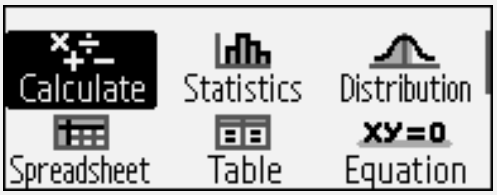
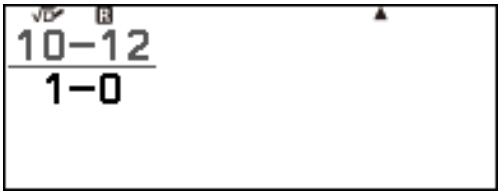
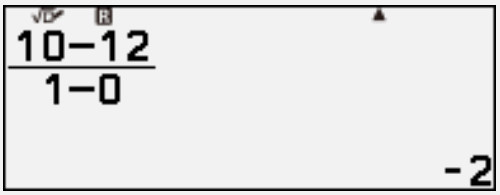
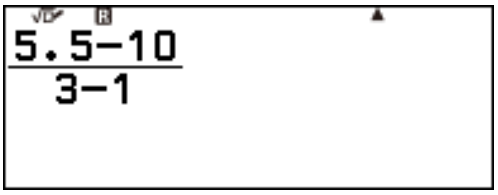
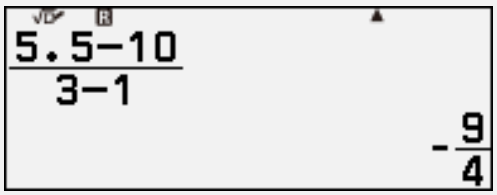
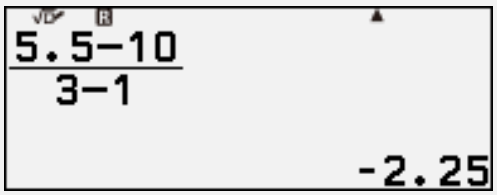
Unit 5: Lesson 9 – Linear Models

Warm-up 9.1: Candlelight

Skill: Use the Calculate app to determine if three points have a linear relationship.

Warm-up Summary:
In this warm-up, students are given the heights of a burning candle after three different times. From these data points, they are asked to use their knowledge about linear relationships to estimate when the candle will burn out and determine if the height of the candle is a linear function of time. The calculator can be used to determine the average rate of change between the points. If the candle burns at a constant rate, the slopes will all be equal. The Format Key can be used to quickly change the form of an answer between an improper fraction, to a decimal, and to a mixed fraction.

1. Turn on the calculator with the ⏻ **- On** button. Press ⌂ **– Home** and then use the arrows to highlight the **Calculate app**.	
2. Press either OK or EXE to open the **Calculate app**. The burning candle heights at three different times gives three points; **(0, 12), (1,10)**, and **(3, 5.5)** where input is time in hours, and the output is height in inches.	
3. If the **average rate of change** is the **same** between these three points, then there is a **linear relationship** between time and the height of the candle. Press the **fraction key**, ▤, to start.	
4. In the **numerator**, enter the **change in height in inches** between the first two points. In this case, **10 – 12**. Press the **down arrow**, ▽, to move to the **denominator** to enter the **change in time in hours** between the points. In this case, **1 – 0**.	

5. Press either OK or EXE. For the first hour, the candle height **decreased** at an average rate of **2 inches per hour**.	
6. Next, determine the **average rate of change** between the second and third points. Press the **fraction key**, ⬚. Enter the **change in height** of the candle in the **numerator** and the **change in time** in the **denominator**.	
7. Press either OK or EXE. The result is the **fraction** of **–9/4 inches per hour**. Fractional slopes are helpful in plotting points, but in a word problem a **decimal** or **mixed fraction** may be a better choice.	
8. Press the **FORMAT Key**, FORMAT, to view the **format menu**.	
9. To view as a **decimal**, press the **down arrow**, ▼, to highlight **Decimal** and then press either OK or EXE. Between the 1st and 3rd hour, the candle height **decreased** at an average rate of **2.25 inches per hour**.	
10. To convert the rate to a **mixed fraction**, press the **FORMAT Key**, FORMAT, and **arrow down**, ▼, to highlight **Mixed Fraction**.	
11. Press either OK or EXE to see the rate as an **equivalent mixed fraction**. Since the rate from the first hour is **not the same** as the rate for the following 2 hours, it is **not a linear relationship** between height and burn time.