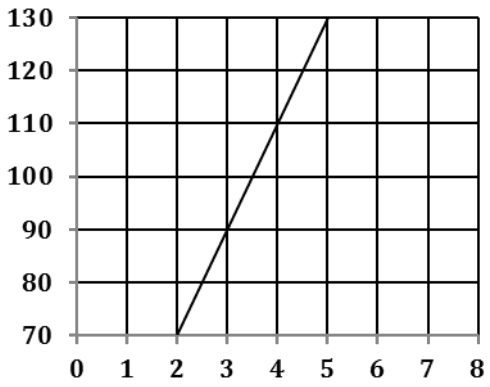
GRADE 8 MATH: EXPRESSIONS & EQUATIONS BENCHMARK PAPERS WITH RUBRICS

This section contains benchmark papers that include student work samples for each of the four tasks in the Expressions & Equations assessment. Each paper has descriptions of the traits and reasoning for the given score point, including references to the Mathematical Practices.

1. Does the graph below represent a proportional relationship? Use mathematical reasoning to justify your response.



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3 Points

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

Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them, and (2) Reason abstractly and quantitatively, since students need to abstract information from the graph, create a mathematical representation of the problem numerically or graphically, and consider whether the relationship is proportional. Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by representing the problem with tables, ratios and/or equations. Evidence of the Mathematical Practice, (6) Attend to precision, can include use of rise/run to extend the line and proper use of ratios. Evidence of the Mathematical Practice, (7) Look for and make use of structure, can include use of intentional techniques (rise/run) to extend the line and/or recognition that the equation of a proportional relationship is linear, with intercept equal to 0.

Either verbally or symbolically, the strategy used to solve the problem is stated, as is the work used to find ratios, intercept, or equation. Minor arithmetic errors may be present, but no errors of reasoning appear.

Justification may include reasoning as follows:

a. Values from the clearly readable points on the graph are used to form ratios; the fact that the ratios are not equivalent is used to justify that the relationship is not proportional.

Readable Points				
x	2	3	4	5
y	70	90	110	130

b. The graph is carefully extended to the y-intercept, possibly using rise/run. The fact that the graph does not pass through (0, 0) is used to justify that the relationship is not proportional.

c. Techniques are used to determine the equation of the line, y = 20x + 30. The fact that the y-intercept is not 0 or the graph does not pass through (0, 0) is used to justify that the relationship is not proportional.

No, because they are not in proportion

$\frac{3}{90} \neq \frac{4}{110}$

$\frac{4}{110} \neq \frac{5}{130}$

$\frac{3}{90} \neq \frac{5}{130}$

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2 Points

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 the problem is stated, as is the work used to find ratios, intercept, or equation. Reasoning may contain incomplete, ambiguous or misrepresentative ideas. Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them, and (2) Reason abstractly and quantitatively (since students need to abstract information from the graph, create a mathematical representation of the problem numerically or graphically, and consider whether the relationship is proportional.) Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by representing the problem with tables, ratios and/or equations. Evidence of the Mathematical Practice, (6) Attend to precision, can include use of rise/run to extend the line and proper use of ratios. Evidence of the Mathematical Practice, (7) Look for and make use of structure, can include use of intentional techniques (rise/run) to extend the line and/or recognition that the equation of a proportional relationship is linear, with intercept equal to 0.

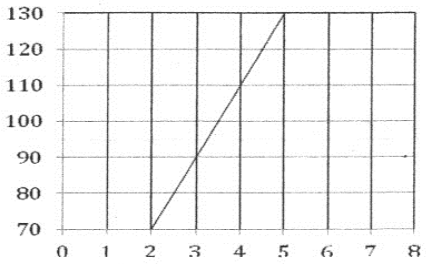
Justification may include reasoning as follows:

a. Values from the clearly readable points on the graph are used to form ratios; however, it is not clear that the student is attempting to show the ratios are not equivalent.

Readable Points				
x	2	3	4	5
y	70	90	110	130

b. The graph is extended to the y-intercept, possibly using rise/run, to determine whether or not the graph passes through (0, 0), but errors in extension make the graph appear to pass through (0, 0).

c. Techniques are incorrectly used to determine the equation of the line, but the value of the resulting y-intercept is then correctly used to justify that the relationship is or is not proportional.



$\frac{2}{70} \rightarrow \frac{3}{90}$

210 180

No because if you take any two coordinates they are not equal

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1 Point

The response demonstrates some evidence of mathematical knowledge that is appropriate to 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, is often based on misleading assumptions, and/or contains errors in execution. Some work is used to find ratios, intercept, or equation or partial answers to portions of the task are evident.

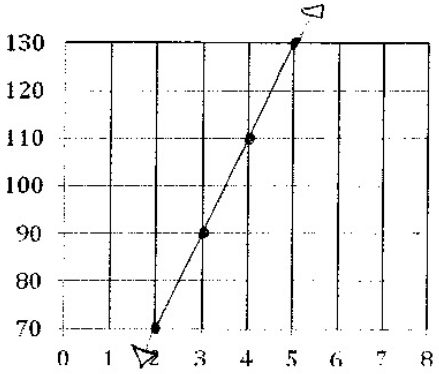
Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them, and (2) Reason abstractly and quantitatively, since students need to abstract information from the graph, create a mathematical representation of the problem numerically or graphically, and consider whether the relationship is proportional. Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by representing the problem with tables, ratios and/or equations. Evidence of the Mathematical Practice, (6) Attend to precision, can include use of rise/run to extend the line and proper use of ratios. Evidence of the Mathematical Practice, (7) Look for and make use of structure, can include use of intentional techniques (rise/run) to extend the line and/or recognition that the equation of a proportional relationship is linear, with intercept equal to 0.

The reasoning used to solve the problem may include:

a. The fact that the graph is a line automatically indicates proportionality.

b. Some attempt to use slope is made, but fails to clearly explain how the slope can help determine proportionality.

c. Some attempt to find the equation of the line is made, but not used to justify or refute proportionality in any way.



(2, 70)
(3, 90)
(4, 110)
(5, 130)

This graph represents a proportional relationship because the x value increases by 1, while the y value increases by 20.

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2. Kanye West expects to sell 350,000 albums in one week.

   a. How many albums will he have to sell every day in order to meet that expectation?

   b. Kanye West has a personal goal of selling 5 million albums. If he continues to sell albums at the same rate, how long will it take him to achieve that goal? Explain your reasoning in words.

   c. The equation $y = 40{,}000x$, where x is the number of days and y is the number of albums sold, describes the number of albums another singer expects to sell. Does this singer expect to sell more or fewer albums than West? Use mathematical reasoning to justify your response.

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3 Points

The response accomplishes the prompted purpose and effectively communicates the student's mathematical understanding. The student's strategy and execution meet the content (including concepts, technique, representations, and connections), thinking processes, and qualitative demands 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 the problem is stated, as is the work used to find ratios, unit rates, and partial answers to problems. Minor arithmetic errors may be present, but no errors of reasoning appear. Complete explanations are stated based on work shown.

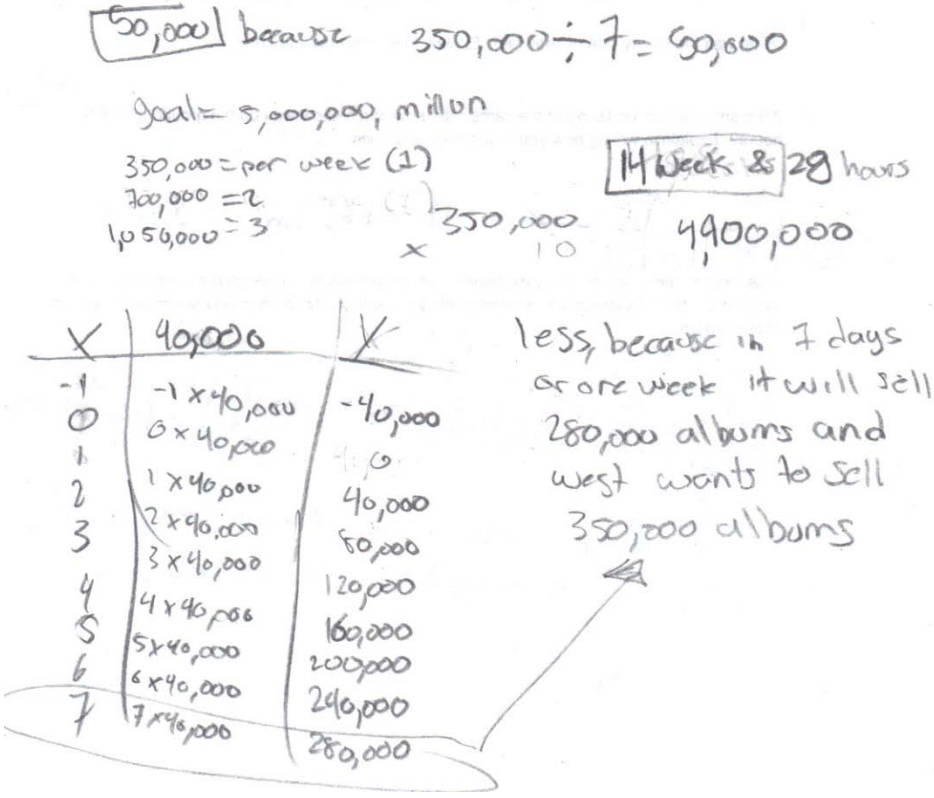
Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them and (2) Reason abstractly and quantitatively, since students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with the ratio that names the probability). Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by representing the problem as a ratio, decimal or percent in each portion of the task. Evidence of the Mathematical Practice, (6) Attend to precision, can include proper use of ratio notation and proper labeling of quantities.

The reasoning used to justify part b may include:

a. Scaling up from 50,000 to 5 million, after forming the ratio of 5 million : 50,000 or by using a table; possibly dividing the 50,000 albums per day unit rate into 5 million,
b. Forming and solving the proportion 50000/1 = 5,000,000/x, or 350,000/7 = 5,000,000/x where x = number of days, possibly by scaling up or solving in the traditional manner.

The reasoning used to justify part c may include:

a. Evaluating the second singer's number of albums sold per day as 40,000 and comparing that to Kanye West's 50,000.
b. Evaluating the second singer's number of albums sold in a given number of days and correctly comparing that to the number sold by Kanye West in the same number of days.
c. Finding the equation where y is the number of albums sold in x days for Kanye West (y = 50,000x) and correctly comparing by using the slopes of the equations as unit rates.



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2 Points

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 the problem is stated, as is the work used to find ratios, unit rates, or partial answers to problems. Partial explanations are stated, based on work shown.

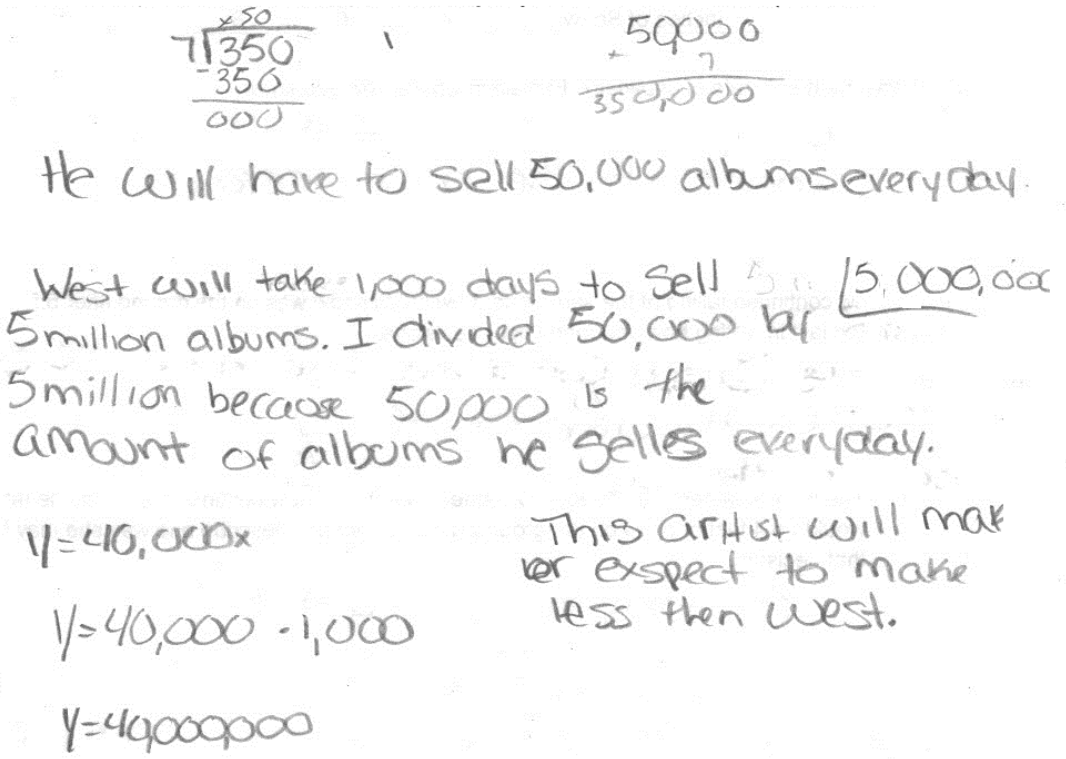
Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them, and (2) Reason abstractly and quantitatively, since students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with the ratio that names the probability. Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by representing the problem as a ratio, decimal or percent in each portion of the task. Evidence of the Mathematical Practice, (6) Attend to precision, can include proper use of ratio notation and proper labeling of quantities.

The reasoning used to justify part b may include:

a. Attempting to scale up from 50,000 to 5 million, possibly by using a table, but failing to reach or stop at 5 million. Scaling up from 350,000 to 5 million, but failing to recognize that the result must be multiplied by the 7 days in the week.
b. Forming and attempting to solve the proportion 50000/1 = 5,000,000/x, or 350,000/7 = 5,000,000/x where x = number of days, but using inappropriate processes to solve the proportion OR forming and correctly solving a proportion with an incorrect unit rate from part a.

The reasoning used to justify part c may include:

a. Incorrectly evaluating the second singer's number of albums sold per day, then correctly comparing that number to Kanye West's 50,000.
b. Evaluating the second singer's number of albums sold in a given number of days and incorrectly comparing that to the number sold by Kanye West in the same number of days.



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1 Point

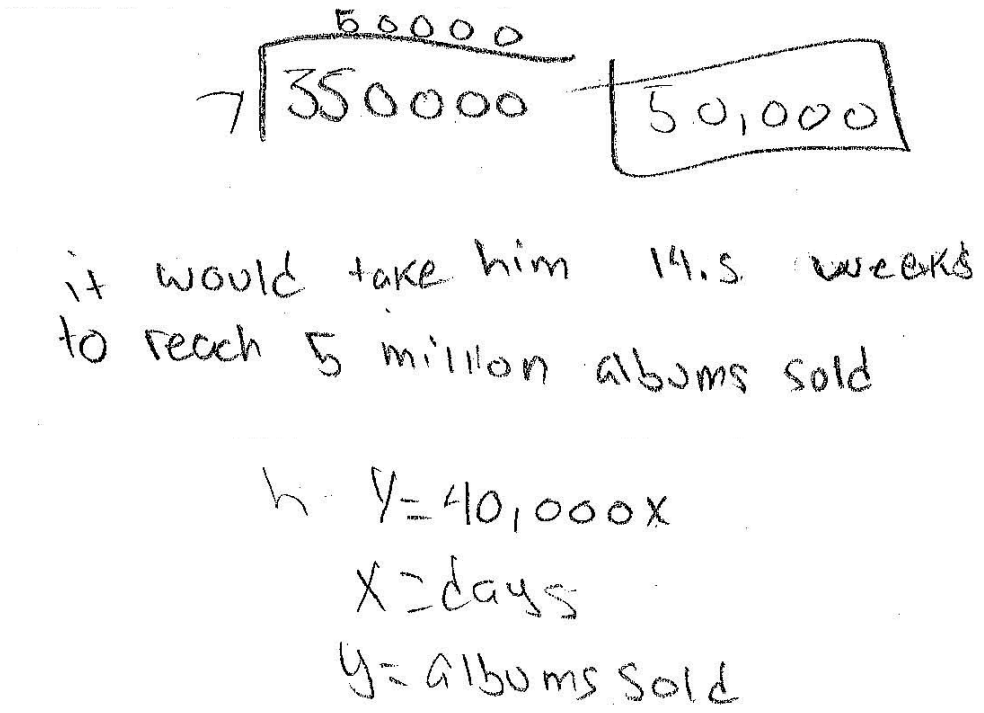
The response demonstrates some evidence of mathematical knowledge that is appropriate to the intent of the prompted purpose. An effort was made to accomplish the task, but with little success. Evidence in the response demonstrates that, with instruction, the student can revise the work to accomplish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

Some evidence of reasoning is demonstrated either verbally or symbolically, but may be based on misleading assumptions, and/or contain errors in execution. Some work is used to find ratios, or unit rates; or partial answers to portions of the task are evident. Explanations are incorrect, incomplete or not based on work shown.

Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them and (2) Reason abstractly and quantitatively, since students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with the ratio that names the probability. Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by representing the problem as a ratio, decimal, or percent in each portion of the task. Evidence of the Mathematical Practice, (6) Attend to precision, can include proper use of ratio notation and proper labeling of quantities.

The reasoning used to solve the parts of the problem may include:

a. Some attempt to scale.
b. Some attempt to form a proportion.
c. Failure to attempt at least two parts of the problem or failure to attempt some kind of explanation in parts b and c.



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3. Marvin likes to run from his home to the recording studio. He uses his iPod to track the time and distance he travels during his run. The table below shows the data he recorded during yesterday's run.

Time (Minutes)	Distance (KM)
5	0.833
10	1.660
15	2.545
20	3.332
25	4.003
30	5.012
35	5.831

a) Write an algebraic equation to model the data Marvin collected. Explain, in words, the reasoning you used to choose your equation.

b) Does the data represent a proportional relationship? Explain your reasoning in words.

c) If Marvin continues running at the pace indicated in your equation, how long will it take him to reach the recording studio, which is 12 km from his home? Use mathematical reasoning to justify your response.

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3 Points

The response accomplishes the prompted purpose and effectively communicates the student's mathematical understanding. The student's strategy and execution meet the content (including concepts, technique, representations, and connections), thinking processes, and qualitative demands 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 find ratios, slope, equation, and partial answers to problems. Minor arithmetic errors may be present, but no errors of reasoning appear. While responses to the prompt, "Explain your reasoning in words", must include words and sentences containing a line of reasoning appropriate to the problem, responses to the prompt, "Use mathematical reasoning to justify your response", must include appropriate mathematical symbolism and/or words.

Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them, and (2) Reason abstractly and quantitatively, since students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with slope and intercept. Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by the linear equation shown in part a. Evidence of the Mathematical Practice, (5) Use appropriate tools strategically, may be demonstrated by use of the graphing calculator to "see" the data graphically, draw a sketch of the graph, and use it to solve part a. Evidence of the Mathematical Practice, (6) Attend to precision, can include proper use of rate, proper symbolism, and proper labeling of quantities and graphs. Evidence of the Mathematical Practice, (7) Look for and make use of structure, may be demonstrated identifying the relationship as proportional because it follows the general d = rt pattern.

The response contains correct explanations for all parts, as required.

The reasoning used to solve part a may include:

a. A graph of the data (or a sketch from data displayed on a graphing calculator); drawing a single line through the data on the graph that attempts to account for as much of the data as possible. Likely lines include: one such that some points appear above, some below and some directly on the line; OR one that passes through the left- and right-most points on the graph, etc.
b. Using the line drawn through the points, forming similar triangles, drawing steps through points on the line, or correctly forming the ratio of the difference between two y-values on the line to the difference between two x-values on the line, etc., to find the slope of the line drawn.
c. If their line passes through (0, 0), acknowledging (0, 0) as the initial value and choosing the 0 to be the y-intercept, OR using the y-value of the point where their line intercepts the y-axis as their y-intercept.
d. Using the values determined above to form a linear equation of the form y = mx + b (or some equivalent model, e.g. in point-slope form).
e. Possibly determining 5.831/35 = 0.1666… ≈ 0.17 as the slope, since it represents the average speed, and choosing 0 as the y-intercept, especially if accompanied by an explanation that the relationship is a proportional one, d = rt, where d = distance in km, r = rate in km/min. and t = time in minutes.

The reasoning used to solve part b may include:

a. Identifying the relationship as proportional because their choice of line appears to pass through (0, 0) indicating that the relationship is the proportional one, d = rt, where d = distance in km, r = rate in km/min. and t = time in minutes, or noting that each y-value is 0.17 times the x-value.
b. Identifying the relationship as non-proportional because their choice of line does NOT pass through (0, 0).

The reasoning used to solve part c may include:

a. Solving their equation for y = 12, e.g., 0.17x = 12.
b. Extending the table or graph to 60 minutes, using the slope chosen for part a.

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2 Points

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 the problem is stated, as is the work used to find slope, intercept, equation, and prediction in part c. Reasoning may contain incomplete, ambiguous, or misrepresentative ideas. Partial explanations are stated, based on work shown.

Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them, and (2) Reason abstractly and quantitatively, since students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with slope and intercept. Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by the linear equation shown in part a. Evidence of the Mathematical Practice, (5) Use appropriate tools strategically, may be demonstrated by use of the graphing calculator to "see" the data graphically, draw a sketch of the graph, and use it to solve part a. Evidence of the Mathematical Practice, (6) Attend to precision, can include proper use of rate, proper symbolism, and proper labeling of quantities and graphs. Evidence of the Mathematical Practice, (7) Look for and make use of structure, may be demonstrated identifying the relationship as proportional because it follows the general d = rt pattern.

The response contains correct explanations for most parts, as required, OR correct calculations to all parts with few or no explanations.

The reasoning used to solve part a of the problem may include:

a. Drawing a single line through the data on the graph that attempts to account for as much of the data as possible, determining the slope, but failing to choose appropriate scale on the x-axis, possibly using {1, 2, 3, 4, 5, etc.} instead of {5, 10, 15, 20, 25, etc.}

OR

b. Drawing an arbitrary single line through the data; then, using the line drawn through the points, forming similar triangles, drawing steps through points on the line, or correctly forming the ratio of the difference between two y-values on the line to the difference between two x-values on the line, etc., to find the slope of the line drawn.

OR

c. Determining the slope logically, but choosing the y-intercept arbitrarily.

OR

d. Possibly determining $5.831/7 \approx 0.83$ as the slope, accounting for 7 intervals, but not the 35 minutes, and choosing 0 as the y-intercept, especially if accompanied by an explanation that the relationship is a proportional one, d = rt, where d = distance in km, r = rate in km/min. and t = time in minutes.

The reasoning used to solve part b may include:

a. Graphing a line passing through (0, 0) and identifying the relationship as proportional but providing no rationale as to why.
b. Graphing a line NOT passing through (0, 0) and identifying the relationship as non-proportional but providing no rationale as to why.

The reasoning used to solve part c may include failing to acknowledge the problem's prompt, "…at pace indicated in your equation," and:

a. Attempting to solve their equation for y = 12, e.g., 0.17x = 12, but not being able to handle the decimal coefficient properly.
b. Unsuccessfully attempting to extend the table or graph to 60 minutes, using the slope chosen for part a.
c. Doubling, e.g., the 30-minute value, 5.012 to 10.024, since the relationship is proportional (or some variation of this method).

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a) Write an algebraic equation to model the data Marvin collected. Explain, in words, the reasoning you used to choose your equation.

$0.166x = y$

b) Does the data represent a proportional relationship? Explain your reasoning in words.

you represent a proportional relationship because you multiply 0.166 to the minutes

c) If Marvin continues running at the pace indicated in your equation, how long will it take him to reach the recording studio, which is 12 km from his home? Use mathematical reasoning to justify your response.

72 minutes because ~~#~~ you divide 12 by 0.166 which gives 72

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1 Point

The response demonstrates some evidence of mathematical knowledge that is appropriate to 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, is often based on misleading assumptions, and/or contains errors in execution. Some work is used to find ratios and probability or partial answers to portions of the task are evident. Explanations are incorrect, incomplete, or not based on work shown. Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them and (2) Reason abstractly and quantitatively, since students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with slope and intercept. Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by the linear equation shown in part a. Evidence of the Mathematical Practice, (5) Use appropriate tools strategically, may be demonstrated by use of the graphing calculator to "see" the data graphically, draw a sketch of the graph, and use it to solve part a. Evidence of the Mathematical Practice, (6) Attend to precision, can include proper use of rate, proper symbolism, and proper labeling of quantities and graphs. Evidence of the Mathematical Practice, (7) Look for and make use of structure, may be demonstrated identifying the relationship as proportional because it follows the general d = rt pattern.

Responding correctly to only one part of the problem; for example, two responses are similar to those described below.

The reasoning used to solve the part a of the problem may include doing two or more of the following:

a. Drawing an arbitrary single line through the data, then, using the line drawn through the points, forming similar triangles, drawing steps through points on the line, or correctly forming the ratio of the difference between two y-values on the line to the difference between two x-values on the line, etc., to find the slope of the line drawn.
b. Choosing the y-intercept to be 0, regardless of whether or not their line passes through that point;
c. Using the values determined above to form a linear equation of the form y = mx + b (or some equivalent model, e.g. in point-slope form), but switching the m and b.

The reasoning used to solve part b of the problem may include:

a. Graphing a line passing through (0, 0) and identifying the relationship as non-proportional but providing no rationale as to why.
b. Graphing a line NOT passing through (0, 0) and identifying the relationship as proportional but providing no rationale as to why.

The reasoning used to solve part c of the problem may include:

a. Solving their equation for x = 12, instead of y = 12.
b. Extending the table or graph to 60 minutes by continually adding 0.819 (the difference between the last two y-values) or some other difference between y-values.

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a) Write an algebraic equation to model the data Marvin collected. Explain, in words, the reasoning you used to choose your equation.

0.833÷5 =0.1666
I chosse my equation so I can figure out whats = to 1 min

b) Does the data represent a proportional relationship? Explain your reasoning in words.

Yes because the numbers increases

c) If Marvin continues running at the pace indicated in your equation, how long will it take him to reach the recording studio, which is 12 km from his home? Use mathematical reasoning to justify your response.

1.9992 0.1666×12 = 1.9992
The time it would take would be 13 min

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4. Jumel and Ashley have two of the most popular phones on the market, a Droid and an iPhone. The cost of both monthly cell phone plans are described below.

   - Jumel's plan: $c = 60 + 0.05t$, where c stands for the monthly cost in dollars, and t stands for the number of texts sent each month.
   - Ashley's plan: $.35 per text, in addition to a monthly fee of $45.

   a. Whose plan, Jumel's or Ashley's, costs less if each of them sends 30 texts in a month? Use mathematical reasoning to justify your answer.

   b. How much will Ashley's plan cost for the same number of texts as when Jumel's plan costs $75.00?

   c. Is there a number of texts for which both plans cost the same amount? Use mathematical reasoning to justify your answer.

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The reasoning used to solve the parts of the problem may include:

a. Evaluating expressions to answer part a.
b. Expressing Ashley's plan in equation form, and using equations to answer some or all of the three parts.
c. Setting up tables and expanding to answer some or all of the three parts.
d. Graphing both plans on the same set of axes to answer some or all of the three parts.
e. Using slope and intercept explanations, possibly with a sketch, to answer part c.

a. $c = 60 + 30 \times 0.05$ | $c = 45 + .35 \times 30$

$c = 61.5$ Jumel | $c = 55.5$ Ashley

$9.50 + 1 = 10.50$; $10.50 + 45 = 55.5$

b. $45 + 300 \times .35$ Her plan would cost \$150.

Jumel = 6 dollars more

\$75.00 − 6.00 = 69.00 = Ashley

$75 − 60 = 15$

$0.05x = 15$

300

c. If they both sent 50 text messages then their plans would cost the same.

Ashley	Jumel
$c = 45 + .35t$	$c = 60 + .05t$

$45 + .35t = 60 + .05t$

$-.05t \quad -.05t$

$45 + .30t = 60$

$-45 \quad -45$

$.30t = 15$

$\div .30 \quad \div .30$

$t = 50$

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2 Points

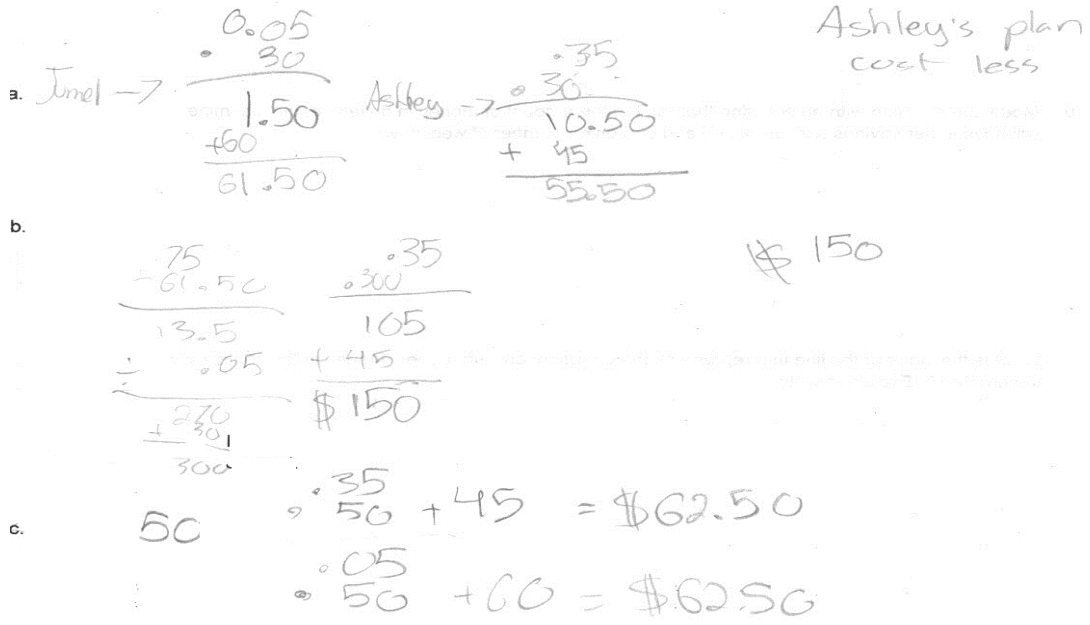
The response demonstrates adequate evidence of the learning and strategic tools necessary to complete the prompted purpose. It may contain overlooked issues, misleading assumptions, and/or errors in execution. Evidence in the response demonstrates that the student can revise the work to accomplish the 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 costs, solve equations, graph, and find partial answers to problems. Minor arithmetic errors may be present. Reasoning may contain incomplete, ambiguous, or misrepresentative ideas.

Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them and (2) Reason abstractly and quantitatively, since students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with the tables, graphs or equations. Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by representing the problem as tables, graphs, or equations. Evidence of the Mathematical Practice, (6) Attend to precision, can include proper use of ratio notation and proper labeling of quantities, variables, and graphs. Evidence of the Mathematical Practice, (7) Look for and make use of structure, may be demonstrated by student recognition that each part of the task can be answered by a single representation.

At least two of the three parts is correctly completed. Justification may include reasoning as follows:

a. Incorrectly evaluating expressions to answer part a, but correctly indicating the less expensive plan, based on the calculations.
b. Incorrectly expressing Ashley's plan in equation form, but correctly using the resulting equations to answer some or all of the three parts.
c. Incorrectly setting up tables and expanding them, but correctly answering some or all of the three parts based on the calculations.
d. Incorrectly graphing both plans on the same set of axes, but correctly answering some or all of the three parts based on the graphs.
e. Using slope and intercept explanations with errors, possibly with a sketch, but correctly answering part c based on the calculations.



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1 Point

The response demonstrates some evidence of mathematical knowledge that is appropriate to 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 be based on misleading assumptions, and/or contain errors in execution. Some work is used to evaluate costs, solve equations, or graph.

Accurate reasoning processes demonstrate the Mathematical Practices, (1) Make sense of problems and persevere in solving them, and (2) Reason abstractly and quantitatively (since students need to abstract information from the problem, create a mathematical representation of the problem, and correctly work with the tables, graphs or equations). Evidence of the Mathematical Practice, (3) Construct viable arguments and critique the reasoning of others, is demonstrated by complete and accurate explanations. Evidence of the Mathematical Practice, (4) Model with mathematics, is demonstrated by representing the problem as tables, graphs or equations. Evidence of the Mathematical Practice, (6) Attend to precision, can include proper use of ratio notation and proper labeling of quantities, variables and graphs. Evidence of the Mathematical Practice, (7) Look for and make use of structure, may be demonstrated by student recognition that each part of the task can be answered by a single representation.

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d. Incorrectly graphing both plans on the same set of axes, but correctly answering some or all of the three parts based on the graphs.
e. Using slope and intercept explanations with errors, possibly with a sketch, but correctly answering part c based on the calculations.

a. J; C=60+0.05·30
C=60+1.5
C=61.50

A; C=45+.35·30
C=45+10.5
C=55.50

Ashley's Plan costs less

b. 150 text.
45+.35·150
45+52.5
97.50

Ashley's Plan will cost 97.50 dollars.

c. I know they cost the same amount because they both sent text untill the reached $75.00 for that month.

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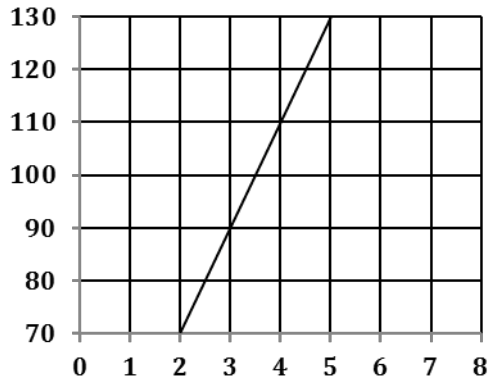
GRADE 8 MATH: EXPRESSIONS & EQUATIONS
STUDENT WORK

NYC Department of Education
Dennis M. Walcott, Chancellor

Assessment 1: Question 1

1. Does the graph below represent a proportional relationship? Use mathematical reasoning to justify your response.



CCLS (Content) Addressed by this Task:

7.RP.2	Recognize and represent proportional relationships between quantities.
7.RP.2a	Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
8.EE.6 (potential)	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

CCLS for Mathematical Practice Addressed by the Task:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
6. Attend to precision
7. Look for and make use of structure

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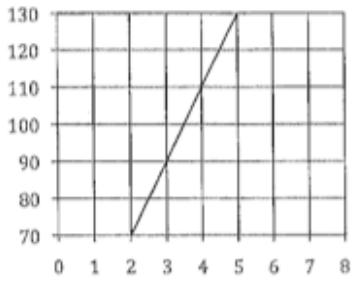
Student Work A



No, because they are not in proportion
cross products ≠

$\frac{3}{90} \neq \frac{4}{110}$

$\frac{4}{110} \neq \frac{5}{130}$

$\frac{3}{90} \neq \frac{5}{130}$

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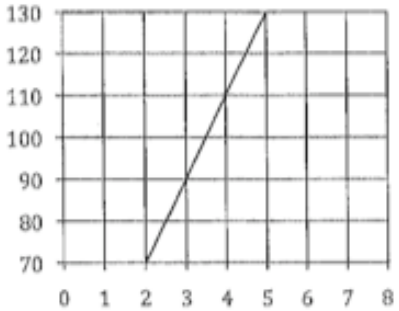
Student Work B



$\frac{5}{130}$ $\frac{4}{110}$ $\frac{3}{90}$ $\frac{2}{70}$

No because if you take any two coordinates
i.e they are not equal

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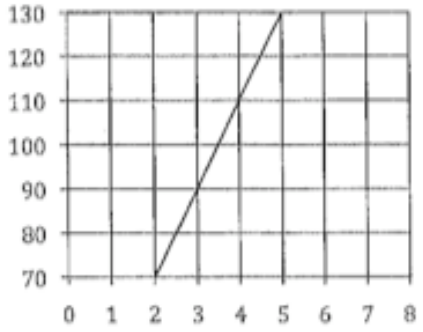
Student Work C



No this graph is not Proportional because the line does not Pass ~~thre~~ through the origin

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Assessment 1: Question 2

2. Kanye West expects to sell 350,000 albums in one week.

   a. How many albums will he have to sell every day in order to meet that expectation?

   b. Kanye West has a personal goal of selling 5 million albums. If he continues to sell albums at the same rate, how long will it take him to achieve that goal? Explain your reasoning in words.

   c. The equation y = 40,000x, where x is the number of days and y is the number of albums sold, describes the number of albums another singer expects to sell. Does this singer expect to sell more or fewer albums than West? Use mathematical reasoning to justify your response.

CCLS (Content) Addressed by this Task:

8.EE.5 (partial)	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
7.RP.2	Recognize and represent proportional relationships between quantities.
7.RP.3	Use proportional relationships to solve multi-step ratio and percent problems.
8.F.2	Compare properties of two functions each represented in a different way.

CCLS for Mathematical Practice Addressed by the Task:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
6. Attend to precision

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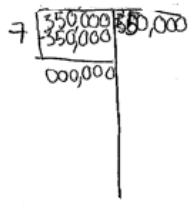
Student Work A

a.



He would have to sell 50,000 albums a day

b.

It would take him 100 days because if he sells 50,000 albums a day and 5 million divided by 50,000 is 100 then it would take 100 days.

c.

4000,000=40,000x100

The singer expects to sell fewer albums than West because if in 100 days West sells 5,000,000 albums and in 100 days the artist sells 4,000,000 albums, then they would have expected to sell fener albums than West.

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Student Work B

a 7 days

$$350{,}000 \div 7 = 50{,}000$$

he will have to see 50,000 albums every day

b

$$\begin{array}{r} 50{,}000 \\ 100 \\ \hline 00000 \\ 00000 \\ 50000 \\ \hline 5{,}000{,}000 \end{array}$$

he will take 100 day to complete his goal.

x=100

because he sell 50,000 a day and he will sell 5 million in 100 days.

c They would sell less because 50,000 is more then 40,000.

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Student Work C

a.

$$7\overline{)350000} = 50000 \quad \boxed{50{,}000}$$

b. it would take him 14.5 weeks to reach 5 million albums sold

c. $y = 40{,}000x$

x = days

y = albums sold

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Assessment 1: Question 5

5. Jumel and Ashley have two of the most popular phones on the market, a Droid and an iPhone. The cost of both monthly cell phone plans are described below.

   - Jumel's plan: $c = 60 + 0.05t$, where c stands for the monthly cost in dollars, and t stands for the number of texts sent each month.
   - Ashley's plan: $.35 per text, in addition to a monthly fee of $45.

   a. Whose plan, Jumel's or Ashley's, costs less if each of them sends 30 texts in a month? Use mathematical reasoning to justify your answer.

   b. How much will Ashley's plan cost for the same number of texts as when Jumel's plan costs $75.00?

   c. Is there a number of texts for which both plans cost the same amount? Use mathematical reasoning to justify your answer.

CCLS (Content) Addressed by this Task:

8.EE.7	Solve linear equations in one variable.
8.EE.8	Analyze and solve pairs of simultaneous linear equations.
8.EE.8c	Solve real-world and mathematical problems leading to two linear equations in two variables.
8.F.2	Compare properties of two functions each represented in a different way.
8.F.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of the relationship or from two (x, y) values. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

CCLS for Mathematical Practices Addressed by the Task:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
6. Attend to precision

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Student Work A

a.

$J = C = 60 + .05t$

$A = C = 45 + .35t$

$.05 \times 30 = 1.5$

If figured if $t = 30$ then Ashley's is 55.50 less and Jumels is 61.50

b.

~~It will cost 300~~

$45.00 + 105.0 = \$150.00$

$75.00 - 60.00 = \$15.00$

$15.00 \div .05 = 300 = t$

c.

if $t = 20$ the $J = \$61$, $A = \$57$

40

$A = 45 + (.35 \cdot 40) = \$59$

$J = 60 + (.05 \cdot 40) = \$62$

50

$45 + (.35 \cdot 50) = \$62.50$

$60 + (.05 \cdot 50) = \$62.50$

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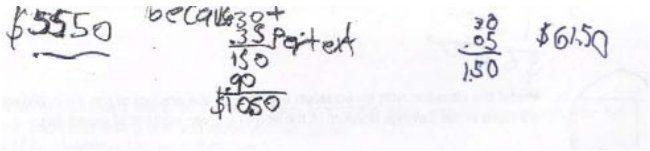
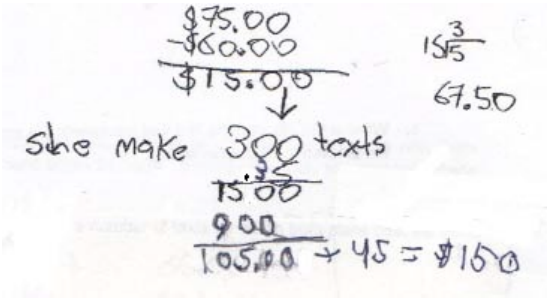
Student Work B

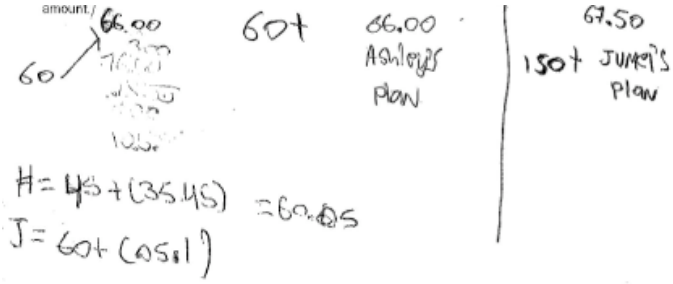
a.



b.



c.



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Student Work C

a.

1.5
+60
61.5

10.5
+45
55.5

I got my answer by multip and then combining

b.

49.3

c.

It will never be a number of text where they will be equal because they both keep increasing by the same amount as before and its either too high or too low

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