

Mathematics – Algebra 1
Practice Test Answer and Alignment Document
Pencil-and-Paper ABO

The following pages include the answer key for all machine-scored items, followed by the rubrics for the hand-scored items.

- The rubrics show sample student responses. Other valid methods for solving the problem can earn full credit unless a specific method is required by the item.
- In items where the scores are awarded for full and partial credit, the definition of partial credit will be confirmed during range-finding (reviewing sets of real student work).
- If students make a computation error, they can still earn points for reasoning or modeling.

Unit 1

Item Number	Answer Key	Evidence Statement Key/Content Scope	Integrated Course Alignment
1.	A, B, D	A-APR.3-1	3
2.	Part A: D Part B: B	N-RN.B-1	2
3.	D	A-REI.12	1
4.	C	A-APR.1-1	2
5.	C, E	A-REI.10	1
6.	B	A-SSE.3a	2
7.	Part A: A, C, F, H Part B: A, D, F, G	F-IF.4-1	none
8.	C, E	F-IF.9-1	none
9.	Part A: D Part B: A, B, C	A-CED.3-1	1

	Part C: 11 Part D: 13		
10.	-3	F-BF.3-1	2
11.	Part A: see rubric Part B: see rubric Part C: see rubric	HS.D.1-1/ 8.EE.C.07.b	1
12.	A, C, D	S-ID.5	1
13.	See rubric	HS.C.6.1/ A-REI.D.10 A-REI.D.11	1
14.	B	A-CED.4-1	1
15.	Part A: D Part B: A, C	S-ID.Int.1	none

Unit 2

Item Number	Answer Key	Evidence Statement Key/Content Scope	Integrated Course Alignment
16.	C	A-REI.4b-1	2
17.	B	A-SSE.1-1	1
18.	Part A: see rubric Part B: see rubric	HS.D.2-5/ A-CED.A.01	1
19.	D	F-IF.5-1	1
20.	A	F-IF.6-6b	none
21.	B	F-IF.7a-1	1
22.	Part A: A Part B: C	F-Int.1-1	none
23.	C	F-LE.2-1	1
24.	A	A-REI.3	1
25.	See rubric	HS.C.12.1/ F-IF.C.08.a	2
26.	Part A: see rubric Part B: see rubric	HS.D.2-9/ F-BF.A.01.a	2
27.	See rubric	HS.C.16.2/	2

		A-REI.B.04.a A-REI.B.04.b	
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Rubrics start on the next page.

Unit 1 #11 Part A

Score	Description
2	<p>Student response includes each of the following 2 elements:</p> <ul style="list-style-type: none"> • Correct equation • Valid justification of how the equation was determined <p>Sample Student Response:</p> <p>Let m be the number of cookies that Matt made. Then the number of cookies that Phil made would be $1.25m$. Let A represent the total amount of money earned.</p> $A = 0.25(0.80)(m + 1.25m)$ <p>The total number of cookies made is the sum of the number Matt made and the number Phil made. Only 80% of the cookies sold, so the total number needs to be multiplied by 0.8. Each cookie sold for \$0.25, so the total amount earned would be 0.25 times the 80% that were sold.</p>
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.

Unit 1 #11 Part B

2	<p>Student response includes each of the following 2 elements:</p> <ul style="list-style-type: none"> • Determination that Matt made 160 cookies and Phil made 200 cookies • Valid work shown <p>Sample Student Response:</p> $72 = 0.25(0.80)(m + 1.25m)$ $72 = (0.20)(2.25m)$ $72 = 0.45m$ $160 = m$ $1.25m = 1.25(160) = 200$ <p>Matt made 160 cookies and Phil made 200 cookies.</p> <p>Note: Student may earn the points in Part B by correctly using an incorrect equation from Part A.</p>
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.

Unit 1 #11 Part C

2	<p>Student response includes the following element:</p> <ul style="list-style-type: none"> • Full justification for raising the price
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	<p>Sample Student Response:</p> <p>If they raise the price to \$0.50 and only sell 70% of the cookies, the equation will be $A = 0.5(0.70)(160 + 200)$.</p> <p>In this case they will make \$126, which is over \$50 more than they made this year. They should raise the price of the cookies.</p> <p>Note: The student may give a valid reason for not raising the price based on risk. This should still earn credit. Also, the student may earn the points in Part C by correctly using an incorrect equation from Part A or B.</p>
1	Student response includes partial justification for raising the price.
0	Student response is incorrect or irrelevant.

Unit 1 #13	
Score	Description
3	<p>Student response includes each of the following 3 elements:</p> <ul style="list-style-type: none"> • Correct justification of the number of points on the graph for $c < 0$ • Correct justification of the number of points on the graph for $c = 0$ • Correct justification of the number of points on the graph for $c > 0$ <p>Sample Student Response:</p> <ul style="list-style-type: none"> • x and y are each nonnegative for all real numbers x and y. So, the sum must be nonnegative for all real numbers. Therefore, the sum cannot equal a negative number. There are no solutions and no points on the graph $c > 0$ • If $c = 0$, there is only one solution, $(0, 0)$. The graph consists of only one point. • If $c > 0$, there are infinitely many solutions, which means that there are infinitely many points on the graph.
2	Student response includes 2 of the 3 elements.
1	Student response includes 1 of the 3 elements.
0	Student response is incorrect or irrelevant.

Unit 2 #18 Part A	
Score	Description
1	<p>Student response includes the following element:</p> <ul style="list-style-type: none"> • Correct model

	<p>Sample Student Response:</p> $x + (x - 50) + (x - 100) + (x - 150) + (x - 200) = P$ <p>Where x is the amount of money for the first place prize and P is the total amount of prize money.</p>
0	Student response is incorrect or irrelevant.
Unit 2 #18 Part B	
2	<p>Student response includes each of the following 2 elements:</p> <ul style="list-style-type: none"> • Correct amounts for each of the five prizes • Valid work shown <p>Sample Student Response:</p> $x + (x - 50) + (x - 100) + (x - 150) + (x - 200) = 1000$ $5x - 500 = 1000$ $5x = 1500$ $x = 300$ <p>Fifth place is \$100, fourth place is \$150, third place is \$200, second place is \$250, and first place is \$300.</p>
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.

Unit 2 #25	
Score	Description
4	<p>Student response includes each of the following 4 elements:</p> <ul style="list-style-type: none"> • Algebraic reasoning about the point $(2 + d, y)$ • Algebraic reasoning about the point $(2 - d, y)$ • Identification of the line of symmetry, $x = 2$ • Justification of the line $x = 2$ as the line of symmetry of $f(x)$ <p>Sample Student Response:</p> <p>If $(2 + d, y)$ is on the graph of f, then:</p> $y = f(2 + d) = (2 + d)(2 + d - 4)$ $= (2 + d)(d - 2)$ $= d^2 - 4$ <p>Therefore, $d^2 - 4$ equals y.</p> <p>If $(2 - d, y)$ is on the graph of f, then:</p>

$$\begin{aligned}
 y &= f(2 - d) = (2 - d)(2 - d - 4) \\
 &= (2 - d)(-d - 2) \\
 &= d^2 - 4 \\
 &= y
 \end{aligned}$$

Therefore, $y = y$, so if the point $(2 + d, y)$ is on the graph of f , then so is $(2 - d, y)$.

The line $x = 2$ is a line of symmetry for the graph of f . I know this because x -values that are the same distance (absolute value) d from 2 yield equal y -values in the function.

Notes:

- Correct simplification is not necessary to earn the first point.
- To earn the second point, the two expressions must match and have no mistakes.
- The student may appeal to a formula (such as $x = -\frac{b}{2a}$) for the line of symmetry.
- Any justification that addresses point pairs on either side of the line is accepted.

3	Student response includes 3 of the 4 elements.
2	Student response includes 2 of the 4 elements.
1	Student response includes 1 of the 4 elements.
0	Student response is incorrect or irrelevant.

Unit 2 #26 Part A

Score	Description
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3	<p>Student response includes each of the following 3 elements:</p> <ul style="list-style-type: none"> • Correct model • Valid work shown • Valid explanation of d with relation to 450. <p>Sample Student Response:</p> <p>For 20 minutes of shower time, the family can save $(5 - 3)(20) = 60$ gallons each day. At \$0.002 per gallon, this is a savings of \$0.12 per day.</p> <p>Let S represent the cost savings, in dollars, and let d represent the time in days:</p> $S = -54 + 0.12d$ <p>The number of days at which the savings become zero can be found by solving this equation:</p> $-54 + 0.12d = 0$ $0.12d = 54$ $d = 450$ <p>For values of d less than 450, the savings due to reduced water consumption have not yet exceeded the cost of the low-flow showerhead. For values of d greater than 450, the savings due to reduced water consumption have exceeded the cost of the low-flow showerhead. Therefore, the cost savings will be greater than zero after 450 days.</p>
2	Student response includes 2 of the 3 elements.
1	Student response includes 1 of the 3 elements.
0	Student response is incorrect or irrelevant.

Unit 2 #26 Part B

3	<p>Student response includes each of the following 3 elements:</p> <ul style="list-style-type: none"> • Correct model • Valid work shown • Correct computation and interpretation of 81 <p>Sample Student Response:</p> <p>In the first year, the savings in water costs are $(365)(\\$0.12) = \\43.80. The low-flow showerhead costs \$54, and so there is still $\\$54 - \\$43.80 = \\$10.20$ to recover. After the first year, the cost savings will be $(12)(1.05) = 12.6$ cents, or \$0.126 per day. So if S represents the savings and d_2 represents the number of days in the second year, then the</p>
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	<p>new model is: $S = -10.2 + 0.126d_2$</p> <p>The number of days at which the savings become zero can be found by solving this equation: $-10.2 + 0.126d_2 = 0$ $0.126d_2 = 10.2$ $d_2 \approx 81$</p> <p>The family will start saving money 81 days into the second year.</p> <p>Note: The student will earn the point if he or she correctly interprets his or her reasonable incorrect model.</p>
2	Student response includes 2 of the 3 elements.
1	Student response includes 1 of the 3 elements.
0	Student response is incorrect or irrelevant.

Unit 2 #27	
Score	Description
3	<p>Student response includes each of the following 3 elements:</p> <ul style="list-style-type: none"> • Correct process for deriving the solution • Correctly states the conditions under which x is a real number when $a = 2$ and $b = 5$, which is that c must be greater than or equal to negative 5 • Correct reasoning shown to support the conditions under which x is a real number when $a = 2$ and $b = 5$ <p>Sample Student Response:</p> $a(x - 3)^2 - b = c$ $a(x - 3)^2 = b + c$ $(x - 3)^2 = \frac{b+c}{a}$ $x - 3 = \pm\sqrt{\frac{b+c}{a}}$ $x = 3 \pm \sqrt{\frac{b+c}{a}}$ <p>If $a = 2$ and $b = 5$, then $x = 3 \pm \sqrt{\frac{5+c}{2}}$. For x to be a real number, $\frac{5+c}{2}$ must be greater than or equal to zero. Therefore, c must be greater than or equal to -5.</p>
2	Student response includes 2 of the 3 elements.
1	Student response includes 1 of the 3 elements.

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Student response is incorrect or irrelevant.
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