

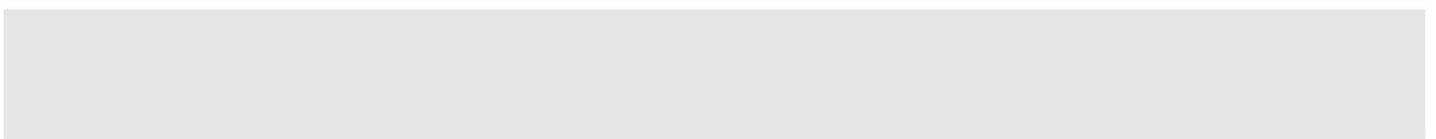
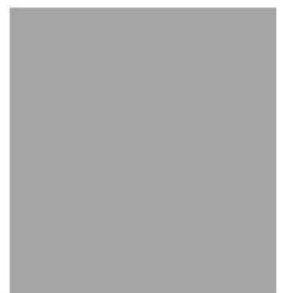
**Chapter 2**  
**The**  
**Industrial**  
**Revolution**  
**in Britain:**  
**1750-1850**

**Section 2**



Why was there Rapid  
Growth of  
Industrialization After  
1780?

Pgs. 59-63



## Background

- the post 1780s saw rapid growth; this is the true revolutionary period
- productivity soared and there were no real obstacles
- reasons for increased production
  - high levels of demand, domestic and abroad
  - the ability to supply demand and make a substantial profit
  - innovative new techniques and increased production/quality
  - the ability to transport bulk raw materials and manufactured goods home and abroad

## Background (cont.)

- available capital that supported **entrepreneurship**
  - a willingness to set up and develop a new business and take risks in order to be successful
- government support of **laissez-faire** policies
  - “hands off” is a reluctance to regulate or interfere in business/industries
- government support of **free trade**
  - a commercial situation in which no barriers are placed in the way of businesses buying or selling, such as governments imposing taxes on imports or exports



## Background (cont.)

- social attitudes which were largely sympathetic to capitalism and industrialization
- an absence of international competition
- an unlimited supply of cheap energy
- a growing and mobile population with a good supply of basic foods

## Source A

In the early days of textile manufactures, the location of the factory depended upon the existence of a stream having sufficient power to turn a water-wheel. Although the establishment of the water mills was the beginning of the breaking up of the domestic system of manufacturing in houses, the mills situated upon the streams, and frequently at considerable distances from one other, formed part of a urban system. It was not until the introduction of steam power as a substitute for the stream that factories were congregated in towns and localities where coal and water were required for the production of steam. The steam-engine is the parent of manufacturing towns.

**Report of the Inspectors of Factories for the half year ending 30 April 1860**

Underline or highlight in the source above why the location of factories changed in the period from 1750 to 1850?

## Source A (answer)

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## Coal

- even though Abraham Darby utilized coke rather than charcoal in making iron, it was still an expensive process and difficult to achieve a high-quality product
- at the time it was still cheaper to import iron

## Developments in Iron Production

- **patents** on **puddling** and rolling iron in 1783-1784 led to the production of better quality and cheaper iron in Britain
  - a patent is the official or legal right to be the sole manufacturer or seller of an invention for a number of years; there were heavy penalties for breaking this law
  - puddling is a vital process converting iron into without using charcoal to make better quality iron in which the iron was stirred to reduce impurities
- iron could now be produced cheaply in large quantities

## Developments in Iron Production (cont.)

- one iron foundry in south Wales produced 500 tons of quality iron in 1785, but after utilizing these new techniques it produced 10,000 tons in 1812
- Britain had all the good quality iron it needed
- producing quality iron was successful due to available capital, cheap coal, and there was a high demand for iron and an emphasis on entrepreneurship

## Developments in Steam Power

- Newcomen's steam engines was the spark that made Britain's industrial development "revolutionary"
- as with other inventions, future development by others occurred
- James Watt developed and patented steam engines which could be used to power machinery
- Watt's version of the steam engine was more successful in pumping water out of coal mines and more efficient/cheaper than that of Newcomen's
- Watt's steam engines enabled more efficient engines to be created



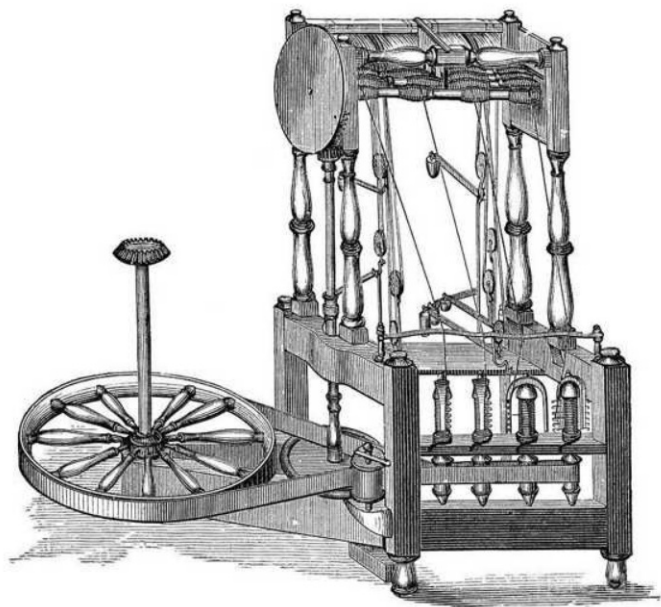
## Developments in Steam Power (cont.)

- variants of Watt's engines were providing power for different enterprises such as cotton and woolen mills, hammers at iron foundries, and grinders at flour mills
- they were also being sold abroad for a substantial profit

## Developments in Textiles

- **textiles** (clothing) were mostly made of wool and cotton and central to the industrialization process in Britain
- they were the biggest employers after agriculture, and many produced textiles early on
- the water frame (1771) was the first major development in textiles: a mechanised spinning process that spun raw cotton into usable thread; one worker could now produce 128 threads at the same time instead of 1, and the thread was also stronger and a higher quality

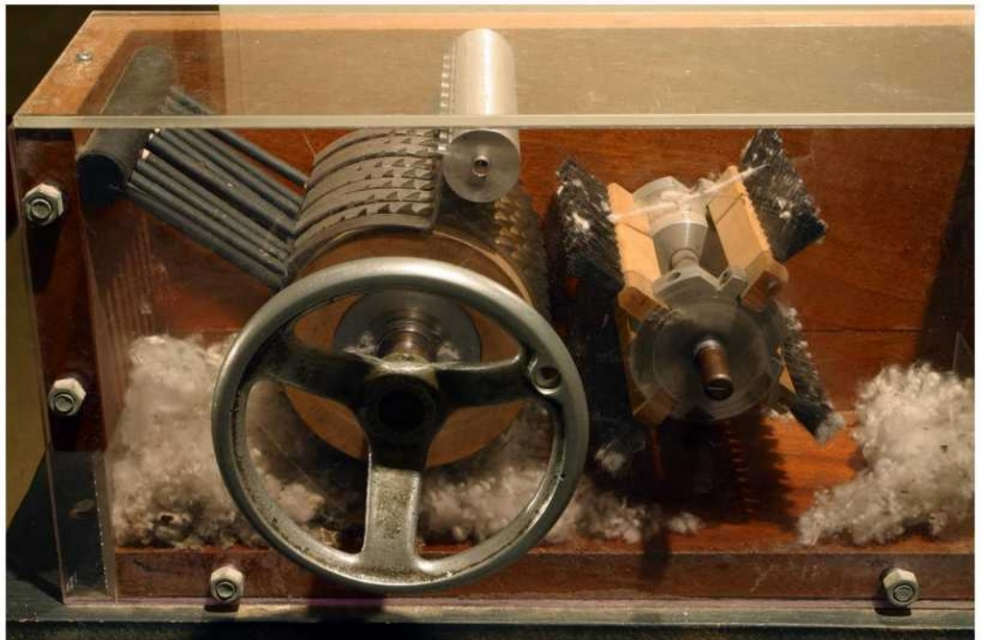
the water  
frame



## Developments in Textiles (cont.)

- the **cotton gin** increased the supply of raw cotton at a cheaper rate, further increasing the availability of raw cotton
  - a small machine that cheaply and easily separates the seeds from cotton

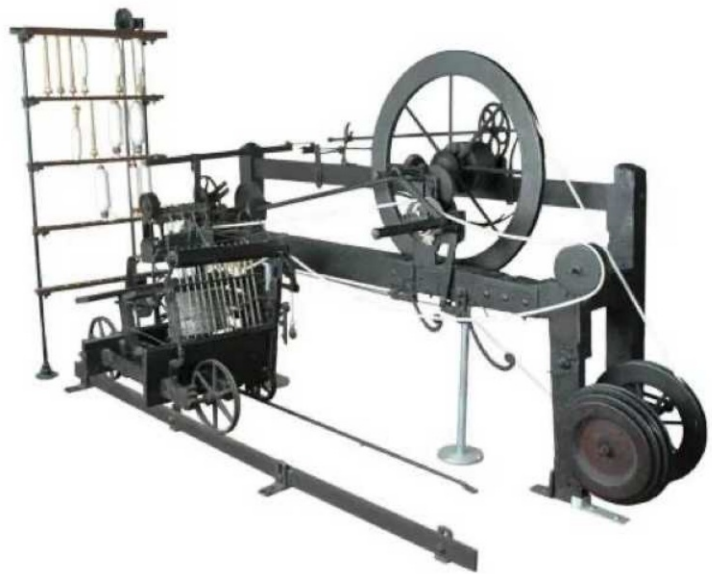
the cotton gin



## Developments in Textiles (cont.)

- the spinning mule (1779) combined the features of the spinning jenny and the water frame; even more high-quality thread was produced with less workers and at a lower price
- this led to increased demand around the world for thread which boosted profits for manufacturers and merchants
- by 1820, more than four million mules were operating in British factories
- later, the steam engine replaced water-power or hand driven power to drive these new machines leading to even more increased output and profit

the spinning  
mule





## Developments in Factories

- with new techniques in production, growth in demand, cheap and an increased availability of raw materials, updated transportation systems, and steam developments, the next step was to combine the production process at a single site
- the first modern factory was established in 1769 in Derbyshire
- Derbyshire's factory had easy access to raw materials and had a good availability of water-power

the Derbyshire  
factory



## Developments in Factories (cont.)

- the factory could operate 24 hours a day and employed over 200 people, a mixture of skilled men women and children
- the workforce was effectively trained and regulated as well as disciplined
- housing for the workforce was available to attract more workers leading to the creation of a small town
- workers were paid well and regularly
- children as young as seven were employed and also educated to allow record keeping at work (parents often could not read or write)

## Developments in Factories (cont.)

- between 1770 and 1835, about 1,200 cotton factories and 1,300 woolen factories were built in Britain
- the factory age had arrived, and textile output soared

## Populations in Factory Textile Towns

Town	Population pre-1801	Population 1801	Population 1851
Blackburn	6,000	12,000	47,000
Bolton	12,000	18,000	61,000
Bradford	4,000	13,000	104,000
Halifax	7,000	12,000	34,000
Leeds	24,000	53,000	172,000
Oldham	5,000	12,000	53,000

## Source B

The term factory system, in technology, designates the combined operation of many levels of people, adult and young, tending with skill to a series of productive machines continuously in motion by a central power. This definition includes such organizations as cotton mills, flax mills, silk mills, woolen mills, and certain engineering works, but it excludes those in which the mechanisms do not form a connected series, nor are dependent on one prime mover. Of the latter class, examples occur in iron works, dye works, soap works, and brass foundries. The factory in its strictest sense involves the idea of a vast automation, composed of various mechanical and intellectual organs acting in uninterrupted concert for the production of a common object, all of them being subordinated to a self-regulated moving force.

**Andrew Ure, writing in 1835, describing the factory system**

How useful is source B in explaining the growth of the factory system? Underline or highlight this in the source above.



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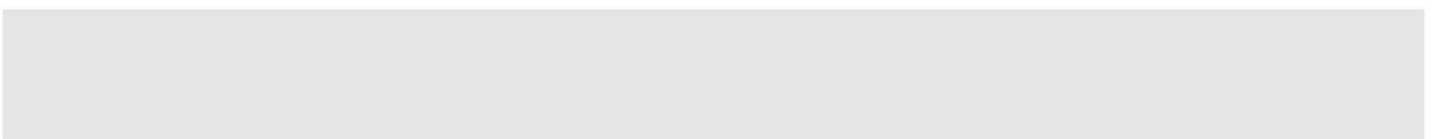
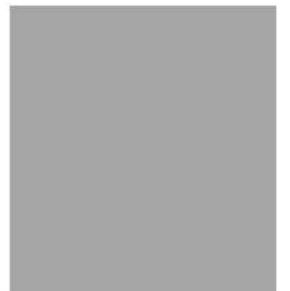
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## Check for Understanding Pgs. 59-63

1. Explain which inventions developed the factory system.
2. How did steam technology change over time?
3. How did textile technology change over time?
4. What factors enabled Derbyshire to develop the first Modern factory?"

Developments in  
Transportation  
pgs. 64-65



## Canals

- companies were established to build canals; some made enormous profits and some failed miserably because they cost so much to build, duplicated existing canals, or weren't finished in time for their full benefits to be enjoyed before railroads
- canals linked rivers with led to the development of industries and new towns where there were once open fields

## Canals (cont.)

- in South Wales, the Glamorgan Canal enabled coal to be carried to the newly built iron works island and then the finished iron could move back down the coast for export or to be taken to build steam engines in Birmingham, all via canal

## Canals (cont.)

- the impact of canals
  - provided employment
  - created a demand for manufactured goods; for example, a new factory was built next to a new canal so the products could be easily unloaded from the barges
  - facilitated industrialisation
  - encouraged the growth of towns

Calculations  
made by  
Engineers in  
1800

Type of transportation...	could carry in tons:
Pack horse	$1/8^{\text{th}}$
Stage wagon on a soft road	$5/8^{\text{th}}$
Stage wagon on a macadam road	2
Barge on river	30
Barge on canal	50
Wagon on iron rails	8

A blue callout box with a white border and a drop shadow, containing the text 'Source K'.

## Source K

England is now crossed in every direction by canals. This is the district in which they were first tried by the present Duke of Bridgewater, whose fortune has been greatly increased by the success of the experiment. His engineer, Brindley, was a man of real genius for this particular type of work who thought nothing but locks and levels and floating barges on aqueduct bridges over unmanageable streams. When he had a plan, he usually went to bed and lay there working it out in his head until the design was completed. It is recorded that when he was asked why rivers were created, he answered after a pause "to feed navigable canals."

**Robert Southey, *Espey's Letters from England*, 1800**

What is the view of source K about the contribution of Brindley to the "transport revolution"?



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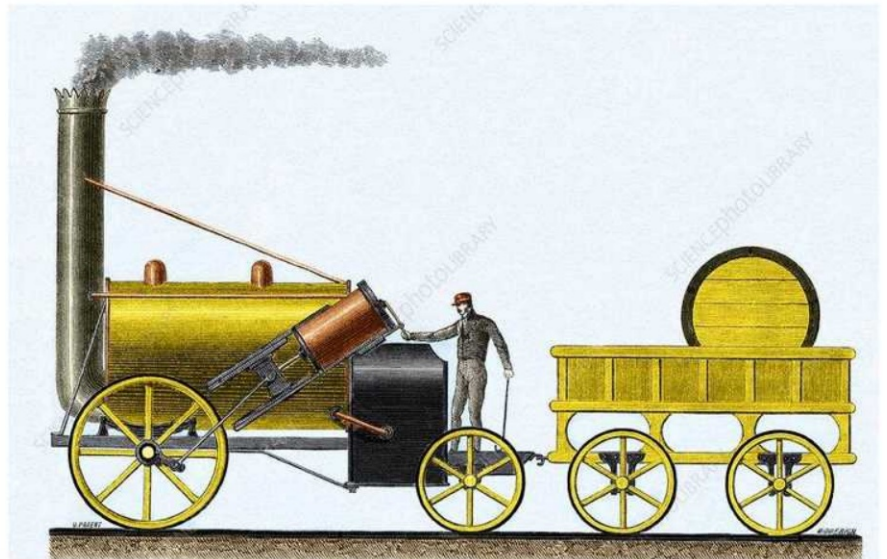
## Developments in Railways

- iron railway tracks had been used in mines to transfer coal to barges for a long time, but the power to pull the trucks was provided by a stationary steam engine

## Developments in Railways (cont.)

- mobile steam engines were created
  - the Stockton to Darlington Railway (1825) was the first mobile steam engine
  - the Manchester to Liverpool Railway (1830) had the best steam engine for locomotives: “The Rocket”
- “The Rocket” could move at 29 miles per hour and was capable of hauling large amounts of coal and other goods
- the cost of transportation was radically reduced across the country because of railroads

# The Rocket



## Developments in Railways (cont.)

- faster trains led to the increase in transportation of both goods and people
- railways were built by private companies and financed by entrepreneurs, and the competition between private businesses kept costs down
- the government didn't interfere (laissez-faire)
  - however, an act of Parliament required every railway company to run at least one service a day on every line, each way, for a maximum of 1/10 cent per mile, providing a public service

## Developments in Railways (cont.)

- this provided employment (building and running the railways and manufacturing tracks, engines and carriages), whereas once a canal was built, employment somewhat ended
- labor became more mobile as families could move more easily in search of work
- urbanization intensified as commuting to work became more practical

## Developments in Railways (cont.)

- growth in demand for iron and steel
- the railway showed that no one single innovation could transform the economy and create a significant amount of growth, but it was one of the many factors which kept the acceleration going and was a vital stimulus to the revolution



## Source L

Railroads are now proposed to be established as a means of convenience hugely superior to existing modes. The railroad holds out to the public not only a cheaper, but more expeditious transportation than yet established. The importance, to the commercial state, is obvious: safe and cheap motor transit for merchandise, from one part of the country to another, will readily be acknowledged. The trains of merchandise between Liverpool and Manchester take four or five hours, and the change to the merchant in transportation will be reduced by at least one third. This will lead to an immense savings to the public, over and above what is perhaps still more important, the economy of time. It will afford stimulus to the productive industry of the country. It will give a new impulse to the powers that want everything, the value and importance of which can be fully understood only by those who are aware of how seriously commerce may be impeded by petty restrictions, and how commercial enterprises encouraged and promoted by following the principles of fair competition and free trade by following the principles of fair competition and free trade.

**Prospectus of the Liverpool and Manchester Railway Company, 1824**

What according to the author of Source L were the advantages of the development of the Liverpool to Manchester Railway?



## Source L (answer)

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## Source M

In the gray mist of the morning, we see a large portion of the supply of the great London markets rapidly unloaded from the trains; fish, flesh, and food, Aylesbury butter and dairy fed pork, apples, cabbages and cucumbers and we know not what else, for the daily consumption of London. No sooner do these disappear than at 10-minute intervals other trains arrive with Manchester packs and bales, Liverpool cotton, and American products. An hour later in the morning, these are followed by other trains with the heaviest class of traffic: stones, brick, iron girders and steel pipes.

**Railway News, 1864**

Compare and contrast the views of Sources L and M about the impact of the railway.

## Developments in Steamships

- between 1800 and 1850, there was an increase of experimentation and innovation with steam power, including steamships at sea pulling canal barges
- having a steamship would be faster and more reliable than sail
- the first steam ship to across the Atlantic was the *Savannah* in 1819

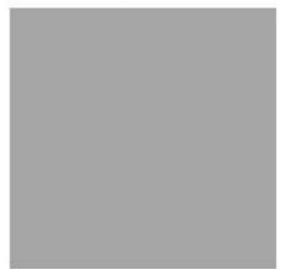
## Developments in Steamships (cont.)

- in 1838, the *Great Western* completed the first transatlantic journey in only 14 days
- *SS Great Britain* (1843)- the first wrought iron ship was built
- steamships continued to be fitted with sails until late in the 1800s as the space needed for coal to power engines reduced the amount of cargo ships could carry
- not until the late 1800s did steamships no longer have sails and were made entirely out of iron and steel

Check for  
Understanding  
pgs. 64-67

1. How has the canal system developed over time?
2. What factors led to the railway system?
3. Who developed the railway system? How?
4. How did the British government view railway transportation? Explain.
5. Explain the domestic and foreign impact of steamships of British trade.

Raw Materials  
Lesson 2.2.3  
Pgs. 66-67



# Coal

- coal was plentiful in Britain
- steam pumps enabled mines to produce more coal
- different types of coal were required for different processes- making iron, heating houses, steam engines, etc.
- canals and railways facilitated the transportation of coal





# Iron

- iron ore was plentiful in Britain
- the demand increased due to machinery, railways, etc.
- canals and railways facilitated the transportation of iron and steel





## Textiles

- cotton was not grown in Britain and had to be imported
- Britain benefited from its colonies which would produce large amounts of raw cotton and a large merchant navy to transport it from America to Britain under protection of the highly effective Royal Navy

## Textiles (cont.)

- despite American independence, Britain continued to import its raw cotton from the American south and cotton manufacturers in Britain took great care to ensure that their trade would not be affected
- Britain was engaged in several major wars and the Royal Navy was very crucial in protecting the cotton imports
- wool was the other major textile
- British sheep produced wool, which could also be imported from British colonies of Australia and New Zealand

## Source N

About the year 1709, Abraham Darby came into Shropshire in Coalbrookdale. Here he cast iron goods in sand out of the blast furnace that blew with wood charcoal. Sometime after he suggested the thought that it might be practicable to melt the iron with pit coal. Upon this he first tried with raw coal as it came out of the mines, but it did not work. He wasn't discouraged, had the coal made into cinder, as is done for drying malt, and then it succeeded to his satisfaction.

**Abraham Darby II's account of his father's iron works at Coalbrookdale**

Using contextual knowledge, how important for the development of the iron industry and industrial growth was Darby's innovation?

## Source O

Since cast iron has got all the rage,  
And scarce anything's now made without it;  
As I live in the cast iron age,  
I mean to say something about it.  
There's cast-iron coffins and carts,  
There's cast-iron bridges and boats,  
Corn factors with cast-iron hearts,  
That I'd hang up in cast-iron coats.  
We have cast-iron gates and lamp posts,  
We have cast-iron mortars and mills too; And our enemies know to their  
cost  
We have plenty of cast-iron pills too.  
We have cast-iron fenders and grates,  
We have cast-iron pokers and tongs, sir;  
And we shall have cast-iron plates;  
And cast-iron clothes, ere long sir.

**Canal song of the 1820s from Birmingham, "Humphrey Hardfeatures" description of Cast Iron Inventors**

What does Source O tell us about the importance of iron in industrial development?

## Source O (answer)

Since cast iron has got all the rage,  
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And we shall have cast-iron plates;  
And cast-iron clothes, soon sir.

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What does Source O tell us about the importance of iron in industrial development?

A blue callout box with a white border and a drop shadow, containing the text 'Source P'.

## Source P

The Lord Chancellor now sits upon a bag of wool. But wool has long ceased to be the symbol of the most important product of England. He ought rather to sit upon a bag of coals, though it might not prove so comfortable.

**George Stephenson comments on the importance of coal**

What does Source P tell us about the changes of the British Economy in the period after 1750?

## Source P (answer)

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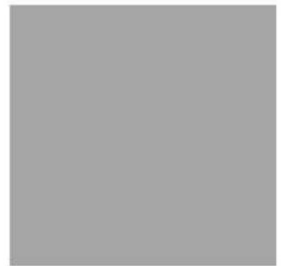
Check for  
Understanding  
Pgs. 66-67

1. Explain the 3 different raw materials discussed in this lesson. In each box, answer
  1. What is the name of raw material?
  2. Where is it found?
  3. How is it used



The Growth of  
Markets (domestic  
and international)  
and Free Trade

Pgs. 68-69



## Growth of Markets and Free Trade

- as the first country to industrialize, Britain had no serious competition
- an increase in domestic demand and exports both contributed to Britain's industrial success
- exports to colonies or former colonies made up about 80% of their exports

## Growth of Markets and Free Trade (cont.)

- by 1850, exports generated over 10% of Britain's gross national product (GDP)
  - the total value of the output of all a country's goods and services in a year
- Britain developed specialized commercial and financial institutions to handle the increase trade and shipping

## Growth of Markets and Free Trade (cont.)

- the British government believed that its main role was not only to maintain law and order to defend the country, but also to defend in advance Britain's commercial and industrial interests
- the principal source of income for the government throughout this were taxes on imports and exports and the government took care not to use this power in a way that would damage trade or industry

## Growth of Markets and Free Trade (cont.)

- as a result, the government encouraged free trade without **tariffs**
  - taxes imposed on goods when they are being either imported into or exported from a country
- even when the British East India company faced difficulties, the British government intervened to ensure it was regulated and that trade could continue
- by the end of the period, Britain exported a higher proportion of industrial output and had more exports overall than any other country in the world

A blue callout box with a white border and a drop shadow, containing the text 'Source Q'.

## Source Q

I see in free trade that which shall act upon the moral world as the principle of the universe, drawing men together, thrusting aside the antagonism of race and creed and language and uniting us in bonds of eternal peace. I believe the effect will be to change the face of the world, to introduce a system of government entirely distinct from that which now exists. I believe that the desire and motive for large and mighty empires, for gigantic armies and navies, will die away when man becomes one family and freely exchanges the fruits of his labor with his brother man.

**Richard Cobden, speech at Manchester, 15 January 1846**

How useful is Cobden's speech in Source Q as evidence for the benefits of free trade?

## Source Q (answer)

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## The Corn Laws

- tariffs brought about by the British government protected British agriculture
- the tariffs prevented the import of corn (grains) until British corn reached a certain price
- the tariffs kept British corn prices high leading to higher prices of bread for workers
- the tariffs guaranteed that British farmers would grow corn



## The Corn Laws (cont.)

- the tariffs were repealed by the British Prime Minister in 1846 because of his views of free trade and pressure from the Anti-Corn League and middle class
- his repeal of the Corn Laws led to his loss of popularity by landowning members of Parliament

A blue callout box with a white border and a drop shadow, containing the text 'Source R'.

## Source R

To pay for the imported corn, more manufacturers would be required from Britain. This would lead to an increased demand for labor in the manufacturing districts, which would necessarily be attended with a rise in wages in order that goods might be made for the purpose of exchanging for the corn brought from abroad.

**Richard Cobden, Speech, 1870**

Summarize in your own words the message from Source R.

Check for  
Understanding  
Pgs. 68-69

1. Explain how domestic and international markets have experienced growth.
2. How did the British government impact domestic and international trade?