Annotated NAEP Tables

	Description	Algebra and Functions	Type	Difficulty
		Grade 8		
1	Complete a letter pattern Extending a (periodic with given period, literal) pattern.		Short Constructed Response	Easy
2	Use algebra to determine a relationship Two linear equations (as balance beam) in three (iconic) variables; express one in terms of one other.		Multiple Choice	Easy
3	Solve an inequality Simple linear inequality, in iconic form, involving minus signs.		Multiple Choice	Easy
4	Graph an inequality on a number line Inequality on number line, involving a negative number		Short Constructed Response	Medium
5	Apply properties of square on coordinate plane Cartesian coordinates: When is the line between two points horizontal/vertical?		Multiple Choice	Easy
6	Relate equation to ordered pairs Substitution and evaluation of linear relations in two variables. (Involves – signs and nos. < 0) [(0,-3) eliminates all but D & E, while ((1,-1) eliminates E. So you don't have to check (2,1). This might be compelled by adding the option F) None of the above.]		Multiple Choice	Medium
7	Determine which term in a pattern of fractions will have a specified decimal value (calculator available) Extension of numerical pattern (the general form), where a given entry occurs (inversion), and converting a decimal to a reduced fraction.		Multiple Choice	Hard

8	Represent the mean of three distances algebraically (calculator available) Find average of three numbers, in story problem context. Need only to recognize the <u>definition</u> of average. [Change "…travels" to "…travels over the three days."]	Multiple Choice	Medium
9	Solve an equation in terms of a variable (calculator available) Solve simple linear relation in two variables.	Multiple Choice	Medium
10	Solve problem using informal algebra Two linear equations in two variables, decimal coefficients, presented in story problem (so variables had to be named).	Extended Constructed Response	Hard
11	Identify the value of a variable that satisfies a given condition Substituting and evaluating simple linear inequality (distinguishing < and ≤).	Multiple Choice	Easy
12	Identify property of graph of a line Cartesian coordinates; determining qualitative properties of line through two given points	Multiple Choice	Medium
13	Compute using order of operations Evaluating mixed (+,-,x,÷) arithmetic expression; order of operations.	Multiple Choice	Medium
14	Solve problem involving two linear relationships Find intersection of lines, each partly shown in coordinate plane, with some integer points indicated, including y-intercept. Need difference quotient to determine slope, and then the two linear functions, to be set equal. H (Many steps, reading coordinate information from geometric picture, strategic choice of information to solve efficiently.) [Change "…continue as shown" to " … continue at the constant rates shown"]	Short Constructed Response	Hard
15	Locate position on grid Naïve vector addition in the coordinate plane, situated in a simple story problem, using 4 compass directions.	Short Constructed Response	Medium
16	Represent even number algebraically Conceptual understanding of evenness, expressed algebraically. [Why the condition "greater than 2?"]	Multiple Choice	Medium
17	Reason using information about relative position along a line Elementary combinatorial logic.	Multiple Choice	Medium

18	**Find (x,y) Solution of Linear Equation**	Multiple Choice	Medium
	Substitution and evaluation in a simple linear relation in two variables.		

19	**Find (x,y) Solution of Linear Equation [Mis-copied???]**	Multiple Choice	Medium
	Algebraic modeling of a simple linear function from a story problem.		

20	**Find Number of Diagonals in a Polygon from a Vertex**	Short Constructed Response	Medium
	Extending a geometric/numerical pattern about # diagonals from a vertex of a polygon. [Polygons should be convex.]		

21	**Subtract Integers**	Short Constructed Response	Hard
	Simple integer subtraction of negative number, framed in a story problem. [The river being below sea level is startling, and potentially distracting; is this really true; I couldn't verify on Google.]		

22	**Find the Next Figure in a Pattern**	Multiple Choice	Easy
	Extending a geometric periodic pattern (successive -90° rotations of a figure); find next term.		

23	**Total Number of Newspapers Delivered [Mathematically uninformative.]**	Multiple Choice	Easy
	Simple algebraic modeling (linear function) of a story problem, where the variable is given an iconic symbolic name.		

24	**Find Puppy's Weight at a Certain Age [Mathematically uninformative]**	Multiple Choice	Easy
	Extending a tabular numerical pattern to next step, situated in story problem. [Quadratic function: Puppy weight w after m months = $-m^2/2 + 13m/2 + 3$. Difference function, easily deduced from table, is 6 – m. Thus puppy begins to lose weight after 6 months, and disappears into anti-matter at 13 months!!!]		

25	**Apply Pattern Recognition**	Multiple Choice	Medium
	Extending geometric pattern of simple linear function (p+1), represented geometrically, to 28th term (p=28).		

26	**Solve For Values That Make an Inequality True**	Short Constructed Response	Medium
	Simple linear inequality presented in iconic form; show two solutions.		

| 27 | Understand Concept of Variable | Multiple Choice | Easy |

How many numbers of the form k + 6? Have to recognize words "infinitely many." Knowledge of infinity.   Asks if they used calculator!!! [Weird question]

| 28 | Extend Pattern to Find Term | Extended Constructed Response | Hard |

Extending a geometric pattern of quadratic growth, to the 20th term; give <u>explanation</u> of reasoning. Calculator use?

| 29 | Evaluate Expression Using Order of Operations | Multiple Choice | Hard |

Evaluating arithmetic expression (+,-,x,÷, exponential); order of operations.

| 30 | Identify Specific Graph Points | Short Constructed Response | Easy |

In the whole number Cartesian plane, plot 2 points with equal coordinates.

| 31 | Complete Pattern in a Table | Multiple Choice | Hard |

Extend function table (giving only even 1st variable values) to 14th term; linear growth.

| 32 | Formulate Logical Conclusion | Multiple Choice | Easy |

Combinatorial logic, in ordinary language.

| 33 | Solve an Inequality | Multiple Choice | Medium |

Simple linear inequality; find minimum whole number solution.

| 34 | Write an Expression to Represent "Width" | Multiple Choice | Hard |

Algebraically odeling a simple linear relation given verbally.

| 35 | Given a Pattern, Find the Number of Dots in the 100th Figure | Multiple Choice | Hard |

Extending a geometric pattern (simple linear growth) to the 100th term.

| 36 | Explain Your Answer for #16 (#35) | Short Constructed Response | Easy |

Explain solution in #35.

| 37 | Find the Value of *n* | Multiple Choice | Easy |

Solve rudimentary linear equation in one variable.   Calculator use? [A really bad sign if so]

38	Find the Number in the Box	Multiple Choice	Easy
	Solve simple linear equation in one iconic variable. Calculator use? [Really bad if so]		
	[Change "should be" to "must be" or "is"]		
39	Which Rule Makes the Ordered Pairs True	Multiple Choice	Medium
	Given function table with 3 entries; which of the following functions (described verbally) is it?		
	Calculator use? (Would the calculator do this?)		
	[Replace "what to do" by "what one could do"]		
40	Fill in a Table on the Cost to Rent a Motorbike	Short Constructed Response	Medium
	Given a partial function table (C = 3h + 2), fill in missing entries: evaluation and calculating inverse.		
	Calculator use?		
41	Plot a Point on a Graph	Short Constructed Response	Hard
	Plot (5,2) on (mostly unmarked) integer Cartesian plane. E Calculator use? ????		

	Description **Algebra and Functions**	**Grade** **4**	**Type**	**Difficulty**
1	Complete a letter pattern [= # 1 on G 8] Extending a (periodic with given period, letter) pattern.		Short Constructed Response	Medium
2	Use algebraic reasoning to determine a relationship [= # 2 on G 8] Two linear equations (as balance beam) in three (iconic) variables; express one in terms of one other.		Multiple Choice	Hard
3	Solve an inequality [= # 3 on G 8] Inequality, in iconic form, involving minus signs.		Multiple Choice	Hard
4	Solve a problem involving multiples of 2 and 4 (calculator available) Arithmetic substitution and evaluation in a simple linear expression in 2 variables; whole number linear combinations of 2 and 4 (with prescribed value). Calculator use? [A bad sign if so.]		Short Constructed Response	Easy
5	Find two possible correct solutions for problem (Two) whole number solutions of one linear equation in two variables, framed in a story problem (same setting as # 4). Calculator use?		Short Constructed Response	Hard
6	Apply a linear relationship and justify answer Extension (from 84 to 90) of pattern of linear growth, presented in table, with jumps of 2 in independent variable. Also asks for explanation. Calculator use?		Extended Constructed Response	Hard
7	Evaluate an algebraic expression Evaluation of 3 variable linear (+ and -) expression; substitution and order of operations.		Multiple Choice	Easy
8	Locate two points on a grid, given coordinates In the whole number coordinate plane, geometrically locate two points given by coordinates.		Short Constructed Response	Medium
9	Write an Expression Using N Algebraic modeling of a simple subtraction in a story problem.		Multiple Choice	Easy

10 Find the Next Figure in a Pattern   [= # 22 on G 8]   Multiple Choice   Easy
Extending a geometric periodic pattern (successive -90° rotations of a figure); next term.

11 Total Number of Newspapers Delivered   [= # 23 on G 8]   Multiple Choice   Medium
Simple algebraic modeling (linear function) of a story problem, where the variable is given an
iconic symbolic name.

12 Find Puppy's Weight at a Certain Age   [Mathematically uninformative]   [= # 24 on G 8]   Multiple Choice   Hard
Extending a tabular numerical pattern to next step, situated in story problem.
[Quadratic function: Puppy weight w after m months = $-m^2/2 + 13m/2 + 3$. Difference function,
easily deduced from table, is 6 – m. Thus puppy begins to lose weight after 6 months, and
disappears into anti-matter at 13 months!!!]

13 Apply Pattern Recognition   [= # 25 on G 8]   Multiple Choice   Hard
Extending geometric pattern of simple linear function (p+1) to 28th term (p=28).

14 Recognize Pattern and Explain   [Mathematically uninformative]   Short Constructed   Hard
Given pattern of growing powers of 2, can 375 occur as value? (Knowledge of even and odd; or calculate   Response
powers till they exceed 375.) Explain.   Calculator use?

15 Complete Table Applying Given Rule   Short Constructed   Medium
Fill in table with initial condition and given constant increase.   Calculator use?   Response

16 Identify Rule Used to Complete Given Table   Multiple Choice   Medium
Verify whether a given function produces a given table.   Calculator use?
[Change "a rule used in the table" to "a rule that could be used in the table"]

17 Complete Table by Applying Rule   [Is the rule given? Is this item attached to #16? If so, then   Short Constructed   Hard
answering depends on correct answer to #16.]   Response
Extend tabular pattern from 40 to 120. [Infer the rule: divide by 4; data given only for multiples of
4, so recursion methods not available. Students will just have to spot the method by eyeballing.]

18 Identify Specific Graph Points   [= # 30 on G8]   Short Constructed   Medium
In the whole number Cartesian plane, plot 2 different points with equal coordinates.   Response

19	Find Location of a House on a Grid In (alphabet) x (whole number) plane, give coordinates of pictured point.	Multiple Choice	Easy
20	Identify the Shape That Comes Next in a Pattern Extending geometric periodic pattern with two dimensions of characteristics – shape and size (and smaller periods for separate dimensions). Calculator use?	Multiple Choice	Easy
21	Find the Number in the Box to Make a True Statement Missing factor division problem, with iconic variable. Calculator use?	Short Constructed Response	Hard
22	Fill in the Missing Number using a Certain Rule Evaluate a verbally described (quadratic) function (n x n + 3). Calculator use?	Short Constructed Response	Easy