Bridge the Trade-Offs

Evaluate a river crossing using priorities and constraints

HS-ETS1-3 "Evaluate a solution to a complex real-word problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as social, cultural…"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the town's top priorities, circle limits the bridge designs must meet, and number at least three trade-offs you find in the text. Use your marks to decide which evidence matters most.

A Crossing to the Clinic

1 After heavy rain, the footpath across Mill Creek closes, cutting off a direct walking route to the clinic and bus stop. The town is considering a new bridge that people using wheelchairs can cross. Its construction budget is $1.4 million. At public meetings, residents ranked safe, dependable access first, followed by staying within budget and protecting the creek's wetland. Appearance matters too because the crossing is visible from a historic neighborhood. A local tribal cultural office has also asked the town to protect a gathering place on the riverbank during construction.

2 One proposal is a raised steel bridge costing $1.3 million to build, with estimated maintenance of $12,000 a year. Its deck would stay above the flood level used in the town's design plans, so the route should remain open during the high-water days that currently close the path. Its two supports would stand outside the gathering place and require less work in the wetland. Some residents dislike its industrial appearance. The designers could add wood railings for $40,000, bringing the construction cost to $1.34 million.

3 A second proposal is a timber bridge costing $950,000 to build, with estimated maintenance of $35,000 a year. Many residents say its wood structure fits the historic neighborhood. Its deck would close during the high-water days, however, and its six supports would require more work in the wetland. Installing two supports near the gathering place could disturb the area, so the tribal cultural office wants further consultation before construction. Both designs include a route for wheelchair users. The town must decide whether timber's lower construction cost and preferred appearance outweigh its access and site impacts.

2 ANSWER WITH EVIDENCE

Use the passage

1. If the town follows its top priority, which proposal has the stronger case? Use two details about access or reliability.

2. Compare the proposals' construction costs and yearly maintenance costs. What financial trade-off would the town face if it chose steel?

3. How do the number and location of supports change your evaluation of each proposal's environmental and cultural impacts?

4. Would adding wood railings to the steel bridge address every concern raised about it? Evaluate the change using the budget and at least one other criterion.

3 YOUR TURN

Your own words

Propose a new condition the town could put in the construction contract to reduce wetland harm. Then recommend a bridge under that condition, using two passage details and explaining one trade-off that would remain.

ANSWER KEY

Bridge the Trade-Offs

HIGH SCHOOL · HS-ETS1-3

PART 1 · READ AND MARK

Underline the town's top priorities, circle limits the bridge designs must meet, and number at least three trade-offs you find in the text. Use your marks to decide which evidence matters most. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	If the town follows its top priority, which proposal has the stronger case? Use two details about access or reliability.	**The steel bridge has the stronger case. Its deck would stay above the design flood level, while the timber bridge would close during high-water days.**
2	Compare the proposals' construction costs and yearly maintenance costs. What financial trade-off would the town face if it chose steel?	**Steel costs $350,000 more to build, but its estimated yearly maintenance is $23,000 less than timber's.**
3	How do the number and location of supports change your evaluation of each proposal's environmental and cultural impacts?	**Steel's two supports require less wetland work and stand outside the gathering place. Timber's six supports require more wetland work, and two would be installed near the gathering place, where work could cause disturbance.**
4	Would adding wood railings to the steel bridge address every concern raised about it? Evaluate the change using the budget and at least one other criterion.	**No. The railings could address some concerns about its appearance, and the $1.34 million construction cost stays under budget, but some residents may still dislike its industrial look.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would require crews to use a work plan that keeps equipment out of the wetland except where supports must be installed. Under that condition, I would choose the steel bridge. Its two supports require less wetland work than timber's six, and its raised deck should keep the route open during high-water days. Steel costs more to build, but its $1.3 million price is within the town's budget. Some residents would still dislike its industrial appearance.

Accept other evidence-based recommendations that follow the stated priorities and budget. For the open task, the proposed condition must be new, address wetland harm, and leave a clearly explained trade-off.