Topic 1 – The Algebra I Regents Exam and Strategies to Pass It

If you are reading this, it means that either you or someone you know has a very limited time to prepare to pass the Algebra I exam. You may be feeling defeated, stressed, overwhelmed. The purpose of this section is to hopefully relieve some of these anxious feelings. Take a look at New York State's best kept secret, the scoring chat:

Raw Score	Scale Score	Performance Level
86	100	5
85	99	5
84	98	5
83	97	5
82	96	5
81	95	5
80	94	5
79	93	5
78	92	5
77	91	5
76	90	5
75	89	5
74	88	5
73	88	5
72	87	5
71	86	5
70	86	5
69	86	5
68	85	5
67	84	4
66	84	4
65	84	4
64	83	4
63	83	4
62	83	4
61	82	4
60	82	4
59	82	4
58	81	4

Raw Score	Scale Score	Performance Level
57	81	4
56	81	4
55	81	4
54	80	4
53	80	4
52	80	4
51	79	3
50	79	3
49	79	3
48	79	3
47	78	3
46	78	3
45	78	3
44	77	3
43	77	3
42	76	3
41	76	3
40	75	3
39	75	3
38	74	3
37	74	3
36	73	3
35	72	3
34	72	3
33	71	3
32	70	3
31	69	3
30	68	3
29	67	3

Raw Score	Scale Score	Performance Level
28	66	3
27	65	3
26	64	2
25	63	2
24	62	2
23	60	2
22	59	2
21	57	2
20	56	2
19	55	2
18	52	1
17	51	1
16	49	1
15	47	1
14	45	1
13	42	1
12	40	1
11	38	1
10	35	1
9	32	1
8	30	1
7	27	1
6	23	1
5	20	1
4	17	1
3	13	1
2	9	1
1	5	1
0	0	1

Notice that there are only 86 total raw points on the test. Earning all 86 points will scale to a 100. Take a moment to locate how many raw points it takes to earn a passing scaled score of 65. Did you find it? It's 27. **You only need to earn 27 points to pass the Algebra I Regents exam**.

So how do we earn at least 27 points? The test is broken into sections.

Section 1 has 24 multiple choice questions worth 2 points each

Section 2 has 8 questions worth 2 points each

Section 3 has 4 questions worth 4 points each

Section 4 has 1 question worth 6 points

If we look at this a little bit more closely

Section	# of questions	Total earnable points
1 Multiple Choice	24	48
2 Free Response	8	16
3 Free Response	4	16
4 Free Response	1	6

Do you notice anything?

- **Over half (56%) of the total points on the test are multiple choice questions**
- **You can pass the test by answering 14 multiple choice questions correctly**

This is great news for someone with limited time. The reality of the Algebra I exam is this: **anyone can pass this exam with the right strategies**.
My experience working with students struggling to pass this exam is that students simply don't know how to take a multiple-choice test. This is our approach for this particular exam and is useful in some situations in life. However, "cramming for the test" is not a strategy for every exam, or for getting through life.

When you get the exam, you need to highlight ten multiple choice problems that you know you can get right. These are the questions you will do first. Then, with the time left, you will answer the rest of the questions.

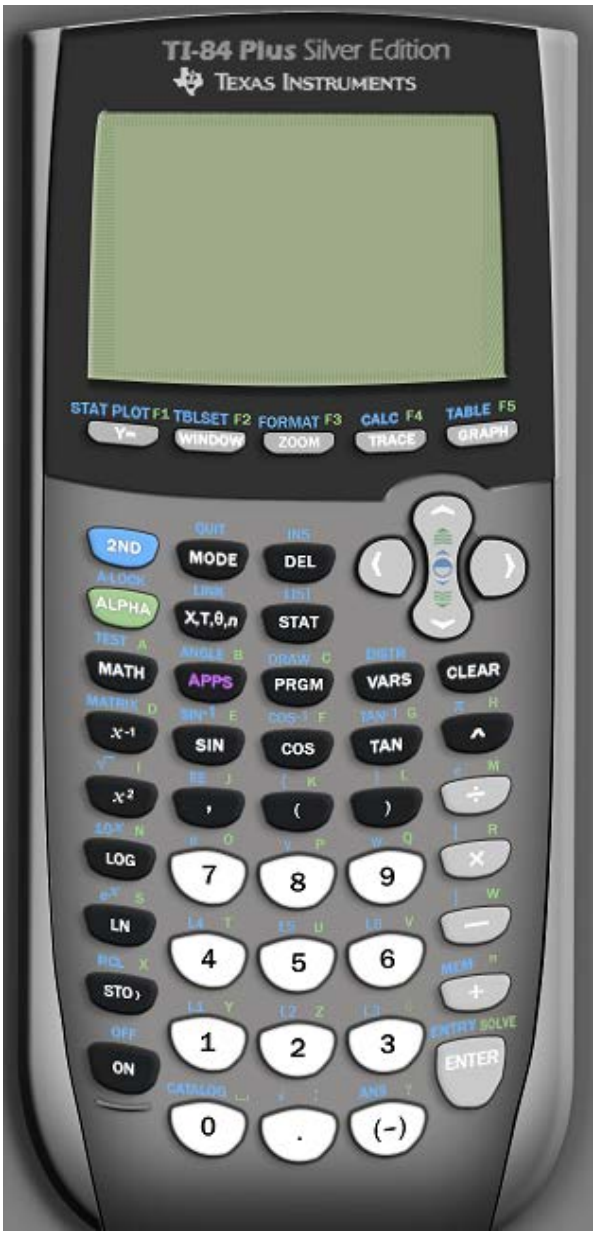
Why ten questions? Think of it this way: ten multiple-choice questions are worth 20 points. Of the 14 multiple-choice questions remaining, you are likely to guess correctly on 25% of them, or about 3 or 4 questions. Even if you only get three more questions correct, that's six more points, which brings your total to 26 points. Remember, you only need 27 points to pass the exam. So if you get ten questions right, you will not need very many points on long response in order to pass.
This brings up a few things.

1) **The graphing calculator is your best resource!** If you really understand how the calculator works, you won't just *think* you got a question right, you will *know* you got a question right.
2) **You need to know which questions you can answer**! We will be working on strategies to identify questions that can be supported or answered by the graphing calculator. This will take practice, but you can do this!!
3) **You can't leave anything blank**! Usually, students who fail the Algebra I exam are leaving most of the long response questions blank. Even though we are focusing on multiple choice questions, you need to fight for every last point on this test, even if you don't think you know the answer. Passing or failing really might come down to a single point.

I hope that you feel at least a little better. You really can do this!

So, what are the strategies and how do we know which ten questions to choose?

This lesson, we are going to focus on two main calculator strategies: using tables and graphs to solve equations and to identify equivalent expressions. But first, let's make sure you understand a few things about the calculator.



- If you want to do something with tables and graphs, you are going to use one of the buttons in the top row. You almost always have to press **Y=** first.
  - There are hidden things if you press ALPHA and one of the top buttons. For instance, if you want to make a fraction, press ALPHA, Y=, ENTER

- Every button does TWO or THREE things. If you want to do the thing that's in blue, you press the blue 2nd button first, then the button you want. If you want to do something that's in green, you have to press ALPHA first.

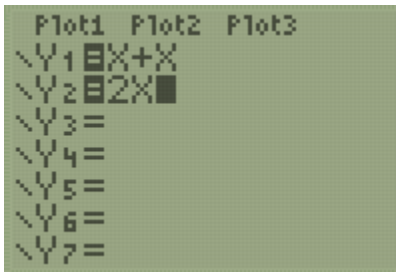
- If you ever get lost in the calculator, quit to the home screen by pressing 2nd MODE

Equivalence

What does it mean to be *equivalent*? **Two expressions are equivalent if they are true for all values of the variable**.

Consider Jose and Eunice once again. Both students are trying to remember what $x + x$ is equivalent to.

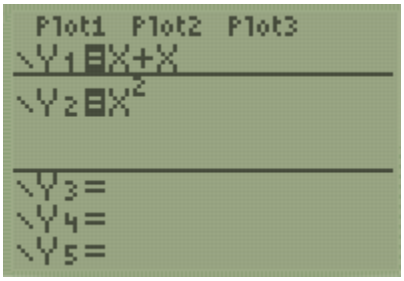
- Jose can't remember if $x + x = 2x$ or if $x + x = x^2$. He takes a guess and writes $x + x = x^2$
- Eunice can't remember if $x + x = 2x$ or if $x + x = x^2$. She decides to use her calculator.



Eunice presses Y=
She types the left side, $x + x$, as Y1. She types the right side, $2x$ as Y2.

She checks the TABLE by pressing 2nd, GRAPH.
She notices that Y1 = Y2 for every value of x.

Eunice is confident that $x + x = 2x$, but to be sure, she follows the same process to check the other possibility.



She types one side of the = sign as Y1 and the other as Y2.

This time, Eunice sees that Y1 and Y2 are <u>not the same</u>.
She concludes that $x + x$ is <u>not</u> equivalent to x^2.

Try to answer the following Regents questions using this strategy. As you read each question, write down all the language used by the exam to indicate that they are testing equivalence.

3 The expression $3(x^2 + 2x - 3) - 4(4x^2 - 7x + 5)$ is equivalent to

(1) $-13x - 22x + 11$ (3) $19x^2 - 22x + 11$

(2) $-13x^2 + 34x - 29$ (4) $19x^2 + 34x - 29$

Answer (2)

10 The trinomial $x^2 - 14x + 49$ can be expressed as

(1) $(x - 7)^2$
(2) $(x + 7)^2$
(3) $(x - 7)(x + 7)$
(4) $(x - 7)(x + 2)$

Answer (1)

1 The number of bacteria grown in a lab can be modeled by $P(t) = 300 \bullet 2^{4t}$, where t is the number of hours. Which expression is equivalent to $P(t)$?

(1) $300 \bullet 8^t$
(2) $300 \bullet 16^t$
(3) $300^t \bullet 2^4$
(4) $300^{2t} \bullet 2^{2t}$

Answer (2)

3 David correctly factored the expression $m^2 - 12m - 64$. Which expression did he write?

(1) $(m - 8)(m - 8)$
(2) $(m - 8)(m + 8)$
(3) $(m - 16)(m + 4)$
(4) $(m + 16)(m - 4)$

Answer (3)

7 The expression $4x^2 - 25$ is equivalent to

(1) $(4x - 5)(x + 5)$
(2) $(4x + 5)(x - 5)$
(3) $(2x + 5)(2x - 5)$
(4) $(2x - 5)(2x - 5)$

Answer (3)

13 If $y = 3x^3 + x^2 - 5$ and $z = x^2 - 12$, which polynomial is equivalent to $2(y + z)$?

(1) $6x^3 + 4x^2 - 34$
(2) $6x^3 + 3x^2 - 17$
(3) $6x^3 + 3x^2 - 22$
(4) $6x^3 + 2x^2 - 17$

Answer (1)

Note: $2(y + z)$ is $2(3x^3 + x^2 - 5 + x^2 - 12)$.

16 If $f(x) = 2x^2 + x - 3$, which equation can be used to determine the zeros of the function?

(1) $0 = (2x - 3)(x + 1)$
(2) $0 = (2x + 3)(x - 1)$
(3) $0 = 2x(x + 1) - 3$
(4) $0 = 2x(x - 1) - 3(x + 1)$

Answer (2)

Note: Discuss all the different ways that the Regents typically asks about equivalence. The fourth question asks for which expression is the correct factored form. Factored form is an equivalent form of an expression. The second last question is tricky in that you can only put expressions involving one variable into the Y= menu. Students must substitute the expressions for *y* and *z*, then use the calculator technique. The final question also requires students to determine which equation sets up an equivalent form of *f(x)*. Note that zeros are discussed in greater detail in further lessons.

Solving Equations

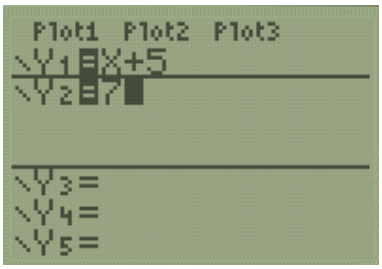
What's the difference between an *equivalence* like $x + x = 2x$ and an ***equation*** like $x + 5 = 7$?

As we said before, equivalent expressions are true for every value of *x*.

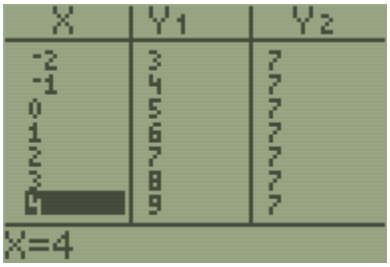
Equations on the other hand, are not true for every value of *x*. Usually they are only true for **1** value of *x*, but sometimes they are true for more than 1 value of *x*, or sometimes they are never true.

We can solve equations using almost the same approach as equivalence. Consider how to solve the equation $x + 5 = 7$.

Method 1 – Using a table



Press Y=, enter one side of the = sign as Y1 and the other side as Y2

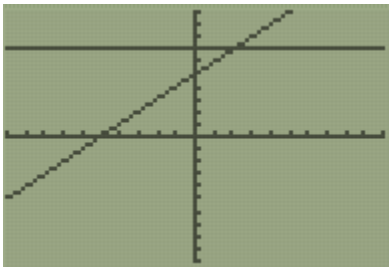


Find the x where Y1 equals Y2

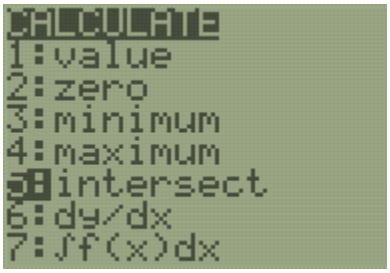
Notice that Y1 = Y2 when x = 2. **The *x*-value is the solution to the equation**.

Method 2 – Using a graph

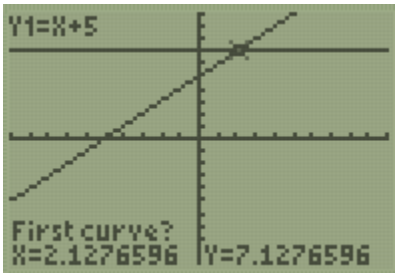
Do the same first step as before: Press Y=, enter one side of the = sign as Y1 and the other side as Y2.



Press GRAPH. The **solution is the point where the graphs intersect**.

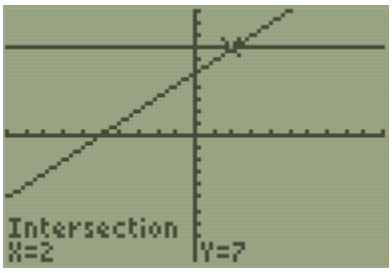


Press 2nd, TRACE, use the down arrow to choose choice 5: intersect, ENTER



Use the left or right arrow to move the blinker close to the desired point.

Then press ENTER, ENTER, ENTER.



The graph intersects at the point (2,7). The solution to the equation is the x-value 2.

We need both the table method and the graph method to solve equations. The table method is fast and simple, but if the solution to the equation is a decimal or a fraction, then the solution will not show up in the standard table. The graphing method will always work, but it is a little more complicated.

Try to answer the following Regents questions by using either tables or graphs.

22 How many real-number solutions does $4x^2 + 2x + 5 = 0$ have?

(1) one
(2) two
(3) zero
(4) infinitely many

Answer (3)

Note: Y2 = 0 is the *x*-axis of the graph, which Y1 never intersects. On the table, Y1 values are all positive and never reach zero.

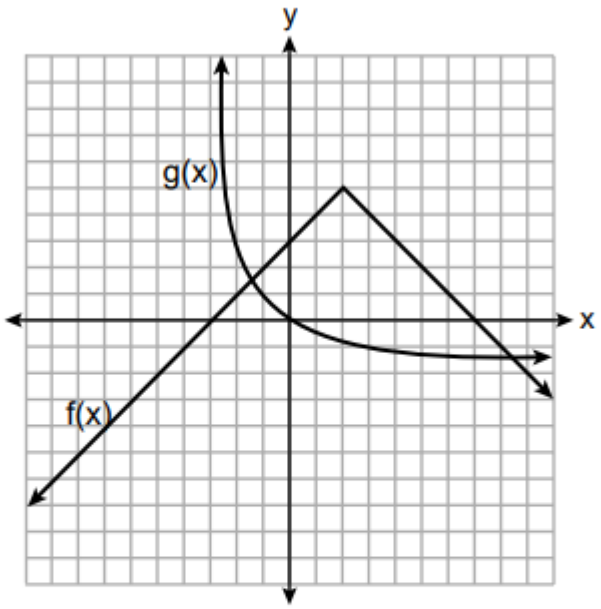
4 The solution to $-2(1 - 4x) = 3x + 8$ is

(1) $\frac{6}{11}$
(2) 2
(3) $-\frac{10}{7}$
(4) -2

Answer (2)

Note: You should have the discussion about when to use the negative button (-) and the minus button (the black one). In general, if the sign is in between two terms, use the minus button. When the sign is in front, use the negative.

19 The functions $f(x)$ and $g(x)$ are graphed below.



Based on the graph, the solutions to the equation $f(x) = g(x)$ are

(1) the x-intercepts

(2) the y-intercepts

(3) the x-values of the points of intersection

(4) the y-values of the points of intersection

Answer (3)