(FSMEr)TJ0 4pc 0 4p 629472 Td -09-c)TJ0 014p 6672 Td 072, AC(E/ 072) 07us/ (ter-(, T)1(r-)3a) (ier-(nier-(n2) 07, HEr)TJ 0 4p 06472 Td -)3201)er)TJET q72 792 675 -792 re W 0 0257 er-(n2) 07, HEr)TJ 0 4p (m4(2 Tr 9964po9 27(FS)-4po9 27(FS nlineShaginachM/TT0 1 Tf 5 gs 4676399e W 0 0257 er-(n2) 07, HEr)TJ 0 4p (m4(2 Tr 9964po9 2()-3d9040(FS nlineShaginachQ-CzH)Tm Q-CSa-(n2) 07, HEr)TJ 0 4p 1042 72 7104m (234264po (C(Eg/ 17us/9(ter7(25) 17,
burden per response to comply with this voluntary collection is approximately 8 hours.Send comments
regarding the burden estimate to the SIred c rd turi vecyrur vicsurecursSF tez.cpl
-10202 (3150-0029), Office of
Management and Budget, Washington, DC 20503.If a means used to impose an information collection

Tentative Schedule - Week 1 – October 19-23, 2009

Enclosure 4

OBJECTIVE

This math review handout waTd sh rcommended by student

Linear Equations

Most linear equations are "literal" equations, which means that they use letters as their variables. To solve linear equations, the following methods are useful:

Addition property

For all real numbers a, b, and c, if a=b, then a+c=b+c.

Multiplication property

For all real numbers a, b, and c, if a=b, then ac=bc+c=b+c

Definition of absolute value

For each real number a, $|a| = a$ if $a \geq 0$ and $|a| = -a$ if $a<0$

Sample

$$3x + 5y = 37$$
$$6x - 3y = 9$$

Solve for x and y:

SAMPLE:

$$3x + 4y = 18$$
$$5x - 3y = 1$$

Solve for x and y:

LAWS OF

The following expressions cannot be simplified any further:

$$x^a y^a$$

Rules of Thumb

For $\mu x \ll 1$, $e^{-\mu x} = 1 - \mu x$

Good to within:

± 5% for $\mu x = 0.3$ and

± 1% for $\mu x = 0.2$

Dimensional Analysis

The ability to keep track of units, cancel them out properly and ensure

- Attenuation equations are typically expressed in

1 oz = 28.35 g

1 yd = 3 feet

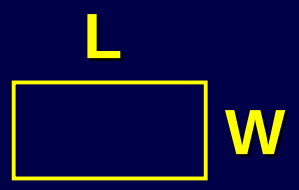
1 foot = 12 inches

1 inch = 2.54 cm

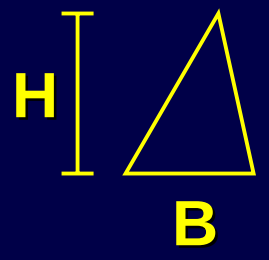
We start out with units of oz/yd^2 and we want to get

Area

Rectangle = Length x Width



Triangle = ½ Base x Height



Circle = π x Radius^2

Degrees or Radians

D is 2 times the radius (2 x

PROBLEMS (calculate the following)

Sine (28

INVERSE TRIGONOMETRIC FUNCTIONS

EXAMPLE: What is the arcsine of 0.06?

On my calculator, if I punch in 2ndF then sine^{-1} and 0.06, I get 3.44

Is this answer degrees or radians?

In this case it's degrees because my calculator is showing DEG at the top of the display.

If I wanted radians, I could just toggle the DRG key to RAD and I would get 0.06 radians

To avoid problems always check your DRG(itttTj 0 0 0 scn

LOGARITHMS

The answer

Since “10” and “e” are both just numbers, there is a fixed relationship between log

On your calculator you

PROBLEMS (Calculate the following)

1. the common logarithm of 88

2. the naturc5.2oaC of1238

3. the natural logarithm of 18

[-0.0084 Tc -0.0003 Tw9.325c 0

INTERPOLATION

NOTE: Some of the following slides list pages in the Health Physics Technology Reference Manual for looking up Table values.

The simplest form of interpolation is the “guesstimate”.

Let’s say you have a set of numbers like these:

speed (mph)	stopping distance (feet)
10	10
20	40
30	

A set of data from a Table

The “line” represented by the “x” and “y” values doesn’t have to be “straight”. In fact, the values listed in the table on the previous page definitely do not represent a “straight” line.

However, if we select two consecutive values from a n approximate the curved “line” by a “straight” line (i.e., if the points are close enough, even a curved line looks straight).

If this approximation is valid we can use “linear interpolation”.

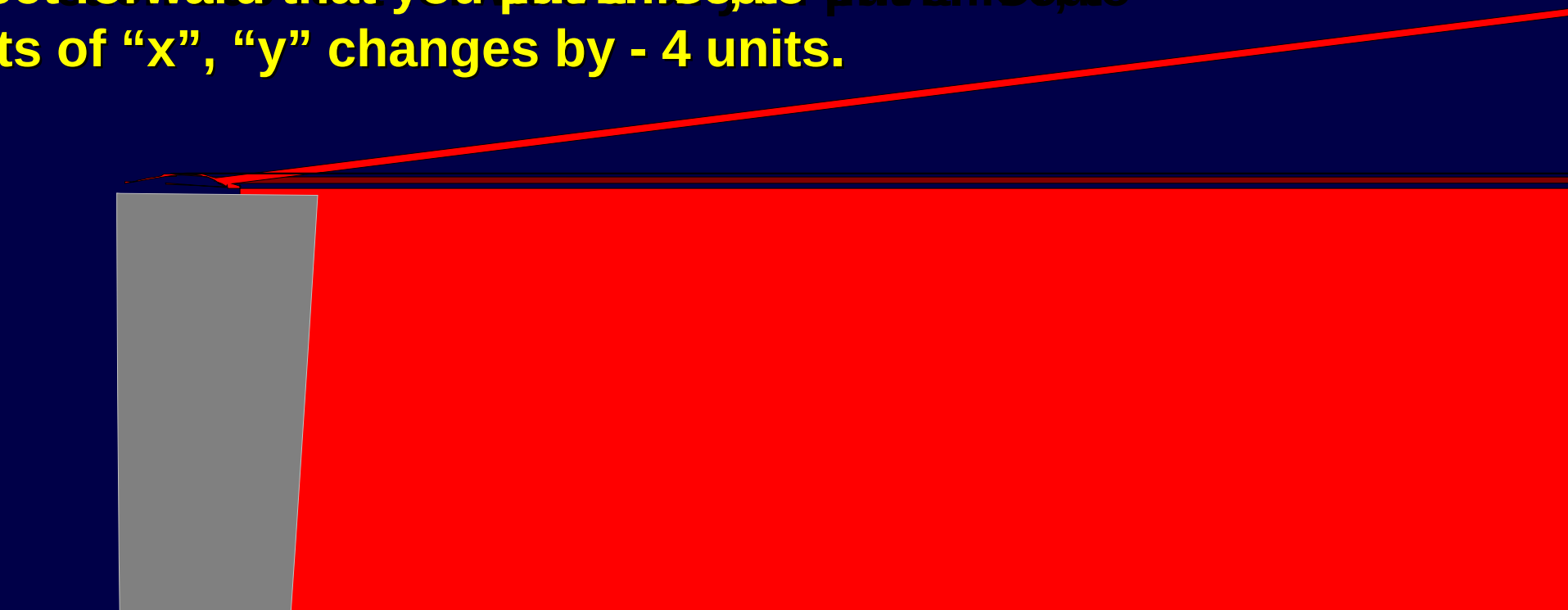
Let’s graph

$y = 2x+1$

The slope of a straight line is just the change in “y” divided by the change in “x”.

You can compare that to the slope of a steep hill where a road sign might state “Caution: 4% grade”.

What the sign is telling you is that the road drops 4 feet for
eet forward that you drive. So, to
ts of “x”, “y” changes by - 4 units.



MeV	μ_{en}/ρ
1.0	0.03087777

Material	MeV	μx*						
		1	2	4	7	10	15	20

SOLVING FOR EMBEDDED VARIABLES

RULES:

1. You can multiply both sides of an equation by the same value

2. You can divide both sides of an equation by the same value

3. You can add the same value to both sides of an equation

4. You can subtract the same value from both sides of an equation

5. You can multiply any side of an equation by 1 or any ratio which equals 1 (e.g. a / a)

6. You can "flip" both sides of an equation (i.e. reverse numerator and denominator) provided there is only one denominator on each side, e.g. ($1/a = 1/b \rightarrow a = b$) but ($1/a + 1/b = 1/c \rightarrow a + b = c$)

7. ln (b [illegible]) = a ln (b) [illegible] sch002on -0.036 .0013 Tw 2.408

Examples (in each case solve for “C”):

$$A = \frac{B \times D}{C \times E}$$

$$A = \frac{B}{C} + \frac{D}{E}$$

$$A = B \times \ln \left[\frac{C}{D} \right]$$

$$\frac{F}{C} = \frac{D}{A} + \frac{E}{B}$$

$$A = B \times \text{sine } C$$

$$A = (B + C) \times (D + E)$$

A =

Extracting Information from Tables

ANSWER

Sample (test your knowledge)

$$3x + 5y = 37$$
$$6x - 3y = 9$$

Substitute into:

$$6x - 3y = 9$$
$$6[(37 - 5y)/3] - 3y = 9$$
$$6(37 - 5y) - 9y = 27$$
$$222 - 30y - 9y = 27$$
$$-30y - 9y = 27 - 222$$
$$y(-30 - 9) = -195$$
$$y = -195/-39 = 5$$
$$y = 5$$

PROBLEMS (calculate the following)

1. area of a circle with a 4 cm diameter? 12.6 cm^2

2. surface area of a hemisphere with a radius of 2.4 meters? 36.2 m^2

3. volume of a sphere with a 78 cm diameter? 248475 cm

4. volume of a box whose length is 7 cm, width is 3 cm and depth is 12 cm?

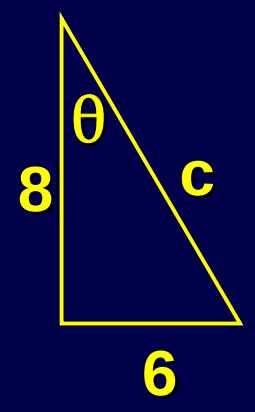
5. surface area of a box whose length, width and depth are all 12 cm?

See page 47

PROBLEMS (calculate the following)

1. Sine (28°) — 0.47
2. Tangent (0.89 radians) — 1.235
3. Cosine (88°) — 0.035

Given this triangle calculate the:



4. Hypotenuse (c) — 10
5. Cosine of θ — 0.8

PROBLEMS (Calculate the following)

1. the common logarithm of 88

2. the natural logarithm of 123

3. the ratio of the natural logarithm of 452 to the common logarithm of 452

4. the natural logarithm of the common logarithm of 333

5. the common logarithm of X is 3.2, what is X

6. the natural logarithm of Y is 6.4, what is Y2.

PROBLEMS (Calculate the following)

1. log $(2.9^3$

Examples (in each case solve for “C”):

$$\frac{A \times D}{C \times E}$$

We want th sin scn 8372 383000280.3 90 l .l2.l2se 3830iid

Multiply both sides by C

$$\frac{B \times D}{E} =$$

Divide both sides by A

Sample problem of this type

$$\text{time} = \frac{\text{dose}}{\text{dose rate}}$$

$$A = \frac{B}{C} + \frac{D}{E}$$

Subtract D/E from both sides.

Multiply the “A” by 1 (E/E)

$$A = B_x$$

$$\ln \frac{A}{B} = \frac{C \times D}{E}$$

Sample problem of this type:

The equation for radioactive decay is

$$A = A_o \times e^{(-0.693 \times t)/T}$$

Ð

A

Sample problem of this type:

1

T

A =

$$A = (B + C) \times (D + E)$$

A

Insteat of using logarithms and exponentials, you coult just take the “n th” root of both sides of the