Fuel Trade-Offs

Compare heat and carbon dioxide from three fuels

E.4.10.1 "Organize simple data sets to compare energy and pollution output of various traditional, non-renewable resources (e.g., coal, crude oil, wood)."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle the largest energy number in the table, underline the smallest carbon dioxide number, and number the fuels 1 to 3 from least to most energy.

Heat for a Campsite

1. At a winter campsite, a cook needs heat to boil water. Fuels can make heat, but burning them also sends gases into the air. Scientists compare fuels fairly by using the same mass of each one. This page compares one kilogram of coal, fuel oil made from crude oil, and dry wood.

2. The table shows rounded example amounts for burning each fuel. Energy is measured in megajoules, or MJ. More MJ means more heat from the same mass of fuel. The other number shows kilograms of carbon dioxide released. Carbon dioxide is a gas that adds to climate change. Real amounts can change with the fuel and how it burns.

ROUNDED AMOUNTS FROM BURNING 1 KILOGRAM OF FUEL

Fuel	Energy (MJ)	Carbon dioxide (kg)
Coal	24	2.4
Fuel oil	42	3.1
Dry wood	16	1.8

3. Coal and fuel oil come from underground supplies that take millions of years to form. Wood comes from trees, which can grow again if forests are cared for. Still, burning any of these fuels releases carbon dioxide. To choose a fuel, compare both columns. A fuel that gives more heat may also release more carbon dioxide.

2 ANSWER WITH EVIDENCE

Use the passage

1. How many more MJ of energy does fuel oil give than coal for each kilogram burned?

2. How many more kilograms of carbon dioxide does coal release than dry wood for each kilogram burned?

3. Which fuel has the middle value for both energy and carbon dioxide?

4. Which two fuels differ most in carbon dioxide output? What is the difference?

3 YOUR TURN

Your own words

The campsite needs a fuel that gives at least 20 MJ of energy per kilogram. Make a table of the fuels that meet this goal, then write two sentences explaining which one you would choose to release less carbon dioxide.

FUEL	ENERGY (MJ)	CARBON DIOXIDE (KG)

ANSWER KEY

Fuel Trade-Offs

GRADE 4 · E.4.10.1

PART 1 · READ AND MARK

Circle the largest energy number in the table, underline the smallest carbon dioxide number, and number the fuels 1 to 3 from least to most energy. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How many more MJ of energy does fuel oil give than coal for each kilogram burned?	**Fuel oil gives 18 more MJ per kilogram.**
2	How many more kilograms of carbon dioxide does coal release than dry wood for each kilogram burned?	**Coal releases 0.6 more kg of carbon dioxide.**
3	Which fuel has the middle value for both energy and carbon dioxide?	**Coal has the middle value in both columns.**
4	Which two fuels differ most in carbon dioxide output? What is the difference?	**Fuel oil and dry wood differ most, by 1.3 kg of carbon dioxide.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Coal | 24 | 2.4
Fuel oil | 42 | 3.1
I would choose coal because both fuels meet the 20 MJ goal. Coal releases 2.4 kg of carbon dioxide, less than fuel oil's 3.1 kg.

Accept either order for the two table rows. The choice must be coal and must compare its carbon dioxide output with fuel oil's; the data do not measure other kinds of pollution.