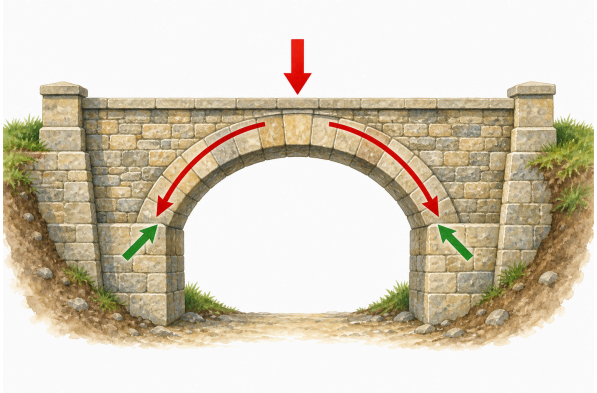
拱桥

观察卡

选1–3项试试；可指、说、画，书写可选。

1 · 看一看

指出桥面、拱和两端桥台。桥面和拱的形状相同吗？



石拱桥剖面示意；红色为荷载传递，绿色为桥台支承反力。

2 · 看一看

沿红箭头从拱顶走向两端，再找桥台向内抵住的绿箭头。

3 · 选一选

如果两端任意向外滑，拱还能按图中方式稳定支承吗？说说理由。

桥台很重要　只靠桥面形状

4 · 写一写

在知识卡找到“桥台”。读一读，再选着写。

桥台

5 · 画一画

画出一个拱和两端桥台。用箭头表示向下荷载及两端支撑。

6 · 记一记

我找到的部件：_____

我对传力的解释：_____

图中不能确定：_____（可画或口述）

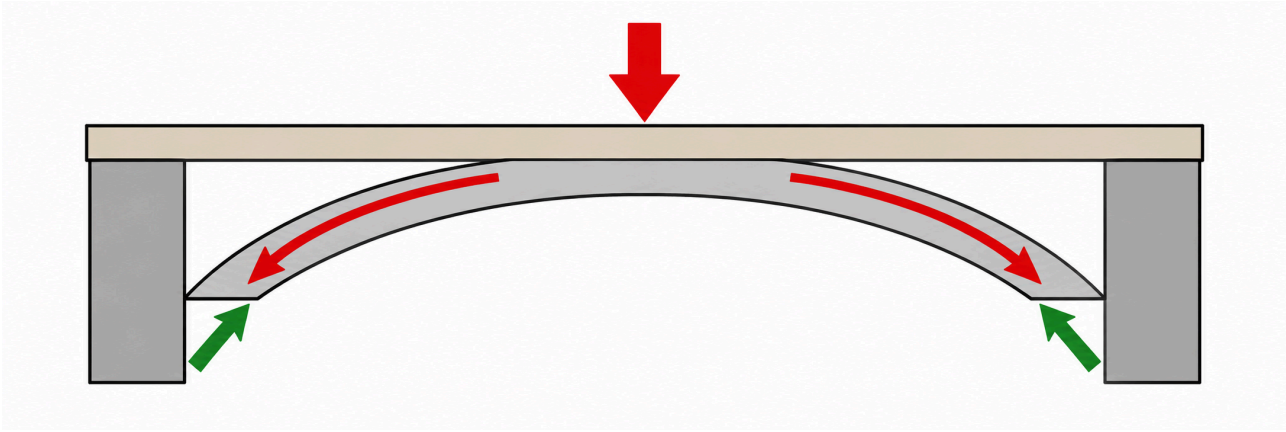
拱桥

知识卡

弯曲的桥怎样承重?

桥跨越河流、山谷等障碍；拱桥沿弧形拱把荷载传向两端。

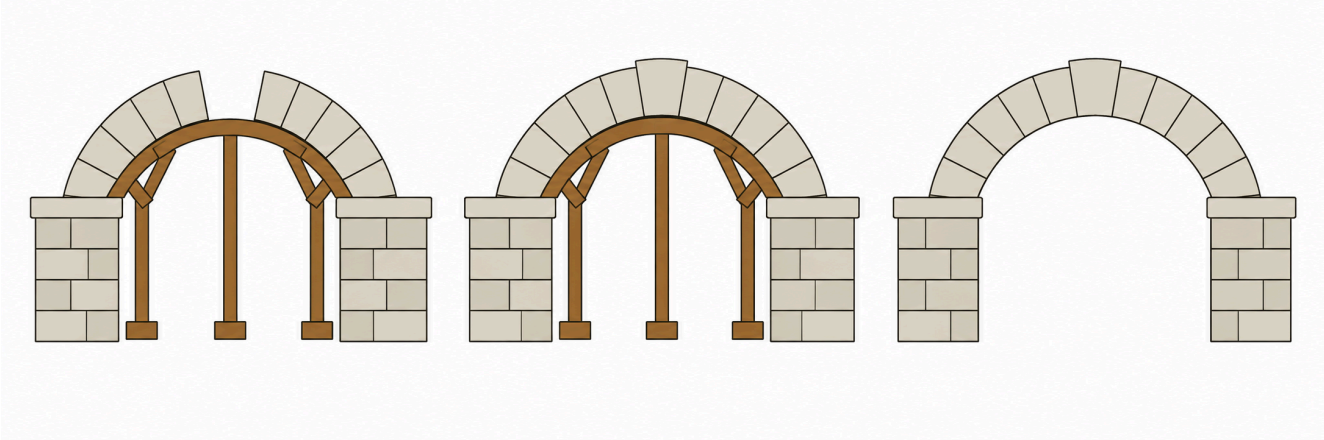
力怎样传递?



受力示意 · 无统一比例

- **桥面：**在拱上方
- 桥台向内抵住，阻止拱脚外张
- **部分已知:** 定性示意，不能据图算承重
- 向下荷载 → 拱受压 → 两端桥台
- **图示范围:** 通用石拱结构

建造 · 传统石拱的一种方法



临时承托 → **拱合拢** → **移除支撑**

- **未合拢：**木架承托
- 非所有方法；非操作教程
- **合拢后：**按工程安排拆架

拱桥

知识卡

材料

- **传统：**石材
- **也可用：**钢、混凝土
- **材料 + 形状：**共同影响结构

拱桥 / 梁桥

- **拱：**沿弧线传力
- **梁：**横跨支点
- 桥面平 ≠ 一定是梁桥

实例 · 赵州桥



结构示意 · 不是测绘图

- **地点：**河北；年代：隋代
- **大拱两端上方：**小拱
- **主跨：**两拱脚之间；不是全桥总长
- 结构示意，非测绘图

- **通用图：**不对应特定桥、年代、尺寸或承重能力
- **箭头：**方向，非力值比例
- 安全公共区域远看；不攀爬、不试载

资料：PBS/NOVA · ASCE · PennDOT pp. 23, 24

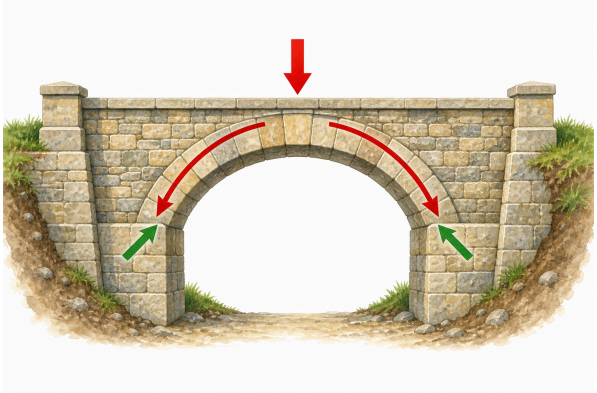
Arch bridge

Observe

Choose 1–3 tasks. Point, say or draw; writing is optional.

1 · Look

Point to the deck, arch and abutments. Do the deck and arch have the same shape?



Stone-arch section: red shows load transfer; green shows abutment reactions.

2 · Look

Follow red arrows from the crown to both ends. Find the green arrows pushing back.

3 · Choose

If the ends slide apart freely, can the arch stay supported as shown? Explain.

- [ ] Abutments matter
- [ ] Only deck shape matters

4 · Write

Find “abutment” on the knowledge card. Say it; write it if you wish.

abutment

5 · Draw

Draw an arch and two abutments. Add arrows for the downward load and end supports.

6 · Record

A part I found: ____

My explanation of the forces: ____

The picture cannot tell me: ____ (or draw/say)

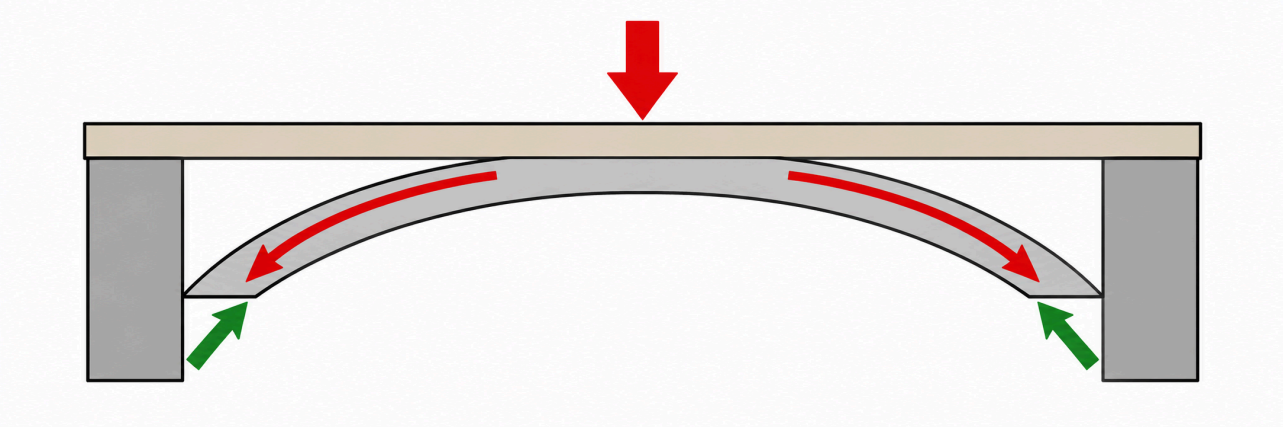
Arch bridge

Discover

How does an arch carry weight?

Bridges cross rivers, valleys and other obstacles. An arch carries load along its curve toward both ends.

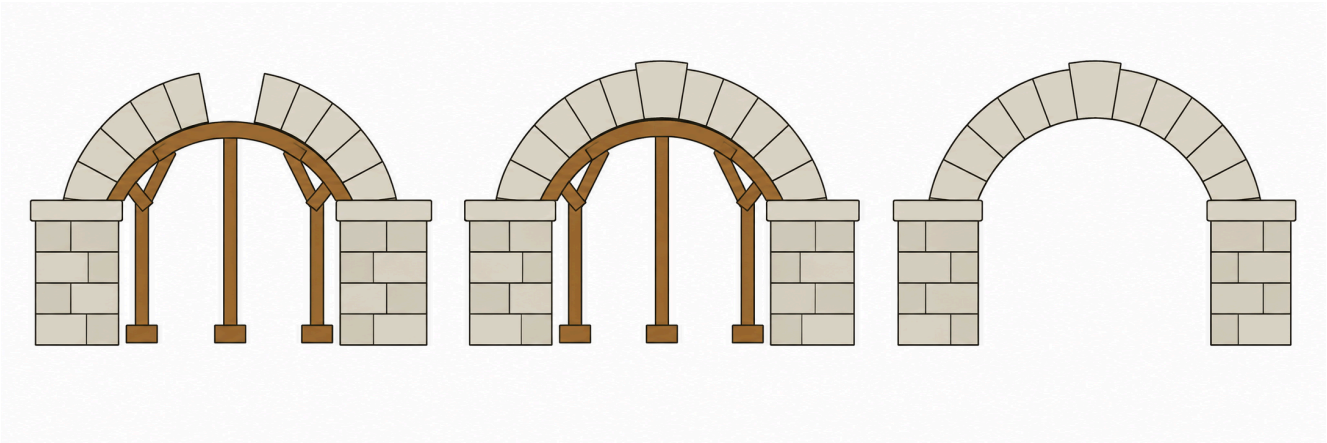
Force directions



Force diagram · not to scale

- **Deck:** above the arch
- Abutments push inward against spreading
- **Partly known:** Qualitative, not a capacity calculation
- Downward load → compressed arch → abutments
- **Diagram scope:** Generic masonry structure

Building · One traditional method



Support → **Close the arch** → **Remove support**

- **Unfinished arch:** wooden centering
- Not every method; not a building guide
- **After closure:** removal as engineering work allows

Arch bridge

Discover

Materials

- **Traditional:** stone
- **Also:** steel, concrete
- **Material + shape:** both matter

Arch / beam

- **Arch:** force along a curve
- **Beam:** spans supports
- Flat deck ≠ necessarily a beam bridge

Example • Zhaozhou Bridge



Structure illustration • not a survey

- Hebei, China; Sui dynasty
- **Small arches:** above both ends of the main arch
- **Main span:** between arch ends, not total bridge length
- Structure illustration, not a survey

- **Generic diagrams:** no specific bridge, date, dimensions or capacity
- **Arrows:** directions, not force magnitudes
- Safe public viewpoints; no climbing or load tests

Sources: PBS/NOVA • ASCE • PennDOT pp. 23, 24