REVIEW SHEETS
INTRODUCTORY PHYSICAL SCIENCE
MATH 52

A Summary of Concepts Needed to be Successful in Mathematics

The following sheets list the key concepts which are taught in the specified math course. The sheets present concepts in the order they are taught and give examples of their use.

WHY THESE SHEETS ARE USEFUL –

- To help refresh your memory on old math skills you may have forgotten.

- To prepare for math placement test.

- To help you decide which math course is best for you.

HOW TO USE THESE SHEETS –

- Students who successfully review spend from four to five hours on this material. We recommend that you cover up the solutions to the examples and try working the problems one by one. Then, check your work by looking at the solution steps and the answer.

KEEP IN MIND –

- These sheets are not intended to be a short course. You should use them to simply help you determine at what skill level in math you should begin study. For many people, the key to success and enjoyment of learning math is in getting started at the right place. You will, most likely, be more satisfied and comfortable if you start onto the path of math and science by selecting the appropriate beginning stepping stone.
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Ask yourself the following questions to assess your own understanding of material covered in Math 52.
1. Am I comfortable with basic mathematics especially fractions, decimals, and percents? If not, perhaps I should consider math 20 as these are needed skills for everyday life as well as math and science courses.
Can I compare numbers in fraction, decimal, and percent notation? (See item # 13 for more.)
Do I know what percents, fractions, and decimals mean?
Do I know the basic equivalences among fractions, decimals and percents?
Can I compute by hand and with a calculator with fractions, decimals, and percent?
Do I know the values of powers of ten? For example, what is the decimal notation for 10_{-2} ?
2. Do I understand and can I use the metric system of measurement comfortably? For example:
Do I know which metric units are used for length, which ones are used for volume, and which ones are used for mass or weight? (Note: For a physics course do you know the difference between mass and weight?)
Can I measure in length with a metric ruler, volume with a metric beaker, and mass or weight on various kinds of scales?
Do I have an idea of the size of a meter, centimeter, millimeter, kilometer, gram, milligram, microgram, kilogram,

liter and milliliter?

Can I estimate lengths, volumes, and masses in metric units? (A new pencil is about ____ cm long. An average newborn baby is about ____ kilograms. A normal sized coffee cup holds about ___ milliliters.)

Do I have a sense of Celsius (Centigrade) temperatures? For example, would I wear a jacket if it is 20° C?

Do I recognize the abbreviations used for the metric system?

Do I know the value of metric prefixes like kilo, milli, centi, Mega, micro, nano, pico, and Giga?

Do I know equivalences in the metric system? For example:

1 L = ___ mL   1 mcg = _____ g   1 cm = _____ mm

Do I know how 1 mL, 1 cc, and 1 cm^3 relate?

3. Do I understand and can I use the American Standard measurement system comfortably? For example:

Do I know the abbreviations for the American Standard measurement system?

Do I know equivalences? For example:

1 ft = ___ in, 1 mi = ____ ft, 1 qt = ____ pt, 1 min = _____ sec, 1 lb = ___oz

Do I know common equivalences between the metric system and the American Standard system?

1 kg = ___ lb 1 in = _____ cm 1 quart = _____ mL

4. Can I do unit conversions within each system and between the two systems? For example:
Can I use the method of unit analysis (dimensional analysis) to change units? Can I fill in the "fraction" conversions with the correct numbers and measurement units to change 3600 gal/hr to c/sec?

$$\frac{3600gal}{1hr} \times \frac{}{gal} \times \frac{}{qt} \times \frac{}{pt} \times \frac{}{min} \times \frac{}{sec} =$$

Can I use the above method to change 2.5 feet to centimeters?

Can I use the above method to change 4.65 gal per min to mL per sec?

Can I use the methods of ratio and proportion to change units?

5. Can I add, subtract, multiply, and divide positive and negative numbers with and without a calculator?
A. -2 – 5 =   B. (-5)(-3)=   C. -10—3=   D. $\dfrac{30}{-5}$ E. $\dfrac{-12+(-4)(2)}{-5} =$

6. Can I interpret and compute with scientific notation?

Can I convert decimal notation to scientific notation and vice versa?

As a decimal $5.62 \times 10^{-5} =$ _____

In scientific notation, 62,500,000 = _____

When a number is in scientific notation can I tell if the number is a large number or a small number?

When two numbers are in scientific notation, can I tell which one is greater and do I have some idea of how much greater one is than the other?

Can I do problems like this by hand giving the answer in scientific notation?

A. $(3.5 \times 10^8) \times (4.0 \times 10^{-12}) =$ B. $\dfrac{2.5 \times 10^{-7}}{5.0 \times 10^{-15}} =$

Can I do the above problems with a calculator?

7. Can I interpret and compute with approximate numbers?

Do I know the different meanings of 4 m, 4.0 m, 4.00 m?

Can I round decimal numbers to a given place?

Can I count the number of significant digits (figures) in measurements?

0.0705 m has _____ significant digits

6450.0 m has _____ significant digits

7.00 x 10 –5 m has _____significant digits

Do I understand in a science class why the answer to 5.4 m + 17.26 m is rounded to 22.7 m?

Do I understand in a science class why the answer to (5.4 m)(17.26 m) is rounded to 93 sq. m.?

8. Can I use ideas of ratio and proportion comfortably?

Do I know what it means for quantities to stay in the same ratio?

Can I solve a proportion for a given unknown?

For example, solve this proportion for "P":
$$\dfrac{(3.5)(7.8)}{125.8} = \dfrac{16.5P}{8.2}$$

Do I know the difference between direct and inverse proportionality?

Do I know how to set up a proportion that will solve a word problem?

9. Can I compute with units when they are squared or cubed?

Can I calculate the equivalences for these? $1\,ft^2 =$ _____in^2 $1m^2 =$ _____cm^2

Can I take a linear equivalence and change it to an equivalence for cubic units?

        $1mm = 10^{-3}m$ means $1mm^3 =$ _____m^3

Can I change $\dfrac{1.2g}{cm^3}$ to $\dfrac{kg}{m^3}$?

10. Do I know how to handle units (labels) in many different types of situations? For example:

Can I simplify expressions like these and come out with the correct number and the correct units for the answer?

A. $\dfrac{(12m+8m)(6m^2)}{(4m)(3\sec)} =$

B. $\dfrac{42mph}{7h} =$

11. Can I interpret graphs that others have made and can I make graphs of my own?

Can I obtain data from graphs? For example: given a graph showing height versus age, can I read the height for a specific age and can I read an age given a specific height?

Can I find the slope of the graph at a particular age? Do I understand that slope has both a numeric value and units (labels)?

Can I look at a graph and draw conclusions like, "As time increased, first the temperature increased rapidly then leveled off and stayed stable."

Can I make a graph out of data I have collected? (For example: heights of children versus ages.)

12. Can I use and compute with logarithms? For example:

Do I know roughly what it means to ask for the logarithm of a number?

Can I determine some specific logarithms by inspection? $\log 1000 =$ ___, $\log 10^{2.5} =$

Do I know why logarithms are used to describe phenomena like earthquakes, loudness, brightness, and acidity?

If I know the log M = 2.5937 and log N = 4.5937, do I know how M and N relate?

With a calculator can I find these? $\log 623.5 =$ _____ $\log = \log(9.4 \times 10^{-16}) =$ _____
Can I roughly estimate the logarithms of numbers without using a calculator?

log 84900 is between ___ and ____

$\log \log(6.2 \times 10^{-16})$ is between ____ and ____

13. Can I use percents comfortably to solve problems?

Can I compute the answers to percent problems?

36 is 18% of what number?

Can I solve word problems involving percents?

If 27% of a substance by mass is water, and a sample of the substance contains 43.0 grams of water, what is the mass of the sample?

Can I solve percent increase and decrease problems?

A piece of elastic is stretched 28% to an increased length 35.0 cm? What was the original length? (The answer is not 25.2 cm but 27.3 cm.)

14. Can I evaluate formulas including units (labels)? For example:

Evaluate this formula for A if h = 3.4m, b₁ = 2.6m and b₂ = 1.8m

$$A = \frac{1}{2}h(b_1 + b_2)$$

Can I use the various Celsius / Fahrenheit formulas to convert from one scale to the other?

$$1.8C = F - 32 \qquad C = \frac{5(F-32)}{9} \qquad F = \frac{9}{5}C + 32$$

15. Can I solve simple equations for an unknown? For example:

Solve for N: $12.4 - N = 6.8$ $\frac{4.5}{N} = 2.4$ $M = \frac{2}{5}(N-8)$

It might be a good idea to share this self assessment with the instructor of your next science class. This self assessment is not a substitute for the placement test. The actual placement test can be taken in Building 1 in the Testing office.

Try these questions as a review for the math 52 placement test.

1] If 83% of a substance by mass is water and a sample of the substance contains 52 grams of water, what is the mass of the sample?

2] Simplify this conversion. Write the answer with the correct labels.

$$\frac{2.3 \times 10^4 \, kg}{1} \times \frac{1g}{10^{-3} \, kg} \times \frac{10^2 \, cg}{1g} =$$

3] Solve using the unit or dimensional analysis process.

   40 ft/ sec equals how many mi per hour?

4] How many significant digits are in each of the following:

   A. 0.0070 _____ B. 905.0 _____ C. 3.4 x 10₄ _____

5] Calculate the following:

   A. $\log 528 =$ _____   B. $\log(5.4 \times 10^{-13}) =$ _____   C. $\log 10^{6.3} =$ _____

6] Fill in the blanks.

   A. 1 cm = _____mm

   B. 450 grams = _____ kg

C. one c is about _____ mL

7] A. What is the distance in cm of your hand span from tip of thumb to tip of small finger when the hand is stretched out?

   B. About how many milliliters are in half a cup?

8] Do these computations by hand.

   A. 12 + -8 =   B. -4 – (-9) =

   C. (-5)(-6) =   D. -40/8 =

9] Write a whole number, decimal, or fraction equal to each of the following:

   A. 10^{-3} =   B. 10^4 =   C. $10^{1.2}$

10] Write these numbers in scientific notation.

   A. 74,300,000 =   B. 0.000329 =   C. 562.4 =

11] Do these computations by hand. Write the answer in scientific notation with the correct significant figures.

   A. $\left(8\times10^{-8}\right)\left(5\times10^{-12}\right)=$

   B. $\left(9.0\times10^{-20}\right)\div\left(3.6\times10^{-9}\right)=$

12] Solve this proportion for P. $\dfrac{(3.5\times7.8)}{136.4}=\dfrac{15.8P}{9.3}$

Solution to review for math 52 placement test:

1] 63 g

2] $2.3\times10^9\,cg$

3] $\dfrac{40\,ft}{1\,sec}\times\dfrac{60\,\sec}{1\,min}\times\dfrac{60\,min}{1\,hr}\times\dfrac{1\,mi}{5280\,ft}=\dfrac{27\,mi}{1\,hr}$

4] A. 2   B. 4   C. 2

5] A. 2.7226   B. -12.2676   C. 6.3

6] A.10 mm   B. 0.450 kg   C.240 mL

7] A. 20 cm   B. 120 mL

8] A. 4   B. 5   C. 30   D. -5

9] A. 1000   B. 0.0001 or 1/10,000   C. 0.0631

10] A. 7.43×10^7 B. 3.29×10^{-4} C. 5.624×10^2

11] A. 4×10^{-19} B. 2.5×10^{-11}

12] P = 0.12