

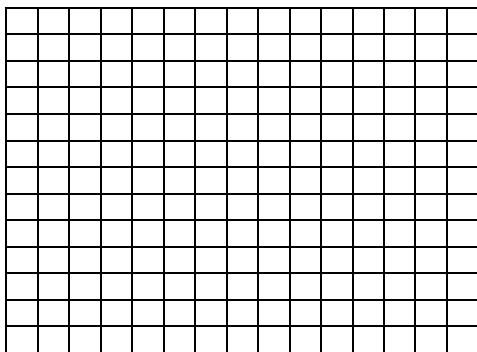
MATHEMATICS ASSESSMENT FOR CHEMISTRY AND PHYSICS INFORMATION SHEET



- ❑ As a student in INCHEM 111 or INPHYS 141, you will be required to take a mathematics assessment exam to evaluate your math skills.
- ❑ The assessment exam consists of the following seven sections:
 - Fractions, Decimals and Percents
 - Scientific Notation, Order of Operations, and Significant Digits
 - Formulas and Ratios and Proportions
 - Solving Equations (linear and quadratic)
 - SI Units and Conversions
 - Logarithms
 - Graphing and Trigonometry
- ❑ The first 6 sections contain 6 multiple choice questions. The questions for the last section on graphing and trigonometry are not multiple-choice.
- ❑ You will need to bring a scientific or graphing calculator with you when you take the assessment exam.
- ❑ You will receive the results of the assessment as soon as possible. At that time, you will be advised if you need to seek tutoring help at the Math Center or if you need to take a mathematics course before taking INCHEM 111 or INPHYS 141.
- ❑ If you have any questions regarding this assessment exam, please contact Eileen Phillips, Director of the Math Center, at ephillip@keene.edu or at 358-2387.
- ❑ The following pages include sample questions and solutions to problems similar to those you will find on the assessment exam. It is in your best interest to do these problems and seek help if you are having trouble agreeing with the correct answer. Tutors are available at The Math Center, 88 Winchester St., room 101. For specific tutoring times visit www.keene.edu/mathctr or call (603) 358-2023.

**SAMPLE QUESTIONS FOR THE
MATHEMATICS ASSESSMENT FOR CHEMISTRY AND PHYSICS**

- 1) Express the answer in lowest terms: $4\frac{2}{5} - 3\frac{1}{2}$
- 2) Convert $\frac{7}{13}$ to a decimal rounded to the nearest hundredth.
- 3) What is 120% of 1435?
- 4) Use the order of operations to simplify: $5.6 - 2(7.3 + 8.2)$
- 5) Divide and express the answer in scientific notation: $\frac{5.36 \times 10^{-15}}{2.07 \times 10^{-4}}$
- 6) Write the product with the correct number of significant digits: $(5.03)(0.08)$
- 7) In a solution of water and alcohol, the ratio of water to alcohol is 4 to 1. If there are 35 liters of the solution, how many liters of water are there?
- 8) Given $D = RT$, find T when $R = 55$ mph and $D = 385$ miles. Be sure to include proper units.
- 9) Given $F = \frac{9}{5}C + 32$, find C when $F = 68^\circ$.
- 10) Solve each of the following equations for the indicated variable.
 - a) for x: $7 - 4x = -28$
 - b) for x: $z = \frac{x - y}{3}$
 - c) for D: $A = kD + A_t$
 - d) for x: $4x^2 - 7 = 9$
- 11) Use the grid below to graph $y = -\frac{1}{2}x + 3$.



ANSWERS

Worked out solutions can be found below these answers.

- 1) $\frac{9}{10}$ 2) 0.54 3) 1722 4) -25.4 5) 2.59×10^{-11}
- 6) 0.4 7) 28L 8) 7 hours 9) $C = 20^\circ$
- 10) a) $x = \frac{35}{4} = 8\frac{3}{4} = 8.75$ b) $x = 3z + y$ c) $D = \frac{A - A_t}{k}$ d) $x = \pm 2$
- 11) 3 points on the graph would be, (-2, 4), (0, 3), (2, 2)
- 12) a) $x = 61.6$ b) $x = 1.35$ 13) $1 \text{ mg} = 10^{-6} \text{ kg} = 10^{-3} \text{ g} = 10^3 \mu\text{g} = 10^9 \text{ pg}$
- 14) 12 oz = 355 mL 15) 36.7 ft/sec 16) $200 \frac{\text{mg}}{\text{mL}}$ 17) 10.204 seconds
- 18) 67.4° 19) 9 miles

SOLUTIONS

- 1) $4\frac{2}{5} = 4\frac{4}{10} = 3\frac{14}{10}$
 $-3\frac{1}{2} = -3\frac{5}{10} = -3\frac{5}{10}$
 $\frac{9}{10}$
- 2) $\frac{7}{13} = 7 \div 13 = 0.538 = 0.54$
- 3) $n = 1.20 \bullet 1435$
 $n = 1722$
- 4) $5.6 - 2(7.3 + 8.2) = 5.6 - 2(15.5) = 5.6 - 31 = -25.4$
- 5) Use the EE or EXP key on your calculator to type in each scientific number:
 $5.36 \text{ EE } -15 / 2.07 \text{ EE } -4 = 2.59 \times 10^{-11}$
- 6) $(5.03)(0.08) = 0.4024 = 0.4$
Since 5.03 has 3 significant digits and 0.08 has 1 significant digit, the answer needs to have 1 significant digit.

7) Total solution is 5, so we get the proportion:

$$\frac{4 \text{ water}}{5 \text{ solution}} = \frac{x \text{ water}}{35 \text{ solution}}$$

$$5x = 35(4)$$

There are 28 L of water in the 35 L solution.

$$5x = 140$$

$$x = 28$$

$$D = RT$$

8) $385 = 55T$ Time would equal 7 hours.

$$T = 7$$

$$F = \frac{9}{5}C + 32$$

9) $68 = \frac{9}{5}C + 32$ C would equal 20° .

$$\frac{5}{9} \cdot 36 = \frac{9}{5}C \cdot \frac{5}{9}$$

$$20 = C$$

$$7 - 4x = -28$$

10) a) $-4x = -35$

$$x = 8.75$$

$$3 \cdot z = \frac{x - y}{3} \cdot 3$$

b) $3z = x - y$

$$x = y + 3z$$

$$A = kD + A_t$$

$$\frac{-A_t}{k} = \frac{-A_t}{k}$$

10) c) $\frac{A - A_t}{k} = \frac{kD}{k}$

$$D = \frac{A - A_t}{k}$$

$$4x^2 - 7 = 9$$

d) $4x^2 = 16$

$$x^2 = 4$$

$$x = \pm 2$$

11) Since the equation of the line is $y = \frac{-1}{2}x + 3$, then the slope is $\frac{-1}{2}$ and the y-intercept is 3. On the graph, plot (0,3) for the y-intercept. From that point, use the slope and go down 1 and over to the right 2 and plot (2,2). At (2,2), go down 1 and over to the right 2 and plot (4,1). You can also go in the reverse order and from (0,3) go up 1 and to the left 2 and plot (-2, 4).

12) a) To solve a logarithmic equation, you need to write it in exponential form.

$$\ln x = 4.12 \text{ so that means the base is } e, \text{ the exponent is } 4.12 \text{ and it equals } x: \quad e^{4.12} = x$$
$$x = 61.6$$

12) b) To solve an exponential equation, you need to take the log of both sides.

$$10^x = 22.4$$
$$\log 10^x = \log 22.4 \quad (\text{Recall that } \log 10^x = x.)$$
$$x = \log 22.4$$
$$x = 1.35$$

For #13 – 16, the unit fraction method is used to convert units.

$$1 \text{ mg} \times \frac{1 \text{ g}}{1000 \text{ mg}} = 0.001 \text{ g} = 10^{-3} \text{ g}$$

$$0.001 \text{ g} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 0.000001 \text{ kg} = 10^{-6} \text{ kg}$$

13)

$$1 \text{ mg} \times \frac{1000 \mu\text{g}}{1 \text{ mg}} = 1000 \mu\text{g} = 10^3 \mu\text{g}$$

$$1000 \mu\text{g} \times \frac{1,000,000 \text{ pg}}{1 \mu\text{g}} = 1,000,000,000 \text{ pg} = 10^9 \text{ pg}$$

14) An appropriate metric unit for ounces would be milliliters.

$$12 \text{ oz} \times \frac{1 \text{ pt}}{16 \text{ oz}} \times \frac{1 \text{ qt}}{2 \text{ pt}} \times \frac{1 \text{ L}}{1.057 \text{ qt}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = \frac{12000 \text{ mL}}{33.824} = 354.778 \text{ mL} = 355 \text{ mL}$$

$$15) \quad \frac{25 \text{ mi}}{1 \text{ hr}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ sec}} = \frac{132000 \text{ ft}}{3600 \text{ sec}} = 36.7 \text{ ft/sec}$$

$$16) \quad \frac{0.20 \text{ g}}{1 \text{ mL}} \times \frac{1000 \text{ mg}}{1 \text{ g}} = \frac{200 \text{ mg}}{1 \text{ mL}} = 200 \text{ mg/mL}$$

$$17) \quad \begin{array}{ll} h = -4.9t^2 + 50t & h = 0 \\ 0 = -4.9t^2 + 50t & a = -4.9 \quad b = 50 \quad c = 0 \end{array}$$

$$t = \frac{-50 \pm \sqrt{50^2 - 4(-4.9)(0)}}{2(-4.9)}$$

$$= \frac{-50 \pm \sqrt{2500}}{-9.8}$$

$$= \frac{-50 \pm 50}{-9.8}$$

$$t = \frac{-50 + 50}{-9.8} = 0 \quad t = \frac{-50 - 50}{-9.8} = \frac{-100}{-9.8} = 10.204$$

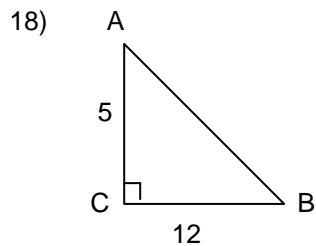
It will take the projectile 10.204 seconds to hit the ground.

For #18 and 19, recall that

$$\sin A = \frac{\text{side opposite to } \angle A}{\text{hypotenuse}}$$

$$\cos A = \frac{\text{side adjacent to } \angle A}{\text{hypotenuse}}$$

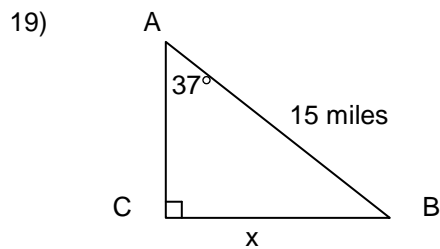
$$\tan A = \frac{\text{side opposite to } \angle A}{\text{side adjacent to } \angle A}$$



$$\tan A = \frac{12}{5}$$

$$A = \tan^{-1}\left(\frac{12}{5}\right)$$

$$A = 67.4^\circ$$



$$\sin 37^\circ = \frac{x}{15}$$

$$15 \sin 37^\circ = x$$

$$x = 9 \text{ miles}$$