2.4 Estimation

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Preview

- In the previous sequence, *problem solving procedure* was presented and applied to two examples.

- In this sequence, the concept of *estimation* will be provided.

Estimation

- Engineers sometimes use *estimation* to avoid long and time consuming calculations.
- Estimating an answer is a quick way of finding the final answer to a problem.
- The estimated result should fall within a reasonable range of the actual answer.
- Engineers use experience, common sense, and knowledge to estimate answers.
- Estimation can become an intuition for experienced engineers.

Example 1

- Estimate the volume of a medium-sized four-door automobile.

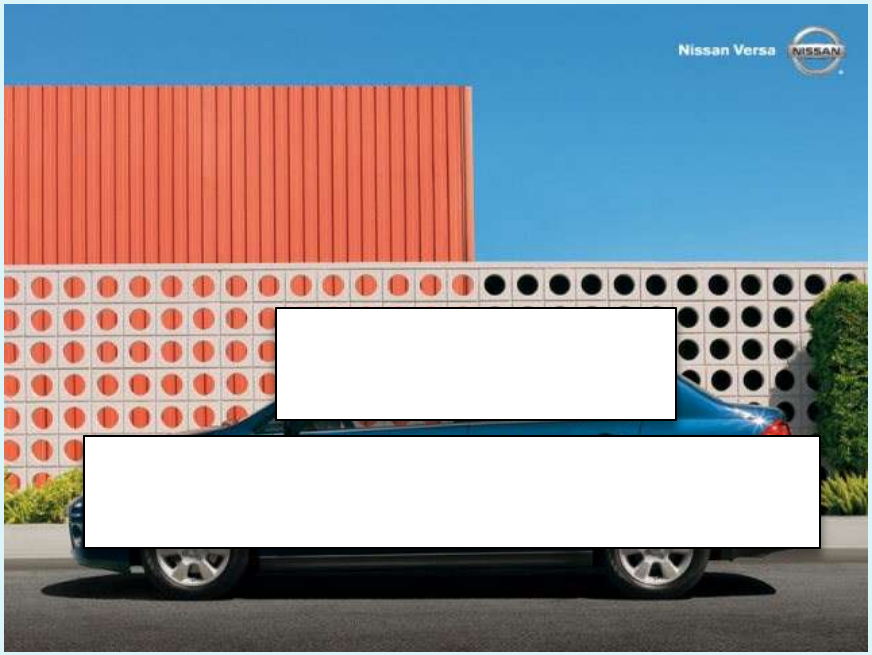
- How can I start to estimate the answer?
- I never measured the volume of a 4-door car!

Example 1

- Start with an image of the car in your head
- Draw the image down.

Example 1

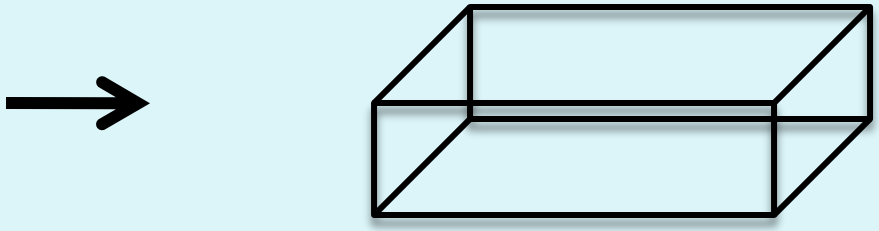
- Simplify the problem
- Partition the car into two parts
- Assume wheels are not included



Example 1

- Now we have two shapes
- Make shapes into 3-D

Part A

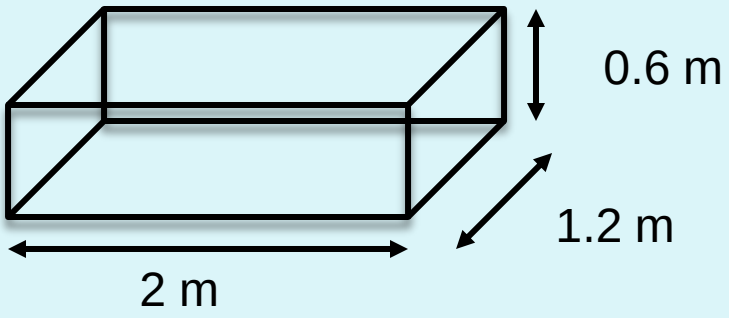


Part B

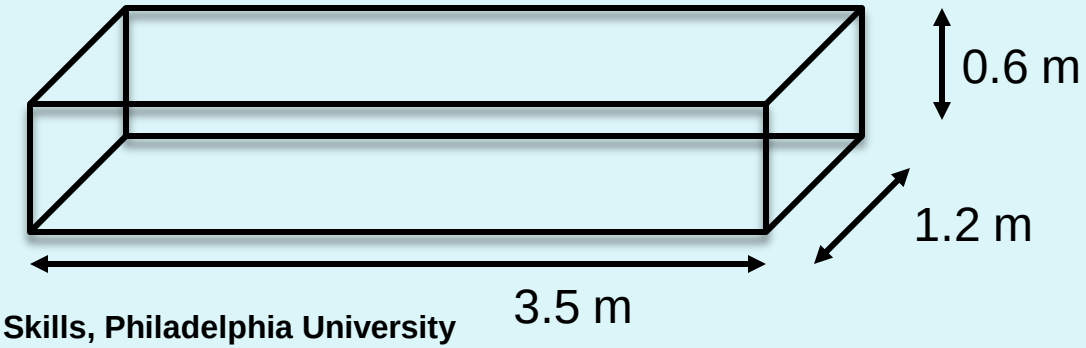
Example 1

- What are the dimensions of the two shape?
- Estimate!

Part A



Part B



Example 1

- Calculate the volume of each part

- Volume for A = 2 m x 1.2 m x 0.6 m = 1.44 m^3
- Volume for B = 3.5 m x 1.2 m x 0.6 m = 2.52 m^3

- Car volume = $V_A + V_B$
- =1.44 m^3 + 2.53 m^3 = 3.96 m^3

- Estimated volume is 4 m^3

Example 2

- Estimate the amount of gasoline consumed by automobiles in Jordan each year.

- How can I know that?
- Start with making reasonable assumptions

Example 2

- Assumptions:

- Population of Jordan is 5 million
- The car to people ratio is 1:20
- On average cars travel 15,000 km/ year
- On average the gas consumption is 150 km / 20 Ltr

Example 2

- Gasoline consumed is

$$Amt = (5{,}000{,}000\,\cancel{people})\left(\frac{1\,\cancel{car}}{20\,\cancel{people}}\right)\left(\frac{15{,}000\,\cancel{km}}{1\,\cancel{car}.year}\right)\left(\frac{20L}{150\,\cancel{km}}\right)$$

$$Amt = 500{,}000{,}000L / year$$

Conclusions

- Estimation is a fast way of finding an approximate solution to a problem

- Estimation is a skill that can be very useful for engineers