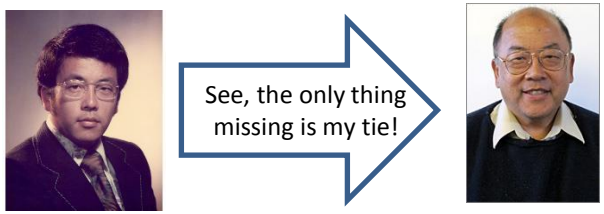
The Tai Chi of Basic Mathematics

(An attempt to find balance)

In 1960, I was an SMSG (School Mathematics Study Group) product, and mathematics enlightened me. Although we're no longer racing to the moon, maybe it is time to reflect on the direction we are taking basic mathematics. Our goal is similar, to raise the standards of our students. In this case, so that they can compete globally.

The I-Ching (Book of Changes) from which the symbol above comes, recognizes the dynamic balance of opposites, looks at the various means for change, and the acceptance that change is inevitable.



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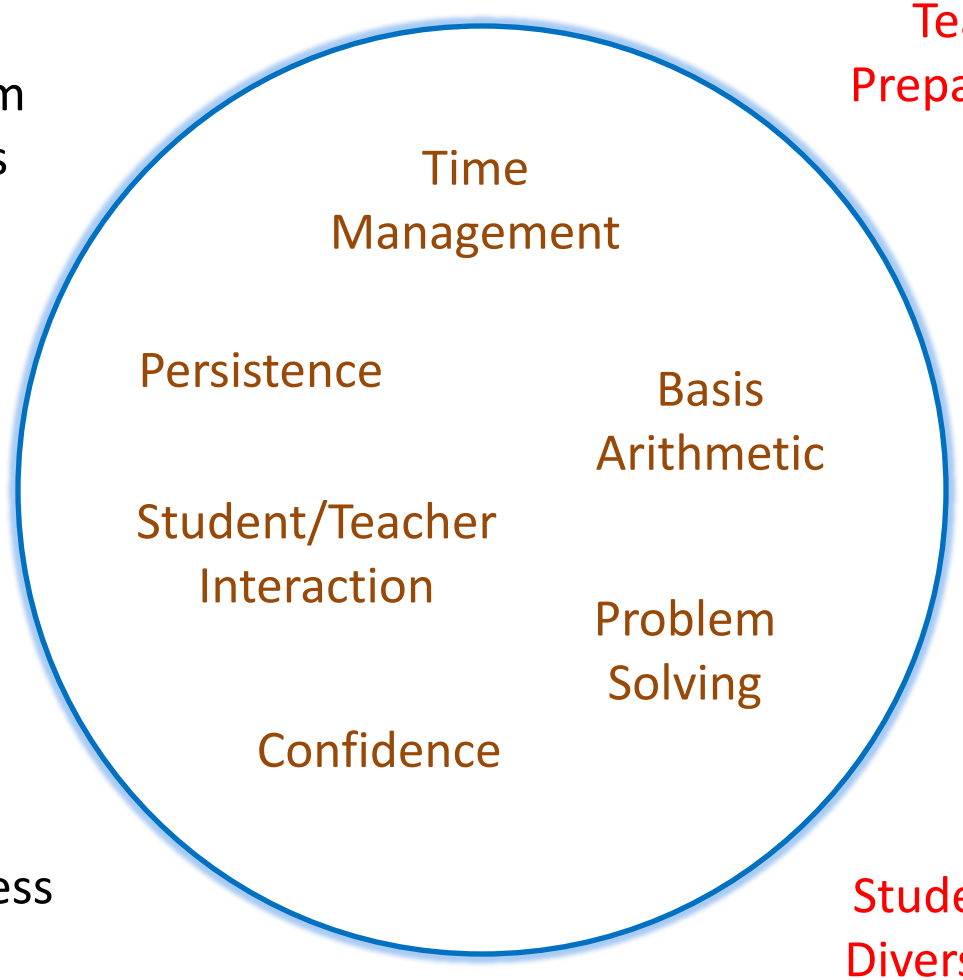


Curriculum Demands

Critical Thinking and Analysis

Student/Student Interaction

Student Preparedness

Teacher Preparedness

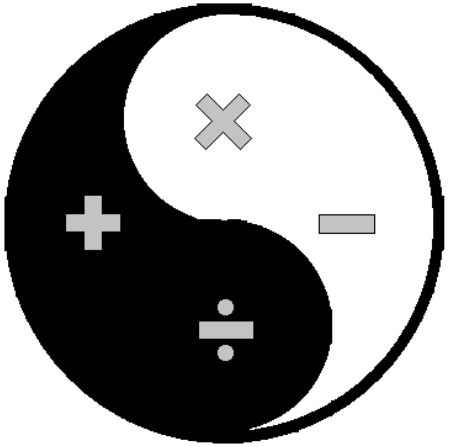
Common Mathematical Core

Evaluation

Creating Student Growth

Learning Environment

Student Diversity



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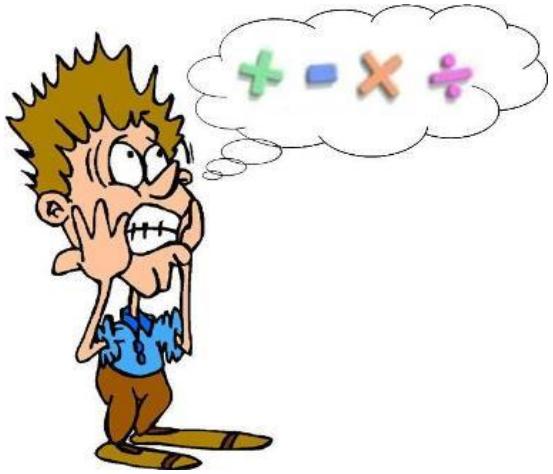
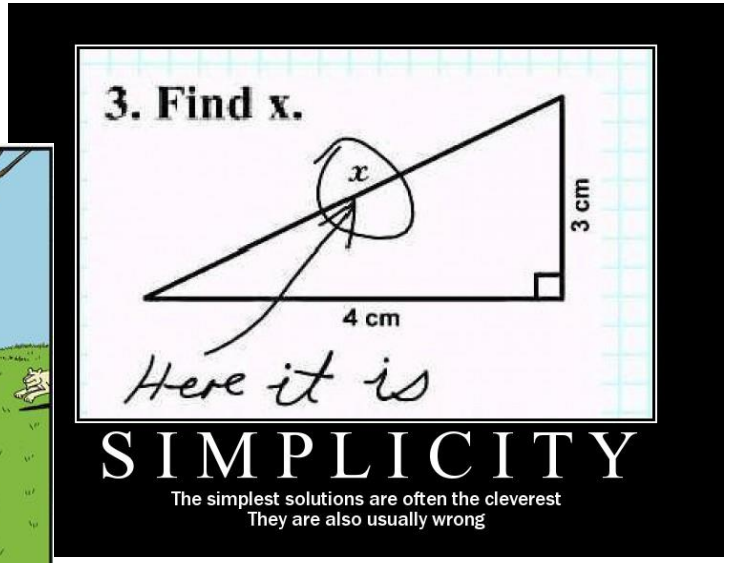
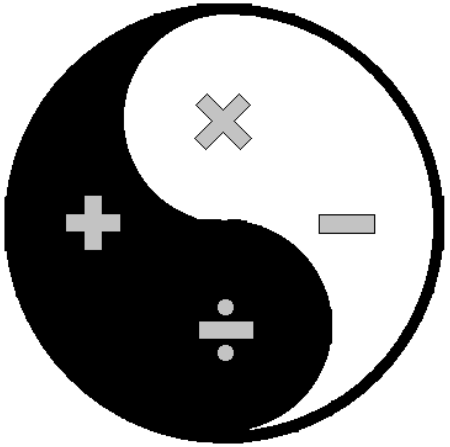
Looking at our students.





"I always did poorly in math, so why bother studying. But I need this class for my major, and it's my third time."

"This stuff is too easy for me!" I don't need to study. I'm in the wrong class. Can I leave class early to study for Biology? Biology is a pre-Med requirement."



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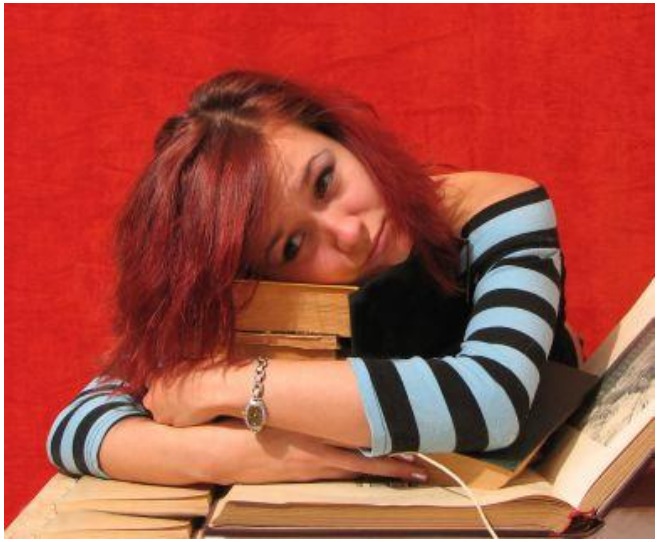
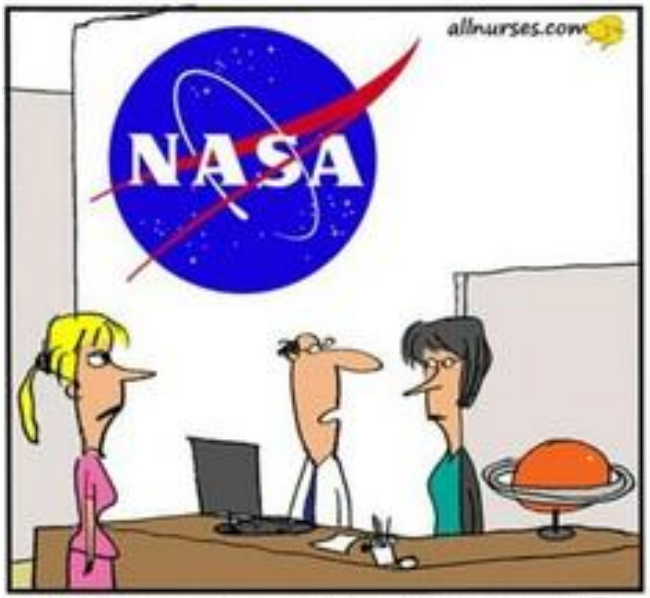
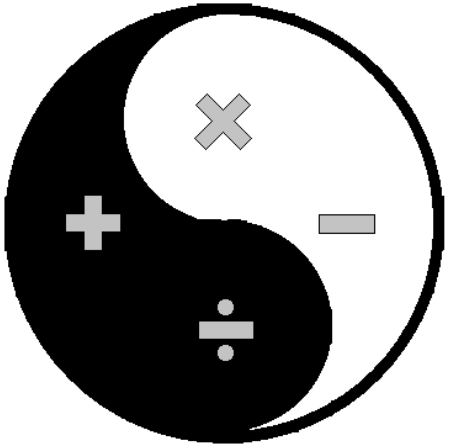


Those students with math anxiety may find some success in returning to the fundamentals, but applications and making the connections is still difficult. Over-confident students have realized that they may not moving on.



This student is in trouble.



The Tai Chi of Basic Mathematics

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Looking at the curriculum.

DRILL and PRACTICE.

Add.

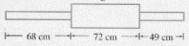
1. 8 + 36
2. 46 + 5
3. 5 + 7 + 8
4. 3 + 9 + 7
5. 7 + 5 + 3
6. 6 + 5 + 8 + 9
7. 792 + 36 + 19
8. 3099 + 8764 + 278
9. 9674 + 20,91[illegible] + 450
10. 10,346 + 9807 + 123
11. 8 + 3[illegible]86
12. 370,816 + 2115 + 92 + 348
13. [illegible]0,075 [illegible]86,501 3,845
14. 66,177 9,323 50,689 + 7,135

15. Mr. Maguire purchases these items at the supermarket.

Beef	$18
Potatoes	$ 3
Dog food	$ 5
Beer	$ 6

What is the total cost?

16. What is the total length of this shaft?



17. Ms. Nichols had $915 in her checking account. She deposited $97 in the account. What is her balance now?
18. Ross weighed 176 pounds before going on his vacation. He gained 14 pounds on his trip. What did Ross weigh after his vacation?

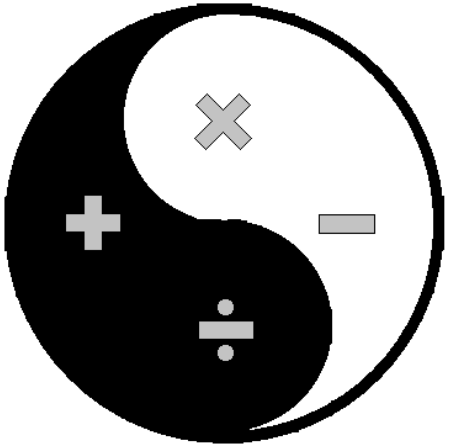
Subtract. Check your answers by adding.

19. 43 − 5
20. 759 − 42
21. 638 − 46
22. 2367 − 124
23. 4238 − 1705
24. 72,378 − 6,084
25. 3107 − 783
26. 6324 − 583
27. 64,013 − 4,208
28. 6004 − 36
29. 50,026 − 1,451
30. 700 − 8
31. 300 − 67
32. 5000 − 407
33. 6000 − 1038
34. 8000 − 350
35. 70,000 − 300
36. 200,300 − 7,502
37. 520,036 − 71,578
38. 308,010 − 73,524
39. 400,000 − 70,293
40. 1030 − 987
41. 41,020 − 9,382
42. 310,015 − 73,046
43. 610,003 − 685
44. 100,000 − 73,600

45. Carlos had $50 in his pocket. He spent $12 on lunch for himself and his friend Dorothy. How much money does he have left?

APPLICATION PROBLEMS

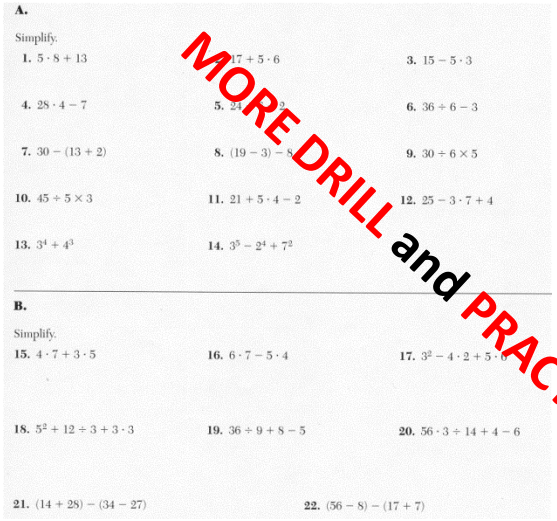
1. There are [illegible] passengers on board an airplane. $\frac{2}{3}$ of them are men, $\frac{1}{[illegible]}$ are women and the rest are children. How many children are there?
2. There are 350 members in a swimming club. $\frac{2}{7}$ of them are new members. $\frac{3}{10}$ of the new members are females. How many new female members are there?
3. Sally made 500 cookies. She sold $\frac{3}{4}$ of them and gave away $\frac{2}{5}$ of the remainder. How many cookies did she give away?
4. Dani made some sticks of satay for a party. $\frac{3}{5}$ of them were chicken satay and the rest were beef satay. There were 240 sticks of beef satay. How many sticks of chicken satay were there?
5. After paying $30 for a shirt, David had $\frac{3}{5}$ of his money left. How much money did he have at first?
6. After spending $\frac{2}{5}$ of his money on a storybook, Mathew had $12 left. How much did he spend on the storybook?



The Tai Chi of Basic Mathematics

(An attempt to find balance)

Looking at a diverse population.



A.

Simplify.

1. $5 \cdot 8 + 13$
2. $17 + 5 \cdot 6$
3. $15 - 5 \cdot 3$
4. $28 \cdot 4 - 7$
5. $21 \cdot 2$
6. $36 \div 6 - 3$
7. $30 - (13 + 2)$
8. $(19 - 3) - 8$
9. $30 \div 6 \times 5$
10. $45 \div 5 \times 3$
11. $21 + 5 \cdot 4 - 2$
12. $25 - 3 \cdot 7 + 4$
13. $3^4 + 4^3$
14. $3^5 - 2^4 + 7^2$

B.

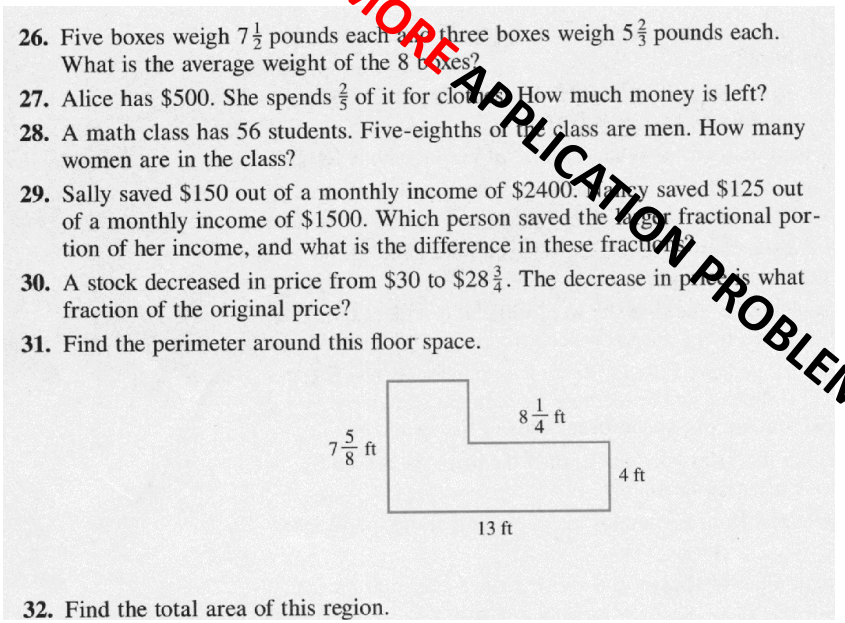
Simplify.

15. $4 \cdot 7 + 3 \cdot 5$
16. $6 \cdot 7 - 5 \cdot 4$
17. $3^2 - 4 \cdot 2 + 5 \cdot$
18. $5^2 + 12 \div 3 + 3 \cdot 3$
19. $36 \div 9 + 8 - 5$
20. $56 \cdot 3 \div 14 + 4 - 6$
21. $(14 + 28) - (34 - 27)$
22. $(56 - 8) - (17 + 7)$

MORE DRILL and PRACTICE.

DRILL and PRACTICE

Whether a students' native language is English or not, many adapts to drill and practice.



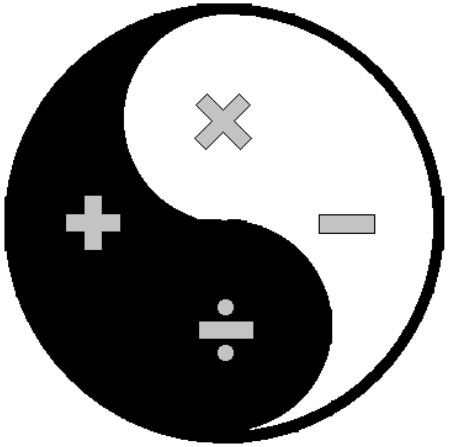
26. Five boxes weigh $7\frac{1}{2}$ pounds each and three boxes weigh $5\frac{2}{3}$ pounds each. What is the average weight of the 8 boxes?
27. Alice has \$500. She spends $\frac{2}{5}$ of it for clothes. How much money is left?
28. A math class has 56 students. Five-eighths of the class are men. How many women are in the class?
29. Sally saved \$150 out of a monthly income of \$2400. Mary saved \$125 out of a monthly income of \$1500. Which person saved the larger fractional portion of her income, and what is the difference in these fractional
30. A stock decreased in price from \$30 to \$28$\frac{3}{4}$. The decrease in price is what fraction of the original price?
31. Find the perimeter around this floor space.

32. Find the total area of this region.

MORE APPLICATION PROBLEMS

APPLICATIONS and READING

For students whose language is NOT English, it is another hurdle. Native born students also have difficulty.



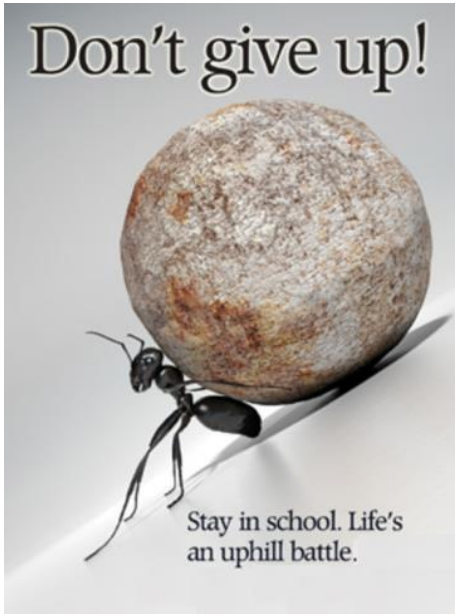
The Tai Chi of Basic Mathematics

(An attempt to find balance)

Looking at PERSISTENCE

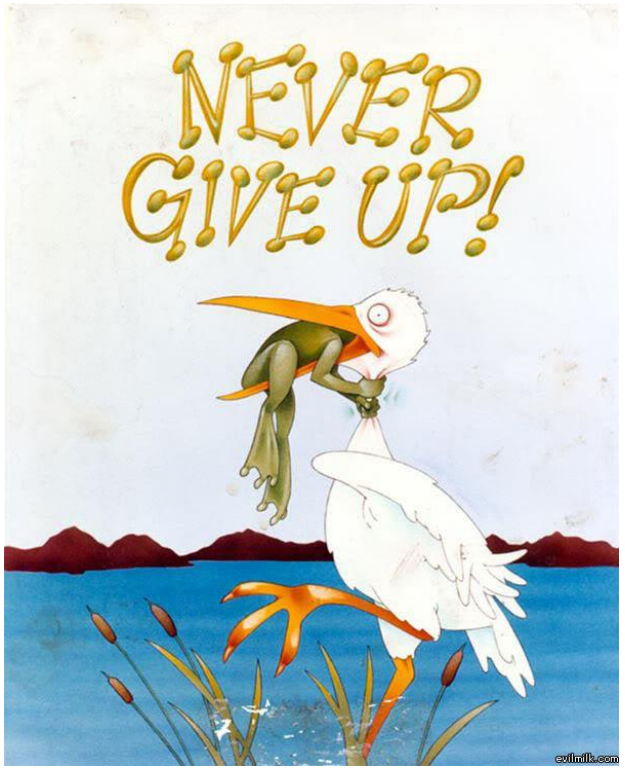
MATH ANXIETY

(w/excuse)



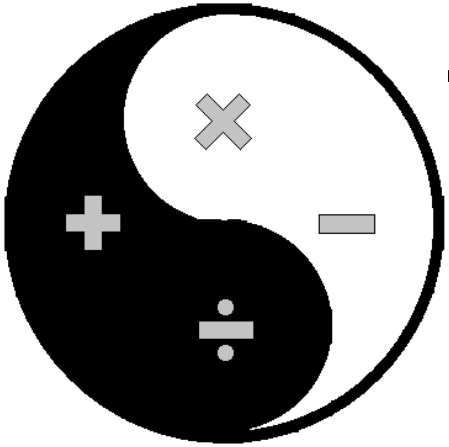
ENCOURAGEMENT

(Find a bone for the dog)



HOPEFUL RESULT

(Found a bone for the dog)



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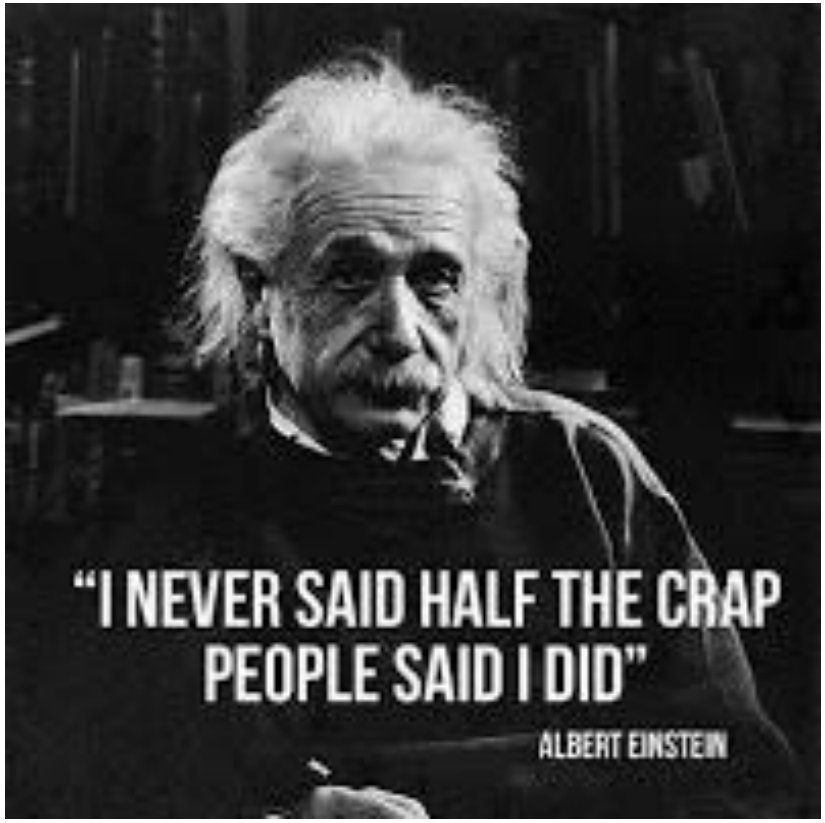
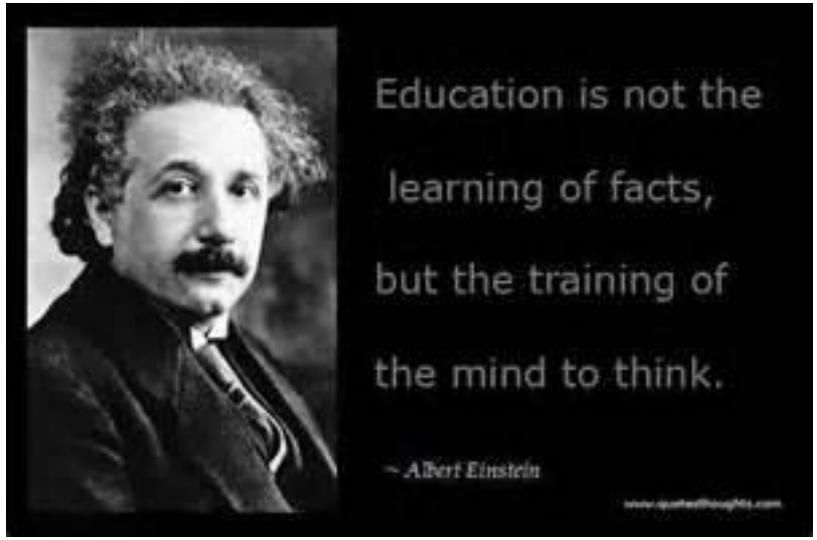
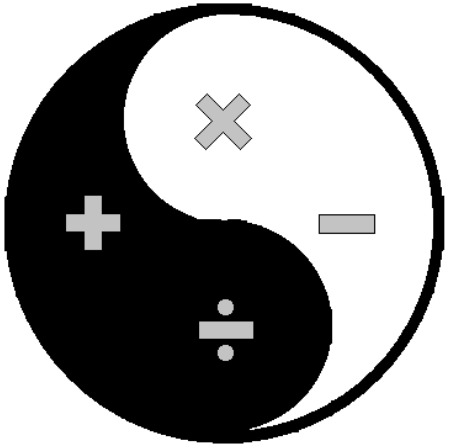


In most cases, there should not be a difference in what we say and what we do. I looked to Albert Einstein for his experience and intellect for what I should be teaching in my classroom. It is still a matter of choice, and I choose to believe the statement below.





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In dealing with PROBLEM SOLVING, one has three areas to address.

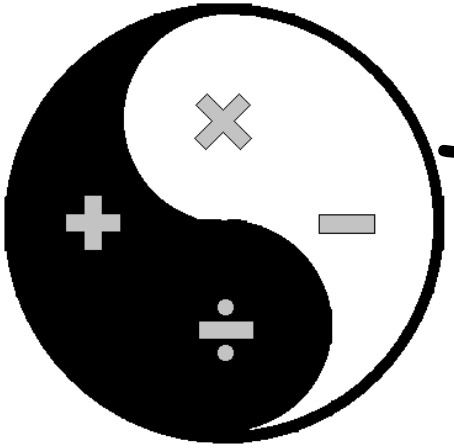
Yin Cycle  Yang Cycle

Create an environment for learning

Promote discovery and long-term understanding

Support and Encourage Persistence

Anxiety ⟷ Feelings Continuum ⟷ Confidence		Psychological/ Emotional
Failure ⟷ Achievement Continuum ⟷ Success		Intellectual/ Educational
Avoidance ⟷ Behavioral Continuum ⟷ Pursuit		Social/ Motivational



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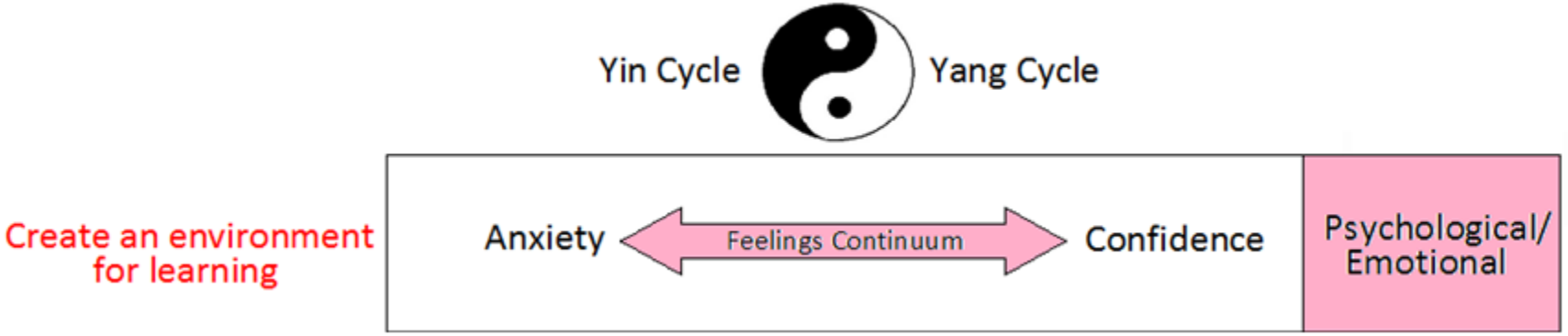
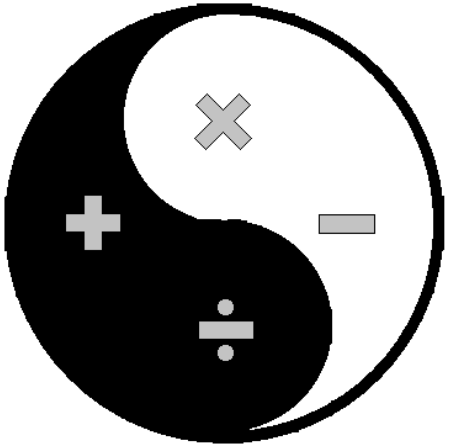
Creating an Environment for





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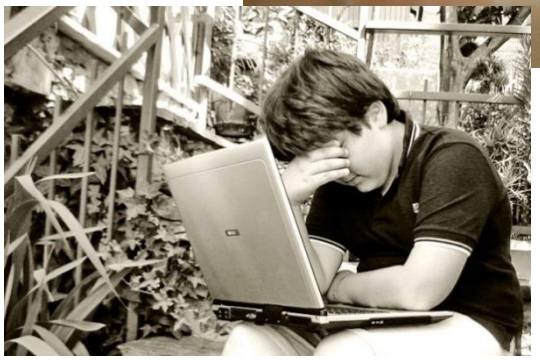

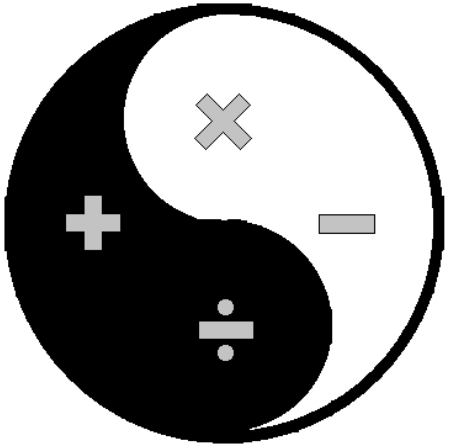

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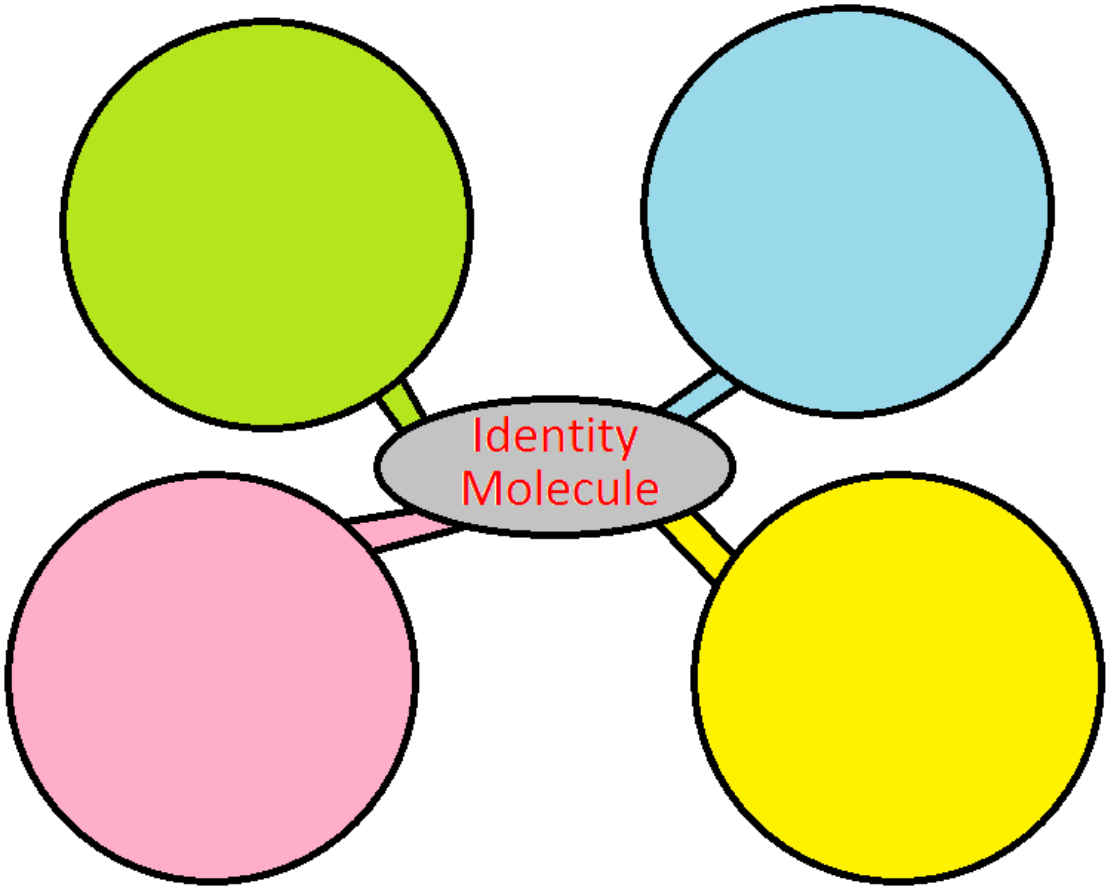
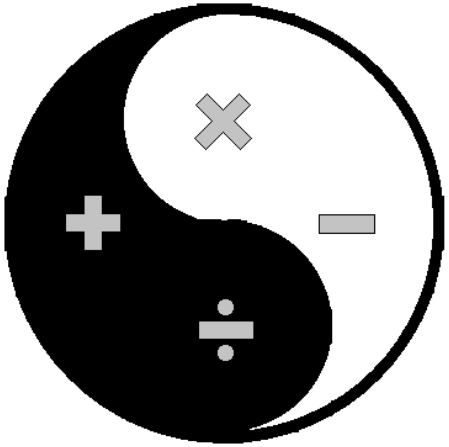
Addressing Isolation

In each circle, write something that is important to you, and perhaps, you would like others to know about you.





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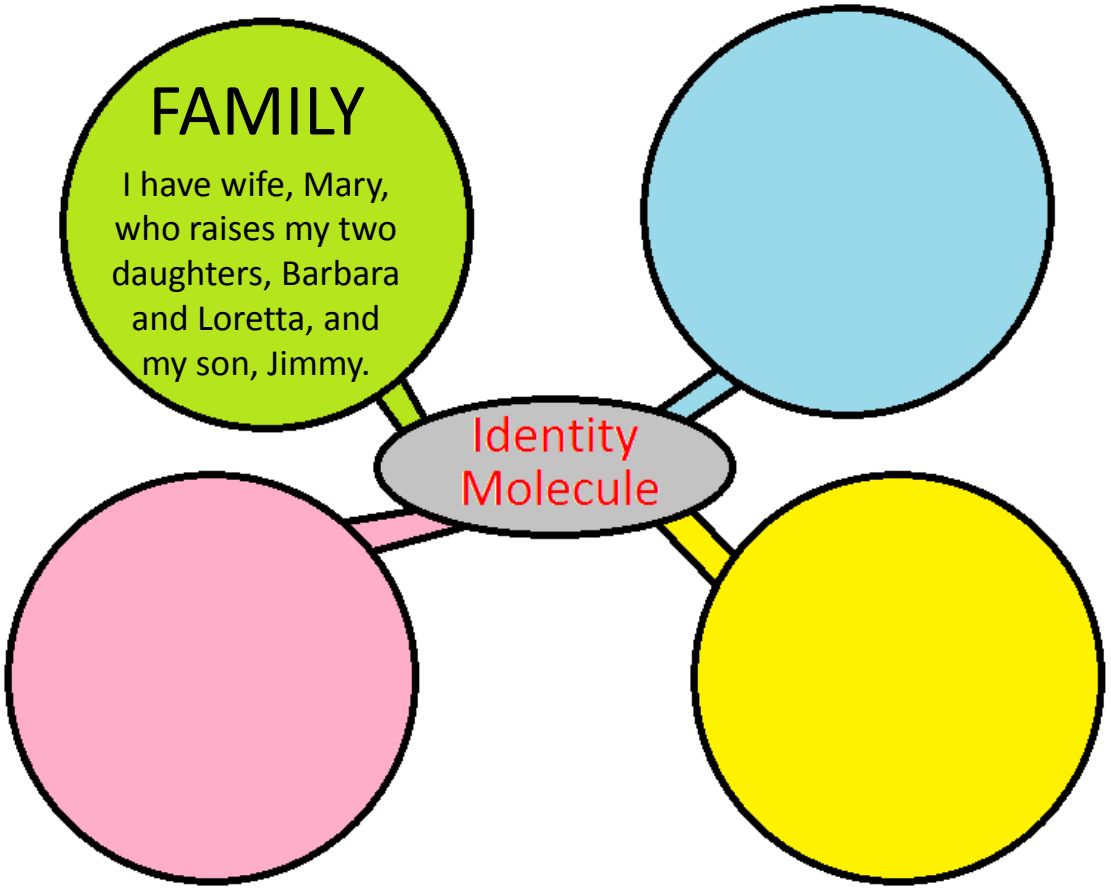

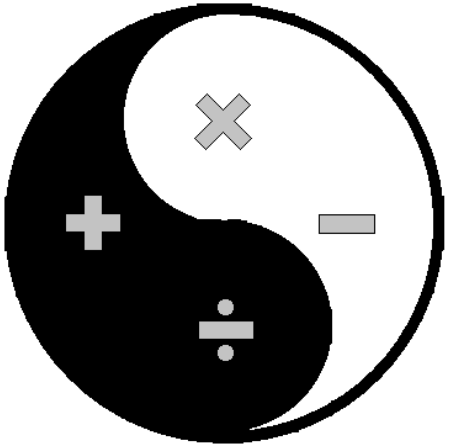

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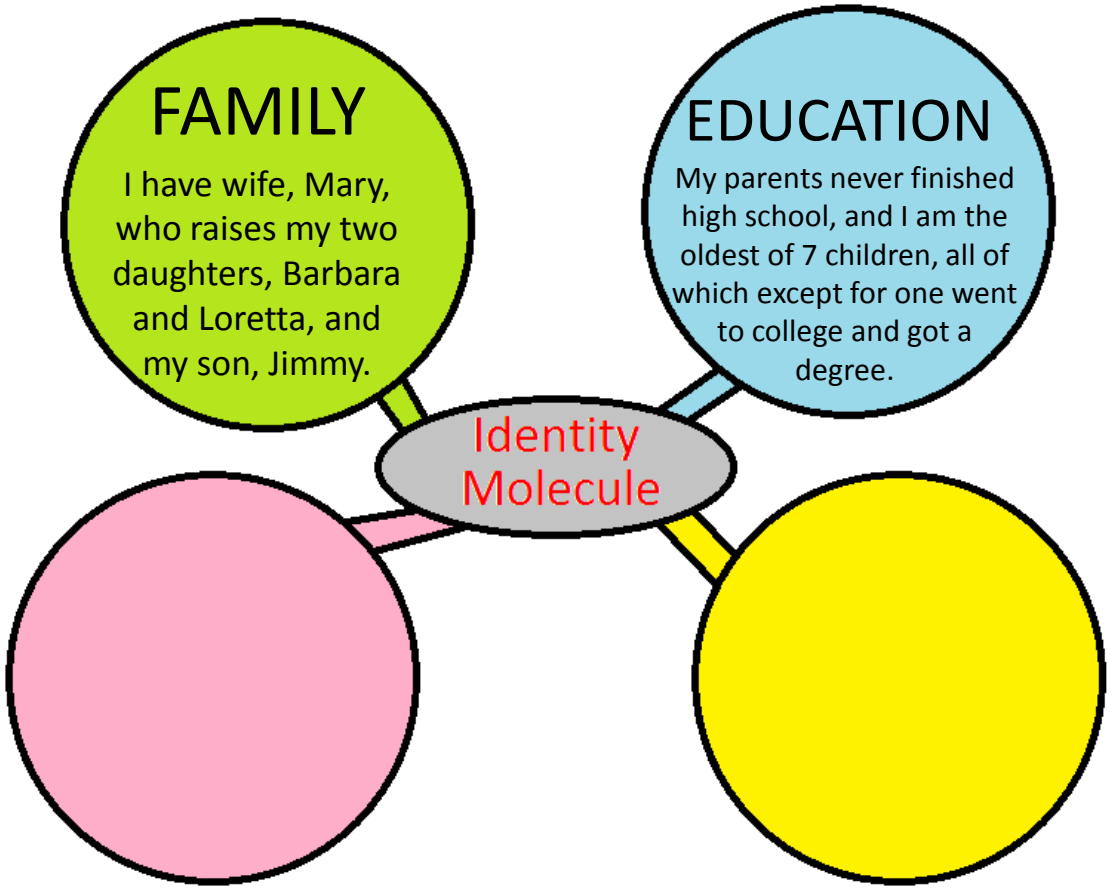

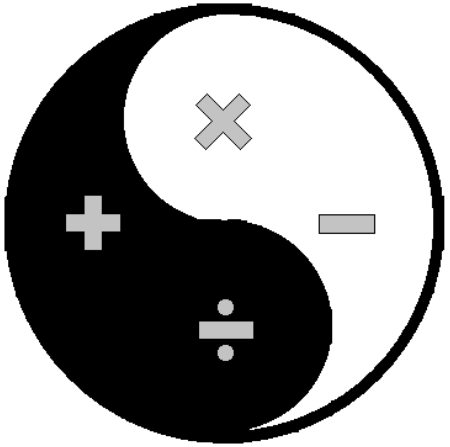

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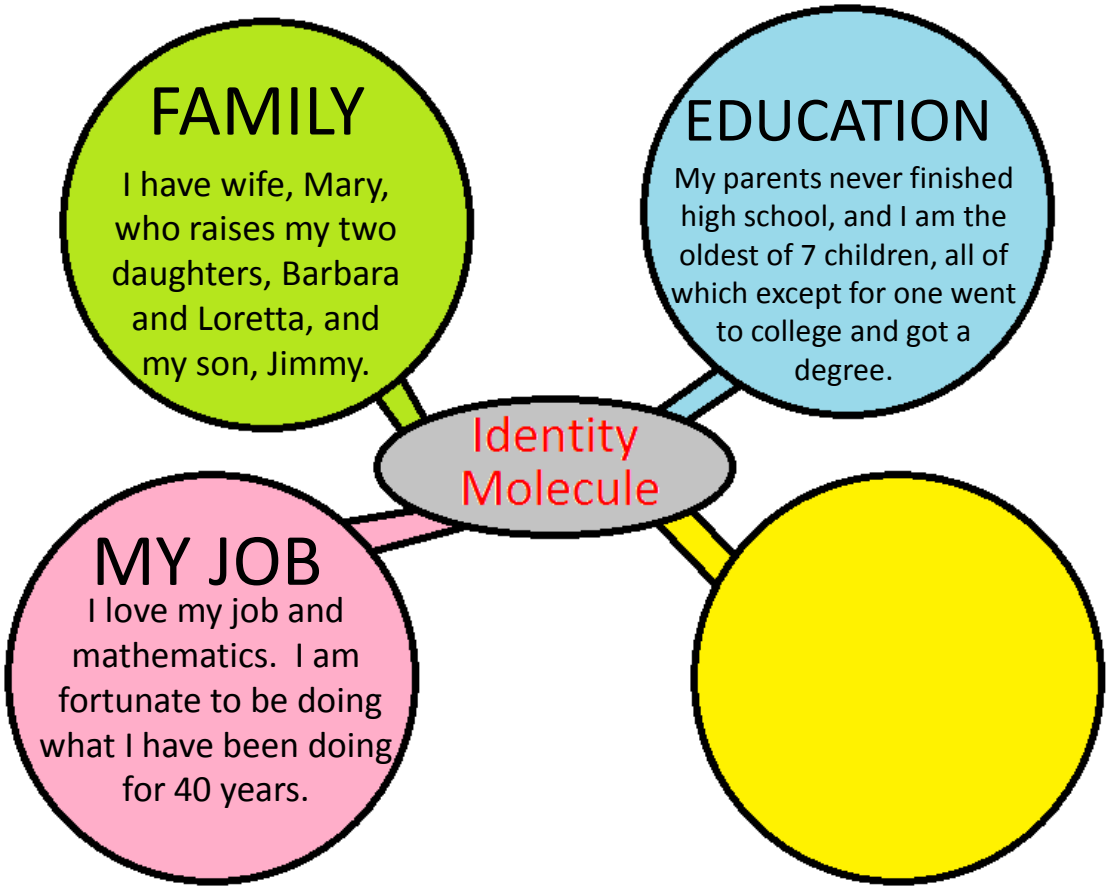

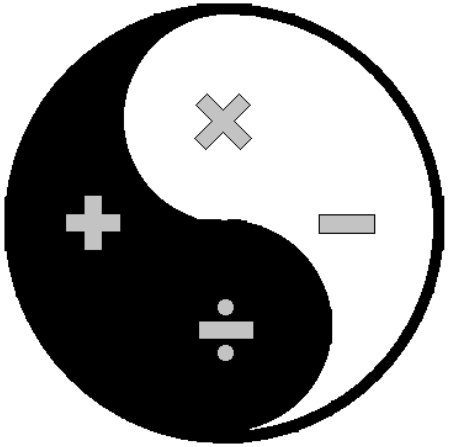

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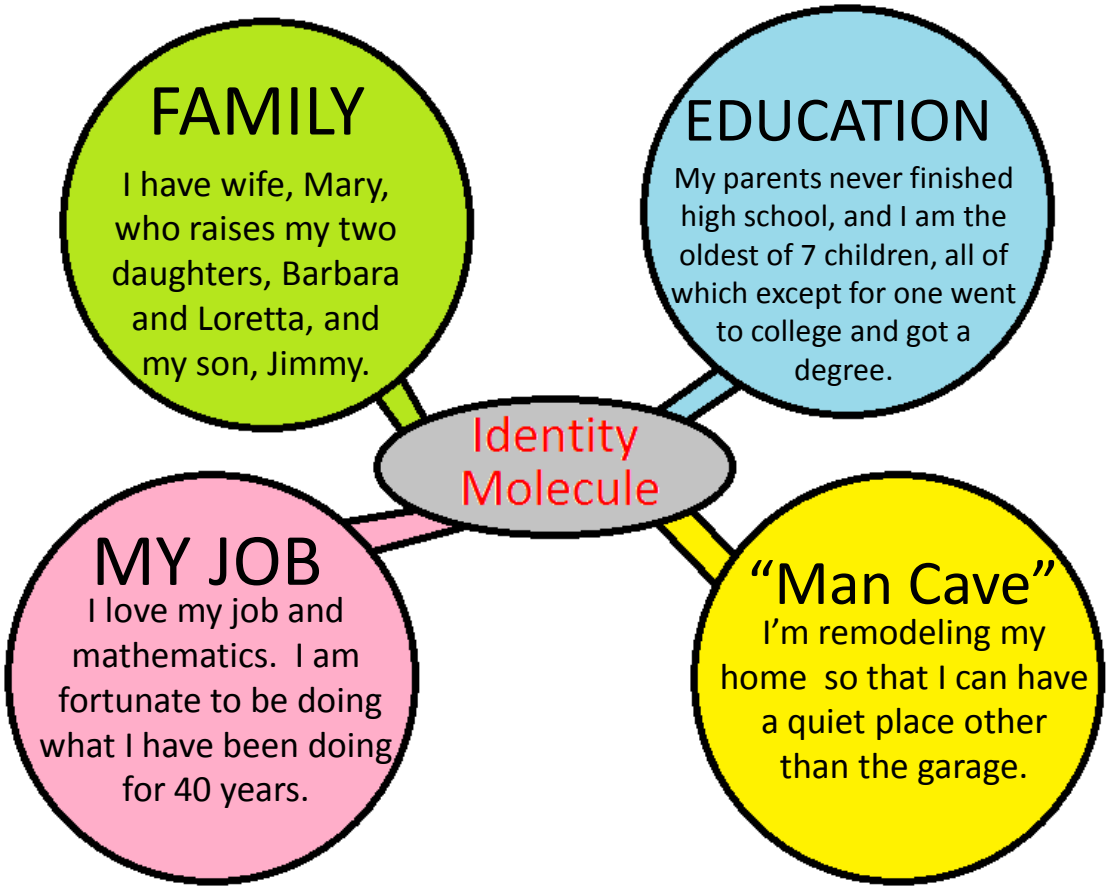

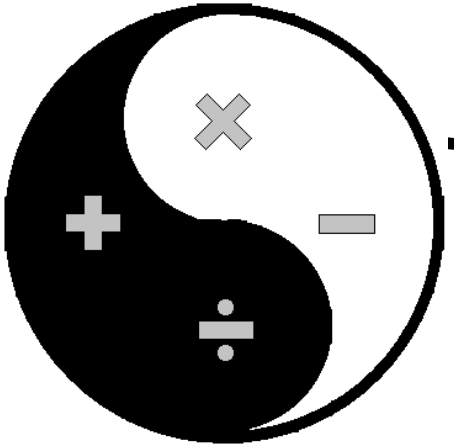

The Tai Chi of Basic Mathematics

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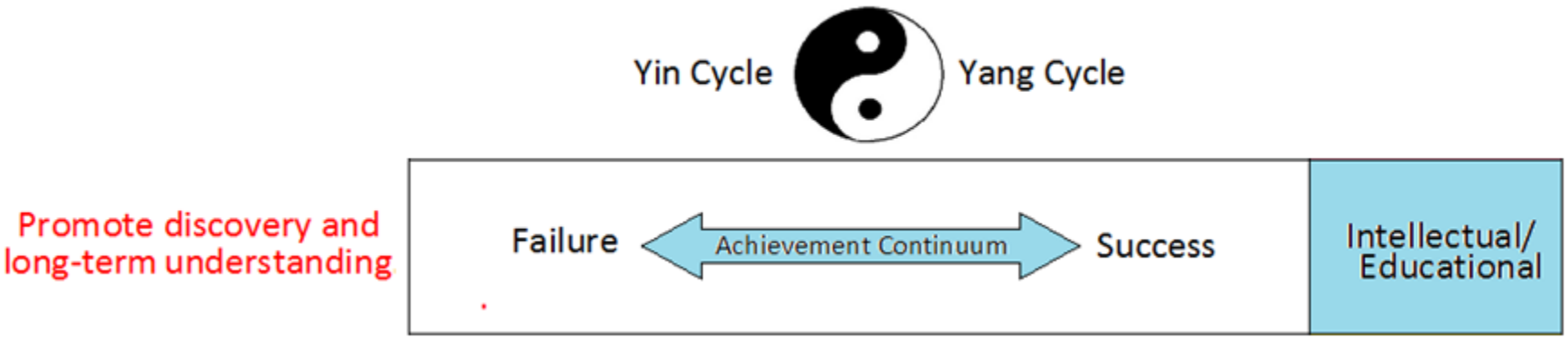
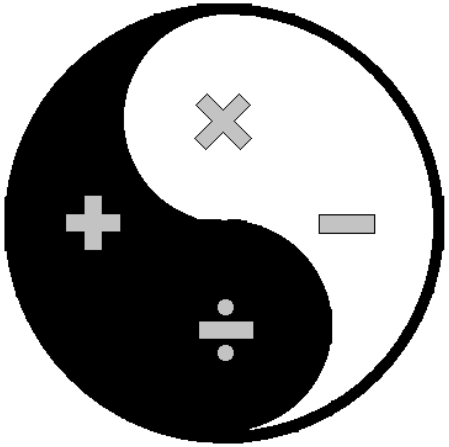
Promote Discovery and Long-term Understanding





The Tai Chi of Basic Mathematics

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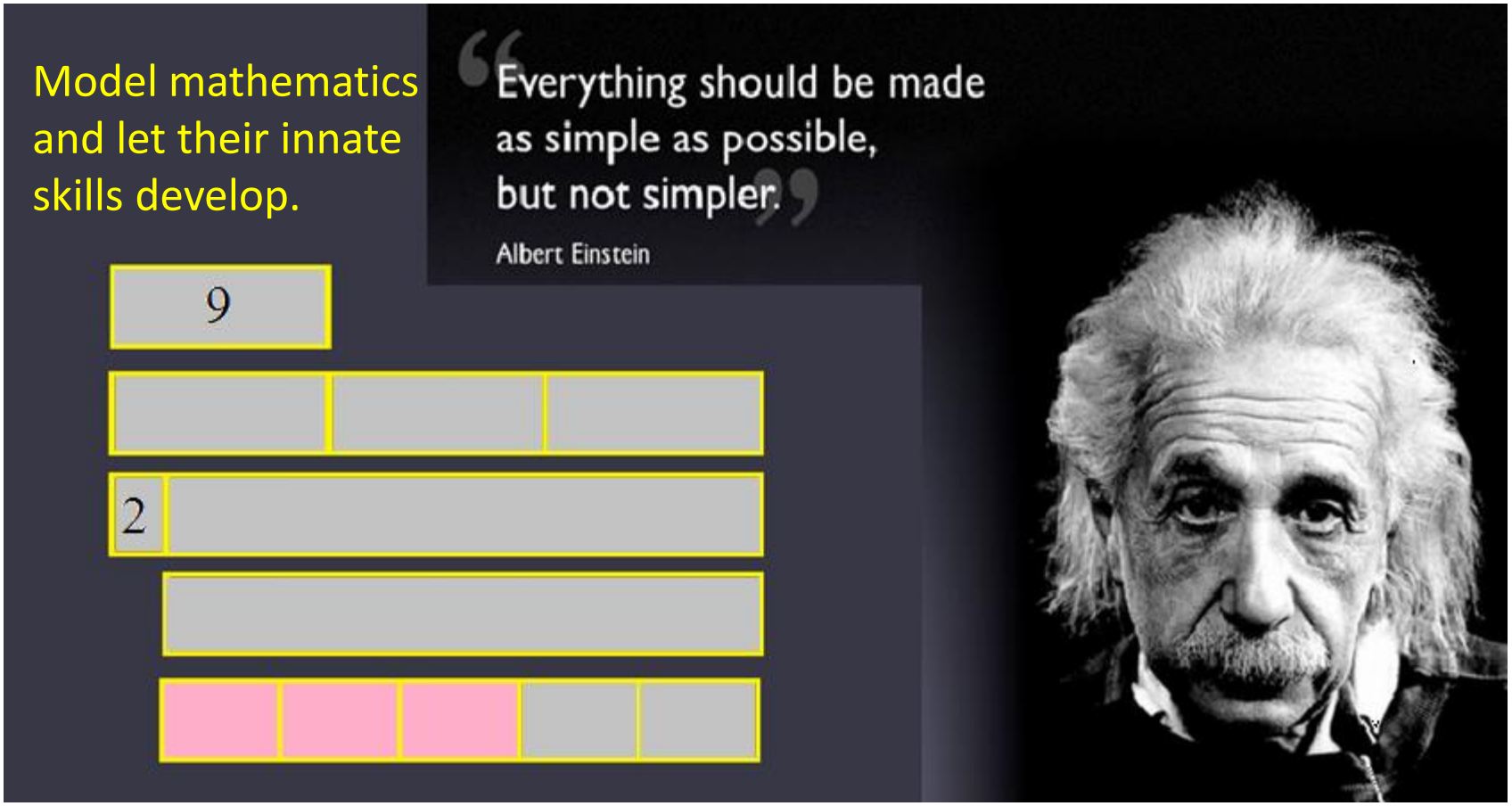
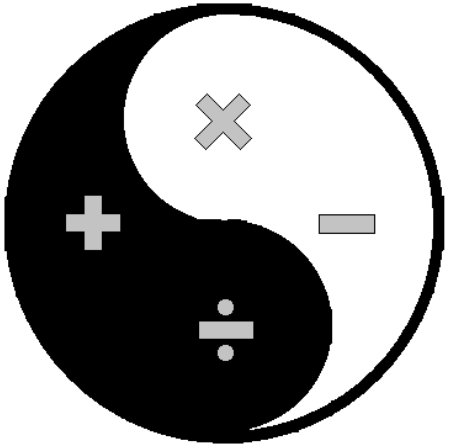
"Challenge the Familiar"

Model mathematics and let their innate skills develop.

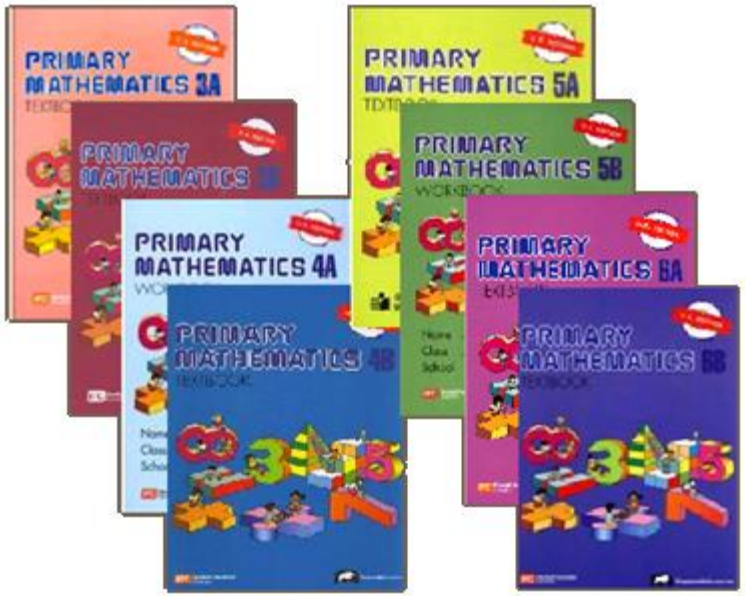


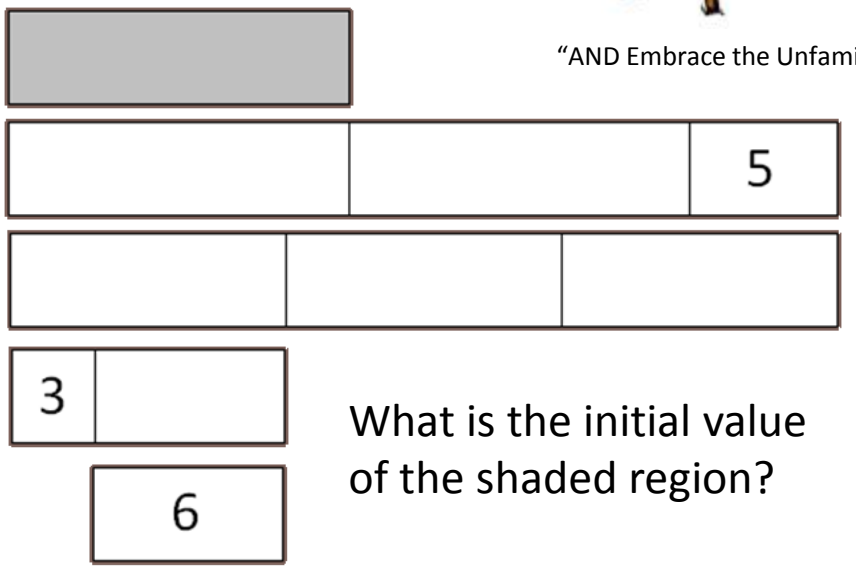


The Tai Chi of Basi Mathematics

(An attempt to find balance)

"AND Embrace the Unfamiliar"





What is the initial value of the shaded region?

A primary component of the Singapore Math course is the use of visual representations of mathematical quantities and its role in problem solving single and multi-step applications.

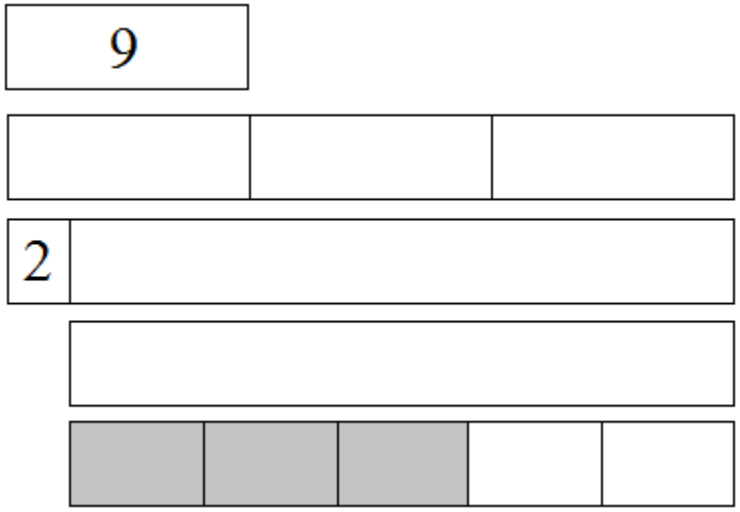
The Tai Chi of Basic Mathematics

(An attempt to find balance)

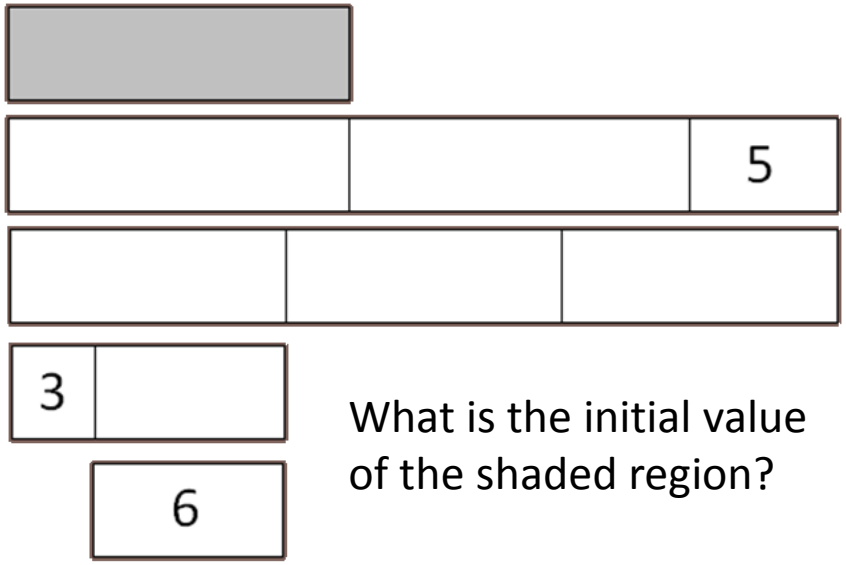
"Extend to the Familiar"

Evaluating the expression when x = 9

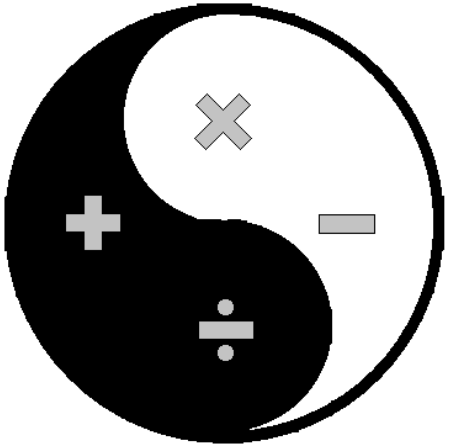
$$\frac{3}{5}(3x - 2).$$



Solving the equation $\frac{2x+5}{3} - 3 = 6.$



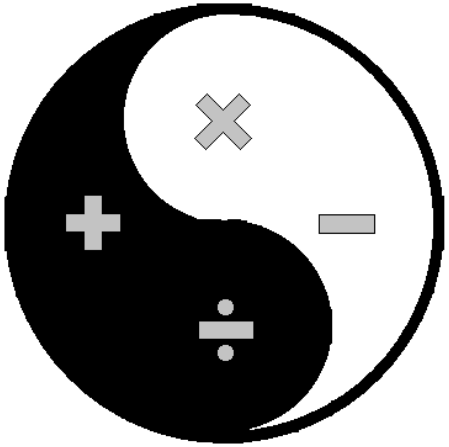
What is the initial value of the shaded region?



The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING STARTS WITH BASIC MATHEMATICS



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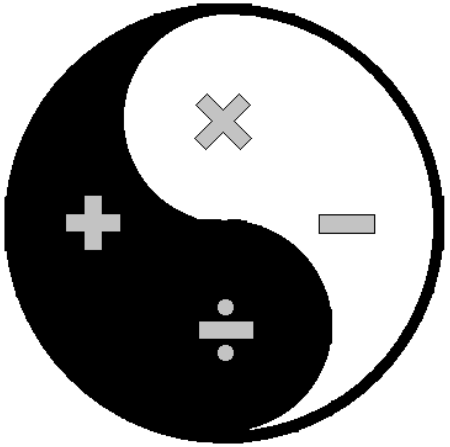
1. Understand the problem

   Paul and Cheryl are selling hats. Cheryl purchased two boxes of hats while Paul purchased three times as many. If 5/6 of Paul's purchase is 10 hats, how many hats did each of them purchase?

2. Devise a plan

3. Carry out the plan

4. Look back



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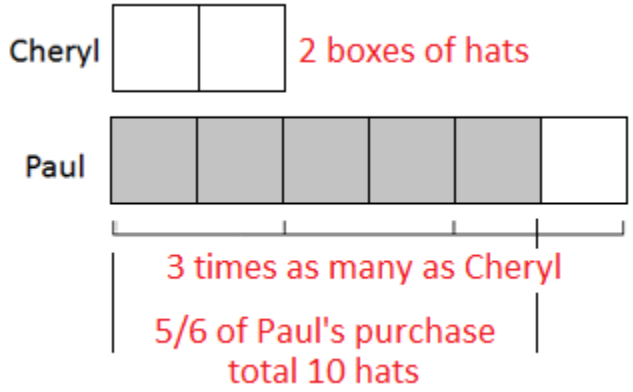

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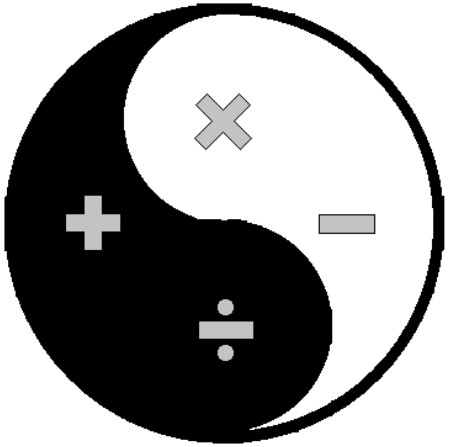

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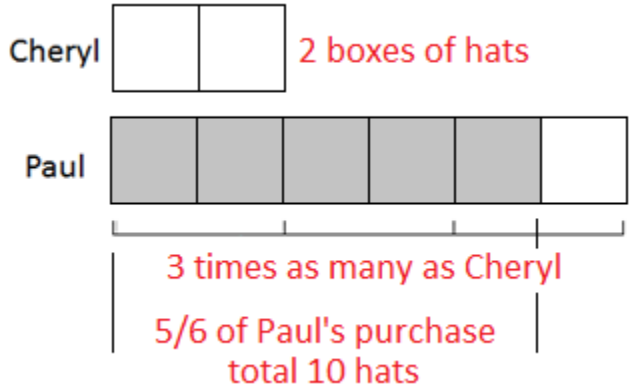

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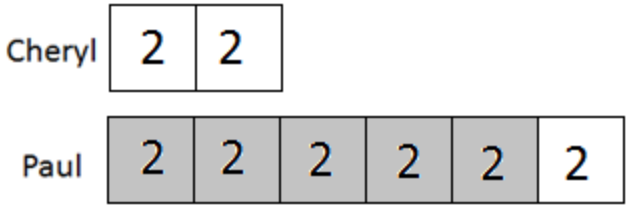

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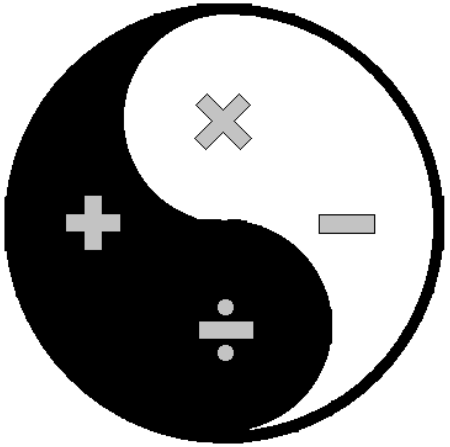

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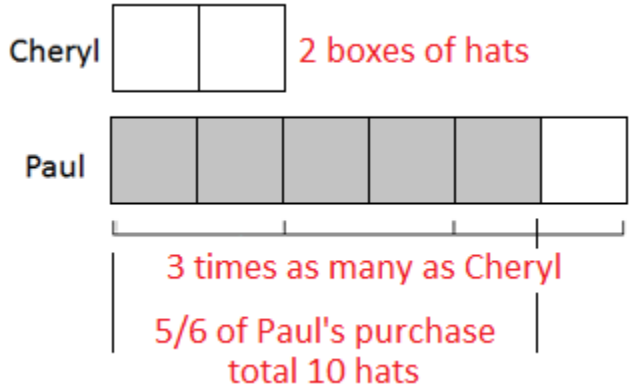

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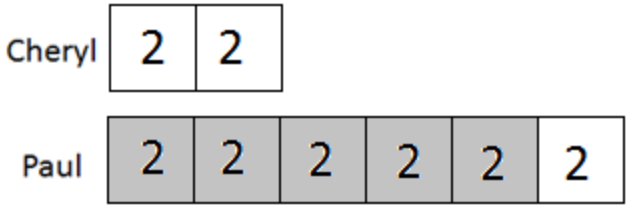
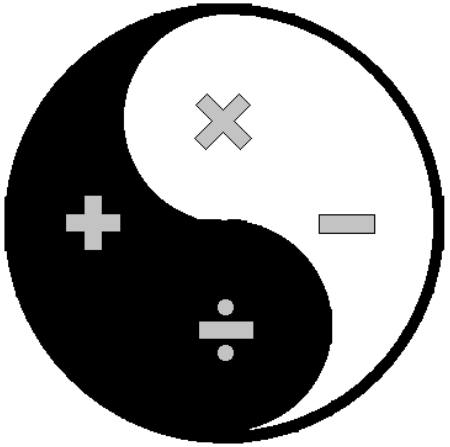


4. Look back

Cheryl bought 4 hats and Paul purchased 12 hats.

5/6 of 12 is 10.



The Tai Chi of Basic Mathematics

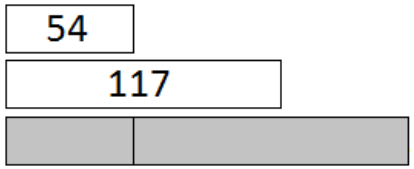
(An attempt to find balance)

PROBLEM SOLVING

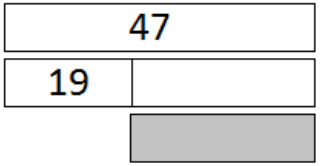
Models → Solutions

Given the information below, what is the value of the shaded regions.

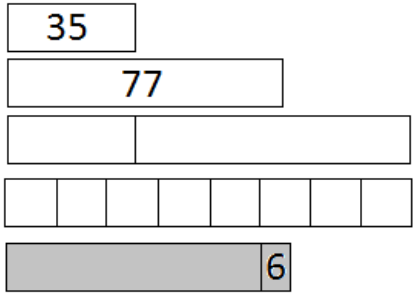
Problem #1



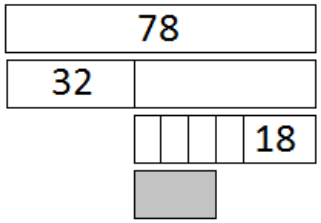
Problem #2



Problem #3

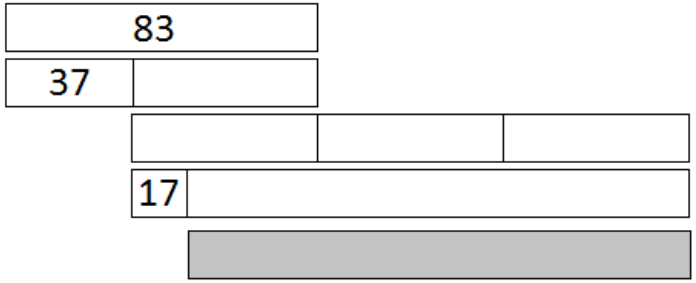


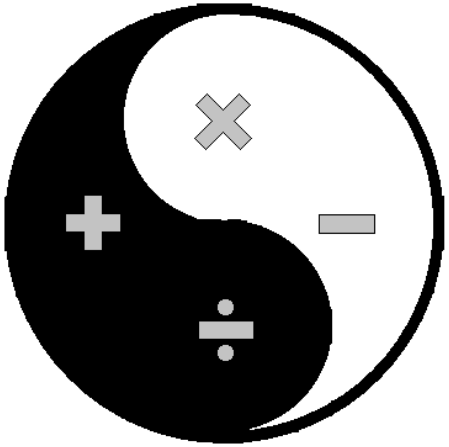
Problem #4



Problem #5

Problem #6



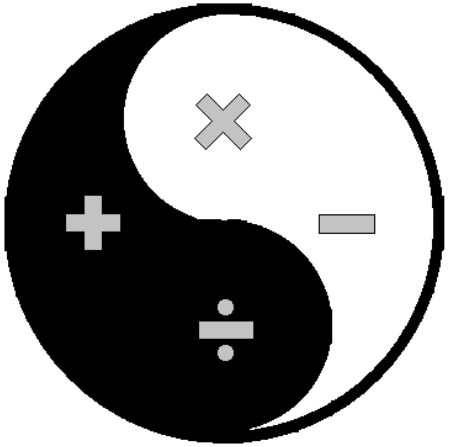


The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING (Words → Models → Solutions)

Fred could not divide the amount of money in his pocket equally among his 4 kids. His wife gave him an additional $3 after which each of his 4 kids received $8.



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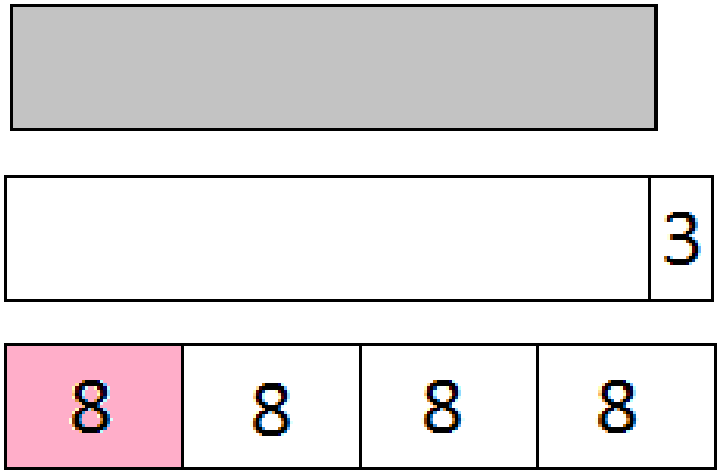

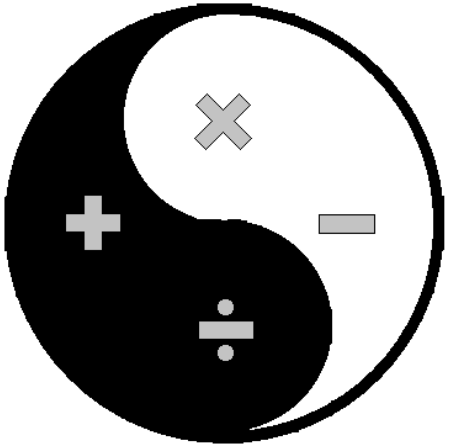

The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING (Words → Models → Solutions)

Tristan divided a certain amount of money into 3 equal shares. He gave the first share to Betty, the second share to Veronica, and he then divided the remainder into 3 equal shares and gave one share to Archie. He kept the rest totaling $24. How much money did Tristan initially have?

The Tai Chi of Basic Mathematics

(An attempt to find balance)

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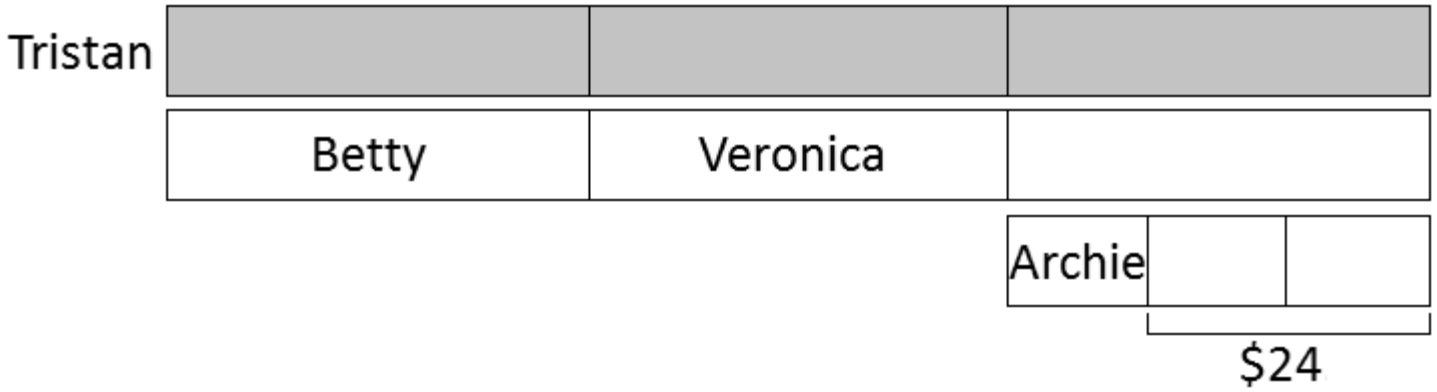
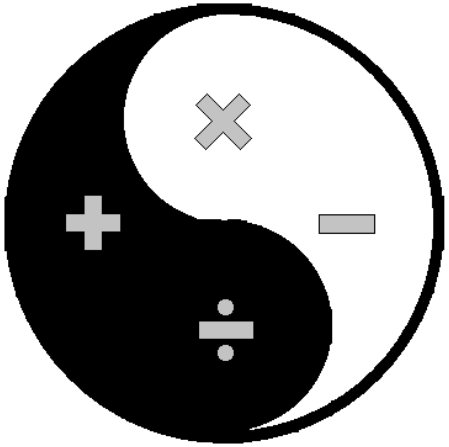




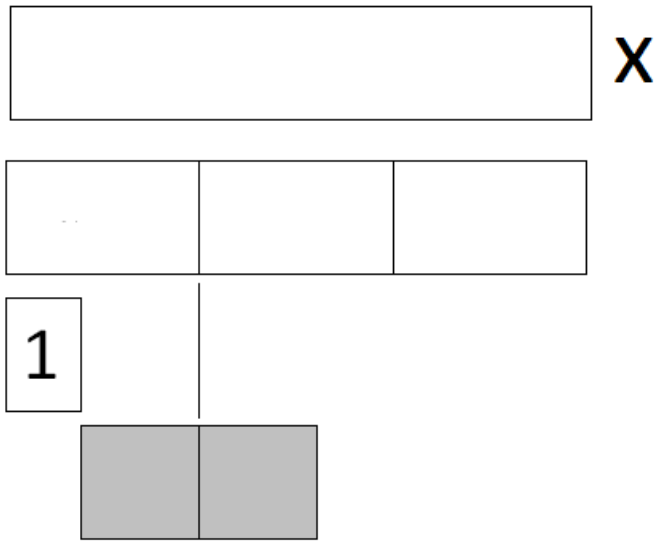
The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING and Linear Models → Expression

Given the model, create the algebraic expression.

Illustration:



What is the
Algebraic Expression?

The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING and Linear Models → Expression

Given the model, create the algebraic expression.

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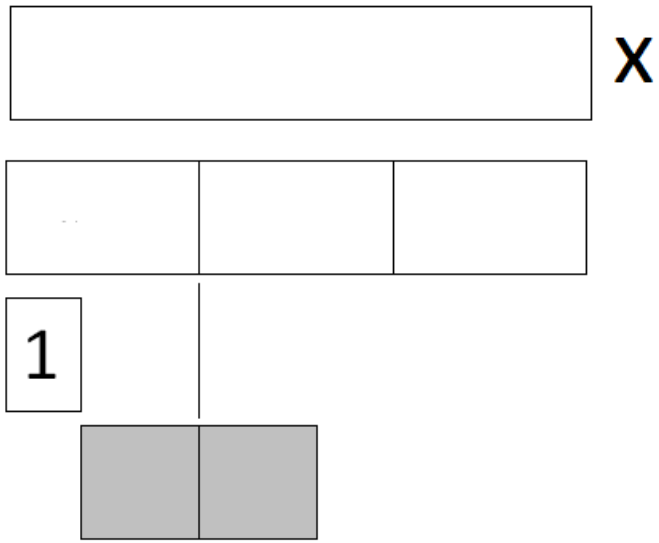

What is the
Algebraic Expression?

$$2\left(\frac{x}{3} - 1\right)$$

The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING and Linear Models → Expression

Given the model, create the algebraic expression.

x

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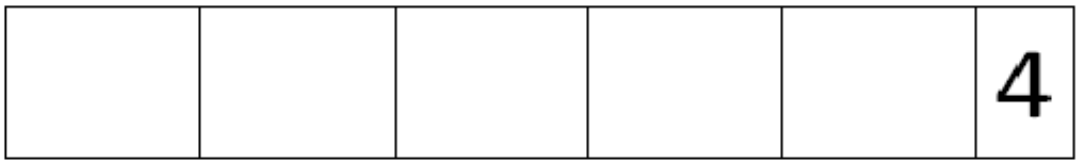

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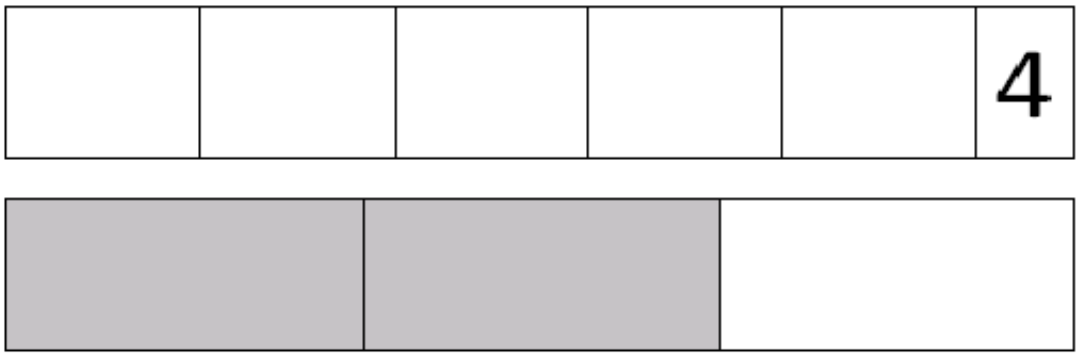
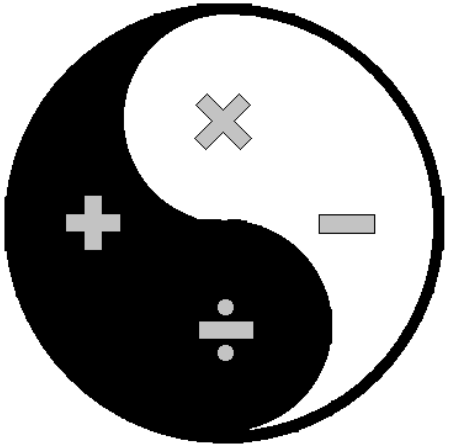


What is the Algebraic Expression?

$$\frac{2}{3}(5x + 4)$$



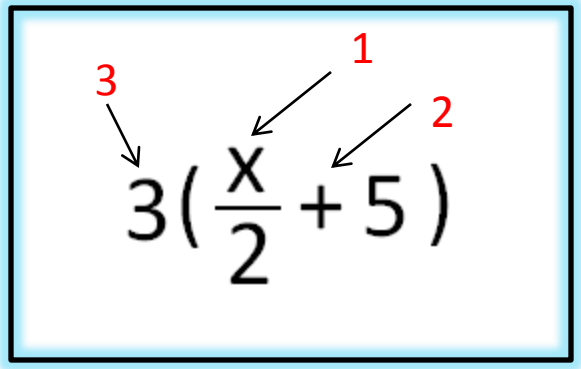
The Tai Chi of Basic Mathematics

(An attempt to find balance)

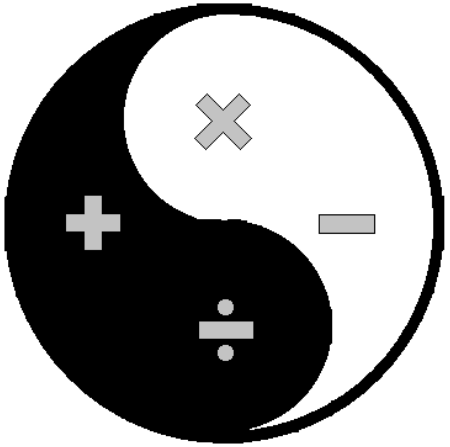
Linear Functions and the Order of Operations → Model

Given the algebraic expression, label the order of each operation involve in the process, and then create the model.

x



3 Operations



The Tai Chi of Basic Mathematics

(An attempt to find balance)

Linear Functions and the Order of Operations → Model

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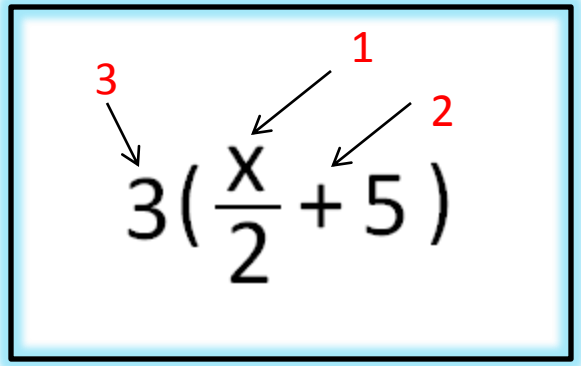

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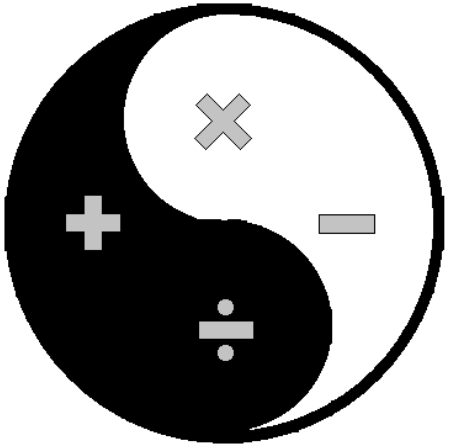

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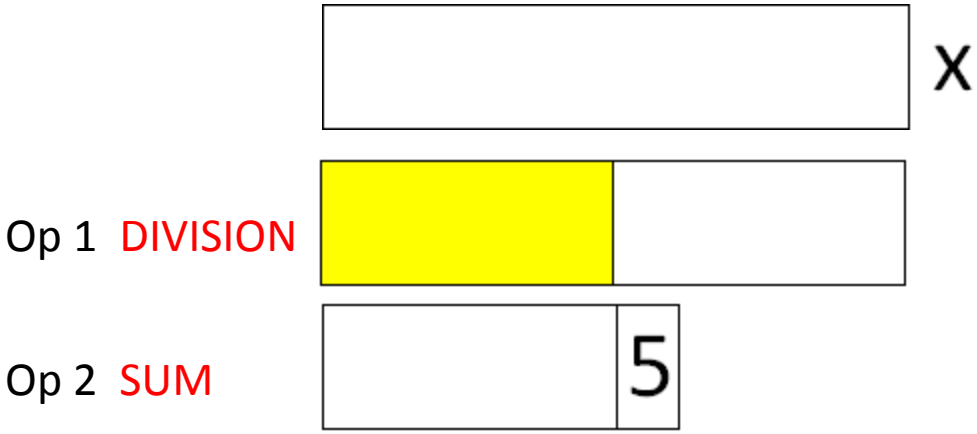

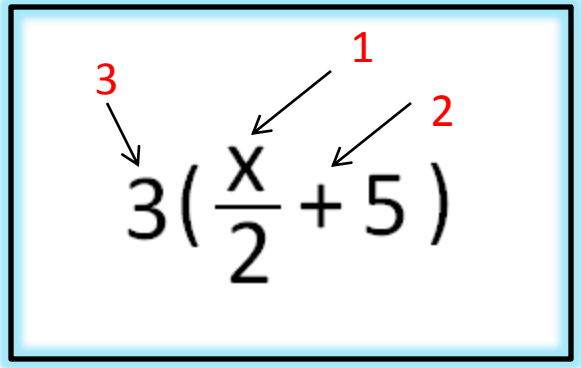

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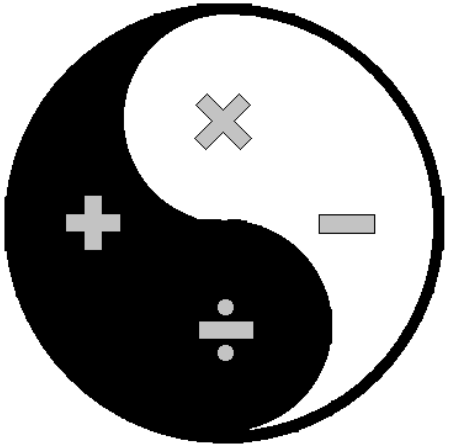

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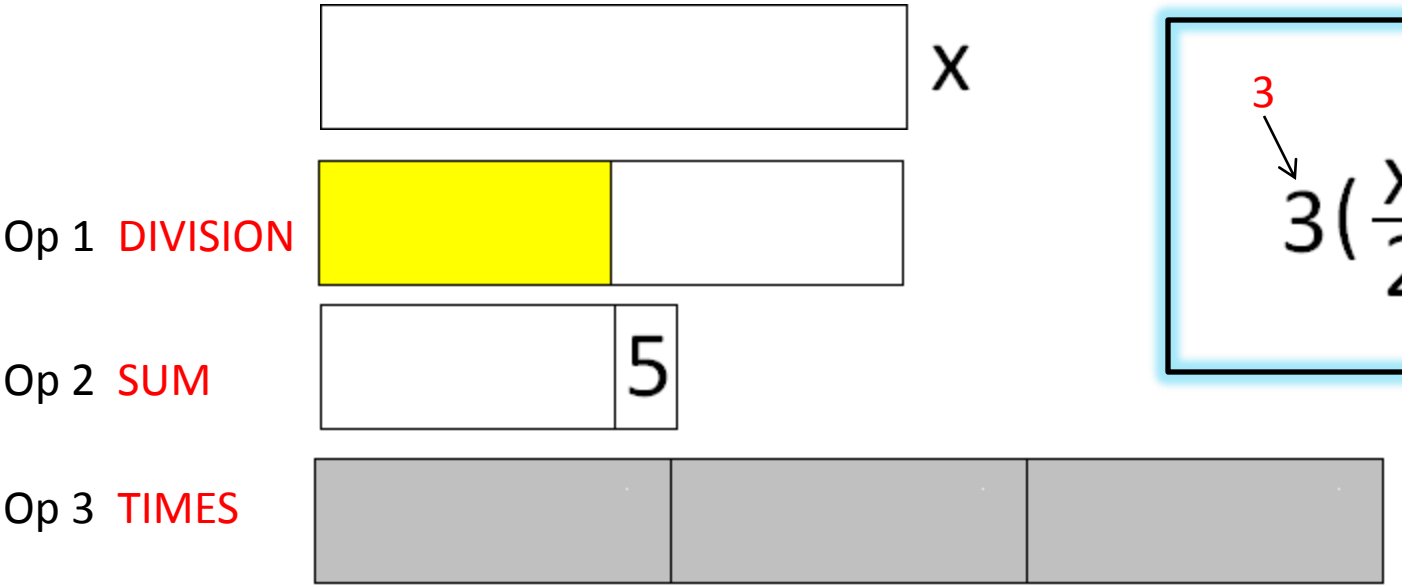

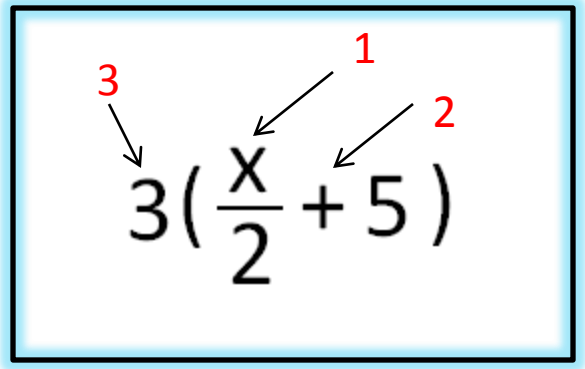

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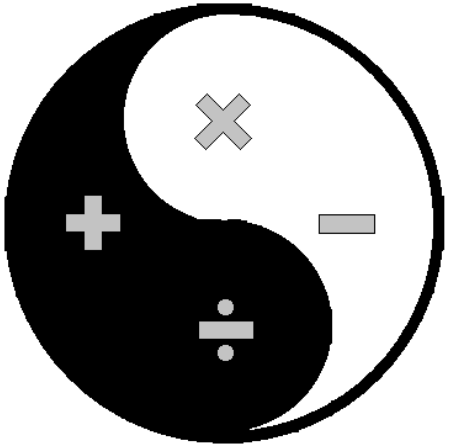

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Linear Functions and the Order of Operations → Model

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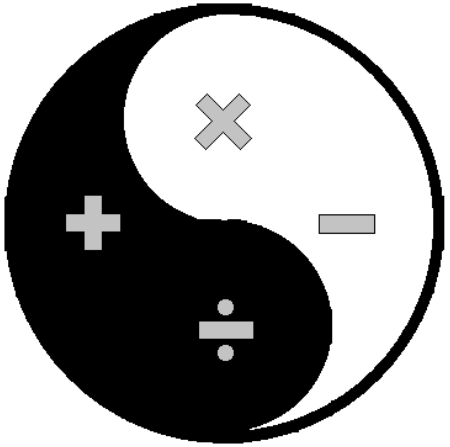
x

$$\frac{3\left(\frac{x}{4}+1\right)+2}{5}$$

1 2 4 3 5

5 Operations



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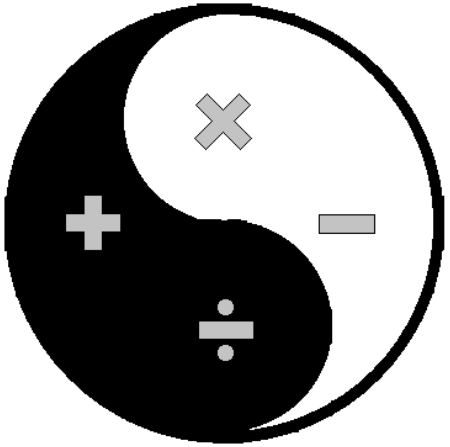
5 Operations



The Tai Chi of Basic Mathematics

(An attempt to find balance)

Linear Functions and the Order of Operations → Model

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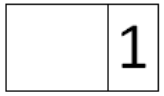
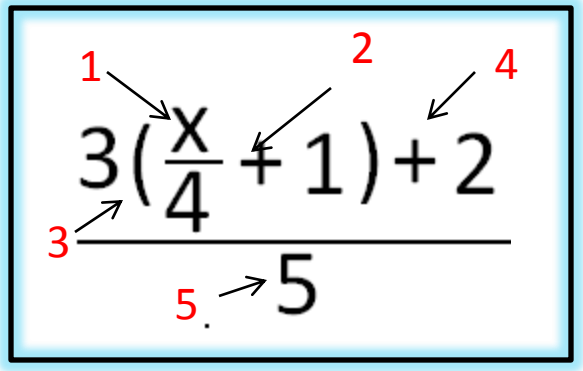
Op 1 DIVIDE

Op 2 SUM





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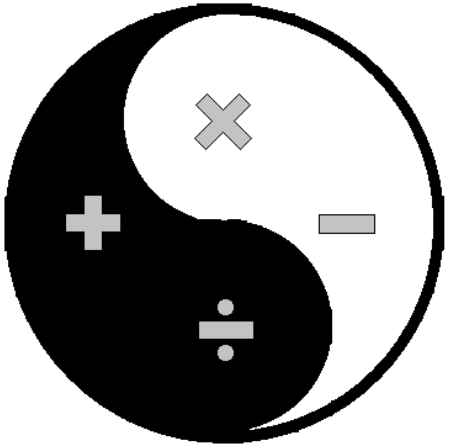

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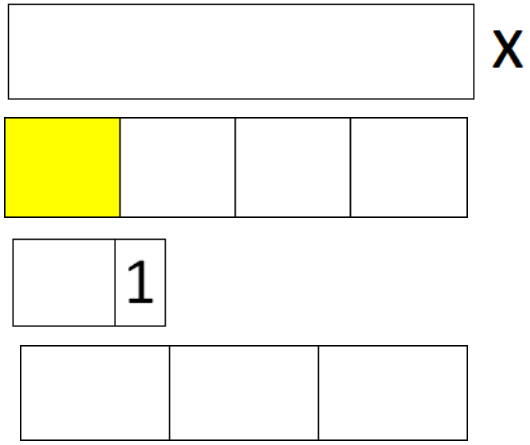

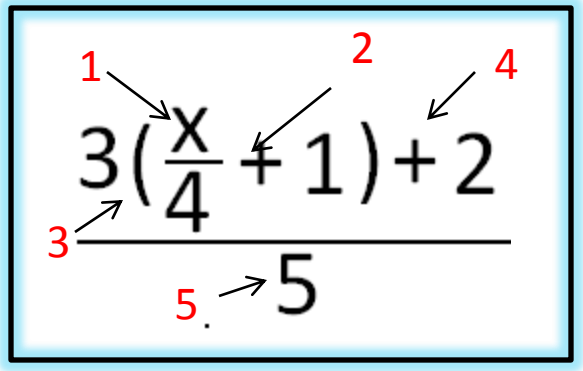

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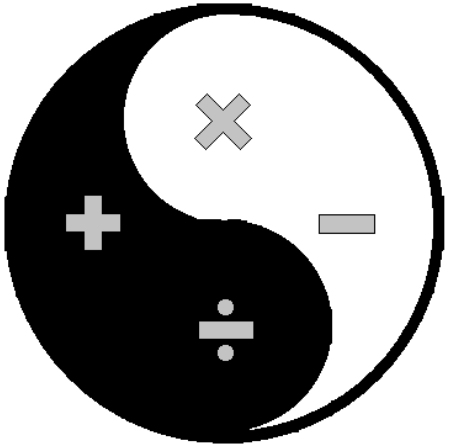

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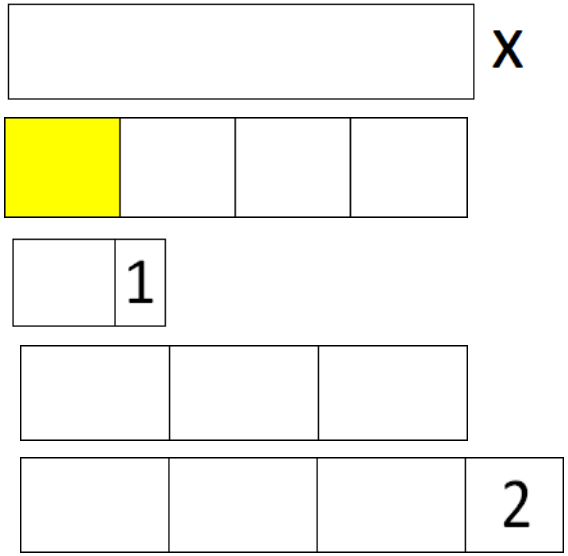

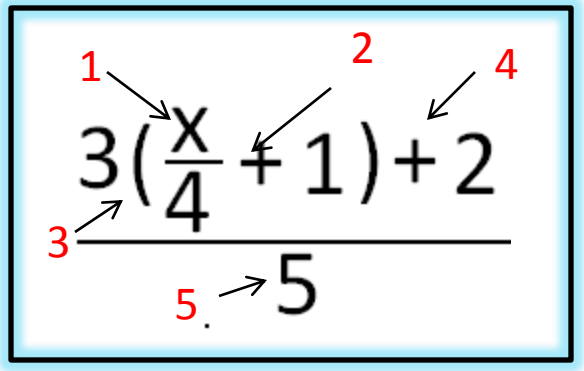

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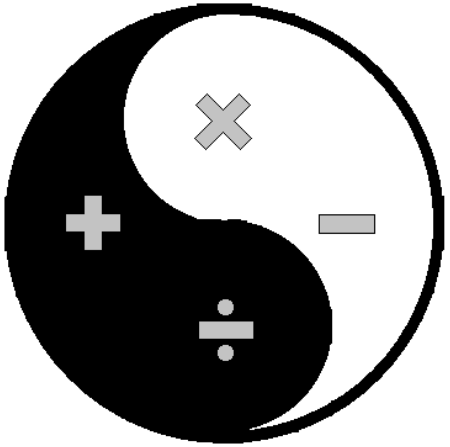

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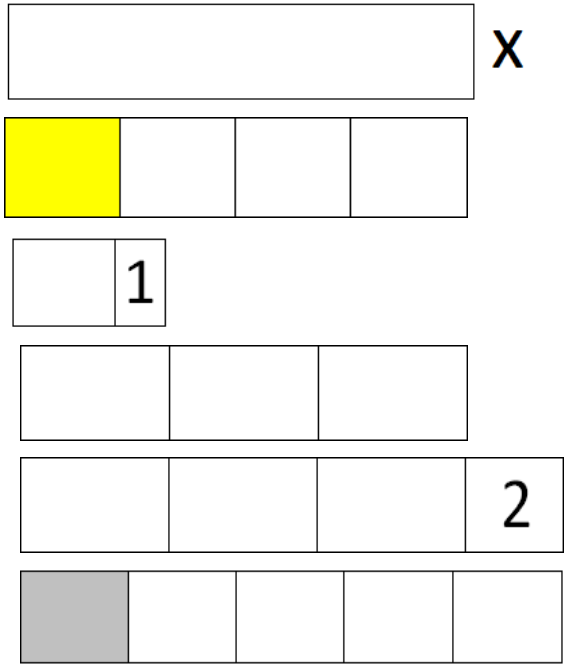
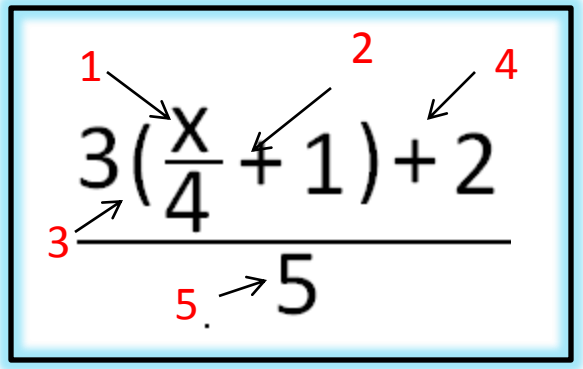
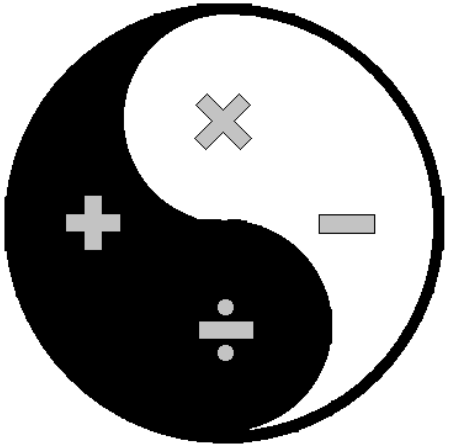
Linear Functions and the Order of Operations → Model

Given the algebraic expression, label the order of each operation involve in the process, and then create the model.





5 Operations

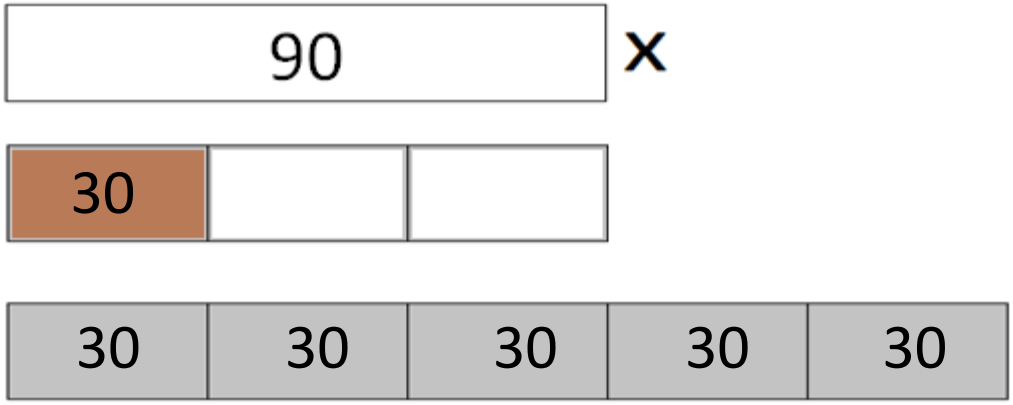


The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING: Evaluating an Expression.

Given the model and the corresponding input value, determine the value the expression.



If the value of the x is 90, determine the value of the expression.

$$\frac{5}{3}x$$

The Tai Chi of Basic Mathematics

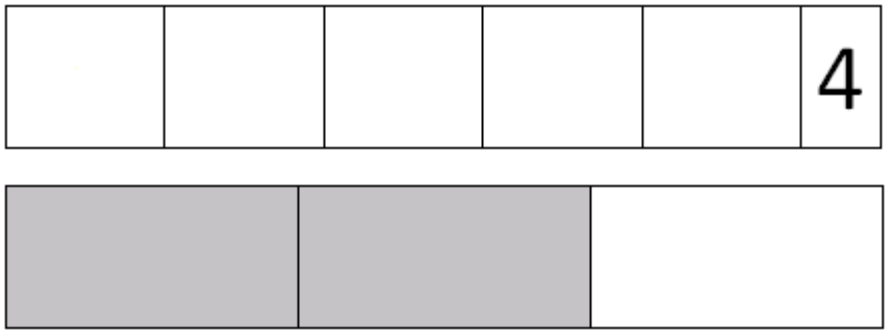
(An attempt to find balance)

PROBLEM SOLVING: Evaluating an Expression.

Given the model and the corresponding input value, determine the value the expression.

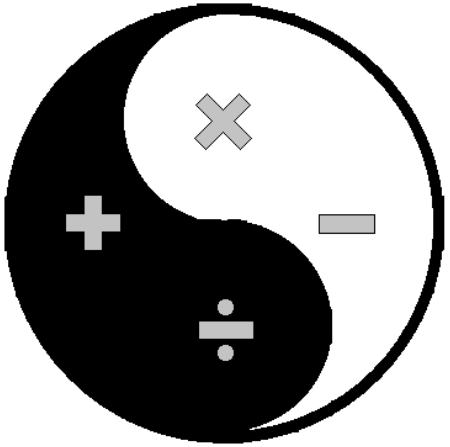
7	x

Illustration:



If the value of the x is 7, determine the value of the expression.

$$\frac{2}{3}(5x + 4)$$



The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING: Evaluating an Expression.

Given the model and the corresponding input value, determine the value the expression.

7	x

Illustration:

7	7	7	7	7	4	39

13	13	

If the value of the x is 7, determine the value of the expression.

$$\frac{2}{3}(5x + 4)$$

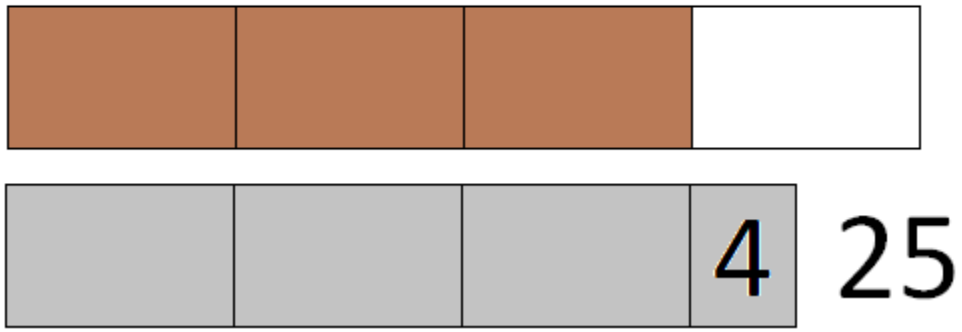
The Tai Chi of Basic Mathematics

(An attempt to find balance)

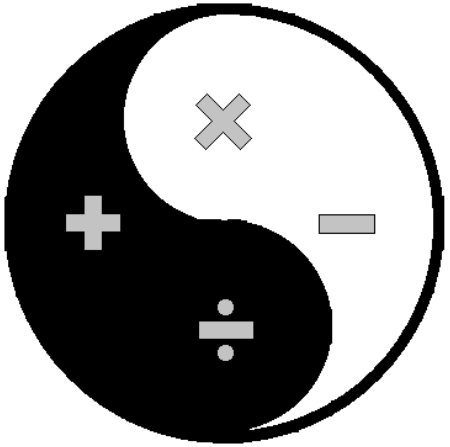
PROBLEM SOLVING Models → Solving an Equation

Given the model and value of the expression, determine the value of its input.

The expression has a value of 25; so what is the value of x?



$$\left(\frac{3}{4}x + 4\right) = 25$$



The Tai Chi of Basic Mathematics

(An attempt to find balance)

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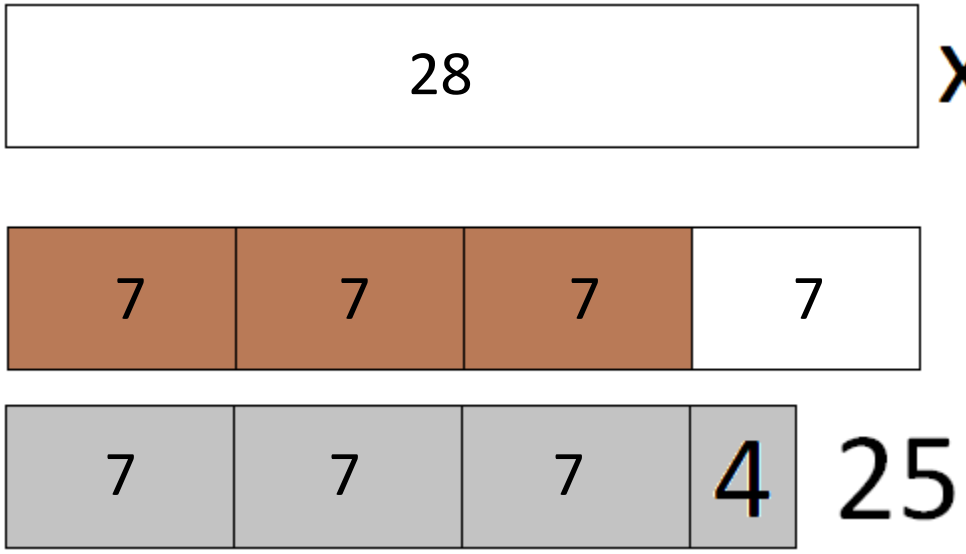

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The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING Models → Solving an Equation

Given the model and value of the expression, determine the value of its input.

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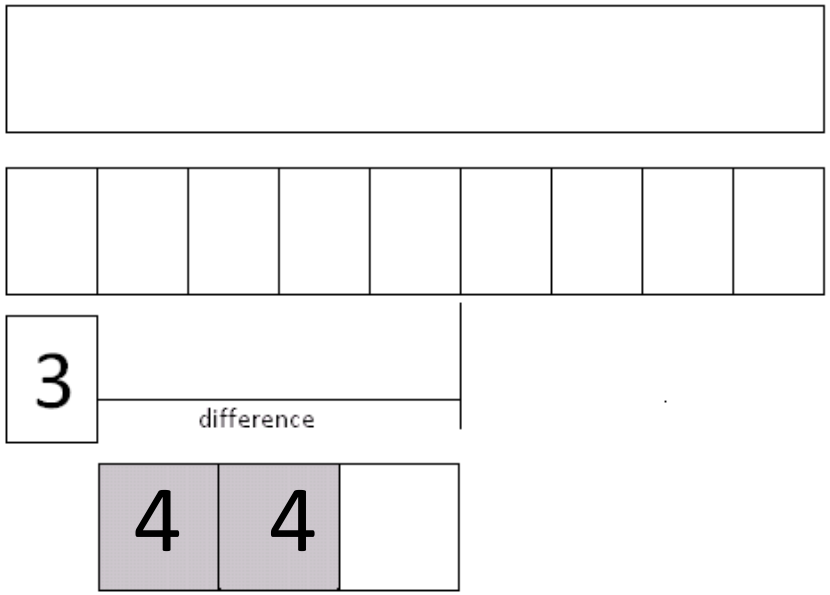
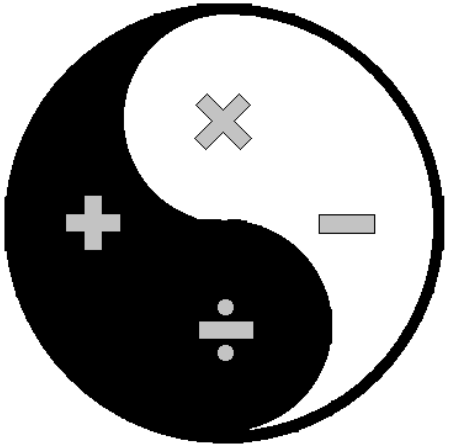


The expression has a value of 8; so what is the value of x?

$$\frac{2}{3}\left(\frac{5}{9}x - 3\right) = 8$$



The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING Models → Solving an Equation

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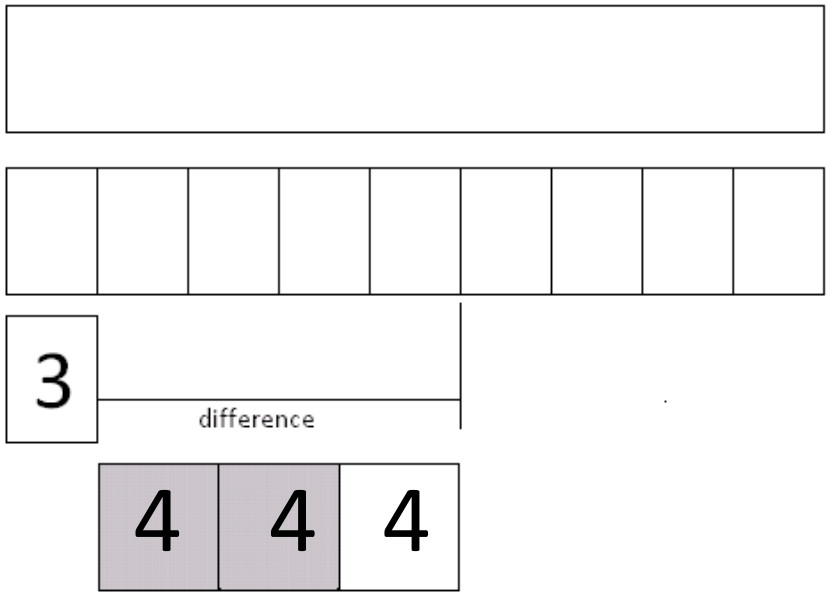

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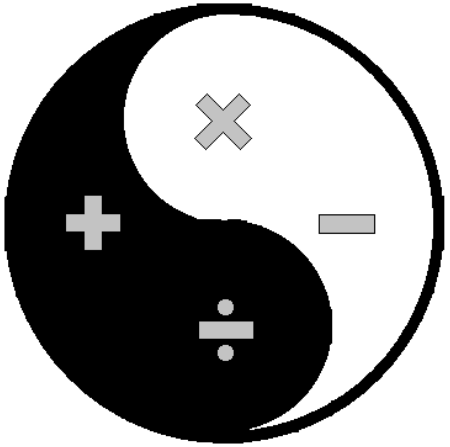

The Tai Chi of Basic Mathematics

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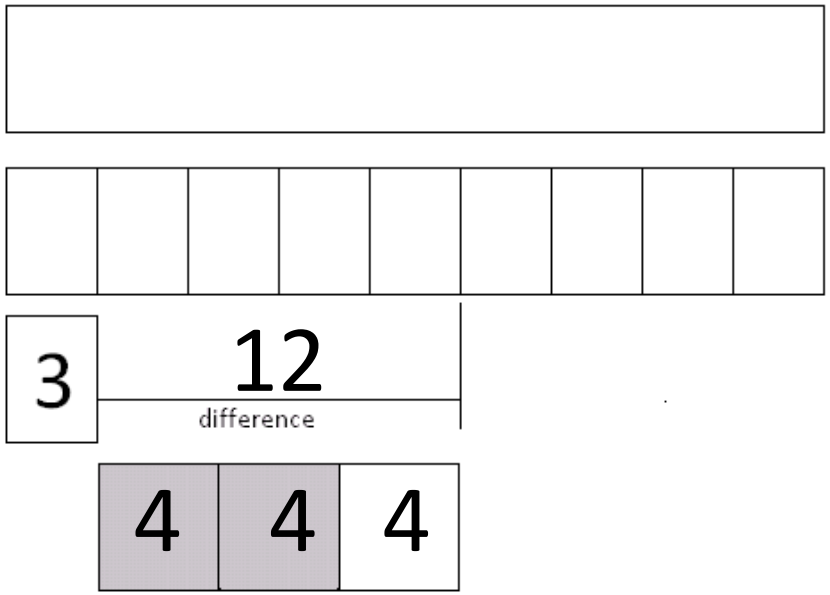

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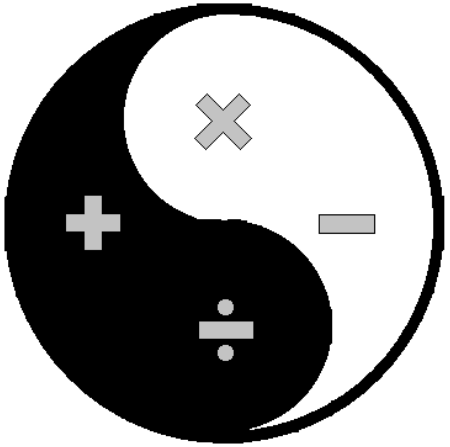
$$\frac{2}{3}\left(\frac{5}{9}x - 3\right) = 8$$



The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING Models → Solving an Equation

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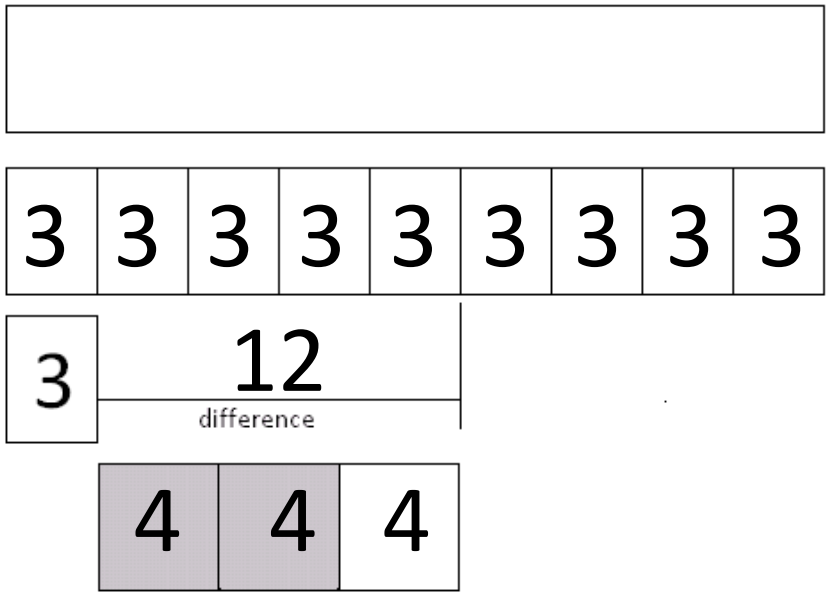

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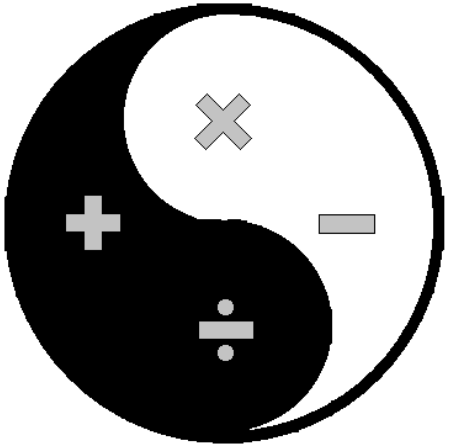

The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING Models → Solving an Equation

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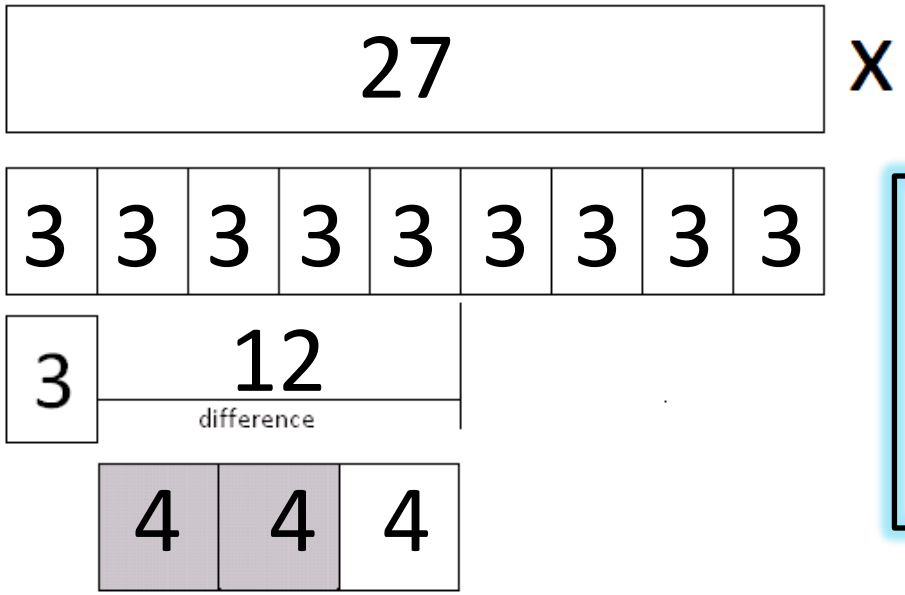


The expression has a value of 8; so what is the value of x?

$$\frac{2}{3}\left(\frac{5}{9}x - 3\right) = 8$$

The Tai Chi of Basic Mathematics

(An attempt to find balance)

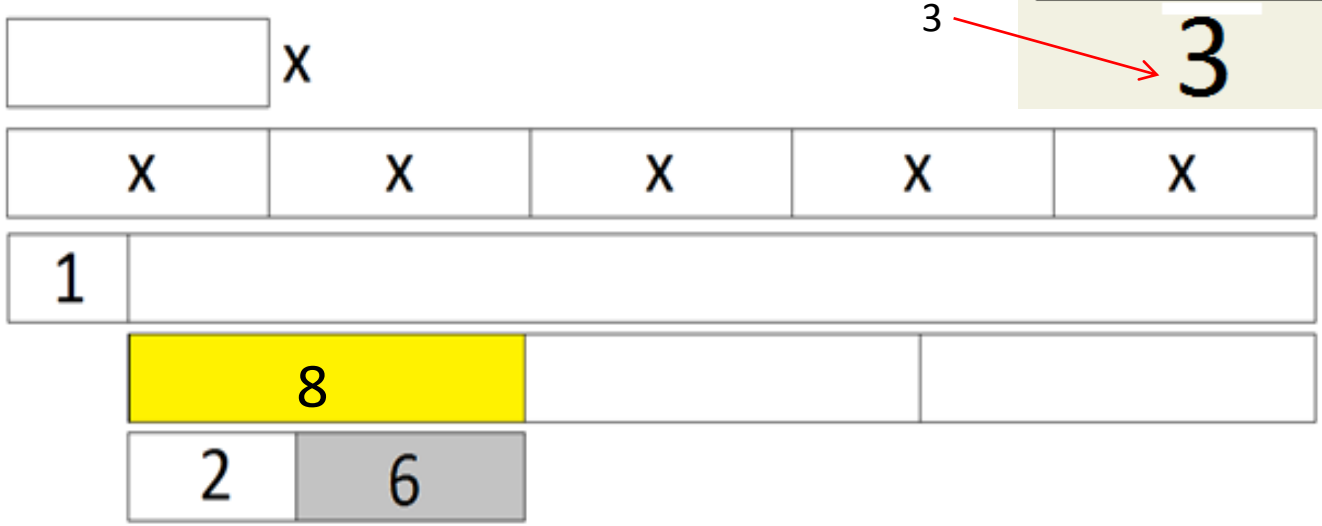
PROBLEM SOLVING Models → Solving an Equation via the Algebraic Method

Given the model and value of the expression, determine the value of its input.

1) ADD 2 to get 8 for the YELLOW box.

$$\frac{(5x - 1)}{3} - 2 = 6$$

1 2 3 4



Describe the steps you will need to do to solve for x.

The Tai Chi of Basic Mathematics

(An attempt to find balance)

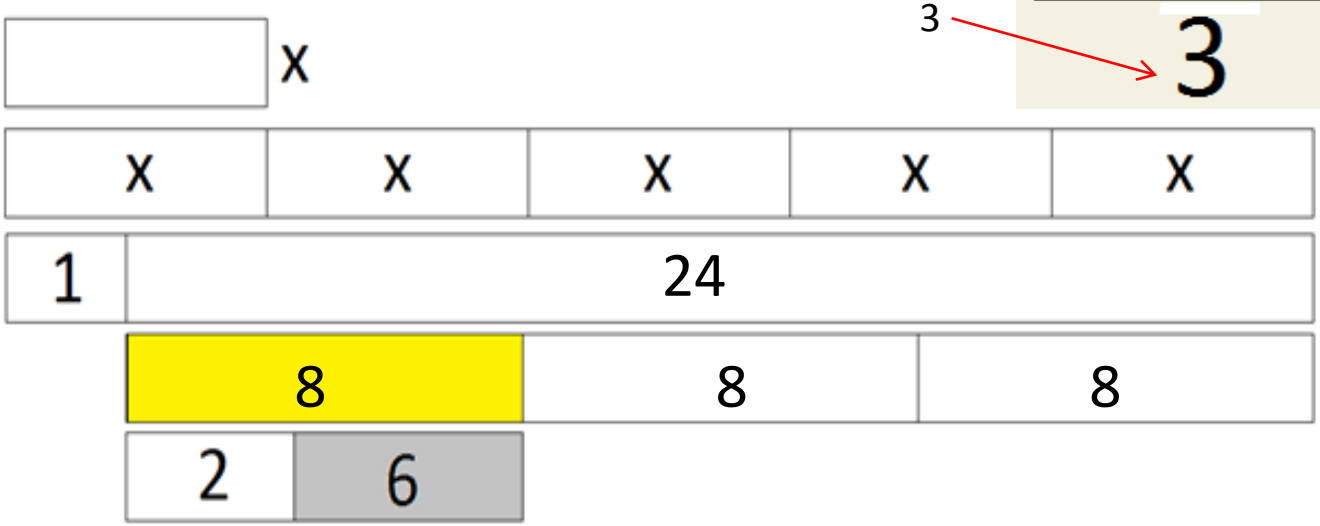
PROBLEM SOLVING Models → Solving an Equation via the Algebraic Method

Given the model and value of the expression, determine the value of its input.

2) MULTIPLY by 3 to get 24

$$\frac{(5x - 1)}{3} - 2 = 6$$

1 2 3 4



Describe the steps you will need to do to solve for x.

The Tai Chi of Basic Mathematics

(An attempt to find balance)

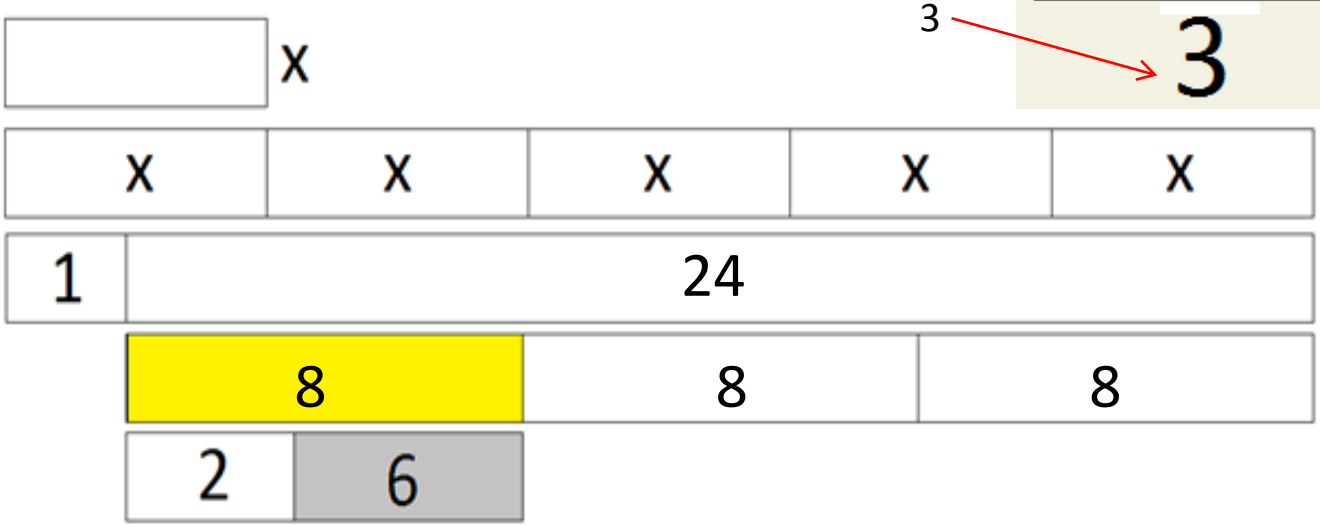
PROBLEM SOLVING Models → Solving an Equation via the Algebraic Method

Given the model and value of the expression, determine the value of its input.

3) ADD 1 to get 25

$$\frac{(5x - 1)}{3} - 2 = 6$$

1 2 3 4



Describe the steps you will need to do to solve for x.

The Tai Chi of Basic Mathematics

(An attempt to find balance)

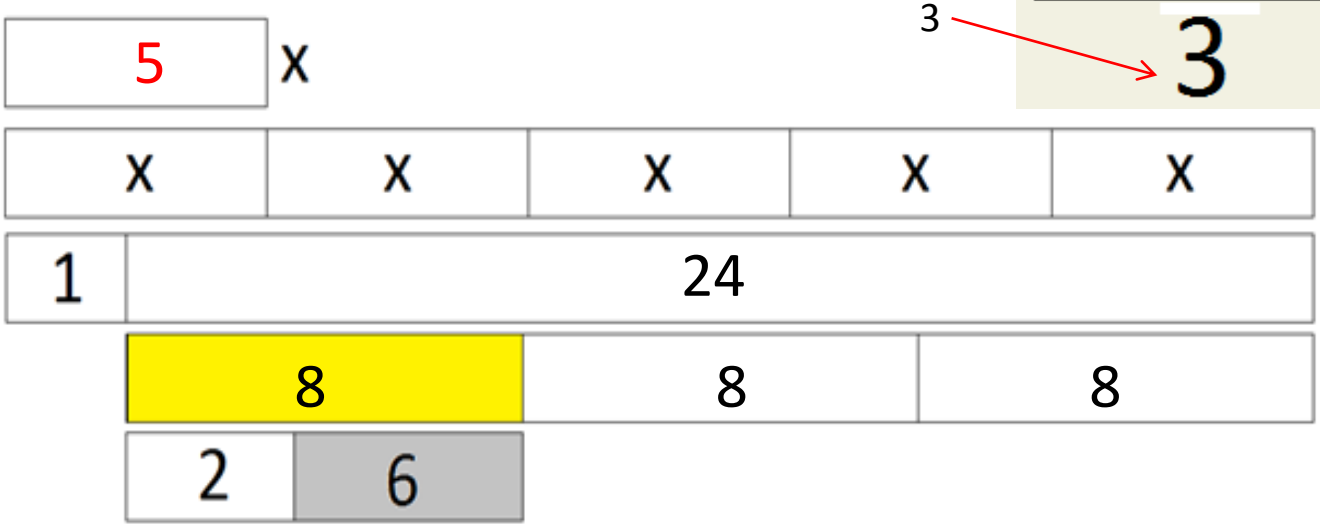
PROBLEM SOLVING Models → Solving an Equation via the Algebraic Method

Given the model and value of the expression, determine the value of its input.

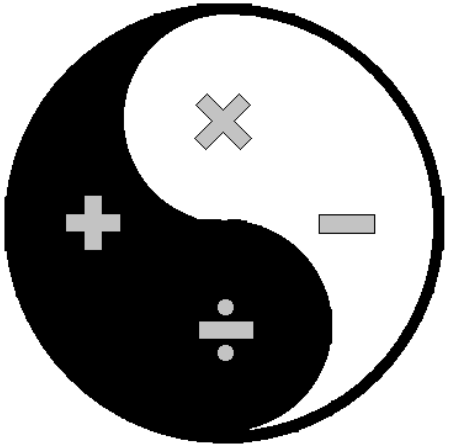
4) DIVIDE by 5 to get 5

$$\frac{(5x - 1)}{3} - 2 = 6$$

1 2 3 4



Describe the steps you will need to do to solve for x.



The Tai Chi of Basic Mathematics

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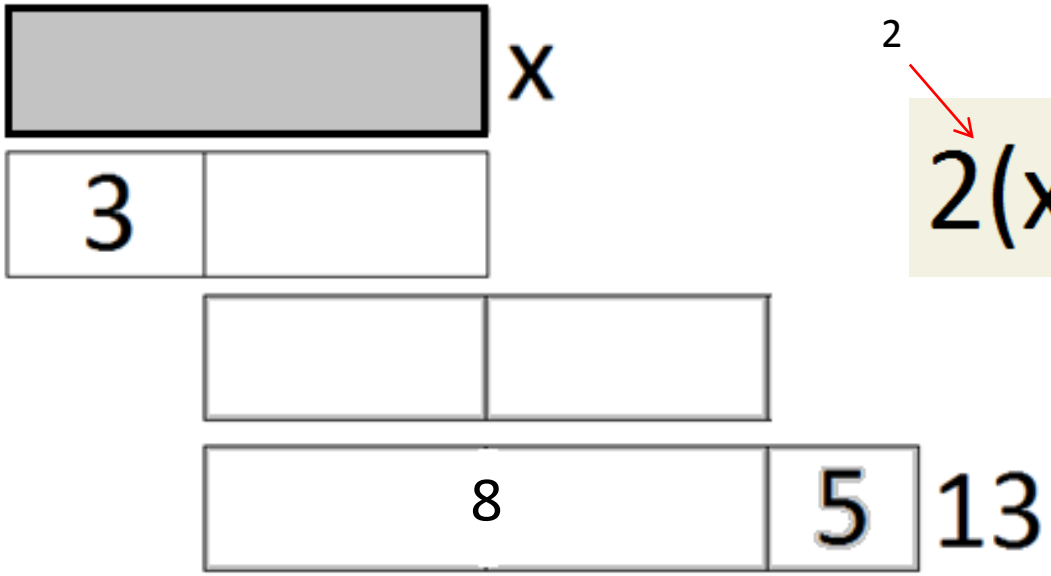


2 1 3

$$2(x - 3) + 5 = 13$$

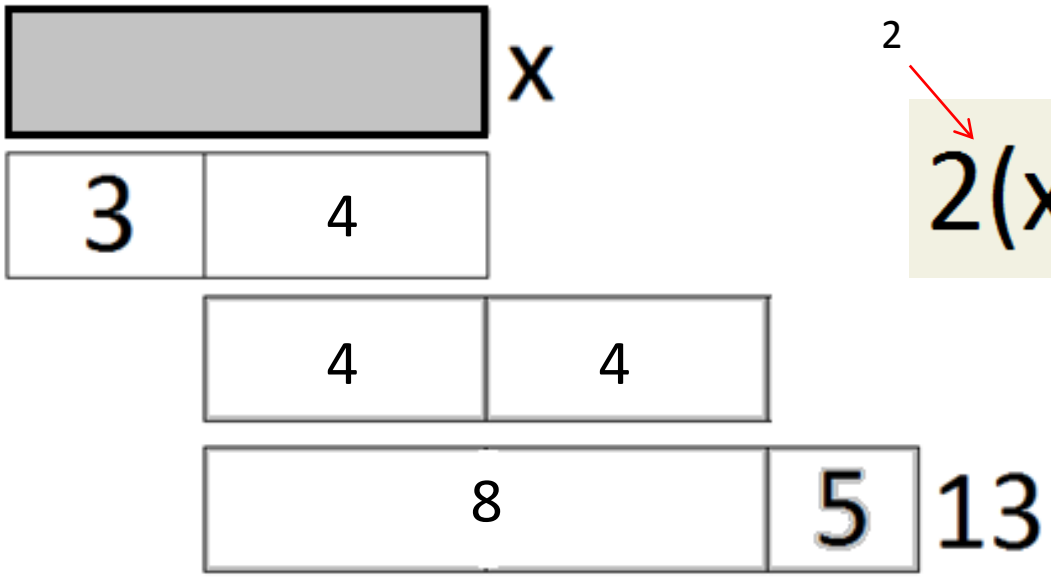
1) Subtract 5 from 13 to get the length of the left rectangle.

The Tai Chi of Basic Mathematics

(An attempt to find balance)

PROBLEM SOLVING Models → Solving an Equation via the Algebraic Method

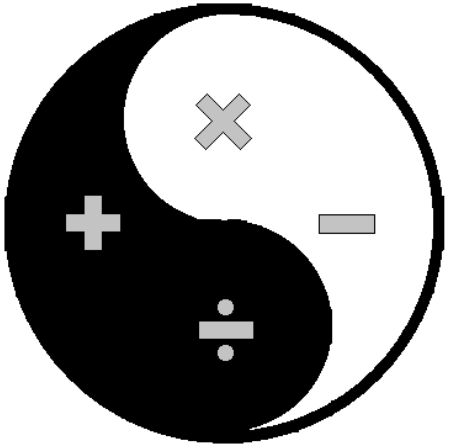
Given the model and value of the expression, determine the value of its input.



2 1 3

$$2(x - 3) + 5 = 13$$

2) Divide by 2



The Tai Chi of Basic Mathematics

(An attempt to find balance)

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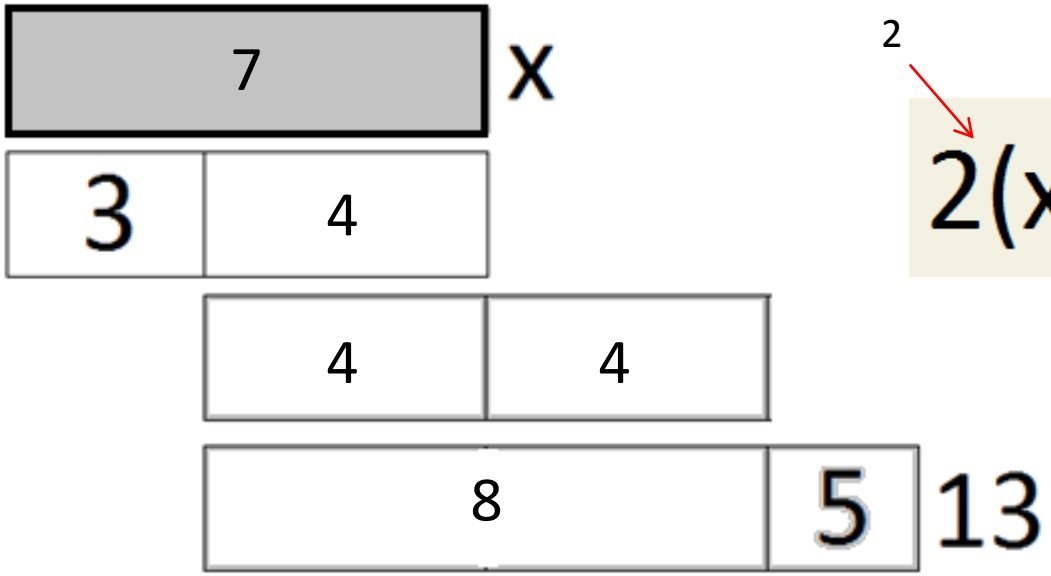
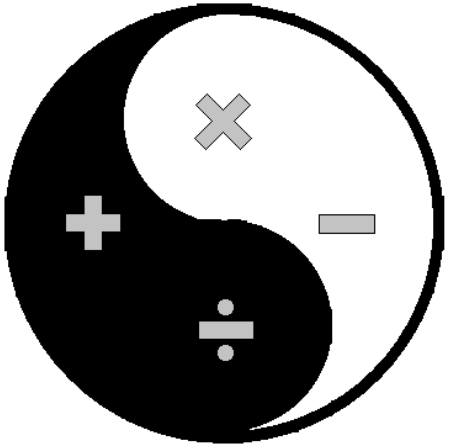


2 1 3

$$2(x - 3) + 5 = 13$$

3) Add 3



The Tai Chi of Basic Mathematics

(An attempt to find balance)

An Important Goal:

Problem Solving and Critical Thinking w/ Applications

The Tai Chi of Basic Mathematics

(An attempt to find balance)

Jim took $23.00 with him to go shopping.
His sister, Loretta took $13.00 more than he did.

How much did Loretta take shopping?

The Tai Chi of Basic Mathematics

(An attempt to find balance)

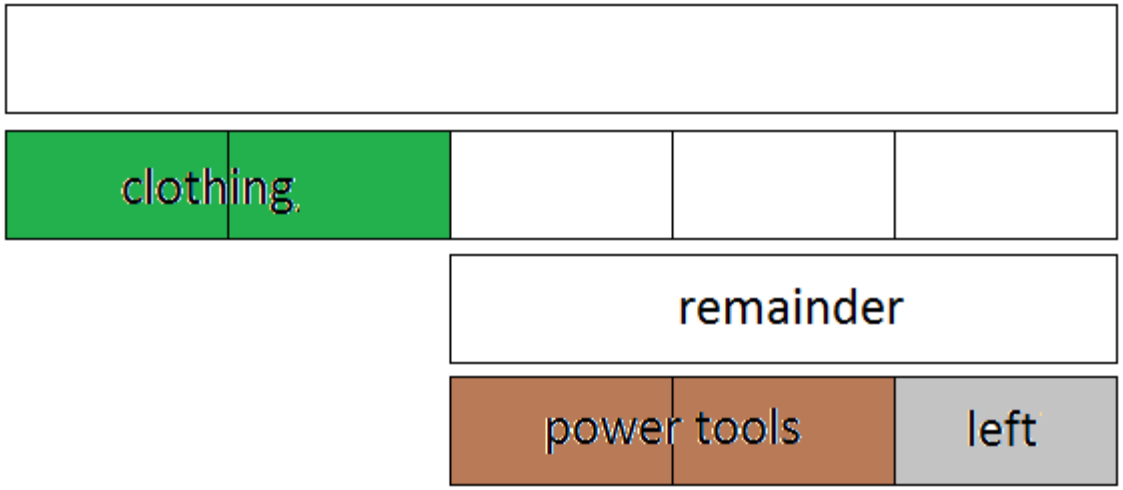
Judy bought some eggs. She used 2/5 of the eggs to bake cakes. She had 18 eggs left.

How many eggs did she did she buy?

The Tai Chi of Basic Mathematics

(An attempt to find balance)

Tomas took a certain amount of money from his bank account to go shopping at the mall. He spent 2/5 of the money on clothing, and 2/3 of the remainder for power tools. What fraction of his original amount was left?



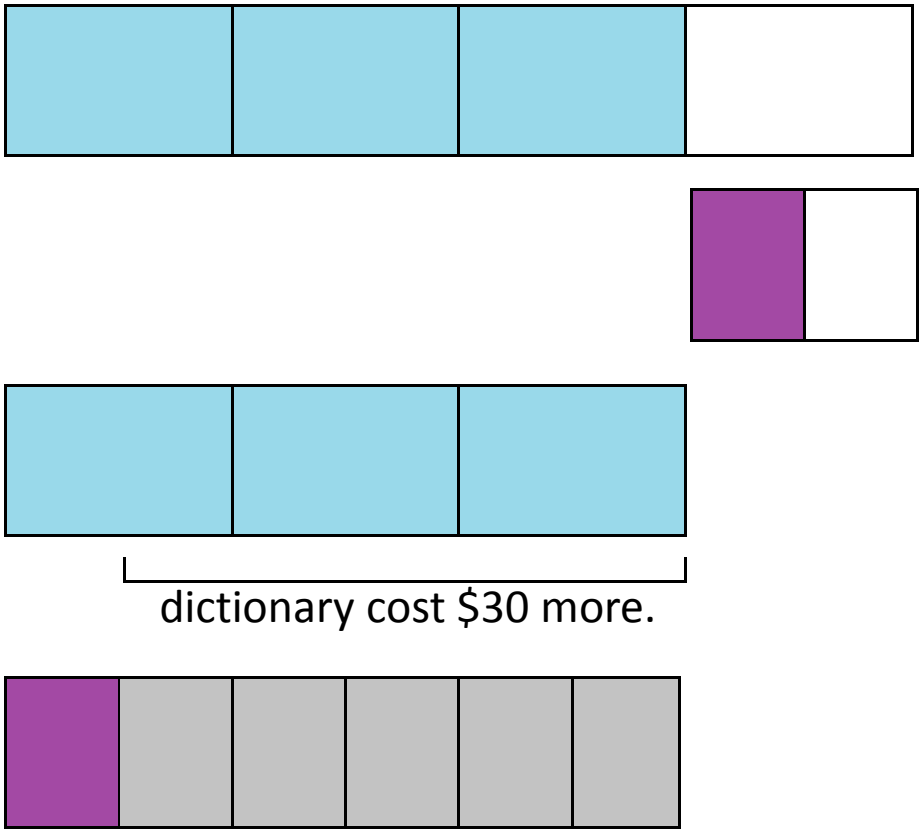
What fraction of his original amount was left?

The Tai Chi of Basic Mathematics

(An attempt to find balance)

Tom spent three-quarters of his money on a dictionary. He spent one-half of the remainder on a calculator. The dictionary cost $30 more than the calculator.

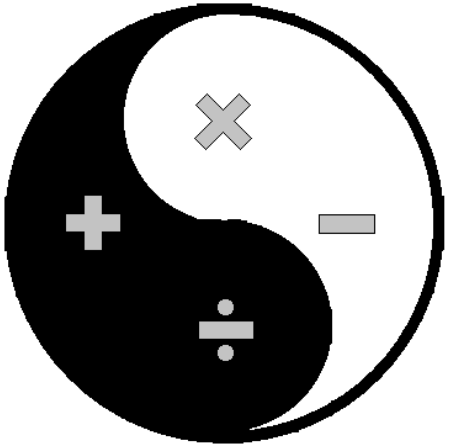
How much does the dictionary cost?



The Tai Chi of Basic Mathematics

(An attempt to find balance)

There are 20 workers in the library. 55% of them were males. How many fewer females than males worked in the library?



The Tai Chi of Basic Mathematics

(An attempt to find balance)

Mary determined that the population of monarch butterflies at a particular site was 12,000. She estimated that next year there would be a 6% increase each year.

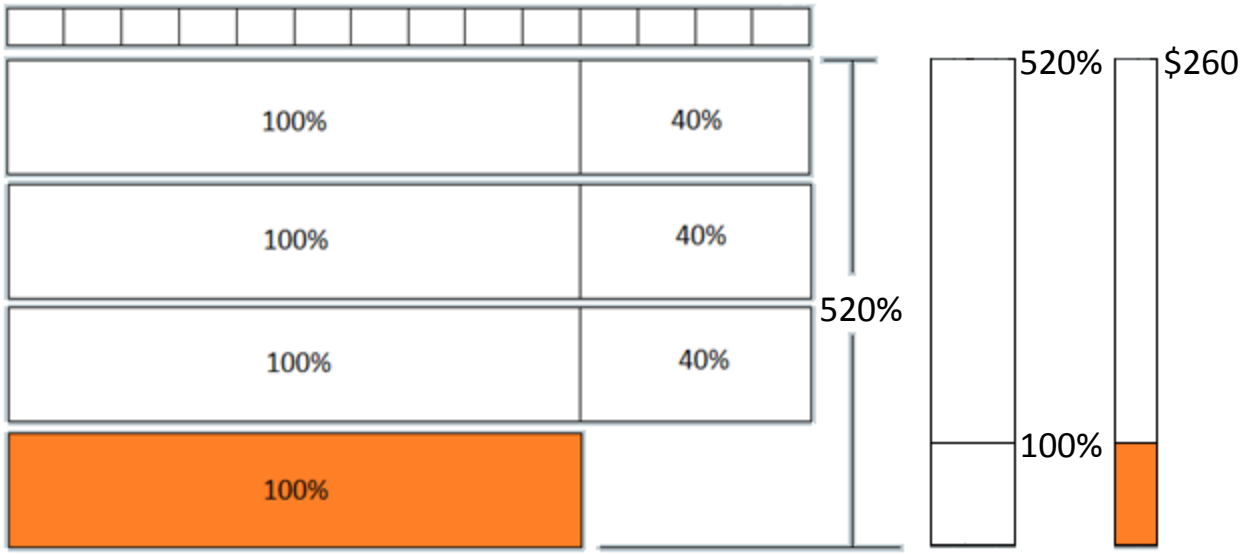
What would be the estimated population of monarch butterflies next year?

100	6
12,000	?

The Tai Chi of Basic Mathematics

(An attempt to find balance)

A shopkeeper had 4 handbags which were of the same cost price. He sold 3 of them at 40% more than the cost price. He sold the fourth handbag at cost price. He received a total of $260 altogether. Find the cost price of each handbag.



The Tai Chi of Basic Mathematics

(An attempt to find balance)

Sally is given $5 more allowance than Megan each week. They each spend $12 per week and save the rest. When Sally has saved $60, Megan saved $20.

Find out Sally's allowance.

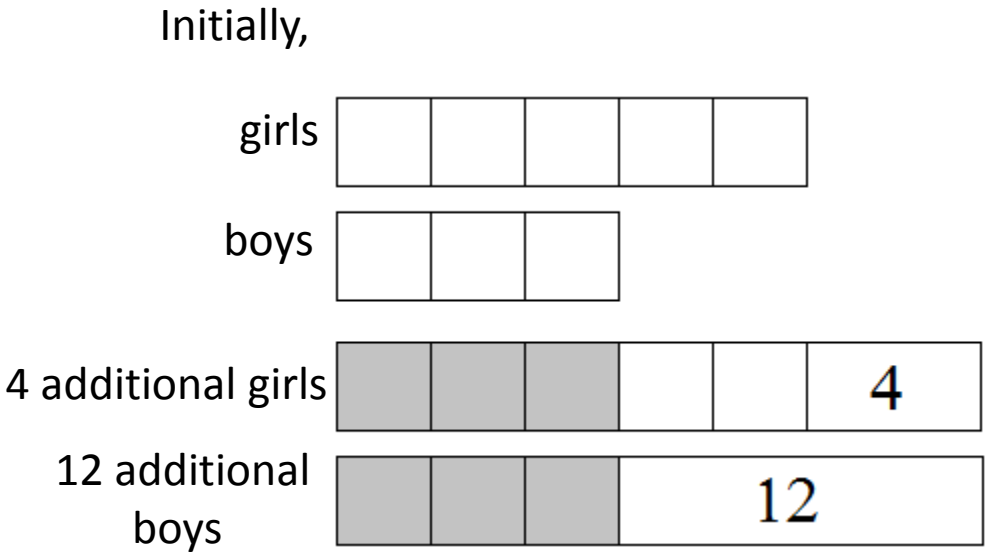
8 weeks of savings from both Sally and Megan

The Tai Chi of Basic Mathematics

(An attempt to find balance)

In a class, at the beginning of the semester, the ratio of girls to boys is 5:3. If an additional 4 girls and 12 boys enrolled, there would be the same number of girls as boys in the class.

How many girls were there at the beginning of the semester?

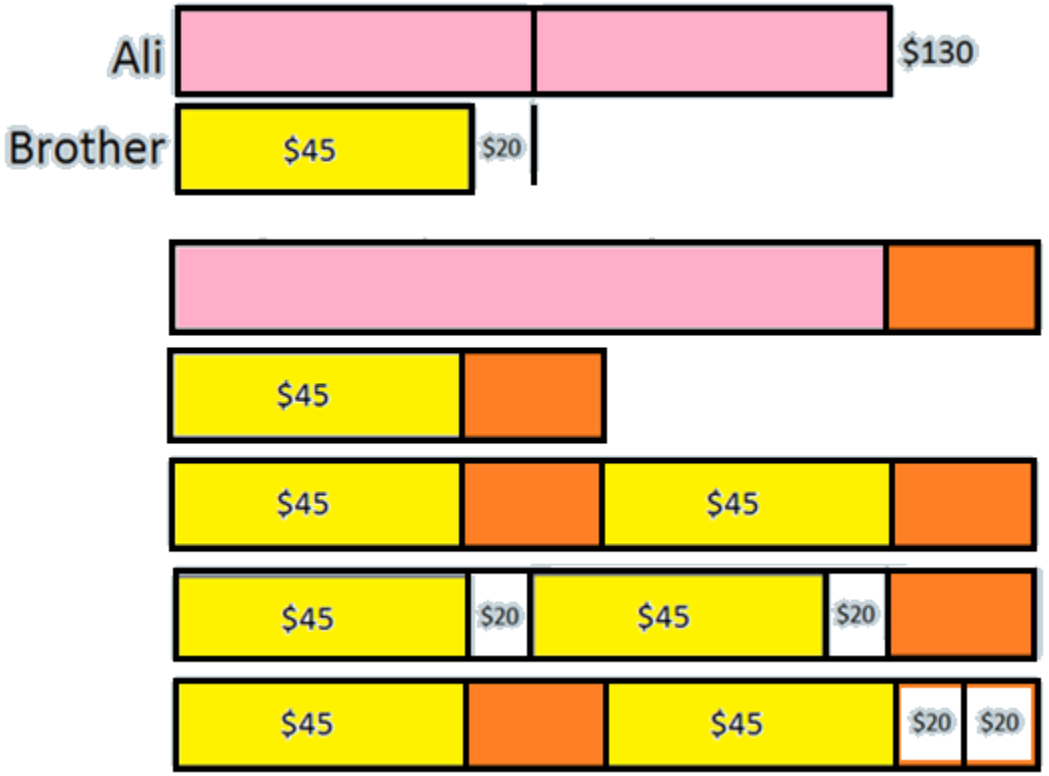


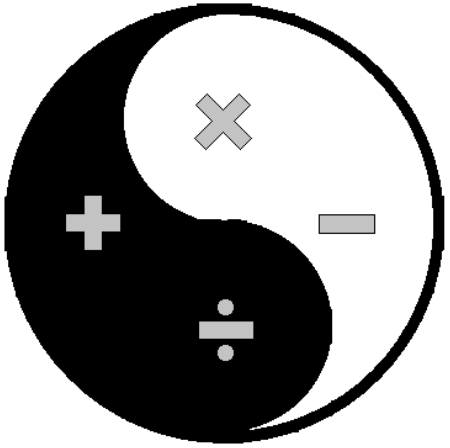
The Tai Chi of Basic Mathematics

(An attempt to find balance)

Ali had $130 and his brother had $45. When their mother gave each of them an equal amount of money, Ali had twice as much as his brother.

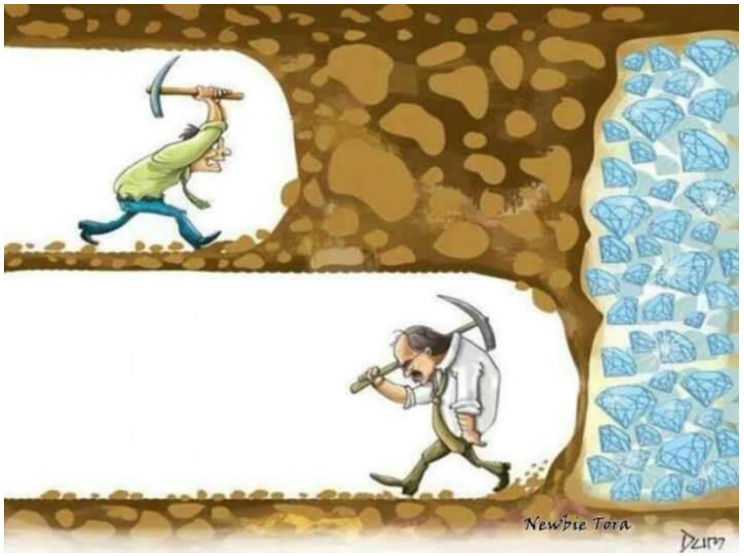
How much did their mother contribute to each of them?





The Tai Chi of Basic Mathematics

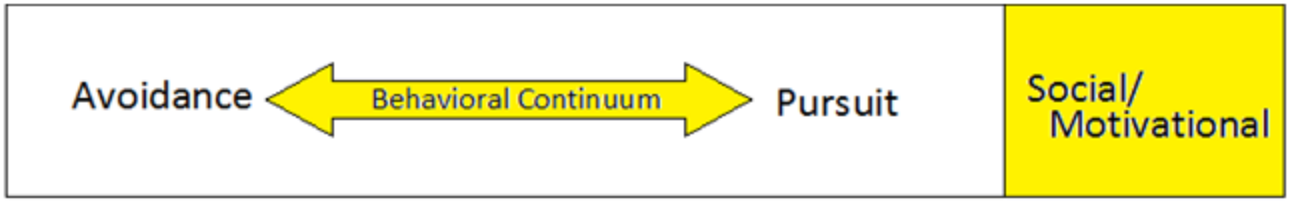
(An attempt to find balance)



Support and Encourage Persistence

Yin Cycle  Yang Cycle

Support Persistance



The Tai Chi of Basic Mathematics

(An attempt to find balance)

Solved it and ready to do the next one.

Okay, ready to begin this problem.

It's tougher than I thought!

The vicious elliptical path problem solving . . .

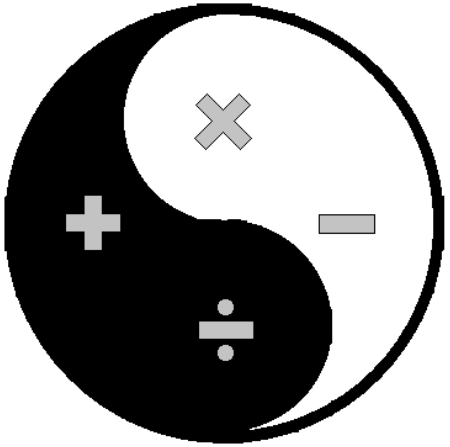
P E R S I S T E N C E

My group mates think that we can get together in the quad to work on it.

Hey, maybe someone in my class study group can help me?

I remember now why I hate math.

I've read it over 25 times. Nothing.



The Tai Chi of Basic Mathematics

(An attempt to find balance)

ComboReview

Half of a Combo-Review (part 1) is taken home giving many students to develop work groups. In class, part 2 with similar objects is given. A master form where answers are recorded when the groups get together is turned in for credit.

Everybody works, everybody benefits.