

- 8) Understand common statistical terms. The **mean** is the mathematical average. The **median** is the 50th percentile, which is the middle value in the distribution of numbers when ranked in increasing order. The **mode** is the number that occurs most frequently in the distribution.
- 9) **Be comfortable working with negative numbers.** Going from -8 °C to +2 °C is a 10° change.
- 10) **Recognize units of area and volume, and be able to convert volumes.**
 1 m = ____ mm... answer → 1000
 1 m³ = ____ mm³ answer → 1³ m³ = 1000³ mm³ (10³)³ = 10⁹ mm³
 For area conversions, square the number, square the unit. For volume conversions, cube the number, cube the unit.
- 11) **Calculate percentages.** Example: 80/200 = 40/100 = 0.4 = 40%
- 12) **Put very large or very small numbers into scientific notation.**
 310,000,000 = 310 million = 310 x 10⁶ = 3.1 x 10⁸
 0.000 000 000 000 097 = 9.7 x 10⁻¹⁴
- 13) **Work scientific notation problems without a calculator.** Multiplication and division will be common. Multiplying numbers in scientific notation requires the exponents to be added. Dividing numbers in scientific notation requires exponents to be subtracted.
- 14) **Know growth rate calculations. Growth rate = [CRUDE BIRTH RATE + immigration] – [(CRUDE DEATH RATE + emigration)]** (see 2003 FRQ #2)
 CBR = crude birth rate = # births per 1000, per year
 CDR = crude death rate = # deaths per 1000, per year
(CBR – CDR) / 10 = percent change
- 15) **Calculate percent change:**
 a) The rate of change (**percent change**, growth rate) from one period to another =
 $[(V_{\text{present}} - V_{\text{past}}) / V_{\text{past}}] * 100$ (where V = value)
 b) **Annual rate of change:** take answer from step a) and divide by the number of years between past and present values
 Example: A particular city has a population of 800,000 in 1990 and a population of 1,500,000 in 2008. Find the growth rate of the population in this city:
 Growth Rate = (1,500,000 - 800,000) / 800,000 * 100 = 700,000/800,000 * 100 = 87.5%
 Average Annual Growth Rate = 87.5% / 18 years = 4.86 %
- 16) **Know the Rule of 70 to predict doubling time.**
Doubling time = 70 / annual growth rate (in %, not decimal!) Example: If a population is growing at a rate of 4%, the population will double in 17.5 years. (70 / 4 = 17.5)
- 17) **Calculate half-life.**
 $AMOUNT\ REMAINING = (ORIGINAL\ AMOUNT)(0.5)^x$
 where x = number of half-lives **x = time / half-life**
- 18) **Calculate pH using -log [H⁺].** Log₁₀ x = y and 10^y = x.
 Any pH problems are easily solved without a calculator. Remember that for every one-increment change in pH, the ions change by a factor of 10.
 Example: If [H⁺] is 10⁻⁶ M, the pH is 6 and the solution is a weak acid.
- 19) **Know that “per capita” means per person; per unit of population.**
- 20) **Graphing tips:** include a title and key; set consistent increments for axes; connect dots; interpolate and extrapolate; be comfortable with graphing by hand.