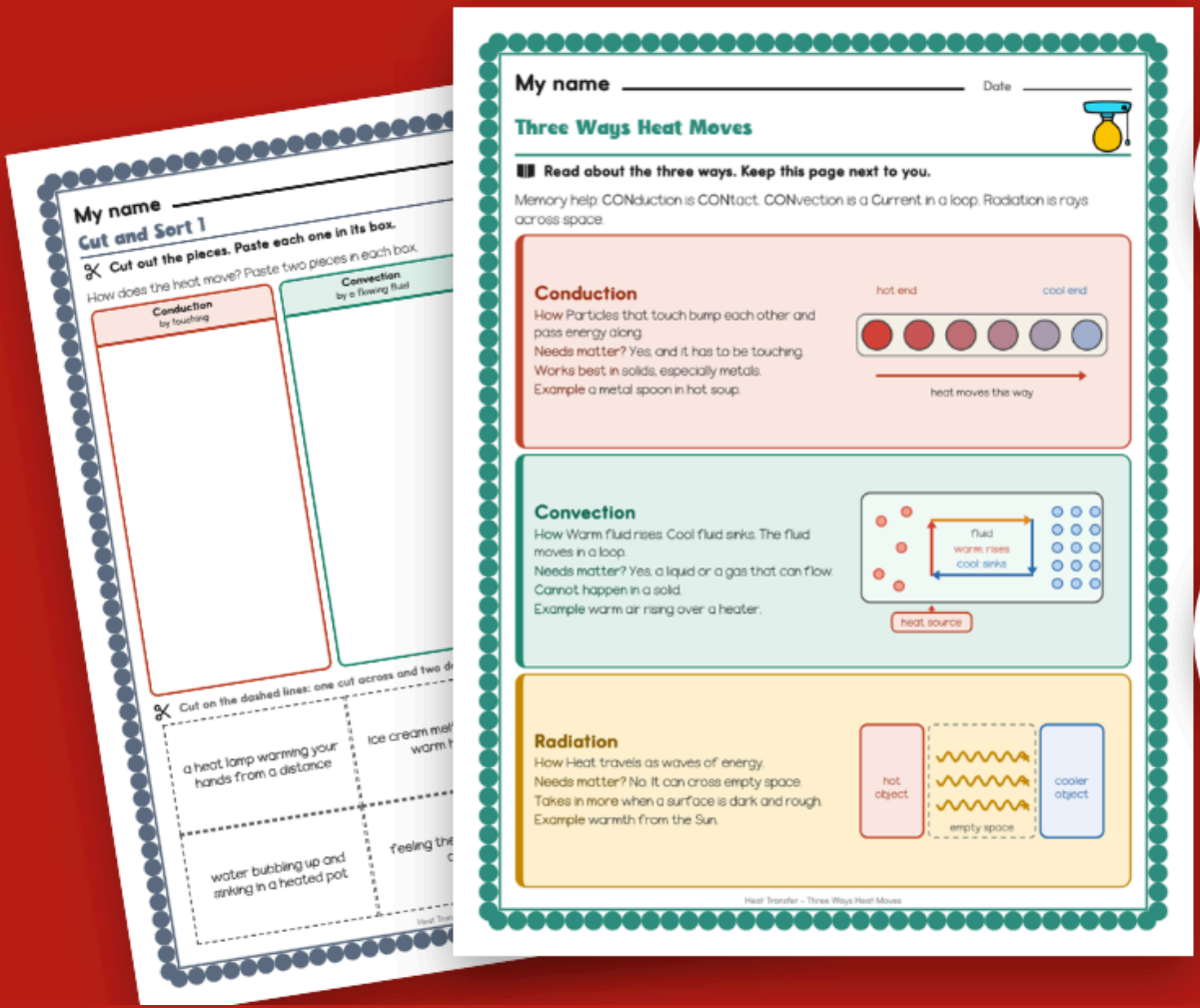
HEAT TRANSFER

CONDUCTION, CONVECTION, RADIATION - GRADES 6-8



39 PAGES

127 ITEMS

Bright Path Sped

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- This file is for one classroom: one teacher, one group of students.
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This is a fillable PDF

- Open it in a PDF reader (Adobe Acrobat Reader, Preview, or your browser), click into a line or a box, type, and Save As.
- Every name line, answer box, check box and ruled box on the student pages is a type-in field, and so are the tracker and the other record pages. You can also print any page and write by hand. Print the graph page to plot the points in pencil.
- It works offline, with no account needed.

Print at 100 percent

Turn off fit to page and shrink to fit so the ruled lines stay 0.34 inch apart. Conduction is red-orange, convection is green and radiation is gold, and every box also carries the word, so a black and white copy reads too.

Student work

A filled-in tracker, class grid or team note carries a real student's name. Keep it in the data folder.

Need help?

If a field will not behave or a page will not print the way you expect, use Ask a Question on the product page before leaving a review. A fix to the file ships as a free update from My Purchases.

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PREVIEW

Teacher Notes

The parts of a student page, the page types in order, and a few teaching notes.

The parts of a page

- **The color code.** Conduction is red-orange, convection is green and radiation is gold on the comparison page, the readings, the sort mats and the keys.
- **The answer box.** A bordered box. Click it to type, or print and write in it.
- **The check box.** Conduction, convection or radiation; true or false; and the quiz choices.
- **The ruled work box.** Lines 0.34 inch apart, one idea to a line.
- **The cut lines.** Mats 1 and 2: 6 pieces in 3 across by 2 down, each 2.4 by 1.46 inches. Mat 3: 10 pieces, 5 across by 2 down, each 1.46 by 1.15 inches. Edge to edge.

Page type	What it looks like	What the student does
Three Ways Heat Moves; Heat Words	2 pages, 6 items	Side-by-side comparison with drawn diagrams, then six words to match.
Read: four short readings	4 pages, 20 items	Conduction, convection, radiation, conductors and insulators; choose or write.
Which Way Does Heat Go?	1 page, 8 items	Compare two temperatures, say which way heat moves, find the difference.
Worked Example	1 page, 3 items	Four steps on a conduction picture, then a Your Turn on a convection picture.
Name the Transfer 1 and 2	2 pages, 16 items	Everyday examples, then clues.
Read the Data Table; Graph the Data	2 pages, 15 items	Find the change for four materials; plot two rods.
Fix It 1 and 2	2 pages, 10 items	True or false; rewrite each false statement.
Claim, Evidence, Reasoning 1 and 2	2 pages, 12 items	Four short scenarios with invented numbers.
Quiz; Short Answer	2 pages, 15 items	Ten choices, then five written answers.

Two steps, marked by a shape

- **Circle.** Name the Transfer 1 (page 13): everyday examples in a sentence.
- **Triangle.** Name the Transfer 2 (page 14): short clues, no story to lean on.

Teaching notes

- Say it every day: **conduction, contact. Convection, current. Radiation, rays.** Heat moves from the warmer place to the cooler place, never the reverse on its own.
- Students often say cold moves. Fix It 2 asks them to rewrite that idea: heat leaves the warm thing; nothing called cold flows.
- Real examples often use more than one way at once (a stove warms a pan by conduction and the air by convection). The examples here each point to one way; talk about the mixed cases in your own words.
- All temperatures are invented for practice. No lab procedure is included; follow your own school's lab rules.

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Three Ways Heat Moves

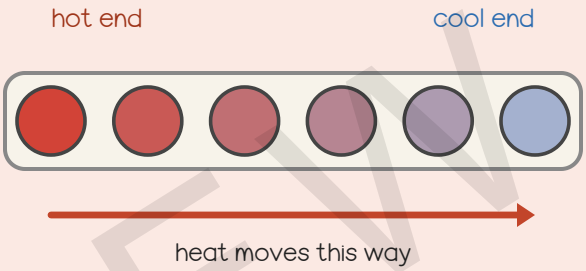


Read about the three ways. Keep this page next to you.

Memory help: CONduction is CONtact. CONvection is a Current in a loop. Radiation is rays across space.

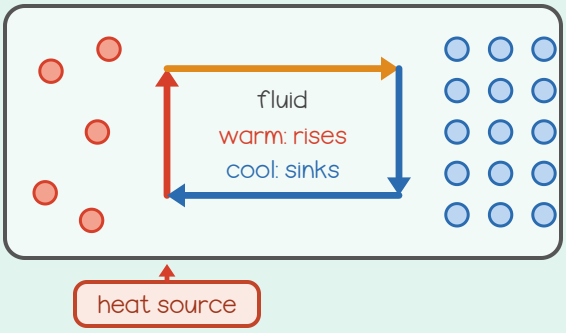
Conduction

How Particles that touch bump each other and pass energy along.
Needs matter? Yes, and it has to be touching.
Works best in solids, especially metals.
Example a metal spoon in hot soup.



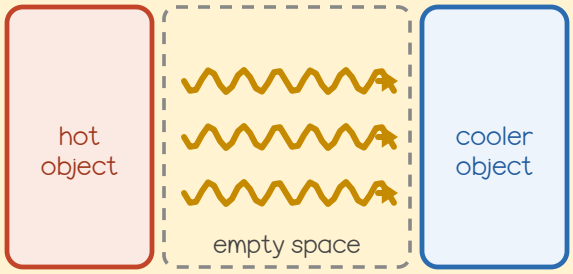
Convection

How Warm fluid rises. Cool fluid sinks. The fluid moves in a loop.
Needs matter? Yes, a liquid or a gas that can flow.
Cannot happen in a solid.
Example warm air rising over a heater.



Radiation

How Heat travels as waves of energy.
Needs matter? No. It can cross empty space.
Takes in more when a surface is dark and rough.
Example warmth from the Sun.



PREVIEW

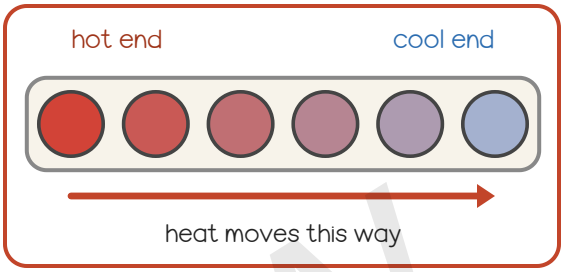
Preview - Bright Path Sped

My name _____ Date _____

Read: Conduction

Read. Then answer the questions.

Everything is made of tiny particles that are always moving. The particles in a hotter place move faster than the particles in a cooler place. When a fast particle bumps a slower one, it passes some of its energy along. Bump after bump, heat moves through matter that is touching. That is conduction. It works best in solids, because their particles are packed close together. Heat always moves from the warmer place to the cooler place, and it stops when both places reach the same temperature.



1. What does a hot particle do to a cooler particle it touches?

☐ **passes energy to it** ☐ **sends waves to it** ☐ **carries it away**

2. Where does conduction work best?

☐ **in a gas** ☐ **in solids** ☐ **in empty space**

3. Heat moves from the...

☐ **warmer place to the cooler place** ☐ **cooler place to the warmer place**

4. Why is conduction good in solids?

_____

5. When does the movement of heat stop?

_____

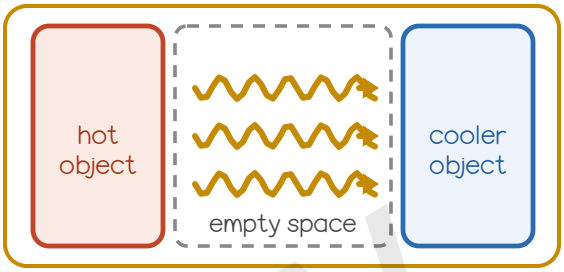
PREVIEW

My name _____ Date _____

Read: Radiation

Read. Then answer the questions.

Radiation is heat that travels as waves of energy. These waves can cross empty space, so radiation needs no matter at all. That is how energy from the Sun reaches Earth. When the waves land on an object, the object takes in the energy and its particles move faster, so it gets warmer. Every warm object gives off some radiation. A dark, rough surface takes in more radiation than a light, shiny one, which reflects more of it.



1. Does radiation need matter to travel?

☐ **yes** ☐ **no**

2. How does energy from the Sun reach Earth?

☐ **by conduction** ☐ **by radiation** ☐ **by convection**

3. What happens when the waves land on an object?

☐ **it takes in energy and warms up** ☐ **it gets colder** ☐ **nothing**

4. Which takes in more radiation: a dark, rough surface or a light, shiny one?

_____

5. Name something that gives off radiation.

_____

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Which Way Does Heat Go?

Look at the temperatures. Which way does the heat go?

Temperatures are in degrees Celsius and are made up for practice. Heat moves from the warmer one to the cooler one.

1. A **85** ? B **40**
   Heat moves ☐ A to B ☐ B to A ☐ even
   How many degrees apart? ☐

2. A **18** ? B **62**
   Heat moves ☐ A to B ☐ B to A ☐ even
   How many degrees apart? ☐

3. A **70** ? B **70**
   Heat moves ☐ A to B ☐ B to A ☐ even
   How many degrees apart? ☐

4. A **30** ? B **95**
   Heat moves ☐ A to B ☐ B to A ☐ even
   How many degrees apart? ☐

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Name the Transfer 1

Check one box for each one. Write how you know.

Does the heat move by touching, by a flowing fluid, or by waves?

1. A metal spoon gets hot when it sits in a bowl of hot soup.

☐ **conduction** ☐ **convection** ☐ **radiation** **I know because** _____

2. You feel warmth on your face from the Sun.

☐ **conduction** ☐ **convection** ☐ **radiation** **I know because** _____

3. Warm air rises from a heater and cool air sinks to take its place.

☐ **conduction** ☐ **convection** ☐ **radiation** **I know because** _____

4. Your hands warm up when you hold a mug of hot cocoa.

☐ **conduction** ☐ **convection** ☐ **radiation** **I know because** _____

5. Water near the bottom of a heated pot rises while cooler water sinks.

☐ **conduction** ☐ **convection** ☐ **radiation** **I know because** _____

6. Energy from the Sun crosses empty space to reach Earth.

☐ **conduction** ☐ **convection** ☐ **radiation** **I know because** _____

7. A hot-air balloon rises because the warm air inside it is less dense.

☐ **conduction** ☐ **convection** ☐ **radiation** **I know because** _____

8. The handle of a metal pan gets hot while the pan sits on a hot stove.

☐ **conduction** ☐ **convection** ☐ **radiation** **I know because** _____

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Read the Data Table

Read the table. Fill in the boxes.

These temperatures are invented. Each rod starts at 20 degrees. The table shows how warm the far end gets. Change = the 6 minute number minus the 0 minute number.

Material	0 min	2 min	4 min	6 min	Change
Copper	20	34	46	54	
Steel	20	28	35	40	
Glass	20	23	25	27	
Wood	20	21	22	22	

Better conductor: _____ **Better insulator:** _____

At 6 minutes, how many degrees warmer is the copper than the wood? _____

Which material would you choose for a pot handle? Use the numbers.

What do the numbers tell you about wood?

PREVIEW

My name _____ Date _____

Fix It 1

Is it true or false? Fix each false one.

Some of these are true. Some have a mistake. Rewrite each false one so it is true.

1. Conduction needs particles that are touching. ☐ true ☐ false

   If false, fix it: _____

2. Radiation cannot travel through empty space. ☐ true ☐ false

   If false, fix it: _____

3. In convection, warm fluid sinks and cool fluid rises. ☐ true ☐ false

   If false, fix it: _____

4. Heat always moves from the warmer place to the cooler place. ☐ true ☐ false

   If false, fix it: _____

5. Convection works best in solids. ☐ true ☐ false

   If false, fix it: _____

PREVIEW

My name _____ Date _____

Claim, Evidence, Reasoning 1

Read the facts. Write your claim, evidence and reasoning.

The two rods (invented numbers)

A metal rod and a wood rod start at 20 degrees. After 6 minutes, the far end of the metal rod is 58 degrees and the far end of the wood rod is 26 degrees. Which material is the better conductor?

Claim

Evidence: use the numbers

Reasoning: why does the evidence fit the claim?

The warm room (invented numbers)

In a warm room, the air near the ceiling is 29 degrees and the air near the floor is 21 degrees. A student says the warm air went up. Is the student right, and how do you know?

Claim

Evidence: use the numbers

Reasoning: why does the evidence fit the claim?

PREVIEW

Preview - Bright Ezee Shop

My name _____ Date _____

Quiz

Check the best answer for each one.

1. Heat moves from a hot burner into a pan that touches it.

   ☐ **conduction** ☐ **convection** ☐ **radiation**

2. Which kind of heat transfer can cross empty space?

   ☐ **conduction** ☐ **convection** ☐ **radiation**

3. Warm water rises and cool water sinks in a tank.

   ☐ **conduction** ☐ **convection** ☐ **radiation**

4. Which kind needs a fluid to carry the heat?

   ☐ **convection** ☐ **conduction** ☐ **radiation**

5. Which kind happens when particles bump into each other?

   ☐ **radiation** ☐ **conduction** ☐ **convection**

6. Sunlight warms your skin.

   ☐ **conduction** ☐ **radiation** ☐ **convection**

7. Heat moves from...

   ☐ **warmer to cooler** ☐ **cooler to warmer** ☐ **neither**

8. A good insulator...

   ☐ **speeds heat up** ☐ **makes heat** ☐ **slows heat down**

9. Which is the best conductor?

   ☐ **rubber** ☐ **copper wire** ☐ **foam**

10. A material that lets heat pass easily is a...

    ☐ **conductor** ☐ **insulator** ☐ **fluid**

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

Cut and Sort 1

Cut out the pieces. Paste each one in its box.

How does the heat move? Paste two pieces in each box.

Conduction by touching	**Convection** by a flowing fluid	**Radiation** by waves

PREVIEW

Cut on the dashed lines: one cut across and two down.

a heat lamp warming your hands from a distance	ice cream melting in your warm hand	a radiator warming a room as the air circulates
water bubbling up and sinking in a heated pot	feeling the Sun on your arms	a bare foot on hot sand

Preview - Bright Path Shed

My name _____ Date _____

Cut and Sort 3

Cut out the pieces. Paste each one in its box.

Does it let heat through easily, or slow it down? Paste five pieces in each box.

Conductor lets heat through easily	**Insulator** slows heat down

PREVIEW

Cut on the dashed lines: one cut across and four down.

a wool sweater	copper wire	a steel spoon	a foam cup	an iron nail
a wooden spoon	a silver ring	a rubber boot	aluminum foil	a plastic handle

Answer Key: Words, Which Way and Readings

Accept any answer that says the same thing in a student's own words. Heat moves from the warmer one to the cooler one; the number apart is the bigger temperature minus the smaller.

Heat Words page 6

Word	Letter
Conduction	B
Convection	E
Radiation	F
Conductor	A
Insulator	D
Thermal energy	C

Which Way Does Heat Go? page 11

Item	A and B	Heat moves	Apart
#1	85 and 40	A to B	45
#2	18 and 62	B to A	44
#3	70 and 70	even	0
#4	30 and 95	B to A	65

Read: Conduction page 7

#	Answer
1	passes energy to it
2	in solids
3	warmer place to the cooler place
4	Their particles are packed close together, so they bump each other easily.
5	When both places reach the same temperature.

Read: Convection page 8

#	Answer
1	a liquid or a gas
2	rises
3	sinks
4	Its particles spread out, so it is less dense than the cooler fluid around it.
5	The particles of a solid cannot flow past each other.

Read: Radiation page 9

#	Answer
1	no
2	by radiation
3	it takes in energy and warms up
4	A dark, rough surface.
5	Any warm object, such as the Sun, a lamp or a person.

Read: Conductors and Insulators page 10

#	Answer
1	easily
2	wool
3	it pulls heat from your hand
4	It slows the heat down.
5	Copper and aluminum, or any two metals.

PREVIEW

Answer Key: Fix It and Quiz

Accept a fixed sentence that says the same thing in a student's own words.

Fix It 1 page 17

#	Is it	Fixed sentence
1	true	-
2	false	Radiation can travel through empty space. It needs no matter.
3	false	In convection, warm fluid rises and cool fluid sinks.
4	true	-
5	false	Convection needs a fluid, because the particles must be able to flow.

Fix It 2 page 18

#	Is it	Fixed sentence
1	false	Heat moves from your warm hand into the ice cube. Nothing called cold flows.
2	true	-
3	false	The wool is an insulator. It slows down the heat your body gives off.
4	false	An insulator slows heat down. It does not stop it.
5	true	-

Quiz page 21

#	Answer
1	conduction
2	radiation
3	convection
4	convection
5	conduction
6	radiation
7	warmer to cooler
8	slows heat down
9	copper wire
10	conductor

Where to go after the quiz

- Missed the naming items: sort again on pages 23 and 24.
- Missed the conductor or insulator items: reread page 10 and sort page 25.
- Missed the direction item: practice page 11.

PREVIEW

Heat Transfer Tracker

One student, every scored page. Filled example: page 35.

Student _____ Teacher _____ Month _____

Page	Page type and set	Items	Right	Date	Notes
6	Heat Words	6			
7	Read: Conduction	5			
8	Read: Convection	5			
9	Read: Radiation	5			
10	Read: Conductors and Insulators	5			
11	Which Way Does Heat Go?	8			
12	Worked Example	3			
13	Name the Transfer 1	8			
14	Name the Transfer 2	8			
15	Read the Data Table	7			
16	Graph the Data	8			
17	Fix It 1	5			
18	Fix It 2	5			
19	Claim, Evidence, Reasoning 1	6			
20	Claim, Evidence, Reasoning 2	6			
21	Quiz	10			
22	Short Answer	5			
23	Cut and Sort 1	6			
24	Cut and Sort 2	6			
25	Cut and Sort 3	10			

How to fill this in

Write how many items the student got right with no prompt, and the date. A blank means not tried yet, never wrong. There are 127 items on the 20 scored pages. Answer keys: pages 26 to 30. Filled example: page 35.

This month we are working on (your own standard or wording)

PREVIEW

Team Note

Use this page between team meetings or when a student moves classes, to hand off what changed without writing a note from scratch. Everything below is observable, with a blank for the number or the wording your team already uses.

Student _____ Team member _____ Date _____

Page type	Covered since last note (Y/N)	Items right	Still blank
Words and readings			
Which way and worked example			
Name the Transfer			
Data and graph			
Fix It and claims			
Sorts			

What I saw (observable, not a conclusion)

- Named conduction, convection or radiation correctly on ___ of ___ items without a prompt.
- Said which way heat moves between two temperatures on ___ of ___ items.
- Used a number or a clue as evidence: yes / no / with a reminder.
- Used the comparison page (page 5): yes / no / with a reminder.

Next step

- Next page or set: ___, because ___ (what you saw).
- What to try in another class or at home: ___.
- What to keep doing because it is working: ___.
- Anything for the team meeting to decide: ___ (this page records what happened, never a label or a plan).

Summary, in one or two sentences, for whoever reads this next

A filled-in line, for reference

"Named the way heat moves on 6 of 8 items on Name the Transfer 1 without a prompt on 11/6. Next step: ask whether the fluid is moving before choosing." That is the level of detail this page is built for. It matches the filled example on page 35.

PREVIEW

Devon's Tracker (Invented Student)

Devon R. is invented; nothing on this page describes a real student. The blank tracker is on page 31.

Student: Devon R. (an invented student)

Teacher: Ms. Alvarez (invented)

Month: November

Page	Page type and set	Items	Right	Date	Notes
6	Heat Words	6	5	11/3	Mixed up conductor and insulator
7	Read: Conduction	5	5	11/4	-
8	Read: Convection	5	-	-	-
9	Read: Radiation	5	-	-	-
10	Read: Conductors and Insulators	5	-	-	-
11	Which Way Does Heat Go?	8	6	11/5	Wrote the sum of the temperatures, not the difference
12	Worked Example	3	-	-	-
13	Name the Transfer 1	8	6	11/6	Called two convection examples conduction
14	Name the Transfer 2	8	-	-	-
15	Read the Data Table	7	6	11/10	Swapped the order of two materials
16	Graph the Data	8	-	-	-
17	Fix It 1	5	-	-	-
18	Fix It 2	5	-	-	-
19	Claim, Evidence, Reasoning 1	6	-	-	-
20	Claim, Evidence, Reasoning 2	6	-	-	-
21	Quiz	10	-	-	-
22	Short Answer	5	-	-	-
23	Cut and Sort 1	6	5	11/12	One piece pasted in the wrong box
24	Cut and Sort 2	6	-	-	-
25	Cut and Sort 3	10	-	-	-

How to read it

Devon R. has done **6 of 20** scored pages and got **33 of 40** items right with no prompt. **1** page was all right and **5** carry a note. Every number comes from the table.

What the table points to

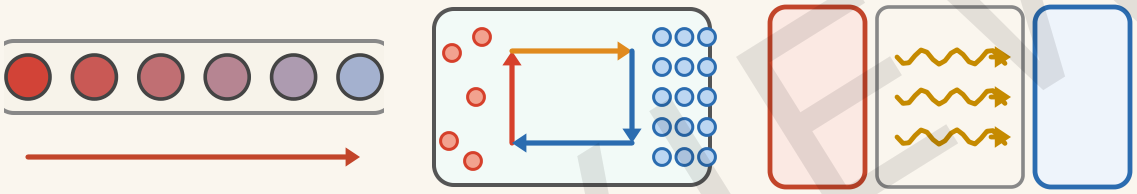
The lowest pages are Which Way Does Heat Go? (6 of 8) and Name the Transfer 1 (6 of 8). That is where the next practice goes. The 14 pages left blank are not tried yet, never wrong.

PREVIEW

Binder Cover

Slide this into the front of a binder. The divider tabs and a spine label to cut out are on the next page (page 38).

Science - Physical Science



HEAT TRANSFER

Conduction, Convection, Radiation

Learn | **Practice** | **Check**

Teacher _____

Class or student _____

PREVIEW