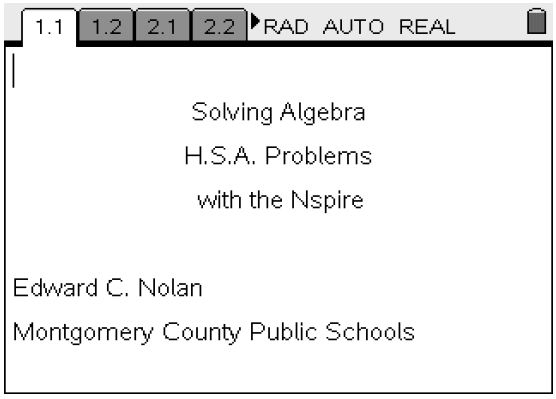
TI-Nspire Activity: Maryland Algebra H.S.A. Activity
By: Edward C. Nolan



Activity Overview

In this activity, students work to solve various problems from the Maryland Algebra/Data Analysis High School Assessment (H.S.A.). These problems all are from the algebra strand. Students examine different ways to represent and solve nine different problems, some multiple choice, some constructed response.

Concepts

- *Representing patterns with verbal models, tables, graphs, and equations*
- *Determining line of best fit and the meaning of the representation*
- *Interpreting values along the line of best fit*
- *Determining and finding meaning for the solution of a system of equations*

Teacher Preparation

- *This activity is presented in two versions – an instructional version (*HSA Problems*) and a review version (*HSA Problems Soln*). The students should have some background in algebraic skills for either approach, but the instructional version is designed to be lead by the teacher as a whole group presentation, as where the review version is designed for students to self-check their work individually or in small groups.*

The Classroom.

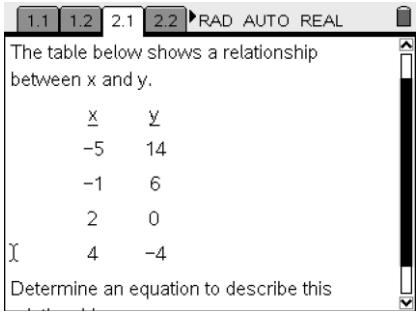
- *This activity is designed to be implemented as independent practice, small group work, or classroom presentation.*

The Lesson

You will need either HSA Problems.tns or HSA Problems Soln.tns loaded onto each calculator and the HSA Problems worksheet for each student.

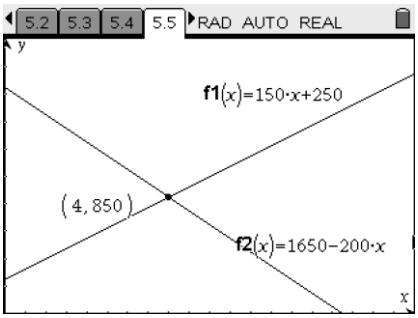
Option 1: Whole Class Instruction

The students will work through the problems with teacher guidance on a problem-by-problem basis. Using the *HSA Problems.tns* file, the teacher guides the students to create multiple representations, solve problems using multiple techniques, and answer each of the problems. See the end of the file or the HSA Problems worksheet for the problem set.



Answer Key

2007
10. J
12. y = -201x + 809
The slope of -201 means that for every year that the computer ages, the value decreases $201.
A computer that is about 2.5 years old is worth $300.
The model does not remain a good model for a 6-year-old computer because the value would be negative. This does not make sense for this context.
11. A
23. y = 150x + 250
y = -200x + 1650

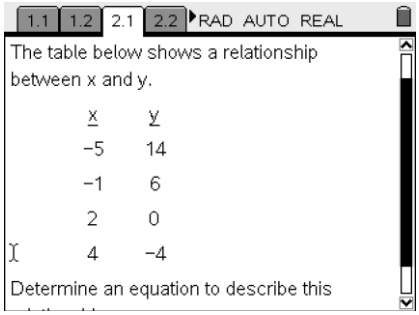


After 4 weeks, they both have $850. You can see this because it is the point of intersection of the two equations.

2008
12. H
19. C
21. A
23. D
34. J

Option 2: Individual or Small Group Instruction

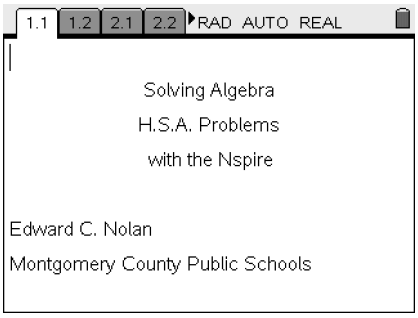
The students will work individually or in small groups. Using the *HSA Problems Soln.tns* file, students solve problems using multiple techniques and answer each of the problems. This file is set up for students to be able to self-check their work on each problem.

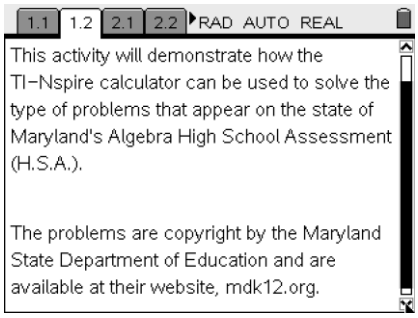


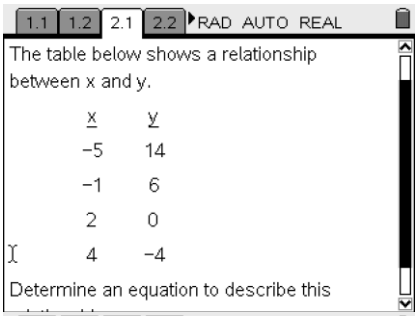
Assessment

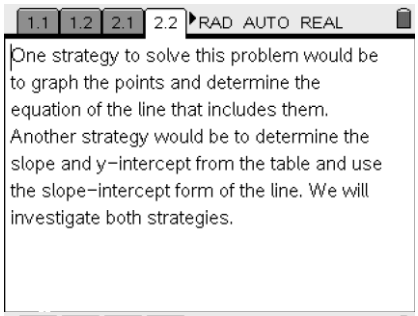
Note: The option exists for the teacher to have each student work individually or in small groups using the *HSA Problems.tns* file. Students could save their work at the end of the class and the answers could be counted as a grade. This could be done by reviewing individual calculators or by collecting using Connect-to-Class.

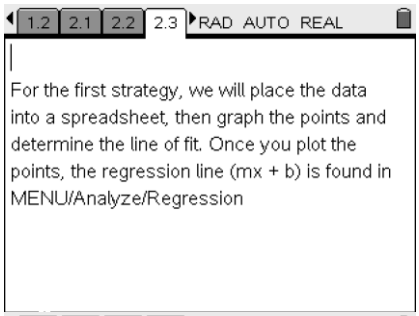
Pages of the Activity [Solution version]

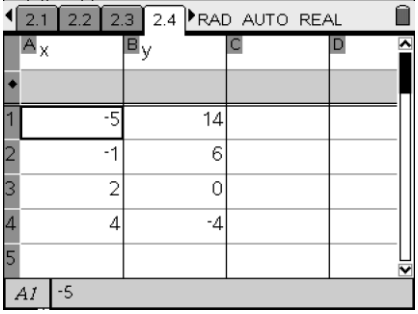


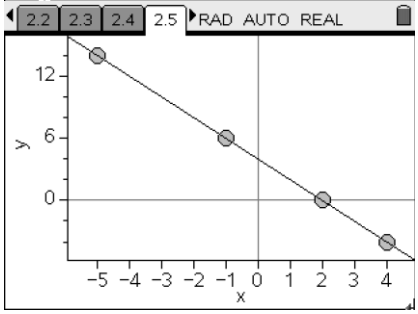


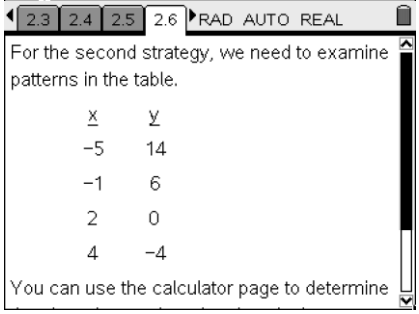


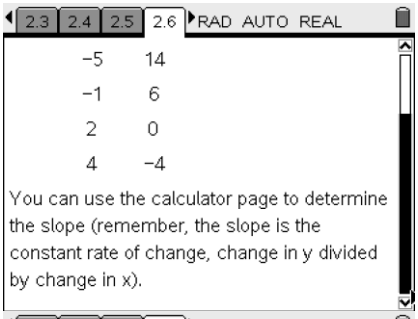






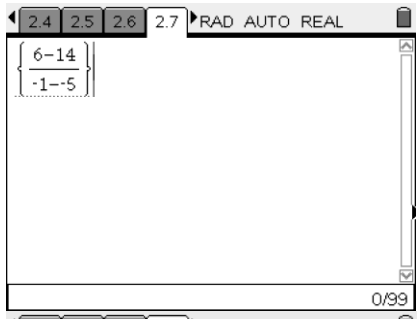






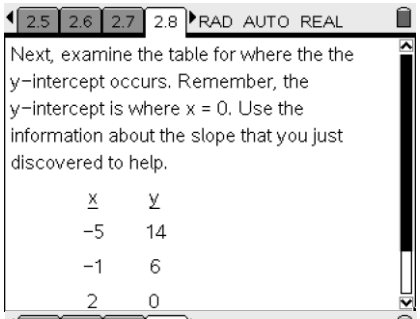
−5	14
−1	6
2	0
4	−4

You can use the calculator page to determine the slope (remember, the slope is the constant rate of change, change in y divided by change in x).



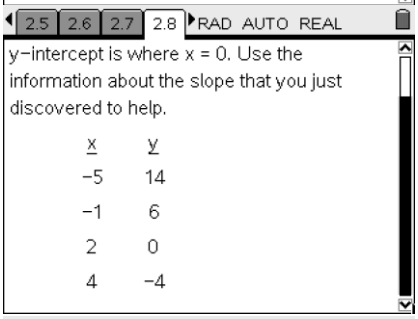
$\left\{\frac{6-14}{-1--5}\right\}$

0/99



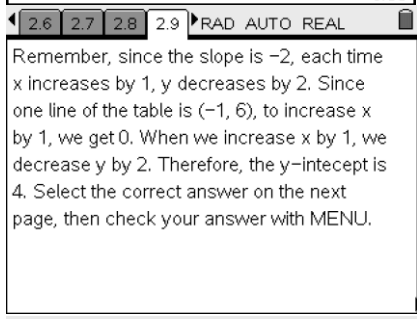
Next, examine the table for where the the y−intercept occurs. Remember, the y−intercept is where x = 0. Use the information about the slope that you just discovered to help.

x	y
−5	14
−1	6
2	0

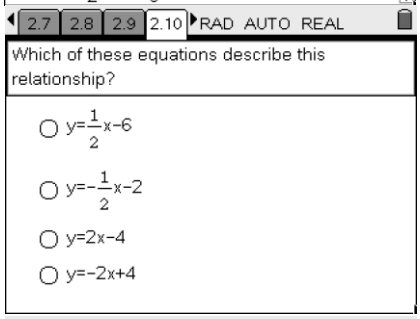


y−intercept is where x = 0. Use the information about the slope that you just discovered to help.

x	y
−5	14
−1	6
2	0
4	−4

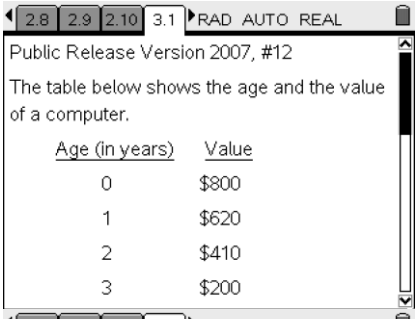


Remember, since the slope is −2, each time x increases by 1, y decreases by 2. Since one line of the table is (−1, 6), to increase x by 1, we get 0. When we increase x by 1, we decrease y by 2. Therefore, the y−intecept is 4. Select the correct answer on the next page, then check your answer with MENU.



Which of these equations describe this relationship?

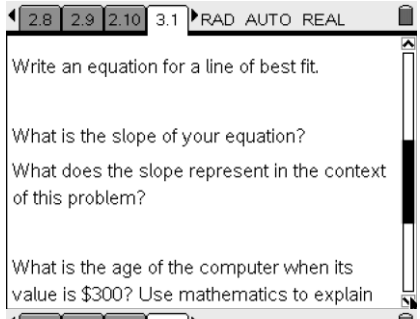
- ○ $y=\frac{1}{2}x-6$
- ○ $y=-\frac{1}{2}x-2$
- ○ $y=2x-4$
- ○ $y=-2x+4$



Public Release Version 2007, #12

The table below shows the age and the value of a computer.

Age (in years)	Value
0	$800
1	$620
2	$410
3	$200

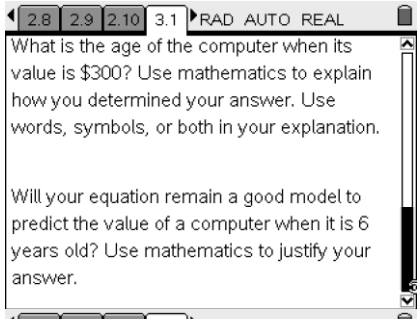


Write an equation for a line of best fit.

What is the slope of your equation?

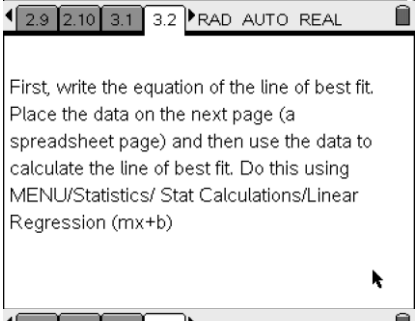
What does the slope represent in the context of this problem?

What is the age of the computer when its value is $300? Use mathematics to explain

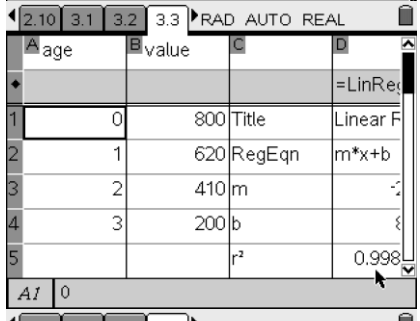


What is the age of the computer when its value is $300? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.

Will your equation remain a good model to predict the value of a computer when it is 6 years old? Use mathematics to justify your answer.

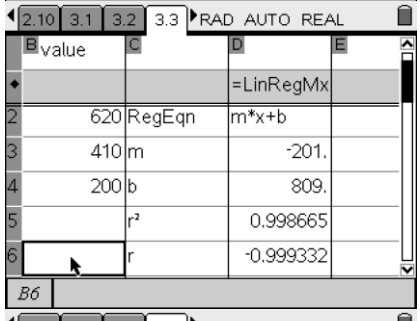


First, write the equation of the line of best fit. Place the data on the next page (a spreadsheet page) and then use the data to calculate the line of best fit. Do this using MENU/Statistics/ Stat Calculations/Linear Regression (mx+b)



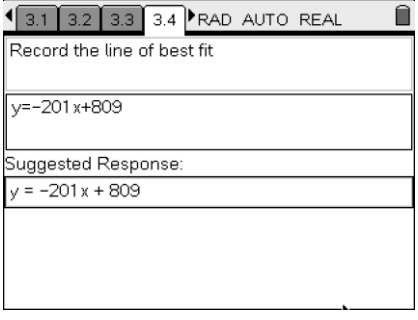
	A age	B value	C	D
				=LinReg
1	0	800	Title	Linear F
2	1	620	RegEqn	m*x+b
3	2	410	m	-2
4	3	200	b	8
5			r²	0.998

A1 0



	B value	C	D	E
			=LinRegMx	
2	620	RegEqn	m*x+b	
3	410	m	-201.	
4	200	b	809.	
5		r²	0.998665	
6		r	-0.999332	

B6

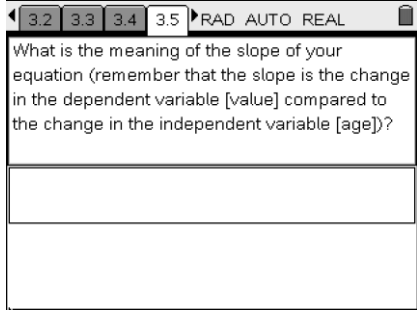


Record the line of best fit

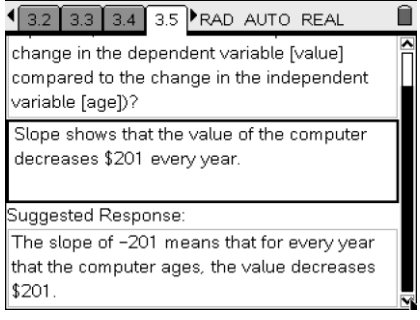
y=−201x+809

Suggested Response:

y = −201x + 809



What is the meaning of the slope of your equation (remember that the slope is the change in the dependent variable [value] compared to the change in the independent variable [age])?



change in the dependent variable [value] compared to the change in the independent variable [age])?

Slope shows that the value of the computer decreases $201 every year.

Suggested Response:

The slope of −201 means that for every year that the computer ages, the value decreases $201.

3.3 3.4 3.5 3.6 RAD AUTO REAL

solve(300=-201·x+809,x)

0/99

Use the calculator page above and your line of best fit to calculate the age of the computer when its value is $300.

3.4 3.5 3.6 3.7 RAD AUTO REAL

What is the age of the computer when its value is $300?

3.4 3.5 3.6 3.7 RAD AUTO REAL

What is the age of the computer when its value is $300?

About 2.5 years

Suggested Response:

A computer that is about 2.5 years old is worth $300.

3.5 3.6 3.7 3.8 RAD AUTO REAL

-201·6+809

0/99

Use the line of best fit and the calculator page above to make your prediction as to whether or not your model is a good fit for a 6-year-old computer.

3.6 3.7 3.8 3.9 RAD AUTO REAL

Will your equation remain a good model to predict the value of a computer when it is 6 years old? Use mathematics to justify your answer.

3.6 3.7 3.8 3.9 RAD AUTO REAL

years old? Use mathematics to justify your answer.

No, the value of the computer is negative after 6 years, so the model doesn't work.

Suggested Response:

The model does not remain a good model for a 6-year-old computer because the value would be negative. This does not make sense for this context.

3.7 3.8 3.9 4.1 RAD AUTO REAL

Public Release Version 2007, #11

Mary is considering two job offers. Job A pays $8.00 an hour and offers a one-time $100 bonus. Job B pays $8.50 an hour and offers a one-time $80 bonus. How many hours would may have to work to earn the same amount of money at Job B as at Job A?

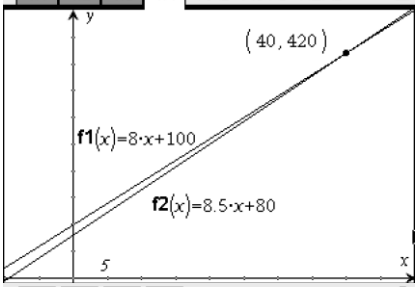
3.8 3.9 4.1 4.2 RAD AUTO REAL

We can solve this problem in many ways. Three ways would be using a graph to find the point of intersection graphically, creating two equations and finding their point of intersection algebraically, or creating a table of values for each job and comparing the amounts.

3.9 4.1 4.2 4.3 RAD AUTO REAL

First, let's find the graphic point of intersection. Graph the lines, create an appropriate window, then use MENU/ Points and Lines/Intersection Points to determine the coordinates of the point of intersection.

4.1 4.2 4.3 4.4 RAD AUTO REAL



4.2 4.3 4.4 4.5 RAD AUTO REAL

The second method would be to find the point of intersection of the two equations.

4.3 4.4 4.5 4.6 RAD AUTO REAL

solve(8·x+100=8.5·x+80,x)

0/99

4.4 4.5 4.6 4.7 RAD AUTO REAL

A third method would be to create a table of values for each of the equations and then look for when the two lists have a common value.

4.5 4.6 4.7 4.8 RAD AUTO REAL

	A a	B b	C	D
1	108	88.5		
2	116	97.		
3	124	105.5		
4	132	114.		
5	140	122.5		

A1 108

4.6 4.7 4.8 4.9 RAD AUTO REAL

How many hours to earn the same amount of money?

- ○ 40
- ○ 41
- ○ 420
- ○ 428

4.7 4.8 4.9 5.1 RAD AUTO REAL

Public Release Version 2007, #23

At the beginning of the summer, Sarah has $250. She takes a summer job and saves $150 per week. Felicia has $1,650 at the beginning of the summer. She travels during the summer and spends $200 per week.

Write an equation that represents the amount of money Sarah has at the end of each week.

4.8 4.9 5.1 5.2 RAD AUTO REAL

Write an equation that represents the amount of money Felicia has at the end of each week.

Graph the two equations (Suggested graphing window: 0 ≤ weeks ≤ 10; 0 ≤ amount ≤ 2000.)

4.8 4.9 5.1 5.2 RAD AUTO REAL

Graph the two equations (Suggested graphing window: 0 ≤ weeks ≤ 10; 0 ≤ amount ≤ 2000.)

At the end of which week do Sarah and Felicia have the same amount of money? How much money do they have? Use mathematics to justify your answer.

4.8 4.9 5.1 5.2 RAD AUTO REAL

Create an equation for Sarah's saving over the summer. Remember that she started with $250 and adds $150 repeatedly each week.

4.8 4.9 5.1 5.2 RAD AUTO REAL

Create an equation for Sarah's saving over the summer. Remember that she started with $250 and adds $150 repeatedly each week.

y=150x+250

Suggested Response:

y = 150x + 250

4.9 5.1 5.2 5.3 RAD AUTO REAL

Now create an equation for Felicia's spending over the summer. Remember that she started with $1,650 and spent $200 per week (does her total increase or decrease?).

4.9 5.1 5.2 5.3 RAD AUTO REAL

Now create an equation for Felicia's spending over the summer. Remember that she started with $1,650 and spent $200 per week (does her total increase or decrease?).

y=−200x+1650

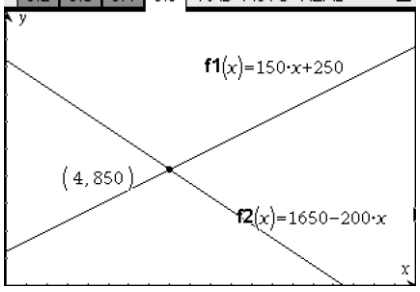
Suggested Response:

y = −200x + 1650

5.1 5.2 5.3 5.4 RAD AUTO REAL

Now graph each of your two equations on the next page. Remember to set your window at 0 ≤ weeks ≤ 10 using x for weeks and 0 ≤ amount ≤ 2000 using y for amount. Find their point of intersection.

5.2 5.3 5.4 5.5 RAD AUTO REAL



5.3 5.4 5.5 5.6 RAD AUTO REAL

At the end of which week do Sarah and Felicia have the same amount of money? How much money do they have? Use mathematics to justify your answer.

5.3 5.4 5.5 5.6 RAD AUTO REAL

have the same amount of money? How much money do they have? Use mathematics to justify your answer.

They both have $850 after 4 weeks. The graph shows this as the point of intersection.

Suggested Response:

After 4 weeks, they both have $850. You can see this because it is the point of intersection of the two equations.

5.4 5.5 5.6 6.1 RAD AUTO REAL

Public Release Version 2008, #12

The following formula can be used to find the wind-chill temperature (w) when the wind speed is 20 miles per hour.

$w = -39 + \frac{3}{2}t$ (t = actual air temp.)

What is the actual air temperature if the wind-chill temperature is −12°?

5.5 5.6 6.1 6.2 RAD AUTO REAL

Use the calculator page on the next page to calculate the answer. The equation is copied for your use.

5.6 6.1 6.2 6.3 RAD AUTO REAL

$\text{solve}\left(-12=-39+\frac{3}{2}\cdot x, x\right)$

0/99

$w = -39 + \frac{3}{2}t$ (t = actual air temp.)

What is the actual air temperature if the wind-chill temperature is −12°?

6.1 6.2 6.3 6.4 RAD AUTO REAL

Which of these is the actual air temperature if the wind-chill temperature is −12°?

- ○ −57°
- ○ −21°
- ○ 18°
- ○ 41°

6.2 6.3 6.4 7.1 RAD AUTO REAL

Public Release Version 2008, #19

Marina has $20 in a savings account. She wants to deposit $10 each week for x weeks into her savings account. If she does not withdraw any money, which expression below represents the total amount, in dollars, she will have in her savings account in x weeks?

6.3 6.4 7.1 7.2 RAD AUTO REAL

To answer this question, think about how much Marina has to start with and how much gets added over and over.

6.4 7.1 7.2 7.3 RAD AUTO REAL

Which expression below represents the total amount of money, in dollars, she (Marina) will have in her savings account in x weeks?

- ○ 10 (20 + x)
- ○ x (10 + 20)
- ○ 10x + 20
- ○ 20x + 10

7.1 7.2 7.3 8.1 RAD AUTO REAL

Public Release Version 2008, #21

Sean's movie rental company charges a monthly fee of $5.00 plus an additional cost of $1.25 per movie rental. Which of these equations represents the total monthly cost (c) of renting x movies?

7.2 7.3 8.1 8.2 RAD AUTO REAL

Which of these equations represents the total monthly cost (c) of renting x movies?

- ○ c = 1.25x + 5.00
- ○ c = 3.75x + 5.00
- ○ c = 5.00x + 1.25
- ○ c = 5.00x + 3.75

7.3 8.1 8.2 9.1 RAD AUTO REAL

Public Release Version 2008, #23

William charges $4 per hour to babysit. LaRhonda charges $10, plus an additional $2 per hour to babysit. Both William and LaRhonda work the same number of hours. After how many hours will they earn the same amount of money?

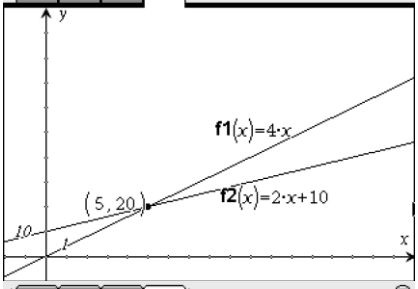
8.1 8.2 9.1 9.2 RAD AUTO REAL

This problem is similar to an earlier one. We can solve this problem using a graph to find the point of intersection graphically, creating two equations and finding their point of intersection algebraically, or creating a table of values for each job and comparing the amounts.

8.2 9.1 9.2 9.3 RAD AUTO REAL

First, let's find the graphic point of intersection. Graph the lines, create an appropriate window, then use MENU/ Points and Lines/Intersection Points to determine the coordinates of the point of intersection.

9.1 9.2 9.3 9.4 RAD AUTO REAL



9.2 9.3 9.4 9.5 RAD AUTO REAL

The second method would be to find the point of intersection of the two equations.

9.3 9.4 9.5 9.6 RAD AUTO REAL

solve(4·x=2·x+10,x)

0/99

9.4 9.5 9.6 9.7 RAD AUTO REAL

A third method would be to create a table of values for each of the equations and then look for when the two lists have a common value.

9.5 9.6 9.7 9.8 RAD AUTO REAL

	A a	B b	C	D
1	4	12		
2	8	14		
3	12	16		
4	16	18		
5	20	20		

A1 4

9.6 9.7 9.8 9.9 RAD AUTO REAL

After how many hours will they (William and LaRhonda) earn the same amount of money?

- ○ 2 hours
- ○ 2.5 hours
- ○ 4.5 hours
- ○ 5 hours

9.7 9.8 9.9 10.1 RAD AUTO REAL

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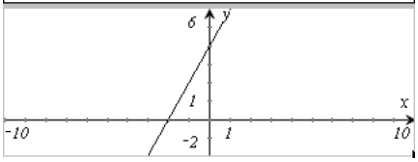
Look at the function that is graphed below. What is the equation of this function?



9.8 9.9 10.1 10.2 RAD AUTO REAL

Look at the graph and consider the slope (change in y divided change in x) and the y−intercept.

9.9 10.1 10.2 10.3 RAD AUTO REAL

Which of these equations represents this function?

- ○ $y = \frac{1}{2}x - 4$
- ○ $y = \frac{1}{2}x + 2$
- ○ $y = 2x - 2$
- ○ $y = 2x + 4$