

Determining Composite Scores in the ABCs Model 1999-2000

In the ABCs, a school's growth/gain and performance are summarized using composite scores. There are two types of composites used: growth/gain composites, and the performance composite.

There are two growth/gain composites—one for expected growth/gain and one for exemplary growth/gain. These growth/gain composites summarize a school's growth/gain over all grade levels and subjects included in the accountability model, and these two composites indicate whether or not a school makes expected or exemplary growth/gain, respectively. The growth/gain composite scores allow a school to fall short of expected or exemplary growth/gain in some areas but exceed it in others and still reach the growth/gain standard overall. If the expected growth/gain composite equals or exceeds zero, the school makes the goal of expected growth/gain. Similarly if the exemplary growth/gain composite equals or exceeds zero then the school makes the goal of exemplary growth/gain.

The performance composite summarizes the performance of students in the school. It tells the percent of student test scores at or above Achievement Level III (consistent mastery of subject/course content matter) in the subjects included in the accountability model.

The performance composite and the expected growth/gain composite are used when determining which schools may need special assistance, i.e., are low-performing. A school with an expected growth/gain composite that is negative (less than zero) and a performance composite of less than 50 (fewer than 50% of students performing at Level III or above) may be identified as a low-performing school.

*An outline of the process for determining these composite scores, using the accountability formula follows. All constants and parameters of the formula are included in this document; see p. 13-14. The formula used in the calculations is published in Accountability Brief Setting Annual Growth Standards: "The Formula," September 1996, Vol. 1, no. 1. This document is available on the DPI Infoweb (www.dpi.state.nc.us). From the DPI homepage, click Index, then Accountability Division, then Reporting Section, then click **Setting Annual Growth Standards**. ABC Tools software, provided to all LEAs by the Division of Accountability Services, performs the steps shown here automatically.*

I. Expected Growth/Gain

A. Determining the Expected Growth Composite for Reading and Mathematics, Grades 3 through 8, and 10.

1. Determine the actual growth in reading and mathematics at each grade level, using data on **matched** groups of students. Subtract the mean pretest score (use pretest for grade 3, use previous year's EOG for grades 4 through 8) from the mean posttest score (current year's EOG) at each grade level to find actual growth. For the North Carolina High School Comprehensive Test in Reading and Mathematics at grade 10, subtract the grade 8 EOG mean posttest score from the mean North Carolina High School Comprehensive Test score. (*See Example 1.*)

EXAMPLE 1. High School worksheet entry for computing expected growth for the North Carolina High School Comprehensive Test.

Grade 10 NC High School Comprehensive Test	Column A Actual Growth	Column B Expected Growth Goal	Column C Actual minus Expected (A – B)	Column D	Column E	Column F	Column G Standard Deviation	Column H Standard Growth (C/G)
Reading	2.0	1.9	0.1				1.6	+0.1
Mathematics	4.0	3.5	0.5				2.0	+0.3

2. Determine the expected growth goal for reading and mathematics at each grade level. (For an explanation of these computations, see the [Accountability Brief, Setting Annual Growth Standards: “The Formula.”](#))
3. Subtract the expected growth goal from the actual growth in reading and mathematics at each grade level.
4. Divide the difference (at each grade level) by the associated standard deviation. *This step is very important. By dividing by the standard deviations, the resulting numbers are standardized to accommodate the different score types.* The quotient is labeled “standard expected growth.”
5. Add the standard expected growth in reading and mathematics at each grade level, 3 through 8 and 10, to the standard expected gain in writing and EOC (for steps in calculations, see p. 4, 5) as applicable. Table A, illustrates steps 1 – 5 for a school with a 3 through 8 grade configuration.

Table A. Calculating expected growth/gain composite for a school with grades 3 - 8 and Algebra I

Subject/ Grade	Column A Actual Growth	Column B Expected Growth Goal	Column C Actual minus Expected Growth Goal	Column D	Column E	Column F	Column G Standard Deviation of Change ¹	Column H Standard Expected Growth (C/G)
Reading 3	5.9	6.0	-0.1				1.7	-0.1
Reading 4	6.6	5.7	+0.9				1.3	+0.7
Reading 5	5.5	4.9	+0.6				1.2	+0.5
Reading 6	4.1	3.2	+0.9				1.3	+0.7
Reading 7	3.0	2.9	+0.1				1.1	+0.1
Reading 8	2.6	2.5	+0.1				1.2	+0.1
Math 3	12.9	12.8	+0.1				2.6	+0.0
Math 4	9.6	8.3	+1.3				2.1	+0.6
Math 5	8.3	8.0	+0.3				2.0	+0.2
Math 6	7.4	7.8	-0.4				2.1	-0.2
Math 7	7.3	8.0	-0.7				2.0	-0.4
Math 8	6.0	7.4	-1.4				1.7	-0.8
	Current Index	Previous Year's Index	Year One Index	Baseline (B + C) ÷ 2	For EOC, A – D; for writing, higher 2 year average - D	(E - 0.1)		Standard Expected Gain (F/G)
Algebra I	76.2	75.6	70.8	73.2	3.0	2.9	9.1	+0.3
Writing 4	48.2	43.0	49.3	46.2	2.6	2.5	6.1	+0.6
Writing 7	50.1	47.0	47.2	47.1	1.6	1.5	4.5	+0.3
Expected growth/gain composite								+2.4²

¹These figures are set as constants.

²Full precision, though not shown here, is used in ABC Tools calculations. The composite is rounded to tenths.

B. Calculating expected gain in writing at grades 4 and 7.

One purpose of testing in the accountability model is to measure the percentage of students who are performing at or above grade level. Therefore, improvement in writing is measured by the change over three years in a writing index which reflects the percentages of students in each of four Achievement Levels. The higher Achievement Levels are weighted more in the index. The indexes are calculated as in the following example.

1. Calculate the writing index for 4th and 7th grades for each of three most recent years as follows:

- a. Multiply the percent of students at Achievement Level IV (Scores 3.5 or 4.0) times 3.
- b. Multiply the percent of students at Achievement Level III (Scores 2.5 or 3.0) times 2.
- c. Multiply the percent of students at Achievement Level II (Scores 1.5 or 2.0) times 1.
- d. Add the three products, and then divide by 3; the quotient is the writing index. The following example illustrates the steps above for year one (the earliest) of the three years.

$$\begin{aligned} &6\% \text{ of students are Level IV } (6 \times 3 = 18) \\ &48\% \text{ of students are Level III } (48 \times 2 = 96) \\ &34\% \text{ of students are Level II } (34) \\ &(18 + 96 + 34) = 148 \\ &148 \div 3 = 49.3 \end{aligned}$$

Use the same procedure to calculate the previous (second) year's index and the current (third) year's index.

- e. Average the indexes for the previous year and year one to get the baseline. (Suppose the index for the previous year is 43.0 and the index for the current year is 48.2)

$$\begin{aligned} &\text{Year one index} + \text{previous year's index} = \text{baseline:} \\ &(49.3 + 43.0) / 2 = 46.15 \end{aligned}$$

- f. Determine the higher of the two-year averages:

$$(\text{Year two [43.0]} + \text{current index [48.2]}) / 2 = 45.6$$

OR

$$(\text{Year one [49.3]} + \text{current index [48.2]}) / 2 = 48.75$$

- g. Subtract the baseline from the higher two-year average:

$$(48.75 - 46.15 = 2.6)$$

- h. Subtract 0.1 from the difference ($2.6 - 0.1 = 2.5$) to assure that zero represents gain, as it does in the growth computations.

- i. Divide by the standard deviation. *(These numbers are standardized to accommodate the different score types; i.e., developmental scale scores and index scores. If only the differences were added, the writing test would count considerably more than other tests in the composite.)*
- j. The quotient is the standard expected gain in writing. There is no exemplary gain in writing at grades 4 and 7; the standard expected gain is used in both expected and exemplary growth/gain calculations.

C. Calculating expected gain in EOC indexes.

1. Compute the EOC index for each of the six courses (Algebra I, Biology, ELPS, English I, English II, U.S. History) for the current year and the two previous years. Use the number for the percent of students in each Achievement Level and calculate the index using these steps:
 - a. Multiply percent of students in Achievement Level IV times 3.
 - b. Multiply percent of students in Achievement Level III times 2.
 - c. Multiply percent of students in Achievement Level II times 1.
 - d. Add the products and divide by 3; the quotient is the EOC Index.
2. Add the first two years' indexes and divide by 2 to determine the baseline.
3. Subtract the baseline from the current (third) year's EOC index.
4. Subtract 0.1 to make zero represent gain, as it does in growth computations.
5. Divide each difference by the associated standard deviation. The quotient is the standard expected gain for a given subject. *(See Examples 2 and 3.)*

EXAMPLE 2. Calculations for Algebra I.

Level	Current Year	Previous Year	Year One
IV	6%	4%	6%
III	48%	49%	45%
II	34%	39%	32%
I	12%	9%	17%

$$\text{Current EOC Index} = [(6 \times 3) + (48 \times 2) + (34 \times 1)] / 3 = 49.3$$

Previous two years' EOC Indexes:

$$[(4 \times 3) + (49 \times 2) + (39 \times 1)] / 3 = 49.7$$

$$[(6 \times 3) + (45 \times 2) + (32 \times 1)] / 3 = 46.7$$

$$\text{Baseline} = (49.7 + 46.7) / 2 = 48.2$$

$$\text{Difference} = 49.3 - 48.2 = 1.1$$

$$\text{Subtract } 0.1(1.1 - 0.1) = 1.0$$

$$\text{Divide by standard deviation} = 1 / 9.1 = 0.1$$

EXAMPLE 3. Completed worksheet for Algebra I.

EOC	Column A Current EOC Index	Column B Previous Year's Index	Column C Year One Index	Column D Baseline (B + C) / 2	Column E Differenc e (A - D)	Column F Subtract 0.1 (E - 0.1)	Column G Standard Deviation (Expected)	Column H Standard Expected Gain (F / G)
1. Algebra I	49.3	49.7	46.7	48.2	1.1	1.0	9.1	0.1 ¹

¹Full precision, though not shown here, is used in ABC Tools calculations.

D. Determining gain in other components of the ABCs at the high school level.

1. College prep/college tech prep (CP/CTP) gain.

- a. Find the percent of current accountability year graduates receiving diplomas who completed either the college prep or the college tech prep course of study. *Students are counted only once if they complete both courses of study.*
- b. Compute the average of the two prior years' percent of graduates that received diplomas and completed either course of study; this is the baseline.
- c. Subtract the baseline from the current year's percent.
- d. Subtract 0.1, unless the percentages are both 100, in which case the standard gain is set to zero.
- e. Divide by the associated standard deviation. The result is the standard expected gain for college prep/college tech prep component. There is no exemplary gain component for college prep/college tech prep. The standard expected gain is used in computing the expected growth/gain composite AND the exemplary growth/gain composite. (See Example 4.)

EXAMPLE 4. Computations for college prep/college tech prep component (Year One of Three Consecutive Years).

Total graduates earning diplomas	Current Year
	213
Completed only college prep	45
Completed only college tech prep	75
Completed both courses of study	10

$$45 + 75 + 10 = 130; 130 / 213 = .61 (X100) = 61.0\%$$

EXAMPLE 5. Completed high school worksheet for college prep/college tech prep component.

Other Components	Column A Current %	Column B Previous Year's %	Column C Year One %	Column D Baseline (B + C) / 2	Column E Difference (A -D)	Column F Subtract 0.1	Column G Standard Deviation	Column H Standard Gain (Expected) (F / G)
CP/CTP	63	62	61	61.5	1.5	1.4	10.0	0.1

2. Competency passing rate.

- a. Find the grade 10 competency passing rate and the grade 8 competency passing rate on a matched set of students.
- b. Subtract the grade 8 rate from the grade 10 rate.
- c. Subtract 0.1 so that zero represents gain.
- d. The result is the expected gain component for the competency passing rate.
(See Example 6.)

EXAMPLE 6. Completed high school worksheet for expected gain in competency passing rate.

Other components	Column A Grade 10 Competency Rate	Column B Grade 8 Competency Rate	Column E Difference (A -B)	Column F Subtract 0.1	Column G Standard Deviation	Column H Standard Gain (Expected) (F / G)
Competency	97.3	80.0	17.3	17.2	12.8	1.3

E. Completing high school calculations for determining the expected growth/gain composite.

1. Sum standard expected gain for EOC, college prep/college tech prep, competency, and standard expected growth for reading and mathematics. If the sum equals or is greater than zero, the school has made its expected gain/growth. (See Example 7.)

EXAMPLE 7. A completed high school worksheet for computing expected gain/growth composite.

Components EOC	Column A Current Index	Column B Previous Year 's Index	Column C Year One Index	Column D Baseline (B + C) / 2	Column E Difference (A - D)	Column F Subtract 0.1	Column G Standard Deviation (Expected)	Column H Standard Expected Gain (F / G)
Algebra I ¹	49.3	49.7	46.7	48.2	+ 1.1	+ 1.0	9.1	+ 0.1
Biology	45.1	45.0	44.0	44.5	+ 0.6	+ 0.5	6.4	+ 0.1
ELPS	50.3	47.8	44.9	46.4	+ 3.9	+ 3.8	7.9	+ 0.5
English I	54.0	49.6	46.5	48.1	+ 5.9	+ 5.8	5.6	+ 1.0
English II	54.1	24.8	51.0	37.9	+ 16.2	+16.1	7.6	+ 2.1
US History	42.3	43.2	46.4	44.8	- 2.5	- 2.6	5.7	- 0.5
NC Comprehensive Test (Grade 10)	Actual Growth	Expected Growth	Actual minus Expected					Standard Expected Growth (C/G)
Reading	2.0	1.9	0.1				1.6	+ 0.1
Math	4.0	3.5	0.5				2.0	+ 0.3
	Current %	Previous Year %	Year One %	Baseline				
CP/CTP	61.0	62.6	63.9	63.3	- 2.3	- 2.4	10.0	+0.1
	Gr. 10 rate	Gr. 8 rate			Difference	Subtract 0.1	Standard Deviation	Standard Gain (Expected)
Competency	97.3	80.0			17.3	17.2	12.8	+1.3
								+5.1²

¹Algebra I is based on students enrolled in the course during the current accountability year.

²Full precision, though not shown here, is used in ABC Tools calculations; the composite is rounded to tenths.

Expected gain/growth composite

II. Exemplary growth/gain composite.

A. Determining exemplary growth for grades 3 through 8 and 10.

1. Use actual growth calculated at each grade level in reading and math as computed earlier. (See p. 2.)
2. Determine the exemplary growth goal for each grade level. (The b_0 in the accountability formula is multiplied by 1.1 in these calculations.)
3. Subtract the exemplary growth goal from the actual growth in reading and mathematics at each grade level.
4. Divide the difference in growth for reading and mathematics at each grade level by the standard deviation. The quotient is the standard exemplary growth. (See Table B for an illustration of these steps.)

Table B. Calculating exemplary growth/gain composite for a school with grades 3-8 and Algebra I

Subject/Grade	Actual Growth	Exemplary Growth Goal	Difference	Standard Deviation	Standard Exemplary Growth
Reading 3	+5.9	+6.6	-0.7	1.7	-0.4
Reading 4	+6.6	+6.2	+0.4	1.3	+0.3
Reading 5	+5.5	+5.4	+0.1	1.2	+0.1
Reading 6	+4.1	+3.5	+0.6	1.3	+0.5
Reading 7	+3.0	+3.1	+0.1	1.1	+0.1
Reading 8	+2.6	+3.0	-0.4	1.2	-0.3
Math 3	+12.9	+14.0	-1.1	2.6	-0.4
Math 4	+9.6	+9.1	+0.5	2.1	+0.2
Math 5	+8.3	+8.7	-0.4	2.0	-0.2
Math 6	+7.4	+8.5	-1.1	2.1	-0.5
Math 7	+7.3	+8.7	-1.4	2.0	-0.7
Math 8	+6.0	+8.0	-2.0	1.7	-1.2
	Current Index	Exemplary Goal	Subtract 0.1		Standard gain (exemplary)
Algebra I	76.2	74.5	+1.6	9.1	+0.2
Writing 4					+0.4
Writing 7					+0.3
Exemplary composite					-1.6¹

¹Full precision, though not shown here, is used in ABC Tools calculations. The composite is rounded to tenths.

B. Determining EOC exemplary gain.

1. Find the exemplary goal, or target index for each course:
 - a. Subtract the baseline index from 100. (See Example 7, p. 4.)
 - b. Multiply the difference by .05 (5%).
 - c. Add the product to the baseline index. This is the exemplary goal, or target index.
2. Determine the standard exemplary gain for each subject:
 - a. Subtract the target index from the current year's EOC index.
 - b. Divide the difference by the standard deviation. The quotient is the standard exemplary gain for the subject.

C. Completing the Calculations for Exemplary Growth/Gain.

1. Add the standard exemplary gain, standard exemplary growth in reading and mathematics, and standard expected gain in College Prep/ College Tech Prep and standard expected gain in the Competency Passing Rate. The sum is the exemplary growth/gain composite. (See Example 8.)

EXAMPLE 8. Worksheet for computing exemplary growth/gain composite using data from EXAMPLE 7.

Components	Column I Exemplary Target Index [(100 - D) X .05] + D		Column J Difference (A - I)	Column K Standard Deviation (Exemplary)	Column L Standard Gain (Exemplary) (J / K)
Algebra I ¹	50.8		- 1.5	9.1	- 0.2
Biology	47.3		- 2.2	6.3	- 0.3
ELPS	49.1		+ 1.2	7.8	+ 0.2
English I	50.7		+ 3.3	5.5	+ 0.6
English II	41.0		+13.1	7.5	+ 1.7
US History	47.6		- 5.3	5.6	- 0.9
NC Comprehensive Test:	Actual Growth	Exemplary Growth	Actual minus Exemplary		
Reading	2.0	2.0	+0.0	1.6	+0.0
Mathematics	4.0	3.9	+0.1	2.0	+0.1
CP/CTP	Use standard expected gain from earlier calculations.				- 0.2
Competency					+0.9
	Composite				+ 1.0 ²

¹Algebra I is based on students enrolled in the course during the current accountability year.

²Full precision, though not shown here, is used in ABC Tools calculations. The composite is rounded to tenths

III. Performance Composite

A. Determining the Composite

1. Compute the percent of students who score at or above Achievement Level III on reading and mathematics EOG tests, the North Carolina High School Comprehensive Test, and all EOC tests given at the school. *EOC subjects are included with the EOG reading and mathematics in elementary/middle schools where the subjects are offered. EOC includes all state tested subjects: Algebra I, Biology, ELPS, English I, English II, U.S. History, Algebra II, Geometry, Chemistry, Physics, and Physical Science.*
 - a. Add the scores at or above Achievement Level III on each of the tests.
 - b. Divide this sum by the total valid scores on each of the tests. (See Examples 9 and 10.)

EXAMPLE 9. Computing the performance composite for a high school.

EOC Test	Column A # Scores At or Above Level III	Column B # of Valid Scores	Column C Total A / Total B X 100
Algebra I	43	60	$904 / 1381 =$ $.6545(X100) =$ 65.5%¹
Biology	76	100	
ELPS	94	165	
English I	89	150	
English II	67	90	
U.S. History	76	150	
Comprehensive – Reading	90	150	
Comprehensive – Math	79	150	
Algebra II	67	75	
Geometry	50	72	
Chemistry	73	89	
Physics	25	40	
Physical Science	75	90	
TOTALS	904	1381	

EXAMPLE 10. Computing the performance composite for a grade 3-5 school.

EOG Test	Column A # Scores At or Above Level III	Column B # of Valid Scores	Column C Total A / Total B X 100
Reading			$476 / 766 =$ $.6214(X100) =$ 62.1%¹
Grade 3	62	100	
Grade 4	60	108	
Grade 5	80	120	
Math			
Grade 3	65	100	
Grade 4	64	108	
Grade 5	75	120	
Writing			
Grade 4	70	110	
TOTALS	476	766	

¹Full precision, though not shown here, is used in ABC Tools calculations.

High School Worksheet for computing expected growth/gain composite for 1999-2000

Components of Composite	Column A Current EOC Index	Column B Previous Year's EOC Index	Column C Year One EOC Index	Column D Baseline (B + C) / 2	Column E Difference (A - D)	Column F Subtract 0.1 (E - 0.1)	Column G Standard Deviation (Expected)	Column H Standard Expected Gain (F / G)
Algebra I ¹							9.1	
Biology							6.4	
ELPS							7.9	
English I							5.6	
English II							7.6	
US History							5.7	
NC Comprehensive Test	Actual Growth	Expected Growth Goal	Actual minus Expected Growth Goal (A-B)					Standard Expected Growth (C/G)
Reading							1.6	
Mathematics							2.0	
	Current %	Previous %	Year One	Baseline				
CP/CTP							10.0	
	Gr. 10 Rate	Gr. 8 Rate			Difference (A - B)			
Competency							12.8	
Composite							Expected Growth/Gain	

¹Algebra I is based on students enrolled in the course during the current accountability year.

High School Worksheet for computing exemplary growth/gain composite for a high school

Components	Column I Exemplary Target [(100 – D) X .05] + D		Column J Difference (A - I)	Column K Standard Deviation (Exemplary)	Column L Standard Exemplary Gain (J / K)
Algebra I ¹				9.1	
Biology				6.3	
ELPS				7.8	
English I				5.5	
English II				7.5	
US History				5.6	
Comprehensive Test	Actual Growth	Exemplary Growth	Actual minus Exemplary		Standard Exemplary Growth
Reading				1.6	
Mathematics				2.0	
C P /C T P	Use Standard Expected Gain				
Competency					
¹ Algebra I is based on students enrolled in the course during the current accountability year.					Exemplary Growth/Gain Composite