GRADE 8 MATH: TALK AND TEXT PLANS

UNIT OVERVIEW

This packet contains a curriculum-embedded Common Core standards aligned task and instructional supports. The task is embedded in a three week unit on systems of linear equations. This unit builds on previous 6th and 7th grade units on Expressions and Equations: translating verbal expressions and equations to algebraic representations and solving equations containing one variable. The unit provides students with the opportunity to deepen their understanding of the representation and connections of real world situations in various forms: equations, tables, and graphs. Furthermore, this unit allows students to determine if and when two or more equations in context have a solution algebraically and graphically.

TASK DETAILS

Task Name: Talk and Text Plans

Grade: 8

Subject: Math

Depth of Knowledge: 3

Task Description: This task assesses students on their understanding of simultaneous pairs of linear equations in a real world context, their ability to set up and solve the system algebraically and graphically, and their ability to estimate solutions using a graph.

Standards:

8.EE.7 Solve linear equations in one variable.

8.EE.7b Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8.EE.8 Analyze and solve pairs of simultaneous linear equations.

8.EE.8a Understand that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously.

8.EE.8b Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.

Standards for Mathematical Practice:

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

NYC Department of Education
Dennis M. Walcott, Chancellor

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The task and instructional supports in the following pages are designed to help educators understand and implement Common Core-aligned tasks that are embedded in a unit of instruction. We have learned through our pilot work that focusing instruction on units anchored in rigorous Common Core–aligned assessments drives significant shifts in curriculum and pedagogy. Call out boxes and Universal Design for Learning (UDL) support are included to provide ideas around how to include multiple entry points for diverse learners.

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Acknowledgements: The unit outline was developed by NYCDOE Math Common Core Fellow Jennifer Hernandez-Almonte, Mathematics Teacher 24Q061, and Lisa Obrien, Mathematics Teacher 24Q061.

COMMON CORE-ALIGNED TASK
WITH INSTRUCTIONAL SUPPORTS

Mathematics

GRADE 8 MATH: TALK AND TEXT PLANS

PERFORMANCE TASK

NYC Department of Education
Dennis M. Walcott, Chancellor

Name: _____ Class:_____ Date:_____

Talk and Text Plans

A cell phone company offers two talk and text plans. The company charges a monthly service fee of $20 for either plan the customer chooses:

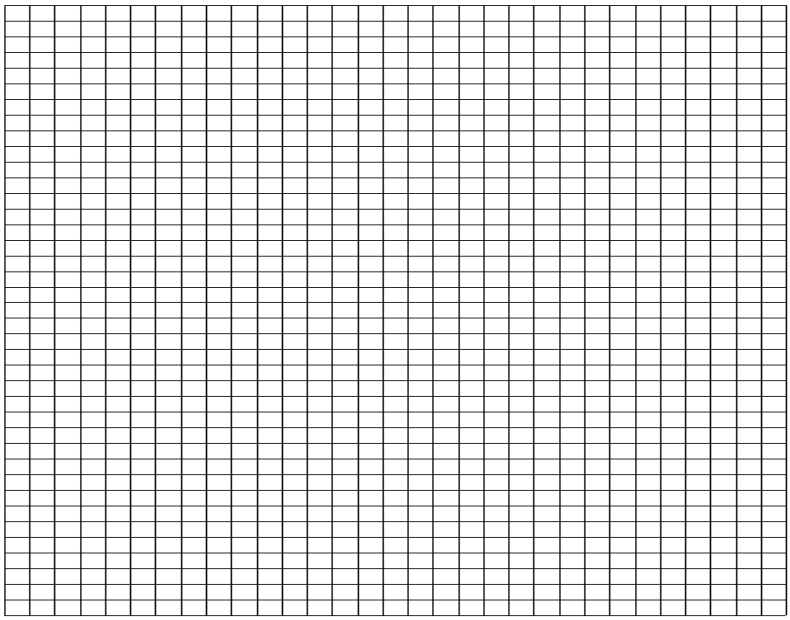
Customers that choose ***Talk and Text Plan A*** are charged five cents a minute and twenty dollars for 250 texts.

Customers that choose ***Talk and Text Plan B*** are charged ten cents a minute (first 100 minutes free) and fifteen dollars for 200 texts. The equation: $c = .10(m - 100) + 15 + 20$ can be used to represent how much a customer would spend monthly for the minutes used.

a) Express Plan A as an equation where c equals the cost and m equals the minutes used.

b) For how many minutes will both plans share the same cost? Show your work algebraically.

c) Graph each Talk and Text plan to determine when both plans cost the same. Write the solution and explain how the graph results match your algebraic solution.



d) If a customer has $75 to spend each month, which plan should the customer choose and why? Use your work to justify your answer.

GRADE 8 MATH: TALK AND TEXT PLANS

RUBRIC

The following rubric is designed to help asses student knowledge and performance on the targeted Common Core standards and Mathematical Practice standards for the unit.

Talk and Text Plans Rubric

Three Point Score

The response accomplishes the prompted purposes and effectively communicates the student's mathematical understanding. The student's strategy and execution meet the content (including concepts, technical representations, and connections), thinking processes, and qualitative demands of all parts of the task. **Minor omissions may exist, but do not detract from the correctness of the response.**

Mathematical Practices	**Evidence Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them. **Reason abstractly and quantitatively.** Abstracts numbers from Talk and Text Plan A: represents the problem algebraically, solves the problem, and correctly notes the meaning of the results in context of the problem. **Construct viable arguments and critique the reasoning of others.** Justifies the answer to part d using a method of choice, clearly explaining the strategy used. Justifies how the graph results match the algebraic solution for parts b and c. **Model with Mathematics.** Correctly uses the information from Plan A to write an equation. Uses an algebraic method to solve for the minutes. Graphs both equations to determine the cost for both plans when using 300 minutes. Identifies solution to be were both lines intersecting each other and expresses it as an ordered pair (or states x = __, y = __) **Attend to precision.** Correctly uses the distributive property, combines like terms, and applies inverse operations to solve for minutes. Correctly sets	Work includes representations of the problem indicating the student made sense of the problem, chose an appropriate strategy, and advanced towards a correct solution. Response indicates the ability to solve linear equations in one variable. Solves linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Analyzes and solves pairs of simultaneous linear equations. Understands that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously. Solves systems of two linear equations in two variables algebraically, and estimates solutions by graphing the equations. a. Expresses Talk and Text Plan A as an equation $c = .05m + 20 + 20$ Or $c = .05m + 40$ b. Solves algebraically for minutes using the substitution method (or can use the elimination method). Uses the distributive property, combines like terms, and uses inverse operations to solve for minutes. $.05m + 20 + 20 = .10(m - 100) + 15 + 20$ $.05m + 40 = .10m - 10 + 15 + 20$ $.05m + 40 = .10m + 25$

up graph. Accurately labels work and uses correct math terminology. **Use appropriate tools strategically**. A graph paper is used for part c to determine the cost of both talk and text plans for 300 minutes. The graph is used to estimate an answer for part d.	$-.05m = -15$ Then divide by -.05 to solve for *m*. *m* = 300 300 minutes c. Graphs each plan to determine the cost of both plans when they have the same number of minutes. Analyzes both the algebraic solution and the graph and determined that for both plans 300 minutes costs 55 dollars. Writes the solution correctly and explains the connection between the algebraic solution and graph. Both equations are graphed correctly and (300, 55) is stated. d. Uses either method to determine that Talk and Text Plan A will give you 700 minutes for $75 and Talk and Text Plan B will give you 500 minutes for $75. Concludes that Talk and Text Plan A will give you more talk time for $75. When justifying the answer, indicates slope or steepness of line. Evaluates each equation for $75 to check which plan gives more minutes.

Two Point Score

The response accomplishes the prompted purposes and effectively communicates the student's mathematical understanding. The student's strategy and execution meet the content (including concepts, technical representations, and connections), thinking processes, and qualitative demands of all parts of the task. **Some of the necessary connections between the context and representation may be flawed.**

Mathematical Practices	**Evidence Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them. **Reason abstractly and quantitatively.** Abstracts numbers from Talk and Text Plan A: represents the problem algebraically, solves the problem, and correctly notes the meaning of the results in context of the problem.	Work includes representations of the problem indicating the student made sense of the problem and advanced towards a correct solution, but indicates a struggle to interpret parts of the context correctly. Response indicates the ability to solve linear equations in one variable. Solves linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Analyzes and solves pairs of simultaneous linear

Construct viable arguments and critique the reasoning of others. Justifies the answer to part d using a method of choice, clearly explaining the strategy used. Justifies how the graph results match the algebraic solution for parts b and c. **Model with Mathematics.** Uses an algebraic method to solve for the minutes shared (preferably substitution but can convert to Standard Form and use elimination). Graphs both equations using slope-intercept form to determine the cost for both plans when using 300 minutes. Identifies solution to be where the lines intersect and expresses it as an ordered pair (or states x = __, y = __) **Attend to precision.** Correctly uses the distributive property, combines like terms, and applies inverse operations to solve for minutes. Correctly sets up graph. Accurately labels work and uses correct math terminology. **Use appropriate tools strategically**. A graph paper is used for part c to determine the cost of both talk and text plans for 300 minutes. The graph is used to estimate an answer for part d.	equations. Understands that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously. Solves systems of two linear equations in two variables algebraically, and estimates solutions by graphing the equations. a. Possibly writes inequality. **OR** Possibly evaluates cost. **OR** Possibly misses representing 100 free minutes, or monthly cost, or text cost in the equation. **OR** Possibly writes charge per minute incorrectly (e.g. not in decimal form). b. Possibly combines like terms incorrectly or fails to use the distributive property accurately. **OR** Algebraic work shows computational errors. c. Possibly starts graphing each line at the origin and not the y-intercept. **OR** Possibly uses x- and y-intercepts when in standard form which would represent an inaccurate representation (negative values). **OR** Possibly doesn't identify the solution as the intersection (or an ordered pair or shared x and y values). **OR** Failure to label graph and/or scale is not reasonable. **OR** Uses slope and y-intercept incorrectly when graphing. **OR** Possibly uses a table to determine the cost for the shared minutes and doesn't use a graph or transfers work incorrectly. **OR** Possibly uses another type of graph. d. Fails to reason why the chosen plan is better to use. **OR**

	Possibly doesn't state the better plan.

One Point Score

The response accomplishes some of the prompted purposes and effectively communicates the student's mathematical understanding. The student's strategy and execution meet only a few of the content demands of the task. The necessary connections between the context and the representations may be flawed.

Mathematical Practices	**Evidenced Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them. **Reason abstractly and quantitatively.** Abstracts numbers from talk and text plan A: represents the problem algebraically, solves the problem, and correctly notes the meaning of the results in context of the problem. **Construct viable arguments and critique the reasoning of others.** Justifies the answer to part d using a method of choice, clearly explaining the strategy used. Justifies how the graph results match the algebraic solution for parts b and c. **Model with Mathematics.** Uses an algebraic method to solve for the minutes shared (preferably substitution but can convert to Standard Form and to use elimination). Graphs both equations using slope-intercept form to determine the cost for both plans when using 300 minutes. Identifies solution to be were both lines intersecting each other and expresses it as an ordered pair (or states x = __, y = __) **Attend to precision.** Correctly uses the distributive property, combines like terms, and applies inverse	Work is missing representations of the problem or understanding of the constraints of the problem given in the context. Response indicates the ability to solve linear equations in one variable. Solves linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Analyzes and solves pairs of simultaneous linear equations. Understands that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously. Solves systems of two linear equations in two variables algebraically, and estimates solutions by graphing the equations. a. Write equation incorrectly (two or more conceptual errors). b. Fails to solve Part II algebraically. **OR** Uses evaluation or a table. **OR** Several computational and/or conceptual errors show in the algebraic work. c. Possibly doesn't use a graph to determine the cost for the shared minutes. **OR** Possibly graphs for the lines are incorrect. **OR** Doesn't label work or use correct math terminology. d. Doesn't provide a response for which plan is best when paying $75.

operations to solve for minutes. Correctly sets up graph. Accurately labels work and uses correct math terminology. **Use appropriate tools strategically**. A graph paper is used for part c to determine the cost of both talk and text plans for 300 minutes. The graph is used to estimate an answer for part d.	

GRADE 8 MATH: TALK AND TEXT PLANS

ANNOTATED STUDENT WORK

This section contains annotated student work at a range of score points. The student work shows examples of student understandings and misunderstandings of the task.

Talk and Text Plans

Annotation of student work with a score of 3

a) Express Plan A as an equation where c equals the cost and m equals the minutes used.

$C = .05m + 20 + 20$

b) For how many minutes will both plans share the same cost? Show your work algebraically.

300 minutes will have the same cost.

c) Graph each Talk and Text Plan to determine when both plans cost the same. Write the solution and explain how the graph results match your algebraic solution.

300 minutes cost $55 for both. This is because the points intersect when they use the same min. + cost whi[illegible] is $55 for 300 min

d) If a customer has $75 to spend each month, which plan should the customer choose and why? Use your work to justify your answer.

The customer should use Plan A because it gives more minutes than Plan B for the same amount of money. I know this because when I look at the corresponding values for $75 on my graph, Plan A gives more minute than B

ghth Grade CCSS for Mathematical Content:

a) $A \approx C = .05m + 20 + 20$

b)

$.05m + 30 + 20 = .10(m - 100) + 15 + 20$

$.05m + 40 = .10m - 10 + 15 + 20$

$.05m + 40 = .10m + 25$

$-.05m \qquad -.05m$

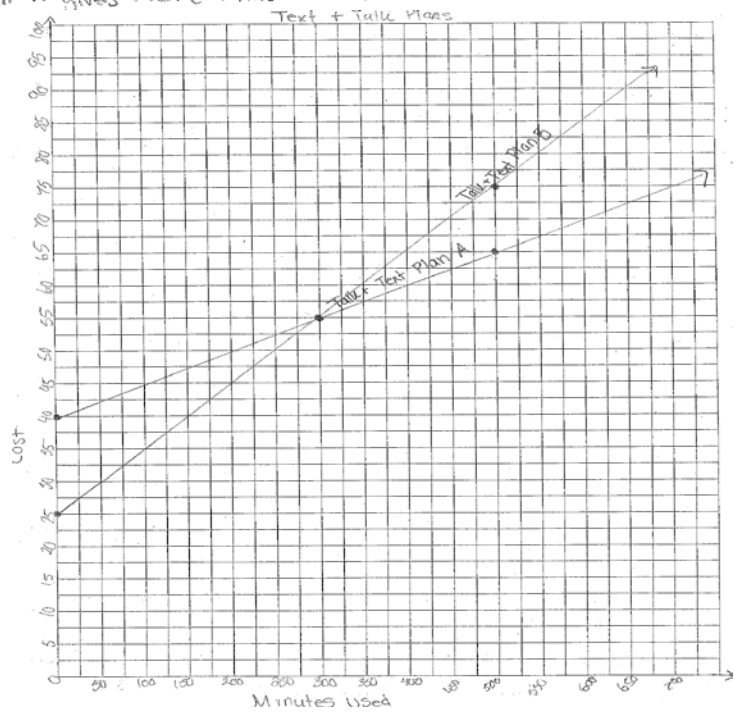
$40 = .05m + 25$

$-25 \qquad -25$

$\frac{15}{.05} = .05m$

$300 = m$

$.05\overline{)15.00}$ = 300

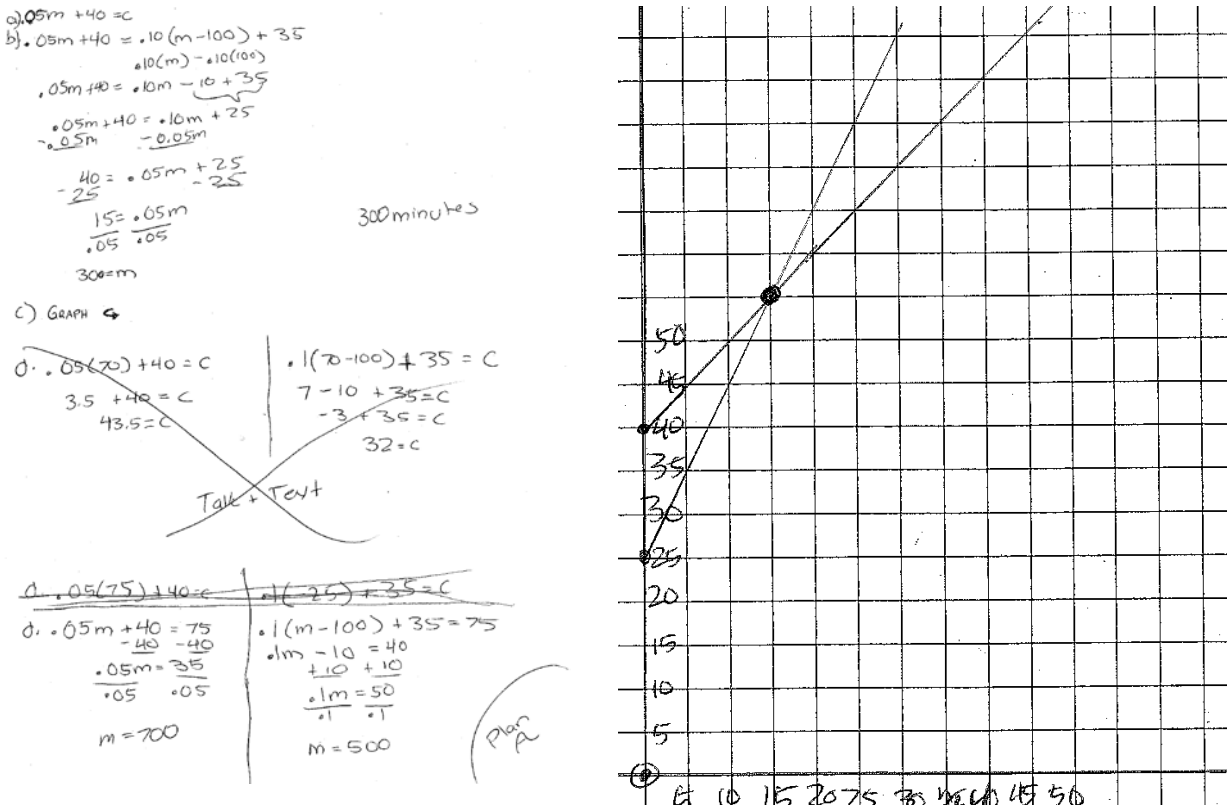


Content Standards: The student receives a score of 3 because the student responds with appropriate mathematical reasoning in all four parts of the problem. In part a), the student has constructed a linear function to model Plan A (8.EE.7). In part b), the student solved the system algebraically using substitution to find out how many minutes will both plans share the same cost (8.EE.7b, 8.EE.8b). In part c), the student graphed both equations to find the solution where both plans share the same cost. The student explains where there is a connection between the algebraic solution and graph (8.EE.8, 8.EE.8a). In part d), the student gave a clear and detailed explanation which plan a customer should choose if a customer has to spend $75, and the student used his/her work to justify the answer (8EE8).

Mathematical Practices: The student makes sense of the problem (Practice 1) and is able to model the situation abstractly and quantitatively and relate the answers back to the context (Practices 2 and 4). Justification for his/her conclusions was detailed and clear and provided proof (Practice 3). The student's calculations were accurate (Practice 6).

Next Instructional Steps: Group the student with other students who took different approaches to the problem, such as elimination or graphing. Ask the students to discuss and compare the different strategies. Afterwards, challenge the students to explain, in writing, why their method works and how it is the same and different from at least one other strategy.

Annotation of student work with a score of 2

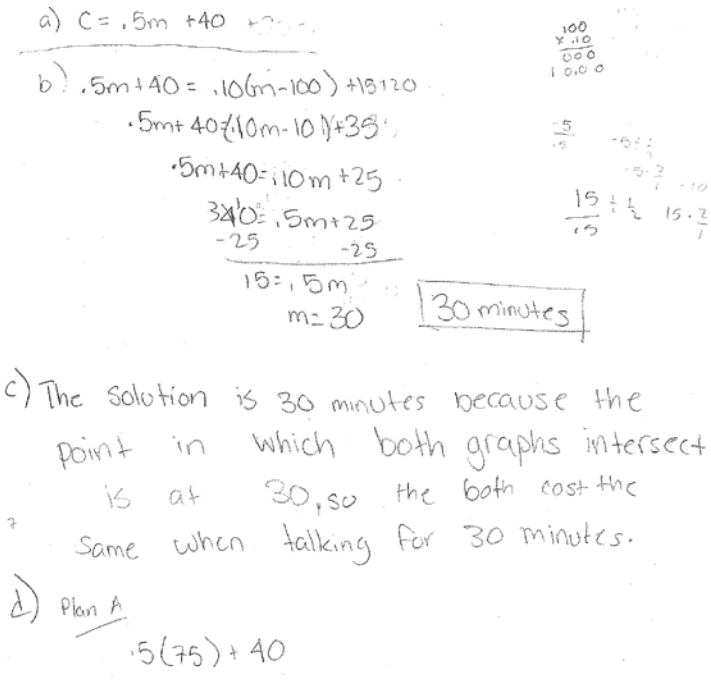


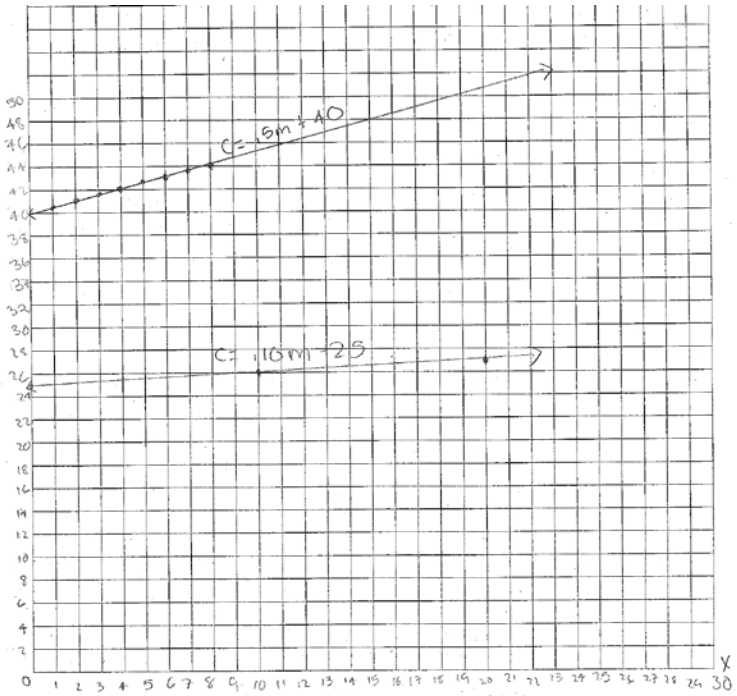
Content Standards: The student receives a score of 2 because the student responds with appropriate mathematical reasoning in two of the four parts of the problem. In part a), the student has constructed a linear function to model Plan A (8.EE.7). In part b), the student solved the system algebraically using substitution to find out how many minutes will both plans share the same cost (8.EE.7b, 8.EE.8b). In part c), the student failed to label the axes and lines. In addition, the scale is not reasonable. The student graphed both equations but incorrectly found the solution and did not state the solution. The student failed to explain how there is a connection between the algebraic solution and the graph (8.EE.8, 8.EE.8a). In part d), the student did state which was the better plan to choose. The student did not give a clear and detailed explanation which plan a customer should choose if a customer has to spend $75. The student solved algebraically to justify his/her answer (8.EE.8).

Mathematical Practices: The student makes sense of the problem (Practice 1) and partially was able to model the situation abstractly and quantitatively and relate the answers back to the context (Practices 2 and 4). Justification for his/her conclusions was stated correctly but did not provide sufficient evidence (Practice 3). The students' calculations were accurate (Practice 6).

Next Instructional Steps: Group the student with other students who took different approaches to the problem, such as elimination or graphing. Student would benefit from feedback and time to revise work.

Annotation of student work with a score of 1





Content Standards: The student receives a score of 1 because the student responds with appropriate mathematical reasoning in one of the four parts of the problem. In part a), the student partially constructed a linear function to model Plan A (8EE7). In part b), the student incorrectly expressed five cents in the equation. The student solved the system algebraically using substitution to find out how many minutes both plans would share the same cost, but failed to get the correct minutes due to a mistake in writing the equation (8.EE.7b 8.EE.8b). In part c), the student failed to label the axes, and the scale is not reasonable. The student graphed both equations incorrectly and therefore was not able to find the solution. The student failed to explain how there is a connection between the algebraic solution and the graph (8.EE.8, 8.EE.8a). In part d), the student states which was the better plan to choose, but fails to reason why the chosen plan is better (8EE8).

Mathematical Practices: The student did make sense of the problem (Practice 1), but was not able to model the situation abstractly and quantitatively and relate the answers back to the context (Practices 2 and 4). The justification for his/her conclusions did not provide sufficient evidence (Practice 3). The student's calculations were not accurate (Practice 6).

Next Instructional Steps: Group the student with other students who took different approaches to the problem, such as elimination or graphing. The student would benefit from more practice and a one-on-one conference with the teacher.

GRADE 8 MATH: TALK AND TEXT PLANS

INSTRUCTIONAL SUPPORTS

The instructional supports on the following pages include a unit outline with formative assessments and suggested learning activities. Teachers may use this unit outline as it is described, integrate parts of it into a currently existing curriculum unit, or use it as a model or checklist for a currently existing unit on a different topic.

Unit Outline – Grade 8 Mathematics

Grade 8: Simultaneous Linear Equations

Unit Topic and Length

The sequence of related lessons is intended to take approximately 15 instructional periods (3 weeks – 90 minutes) depending on students' prior knowledge and work with expressions, equations, tables, and graphs. It is recommended that this unit be taught after Linear Relationships and Linear Equations units (mid-year).

Common Core Content Standards

Eighth Grade Common Core Standards for Mathematical Content:

8.EE.7 Solve linear equations in one variable.

8.EE.7a Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x=a$, $a=a$, or $a=b$ results (where a and b are different numbers).

8.EE.7b Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8.EE.8 Analyze and solve pairs of simultaneous linear equations.

8.EE.8a Understand that solutions to a system of two linear equations in two variables corresponds to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously.

8.EE.8b Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.

Eighth Grade Common Core Standards for Mathematical Practice:

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.

Big Ideas/Enduring Understandings

- When an *ordered pair* in a system makes all the equations true, it is a *solution* to the system of linear equations and the point of *intersection* on a graph.
- A solution to a system can be interpreted in the context of a real world situation.

Essential Questions

- What is a system of equations?
- How can mathematical models (tables, graphs, equations) be used to display and describe a real world situation?
- What does it mean if an x-value gives the same y-value for simultaneous

➢ When two lines are *parallel* (same slope and different *y*-intercept), there are no points of intersection, therefore, there is *no solution* for the system. ➢ When two lines are the *same* (overlap each other on a graph), there are *infinitely many solutions*. ➢ Simple case systems can be solved by inspection. For example: A system where both equations contain the same slope and different *y*-intercept will never intersect, or two equations written in standard form where both have the same A and B coefficients and different constants will not share a solution. ➢ When two expressions are equivalent to the same variable, substitution can be used to solve the system algebraically.	equations? ➢ What are the three types of solutions for systems of equations?
CONTENT ➢ Pairs of simultaneous equations represented as tables, equations, and graphs. ➢ Pairs of simultaneous equations solved algebraically: substitution and elimination. ➢ Pairs of simultaneous equations solved graphically. ➢ Pairs of simultaneous equations solved by inspection. ➢ Identifying the type of solution for a pair of simultaneous equations. ➢ Estimating solutions for a pair of simultaneous equations on a graph. ➢ Interpreting the solution for a pair of simultaneous equations in the context of the problem.	**SKILLS** ➢ **Solve** linear equations in one variable. ➢ **Solve** pairs of simultaneous linear equations algebraically and graphically. ➢ **Solve** simple cases of pairs of simultaneous equations by inspection. ➢ **Interpret** solutions to pairs of simultaneous equations in the context of the problem. ➢ **Graph** pairs of simultaneous equations. ➢ **Estimate** solutions on a graph.
VOCABULARY/KEY TERMS Equation, slope, *y*-intercept, system of equations, solution of a system of equation, no solution, infinite, parallel lines, perpendicular lines	

ASSESSMENT EVIDENCE AND ACTIVITIES

INITIAL ASSESSMENT

The initial assessment of the unit is titled ***Movie Tickets***. The task asks students to:

a) Determine the number of children and adult tickets sold that weekend and verify that their solution is correct.

b) Determine whether the supervisor's assumption was correct and use their work to justify their answer.

FORMATIVE ASSESSMENTS:

The 1st formative assessment of the unit is titled ***Job Advertisements***. The task asks students to:

a) Write a system of equations that expresses each posting as an equation using the variables provided.

b) Solve the system by graphing to determine the amount in sales that they would have to achieve in one week to earn the same amount of money at either job.

c) Justify using their graph which job they would benefit more from if they estimate a weekly sales of $500.

The 2nd formative assessment of the unit is titled ***Video Game Console***. The task asks students to:

a) Write a system of equations in standard form that represents the number of consoles sold and the total sales made using the variables provided.

b) Solve the system algebraically to determine the amount of each type of console sold.

c) Justify why a given statement is true, using their work.

FINAL PERFORMANCE TASK

The final performance task of the unit is titled ***Talk and Text Plans***. The task asks students to:

a) Write an equation for Talk and Text Plan B using the variables provided.
b) Solve algebraically for the number of minutes equally shared for both plans.
c) Graph each Talk and Text plan and determine the shared cost of the plans for the number of minutes shared.
d) Explain how the graph matches the algebraic work/solution.
e) Justify which plan would be best to use when only spending $75 using a method of choice.

LEARNING PLAN & ACTIVITIES

- This unit contains an initial assessment, formative assessments, and final assessments. Each assessment includes a real world situation in which students are asked to work with pairs of simultaneous equations. Students are assessed on their understanding of the concepts presented in the lesson and their ability to communicate their findings. The formative assessments are unique, and each measures a different aspect of the unit where students represent pairs of simultaneous equations in various forms, solve pairs of simultaneous equations algebraically or graphically, and interpret and estimate solutions given a graph with simultaneous equations.
- **Initial Assessment**: Students will be given an initial assessment involving a real world situation where the system of equations is provided in standard form. The purpose of the initial assessment is to check the student's prior knowledge (if any) of systems of equations, but also to check the student's ability to make sense and persevere given a pair of simultaneous equations in any context. This is the teacher's chance to check the various ways in which students solve the problem (e.g., using a table, making a list, graphing, etc.), and to see the connection students make with the prior unit on linear equations.
- **Formative Assessments**: Students will have three formative assessments based on the unit standards. *Two formative assessments* are in task form where students are presented with a real world situation for a pair of simultaneous equations. These formative assessments not only allow the teacher to check students' understanding, but also provide the teacher with the opportunity to notice any misconceptions that may arise in their work. Half way through the unit, teachers will distribute a *mid-assessment* to gauge students' understanding of solving, graphing, and interpreting pairs of simultaneous equations without context. The mid-assessment should be used to check students in fluency.
- **Student Conferences**: Teacher consistently monitors students' progress by holding one-on-one follow-ups or small group interventions (where teacher chooses a common skill needed to be addressed again). Teacher uses the pre-assessment, formative assessments, and mid-assessment as tools to review students' work, check their understanding with a similar problem, deepen their understanding, and address any misconceptions. Teacher also uses observations from students' presentations and discussions about a learned concept to confer with students.
- **Students Reflections**: Students should reflect on what they learned each day. Teachers provide students with a closing question or statement at the end of each instructional period and have students respond. The reflections can be presented in various ways, such as writing the steps for solving a pair of simultaneous equations, asking for the meaning of a solution for a pair of simultaneous equations, or presenting a solved problem and having students identify the mistake/misconception and correct the mistake. Reflections allow students to deepen their understanding of the concept learned.
- **Learning Environment**: Teachers should allow students time to explore, discover, and investigate by engaging them in meaningful activities that activate prior knowledge and help them make connections. Students should be able to understand and communicate findings using precise mathematical vocabulary.

Example: A statement such as "Describe a solution to an equation," prompts students to think about working with equations and to write down the different representations of linear equations. Asking a question like this leads students to think about past experiences, activate prior knowledge about equations, and make connections with new material. After students discuss the meaning of a solution, the teacher presents a pair of simultaneous equations and asks, "Thinking back to your discussions, what do you think would be a solution to this pair of equations?"

Questions should be used to deepen students' understanding and ability to make sense of the context of a presented mathematical situation.

Example: Provide students with a graph of simultaneous linear equations and have students interpret the solution (if any) in the context of the problem. (Suggestion for Teacher: Present the students with more than one linear equation on the same plane where two lines intersect and another line is parallel and never intersects one of the other two lines. Ask students to determine if there is a direct relationship between any of the equations and draw conclusions about the lines).

- **Map and Guidance**:

*** *Teachers should include equations that need to be simplified using the Distributive Property and Combining Like Terms within as many lessons as possible to meet standards 8.EE.7 and 8.EE.7b.*

*** *Teachers should also expose students in beginning lessons with equations not written in slope-intercept form (where y is not in isolation) and have students write the equations in slope-intercept form.*

Day	Standards	Goal	Activity
1	8.EE.8	Check students' prior knowledge of Systems of Equations.	Initial Task
2	8.EE.8 8.EE.8a 8.EE.8b	Introduce students to solving pairs of simultaneous equations by graphing.	Savings Activity (Lesson Guidance Below)
3	8.EE.8 8.EE.8a 8.EE.8b	Have students solve systems of equations by graphing (using a table) and estimate solutions on a graph for real life situations.	
4	8.EE.8 8.EE.8a 8.EE.8b	Have students solve systems of equations by graphing the equations in slope-intercept form and estimate solutions on a graph for real life situations.	

	5	8.EE.8 8.EE.8a 8.EE.8b	Have students investigate different types of solutions for pairs of simultaneous equations by using a graphing calculator. *** Focus on having students identify the constraints of equations with one solution, no solution, or infinite solutions (e.g. same slope/different slope, *y*-intercepts, etc.)	Graphing Calculator Activity (Lesson Guidance Below)
	6	8.EE.7 8.EE.7a 8.EE.8 8.EE.8a 8.EE.8b	Have students solve systems of equations algebraically where the pairs have one solution, no solution, or infinite solutions. *** Focus on having students make sense of the final solutions for each case.	
	7	8.EE.7 8.EE.8 8.EE.8a 8.EE.8b	Introduce students to solving systems of equations algebraically by using substitution.	Downloading Music Activity (Lesson Guidance Below)
	8	8.EE.7 8.EE.7b 8.EE.8 8.EE.8b	Have students solve systems of equations in a real world context by using substitution where the equations require simplifying using the distributive property.	
	9	8.EE.7 8.EE.7b 8.EE.8 8.EE.8b	Have students solve systems of equations in a real world context by using substitution where the equations require simplifying by combining like terms.	
	10	8.EE.7 8.EE.7a 8.EE.8 8.EE.8a 8.EE.8b	Assess students in fluency when solving pairs of simultaneous equations without context.	Mid-Assessment (Quiz)
	11	8.EE.8	Have students solve	

	8.EE.8a 8.EE.8b	systems of equations in standard form using elimination without context.	
12	8.EE.8 8.EE.8a 8.EE.8b	Have students write and solve systems of equations in standard form given real life situations.	
13	8.EE.7 8.EE.7b 8.EE.8 8.EE.8a 8.EE.8b	Have students solve pairs of simultaneous equations where one equation is given in slope-intercept form and the other is given in standard form without context.	
14	8.EE.7 8.EE.7b 8.EE.8 8.EE.8a 8.EE.8b	Have students solve for the value given a solution and a pair of simultaneous equations where one has both the slope and *y*-intercept and the other has an unknown.	
15	8.EE.7 8.EE.7b 8.EE.8 8.EE.8a 8.EE.8b	Asses students on the unit.	Final Performance Task

Lesson 2 Guidance

(Introduction to Solving by Graphing)

Standards: 8.EE.8
8.EE.8a
8.EE.8b

Objective: To introduce students to solving pairs of simultaneous equations by graphing.

Vocabulary: *system of equations, solution of a system of equation*

Materials: Graph paper and rulers

Work Period: Saving Goal Activity

Allow students to work independently, in pairs, or in groups. Teacher allots students 45 minutes to work and prepare for presentations on the following activity:

Suppose you have $150 in your bank account. You are beginning a part-time summer job and want to deposit $32 each week. Assuming that you do not make any withdrawals:

a) What will be you account balance after 4 weeks?
b) Write an expression that shows the account balance after ***w*** weeks.
c) If your account balance is $374, how many weeks have you worked? Explain how you determined your answer.
d) Write an equation that relates the number of weeks worked, ***w***, and the account balance, ***b***.
e) Your best friend works with you over the summer. He has an account balance of $185 and deposits the same amount each week. He claims that you will both have the same account balance sometime during summer. Is his claim correct? Justify using your work.
f) Your sister also works part-time during the summer. She started working at the same time with an account balance of $214 and deposits $24 each week. How many weeks will you and your sister have to work to have the same balance in each account? How do you

Misconceptions: Teachers may want to address the following while facilitating students working on the task:

- Confusing independent and dependent variables (when graphing or writing expressions/equations)
- Incorrectly evaluating when solving algebraically
- Incorrectly reading the graph (mixing axis)

Presentations: Gallery Walk

Allow students to walk around the room and observe the various methods/strategies used to solve the problem. Teacher provides the students with sticky notes for students to ask work-related questions or comment on another student's/group's work. The comments and questions are addressed through a whole group discussion after the gallery walk.

Closing: In your own words, describe a system of equations and its solution. Give an example and prove your example is appropriate by determining the solution.

Lesson 5 Guidance

(Introduction to various types of solutions)

Standards: 8.EE.8
8.EE.8a
8.EE.8b

Objective: To have students investigate different types of solutions for pairs of simultaneous equations by using a graphing calculator.

V**ocabulary**: system of equations, solution of a system of equation, infinite solutions, no solution

Materials: Graphing calculators

Work Period: Graphing Calculator Activity

Allow students to work independently, in pairs, or in groups. Teacher gives the following activity to students and allots them 45 minutes to work and prepare for presentations:

Provide students with two systems of equations:

- One with no solution
  Parallel Lines (same slope and different *y*-intercept)
- One with infinite number of solutions
  Overlapping lines (same slope and *y*-intercept but one equation is given in slope-intercept form and the other in standard form)

Have students use graphing calculators to solve each system and have them answer the following questions:

- What would be a solution for each of the systems solved using a graphing calculator?
- What characteristics would you associate with the solution? What may have caused that type of solution?

<u>Misconceptions</u>: Teachers may want to address the following while facilitating students working on the task:

- Adjusting the scales for the window
- Not using the negative symbol and using the minus sign instead when putting in equations
- Solving for *y* (isolating *y*)
- Not noticing similarities and differences for the solution types:
  - No solution
  - Infinitely many

Mini-Lesson: Three Types of Solutions

1. Have students identify characteristics associated with systems having each of the different types of solutions.

Closing: Create an example of a system of equations with no solutions or an infinite number of solutions. Explain how you know your answer is correct.

Lesson 7 Guidance

(Introduction to Solving by Substitution)

Standards: 8.EE.7
8.EE.8
8.EE.8a
8.EE.8b

Objective: To introduce students to solving systems of equations algebraically by using substitution.

Vocabulary: *system of equations, solution of a system of equation*

Materials: Graph paper and rulers

Work Period: Downloading Music Activity

Allow students to work independently, in pairs, or in groups. Teacher gives the following activity to students and allots them 45 minutes to work and prepare for presentations:

Suppose during one month you download unlimited songs for $2 and music videos for $5 each. Your best friend pays $3 for each music video and $10 for unlimited son downloads.

a) Write a system of equation that relates the total you and your best friend paid individually if ***p*** represents the amount paid and ***v*** represents the number of music videos downloaded.
b) For how many music videos downloads will each of you end up paying the same amount?
c) How much would each of you pay for the same number of music video downloads?
d) Express this solution algebraically and interpret the meaning of the solution in the context of the problem.
e) Would you or your best friend pay less when downloading 12 music videos? Show your work algebraically and use the work to justify your answer.

<u>*Misconceptions*</u>: Teachers may want to address the following while facilitating students working on the task:

- Confusing independent and dependent variables (when writing equations)
- Mixing up amounts when writing equations
- Incorrectly evaluating when solving algebraically for given number of downloads

Presentations: Gallery Walk

Allow students to walk around the room and observe the various methods/strategies used to solve the problem. Teacher provides the students with sticky notes for students to ask work-related questions or comment on another student's/group's work. The comments and questions are addressed through a whole-group discussion after the gallery walk.

RESOURCES

- Graphing paper, rulers, scientific calculator, graphing paper, geometer's sketchpad
- Impact Mathematics – Course 3

Chapter	Content/Skills Addressed
Chapter 7.1 *Equations* ** Checking for readiness and supplemental resource*	Can be used to review solving equations (including multi-step equations, combining like terms, and using the distributive property) or check fluency

		when solving various types of equations in one variable.
	Chapter 7.3 *Systems of Equations*	In this lesson, students are introduced to pairs of simultaneous equations (only focus on linear pairs for whole-group instruction, other types of equations can be given to advanced learners) where each part shows students how to solve a pair using different methods: graphing, substitution, and elimination. This lesson also introduces linear equations in Standard Form and solving systems in a real world context.

Movie Tickets

Queens Theater had tickets on sale over the weekend. Children's tickets sold for $5 each and adult tickets sold for $8 each. The theater sold a total of 240 tickets for $1,614.

The equations below represent the total number of tickets sold and the total sales for both types movie tickets where ***c*** represents the number of children's tickets and ***a*** represents the number of adult tickets.

$$c + a = 240$$
$$5c + 8a = 1{,}614$$

Queens Theater's supervisor claimed that they made more profit from selling adult tickets that weekend.

a) Determine the number of children's tickets and the number of adult tickets sold that weekend. Verify that your solution is correct.
b) Was the supervisor's claim correct? Use your work to justify your answer.

Eighth Grade Common Core Standards for Mathematical Content:

8.EE.8 Analyze and solve pairs of simultaneous linear equations.

8.EE.8b Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing. Solve simple cases by inspection.

Eighth Grade Common Core Standards for Mathematical Practice:

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.6 Attend to precision.

Movie Tickets Rubric

Three Point Score

The response accomplishes the prompted purposes and effectively communicates the student's mathematical understanding. The student's strategy and execution meet the content (including concepts, technical representations and connections), thinking processes and qualitative demands of all parts of the task. **Minor omissions may exist, but do not detract from the correctness of the response.**

Either verbally or symbolically, the strategy used to solve each part of the problem is stated, as is the work used to evaluate the number of tickets bought, evaluate costs, solve equations, graph, and find partial answers to problems. Minor arithmetic errors may be present, but no errors of reasoning appear.

Mathematical Practices	**Evidence Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them.	Work includes representations of the problem indicating the student made sense of the problem, chose an appropriate strategy, and advanced towards a correct solution.
Reason abstractly and quantitatively. Students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with the tables, graphs, or equations.	Response indicates the student's ability to solve linear equations in one variable. The student solves linear equations with rational number coefficients. Analyzes and solves pairs of simultaneous linear equations. Understands that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously. Solves systems of two linear equations in two variables algebraically or graphing.
Construct viable arguments and critique the reasoning of others. Students demonstrate complete and accurate explanations.	
Model with Mathematics. Students demonstrate by representing the problem as tables, graphs, or equations.	a. Correctly solves algebraically for amount of tickets bought by adults and children using the substitution method or elimination method. If students choose to graph, the graphs are drawn correctly, at least one is labeled, and the solution is stated. Students must check the solution to verify that it is correct.
Attend to precision. Students include proper use of labeling of quantities, variables, and graphs.	b. Concludes that supervisor's assumption was correct with a clear and detailed explanation and must use the work to prove the answer.

Two Point Score

The response demonstrates adequate evidence of the learning and strategic tools necessary to complete the prompted purpose. It may contain overlooked issues, misleading assumptions, and/or errors in execution. Evidence in the response demonstrates that the student can revise the work to accomplish the task with the help of written feedback or dialogue.

Either verbally or symbolically, the strategy used to solve each part of the problem is stated, as is the work used to evaluate the number of tickets bought, evaluate costs, solve equations, graph, and find partial answers to problems. Minor arithmetic errors may be present. Reasoning may contain incomplete, ambiguous, or misrepresentative ideas.

Mathematical Practices	**Evidenced – Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them.	Work includes representations of the problem indicating the student made sense of the problem and advanced towards a correct solution, but indicates a struggle to interpret parts of the context correctly.
Reason abstractly and quantitatively. Students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with the tables, graphs, or equations.	Response indicates the student's ability to solve linear equations in one variable. The student solves linear equations with rational number coefficients. Analyzes and solves pairs of simultaneous linear equations. Understands that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously. Solves systems of two linear equations in two variables algebraically or graphing. *a. Algebraic:* Values are stated for *a* and *c* and appropriate work is shown. Incorrectly substituted for check. Or Appropriate algebraic work is shown, but two or more computational errors are made, though appropriate values are found for *a* and *c*. Incorrectly substituted for check. Or Appropriate algebraic work is shown, but one conceptual error is made. Incorrectly substituted for check. Or Values for *a* and *c* are stated, but a method other than an algebraic method is used.
Construct viable arguments and critique the reasoning of others. Students demonstrate complete and accurate explanations.	
Model with Mathematics. Students demonstrate by representing the problem as tables, graphs, or equations.	
Attend to precision. Students include proper use of labeling of quantities, variables, and graphs.	

	Incorrectly substituted for check. *Graphing:* Appropriate work is shown, but one computational, graphing, or labeling error is made. Evaluates equation incorrectly for check. Or Correct graphs are drawn, and at least one is labeled, but the solution is not stated or is stated incorrectly. Evaluates equation incorrectly for check. b. Concludes that supervisor's assumption was correct but explanation was not clear and detailed. Possibly used their work to prove their answer. or Concludes that supervisor's assumption was correct with clear and detailed explanation but did not use work to justify their explanation.

One Point Score

The response demonstrates some evidence of mathematical knowledge that is appropriate for the intent of the prompted purpose. An effort was made to accomplish the task, but with little success. Evidence in the response demonstrates that, with instruction, the student can revise the work to accomplish the task.

Some evidence of reasoning is demonstrated either verbally or symbolically, but may include misleading assumptions, and/or contain errors in execution. Some work is used to evaluate the number of tickets bought, evaluate costs, to solve equations, graph, and find partial answers to problems. Minor arithmetic errors may be present. Reasoning may contain incomplete, ambiguous, or misrepresentative ideas.

Mathematical Practices	**Evidence–Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them.	Work is missing representations of the problem or understanding of the constraints of

Reason abstractly and quantitatively. Students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with the tables, graphs, or equations. **Construct viable arguments and critique the reasoning of others.** *Students* demonstrate complete and accurate explanations. **Model with Mathematics.** Students demonstrate by representing the problem as tables, graphs, or equations. ********** ********** **Attend to precision.** Students include proper use of labeling of quantities, variables and graphs.	the problem given in the context. Response indicates the student's ability to solve linear equations in one variable. The student solves linear equations with rational number coefficients. Analyzes and solves pairs of simultaneous linear equations. Understands that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously. Solves systems of two linear equations in two variables algebraically or graphing. a. *Algebraic:* Incomplete algebraic work is shown, but one or more conceptual errors and at least two computational errors are made. Does not check solution. Or *a* and *c* are stated, but a method other than an algebraic method is used. Does not check solution. Or *a* and *c* is stated, but no work is shown. Does not check solution. *Graphing:* Appropriate work is shown, but two or more computational, graphing, or labeling errors are made. Does not evaluate the equation for check. Or Appropriate work is shown, but one or more conceptual error is made. Does not evaluate equation for check. Or One equation is graphed and labeled correctly, but no further correct work is shown. Does not evaluate equation for check. Fails to reason/prove why the supervisor's assumption is correct or not. Possibly doesn't state if the supervisor is correct or states an incorrect answer.

Formative Assessment

Job Advertisements

When looking through the classified section of your Sunday paper, you came across two job postings of interest to you:

Sales Person Needed	**Knowledgeable in Computers?**
Foot Warehouse	***Computers for You***
Pay rate: $160 per week and 25% commission	Pay rate: 15% commission + $220 weekly

a) Write a system of equations that expresses each posting as an equation that relates the money earned, ***e***, and the sales made, ***s***.
b) Solve the system by graphing. How much would you need to sell at either job to earn the same amount in one week?
c) At which job you would earn more if you estimate your sales to be $500? Use your graph results to justify your answer.

Eighth Grade Common Core Standards for Mathematical Content:

8.EE.8 Analyze and solve pairs of simultaneous linear equations.

8.EE.8a Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

8.EE.8b Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing. Solve simple cases by inspection.

Eighth Grade Common Core Standards for Mathematical Practice:

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

Job Advertisements Rubric

Three Point Score

The response accomplishes the prompted purposes and effectively communicates the student's mathematical understanding. The student's strategy and execution meet the content (including concepts, technical representations, and connections), thinking processes, and qualitative demands of all parts of the task. **Minor omissions may exist, but do not detract from the correctness of the response.**

Mathematical Practices	**Evidence Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them.	Work includes representations of the problem indicating the student made sense of the problem, chose an appropriate strategy, and advanced towards a correct solution.
Reason abstractly and quantitatively. Abstracts numbers from both job postings: represents the problem algebraically, solves the problem, and correctly notes the meaning of the results in context of the problem.	Response indicates the student analyzes and solves pairs of simultaneous linear equations. The student understands that solutions to a system of two linear equations in two variables correspond to points of intersection on their graphs, because points of intersection satisfy both equations simultaneously. Solves systems of two linear equations in two variables algebraically, and estimates solutions by graphing the equations.
Construct viable arguments and critique the reasoning of others. Justifies the answer to part c and supports the response by referencing work.	a. Expresses each job posting correctly using the variables provided.
Model with Mathematics. Correctly uses the information from both job postings to write a system of equations. Graphs both equations to determine the earnings for either job when selling the same amount in one week. Identifies solution to be where the lines intersect and expresses it as an ordered pair (or states x = __, y = __)	b. Solves the system by graphing. Uses independent and dependent variables correctly for set up and use an appropriate scale. Uses graph results to correctly determine the shared earnings for the shared sales made in a given week. Analyzes the graph, determines a correct solution, and writes the solution as an ordered pair (600, 310) or states the value of each variable.
Attend to precision. Correctly sets up graph. Correctly uses the slope and y-intercept to graph each line. Accurately labels work and graph with an appropriate scale, and uses correct math	c. Uses the graph to determine which job is best when estimating sales of $500. Concludes that Computers for You would be best and references slope or steepness of line.

terminology. **Use appropriate tools strategically**. A graph paper is used for part b to determine shared earnings for both jobs when making sales amount. The graph is used to justify which job would benefit working for when making sales of $500 in one week.	

Two Point Score

The response accomplishes the prompted purposes and effectively communicates the student's mathematical understanding. The student's strategy and execution meet the content (including concepts, technical representations, and connections), thinking processes, and qualitative demands of all parts of the task. **Some of the necessary connections between the context and representation may be flawed.**

Mathematical Practices	Evidence Based Traits: Mathematical Content
Make sense of problems and persevere in solving them. **Reason abstractly and quantitatively.** Abstracts numbers both job postings: represents the problem algebraically, solves the problem, and correctly notes the meaning of the results in context of the problem. **Construct viable arguments and critique the reasoning of others.** Justifies the answer to part c and supports the response by referencing. **Model with Mathematics.** Correctly uses the information from both job postings to write a system of equations. Graphs both equations to determine the	Work includes representations of the problem indicating the student made sense of the problem and advanced towards a correct solution, but indicates a struggle to interpret parts of the context correctly. Response indicates the student analyzes and solves pairs of simultaneous linear equations. The student understands that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously. Solves systems of two linear equations in two variables algebraically, and estimates solutions by graphing the equations. a. Possibly writes inequality. **OR** Possibly mixes independent and dependent variable in the equations. **OR** Possibly confuses the constant and coefficient in the equations. **OR** Possibly writes percent of sales incorrectly (e.g., not in decimal form).

earnings for either job when selling the same amount in one week. Identifies solution to be where the lines intersect and expresses it as an ordered pair (or states x = __, y = __) **Attend to precision.** Correctly sets up graph. Correctly uses the slope and y-intercept to graph each line. Accurately labels work and graph with an appropriate scale, and uses correct math terminology. **Use appropriate tools strategically**. A graph paper is used for part b to determine shared earnings for both jobs when making sales amount. The graph is used to justify which job would benefit working for when making sales of $500 in one week.	b. Possibly starts graphing each line at the origin and not the y-intercept. **OR** Possibly doesn't identify the solution as the intersection (or an ordered pair or shared x and y values). **OR** Possibly doesn't set up the graph using the independent variable on the x-axis and the dependent variable on the y-axis. **OR** Failure to label graph and/or scale is not reasonable. **OR** Uses slope and y-intercept incorrectly when graphing. c. Possibly evaluates to justify which job is better. **OR** Possibly states the answer but fails to reason using the graph.

One Point Score

The response accomplishes some of the prompted purposes and effectively communicates the student's mathematical understanding. The student's strategy and execution meet only a few of the content demands of the task. The necessary connections between the context and the representations may be flawed.

Mathematical Practices	**Evidence Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them. **Reason abstractly and quantitatively.** Student abstracts numbers from both job postings: represents the problem algebraically, solves the problem, and correctly notes the meaning of the results in context of the problem. **Construct viable arguments and critique the reasoning of others.** Justifies the answer to part c and supports the	Work is missing representations of the problem or understanding of the constraints of the problem given in the context. Response indicates the student analyzes and solves pairs of simultaneous linear equations. The student understands that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously. Solves systems of two linear equations in two variables algebraically, and estimates solutions by graphing the equations.

response by referencing. **Model with Mathematics.** Correctly uses the information from both job postings to write a system of equations. Graphs both equations to determine the earnings for either job when selling the same amount in one week. Identifies solution to be where both lines intersect and expresses it as an ordered pair (or states x = __, y = __) **Attend to precision.** Correctly sets up graph. Correctly uses the slope and y-intercept to graph each line. Accurately labels work and graph with an appropriate scale, and uses correct math terminology. **Use appropriate tools strategically**. A graph paper is used for part b to determine shared earnings for both jobs when making sales amount. The graph is used to justify which job would benefit working for when making a sales of $500 in one week.	a. Writes the equations incorrectly (two or more conceptual errors). b. Fails to solve Part II using a graph. **OR** Uses an algebraic method or a table. **OR** Possibly identifies a solution but some of the work shown may be correct. **OR** Possibly graphs for the lines are incorrect. **OR** Doesn't label work or use correct math terminology. c. Doesn't provide an answer or justification.

Video Game Console

The company Just for Kids released two versions of a new video game console. The basic console sells for $249.99 and the limited edition sells for $329.99. The company claimed that stores sold more of the limited edition version during the release month.

A local store reported selling a total of 45 consoles giving a total sales of $12,849.55.

a) Write a system of equations in Standard Form that represents the number of consoles sold and the total sales made. Use ***b*** for the number of basic consoles and ***l*** the number of limited edition consoles.
b) Solve the system algebraically. How many of each type of console was sold at the local store.
c) Just for Kids reported to the press "When considering the sales from a local store, the limited edition console was very successful". Justify why this is a true statement.

Eighth Grade Common Core Standards for Mathematical Content:

8.EE.8 Analyze and solve pairs of simultaneous linear equations.

8.EE.8b Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing. Solve simple cases by inspection.

Eighth Grade Common Core Standards for Mathematical Practice:

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.6 Attend to precision.

Video Game Console Rubric

Three Point Score

The response accomplishes the prompted purposes and effectively communicates the student's mathematical understanding. The student's strategy and execution meet the content (including concepts, technical representations, and connections), thinking processes, and qualitative demands of all parts of the task. **Minor omissions may exist, but do not detract from the correctness of the response.**

Mathematical Practices	**Evidence Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them. **Reason abstractly and quantitatively.** Abstracts numbers for the total profit made and the total number of consoles sold: represents the problem algebraically, solves the problem, and correctly notes the meaning of the results in context of the problem. **Construct viable arguments and critique the reasoning of others.** Justifies the answer to part c and supports the response by referencing work. **Model with Mathematics.** Correctly uses the information from the situation to write a system of equations in Standard Form. Uses elimination to solve for the number of consoles sold for each type (basic and limited edition). States x = __, y = __ for the solution. Converts equations to slope-intercept form to solve using substitution and identifies the solution as an ordered pair (identifying each variable as an independent or dependent variable). **Attend to precision.** Correctly combines like terms, and applies inverse operations to solve for number of each	Work includes representations of the problem indicating the student made sense of the problem, chose an appropriate strategy, and advanced towards a correct solution. Response indicates the student's ability to analyze and solve pairs of simultaneous linear equations. The student solves systems of two linear equations in two variables algebraically, and estimates solutions by graphing the equations. a. Expresses the total profit and total number of consoles sold as equations in Standard Form. b. Solves algebraically using elimination. Correctly combines like terms and uses inverse operations to solve for the number of consoles sold of each type. Writes the solution correctly stating each as an equation x = __, y = __. **OR** Possibly converts equations to slope-intercept form to solve using substitution and identifies the solution as an ordered pair. c. Uses substitution to justify why the statement is correct. Concludes that more profit was made from selling the limited edition even though fewer consoles were sold.

type of console sold. Accurately labels work and uses correct math terminology.	

Two Point Score

The response accomplishes the prompted purposes and effectively communicates the student's mathematical understanding. The student's strategy and execution meet the content (including concepts, technical representations, and connections), thinking processes, and qualitative demands of all parts of the task. **Some of the necessary connections between the context and representation may be flawed.**

Mathematical Practices	**Evidence Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them. **Reason abstractly and quantitatively.** Abstracts numbers for the total profit made and the total number of consoles sold: represents the problem algebraically, solves the problem, and correctly notes the meaning of the results in context of the problem. **Construct viable arguments and critique the reasoning of others.** Justifies the answer to part c and supports the response by referencing work. **Model with Mathematics.** Correctly uses the information from the situation to write a system of equations in Standard Form. Uses elimination to solve for the number of consoles sold for each type (basic and limited edition). States x = __, y = __ for the solution. Converts equations to slope-intercept form to solve using substitution and identifies the solution as an ordered pair (identifying each variable as an independent or dependent variable).	Work includes representations of the problem indicating the student made sense of the problem and advanced towards a correct solution, but indicates a struggle to interpret parts of the context correctly. Response indicates the student's ability to analyze and solve pairs of simultaneous linear equations. The student solves systems of two linear equations in two variables algebraically, and estimates solutions by graphing the equations. a. Possibly writes inequality. **OR** Possibly writes one equation completely correctly. **OR** Possibly confuses profit with amount of each sold. b. Possibly doesn't identify the solution as shared values or as an ordered pair. **OR** Possibly combines like terms incorrectly. **OR** Algebraic work shows computational errors. **OR** Possibly uses a graph. c. Possibly states the answer but fails to reason using work (evaluating). **OR** Possibly fails to identify why the statement is true and claims false reasoning with work.

Attend to precision. Correctly combines like terms, and applies inverse operations to solve for number of each type of console sold. Accurately labels work and uses correct math terminology.	

One Point Score

The response accomplishes some of the prompted purposes and effectively communicates the student's mathematical understanding. The student's strategy and execution meet only a few of the content demands of the task. The necessary connections between the context and the representations may be flawed.

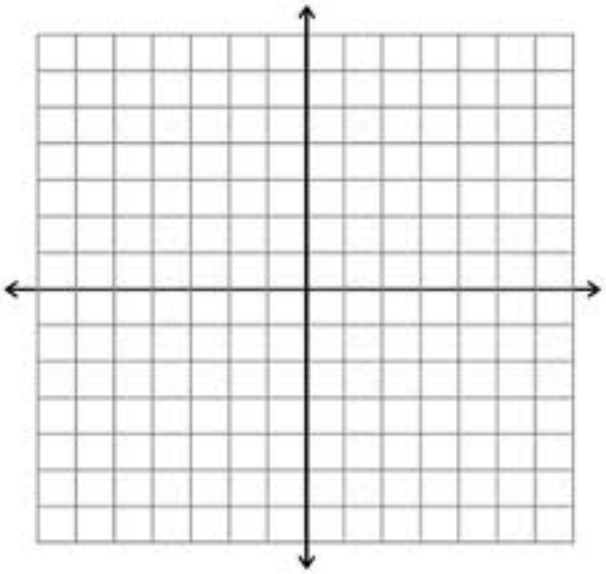
Mathematical Practices	**Evidence Based Traits: Mathematical Content**
Make sense of problems and persevere in solving them.	Work is missing representations of the problem or understanding of the constraints of the problem given in the context.
Reason abstractly and quantitatively. Abstracts numbers for the total profit made and the total number of consoles sold: represents the problem algebraically, solves the problem, and correctly notes the meaning of the results in context of the problem.	Response indicates the student's ability to analyze and solve pairs of simultaneous linear equations. The student solves systems of two linear equations in two variables algebraically, and estimates solutions by graphing the equations.
Construct viable arguments and critique the reasoning of others. Justifies the answer to part c and supports the response by referencing work.	a. Writes equation incorrectly (two or more conceptual errors). b. Incorrectly solves Part II using elimination or substitution (if converted). **OR** Uses evaluation or a table. **OR** Several computational and/or conceptual errors show in the algebraic work. **OR** Possibly graphs lines and work is incorrect. c. Fails to reason why the statement is true.
Model with Mathematics. Correctly uses the information from the situation to write a system of equations in Standard Form. Uses elimination to solve for the number of consoles sold for each type (basic and limited edition). States x = __, y = __ for the solution. Converts equations to slope-intercept form to solve using substitution and identifies the solution as an ordered pair (identifying each variable as an independent or dependent variable).	

Attend to precision. Correctly combines like terms, and applies inverse operations to solve for number of each type of console sold. Accurately labels work and uses correct math terminology.	

Mid-Assessment

1. Solve the following by graphing:

$$y = 3x + 2$$
$$y = 3x - 2$$



Solution: _____

2. Is (-2, -7) a solution to the following system? Justify your answer.

$$7y - 4x = 29$$
$$x = y - 5$$

_____
_____
_____

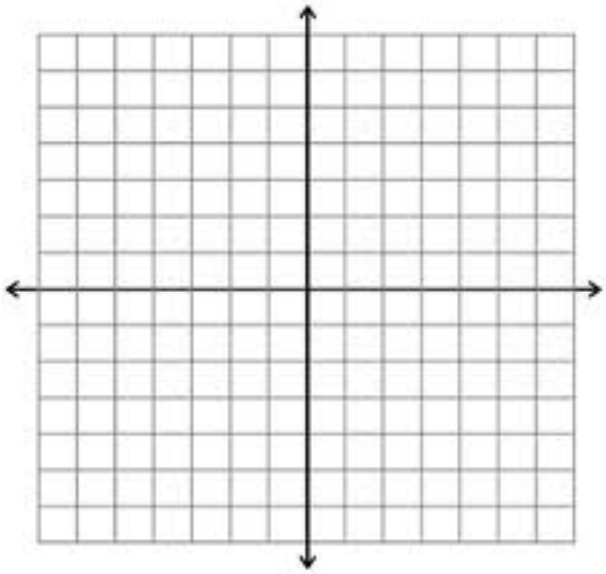
3. Tell whether the following system has no solution, one solution, or infinitely many solutions and explain your reasoning.

$$y = 3x - 4$$
$$-12x + 4y = 16$$

_____
_____
_____

4. Solve the following by graphing:

$$3x + 4y = 12$$
$$y = -\frac{3}{4}x + 3$$



Solution: _____

Describe a situation that could be represented using the system of equations above. Explain what the solution you determined above would represent in the context of your situation.

_____
_____
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_____
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_____
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_____

5. For what values of *w* and *v* does the following system have no solution? Infinitely many solutions? How did you determine your answer?

$$y = -5x + w$$
$$y = -5x + v$$

_____
_____
_____