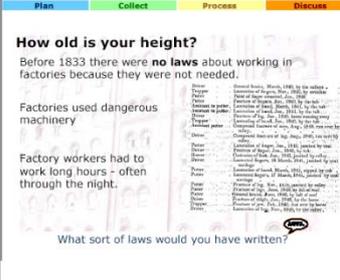


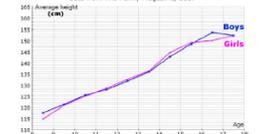
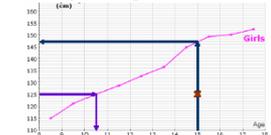
No	Slide	Objectives children should learn:	Activities
1	 <p>How old is your height?</p> <p>The presentation requires Microsoft PowerPoint version 2002 or above.</p> <p>This presentation contains 28 slides.</p>	<ul style="list-style-type: none"> <li>• to relate individual statistical techniques to a wider problem</li> <li>• to think analytically about a statistical problem</li> <li>• to apply a variety of techniques to solve a problem</li> </ul>	<p><b>Context (provided for the teacher's benefit – this is introduced through the slides)</b></p> <p>After the Industrial Revolution child labour in Britain was rife. Children worked long hours, being poorly paid for their efforts. The Factory Act of 1833 was one of several Acts introduced to protect children from poor working conditions (even having to work at all). The Act was difficult to enforce however so inspectors were employed to help protect the children. They collected the age and height of thousands of children and calculated the average height of children at different ages to provide a guide. These materials can be used to consider the use of an average as a guide for children's age or used to compare the heights of children in 1837 with children of today. Pupils can hypothesise and then use data from the <i>CensusAtSchool</i> database to examine the reality.</p>
2.	 <p>How old is your height?</p> <p>The Industrial Revolution began in the 18<sup>th</sup> century. When steam power was introduced factories opened all over Britain. Many people moved from the countryside into the cities.</p> <p>Why do you think people moved into the cities?</p> <p>Britain started getting its money from <b>factories (industry)</b> instead of <b>farms (agriculture)</b>.</p> <p>The population in Manchester and Salford (cities) grew from <b>25 000 people in 1772 to 455 000 in 1851.</b></p>	<ul style="list-style-type: none"> <li>• about the Industrial Revolution</li> <li>• the significance of the Industrial Revolution</li> </ul>	<p>The emphasis placed on this slide will depend on your cross-curricular requirements for the activity. Activities could be soft discussion about the Industrial Revolution. The following questions could be used:</p> <p><i>Why did people move to the cities?</i>  <i>What impact did the shift have?</i>  <i>[Introduction of canals, improved roads and then railways. Later came steam powered ships, the internal combustion engine and electricity.]</i></p>
3.	 <p>How old is your height?</p> <p>Before 1833 there were <b>no laws</b> about working in factories because they were not needed.</p> <p>Factories used dangerous machinery</p> <p>Factory workers had to work long hours - often through the night.</p> <p>What sort of laws would you have written?</p>	<ul style="list-style-type: none"> <li>• why working law was introduced</li> </ul>	<p>Discussion points from the slide.</p> <p><b>Points to note:</b></p> <p>The Factory Act of 1833 was one of a series of acts written for factory workers.</p>
4.	 <p>How old is your height?</p> <p>Families sent their children to work in the factories. They were useful because their small hands could get into tiny gaps between machines.</p> <p>What do you think the work was like?</p> <p>To protect children from the <b>dangers</b> of factory work laws were written.</p> <p>One of these was the <b>Factory Act</b> in 1833.</p> <p>It applied to textile factories but other laws for other types of factory followed.</p>	<ul style="list-style-type: none"> <li>• to think about the historical experiences of others</li> <li>• why the Factory Act of 1833 was written</li> </ul>	<p>Discussion of the points on the slide.</p>

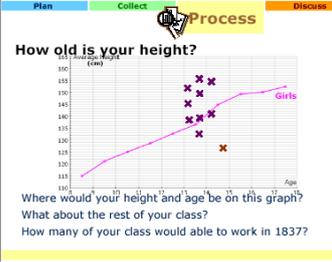
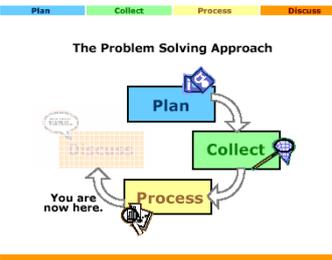
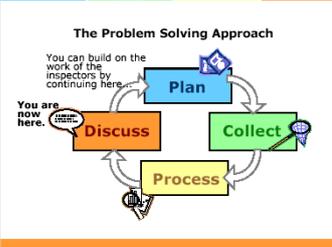
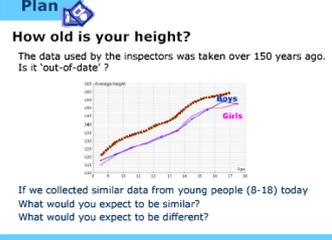
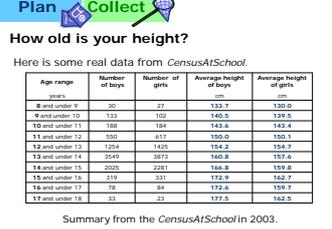
# How old is your height?

<p>5.</p>	<p><b>How old is your height?</b></p> <p>The law put limits on the number of days and hours that children of different ages could work.</p> <p>What do you think was the youngest age children could work in a factory?</p> <p>How many hours-a-day and days-a-week do you think children could work?</p> <p>The act also talked about schooling. How many hours-a-day do you think children had to get?</p>	<ul style="list-style-type: none"> <li>to think about the historical experiences of others</li> <li>to think about how working conditions <i>then</i> relate to now</li> </ul>	<p>PUPIL WORKSHEET has spaces for pupils to fill in ideas.</p> <p>Discussion: predictions of what they think the rules were.</p>
<p>6.</p>	<p><b>The Factory Act 1833</b></p> <p>Children under 9 years of age are <b>not permitted to work</b>.</p> <p>Children aged 9-13 years are permitted to work: <b>no more than 9 hours a day</b>.</p> <p>Children aged 13-18 years are permitted to work: <b>no more than 12 hours a day</b>.</p> <p>Children are <b>not to work at night</b>.</p> <p><b>Two hours of schooling</b> each day for children.</p>	<ul style="list-style-type: none"> <li>what the Factory Act of 1833 said</li> <li>how current law compares</li> </ul>	<p>Discussion: <b>How does the Factory Act compare with what the students expected?</b></p> <p><b>How does it compare to today?</b></p> <p><b>Points to note: today's law:</b></p> <p>These apply to any businesses where work is done for profit</p> <ul style="list-style-type: none"> <li>no work during school hours or lunch breaks</li> <li>no work before 7am or after 7pm</li> <li>only 2 hours work allowed on a school day (no more than 1 hour before school)</li> <li>no more than 8 hours work on a Saturday or during the holidays (5 hours for those under 15)</li> <li>no more than 35 hours a week during the holidays (25 hours for under 15's)</li> <li>no more than 12 hours a week when attending school</li> <li>young children should get at least a 2 week break during the school holidays at any point during the year</li> <li>may not work in an industrial setting such as a factory</li> </ul>
<p>7.</p>	<p><b>Enforcing the Factory Act</b></p> <p>The passing of this Act didn't mean the everyone stopped employing under-age children.</p> <p><b>Four inspectors were hired to enforce the law across the whole country.</b></p> <p>Why might young children have continued being illegally employed?</p> <p>How might the employers or even the families try to get around the new laws?</p>	<ul style="list-style-type: none"> <li>how the Factory Act was enforced</li> <li>why the Act needed enforcing</li> </ul>	<p>Discussion of questions on the slide.</p> <p><b>Points to note:</b></p> <p>Many families depended on the income of the children in order to live.</p>
<p>8.</p>	<p><b>How old is your height?</b></p> <p>Imagine that you are one of those four factory inspectors. They weren't sure they could trust everyone to tell the truth.</p> <p>They needed a way to judge a child's age.</p> <p>What measurements do you think they could use to help judge how old a person is?</p>	<ul style="list-style-type: none"> <li>to think about questions which can be answered using statistics</li> <li>to think about what information data can provide</li> </ul>	<p>Brainstorm attributes which might be age related – some examples might be height, weight, size of waist, length of ears, teeth.</p>
<p>9.</p>	<p><b>How old is your height?</b></p> <p>They decided to survey children's heights and use the data to judge the age of employees.</p> <p>What information would they need to collect?</p> <p>How big a sample do you think they took?</p>	<ul style="list-style-type: none"> <li>what data was collected</li> <li>what things need to be considered when planning to collect data</li> </ul>	<p>Discussion: <b>How could they collect the data?</b></p> <p><b>What problems might they encounter?</b></p> <p><b>How can you ensure the data is truthful?</b></p> <p><b>Points to note:</b></p> <p>The height data was recorded from 15,000 children. Only a summary of the data is available today (including average heights). The next slide gives</p>

			a choice of looking at the original table or a 'tidied up' metric version.																																																							
10.		<ul style="list-style-type: none"> <li>that data often needs reorganising to enable processing</li> </ul>	<p>Depending on students' ability and the amount of time available, either the original table or a reorganised metric version can be used.</p> <p><b>ORIGINAL TABLE:</b> Higher ability students could be given this and asked to adapt it to get it in a usable state. There are slides illustrating the process for review purposes.</p> <p><b>METRIC VERSION:</b> This version of the table is ready for students to use with the exception of finding the midpoint of the age groups.</p>																																																							
11.		<ul style="list-style-type: none"> <li>where the current task fits within the 'problem solving approach'</li> <li>to review prior work</li> </ul>	<p><b>Points to note:</b> After they <b>planned</b> what to do, the inspectors <b>collected</b> information to help them answer the problem.</p>																																																							
12.	<table border="1"> <thead> <tr> <th>Age</th> <th>Number of boys</th> <th>Number of girls</th> <th>Average height of boys</th> <th>Average height of girls</th> </tr> </thead> <tbody> <tr> <td>8 and under 9</td> <td>166</td> <td>539</td> <td>3 10 1/2"</td> <td>3 9 1/2"</td> </tr> <tr> <td>9 and under 10</td> <td>145</td> <td>813</td> <td>3 11 1/2"</td> <td>3 11 1/2"</td> </tr> <tr> <td>10 and under 11</td> <td>124</td> <td>927</td> <td>4 2 1/2"</td> <td>4 4 1/2"</td> </tr> <tr> <td>11 and under 12</td> <td>723</td> <td>1 055</td> <td>4 2 1/2"</td> <td>4 2 1/2"</td> </tr> <tr> <td>12 and under 13</td> <td>1 427</td> <td>1 330</td> <td>4 3 1/2"</td> <td>4 4 1/2"</td> </tr> <tr> <td>13 and under 14</td> <td>3 220</td> <td>3 240</td> <td>4 3 1/2"</td> <td>4 3 1/2"</td> </tr> <tr> <td>14 and under 15</td> <td>117</td> <td>150</td> <td>4 8 1/2"</td> <td>4 6"</td> </tr> <tr> <td>15 and under 16</td> <td>82</td> <td>106</td> <td>4 10 1/2"</td> <td>4 10 1/2"</td> </tr> <tr> <td>16 and under 17</td> <td>43</td> <td>50</td> <td>5 0 1/2"</td> <td>4 11 1/2"</td> </tr> <tr> <td>17 and under 18</td> <td>47</td> <td>112</td> <td>5 0"</td> <td>5 0"</td> </tr> </tbody> </table> <p>Summary from the Penny Magazine in 1837. "If a child be 36 11" in height it may be assumed that it is nine years of age..."</p>	Age	Number of boys	Number of girls	Average height of boys	Average height of girls	8 and under 9	166	539	3 10 1/2"	3 9 1/2"	9 and under 10	145	813	3 11 1/2"	3 11 1/2"	10 and under 11	124	927	4 2 1/2"	4 4 1/2"	11 and under 12	723	1 055	4 2 1/2"	4 2 1/2"	12 and under 13	1 427	1 330	4 3 1/2"	4 4 1/2"	13 and under 14	3 220	3 240	4 3 1/2"	4 3 1/2"	14 and under 15	117	150	4 8 1/2"	4 6"	15 and under 16	82	106	4 10 1/2"	4 10 1/2"	16 and under 17	43	50	5 0 1/2"	4 11 1/2"	17 and under 18	47	112	5 0"	5 0"	<ul style="list-style-type: none"> <li>that data often needs to be put into a more user friendly form</li> </ul>	<p><b>Points to note:</b> The chart needs some work – changing the measures into metric and so on. Some stronger students may enjoy the challenge of this. Areas to highlight – Age groups Imperial heights</p>
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13.		<ul style="list-style-type: none"> <li>where their current task fits within the whole 'problem solving approach'</li> <li>to review their prior work</li> </ul>	<p><b>Points to note:</b> Now we have <b>collected</b> our data, we need to <b>process</b> it. We need to get it into a form that is easier to manage by drawing some graphs and charts and doing some calculations.</p>																																																							
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# How old is your height?

15.	<p>Plan Collect Process Discuss</p> <p><b>How old is your height?</b></p> <table border="1"> <thead> <tr> <th>Age range years</th> <th>Number of boys</th> <th>Number of girls</th> <th>Average height of boys (cm)</th> <th>Average height of girls (cm)</th> </tr> </thead> <tbody> <tr><td>8 and under 9</td><td>666</td><td>529</td><td>117.6</td><td>114.8</td></tr> <tr><td>9 and under 10</td><td>945</td><td>813</td><td>123.4</td><td>121.0</td></tr> <tr><td>10 and under 11</td><td>1124</td><td>927</td><td>128.6</td><td>126.1</td></tr> <tr><td>11 and under 12</td><td>723</td><td>1035</td><td>138.0</td><td>136.0</td></tr> <tr><td>12 and under 13</td><td>1427</td><td>1310</td><td>137.9</td><td>132.7</td></tr> <tr><td>13 and under 14</td><td>2131</td><td>2240</td><td>142.9</td><td>144.8</td></tr> <tr><td>14 and under 15</td><td>117</td><td>140</td><td>148.6</td><td>149.2</td></tr> <tr><td>15 and under 16</td><td>82</td><td>106</td><td>152.7</td><td>150.1</td></tr> <tr><td>16 and under 17</td><td>43</td><td>30</td><td>153.7</td><td>150.1</td></tr> <tr><td>17 and under 18</td><td>47</td><td>112</td><td>152.4</td><td>152.4</td></tr> </tbody> </table> <p>First let's convert feet and inches into metric units (cm).</p>	Age range years	Number of boys	Number of girls	Average height of boys (cm)	Average height of girls (cm)	8 and under 9	666	529	117.6	114.8	9 and under 10	945	813	123.4	121.0	10 and under 11	1124	927	128.6	126.1	11 and under 12	723	1035	138.0	136.0	12 and under 13	1427	1310	137.9	132.7	13 and under 14	2131	2240	142.9	144.8	14 and under 15	117	140	148.6	149.2	15 and under 16	82	106	152.7	150.1	16 and under 17	43	30	153.7	150.1	17 and under 18	47	112	152.4	152.4	<ul style="list-style-type: none"> <li>to make figures more easy to use and understand</li> </ul>	<p>Students to convert the figures to cm. Conversion used: 1 inch = 2.54 cm 1 foot = 12 inches</p>
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18.	<p>Plan Collect Process Discuss</p> <p><b>How old is your height?</b></p> <p>Now the data is easier to use we can draw a graph to help us look to see if age and height are linked.</p>  <p>What kind of graph could be used to show this data? And to use to check a person's possible age?</p>	<ul style="list-style-type: none"> <li>that graphs can help us understand information</li> </ul>	<p>Discussion of questions on the slide. Plot the appropriate graph on pupil's worksheet.</p>																																																							
19.	<p>Plan Collect Process Discuss</p> <p><b>Height against age for children 8-18</b> Data from: The Census AtSchool, 2017</p>  <p>Can you see a relationship between average height and age? What do you notice about the boys heights? Can you see any reason for the unexpected pattern? Hint: Look again at the table of data</p>	<ul style="list-style-type: none"> <li>to look at graphical information and interpret it</li> </ul>	<p>Discussion of the questions posed and write short response on pupil's worksheet. <b>Points to note:</b> It should be noted the small numbers of people involved in the survey at the 16+ age group. This is likely to explain the drop in average for the boys.</p>																																																							
20.	<p>Plan Collect Process Discuss</p> <p><b>How old is your height?</b></p>  <p>One inspector interviewed a girl that was 4'11" tall (125cm). She claimed to be 15. <del>How would the inspector check her age?</del></p>	<ul style="list-style-type: none"> <li>to read information from a graph</li> <li>to reason with data</li> </ul>	<p>Discussion of the likely age of the girl.</p>																																																							

21.		<ul style="list-style-type: none"> <li>• to relate presented information to their own experiences</li> <li>• to question presented information</li> </ul>	<p>Discussion of questions on the slide</p> <p><b>Points to note:</b></p> <p>It is intended that students relate themselves to the data. Since the mean is plotted, it would be expected that roughly half of the children surveyed would be above and below the line. By plotting the group's heights on the graph you are likely to see that well over half of the group are above the line (thus unable to work). Pupils should be encouraged to think about why this might be and how it can be investigated further. In actual fact, children are taller (on average) now than they were in 1837.</p>
22.		<ul style="list-style-type: none"> <li>• where the current task fits within the whole 'problem solving approach'</li> <li>• to review prior work</li> </ul>	<p><b>Points to note:</b></p> <p>Now we have <b>processed</b> the information by drawing charts and doing calculations, we need to <b>discuss</b> what our results show us and how they help us consider the problem.</p>
23.		<ul style="list-style-type: none"> <li>• to discuss their findings and relate them to the original problem and the data</li> <li>• to come up with new questions or hypotheses about the information</li> </ul>	<p>Discussion about questions on the slide</p> <p><b>Points to note:</b></p> <p>The remaining slides will lead students to taking samples of data from <i>CensusAtSchool</i> and comparing data for 'now' to 1837. Students may come up with hypotheses they wish to investigate. Data are also available to compare other countries with the UK data.</p>
24.		<ul style="list-style-type: none"> <li>• where their current task fits within the whole 'problem solving approach'</li> <li>• to review their prior work</li> </ul>	<p><b>Points to note:</b></p> <p>At the end of the work, having <b>discussed</b> our findings we could now start the whole cycle again.</p>
25.		<ul style="list-style-type: none"> <li>• to pose a new question</li> </ul>	<p>Discussion of questions posed.</p>
26.		<ul style="list-style-type: none"> <li>• to plan what data they would need to collect</li> <li>• decide on an appropriate method to display this</li> </ul>	<p>Discussion of questions posed. Complete Table 2 on pupil's worksheet from data in the slide. Plot this data on the worksheet, labelling clearly.</p>

28.	<p>When you plot the data for modern children, how does this compare to the data from 1837... What do you think these points are trying to show?</p>	<ul style="list-style-type: none"> <li>• to think about what information is being presented</li> <li>• to consider what affect the spread has on 'children being able to work'</li> <li>• to think about maximums and minimums</li> </ul>	Discussion of the questions posed. On pupil's worksheet write down 2 sentences that explain clearly what you have found out.
30.			End of slideshow

The pupil worksheet available from the site:

**How old is your height?**

Name: \_\_\_\_\_

170 years ago many children were employed in factories. This Act of Parliament put limits on the number of days and hours that children of different ages could work.

**Introduction**

I think that the youngest age allowed in a factory was \_\_\_\_ years. They would have been allowed to work for \_\_\_\_ hours per day and \_\_\_\_ days per week. I also think they would have had \_\_\_\_ hours of school per day. Factories were inspected to make sure that owners were not employing under-aged workers. To help them to quickly judge children's ages they needed a quick and simple method.

Complete the table to show the survey that was carried out to help the inspectors.

**Table 1**

Age Range	Mid point	Average (cm)	
		Boys	Girls

height / cm

For more information on the 2011 Census visit our website at [www.census.gov.uk](http://www.census.gov.uk)  
Resource from the [CensusAtSchool](http://www.censusatschool.org.uk) project at [www.censusatschool.org.uk](http://www.censusatschool.org.uk)

**How old is your height?**

**Discuss**

Were there any patterns linking age and height in the inspectors' data?  
As age increases does height increase in a regular way? In the graph for boys similar to girls?

Are there any problems with these graphs created from the age and average height?

When you add your own heights, how many pupils fall below or above the lines the inspectors used? Does this suggest anything about modern pupils?

**Plan** **Collect**

What are you going to investigate?

What information are you going to collect?  
Is it primary or secondary data?

How large a sample are you going to collect?

What patterns do you think you are likely to find?  
This is your hypothesis

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**How old is your height?**

**Table 2**

Age Range	Mid point	Average (cm)	
		Boys	Girls

**Discuss**

What have you found out?

Explain anything you have found out.

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