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# CREATING FORMULAS

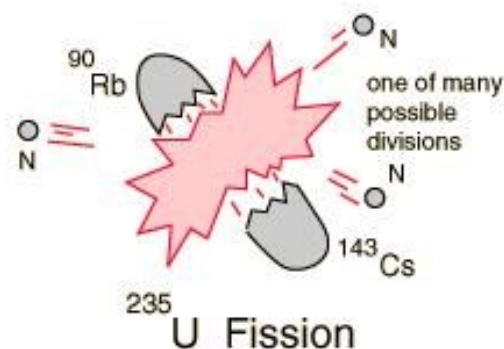
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## □ INTRODUCTION

Many times in your math, science, computer, and business classes, formulas will be given to you. For example you may know that the Einstein formula that relates mass and energy is  $E = mc^2$  (where  $c$  is the speed of light). But these formulas have to come from somewhere, don't they?



In the formulas below, do not worry that you may not know the meanings of the some of the terms used. Your job is to see how the “English” formula is translated into an “Algebra” formula.

## □ CREATING FORMULAS FROM DESCRIPTIONS

A. Assets is the sum of liabilities and capital.  $A = L + C$

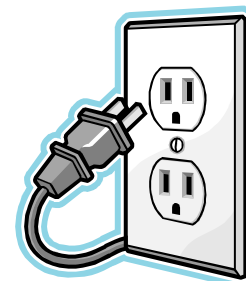
B. Profit is the difference of revenue and expenses.  $P = R - E$

C. Distance is the product of rate and time.  $d = rt$

D. Density is the quotient of mass and volume.  $D = \frac{m}{V}$

E. The average is the sum divided by the number of items.  $A = \frac{S}{n}$

F. Voltage is the product of current ( $I$ ) and resistance.  $V = IR$



G. Potential energy is the product of the mass, the acceleration of gravity ( $g$ ), and the height.

$$P = mgh$$

H. Energy is mass times the square of the speed of light ( $c$ ).

$$E = mc^2$$

I. Kinetic energy is one-half the product of mass and the square of the velocity.

$$K = \frac{1}{2}mv^2$$

J. The frequency of genotypes is the square of the sum of the allele frequencies.

$$f = (A_1 + A_2)^2$$

K. The square of the hypotenuse is equal to the sum of the squares of the legs.

$$h^2 = a^2 + b^2$$

L. The area of a rectangle is the product of its length and its width.

$$A = lw$$

M. The perimeter of a square is four times the length of its side.

$$P = 4s$$

N. The number of bits ( $b$ ) is found by multiplying the number of bytes ( $B$ ) by 8.

$$b = 8B$$

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## Homework

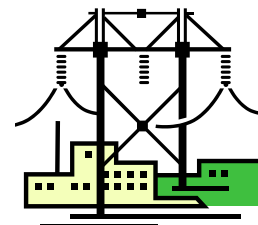
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Create a formula from the given description. It's fine if the variables you choose don't match the variables in the solutions.

1. Liabilities is the difference between assets and capital.
2. Revenue is the sum of profit and expenses.
3. Rate is the quotient of distance and time.
4. Mass is the product of density and volume.



5. The number of items is the quotient of the sum and the average.
6. Current is the quotient of voltage and resistance.
7. Mass is found by dividing potential energy by the product of gravity and height.
8. Mass is the quotient of energy and the square of the speed of light.
9. Mass is twice the kinetic energy divided by the square of the velocity.
10. The width of a rectangle is the quotient of the area and the length.
11. The side of a square is one-fourth of the perimeter.
12. The number of bytes is found by dividing the number of bits by 8.
13. The sum of the squares of the legs is equal to the square of the hypotenuse.
14. The width is equal to the square of the difference of  $x$  and  $y$ .



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## Review Problems

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15. Create a formula from the given description:
  - a. Capital is the difference between assets and liabilities.
  - b. Expense is the difference between revenue and profit.
  - c. Time is the quotient of distance and rate.

- d. Volume is the quotient of mass and density.
- e. The sum is the product of the average and the number of items.
- f. Resistance is the quotient of voltage and current.
- g. Length is the quotient of the area and the width.
- h. Energy is the product of the squares of  $a$  and  $b$ .
- i. Mass is the square of the product of  $u$  and  $w$ .

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## Solutions

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1.  $L = A - C$

2.  $R = P + E$

3.  $r = \frac{d}{t}$

4.  $m = dv$

5.  $n = \frac{S}{A}$

6.  $I = \frac{V}{R}$

7.  $m = \frac{P}{gh}$

8.  $m = \frac{E}{c^2}$

9.  $m = \frac{2K}{v^2}$

10.  $w = \frac{A}{l}$

11.  $s = \frac{P}{4}$  or  $\frac{1}{4}P$

12.  $B = \frac{b}{8}$

13.  $a^2 + b^2 = h^2$

14.  $w = (x - y)^2$

15. a.  $C = A - L$

b.  $E = R - P$

c.  $t = \frac{d}{r}$

d.  $V = \frac{m}{d}$

e.  $S = An$

f.  $R = \frac{V}{i}$

g.  $l = \frac{A}{w}$

h.  $E = a^2b^2$

i.  $m = (uw)^2$

## ❑ *TO ∞ AND BEYOND*

Express as a formula:

The force of gravity,  $F$ , between two objects is the product of the gravitational constant,  $G$ , the mass,  $m_1$ , of the first object, and the mass,  $m_2$ , of the second object – all divided by the square of the distance,  $r$ , between the objects.

Express as a formula:

The hypotenuse,  $h$ , is the square root of the sum of the squares of the legs,  $a$  and  $b$ .

“The only  
good is  
knowledge,  
and the only  
evil is  
ignorance.”

- Σοχρατες (Socrates)