CSET MULTIPLE SUBJECTS – Subtest II: Math and Science

MATHEMATICS PACKET

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First Source: CSET Website **www.cset.nesinc.com**
(you can print up an "official" practice test)

Other Sources:

Math 210 Webpage **www.csun.edu/math/210.html**
Math 310 Webpage **www.csun.edu/math/310.html**
(you can print up detailed sample finals with solutions for both courses)

References:

The first two are excellent references for Math 210 and Math 310 material.
Mathematics for Elementary Teachers,
by Sybilla Beckmann (published by Addison Wesley)

A Problem Solving Approach to Mathematics for Elementary School Teachers,
by Billstein, Libeskind, Lott (published by Addison Wesley)

Elementary Mathematics for Teachers,
by Parker and Baldridge (Sefton-Ash Publishing)
(this is an excellent reference for Math 210 material)

Math on Call: A Mathematics Handbook,
Great Source Education Group (2004) (published by Houghton-Mifflin)
ISBN 0-669-50819-5
(this is an easy-to-understand resource book covering a wide variety of topics)

HOW TO USE THE CLIFFS TEST PREP BOOK
Step-by-step outline of what to do:

1) Make use of the **Mathematics Review, p 215-271**
   - First look over basic math terminology, formulas, and general mathematical information, p 215-221
   - The Review is broken up into four parts: arithmetic, algebra, geometry, basic coordinate geometry. There are three diagnostic tests – for arithmetic (p 221-222), algebra (p 235-236), geometry (p 247-251). After doing each of these, study the corresponding review sections that follow to strengthen any weak areas you may have. Study the basic coordinate geometry review and work on the sample questions and practice questions that follow.

IMPORTANT POINT: Always try each problem on your own before looking at the worked out solution. You have to study math actively – always have a pencil and paper available and work out every sample problem as you go through the reviews.

2) Read through the **Content Domains for Subject Matter Understanding and Skill in Mathematics, p 49-51**
   Domain 1: Number Sense
   Domain 2: Algebra and Functions
   Domain 3: Measurement and Geometry
   Domain 4: Statistics, Data Analysis, and Probability

You'll recognize all the topics you covered in Math 210 and Math 310.
Taking Subtest II on the heels of your coursework will be to your advantage.

- Next go to the **Sample Questions and Strategies for the Multiple Choice Section, p 52-72**. Again, try each problem first. When reading the solutions provided, you will pick up strategies on problem solving. If you couldn't solve a problem, make sure to go back after reading the solution and try it again to see that you can apply what you've learned.
- Then go to the **Sample Questions and Strategies for the Short Constructed-Response Question, p 73-80**. The purpose of the SCR questions is for you to illustrate your ability to communicate how to solve problems using the fundamentals of mathematics. The key to a clear, concise response is to think out and organize what you plan to write. The goal is to describe how you arrived at your answer – that is, to explain the reasons behind the steps. Filling in the "whys" takes practice. Computing your answer first will help you organize your explanation. Someone reading your response should be able to follow your reasoning and understand mathematically how you are going from one step to the next. Make sure you answer all parts and use appropriate notation and terminology. Try the sample SCR questions and read your responses over to see if you have effectively communicated your solutions and illustrated your mathematical skills.

3) Finally you're ready to try the two practice tests! Take the practice tests under "test conditions" and practice using the strategies for problem solving and test-taking as you do this. The more you practice these strategies, the more second nature they will become.

Word on using a calculator: Remember that each problem can be solved without a calculator. You have to understand the problem in order to solve it. Focus on how to solve a given problem and then decide if the calculator will save you time on the computations.

Tips for Multiple Choice Questions

1) Carefully read what is being asked. You can circle or underline key words on the test booklet. You don't want to correctly solve a problem and then fill in an incorrect answer because you misread what was being asked.

   For example: If $2x + 7 = 19$, what is $x + 2$?
   You shouldn't give the answer 6, when the question is asking for $6 + 2$ or 8.

2) If there's a graph or picture provided, read the question first to help you focus on what to look for.

3) Select the "best" answer – that is, the best of those given (for example, when you asked to estimate).

4) Answer the questions you are sure of first. If you can solve a problem in a reasonable amount of time, do it! Then go back to the questions that you have an idea how to do, but that require more time or thought.

5) Never leave an answer space blank!

6) Use mental math whenever you can.

7) Use the following strategies:
   - Eliminate as many answers as you can. Eliminate obviously wrong choices.
   - Sometimes common sense allows you to recognize a correct answer.
   - You can try a specific example or a special easy case to see what happens.
   - You can use "trial and error" or "checking" – that is, check to see if the given answers work. Try the easier choices first.
   - Visualize! Draw a picture whenever you can to help you visualize the problem.
   - Bring in something else that you know and try to use it.

     Here's an example: In a senior class of 800, only 240 decide to attend the prom. What percentage of the senior class attended the prom?
     You know 10% of 800 is 80. So 240 (which is 3 times 80) is 30% of 800.

Practical Advice: The goal is to correctly answer as many questions as you can. It is not always necessary to solve completely (or sometimes even to solve at all). Many times the question isn't "Can you solve it?" but rather, "Can you recognize the correct answer?"

CORRECTIONS/COMMENTS - CLIFFS TEST PREP BOOK (CSET Multiple Subjects)

p 53 Definition of SCIENTIFIC NOTATION

In scientific notation, a positive number is written as the product of a number greater than or equal to 1 and less than 10 and an integer power of 10; that is, in the form $a \times 10^k$ where $1 \le a < 10$, k an integer

for example, $2,957,000 = 2.957 \times 10^6$
$.000834 = 8.34 \times 10^{-4}$

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p74 Problem 3 If x is an even integer, then $x(x+1)(x+2)$ is also an even integer.
Using your knowledge of algebra:
- determine if this is true; and
- show and explain two methods to make this determination

The solution INCORRECTLY says:

"Simply select an even integer, plug in, and show the outcome.
Let $x = 2$ Then $2(2+1)(2+2) = 2(3)(4) = 24$, which is an even integer."

You cannot plug in a specific even integer for x, see that $x(x+1)(x+2)$ works out to be even for that specific x, and then conclude that it will work for all even integers.

You can try some specific even integers for x to see that $x(x+1)(x+2)$ comes out to be even, but this just gives you the sense that the statement is probably true. To prove it is true, you need to explain why it works in general (that is, explain why no matter what even integer x you start with, $x(x+1)(x+2)$ will always be even)

One solution: The statement is true because the product of an even integer and any integer is always even.

Why? Since x is even, x is an integer multiple of 2
$(x = 2 \cdot n$ for some integer $n)$

When you multiply x by any integer, the resulting product has to be an integer multiple of 2 (since x is)
(so $x(x+1)(x+2) = 2n(x+1)(x+2)$)

So since x is even, x times any integer is even. In particular, $x(x+1)(x+2)$ is even.

Another solution: If x is an even integer, then $x+1$ is an odd integer and $x+2$ is an even integer.

Multiplying an even integer times an odd integer gives an even integer

So $x(x+1)$ is even

Multiplying an even integer times an even integer gives an even integer

So $(x(x+1))(x+2)$ is even

If x is an even integer, we have shown $x(x+1)(x+2)$ is an even integer.

NOTE: To show a statement is FALSE, it is enough to find one counterexample

For example, is the following statement T or F?

"The sum of two odd whole numbers is odd"

This statement is FALSE. Here's a counterexample:

1, 3 are odd whole numbers but $1+3=4$ which is even

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p 79 Problem 9 Sara flips a two-sided coin three times

Determine the ~~ODDS~~ of getting three heads in a row.

The term PROBABILITY should be used (Based on the solution, the problem should ask for the probability of this event, not the odds in favor of it)

When Sara flips the coin the first time, the probability of getting heads is $\frac{1}{2}$

Since each flip is independent of the next flip, you multiply the probabilities for each independent event. There are 3 independent events.

So the probability of getting three heads in a row is $\frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{2}$ or $\frac{1}{8}$

The term ODDS has a specific meaning

ODDS IN FAVOR of an event $A = \dfrac{P(A)}{P(\bar{A})} = \dfrac{P(A)}{1-P(A)}$

$\bar{A}$ is the complement of A

note: can also define ODDS AGAINST an event A as $\dfrac{P(\bar{A})}{P(A)}$ or $\dfrac{1-P(A)}{P(A)}$

(In the case of equally likely outcomes,

$$\text{odds in favor} = \frac{\text{number of favorable outcomes}}{\text{number of unfavorable outcomes}}$$)

So the odds in favor of getting three heads in a row is

$$\frac{\frac{1}{8}}{1-\frac{1}{8}} \text{ or } \frac{\frac{1}{8}}{\frac{7}{8}} \text{ or } \frac{1}{7} \text{ or } 1:7$$

Note: here there are 8 equally likely outcomes

HHH $\underbrace{\text{HHT HTH HTT THH THT TTH TTT}}_{\text{7 unfavorable}}$

1 favorable

p229, p231 sloppy notation - left out % sign in certain spots

p229 To change a fraction or decimal to a percent, multiply by 100 and attach a % sign

$$\frac{1}{2} = \frac{1}{2} \times 100(\%) = \frac{100}{2}(\%) = 50\%$$

$$\frac{2}{5} = \frac{2}{5} \times 100(\%) = \frac{200}{5}(\%) = 40\%$$

p231 $$\frac{\text{change}}{\text{starting point}} \times 100(\%) = \text{percentage change}$$

Example: what is the percentage decrease of a \$500 item on sale for \$400?

$$\frac{\text{change}}{\text{starting point}} \times 100(\%) = \frac{\overset{500-400}{100}}{500} \times 100(\%) = \frac{1}{5} \times 100(\%) = 20\%$$

(similarly fill in % sign on p70 Problem 2)

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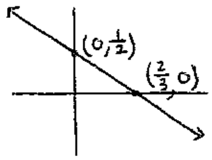
p246 Problem 3 Solve for a and b: $3a + 4b = 2$
$6a + 8b = 4$



If you multiply the first equation by 2, you get $6a + 8b = 4$
So the equations are the same.
The solution INCORRECTLY says "In this instance, the system is unso~~l~~vable"

Should say: Since the equations represent the SAME LINE, the system has infinitely many solutions; every point on the line is a solution

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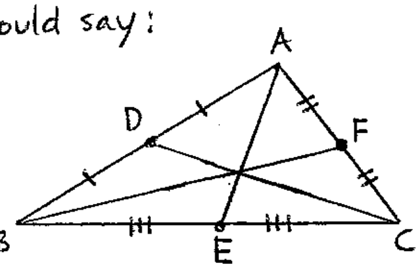
p257 Under FACTS ABOUT TRIANGLES, should say:

- Every triangle has three medians.



$\overline{AE}$, $\overline{BF}$, $\overline{CD}$ are the medians of ΔABC

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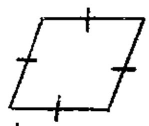
p260

RECTANGLE: quadrilateral with 4 right angles

Note: if you know the quadrilateral is a parallelogram, you only need 1 right angle to conclude it is a rectangle
that is, If an angle of a parallelogram is a right angle, then the parallelogram is a rectangle.

really should say CONGRUENT



RHOMBUS: quadrilateral with 4 equal sides
Note: if you know the quadrilateral is a parallelogram, you only need 2 consecutive sides equal to conclude it is a rhombus
that is, If two consecutive sides of a parallelogram are equal, then the parallelogram is a rhombus

SOLVING A SYSTEM OF LINEAR EQUATIONS

The following two problems involve solving a system of two linear equations in two unknowns.

① Prof. J. Rosen and Prof. M. Rosen are each teaching a section of Math 210. Suppose J. Rosen's class has eleven less than twice as many in M. Rosen's class. How many are in each class if the total number of students is 70?

Method 1 SUBSTITUTION Get one of the variables in terms of the other. Then substitute this into the other equation.

Let x = number in M. Rosen's class
y = number in J. Rosen's class

$y = 2x - 11$ ← already have y in terms of x
$x + y = 70$

Substituting $x + (2x - 11) = 70$
$3x - 11 = 70$
$3x = 81$
$x = 27$

Once you know $x = 27$, go to either equation to get y
$y = 2(27) - 11 = 54 - 11 = 43$
or
$27 + y = 70 \rightarrow y = 43$

Method 2 ELIMINATE A VARIABLE

First line up the two equations
$y = 2x - 11$ can be rewritten as $2x - y = 11$

So we have
$$\begin{array}{r} 2x - y = 11 \\ x + y = 70 \\ \hline \end{array}$$

NOTICE The coefficients in front of the y's are -1 and 1 (ADDITIVE INVERSES of each other)

Adding, $3x = 81$ WE'VE ELIMINATED y
$x = 27$

and so $y = 43$ (as before)

Solution:
M. Rosen's class has 27
J. Rosen's class has 43

check: $43 = 2(27) - 11$ ✓
$27 + 43 = 70$ ✓

(2) The sum of two integers is 38 and twice the first plus three times the second is 100. Find the integers.

Let x = the first integer

y = the second integer

$$x + y = 38$$
$$2x + 3y = 100$$

Method 1 SUBSTITUTION Solving $y = 38 - x$ Substitute this into the other equation

$$2x + 3(38 - x) = 100$$
$$2x + 114 - 3x = 100$$
$$-x = -14$$
$$x = 14 \quad \text{and so } y = 38 - 14 = 24$$

Method 2 ELIMINATE A VARIABLE

Multiply 1st equation by -2 (to ELIMINATE x)

$$\begin{array}{rcl} -2x + (-2y) &=& -76 \\ 2x + 3y &=& 100 \\ \hline \end{array}$$

Adding $y = 24 \longrightarrow x + 24 = 38$ So $x = 14$

Alternatively, multiply 1st equation by -3 (to ELIMINATE y)

Solution:

The first integer is 14 and the second integer is 24

check: $14 + 24 = 38$ ✓

$2(14) + 3(24) = 100$ ✓

Note: If you have the system $\begin{array}{l} 3x + 4y = 85 \\ 2x + 6y = 90 \end{array}$

you could multiply 1st equation by 2 and multiply the 2nd equation by -3 (to ELIMINATE x)
($\text{LCM}(3,2) = 6$)

$$\begin{array}{rcl} 6x + 8y &=& 170 \\ -6x + (-18y) &=& -270 \\ \hline \end{array}$$

Adding $-10y = -100$

$y = 10$ So $2x + 6(10) = 90$

$$2x + 60 = 90$$
$$2x = 30$$
$$x = 15$$

check:

$3(15) + 4(10) = 85$ ✓

$2(15) + 6(10) = 90$ ✓

Alternatively, multiply 1st eq by 3, multiply 2nd eq by -2 (to ELIMINATE y)
($\text{LCM}(4,6) = 12$)

All examples so far have had unique solutions. However, other situations may arise.

<u>SUMMARY</u> Geometrically, a system of two linear equations may be characterized as follows:

1. The system has a <u>unique solution</u> if and only if the graphs of the equations intersect in a single point.
2. The system has <u>no solution</u> if and only if the equations represent parallel lines.
3. The system has <u>infinitely many solutions</u> if and only if the equations represent the same line.

Here is an example of each:

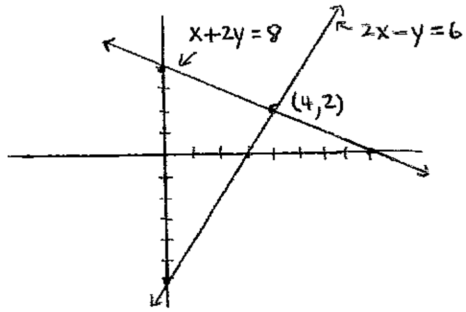
① $2x - y = 6$
$x + 2y = 8$

Mult 1st eq by 2

$$\begin{aligned} 4x - 2y &= 12 \\ x + 2y &= 8 \\ \hline \text{Adding} \quad 5x \qquad &= 20 \\ x &= 4 \end{aligned}$$

So $4 + 2y = 8$
$2y = 4$
$y = 2$

<u>UNIQUE SOLUTION</u> - The lines intersect in a single point $(4,2)$



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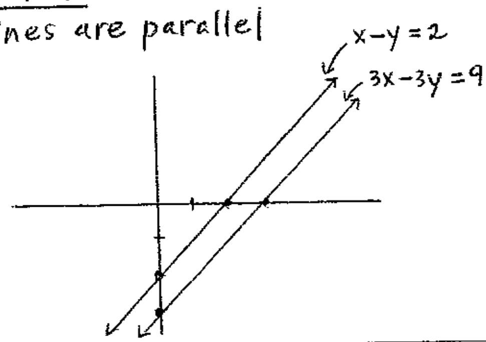
② $x - y = 2$
$3x - 3y = 9$

Mult 1st eq by -3

$$\begin{aligned} -3x + 3y &= -6 \\ 3x - 3y &= 9 \\ \hline \text{Adding} \qquad 0 &= 3 \end{aligned}$$

This indicates no solution

<u>NO SOLUTION</u> - the lines are parallel



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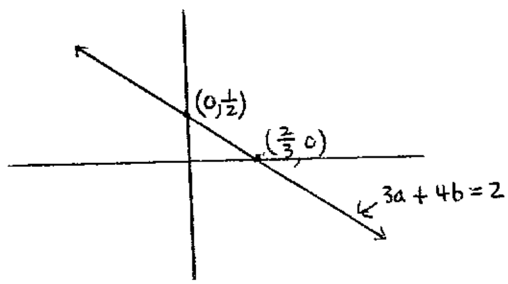
③ $3a + 4b = 2$ This is p 246 Problem 3
$6a + 8b = 4$

Mult 1st eq by -2

$$\begin{aligned} -6a + (-8b) &= -4 \\ 6a + 8b &= 4 \\ \hline \text{Adding} \qquad 0 &= 0 \end{aligned}$$

This indicates the lines are the same

<u>INFINITELY MANY SOLUTIONS</u> - the lines are the same; <u>every</u> point on the line is a solution



Note: if you simply multiply the 1st eq by 2, you get $6a + 8b = 4$ (the 2nd eq)

SOLVING QUADRATIC EQUATIONS by factoring and completing the square

A quadratic polynomial is a polynomial of the form $ax^2 + bx + c$ (where $a \neq 0$)

First a REVIEW OF FACTORING

means to write as a PRODUCT

FACTORING OUT A COMMON FACTOR

for ex, $x^2 - 5x = x(x-5)$

FACTORING A DIFFERENCE OF TWO SQUARES

for ex, $x^2 - 49 = (x+7)(x-7)$

notice when you multiply out $(x+7)(x-7)$, the middle term drops out

$(x+7)(x-7) = x^2 \cancel{-7x} \cancel{+7x} - 49 = x^2 - 49$

in general, $a^2 - b^2 = (a+b)(a-b)$

FACTORING QUADRATICS OF THE FORM $ax^2 + bx + c$

Let's start with the case when $a = 1$ (so our quadratic looks like $x^2 + bx + c$)

Start by writing $(x \quad)(x \quad)$

what goes into these spots depends on the last term and the coefficient of the middle term

If the sign of the last term is $+$, then you'll either have

$(x + \quad)(x + \quad)$

$(x - \quad)(x - \quad)$

The sign of the middle term determines which of these to use

for ex, $x^2 + 7x + 12 = (x+3)(x+4)$

notice how $\underbrace{3 \cdot 4 = 12}_{\text{last term}}$ and $\underbrace{3+4 = 7}_{\text{coeff of middle term}}$

$x^2 - 8x + 12 = (x-2)(x-6)$

(* IT'S A GOOD IDEA TO CHECK BY MULTIPLYING OUT YOUR PRODUCT TO SEE THAT IT EQUALS THE QUADRATIC YOU STARTED WITH)

If the sign of the last term is $-$, then you'll have $(x + \quad)(x - \quad)$

The coefficient of the middle term determines which factor to put with the $+$ and which factor to put with the $-$

for ex,
$$x^2 + 11x - 12 = (x+12)(x-1)$$
$$x^2 - 11x - 12 = (x+1)(x-12)$$
$$x^2 + x - 12 = (x+4)(x-3)$$
$$x^2 - x - 12 = (x+3)(x-4)$$

What if $a \neq 1$? Some additional trial and error is necessary.

for ex,
$$2x^2 + 5x + 3 = (2x+3)(x+1)$$
$$2x^2 + 7x + 3 = (2x+1)(x+3)$$
$$2x^2 - 7x - 4 = (2x+1)(x-4)$$
$$2x^2 + 7x - 15 = (2x-3)(x+5)$$

Consider $4x^2 + 9x + 2$

If you try $(2x+1)(2x+2)$, the middle term works out to $6x$, <u>not</u> $9x$

So try $(4x \quad)(x \quad)$ instead

$$4x^2 + 9x + 2 = (4x+1)(x+2)$$

<u>Solving Quadratic Equations by Factoring</u>

1) Bring all terms to one side, leaving 0 on the other side
   (should have $ax^2 + bx + c = 0$)
2) Factor the quadratic (if you can)
3) Set each factor equal to 0 and solve each of these equations
   (this uses the following property of real numbers:
   If $AB = 0$, then $A = 0$ or $B = 0$)

<u>Examples</u>

1. $x^2 + 6x = 0$

   $x(x+6) = 0$

   So $x = 0$ or $x + 6 = 0$

   $x = -6$

   The solutions are $x = 0$, $x = -6$

2. $2x^2 - 5x - 3 = 0$

   $(2x+1)(x-3) = 0$

   $2x + 1 = 0$ or $x - 3 = 0$

   $2x = -1$ $\qquad x = 3$

   $x = -\frac{1}{2}$

3. $x^2 - 6x - 2 = -10$

Remember to add 10 to both sides first

$x^2 - 6x + 8 = 0$

$(x-2)(x-4) = 0$

$x - 2 = 0$ or $x - 4 = 0$

$x = 2$ $\quad$ $x = 4$

4. $4x^2 - 4x = 15$

Subtract 15 from both sides first

$4x^2 - 4x - 15 = 0$

$(2x+3)(2x-5) = 0$

$2x + 3 = 0$ or $2x - 5 = 0$

$2x = -3$ $\quad$ $2x = 5$

$x = -\frac{3}{2}$ $\quad$ $x = \frac{5}{2}$

Completing the Square

Preliminary Fact

$\sqrt{100}$ means the positive square root of 100, so $\sqrt{100} = 10$

However the equation $x^2 = 100$ has two solutions, namely $x = 10, x = -10$

$x^2 = 100$

$x = \pm\sqrt{100} = \pm 10$

(when taking the square roots of both sides here remember to put $\pm$ on the right side)

Consider the expression $x^2 + 8x$

If we take half the coefficient of x and square it

$\frac{1}{2}(8) = 4$ and $4^2 = 16$

adding 16 on gives a new expression $x^2 + 8x + 16$ which is a perfect square

$x^2 + 8x + 16 = (x+4)(x+4) = (x+4)^2$

IDEA: get a perfect square on one side of the equation and then take square roots of both sides

To make $x^2 + bx$ into a perfect square, ADD $\left(\frac{b}{2}\right)^2$ (that is, take half the coefficient of x and square it)

$$x^2 + bx + \left(\frac{b}{2}\right)^2 = \left(x + \frac{b}{2}\right)\left(x + \frac{b}{2}\right) = \left(x + \frac{b}{2}\right)^2$$

Examples

1. Let's go back to $x^2 - 6x + 8 = 0$ (from Example 3 above)

Certainly factoring is easier, but let's see how completing the square works

$x^2 - 6x = -8$

$x^2 - 6x + 9 = -8 + 9$

$(x-3)^2 = 1$

$\frac{1}{2}(-6) = -3$ and $(-3)^2 = 9$

If you add 9 to one side of the equation, you must also add 9 to the other side

Taking sq roots, $x - 3 = \pm\sqrt{1} = \pm 1$

So $x = 3 \pm 1$

$x = 3 + 1 = 4$ or $x = 3 - 1 = 2$

(same sols we got above)

Always try to FACTOR first; if you can't, can use COMPLETING THE SQUARE

2. $x^2 - 4x + 1 = 0$

$x^2 - 4x = -1$

$x^2 - 4x + 4 = -1 + 4$ $\qquad \frac{1}{2}(-4) = -2$ and $(-2)^2 = 4$

$(x-2)^2 = 3$

Taking sq roots, $x - 2 = \pm\sqrt{3}$

$x = 2 \pm \sqrt{3}$

Note when completing the square, make sure the coefficient of x^2 is 1 (if it's not, factor out the coefficient of x^2 from both terms containing x)

3. $2x^2 + 4x - 3 = 0$

$2x^2 + 4x = 3$

$2(x^2 + 2x) = 3$

$x^2 + 2x = \frac{3}{2}$

Now complete the square $\qquad \frac{1}{2}(2) = 1$ and $1^2 = 1$

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

$(x+1)^2 = \frac{5}{2}$

Taking sq roots, $x + 1 = \pm\sqrt{\frac{5}{2}}$

$x = -1 \pm \sqrt{\frac{5}{2}}$

OPTIONAL Can always use the QUADRATIC FORMULA

Given $ax^2 + bx + c = 0$ (where $a \neq 0$)

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Note: the proof of the Quad Formula uses completing the square

Note: the expression under the square root sign determines how many real solutions you get

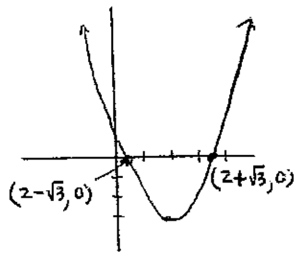
1. If $b^2 - 4ac > 0$, there are 2 distinct real sols.
2. If $b^2 - 4ac = 0$, there is exactly 1 real sol.
3. If $b^2 - 4ac < 0$, there are no real sols.

Examples

1. $x^2 - 4x + 1 = 0$ (from Example 2 on completing the square)

here $a = 1,\ b = -4,\ c = 1$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(1)}}{2(1)} = \frac{4 \pm \sqrt{16-4}}{2} = \frac{4 \pm \sqrt{12}}{2} = \frac{4 \pm 2\sqrt{3}}{2} = 2 \pm \sqrt{3}$$



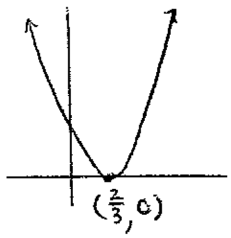
2 real sols; parabola crosses x-axis two times

2. $9x^2 - 12x + 4 = 0$

Note could FACTOR $(3x-2)(3x-2) = 0$

So $3x - 2 = 0$

$x = \frac{2}{3}$



1 real sol; parabola touches x-axis one time

By the Quad Formula,

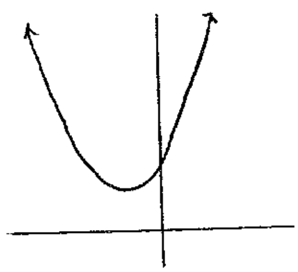
$$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(9)(4)}}{2(9)} = \frac{12 \pm \sqrt{144-144}}{18} = \frac{12 \pm 0}{18} = \frac{12}{18} = \frac{2}{3}$$

3. $x^2 + x + 1 = 0$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(1)}}{2(1)} = \frac{-1 \pm \sqrt{1-4}}{2} = \frac{-1 \pm \sqrt{-3}}{2}$$

In the real numbers, can only take the square root of a number that's ≥ 0

there is no real number whose square is -3



No real sol; parabola doesn't touch x-axis