THE BARTON SERIES

BARTON'S WIDE, WIDE WORLD

BY

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(Ages 8 and over)

BARTON'S WIDE, WIDE WORLD

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JUST LIKE BEFORE

The midday sun shone mercilessly upon the quiet, countryside. Barton's school lay just around the middle of the region that was experiencing the heatwave. It was not one that was geographically alienated from the sweltering heat which engulfed the green, scenic valley.

All around the school students could be seen sipping from cups and bottles of cool, rehydrating liquids. The amount of physical activity, usually witnessed during the luncheon interval, was visibly reduced. Many of the students sought shelter from the fierce heat by sitting quietly in the shaded areas around the school. Some walked slowly about, engaging in light conversation as opposed to vigorous activity. Still, though, a few others opted to indulge in their favourite sports, which they usually engaged in at this opportune time.

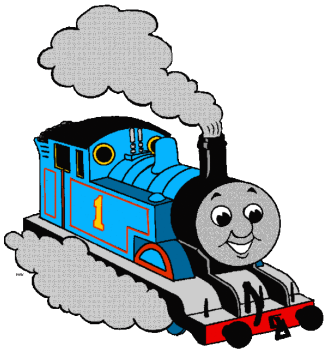
Barton sat with Dane and the two reminisced about the days when they were small, the games they played, and how they learned to tell time, mostly by their own discoveries. The two close friends laughed as they spoke about their early exploits from almost seven years ago. They laughed at the younger students jumping and running around, oblivious to the torment of the midday heat.

“Barton,” said Dane, “a thought has occurred to me. It is somewhat related to the lesson taught to us by Kwame a few days ago.”

“I’m all ears,” replied his comrade. “What thoughts are now revolving in that active head of yours?”

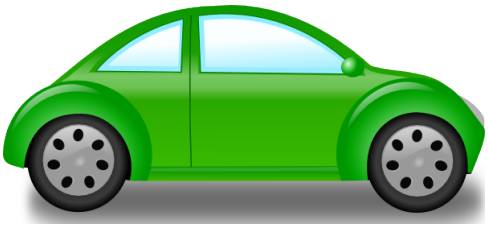
“Do you remember when Kwame spoke about **‘scale factor’**,” asked Dane?

“I most certainly do,” replied the remembering Barton. “It was the number of times that the linear dimensions such as length, width, and height of a smaller figure, is increased by, to obtain an enlarged figure.”

 x 4 =  SCALE FACTOR = 4

“Your memory is excellent, as usual, Barton,” complimented Dane.

“On that day we learned that the smaller figure is sometimes referred to as a reduction of the larger figure and the larger figure is an enlargement of the smaller figure,” he added.

REDUCTION  ENLARGEMENT 

“We certainly enjoyed Kwame’s great lesson that day, didn’t we,” said Barton rhetorically.

“We learned also that the area of the enlarged figure is the square of the scale factor multiplied by the area of the original figure.” Dane nodded.

“We also learned that the volume of the enlarged figure is the cube of the scale factor, times the volume of the original figure,” added Dane.

“So what are your thoughts as a consequence, Dane,” questioned Barton?

Dane looked at Barton and then looked around as though looking for any nearby spies. He shifted closer to Barton as though he was about to disclose a big secret or perhaps had made a world-changing discovery. His voice dropped to almost a whisper.

“Barton,” said Dane, “if I were to increase the linear dimensions of any smaller figure by, say five times, then the larger figure obtained, when compared to the smaller figure, will have the following properties:

(i) Its linear dimensions, such as length, width, and height will all be increased by 5, which is called the scale factor.
(ii) Its area will be increased by the square of 5, which is 5 x 5 = 25, and this is because the scale factor is 5. The area will always be times the square of the scale factor.
(iii) Its volume will be increased by the cube of 5, which is 5 x 5 x 5= 125 and so because 5 is the scale factor. The volume will always be times the cube of the scale factor.
(iv) The two figures, the smaller and the larger will have the same shape and differ only in their respective sizes.
(v) The two figures are called similar.”

“I am in full agreement with all that you have said so far, my good, old buddy”, replied Barton. “Full marks are awarded to you; five out of a possible five.”

But Dane it seemed was anxious to divulge a big secret or to announce a great discovery to his close friend. He did not seem to hear Barton’s compliment. Dane was too occupied with his thoughts.

“Barton,” he said, “if we had the linear dimensions of an enlarged figure and wanted to find the linear dimensions of the smaller figure, then, would we not be expected to do the reverse procedure?”

“Which is what,” questioned Barton?”

“We should be able to find the length, width, and height of the smaller figure by DIVIDING the length, width, and height of the larger figure, by the scale factor,” announced Dane.

Barton thought about this for a brief period.

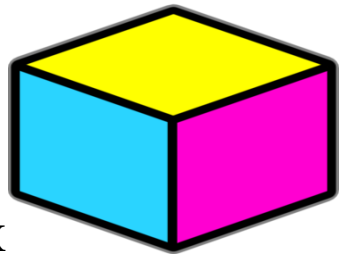
“You know something, Dane,” he remarked, “that makes logical sense. It is very easy to prove that you are right. I have seen it in my head.”

Barton pulled out his notebook and wrote:

The length of the smaller figure × the scale factor = length of the enlarged figure.

For example, if the length of a small box is 3 cm and the box is to be enlarged by a scale factor of 6, then the length of the enlarged box will be 3 cm × 6 = 18 cm.

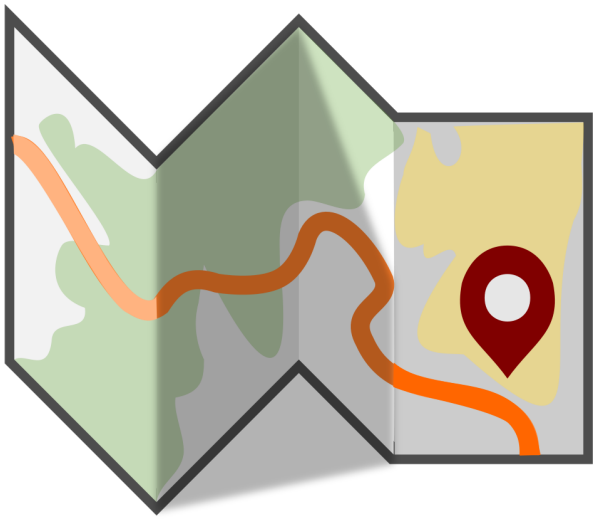
SMALL BOX 

ENLARGED BOX 

And now to find the length of the smaller box, if we were given the length of the larger box is 18 cm and the scale factor is 6, we reverse the procedure. This is done by dividing 18 cm by 6 to get 3 cm, which we know to be the correct length of the small box.

"Just as I thought," said Dane, looking at Barton's notes. "This is also quite true for measurements of widths and heights, that is, all linear dimensions," he added.

Dane pulled out a map from his pocket. He unfolded it and showed it to Barton.



“It’s a map of our town,” exclaimed Barton, “and it is a very recent one,” he shouted, pointing at the date printed at the top of the map.

The two little boys looked at the map and began to recognise many places on it. They located their school and saw the names of the streets. They recognised rivers and small lakes and could see the wooded areas of the countryside. Some of the buildings, like the hospital, the courthouse, the fire station, the major shopping malls and government offices, that were considered landmarks, were also clearly shown.

The two boys together admired the map and its details.

“I bought this map when I had just returned to this country,” explained Dane, “so that I could re-acquaint myself with the local places, which I would likely have forgotten.”

“Here’s the road that takes me from my house to school and here’s the road from my house to the main street in town,” exclaimed the rather excited Barton.

“Barton,” said Dane, pointing to the bottom of the map, “look and read this.”

At the bottom of the map was written in bold letters and numbers, **SCALE: 1 TO 500 000**

“Very interesting,” suggested Barton.

“Are you thinking what I am thinking,” asked Dane?

“I’m sure I am, replied Barton, laughing at the answer he gave to the question he got.

“A map is a reduced image of an actual place,” he said. “A map is a reduction of the real size of a place and it is of a smaller size which enables us to easily hold and look at it, conveniently keep and store it, and mostly to read off the information stored on it. This is all at our convenience.”

“I believe, Barton, the scale on the map is the scale factor that the actual place is reduced by so that the map can fit on the page,” suggested Dane.

“I do not doubt in my mind at all,” shouted Barton.

Dane was pleased that Barton agreed but looked on in anxiety as a small frown and then a smile came across his friend’s face.

“I can prove that this theory is correct,” said Barton, “and I can do so with you tomorrow.”