

Junior Ranger Activity Guide

National Park Service
U.S. Department of the Interior



Hopewell Furnace
National Historic Site



This Book Belongs To:

Welcome to Hopewell Furnace!



Welcome to Hopewell Furnace!
This is a picture of Clement Brooke, the ironmaster here. He is delighted that you are visiting Hopewell, one of many iron furnaces once located in Southeastern Pennsylvania. He is even more excited that you decided to become a Junior Ranger. Make sure to visit the entire village to learn how iron was made at Hopewell. You might even meet some of the people who lived and worked here!

All of the workers here are very important, including you! Complete activities in this book to become a Junior Ranger. When you are done, bring your Activity Guide back to a Ranger in the Visitor Center who will sign your certificate and present you with a badge!

Complete **THREE (3)** activities to become a **WOODCUTTER (ages 4-6)**
Complete **FOUR (4)** activities to become a **MOULDER (ages 7-10)**
Complete **SIX (6)** activities to become an **IRONMASTER (ages 10+)**

- | | | |
|---|--|---|
| <input type="checkbox"/> Arrowhead | <input type="checkbox"/> Cast House and Word Search | <input type="checkbox"/> Jobs at Hopewell |
| <input type="checkbox"/> Hopewell Word Scramble | <input type="checkbox"/> Label the Furnace | <input type="checkbox"/> Design a Stove Plate |
| <input type="checkbox"/> Fill the Furnace | <input type="checkbox"/> Big House Spot the Difference | <input type="checkbox"/> Village Bingo Farm |
| <input type="checkbox"/> Office and Store | <input type="checkbox"/> The Farm | |

If you need help completing this book, ask a Ranger or look at the “Important Words” page!

Important Words

There are lots of things to see and do around Hopewell, and lots of things to remember. Here are some important words that will help you complete your Junior Ranger Activity Guide.

BELLOWS: a device to produce a stream of air under pressure. In iron making, this air kept the furnace fire burning and was contained in two large blowing tubs

BIG HOUSE: residence of the ironmaster, or manager of the furnace, and his family

BLACKSMITH: person who works, repairs, and shapes iron

BLAST: the period of time that the furnace was in operation

BLAST FURNACE: a furnace where blasts of air are pumped into the fire to speed up the smelting process

CAST HOUSE: the building surrounding the furnace

CHARCOAL: the fuel used at Hopewell to heat iron ore and limestone inside the furnace

COLLIER: person who makes charcoal from wood

FILLER: person who fills the furnace stack with iron ore, limestone, and charcoal

FLASK: the wooden frame used to hold sand in place when making cast products

FLUX: cleaning agent used to remove impurities from ore; limestone was used at Hopewell

FOUNDER: skilled manager of furnace operations

FURNACE: stone structure where iron is made at a high temperature (about 3000° F)

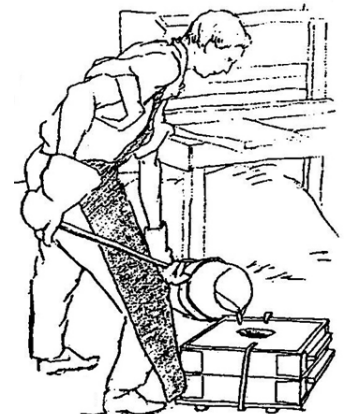
GUTTERMAN: worker who removed slag from the work area and made pig iron

IRONMASTER: general manager of the furnace

PIG IRON: raw cast iron of uniform size and shape formed by molds in the sand floor of the cast house

RACE: ditch that carries water to or from the water wheel

SMELTING: process during which iron is removed from iron ore



National Park Service Arrowhead

Founded in 1916, the National Park Service is a federal agency responsible for protecting, preserving, and caring for over 400 sites nationwide! These sites include monuments, battlefields, historic sites, recreation areas, lakeshores, seashores, and scenic rivers and trails. Every National Park proudly displays this symbol:

The **Arrowhead** represents history, culture, and archaeology

The **Sequoia Tree** represents plants and vegetation

The **Bison** represents animals and wildlife



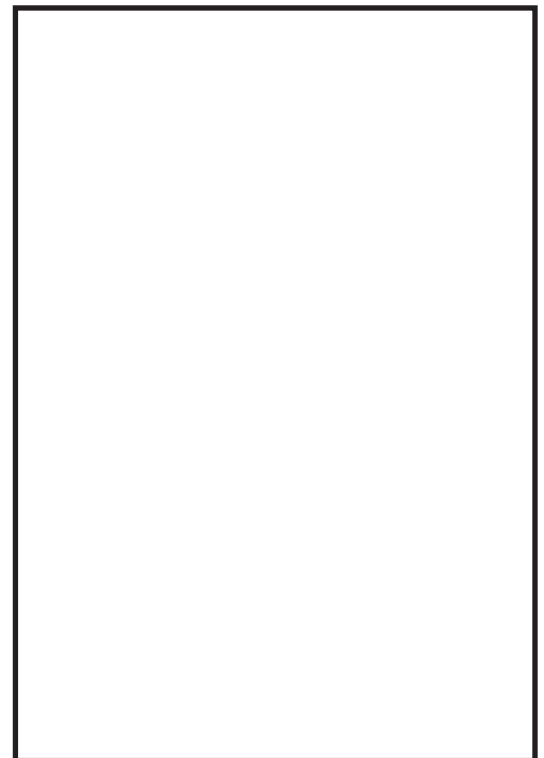
The **Mountain** represents scenic land

The **Water** represents rivers, seashores, and lakeshores

Using the box to the right, design your own symbol for the National Park Service.

What kind of National Park is Hopewell Furnace?

What symbol on the arrowhead represents Hopewell Furnace?



Hopewell Facts Word Scramble

Here is a fact sheet about Hopewell Furnace, but there's a problem. . .the most important words are scrambled! Explore the village to unscramble the bolded words.

Hopewell Furnace was founded by **ARKM DBIR** in 1771. _____

The Pennsylvania landscape was perfect for iron production because **RONI EOR**, hardwood trees for converting into **ARCOACLH**, and **SONTLEIME** were readily available. _____

A **WTEREWAHLE** would add a blast of air into the fire to speed up the smelting process.

The furnace is located in the **ASCT OUSHE**. _____

Before the furnace could be tapped, **GLAS** needed to be removed. _____

Molten iron was allowed to flow into trenches on the floor of the cast house. When cooled this product was called **GPI RINO**. _____

Moulders would make molds for **TVOSE LAPTES**. Hopewell stopped producing these in 1844.

In 1853 an **ANRTCATIHE** furnace was built at Hopewell. This type of furnace cost too much money, so Hopewell returned to the charcoal furnace in 1855. _____

Clement Brooke was the **Ironmaster** and Owner here. He lived in the **IBG USEHO**.

The company clerk kept accounts of orders and production in ledger books. The clerk worked in the **FICOFE TORSE**. _____

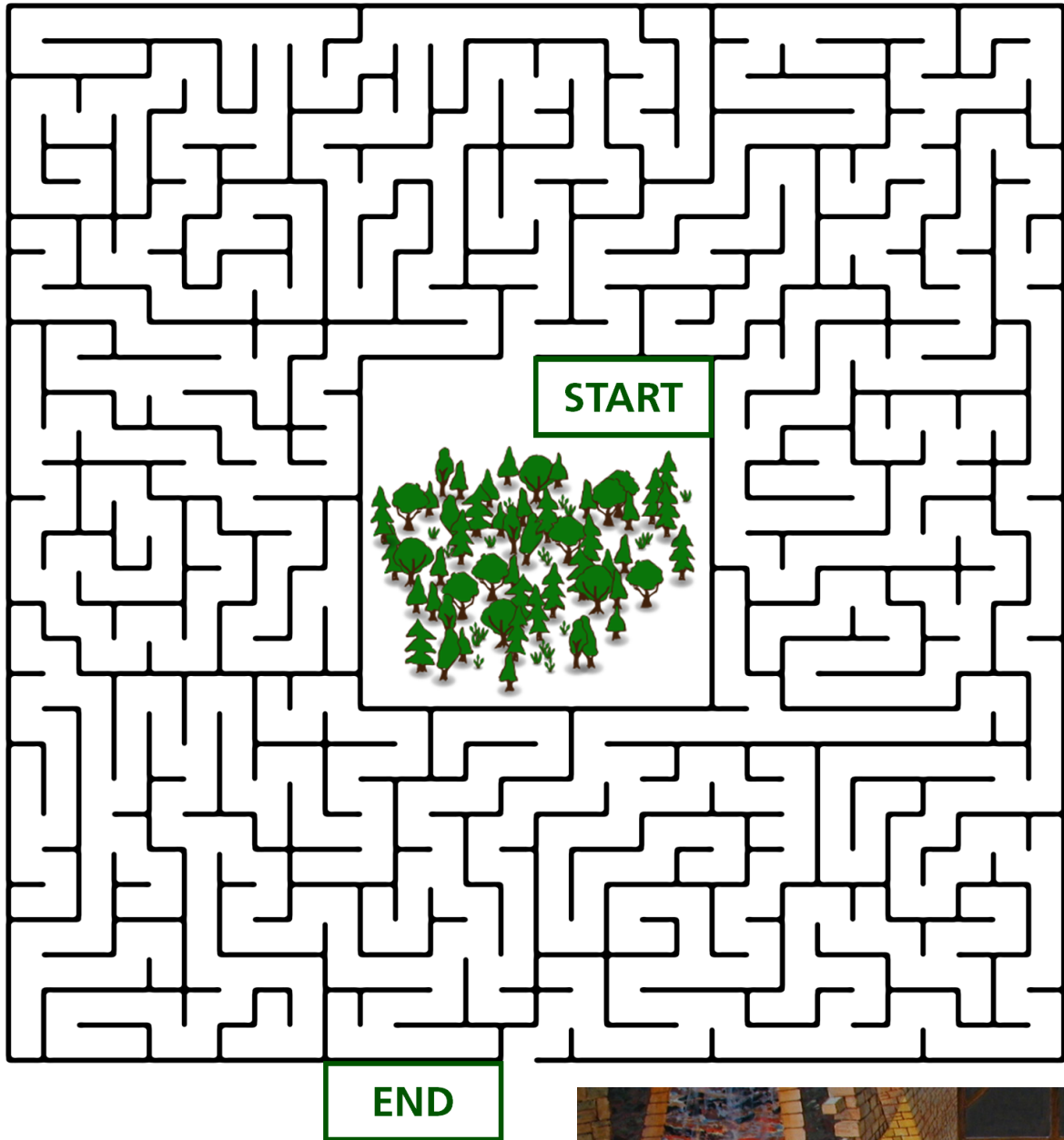
Workers and their families lived close to the furnace in **TANTEN SESHOU** while single men lived in the **ROARBGINSDEHOU**. _____

Hopewell had its last **LASBT** in 1883. _____

The **LIANIVIC SECNRNOATVION ROPSC** was a federal relief agency that built a camp here in 1935 and performed some of the initial restoration work at the furnace and in the village.

Fill the Furnace

Several important materials were needed to make iron. Help the iron ore, limestone, and charcoal get from the mines and forest to Hopewell so the filler can fill the furnace!



Buckley & Brooke Office and Store

Workers were paid for the work they completed with credit to the Store. At the store, workers could buy a variety of goods.

For every year old you are, you have earned \$0.50 to spend at the Buckley & Brooke Office and Store!

**Some Common Items
were:**

Corn (shelled): 0.56 bushel	Bacon: 0.10 pound	Pork: 0.04 1/2 pound
Corn (ear): 0.37 bushel	Beef: 0.05 pound	Tea: 0.32 pound
Horse Feed: 0.01 pound	Cheese: 0.12 1/2 pound	Lard: 0.09 pound
	Coffee: 0.16 pound	Soap: 0.10 pound
	Chocolate: 0.20 pound	Lamp Oil: 0.12 1/2 quart
	Molasses: 0.16 quart	Tallow: 0.10 pound



Using your earnings, what goods would you buy at the Store?

If you were the clerk at the Store, what would you sell?

BONUS! Draw yourself above as the clerk or furnace worker

Cast House Word Search

The Cast House is where iron was produced at Hopewell. Different workers spent their day here tending the furnace and making molds for castings. Find the names of important workers and parts of the cast house by circling them below.

M	A	S	F	W	A	C	R	E	B	L	T	D	M	A	R	T	W	H	I
N	E	G	Y	R	F	I	L	L	E	R	L	M	A	D	S	T	I	D	R
S	A	N	M	O	A	T	H	E	A	D	S	F	Y	A	C	L	B	E	O
T	D	I	B	A	N	Y	L	R	T	S	F	Y	L	E	U	R	A	C	N
O	M	T	R	E	F	H	U	R	L	W	S	B	N	Y	B	U	C	G	M
R	T	S	C	D	F	W	C	A	E	I	F	O	U	N	D	E	R	W	H
E	R	A	T	E	U	C	O	W	D	A	M	S	T	O	N	E	U	T	R
V	H	C	E	O	R	C	S	E	Y	O	A	E	B	S	R	V	C	S	T
B	O	S	H	C	R	F	T	U	D	N	S	C	S	E	O	N	I	F	O
W	M	W	T	A	R	F	N	A	C	M	T	O	N	T	E	M	B	W	N
I	N	A	H	F	A	C	E	L	V	E	R	L	Y	E	O	N	L	A	E
R	Y	C	E	S	C	H	A	R	C	H	I	M	N	E	Y	N	E	T	L
O	R	C	A	R	L	E	U	Y	T	G	C	S	F	R	G	C	E	E	G
N	V	O	D	E	K	S	T	O	V	E	P	L	A	T	E	D	A	R	S
M	N	U	N	C	O	I	B	W	E	R	L	C	R	U	R	F	I	W	M
A	R	N	C	O	A	L	H	R	Y	C	A	G	Y	S	W	H	G	H	A
S	U	Y	R	W	U	R	E	S	F	Y	B	I	R	O	N	O	R	E	S
T	S	Y	A	T	C	Y	I	S	T	O	R	N	Y	E	L	A	H	E	T
E	M	R	C	H	U	R	H	T	E	Y	A	I	O	S	S	T	Y	L	G
R	Y	A	W	T	R	M	O	U	L	D	E	R	G	Y	T	I	L	L	A

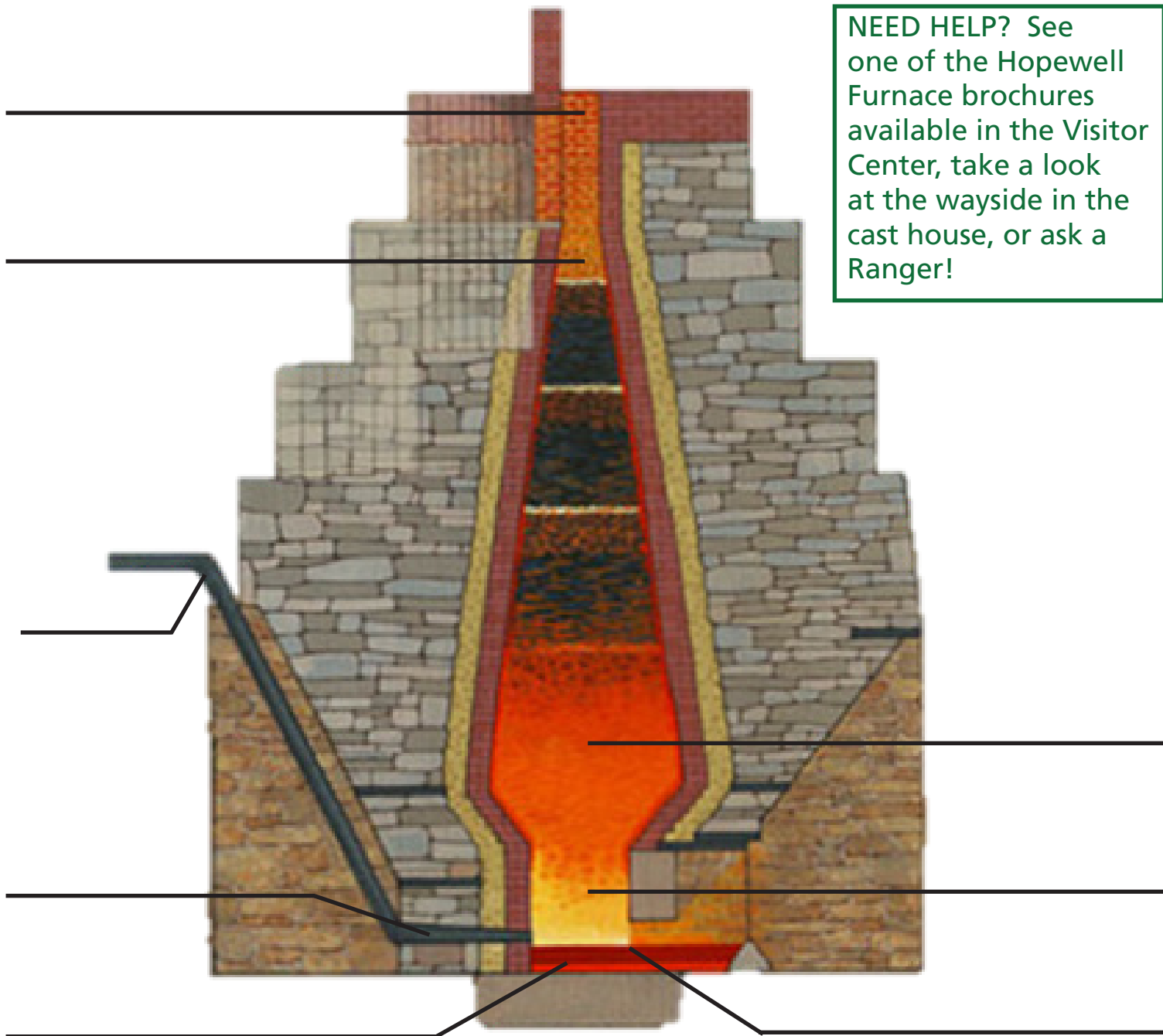
<u>Air</u> duct	Charcoal	Filler	Iron Ore	Stove Plate
Blast	<u>Chim</u> ney	Founder	Limestone	<u>Tunnel</u> Head
<u>Bosh</u>	<u>Crucible</u>	<u>Iron</u>	Moulder	<u>Tuyere</u>
Castings	Dam Stone	Ironmaster	<u>Slag</u>	Water Wheel

Label the Furnace

Now that you know how iron is made, let's learn about the furnace. Every 30 minutes, fillers would add 400-500 pounds of iron ore, 30-40 pounds of limestone, and 15 bushels of charcoal to charge the furnace. The founder carefully watched over the furnace and decided when it was ready to be tapped, about once every 12 hours. The molten iron could then be poured into trenches in the sand floor of the Cast House and flask molds to make pig iron, stove plates, and other castings.

Using the underlined words on the previous page, label the furnace parts:

NEED HELP? See one of the Hopewell Furnace brochures available in the Visitor Center, take a look at the wayside in the cast house, or ask a Ranger!



Big House Spot the Difference



Can you find the painting of Clement Brooke in the Big House?

Welcome to the Big House. This is where Clement Brooke, the Ironmaster, lived. Explore the parlor, the dining room, and the study to see what the house was like in the 1840s. Can you find as many as four (4) differences between the pictures on the left and on the right?



Some of the objects in the Big House were owned by Clement Brooke and his family. Ask a Ranger which pieces the family owned and used!

Big House Spot the Difference

The animals at Hopewell were important to furnace operations. A 36-stall barn was built in 1840 for these animals.

What animals would you have if you owned a farm? Draw them in the pasture below.

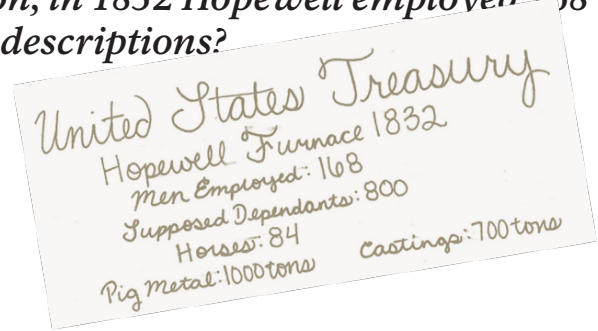


What kind of animals did you see at Hopewell?

What jobs did these animals have?

Jobs at Hopewell

It took the entire village to run the furnace. Each person had a specific job to keep the furnace in blast. At the height of production, in 1832 Hopewell employed 168 men! Can you match the workers to their job descriptions?



- | | |
|------------------|--|
| _____ Ironmaster | A) Hauled ore from mines, charcoal from forests, limestone from quarries, and finished products to markets |
| _____ Founder | |
| _____ Clerk | B) The largest group of employees at Hopewell, they would cut cords of wood for charcoal production |
| _____ Collier | C) Recorded all financial transactions including labor costs, materials, transportation, taxes, income, payments, and furnace repairs |
| _____ Teamster | |
| _____ Gutterman | D) Charged the furnace with 400-500 pounds of iron ore, 30-40 pounds of limestone, and 15 bushels of charcoal every 30 minutes |
| _____ Blacksmith | E) Checked the furnace to keep it blowing at peak efficiency |
| _____ Moulder | F) Made tools and equipment out of iron |
| _____ Woodcutter | G) The highest paid workers, these men used flask casting to create stove plates and other castings by pouring molten iron into a sand mold |
| _____ Filler | H) Removed slag from the furnace so it could be tapped. Once tapped, this worker let molten iron flow into trenches in the sand floor to make pig iron |
| | I) Converted wood into charcoal |
| | J) Director and owner of the furnace |

What jobs did children have at Hopewell?

What jobs did women have at Hopewell?

Design Your Own Stove Plate

Now that you have explored Hopewell, you probably saw many Hopewell Stoves. Moulders made sand molds for each plate (piece), and when put together they would make a complete stove. Popular stove designs in the 1800s had floral (flower) or Biblical themes. Purchasers also liked stoves dedicated to current events like the Oliver Hazard Perry victory at the Battle of Lake Erie.



What would your stove plate look like? Use the space below and draw your own.

Sand casting was an effective way to make a mold for stove plates, skillets and other types of cookware. Did you know sand casting is still a method we use today to make metal products!



Village Bingo

Hopewell Village was a busy place when the furnace was in blast. Can you spot the things that made Hopewell so successful? Use the card below and circle the pictures that match what you see. Find five (5) in a row and collect BINGO!



CONGRATULATIONS!

This certifies that

_____ has successfully fulfilled the requirements for becoming a Junior Ranger at Hopewell Furnace and takes the following pledge:

I, _____, pledge to be a good Junior Ranger and to teach others about Hopewell Furnace National Historic Site. I will help protect the park from harm. I will help others learn about the history of the park and to appreciate the plants and animals that live here. I promise to take only pictures and leave only footprints. I will obey the park rules and act in a safe manner.

My Junior Ranger Motto:
Explore. Learn. Protect.

Park Ranger Signature

