QUESTIONS

MATH PRACTICE PROBLEMS FOR NON-TECHNICAL MAJORS

DOE "MATHEMATICS" VOLUME 1 of 2

FRACTIONS

Perform the indicated operations. Leave all answers in reduced fractional form.

1. $\dfrac{\frac{4}{21}}{\frac{30}{84}} + 3\frac{1}{2} - \frac{13}{2}$

2. $-10\frac{2}{7} + 16\frac{17}{68} - 7\frac{18}{33}$

3. $\dfrac{6}{(x+2)(x-2)} + \dfrac{2}{(x-2)}$

EXPONENTS

Simplify the following:

1. $8 \cdot 3^{2x} + 9^{x}$

2. $15^{y-1} \cdot 3^{1-y}$

3. $\dfrac{x^{-4}yz^{-2}}{x^{-5}y^{-3}z^{3}}$

4. $\left(\dfrac{x^{-1}y^{-2}-x^{-3}}{x^{-3}y^{-1}-x^{-2}y^{-2}}\right)^{-2}$

SCIENTIFIC NOTATION

Perform the indicated operations. Place all answers in scientific notation and round to **5** significant figures.

1. $212755 + 63713473$

2. $.0000006876250 \times 7.114499$

3. $.0007800491 \times 10^{-4} \div 4107063$

ALGEBRAIC LAWS

Expand the following, and simplify.

1. $2a + 5a(ab - 4) - 3ab(a + 3)$

2. $\dfrac{a\left[a+\left(b+c\right)\right]bc}{abc+b^{2}c+c^{2}b}$

LINEAR EQUATIONS

Solve for x.

1. $a = \frac{b - cx}{2 - x}$

2. $\frac{3x}{4} - \frac{1}{7}(3x + 5) = 14$

3. $\frac{1}{3x} + \frac{1}{x + 2} = \frac{1}{3x^2 + 6x}$

4. $\frac{2x+5}{4x+1} = \frac{x-2}{2x-1}$

QUADRATIC EQUATIONS

Find the roots.

1. $x^2 - 8x + 16 = 0$

2. $13x - 3 = 4x^2 + 4x$

SIMULTANEOUS EQUATIONS

Solve the following simultaneous equations for both x and y:

1. $3y - 2x = 4, \quad y + 2x = 0$

2. $y = ax + bx, \qquad y = cx + d$

WORD PROBLEMS

1. If a consumer is billed $210 for 1500 kilowatt-hours of electrical use, what consumption would result in a bill of $125? Assume a direct proportion between amount of the bill and consumption.

2. A submarine leaves Pearl Harbor, heading for Bangor, Washington. At the same time, another submarine leaves San Diego, heading for Bangor. If the submarine leaving Pearl Harbor travels twice as fast as the submarine leaving San Diego, and takes 14 days to get to Bangor, how long will it take the other submarine to arrive? (For simplicity, assume that the distance from Bangor to Pearl Harbor is three times the distance from Bangor to San Diego.)

LOGARITHMS

Solve for x.

1. $10^x = 2$

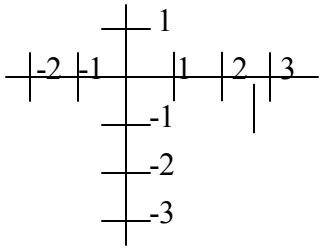
2. $6^x = 4$

3. $e^x = a + b$

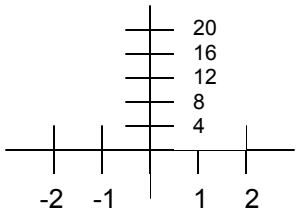
GRAPHING

Graph the following as y=f(x).

1. $x = 3y + 5$ for $-2 \le x \le 3$



2. $y = (2x)^2 + 3^2 - 5$ for $-2 \le x \le 2$



INTERPOLATION AND EXTRAPOLATION

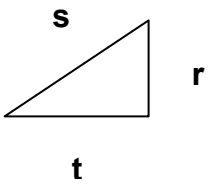
1. **In GRAPHING problem 1 above, extrapolate the value of x at y=0.**

2. **In GRAPHING problem 2 above, interpolate the value of y at x=1.5**

DOE "MATHEMATICS" VOLUME 2 of 2

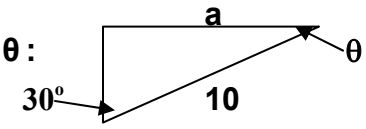
PYTHAGOREAN THEOREM

1. r = 4, s = 7, t = ?
Solve for t.



TRIGONOMETRIC FUNCTIONS

1. 1. Find a and cos θ :



2. What is θ above?

RADIANS

1. **Change $90°$ to radians.**

2. **Change $\frac{3\pi}{2}$ to degrees.**

IMAGINARY AND COMPLEX NUMBERS

1. **Solve for the roots of y: $3y^2 = y - 2$**

2. **Find $Z_T = \frac{Z_1 Z_2}{Z_1 + Z_2} + Z_3$, where $Z_1 = 3 + 2i$, $Z_2 = 4 - i$, and $Z_3 = 2i$**