Due: ________

PreAP Math Review Homework

You cannot use a calculator on the math quiz, so do each problem without the calculator first, then check yourself.

Scientific Notation $1.2\bullet10^3 = 1.2\times10^3 = 1.2\times1000 = 1{,}200$ $\quad 6.1\times10^{-3} = 6.1\times\frac{1}{10^3} = 6.1\times\frac{1}{1000} = \frac{6.1}{1000} = 0.0061$

5.41022×10^5 in standard notation is 541,022
2.089×10^{-4} in standard notation is 0.0002089

341.5×10^4 is wrong *correct is: 3.415×10^6*

1. Write the following numbers in scientific notation.
   A. * 12,756 km (*diameter of the earth*) =
   B. 0.082 =
   C. 702,000,000 =
   D. 0.0000000000000000000000000266 kg = (*mass of an oxygen atom*) [this why we like scientific notation]

2. Write out these numbers in standard notation.
   A. * $5.902\text{x}10^{-4}$ =
   B. $3\text{x}10^8$ m/s (*the speed of light*) =
   C. $9.11\text{x}10^{-31}$ kg (*the mass of an electron*) =

3. In scientific notation 18.3×10^4 is incorrect. It should be written as:

Fractions *(study the following examples):*

Ex. 1: $8\left(\frac{4}{2}\right) = \frac{8}{1}\left(\frac{4}{2}\right) = 8\times4\div2$ $\quad OR \quad \frac{8}{1}\left(\frac{4}{2}\right) = \frac{32}{2} = 16$

$\frac{24}{2(6)} = \frac{24}{12} = 2 \quad OR \quad 24\div2\div6 = 2$

Ex. 2: $\frac{\left(\frac{12}{3}\right)}{\left(\frac{2}{6}\right)} = \frac{12}{3}\left(\frac{6}{2}\right) = \frac{12}{3}\left(\frac{3}{1}\right) \quad OR \quad = \frac{12}{1}\left(\frac{2}{2}\right) = 12$ *Hmmmm... remember multiplying by the reciprocal?*

Ex. 3: $\frac{1}{6}+\frac{2}{5} = \frac{5(1)}{5(6)}+\frac{6(2)}{6(5)} = \frac{5+12}{30} = \frac{17}{30}$ *O, yeah! Common denominator! Right!*

Ex. 4: *Separate and simplify:* $\frac{4+3}{2} = \frac{4}{2}+\frac{3}{2} = 2+\frac{3}{2}$

4. Simplify: A. $6\left(\frac{5}{2}\right) =$ B. $\frac{1}{r}+\frac{1}{t} =$ C. * $\frac{\left(\frac{y}{t}\right)}{\left(\frac{yt}{p}\right)} =$

   D. $\frac{5+3x}{x} =$

Exponents: *$x^0 = 1$; Using the carat key (^) you can prove this on your calculator: $5^0 = 1$ and $8^0 = 1$.*
Exponents in fractions: $1/(x^{-2}) = x^2$ And: $x^{-6} = 1/(x^6)$ for proof, see the scientific notation examples at the very top.
Multiplying exponents: $x^4x^6 = x^{10}$ Proof: $(10^2)(10^3) = 100(1000) = 100{,}000 = 10^5$
Exponents of exponents: $(x^4)^6 = x^{24}$ Proof: $(10^2)^3 = (10^2)(10^2)(10^2) = 100(100)(100) = 1{,}000{,}000$ (6 zeroes) $= 10^6$

5. Simplify: A. * $t^{-2}t^6 =$ B. $q^8q^4/q^{-3} =$ C. * $(a^6)^{1/2} =$ D. $\left((c^2)^{-4}\right)^{1/2} =$

Simultaneous equations*: If there are two variables you can solve only if there are two equations. (Graphically, you are finding the intersection between two functions.)* *Example:* $2x+3y=4$ and $x-2y=-5$

Way 1: solve for one of the variables in either equation: $x = 2y-5$; then substitute into the OTHER equation: $2x+3y=4$ so: $2(2y-5)+3y=4$

$$4y-10+3y=4$$
$$7y-10=4$$
$$7y=14$$
$$y=2$$

Now substitute your known value into either equation.

$$2x+3(2)=4$$
$$2x+6=4$$
$$2x=-2$$
$$x=-1$$

Way 2: subtract one equation from the other. You may have to multiply one of the equations by a number so that one of the variables can be eliminated.

Multiply the second equation by -2: $-2(x-2y=-5)$ becomes $-2x+4y=10$

$$\begin{array}{r} 2x+3y=4 \\ -\ \ 2x+4y=10 \\ \hline 7y=14 \\ y=2 \end{array}$$

Then solve for the other variable as shown above.

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6. * $4x - 10y = 2$ and $3x + 5y = 14$. Solve for x and y.

Basic Algebra:

Given: $I = \frac{Q}{t}$ solve for t

1) Multiply by t: $I(t) = \frac{Q}{t}(t)$

2) Now: $It = Q$

3) Divide by I: $\frac{It}{I} = \frac{Q}{I}$

4) $t = \frac{Q}{I}$

Proof: $4 = \frac{12}{3}$, so $4(3) = 12$ and $3 = \frac{12}{4}$ *Just cross-multiply.*

7. * If $\frac{x+y}{F} = \frac{1}{t}$ then $t =$

8. If $\frac{a}{b} = \frac{c}{d}$ then $d =$

9. * $I = \frac{P}{4\pi r^2}$ *then* r =

(*see help at right*)

10. $T_{spring} = 2\pi\sqrt{\frac{m}{k}}$ Solve for k:

Squares and square roots:

$4^2 = 4(4) = 16$ so, $\sqrt{16} = 4$

likewise: $x(x) = x^2$ so, $\sqrt{x^2} = x$

Given: $v_f^2 = v_i^2 + 2a\Delta x$ solve for v_i

Isolate the variable: $v_f^2 - 2a\Delta x = v_i^2$

Take the square root: $v_i = \sqrt{v_f^2 - 2a\Delta x}$

And you can't just take out the v_f^2.

Getting rid of decimals:
Multiply by a number to remove the decimal.

Ex. 1: $(0.\overline{33})x = 2$
multiply by 3
$1x = 6$ so, $x = 6$

Ex. 2: $\frac{0.5}{30} = \frac{0.2}{x}$ solve for x
multiply both sides by 10:
so, $\frac{5}{30} = \frac{2}{x}$

cross multiply:
$5x = 60$
$x = 12$

11. * Solve for t: $\frac{0.25t}{3} = 2$

12. Simplify: $\frac{(9\times10^{-9})(5\times10^{3})}{(4.5\times10^{-5})} =$

(Additional hint: see the very first example. The 10^x parts don't have to stay attached to their numbers.)

Answers to asterisks:

6) x = 3; y = 1 7) t = F/(x+y)

9) $r^2 = \frac{P}{4\pi I}$ so $r = \sqrt{\frac{P}{4\pi I}}$

1A) 1.2756×10^4 km 2A) 0.0005902 $\left(\frac{y}{t}\right)\left(\frac{p}{yt}\right) = \frac{p}{t^2}$ 4C) 5A) t^4 5C) a^3

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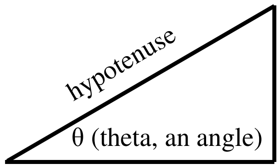
Trigonometry relates the following 4 quantities.



Trig formulas:

$\text{Sin } \theta = \dfrac{\text{opp}}{\text{hyp}}$

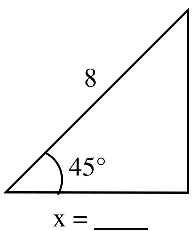
$\text{Cos } \theta = \dfrac{\text{adj}}{\text{hyp}}$

$\text{Tan } \theta = \dfrac{\text{opp}}{\text{adj}}$

The ratios of common angles:

	0°	30°	37°	45°	53°	60°	90°
sinθ	0	1/2	3/5	$\sqrt{2}/2$	4/5	$\sqrt{3}/2$	1
cosθ	1	$\sqrt{3}/2$	4/5	$\sqrt{2}/2$	3/5	1/2	0
tanθ	0	$\sqrt{3}/3$	3/4	1	4/3	$3/\sqrt{3}$	∞

Ex1: Solve for x.



Step 1: Assign variables:
hypo = 8
θ = 45°
adjacent = x

Step 2: Pick a formula:
hypo, θ, and adj is cos.
cosθ = adj/hypo

Step 3: Put in #'s + solve:

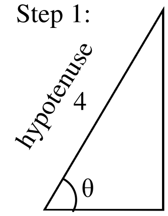
$\text{Cos } \theta = \dfrac{\text{adj}}{\text{hyp}}$

$\dfrac{\sqrt{2}}{2} = \dfrac{x}{8}$ cross-multiple

$\dfrac{8\sqrt{2}}{2} = x$, so $x = 4\sqrt{2}$

Ex2: Solve for θ.

Step 1:



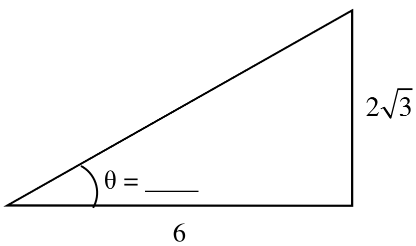
Step 2: hypo, opp, and θ is sin

Step 3: $\sin \theta = \dfrac{\text{opp}}{\text{hyp}} = \dfrac{3}{4}$

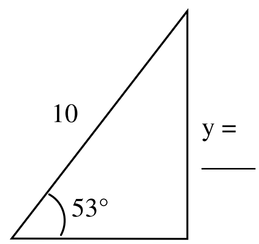
3/4 is not in table, so take $\sqrt{\ }$

$\sin \theta = \sqrt{\dfrac{3}{4}} = \dfrac{\sqrt{3}}{2}$ so $\theta = 60°$

13. * Solve for the angle.



14. Solve for the vertical side.



13: θ = 30° (tan30° = O/A = 3/9 = $\dfrac{\sqrt{3}}{3}$)

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