



**NEW ENGLAND
COMMON ASSESSMENT PROGRAM**

**Released Items
Support Materials
2010**

**Grade 7
Mathematics**

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

N&O 6.3 Demonstrates conceptual understanding of mathematical operations by describing or illustrating the meaning of a power by representing the relationship between the base (whole number) and the exponent (whole number) (e.g., 3^3 , 4^3); and the effect on the magnitude of a whole number when multiplying or dividing it by a whole number, decimal, or fraction.



1 Which expression below is equivalent to $3^2 \times 3^4$?

- A. 3^6
- B. 3^8
- C. 9^6
- D. 9^8

G&M 6.1 Uses properties or attributes of angles (right, acute, or obtuse) or sides (number of congruent sides, parallelism, or perpendicularity) to identify, describe, classify, or distinguish among different types of triangles (right, acute, obtuse, equiangular, scalene, isosceles, or equilateral) or quadrilaterals (rectangles, squares, rhombi, trapezoids, or parallelograms).

2 Which triangle is **not** possible to construct?

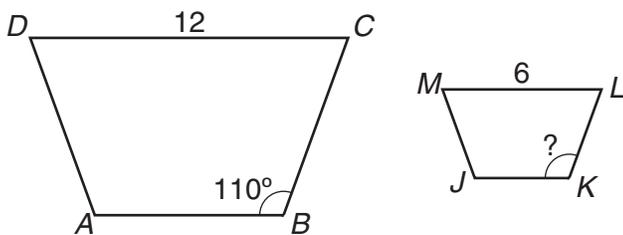
- A. a right isosceles triangle
- B. an acute equilateral triangle
- C. an obtuse scalene triangle
- D. a right equilateral triangle

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

G&M 6.5 Demonstrates conceptual understanding of similarity by describing the proportional effect on the linear dimensions of polygons or circles when scaling up or down while preserving the angles of polygons, or by solving related problems (including applying scales on maps). Describes effects using models or explanations.



3 Look at this diagram.



Trapezoid $ABCD$ is similar to trapezoid $JKLM$. What is the measure of $\angle K$?

- A. 55°
- B. 70°
- C. 110°
- D. 140°

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

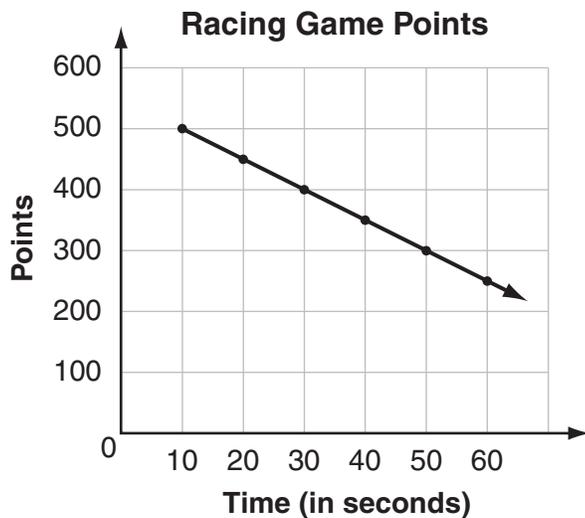
G&M 6.6 Demonstrates conceptual understanding of perimeter of polygons, the area of quadrilaterals or triangles, and the volume of rectangular prisms by using models, formulas, or by solving problems; and demonstrates understanding of the relationships of circle measures (radius to diameter and diameter to circumference) by solving related problems. Expresses all measures using appropriate units.

- 4 Henry rode his bike around a circular track.
One time around the track is about 300 feet.
About how far is it from one side of the track through the center to the other side?
- A. 50 feet
 - B. 100 feet
 - C. 600 feet
 - D. 900 feet

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

F&A 6.1 Identifies and extends to specific cases a variety of patterns (linear and nonlinear) represented in models, tables, sequences, graphs, or in problem situations; or writes a rule in words or symbols for finding specific cases of a linear relationship; or writes a rule in words or^{sc} symbols for finding specific cases of a nonlinear relationship; and writes an expression or^{sc} equation using words or^{sc} symbols to express the generalization of a linear relationship (e.g., twice the term number plus 1 or^{sc} $2n + 1$).

- 5 Wendy is playing a racing game. This graph shows the relationship between the time it takes Wendy to finish a race and the number of points she earns.



Based on this graph, how many points does Wendy earn when she finishes a race in 80 seconds?

- A. 250
- B. 200
- C. 150
- D. 100

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

F&A 6.2 Demonstrates conceptual understanding of linear relationships ($y = kx$; $y = mx + b$) as a constant rate of change by constructing or interpreting graphs of real occurrences and describing the slope of linear relationships (faster, slower, greater, or smaller) in a variety of problem situations; and describes how change in the value of one variable relates to change in the value of a second variable in problem situations with constant rates of change.

6 Look at this table.

Client Charges

Client	Hours	Charge
Angie	2.0	\$40.00
Dave	1.5	\$32.50
Frank	3.0	\$55.00
Carrie	0.5	\$17.50
Deb	2.5	\$47.50

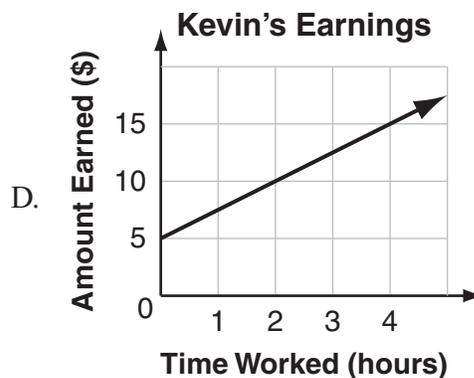
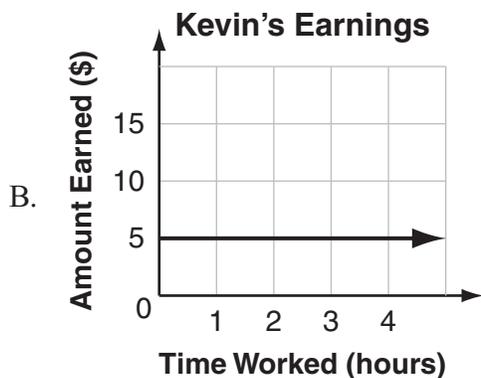
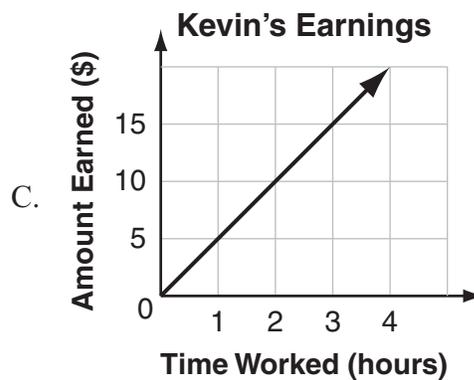
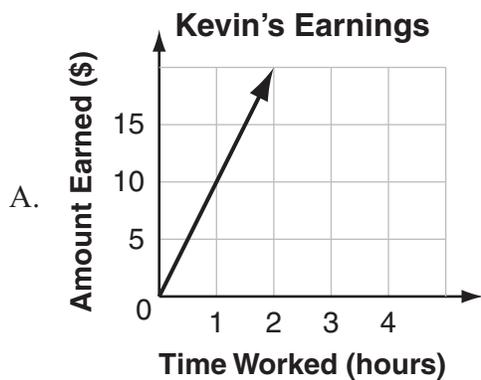
Yoshi is a personal trainer. The table shows how much he charges his clients. Yoshi has two new clients, Wayne and Emily. He worked with Wayne one more hour than he did with Emily. How much more money did Yoshi charge Wayne than he charged Emily?

- A. \$15.00
- B. \$20.00
- C. \$25.00
- D. \$35.00

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

F&A 6.2 Demonstrates conceptual understanding of linear relationships ($y = kx$; $y = mx + b$) as a constant rate of change by constructing or interpreting graphs of real occurrences and describing the slope of linear relationships (faster, slower, greater, or smaller) in a variety of problem situations; and describes how change in the value of one variable relates to change in the value of a second variable in problem situations with constant rates of change.

- 7 Kevin earns \$5 per hour working at an ice rink. Which graph best represents Kevin's total earnings over time?



NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

F&A 6.3 Demonstrates conceptual understanding of algebraic expressions by using letters to represent unknown quantities to write linear algebraic expressions involving two or more of the four operations; or by evaluating linear algebraic expressions (including those with more than one variable); or by evaluating an expression within an equation (e.g., determine the value of y when $x = 4$ given $y = 3x - 2$).



8 Look at this equation.

$$w = \frac{2}{3}t + 6$$

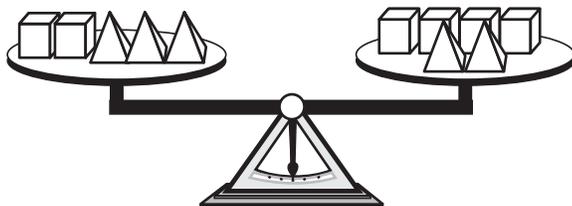
What is the value of w when $t = 12$?

- A. 24
- B. 14
- C. 12
- D. 9

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

F&A 6.4 Demonstrates conceptual understanding of equality by showing equivalence between two expressions using models or different representations of the expressions (expressions consistent with the parameters of M(F&A)–6–3), solving multi-step linear equations of the form $ax \pm b = c$, where a , b , and c are whole numbers with $a \neq 0$.

- 9 This scale is balanced.



Let c be the weight of one cube and p be the weight of one pyramid. Based on the scale, which equation represents the relationship between c and p ?

- A. $5c = 6p$
- B. $5p = 6c$
- C. $c = 2p$
- D. $p = 2c$

**NECAP 2010 RELEASED ITEMS
GRADE 7 MATH**

DSP 6.4 Uses counting techniques to solve problems in context involving combinations or simple permutations using a variety of strategies (e.g., organized lists, tables, tree diagrams, models, Fundamental Counting Principle, or others).

- 10 Each member of a computer club picks a password that is three characters long.
- The first character in each password is a vowel (A, E, I, O, U).
 - The second and third characters are digits from 1 through 3.
 - A digit can be repeated.

How many different passwords are possible?

- A. 8
- B. 15
- C. 30
- D. 45

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

N&O 6.4 Accurately solves problems involving single or multiple operations on fractions (proper, improper, and mixed), or decimals; and addition or subtraction of integers; percent of a whole; or problems involving greatest common factor or least common multiple. (IMPORTANT: *Applies the conventions of order of operations with and without parentheses.*)



- 11 The temperature at 4:00 P.M. was -6 degrees Celsius. By 10:00 P.M., the temperature had decreased by 5 degrees Celsius. What was the temperature at 10:00 P.M.?

Scoring Guide:

Score	Description
1	for the correct answer, -11 (degrees Celsius)
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 1
(EXAMPLE A)



11

$$\begin{array}{l} 4:00\text{PM} = -6^{\circ}\text{C} \\ 10:00\text{PM} = -11^{\circ}\text{C} \end{array} \quad \begin{array}{r} -6 \\ -5 \\ \hline -11 \end{array}$$

The student's answer is correct. (Showing work is not required.)

SCORE POINT 1
(EXAMPLE B)



11

The temperature was -11

The student's answer is correct.

SCORE POINT 0
(EXAMPLE A)



11

$$\begin{array}{l} -6 + 5^{\circ} = 11^{\circ} \\ 11^{\circ} \text{ at } 10:00 \text{ pm.} \end{array}$$

The student's response is incorrect.

SCORE POINT 0
(EXAMPLE B)



11

$$\begin{array}{l} 6^{\circ}\text{C} \\ -5^{\circ}\text{C} = \textcircled{1^{\circ}\text{C}} \end{array}$$

The student's response is incorrect.

**NECAP 2010 RELEASED ITEMS
GRADE 7 MATH**

F&A 6.3 Demonstrates conceptual understanding of algebraic expressions by using letters to represent unknown quantities to write linear algebraic expressions involving two or more of the four operations; or by evaluating linear algebraic expressions (including those with more than one variable); or by evaluating an expression within an equation (e.g., determine the value of y when $x = 4$ given $y = 3x - 2$).

- 12 The equation below shows the relationship among the number of faces, f , the number of vertices, v , and the number of edges, e , of any prism.

$$f + v = 2 + e$$

A prism has 6 faces and 12 edges. How many vertices does the prism have?

Scoring Guide:

Score	Description
1	for the correct answer, 8
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 1
(EXAMPLE A)

12

8

The student's answer is correct.

SCORE POINT 1
(EXAMPLE B)

12

$$f + v = (2 + e^{12}) = 14 \quad 6 + ? = 14 \quad 14 - 6 = 8$$
$$v = 8$$

The student's answer is correct. (Showing work is not required.)

SCORE POINT 0

12

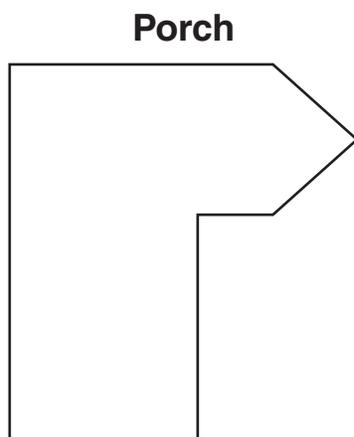
$$F + v = 2 + e$$
$$6 + 12 = 18 \quad v = 18$$

The student's response is incorrect.

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

G&M 6.5 Demonstrates conceptual understanding of similarity by describing the proportional effect on the linear dimensions of polygons or circles when scaling up or down while preserving the angles of polygons, or by solving related problems (including applying scales on maps). Describes effects using models or^{sc} explanations.

- 13 Look at this scale drawing of a porch.



Scale
1 cm represents 4 ft

Use a ruler to answer this question. What is the perimeter, in feet, of the porch? Show your work or explain how you know.

Scoring Guide:

Score	Description
2	for the correct answer, 72 (ft), with work or explanation
1	for the correct answer with incomplete or no work or explanation or for the correct strategy with incorrect answer
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Sample Response:

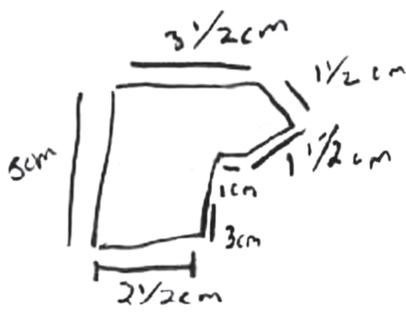
Total perimeter of drawing is 18 cm.

$$18 \times 4 = 72$$

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 2
(EXAMPLE A)

13



$1\frac{1}{2}$ } 1cm
 $1\frac{1}{2}$
 1
 3
 $2\frac{1}{2}$ } 1cm
 5
 $3\frac{1}{2}$

1
 1
 $\frac{3}{2}$
 1
 5
 3

= 18cm total

18 x 4 = 72ft

The student's answer is correct, with sufficient work shown to indicate correct strategy.

SCORE POINT 2
(EXAMPLE B)

13

18cm x 4 = 72 feet

The student's answer is correct, with sufficient work shown to indicate correct strategy.

SCORE POINT 2
(EXAMPLE C)

13

72 ft. I got this answer by using my ruler and making marks for 4 ft. and when I came to $\frac{1}{2}$ a centimeter I counted it as 2 because $\frac{1}{2}$ of 4 = 2.

The student's answer is correct, with sufficient explanation to indicate correct strategy.

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 1
(EXAMPLE A)

13

72 feet

I measured the perimeter and got
72 feet.

The student's answer is correct, with insufficient strategy shown.

SCORE POINT 1
(EXAMPLE B)

13

$$5 \times 4 + 3.5 \times 4 + 3 \times 4 + 1 \times 4 + 1.5 \times 4 + 1.5 \times 4 =$$

$$20 + 14 + 12 + 4 + 6 + 6 =$$

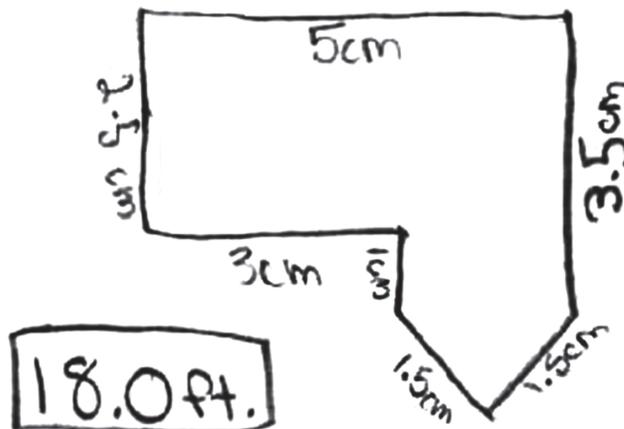
$$51 \text{ ft}$$

The student's strategy is appropriate, with incorrect answer due to missing one side. The student also made a computation error.

SCORE POINT 0
(EXAMPLE A)

13

$$\begin{array}{r} 2.5 \\ + 3.5 \\ \hline 6.0 \\ + 1.0 \\ \hline 7.0 \\ + 1.0 \\ \hline 8.0 \\ + 1.0 \\ \hline 9.0 \\ + 9.0 \\ \hline 18.0 \end{array}$$



18.0 ft.

The student's answer is incorrect, with insufficient strategy.

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 0
(EXAMPLE B)

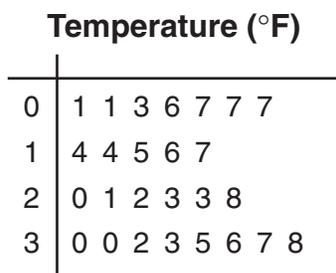
13 295.312 ft is the perimeter of the porch. I get this by measuring each side in centimeters with my ruler and multiplying the length of each side on my calculator.

The student's answer is incorrect, with inappropriate strategy.

**NECAP 2010 RELEASED ITEMS
GRADE 7 MATH**

DSP 6.1 **Interprets a given representation** (circle graphs, line graphs, or stem-and-leaf plots) to answer questions related to the data, to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems.

- 14 This stem-and-leaf plot shows the temperature at 6 A.M. for 26 days of one month.



Key

0	3 represents 3°F
---	------------------

- a. What is the mode of this data set?

- b. When data for the last four days of the month are included in the set, the mode decreases but the median does not change. List a set of four temperatures that could give this result.

Scoring Guide:

Score	Description
2	for the correct answers to both parts, 7(°F) and {1, 1, with any two temperatures of 21° or greater and not both 23° or 30°}
1	for the correct answer to one part
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Sample Responses:

Part a: 7°F

Part b: {1, 1, 23, 39}

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 2
(EXAMPLE A)

14

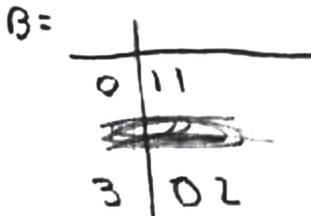
A. 70°F was the mode.
B. 10°F , 10°F , 31°F , 39°F

The student's answers to each part are correct.

SCORE POINT 2
(EXAMPLE B)

14

A = 7°F



The student's answers to each part are correct. The stem-and-leaf plot is an acceptable way to list a set of data.

SCORE POINT 1

14

a. 07°F
b. 01°F , 01°F , 30°F , 30°F

The student's answer to part a is correct.
The student's answer to part b is incorrect.

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 0
(EXAMPLE A)

14

11, 25, 16, 17, 17, 14, 14, 15, 16, 17, 20, 21, 23, 23, 23, 30, 30, 32,
33, 33, 36, 37, 38

the mode is 20°F

2°F, 5°F, 31°F, 39°F

The student's answers to both parts are incorrect.

SCORE POINT 0
(EXAMPLE B)

14

A The Mode
is (3) : (7)

B
6 7 8 4
| | | |
6 7 8 4

The student's answers to both parts are incorrect.

**NECAP 2010 RELEASED ITEMS
GRADE 7 MATH**

N&O 6.1 Demonstrates conceptual understanding of rational numbers with respect to ratios (comparison of two whole numbers by division a/b , $a:b$, and $a \div b$, where $b \neq 0$); and rates (e.g., a out of b , 25%) using models, explanations, or other representations.

- 15** Jana uses 20 cards to play a memory game. The cards are either animal cards or fruit cards. The ratio of animal cards to fruit cards is 2:3.
- Draw a model to show the ratio of animal cards to fruit cards. Use the letter A to represent animal cards and the letter F to represent fruit cards.
 - How many of the 20 cards are animal cards?
 - Of the fruit cards, $\frac{1}{3}$ have bananas on them. How many cards have bananas on them? Show your work or explain how you know.

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 a representation that shows a ratio of 2 As to 3 Fs (or equivalent)
- Part b: 1 point for correct answer, **8** (cards)
- Part c: 2 points for correct answer, **4** (cards), with sufficient work shown or explanation to indicate correct strategy
- OR
- 1 point for correct answer with insufficient or no explanation or work shown
or
for appropriate strategy with incorrect or no answer

Sample Responses:

Part a: A A F F F or $\frac{A}{F} = \frac{2}{3}$

Part b: 8

Part c: 20 cards – 8 animal cards = 12 fruit cards
1 in 3 out of 12 cards: $12 \div 3 = 4$ cards with bananas

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 4
(EXAMPLE A)

15 a.) 2:3



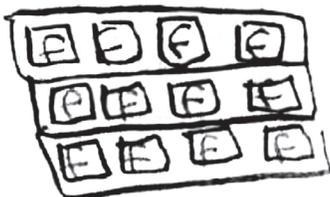
8 animal cards : 12 fruit cards

a.) The student's response is correct.

b.) Eight of the 20 are animal cards

b.) The student's answer is correct.

c.) Four cards have bananas on them.



c.) The student's answer is correct, with appropriate strategy shown.

SCORE POINT 4
(EXAMPLE B)

15

a.) The student's response is correct.

A. A A A A A A A A 8 : = 2 :
F F F F F F F F F F F F 12 = 3

B. Out of the 20 cards 8 of them are animal. I know this because

$$\frac{2 \times 4 = 8}{3 \times 4 = 12} + = 20$$

b.) The student's answer is correct. (Showing work is not required.)

$$C. \begin{array}{r} 4 \\ 3 \overline{) 12} \\ \underline{-12} \\ 0 \end{array}$$

If 1/3 of the fruit cards have bananas on them, 4 cards have bananas. This is because

$$4 \times 1 = 4$$

$$12 \div 3 = 4 \times 1 = 4$$

c.) The student's answer is correct, with appropriate work shown.

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 3
(EXAMPLE A)

15

a. If there are 20 cards, and in every 5, 2 are animals and 3 are fruit, then we multiply each ratio by 4 $(A \cdot 4) + (F \cdot 4) = 20$

a.) The student's response is incorrect.

b.

Or $2 \cdot 4 = 8$ there are 8 animal cards

b.) The student's answer is correct. (Showing work is not required.)

c. There are 12 fruit cards. $\frac{1}{3}$ of 12 is 4. If $\frac{1}{3}$ of cards are bananas, then there are 4 banana cards.

c.) The student's answer is correct, with appropriate explanation.

SCORE POINT 3
(EXAMPLE B)

15

a.



a.) The student's response is correct.

b.

$$\begin{array}{r} 4 \\ \times 3 \\ \hline 12 \end{array} \quad \begin{array}{r} 4 \\ \times 2 \\ \hline 8 \end{array}$$

12 cards

b.) The student's answer is incorrect.

c.

$$12 \div 3 = 4$$

4 cards

c.) The student's answer is correct, with sufficient work shown.

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 3
(EXAMPLE C)

15



a.) The student's response is correct.

(A)

(B)

b.) The student's answer is correct.

There are
8 Animal
cards

(C)

There are 4 cards
with bananas on
them.

c.) The student's answer is correct,
with no explanation or work shown.

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 2
(EXAMPLE A)

15

(A)

$$\boxed{A} \boxed{A} = \boxed{F} \boxed{F} \boxed{F}$$

a.) The student's response is incorrect.
Use of "=" is inappropriate.

(B) 8 of the cards are animal cards

b.) The student's
answer is correct.

(C) 12 fruitcards $\div \frac{1}{3} = 4$ banana cards

12 of the cards are fruit, but $\frac{1}{3}$ of the fruit cards
are banana so $12 \div \frac{1}{3} = 4$

c.) The student's answer is correct, but
the explanation contains an error.

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 2
(EXAMPLE B)

15

A.
2A : 1F

a.) The student's response is incorrect.

B.
14

b.) The student's answer is incorrect.

c. 2 of the fruit cards have bananas on them. How I know this is 14 of the cards have animals on them. Therefore 6 have fruit on them. And $\frac{1}{3}$ of 6 is 2. That's how I found out my answer.

c.) The student's answer is correct based on the answer given in part b, with sufficient explanation to indicate correct strategy.

NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 2
(EXAMPLE C)

15

a.) The student's response is correct.

b.) The student's answer is correct.

A AA: FFF or AA
F F F } B 8

c. $\frac{12}{0} - \frac{1}{3} = \frac{11}{3}$

c.) The student's answer is incorrect, with incorrect strategy.

11 cards have Bananas

SCORE POINT 1

15

a.) The student's response is correct.

b.) The student's answer is incorrect.

b.) $\frac{1}{2}$ animal cards

3 cards are fruit

c.) The student's answer is incorrect, with no explanation or work shown.



NECAP 2010 RELEASED ITEMS
GRADE 7 MATH

SCORE POINT 0

15

a 20 carbs $20 \times 5 = 100$
 $\frac{1}{3}$ are animal $33.1 = a$
 $\frac{2}{3}$ are fruit $83 = F$

a.) The student's response is incorrect.

b $\frac{1}{3}$ are animal $3 \overline{) 100} \begin{matrix} 033 \\ \underline{9} \\ 10 \\ \underline{9} \\ 1 \end{matrix} \text{R1}$
 33.1 animals

b.) The student's answer is incorrect.

c $\frac{2}{3}$ are fruit $3 \overline{) 16.4} \begin{matrix} 005.14 \\ \underline{15} \\ 14 \end{matrix}$
 16.4 fruit
 5.14 are bananas

c.) The student's answer is incorrect, with incorrect strategy.

Grade 7 Mathematics Released Item Information - 2010

Released Item Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No Tools Allowed	✓		✓					✓			✓				
Content Strand ¹	NO	GM	GM	GM	FA	FA	FA	FA	FA	DP	NO	FA	GM	DP	NO
GLE Code	6-3	6-1	6-5	6-6	6-1	6-2	6-2	6-3	6-4	6-4	6-4	6-3	6-5	6-1	6-1
Depth of Knowledge Code	2	2	1	1	2	2	2	1	2	1	2	2	2	3	2
Item Type ²	MC	SA	SA	SA	SA	CR									
Answer Key	A	D	C	B	C	A	C	B	D	D					
Total Possible Points	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4

¹Content Strand: NO = Numbers & Operations, GM = Geometry & Measurement, FA = Functions & Algebra, DP = Data, Statistics, & Probability

²Item Type: MC = Multiple Choice, SA = Short Answer, CR = Constructed Response