LESSON MAKER PRO

Resource Trade-Offs

Compare benefits with full costs

HIGH SCHOOL · HS-ENV2-6

HS-ENV2-6 "Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. [Clarification Statement: Emphasis is on the conservation, recycling…"

NAME _____ DATE _____

COUNT THE COSTS

Add direct costs and estimated environmental costs. Then divide the benefit by the total cost to find the benefit-cost ratio. A higher ratio means more measured benefit per dollar, but estimates may leave out environmental harm.

WORKED EXAMPLE

Find the benefit-cost ratio for recovering metals. Include the environmental cost.

METAL RECOVERY PLAN

Benefit ($)	Direct cost ($)	Environmental cost ($)
84	21	7

1. Total cost = 21 + 7 = $28.
2. Benefit-cost ratio = 84/28 = 3.

Answer: 3:1

PRACTICE 4 problems

1 A recycling plan has $12 in direct costs and $8 in environmental costs. What is its total cost?

ANSWER _____

2 A reuse plan has a $54 benefit, $9 in direct costs, and $9 in environmental costs. Find its benefit-cost ratio.

ANSWER _____

3 A mining plan has an $80 benefit, $20 in direct costs, and $20 in environmental costs. Find its ratio without, then with, environmental costs.

ANSWER _____

_____

4 A reuse plan has a $36 benefit and $12 total cost. A mining plan has a $48 benefit and $24 total cost. Which has the higher ratio? Show both.

ANSWER _____

_____

APPLY IT Show your work

1 Your robotics club can buy recycled or newly mined metal. The table gives estimates for one batch. Include environmental costs. Which plan has the higher ratio? Show both.

METAL FOR THE ROBOTICS CLUB

Plan	Benefit ($)	Direct cost ($)	Environmental cost ($)
Recycled	96	24	8
Newly mined	120	24	36

ANSWER _____

2 At a phone repair fair, reusing working screens has a $75 benefit, $15 direct cost, and $10 environmental cost. Recycling the screens has an $80 benefit, $20 direct cost, and $20 environmental cost. Which has the higher ratio? Show both.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A mining plan has a $100 benefit and $20 direct cost. A reuse plan has a $72 benefit and $24 total cost. What is the smallest whole-dollar environmental cost for mining that makes reuse's ratio higher? Explain.

WORK SPACE AND ANSWER

Resource Trade-Offs

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A recycling plan has $12 in direct costs and $8 in environmental costs. What is its total cost?	**$20**
2	A reuse plan has a $54 benefit, $9 in direct costs, and $9 in environmental costs. Find its benefit-cost ratio.	**3:1**
3	A mining plan has an $80 benefit, $20 in direct costs, and $20 in environmental costs. Find its ratio without, then with, environmental costs.	**Without environmental costs: 4:1. With environmental costs: 2:1.**
4	A reuse plan has a $36 benefit and $12 total cost. A mining plan has a $48 benefit and $24 total cost. Which has the higher ratio? Show both.	**Reuse: 3:1. Mining: 2:1. Reuse has the higher ratio.**

PART 2 · APPLY IT

1. **Recycled: 3:1. Newly mined: 2:1. Recycled metal has the higher ratio.** For recycled metal, 96/(24 + 8) = 3. For newly mined metal, 120/(24 + 36) = 2.
2. **Reuse: 3:1. Recycling: 2:1. Reuse has the higher ratio.** Reuse gives 75/(15 + 10) = 3. Recycling gives 80/(20 + 20) = 2.

CHALLENGE

$14. Reuse's ratio is 72/24 = 3. Mining's ratio is still above 3 at $13 in environmental costs, since 100/33 > 3. At $14, 100/34 < 3.

Accept ratios written as equivalent fractions or as dollars of benefit per dollar of total cost. These ratios compare the stated estimates, not every possible impact or value a community might consider.