

P 5.7 (pg 1 of 2)

Scientific Notation - Accuracy and Precision Area and Volume

1. Put the following numbers into proper scientific notation.

- | | | |
|--------------|-------------------|-------------------------------|
| a 9,754 | c 0.000 000 065 8 | e 0.000 000 000 000 000 20 |
| b 0.000 0840 | d 30,710,000,000 | f 602,000,000,000,000,000,000 |

2. Put the following numbers back into standard notation.

- | | | |
|--------------------------|----------------------|--------------------------|
| a 3.56×10^{12} | c 6.99×10^5 | e 4×10^3 |
| b 2.040×10^{-9} | d 3×10^{-5} | f 8.075×10^{-4} |

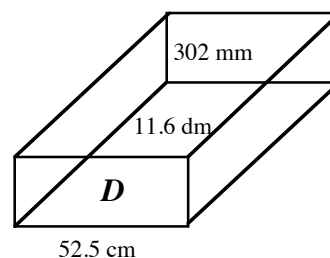
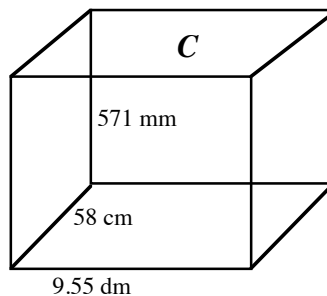
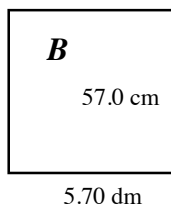
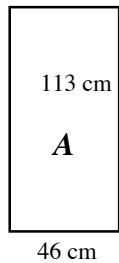
3. Make the following calculations, report the answer in scientific notation, and round off to the appropriate number of significant figures.

- | | |
|---|---|
| a $(4.59 \times 10^{-14}) * (3.1 \times 10^6) =$ | e $(5 \times 10^{-10}) * (6.07 \times 10^3) =$ |
| b $(7.08 \times 10^{-7}) / (8 \times 10^{-11}) =$ | f $(4.56 \times 10^{26}) / (6.02 \times 10^{23}) =$ |
| c $(2.303 \times 10^{23}) * (3.4 \times 10^{-4}) =$ | g $(7.80 \times 10^{-9}) * (5.3 \times 10^{-15}) =$ |
| d $(6.30 \times 10^{15}) / (3.02 \times 10^9) =$ | h $(4.3 \times 10^{31}) / (5.87 \times 10^{-5}) =$ |

4. A group of 5 state trooper recruits were on the side of the highway learning to use the radar devices. Their results for 4 different cars are listed below, with the car's speedometer listed in bold at the top. Comment on the accuracy and precision of their results. Do you notice any systematic errors?

| | car 1 | car 2 | car 3 | car 4 | |
|-------|--------------|--------------|--------------|--------------|---|
| | 46 | 55 | 74 | 82 | actual reading on speedometer in car |
| A | 27 | 55 | 73 | 58 | |
| B | 10 | 36 | 74 | 63 | |
| C | 29 | 54 | 72 | 95 | |
| D | 28 | 55 | 76 | 78 | |
| E | 27 | 56 | 74 | 113 | |
| ----- | | | | | |
| | 24.2 | 51.2 | 73.8 | 81.4 | average of the 5 radar readings |

5. Calculate the size of the squares and boxes below. Be careful of different units.
Be sure and put unit labels on your number answers. **NO NAKED NUMBERS!**
Hint: area = length x width volume = length x width x height



ANSWERS

1. a 9.754×10^3 c 6.58×10^{-8} e 2.0×10^{-16}
 b 8.40×10^{-5} d 3.071×10^{10} f 6.02×10^{23}
2. a 3,560,000,000,000 c 699,000 e 4,000
 b 0.000 000 002 040 d 0.00 003 f 0.000 807 5
3. a $1.4229 \times 10^{-7} \rightarrow 1.4 \times 10^{-7}$ (2 sf) e $3.035 \times 10^{-6} \rightarrow 3 \times 10^{-6}$ (1 sf)
 b $8.85 \times 10^3 \rightarrow 9 \times 10^3$ (1 sf) f $757.4750831 \rightarrow 757$ or 7.57×10^2 (3 sf)
 c $7.8302 \times 10^{19} \rightarrow 7.8 \times 10^{19}$ (2 sf) g $4.134 \times 10^{-23} \rightarrow 4.1 \times 10^{-23}$ (2 sf)
 d $2.086092715 \times 10^6 \rightarrow 2.09 \times 10^6$ (3 sf) h $7.325383305 \times 10^{35} \rightarrow 7.3 \times 10^{35}$ (2 sf)
4. for car 1 the average is not accurate but as a group the troopers are precise (except for trooper B)
 for car 2 the average is fairly accurate and as a group the troopers are precise (except for trooper B)
 for car 3 the average is both very precise and accurate (even trooper B seems to have gotten his act together)
 for car 4 the average is very accurate but as a group the troopers are not precise (nor are they accurate individually)
- Because 3 out of 4 of his radar readings are low, it appears as if trooper B was is making a systematic error.
 Because all of the results for car 1 are low, it appears if there is a systematic error. One might wonder if in fact it is the speedometer on the car could be 18 or 20 mph to high.
5. a $5,198 \text{ cm}^2 \rightarrow 5,200 \text{ cm}^2$ (2 sf) b $3249 \text{ cm}^2 \rightarrow 3,250 \text{ cm}^2$ or 32.5 dm^2 or (3 sf)
 c $316,276.9 \text{ cm}^3 \rightarrow 320,000 \text{ cm}^3$ or 320 dm^3 or $320,000,000 \text{ mm}^3$ (2 sf)
 d $183,918 \text{ cm}^3 \rightarrow 184,000 \text{ cm}^3$ or 184 dm^3 or $184,000,000 \text{ mm}^3$ (3sf)