedges, thick at the top and thin at the bottom. They lean against one another. Weight that falls on the arch does not just push straight down. It travels along the curve to the two ends.

At each end of the arch, there is a solid block of stone or ground called an abutment. The abutments push back, which keeps the ends from spreading apart. At the very top sits the keystone, the last stone to be placed. It locks the others in place.

Builders long ago used wooden frames to hold the stones until the keystone went in. Once it was in, the frame was no longer needed, because the arch held itself up. The Romans built many arches, for bridges and for channels that carried water, and some of them are still in use.

Questions

1. What is the curved shape of many old stone bridges called?

_____

_____

2. What can happen to a flat stone slab laid across a gap?

_____

_____

3. Where does weight on an arch travel?

_____

_____

4. What is the stone at the top of an arch called?

_____

_____

5. What did builders use to hold the stones until the keystone went in?

_____

_____

6. Why do the abutments matter to an arch?

_____

_____

Words to know

arch: a curved shape that holds up weight over an open space
slab: a thick, flat piece of stone or other hard material
abutment: a solid support at the end of an arch or bridge
keystone: the center stone at the top of an arch that locks the others in place
frames: structures made of pieces joined together to hold something up

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: _____

Why Arches Hold Up Bridges

Square group

Some of the oldest bridges in the world are built of stone, and a number of them are still standing today. Many share the same distinctive shape, rising in a curve known as an arch. Why is an arch so remarkably strong?

Consider how a flat stone slab behaves. If you lay it across a gap, its own weight and anything placed on top pulls the middle downward, and the slab can crack. An arch solves the problem in an entirely different way. The stones in an arch are shaped somewhat like wedges, thick at the top and thin at the bottom, and they lean against one another. Weight that falls on the arch does not simply push straight down. Instead, it travels along the curve toward the two ends.

At each end of the arch stands a solid block of stone or ground called an abutment. The abutments push back, which prevents the ends from spreading apart. At the very top sits the keystone, the last stone to be placed, which locks all of the others firmly in place.

Builders long ago used wooden frames to support the stones until the keystone was set. Once it was in position, the frame was no longer needed, because the arch held itself up. The Romans constructed many arches, both for bridges and for channels that carried water, and some of them remain in use.

Questions

1. What is the curved shape of many old stone bridges called?

_____

_____

2. What can happen to a flat stone slab laid across a gap?

_____

_____

3. Where does weight that falls on an arch travel?

_____

_____

4. What is the stone at the very top of an arch called?

_____

_____

5. What did builders use to support the stones until the keystone was set?

_____

_____

6. Why are the abutments important to an arch?

_____

_____

Words to know

arch: a curved shape that holds up weight over an open space
slab: a thick, flat piece of stone or other hard material
abutment: a solid support at the end of an arch or bridge
keystone: the center stone at the top of an arch that locks the others in place
frames: structures made of pieces joined together to hold something up

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: Why Arches Hold Up Bridges

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

Circle: Why Arches Hold Up Bridges

Easier · 172 words · Flesch-Kincaid grade 1.5

1. An arch.
2. The weight pulls the middle down and it can crack.
3. Along the curve to the two ends.
4. The keystone.
5. Wooden frames.
6. They push back so the ends do not spread apart and fall.

Triangle: Why Arches Hold Up Bridges

This passage · 223 words · Flesch-Kincaid grade 3.5

1. An arch.
2. The weight pulls the middle down and it can crack.
3. Along the curve to the two ends.
4. The keystone.
5. Wooden frames.
6. They push back against the ends, which keeps the arch from spreading apart and falling.

Square: Why Arches Hold Up Bridges

Harder · 233 words · Flesch-Kincaid grade 5.9

1. An arch.
2. Its weight pulls the middle downward and the slab can crack.
3. Along the curve toward the two ends.
4. The keystone.
5. Wooden frames.
6. They push back against the ends, which prevents the arch from spreading apart and collapsing.