



Math Connections

Name: _____ Date: _____

Thermal Energy Transfer in Different Materials

An object's thermal energy equals the total energy of all its moving particles. Thermal energy transfer happens when some of this energy moves from one object to another object in the form of heat and can be measured by a temperature difference. When there is no longer a temperature difference between substances, thermal energy transfer stops.

The following investigation was designed to determine how efficient different materials are at thermal energy transfer. Water heated to 100°C was added to four identical containers made of different materials. The temperature of the water in the container was measured and recorded in two-minute intervals for 30 minutes. The data collected during the investigation is shown below.

Water Temperatures in Degrees Celsius

Time in Minutes	0	2	4	6	8	10	12	14
Material 1	100	95	90	85	80	75	70	65
Material 2	100	97	92	90	87	82	79	75
Material 3	100	94	91	87	81	75	70	66
Material 4	100	96	92	88	83	79	75	70

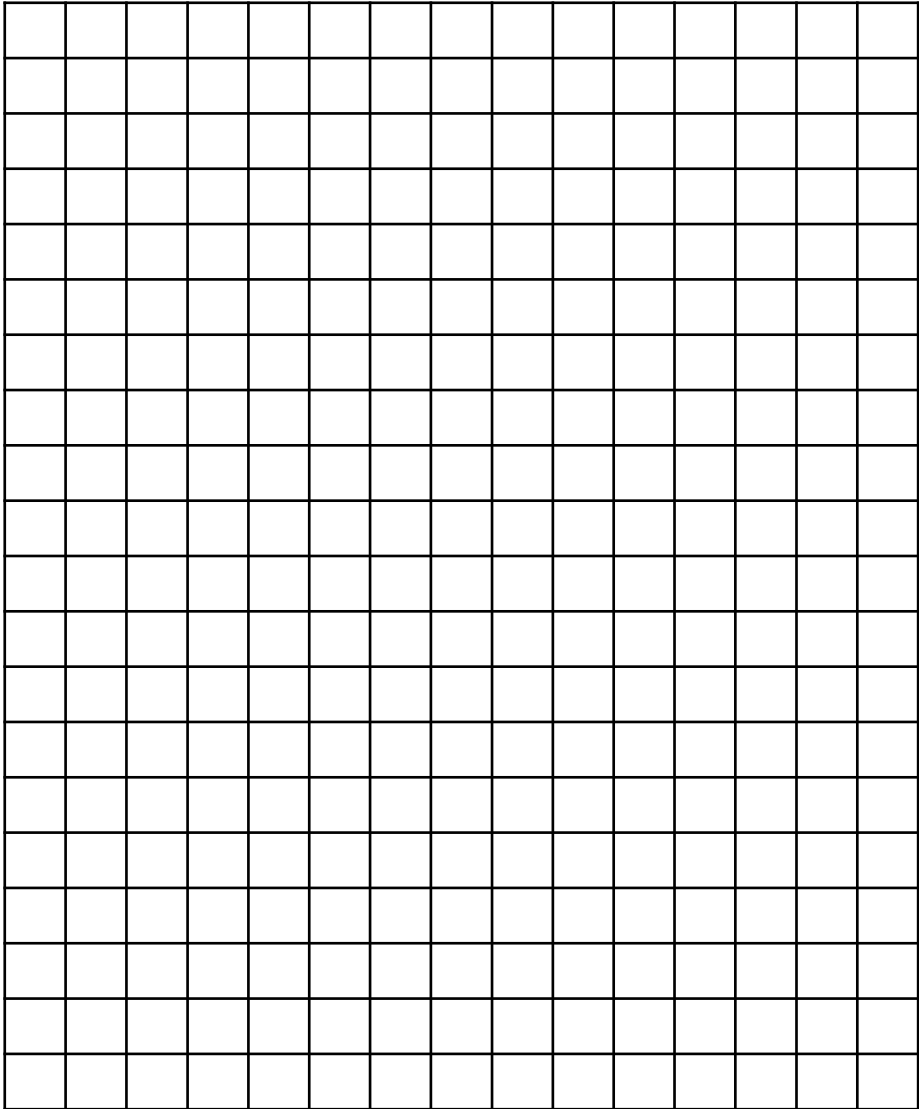
Time in Minutes	16	18	20	22	24	26	28	30
Material 1	60	55	50	45	40	35	30	22
Material 2	70	67	63	60	58	55	51	47
Material 3	63	60	54	50	45	40	34	27
Material 4	65	62	59	54	50	47	43	40

Create a line graph on the next page to display the data from the investigation.

1. Label the x-axis "Time in Minutes." The scale will start at 0 and end at 30.
2. Label the y-axis "Temperature in °C." The scale will start at 0 and end at 100.
3. Plot the Material 1 temperature data on the graph. Draw a best fit line for Material 1 in blue. Color a box in the "Key" blue and label it Material 1.
4. Plot the Material 2 temperature data on the graph. Draw a best fit line for Material 2 in green. Color a box in the "Key" green and label it Material 2.
5. Plot the Material 3 temperature data on the graph. Draw a best fit line for Material 3 in red. Color a box in the "Key" red and label it Material 3.
6. Plot the Material 4 temperature data on the graph. Draw a best fit line for Material 4 in black. Color a box in the "Key" black and label it Material 4.



Temperature Over Time of Water in Four Different Types of Containers



Key

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Use the graph to answer the following questions.

7. Determine the range of the data for each material.

Material	Range of Temperature
Material 1	
Material 2	
Material 3	
Material 4	



8. Determine the rate of thermal energy transfer for each material by dividing the range by 30 minutes.

Material	Rate of Thermal Energy Transfer (degree/min)
Material 1	
Material 2	
Material 3	
Material 4	

9. Which material is the least effective at transferring thermal energy? Explain your answer using data from the investigation.

10. Which material is the most effective at transferring thermal energy? Explain your answer using data from the investigation.

11. Which material would be most effective in keeping hot chocolate warm on a cold day? Explain your answer using data from the investigation.

12. Which material would be the least effective in keeping hot chocolate warm on a cold day? Explain your answer using data from the investigation.