New England Common Assessment Program

Practice Test Resource Material 2007

Grade 11

Mathematics

2007 NECAP Practice Test Resource Material
Grade 11 Mathematics

Session 1 – Non-Calculator

Item Number	Item Type	Correct Answer	Depth of Knowledge Level	Content Strand	Grade Expectation Text
1	Multiple choice (1pt.)	D	1	Functions & Algebra	**F&A 10.3 - Demonstrates conceptual understanding of algebraic expressions** by solving problems involving algebraic expressions, by simplifying expressions (e.g., simplifying polynomial or rational expressions, or expressions involving integer exponents, square roots, or absolute values), by evaluating expressions, or by translating problem situations into algebraic expressions.
2	Multiple choice (1pt.)	C	2	Geometry & Measurement	**G&M 10.5 - Applies concepts of similarity by solving problems** within mathematics or across disciplines or contexts.
3	Multiple choice (1pt.)	D	2	Functions & Algebra	**F&A 10.1 - Identifies, extends, and generalizes a variety of patterns** (linear and nonlinear) represented by models, tables, sequences, or graphs in problem solving situations.
4	Multiple choice (1pt.)	A	2	Geometry & Measurement	**G&M 10.6 - Solves problems involving perimeter, circumference, or area** of two-dimensional figures (including composite figures) or **surface area or volume** of three-dimensional figures (including composite figures) within mathematics or across disciplines or contexts.
5	Short answer (1 pt.)	N/A	2	Geometry & Measurement	**G&M 10.9 - Solves problems on and off the coordinate plane** involving distance, midpoint, perpendicular and parallel lines, or slope.
6	Constructed response (4 pts.)	N/A	2	Numbers & Operations	**N&O 10.4 - Accurately solves problems involving** rational numbers within mathematics, across content strands, disciplines or contexts (with emphasis on, but not limited to, proportions, percents, ratios, and rates).

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Session 2 – Calculator Active

Item Number	Item Type	Correct Answer	Depth of Knowledge Level	Content Strand	Grade Expectation Text
7	Multiple choice (1pt.)	A	2	Geometry & Measurement	**G&M 10.4 - Applies the concepts of congruency by solving problems** on or off a coordinate plane involving reflections, translations, or rotations; or solves problems using congruency involving problems within mathematics or across disciplines or contexts.
8	Multiple choice (1pt.)	D	1	Functions & Algebra	**F&A 10.4 - Demonstrates conceptual understanding of equality** by solving problems involving algebraic reasoning about equality; by translating problem situations into equations; by solving linear equations (symbolically and graphically) and expressing the solution set symbolically or graphically, or provides the meaning of the graphical interpretations of solution(s) in problem-solving situations; or by solving problems involving systems of linear equations in a context (using equations or graphs) or using models or representations.
9	Multiple choice (1pt.)	D	2	Data, Statistics, & Probability	**DSP 10.1- Interprets a given representation(s)** (e.g., box-and-whisker plots, scatter plots, bar graphs, line graphs, circle graphs, histograms, frequency charts) to make observations, to answer questions, to analyze the data to formulate or justify conclusions, critique conclusions, make predictions, or to solve problems within mathematics or across disciplines or contexts (e.g., media, workplace, social and environmental situations). (IMPORTANT: *Analyzes data consistent with concepts and skills in DSP 10.2.*)

continued

Item Number	Item Type	Correct Answer	Depth of Knowledge Level	Content Strand	Grade Expectation Text
10	Multiple choice (1pt.)	B	2	Functions & Algebra	**F&A 10.2 - Demonstrates conceptual understanding of linear and nonlinear functions and relations** (including characteristics of classes of functions) through an analysis of constant, variable, or average rates of change, intercepts, domain, range, maximum and minimum values, increasing and decreasing intervals and rates of change (e.g., the height is increasing at a decreasing rate); describes how change in the value of one variable relates to change in the value of a second variable; or works between and among different representations of functions and relations (e.g., graphs, tables, equations, function notation).
11	Short answer (1 pt.)	N/A	2	Functions & Algebra	**F&A 10.4 - Demonstrates conceptual understanding of equality** by solving problems involving algebraic reasoning about equality; by translating problem situations into equations; by solving linear equations (symbolically and graphically) and expressing the solution set symbolically or graphically, or provides the meaning of the graphical interpretations of solution(s) in problem-solving situations; or by solving problems involving systems of linear equations in a context (using equations or graphs) or using models or representations.
12	Short answer (2 pts.)	N/A	2	Data, Statistics, & Probability	**DSP 10.1 - Interprets a given representation(s)** (e.g., box-and-whisker plots, scatter plots, bar graphs, line graphs, circle graphs, histograms, frequency charts) to make observations, to answer questions, to analyze the data to formulate or justify conclusions, critique conclusions, make predictions, or to solve problems within mathematics or across disciplines or contexts (e.g., media, workplace, social and environmental situations). (IMPORTANT: *Analyzes data consistent with concepts and skills in DSP 10.2.)*
13	Short answer (2 pts.)	N/A	3	Data, Statistics, & Probability	**DSP 10.2 - Analyzes patterns, trends, or distributions in data in a variety of contexts** by determining, using, or analyzing measures of central tendency (mean, median, or mode), dispersion (range or variation), outliers, quartile values, estimated line of best fit, regression line, or correlation (strong positive, strong negative, or no correlation) to solve problems; and solve problems involving conceptual understanding of the sample from which the statistics were developed.

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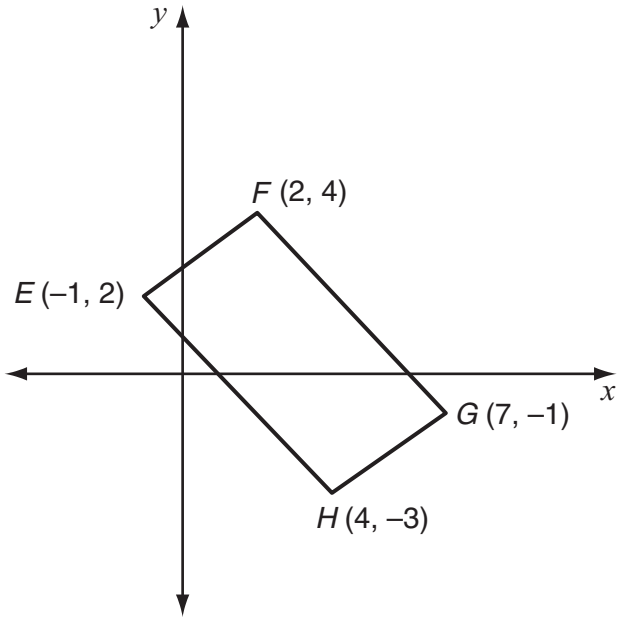
Non-Calculator Short-Answer Item (1 point)

G&M 10.9 Solves problems on and off the coordinate plane involving distance, midpoint, perpendicular and parallel lines, or slope.

5 Look at parallelogram *EFGH*.



The diagonals of parallelogram *EFGH* intersect at point *P*. What are the coordinates of point *P*?

Scoring Guide

Score	Description
1	Student gives correct coordinates, $\left(\mathbf{3}, \frac{\mathbf{1}}{\mathbf{2}}\right)$.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

* All students were provided the same amount of space in which to write their answers. For the purposes of this document, extraneous white space was removed from each student work sample to save space.

Sample 1-Point Response

❺

E(-1,2) F(2,4) G(7,1) H(4,-3)

$\frac{\overset{2}{+4}}{6} = 3 \quad \frac{\overset{4}{+-3}}{1} = .5 \quad \frac{\overset{7}{+-1}}{6} = 3 \quad \frac{\overset{-1}{+2}}{1} = .5 \quad = (3, 0.5)$

Sample 1-Point Response

❺

(3, 0.5)

Sample 0-Point Response

❺

The coordinates of point P is
(3,1)

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Non-Calculator Constructed Response Item (4 points)

N&O 10.4 **Accurately solves problems involving** rational numbers within mathematics, across content strands, disciplines or contexts (with emphasis on, but not limited to, proportions, percents, ratios, and rates).

6 When Andy, Felicia, and Tran started a company, they invested these amounts of money.

- Andy: $1000
- Felicia: $5000
- Tran: $7500

a. What fraction of the total amount invested was Andy's investment?

Andy, Felicia, and Tran decided to share the profits in the same ratio as the ratio of the amounts they invested. This year the company had a profit of $162,000.

b. How much of the profit should each person receive? Show your work or explain how you know the amount of profit for each person.

Jay, Kim, and Lisa also started a company. Jay invested x dollars, Kim invested y dollars, and Lisa invested z dollars. They will share their profits in the same ratio as the ratio of the amounts they invested.

c. What fraction of the profits should Jay receive?

* All students were provided the same amount of space in which to write their answers. For the purposes of this document, extraneous white space was removed from each student work sample to save space.

Scoring Guide

Score	Description
4	4 points
3	3 points
2	2 points
1	1 point
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Training Notes:

Part a: 1 point — for the correct answer, $\mathbf{\frac{2}{27}}$ **(or equivalent)**

Part b: 2 points — for the correct answer, **$12,000; $60,000; $90,000**, with appropriate strategy or explanation
OR
1 point — for the correct answer with incomplete or no strategy shown
OR
for appropriate strategy shown in solving the problem

Part c: 1 point — for the correct answer, $\mathbf{\frac{x}{x+y+z}}$

Sample Response:

Part a: $\frac{2}{27}$

Part b: Ratio of investments is 2:10:15. That makes 27 equal parts. The partners should get:

Andy, $\frac{2}{27}$; Felicia, $\frac{10}{27}$; Tran, $\frac{15}{27}$.

Andy: $\frac{2}{27} \times 162,000 = 12,000$

Felicia: $\frac{10}{27} \times 162,000 = 60,000$

Tran: $\frac{15}{27} \times 162,000 = 90,000$

They should receive profits of: Andy, $12,000; Felicia, $60,000; Tran, $90,000.

Part c: $\frac{x}{x+y+z}$

Sample 4-Point Response

6

a. A 1000
F 5000
T 7500
13,500

$\frac{1000}{13500} = \frac{2}{27}$

Andy invested $\frac{2}{27}$

c. J x
K y
L z
$(x+y+z)$

Jay will recieve $\frac{x}{(x+y+z)}$

b.
$A = 2/27$
$F = 10/27$
$T = 15/27$

Andy should recieve \$12,000
Felicia should recieve \$60,000
Tran should recieve \$90,000

$162{,}000 \times 2/27 = 12{,}000$
$162{,}000 \times 10/27 = 60{,}000$
$162{,}000 \times 15/27 = 90{,}000$

Sample 4-Point Response

6

(a) $\frac{1000}{13500} = \frac{10}{135}$

(b) Each should reciere the same ratio as they invested, so I added up all the investments and found each ratio. Then I converted each ratio to have a denominator of 162,000.

Andy = 12,000 dollars

Felecia = 60,000 dollars

Tran = 90,000 dollars

(c) Jay should recieve $\frac{x}{x+y+z}$ of the profit.

Sample 3-Point Response

6

a.

$$\begin{array}{r} 1000 \\ 5000 \\ 7500 \\ \hline \$13500 \end{array}$$

Andy = 1000

$$\frac{1000}{13500} = \frac{2}{27}$$

b.

$$\frac{5000}{13500} = \frac{10}{27}$$

$$\frac{7500}{13500} = \frac{15}{27}$$

Andy will get 2/27th of the profit, Felicia will get 10/27, and Tran will get 15/27 of the profit.

c. $x / x+y+z$

Sample 3-Point Response

6

a. Andy's investment was $\frac{2}{27}$ of the total amount

b. • Felicia should receive: \$60,000
• Tran should receive: \$90,000
• Andy should receive: \$12000

6

F: $\frac{10 \cdot 6}{27 \cdot 6}$ T: $\frac{15 \cdot 6}{27 \cdot 6}$ A: $\frac{2 \cdot 6}{27 \cdot 6}$ $27\overline{)\$162,000}$

$\frac{5000}{13500}$ $\frac{7500}{13500}$ $\frac{1000}{13500}$

c. Jay should receive $\frac{x}{xyz}$

Sample 2-Point Response

6

a)
$$\begin{array}{r} 1000 \\ 5000 \\ +7500 \\ \hline 13500 \end{array}$$

$$\boxed{\text{Andy's Investment} = \frac{1000}{13500} = \frac{10}{135} = \frac{1}{13.5}}$$

b) Andy = 1000 = x

Felicia = 5000 = 5x

Tran = 7500 = 7.5x

x = $2160.00

$$\begin{array}{r} 2160. \\ 75.\overline{)162,000.} \\ -150 \\ \hline 1200 \\ \cdot 75 \\ \hline 450 \\ 450 \\ \hline 000 \end{array}$$

Andy's Profit = $2160.00

Felicia's Profit = $10800.00

Tran's Profit = $16200.00

Each person should recieve that much more for the money the originally contributed.

c) $x + y + z = a$

$\frac{x}{a}$ = Jay's profit.

Sample 2-Point Response

6

7500
5000
1000
13500

xxx13 $\frac{1}{2}$
1000/13500
-1000
3500
-3000
500

a. Andy's Investment: $\boxed{\frac{13.5}{100}}$

xxxx12
13500/162000
-13500
-27000
27000
0

b.

Andy	Felicia	Tram
1000	5000	7500
× 12	× 12	× 12
2000	10000	15000
+10000	+50000	+75000
$12,000	$60,000	$90,000

c. Jay receives: $\boxed{\frac{X}{100}}$

Sample 1-Point Response

6

a. $\frac{1}{3}$

b. Andy - invested \$1,000 profit \$12,000

Felicia - invested \$5,000 profit \$60,000

Tran - invested \$7500 profit \$90,000

c. $\frac{1}{3}$

Sample 0-Point Response

6

A: Andy gets invested $1,000

B:
$$\begin{array}{r} 54,000 \\ 3\overline{)162,000} \\ -15 \\ \hline 12 \\ -12 \\ \hline 0 \end{array}$$

$54,000

C: Jay should recieve the x amant of money because that is how much he invented.

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Calculator-Active Short Answer Item (1 point)

F&A 10.4 **Demonstrates conceptual understanding of equality** by solving problems involving algebraic reasoning about equality; by translating problem situations into equations; by solving linear equations (symbolically and graphically) and expressing the solution set symbolically or graphically, or provides the meaning of the graphical interpretations of solution(s) in problem-solving situations; or by solving problems involving systems of linear equations in a context (using equations or graphs) or using models or representations.

11 A rectangle has a length of 5 feet and a width of 3 feet. When the length and width are each increased by the same amount, the perimeter is increased by 10 feet. By how much are the length and width increased?

Scoring Guide

Score	Description
1	Student gives correct answer, **2.5 (feet) or equivalent**.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Sample 1-Point Response

11

$P = 2(3) + 2(5)$

$P = 16$

$2(3+x) + 2(5+x) = 16 + 10$

$6 + 2x + 10 + 2x = 26$

$-16 \qquad -16$

$\frac{4x}{4} = \frac{10}{4}$

$x = \boxed{\frac{5}{2} \text{ ft.}}$

Sample 1-Point Response

11

$10 \div 4 =$ 2.5 feet

Sample 0-Point Response

11

It increased beg the length so know i't 10
so it increased by 5

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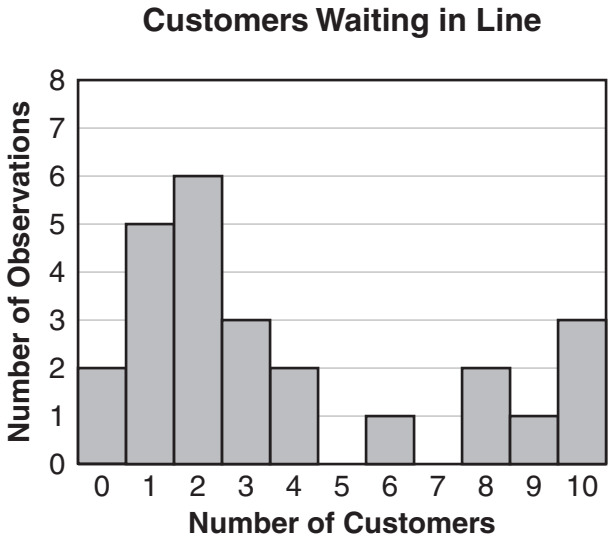
Calculator-Active Short Answer Item (2 points)

DSP 10.1 **Interprets a given representation(s)** (e.g., box-and-whisker plots, scatter plots, bar graphs, line graphs, circle graphs, histograms, frequency charts) to make observations, to answer questions, to analyze the data to formulate or justify conclusions, critique conclusions, make predictions, or to solve problems within mathematics or across disciplines or contexts (e.g., media, workplace, social and environmental situations).

(IMPORTANT: *Analyzes data consistent with concepts and skills in DSP 10.2.)*

12 Every 15 minutes on Thursday, Aisha counted the number of bank customers waiting in line. She made this bar graph from all of her observations.



a. What was the median number of customers waiting in line on Thursday?

b. What was the mean number of customers waiting in line on Thursday?

Scoring Guide

Score	Description
2	2 points
1	1 point
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Training Notes:

Part a: 1 point for the correct answer, **2**

Part b: 1 point for the correct answer, **3.8**

Sample 2-Point Response

⓬

The median # of customers is 2. I know This because 2 is in the middle of the data

0, 0, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, $\boxed{2}$ 3, 3, 3, 4, 4, 6, 8, 8, 9, 10, 10, 10

median

The mean is all of the numbers averaged together.

The # of customers adds up to 95.

$\frac{95}{25} = 3.8 \rightarrow$ The mean is about 4

Sample 2-Point Response

⓬

Median = 2

Mean = 3.8

Sample 1-Point Response

⓬

The median number of customers was 4

ⓑ Total number of observations = 25
Total number of Customers = 95

95/25 = 3.8 customers

Sample 1-Point Response

12

A) 2 customers

B.) 6 customers

Sample 0-Point Response

12

a. $2(0)+5(1)+6(2)+3(3)+2(4)+1(6)+2(8)+1(9)+3(10)=87$

# of observations: 25

$\frac{87}{25} = 3.48$ = median 3

b. mean: 2 because 2 was most common

Calculator-Active Short Answer Item (2 points)

DSP 10.2 **Analyzes patterns, trends, or distributions in data in a variety of contexts** by determining, using, or analyzing measures of central tendency (mean, median, or mode), dispersion (range or variation), outliers, quartile values, estimated line of best fit, regression line, or correlation (strong positive, strong negative, or no correlation) to solve problems; and solve problems involving conceptual understanding of the sample from which the statistics were developed.

13 A college recruiter compared the starting salaries for graduates with various majors. This table shows the results for two majors.

Major	Mean Starting Salary	Median Starting Salary	Range of Starting Salaries
Business	$39,000	$30,000	$20,000
Engineering	$35,000	$34,000	$12,000

Derrick will choose a major. He will decide between a business major and an engineering major. Use **all** of the information in the table to explain which major Derrick should choose.

Scoring Guide

Score	Description
2	Student gives a complete argument based on the information in the table.
1	Student shows a minimal understanding of mean, median, and range.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Sample Response:

Derrick should choose the engineering major, which has the higher median salary. Of the two, the business major has the higher mean starting salary; **however**, the range is significantly greater, which indicates that there might be an outlier. The median, therefore, would better represent the starting salaries of business majors. The mean and median starting salary for engineering majors are about the same and the range is relatively small, which indicates a typical starting salary around $34,000–$35,000 vs. $30,000 for business majors.

Sample 2-Point Response

13

Derrick should choose to major in engineering. Though the mean, or average, starting salary for business is slightly higher, the median, or middle of the possible starting salaries is higher. Range indicates the difference between the greatest starting salary and the lower starting salary, and the range for engineering is quite a bit lower than the range for business. This indicates that the starting salaries for engineering are closer together, and a person who has an engineering major is more likely to get a higher starting salary than a business major.

Sample 1-Point Response

13

The business range is farther apart so the salary might be lower than the engineering.
The median for engineering is higher so you know that the salary is better.

Even though the mean salary is larger the median and the range give Derrick a better starting salary.

Sample 0-Point Response

13

He should choose engineering because the middle sallary is lower but the allerage salary is higher and there is a smaller range of starting sallaries