LESSON MAKER PRO

Resource Decisions

Compare energy and mineral plans by benefit per dollar.

HIGH SCHOOL · ES.ESS3.2

ES.ESS3.2 "Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios on large and small scales.*"

NAME _____ DATE _____

BENEFIT PER DOLLAR

Divide total benefit by total cost to find the benefit/cost ratio. Use the same units and time span for each plan. A higher ratio means more benefit per dollar, but check what costs and benefits the estimates include.

WORKED EXAMPLE

A library compares two solar plans over 20 years. Which has the higher benefit/cost ratio?

LIBRARY SOLAR PLANS

Plan	Cost ($1,000s)	Benefit ($1,000s)
Roof	11	55
Canopy	13	52

1. Roof: 55 / 11 = 5.
2. Canopy: 52 / 13 = 4.
3. Compare 5 to 4.

Answer: Roof, with $5 in benefit per $1 of cost.

PRACTICE 4 problems

1 A school solar project costs $20,000 and provides $80,000 in lifetime benefits. Find its benefit/cost ratio.

ANSWER _____

2 Solar costs $30,000 and benefits $90,000. Wind costs $40,000 and benefits $80,000. Find both ratios and choose the higher one.

ANSWER _____

3 Mineral recycling costs $50 million and benefits $100 million. Mining costs $80 million and benefits $120 million. Find both ratios and choose the higher one.

ANSWER _____

4 Geothermal energy costs $60 million and benefits $150 million. Natural gas costs $100 million and benefits $200 million. Find both ratios and choose the higher one.

ANSWER _____

APPLY IT Show your work

1 A school festival needs a phone-charging station. Benefits include charging fees; costs include estimated pollution impacts. Which rental gives more benefit per dollar? Show both ratios.

FESTIVAL CHARGING RENTALS

Rental	Total cost	Total benefit
Solar	$120	$360
Gas generator	$80	$160

ANSWER _____

2 A student group compares two services that recover minerals from old phones. Local recycling costs $200 and recovers minerals worth $500. Distant recycling costs $300, including transport, and recovers minerals worth $900. Which has the higher ratio? Show both.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A district can open one battery-mineral recovery site. Site A costs $100,000 and provides $400,000 in benefits. Site B costs $200,000 and provides $600,000 in benefits. Which has the higher benefit/cost ratio? Which provides more total benefit? Explain the difference.

WORK SPACE AND ANSWER

ANSWER KEY # Resource Decisions

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A school solar project costs $20,000 and provides $80,000 in lifetime benefits. Find its benefit/cost ratio.	**4:1**
2	Solar costs $30,000 and benefits $90,000. Wind costs $40,000 and benefits $80,000. Find both ratios and choose the higher one.	**Solar: 3:1; wind: 2:1. Solar is higher.**
3	Mineral recycling costs $50 million and benefits $100 million. Mining costs $80 million and benefits $120 million. Find both ratios and choose the higher one.	**Recycling: 2:1; mining: 1.5:1. Recycling is higher.**
4	Geothermal energy costs $60 million and benefits $150 million. Natural gas costs $100 million and benefits $200 million. Find both ratios and choose the higher one.	**Geothermal: 2.5:1; natural gas: 2:1. Geothermal is higher.**

PART 2 · APPLY IT

1. **Solar: 3:1; gas generator: 2:1. Choose solar.** Divide each total benefit by its total cost: 360 / 120 = 3 and 160 / 80 = 2.
2. **Local: 2.5:1; distant: 3:1. Distant recycling is higher.** Compute 500 / 200 = 2.5 and 900 / 300 = 3.

CHALLENGE

Site A has the higher ratio: 400,000 / 100,000 = 4:1, compared with Site B's 600,000 / 200,000 = 3:1. Site B provides more total benefit, $600,000 rather than $400,000, but costs more.

Accept ratios written as decimals or as dollars of benefit per dollar of cost. Ratios compare efficiency, not total benefit.