New England Common Assessment Program

Released Items
2008

Grade 8
Mathematics

Mathematics

Items with this symbol were selected from Session One—no calculators or other mathematics tools allowed.

1 Look at this table.

Student Groups at Sunrise School

Student Group	Total Number of Members (all grades)	Percent of Members in 8th Grade
Honor society	50	40%
Jazz band	15	80%
Chess club	20	50%
Recycling club	70	30%

Which student group has the least number of members in 8th grade?

A. honor society
B. jazz band
C. chess club
D. recycling club

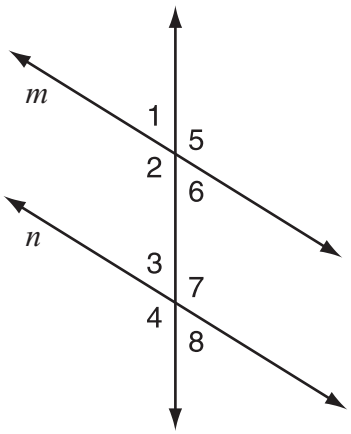
2 The ships of Oceanic Freight traveled approximately 2.3×10^7 nautical miles. Which number could be the actual number of nautical miles the ships traveled?

A. 2,343,167
B. 23,431,671
C. 234,431,671
D. 234,316,710

3 Keesha's computer can receive information at a rate of 52 kilobytes per second. At this rate, how many kilobytes of information can her computer receive in one minute?

A. 3012
B. 3120
C. 5020
D. 5200

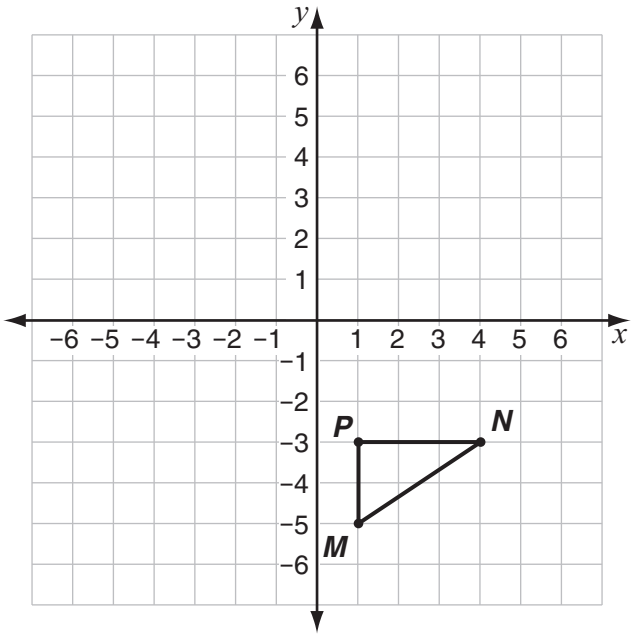
4 In the diagram below, lines m and n are parallel.



Which angles are congruent to $\angle 1$?

A. $\angle 2$, $\angle 3$, and $\angle 8$
B. $\angle 5$, $\angle 2$, and $\angle 3$
C. $\angle 6$, $\angle 7$, and $\angle 4$
D. $\angle 6$, $\angle 3$, and $\angle 8$

5 Look at triangle *MNP*.



What are the coordinates of the image of point *N* after a 180° clockwise rotation about point *P*?

A. (–2, –3)
B. (–3, –4)
C. (–3, –2)
D. (–4, –3)

6 The base of a circular pool has a radius of 3 feet. What is the approximate area of the base of the pool? (Use 3.14 for π.)

A. 88.74 square feet
B. 37.78 square feet
C. 28.26 square feet
D. 18.84 square feet

7 Ian and Lauren are each making patterns that follow the same rule.

Ian's pattern: 1, 4, 16, 64
Lauren's pattern: –2, –8, ____

What is the next number in Lauren's pattern?

A. –14
B. –16
C. –24
D. –32

8 This table shows the cost of renting a kayak.

Hours	Cost
1	$13
2	$21
3	$29
4	$37
5	$45

The cost of renting a kayak is represented by the equation $y = 8x + 5$, where x represents the number of hours. What does the slope of the equation represent?

A. the total cost for the rental
B. the cost of renting a kayak for 5 hours
C. the cost of renting a kayak for 8 hours
D. the cost increase for each hour of rental

9 Tessa bakes muffins in an oven.

- The oven takes 10 minutes to warm up before the first tray of muffins can be baked.
- Each tray of muffins takes 20 minutes to bake.

Which table shows the relationship between the number of trays of muffins Tessa bakes and the total oven time?

A.

Number of Trays of Muffins	Total Oven Time (minutes)
1	30
2	40
3	50
4	60

B.

Number of Trays of Muffins	Total Oven Time (minutes)
1	10
2	30
3	50
4	70

C.

Number of Trays of Muffins	Total Oven Time (minutes)
1	30
2	50
3	70
4	90

D.

Number of Trays of Muffins	Total Oven Time (minutes)
1	30
2	60
3	90
4	120

10 The equation below can be used to convert Celsius temperature, C, to Fahrenheit temperature, F.

$$F = 1.8C + 32$$

What is the Fahrenheit temperature when the Celsius temperature is 20 degrees?

A. 33.8 degrees Fahrenheit
B. 50 degrees Fahrenheit
C. 53.8 degrees Fahrenheit
D. 68 degrees Fahrenheit

11 Megan made 3 posters in 15 minutes. At that rate, how long will it take Megan to make 24 posters?

12 What number comes next in the pattern below?

$$\frac{1}{3}, \frac{2}{3}, \frac{4}{3}, \frac{8}{3}, \frac{16}{3}, ?$$

13 The lengths of two sides of a triangle are 20 cm and 32 cm.

a. Explain why the third side of the triangle can or cannot have a length of 10 cm.

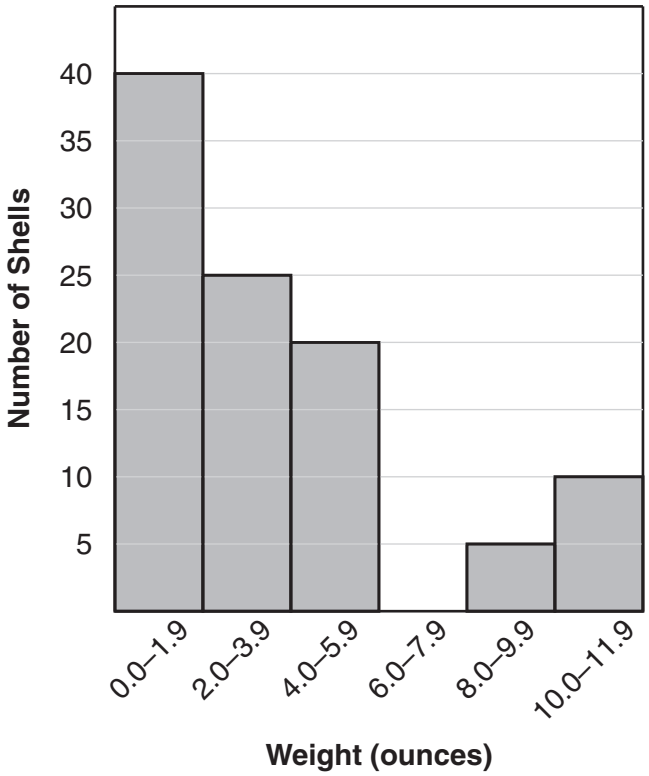
b. Explain why the third side of the triangle can or cannot have a length of 48 cm.

14 Ken wants to earn \$37.50 to buy a computer game. He uses the equation below to calculate the number of hours, h, he needs to babysit to earn the \$37.50.

$$5h + 10 = 37.50$$

How many hours does Ken need to babysit to earn enough money to buy the computer game?

15 Terry weighed each of the seashells in his collection to the nearest tenth of an ounce. This histogram displays his results.



a. How many seashells are in Terry's collection altogether?

b. Explain whether or not the median weight of Terry's seashells is between 4.0 and 5.9 ounces.

Terry adds another seashell to his collection. The new seashell weighs 27.8 ounces.

c. Explain whether or not the **mode** of the weights will change when Terry includes 27.8 ounces.

d. Explain whether or not the **mean** of the weights will change when Terry includes 27.8 ounces.

Grade 8 Mathematics Released Item Information

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	NO	NO	GM	GM	GM	FA	FA	FA	FA	NO	FA	GM	FA	DP
GSE Code	7-1	7-2	7-4	7-1	7-4	7-6	7-1	7-2	7-2	7-3	7-4	7-1	7-2	7-4	7-1
Depth of Knowledge Code	2	2	1	1	2	1	2	2	2	1	2	2	2	2	3
Item Type[2]	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	SA	SA	SA	SA	CR
Answer Key	C	B	B	D	A	C	D	D	C	D					
Total Possible Points	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4

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

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

New England Common Assessment Program

Released Items Support Materials 2008

Grade 8 Mathematics

N&O 7.1 **Demonstrates conceptual understanding of rational numbers with respect to percents** as a means of comparing the same or different parts of the whole when the wholes vary in magnitude (e.g., 8 girls in a classroom of 16 students compared to 8 girls in a classroom of 20 students, or 20% of 400 compared to 50% of 100); and percents as a way of expressing multiples of a number (e.g., 200% of 50) **using models, explanations, or other representations**.

1 Look at this table.

Student Groups at Sunrise School

Student Group	Total Number of Members (all grades)	Percent of Members in 8th Grade
Honor society	50	40%
Jazz band	15	80%
Chess club	20	50%
Recycling club	70	30%

Which student group has the least number of members in 8th grade?

A. honor society
B. jazz band
C. chess club
D. recycling club

N&O 7.2 **Demonstrates understanding of the relative magnitude of numbers** by ordering, comparing, or identifying equivalent rational numbers across number formats, numbers with whole number bases and whole number exponents (e.g., 3^3, 4^3), integers, absolute values, or numbers represented in scientific notation using number lines or equality and inequality symbols.

2 The ships of Oceanic Freight traveled approximately 2.3×10^7 nautical miles. Which number could be the actual number of nautical miles the ships traveled?

A. 2,343,167

B. 23,431,671

C. 234,431,671

D. 234,316,710

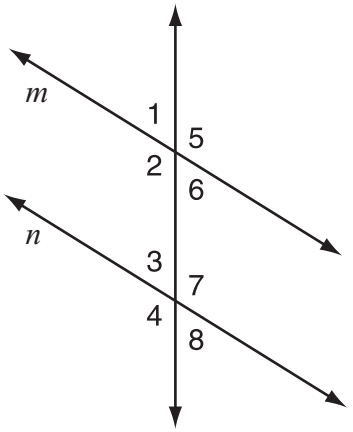
N&O 7.4 **Accurately solves problems involving** proportional reasoning; percents involving discounts, tax, or tips; and rates. (IMPORTANT: *Applies the conventions of order of operations including parentheses, brackets, or exponents.*)

3 Keesha's computer can receive information at a rate of 52 kilobytes per second. At this rate, how many kilobytes of information can her computer receive in one minute?

A. 3012
B. 3120
C. 5020
D. 5200

G&M 7.1 **Uses properties of angle** relationships resulting from two or three intersecting lines (adjacent angles, vertical angles, straight angles, or angle relationships formed by two non-parallel lines cut by a transversal), or two parallel lines cut by a transversal to solve problems.

4 In the diagram below, lines m and n are parallel.



Which angles are congruent to $\angle 1$?

A. $\angle 2$, $\angle 3$, and $\angle 8$

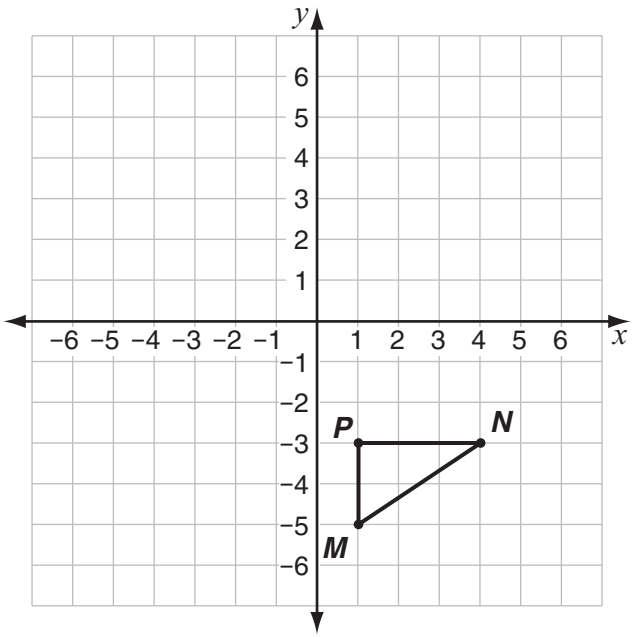
B. $\angle 5$, $\angle 2$, and $\angle 3$

C. $\angle 6$, $\angle 7$, and $\angle 4$

D. $\angle 6$, $\angle 3$, and $\angle 8$

G&M 7.4 **Applies the concepts of congruency** by solving problems on a coordinate plane involving reflections, translations, or rotations.

5 Look at triangle *MNP*.



What are the coordinates of the image of point *N* after a 180° clockwise rotation about point *P*?

A. (–2, –3)
B. (–3, –4)
C. (–3, –2)
D. (–4, –3)

G&M 7.6 **Demonstrates conceptual understanding of the area** of circles or the area or perimeter of composite figures (quadrilaterals, triangles, or parts of circles), **and the surface area of** rectangular prisms, **or volume of** rectangular prisms, triangular prisms, or cylinders using models, formulas, or by solving related problems. Expresses all measures using appropriate units.

6 The base of a circular pool has a radius of 3 feet. What is the approximate area of the base of the pool? (Use 3.14 for π.)

A. 88.74 square feet

B. 37.78 square feet

C. 28.26 square feet

D. 18.84 square feet

F&A 7.1 **Identifies and extends to specific cases a variety of patterns** (linear and nonlinear) represented in models, tables, sequences, graphs, or in problem situations; **and generalizes** a linear relationship using words and symbols; generalizes a linear relationship to find a specific case; or writes an expression or equation using words or symbols to express the **generalization** of a nonlinear relationship.

7 Ian and Lauren are each making patterns that follow the same rule.

Ian's pattern: 1, 4, 16, 64

Lauren's pattern: –2, –8, ____

What is the next number in Lauren's pattern?

A. –14

B. –16

C. –24

D. –32

F&A 7.2 **Demonstrates conceptual understanding of linear relationships** ($y = kx$; $y = mx + b$) **as a constant rate of change** by solving problems involving the relationship between slope and rate of change, by describing the meaning of slope in concrete situations, or informally determining the slope of a line from a table or graph; **and distinguishes between constant and varying rates** of change in concrete situations represented in tables or graphs; **or 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.

8 This table shows the cost of renting a kayak.

Hours	Cost
1	$13
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The cost of renting a kayak is represented by the equation $y = 8x + 5$, where x represents the number of hours. What does the slope of the equation represent?

A. the total cost for the rental
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9 Tessa bakes muffins in an oven.

- The oven takes 10 minutes to warm up before the first tray of muffins can be baked.
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3	50
4	70

C.

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2	50
3	70
4	90

D.

Number of Trays of Muffins	Total Oven Time (minutes)
1	30
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4	120

F&A 7.3 **Demonstrates conceptual understanding of algebraic expressions** by using letters to represent unknown quantities to write algebraic expressions (including those with whole number exponents or more than one variable); or by evaluating algebraic expressions (including those with whole number exponents or more than one variable); or by evaluating an expression within an equation (e.g., determine the value of y when $x = 4$ given $y = 5x^3 - 2$).

10 The equation below can be used to convert Celsius temperature, C, to Fahrenheit temperature, F.

$$F = 1.8C + 32$$

What is the Fahrenheit temperature when the Celsius temperature is 20 degrees?

A. 33.8 degrees Fahrenheit

B. 50 degrees Fahrenheit

C. 53.8 degrees Fahrenheit

D. 68 degrees Fahrenheit

N&O 7.4 **Accurately solves problems involving** proportional reasoning; percents involving discounts, tax, or tips; and rates. (IMPORTANT: *Applies the conventions of order of operations including parentheses, brackets, or exponents.*)

11 Megan made 3 posters in 15 minutes. At that rate, how long will it take Megan to make 24 posters?

Scoring Guide

Score	Description
1	Student gives correct answer, **120** (minutes) **or equivalent**.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

SCORE POINT 1
(EXAMPLE A)

11

It will take her 120 minutes. 5 min. per poster, 24×5=120.

Student's response is correct.
(Showing work is not required.)

SCORE POINT 1
(EXAMPLE B)

11

120 min. = 2 hours

Student's response is correct.

SCORE POINT 1
(EXAMPLE C)

11

120 min.s

Student's response is correct.

Score Point 0
(Example A)

11

3 posters = 15 minutes means 1 poster every 5 min. so
24 posters are made in 128 minuts or 2 hr. and 8 min.

Student's response is incorrect.

Score Point 0
(Example B)

11

$3\overline{)15}$ = 5

$5\overline{)24}$ = 4.4
-20
4

4.4 min.

Student's response is incorrect.

F&A 7.1 **Identifies and extends to specific cases a variety of patterns** (linear and nonlinear) represented in models, tables, sequences, graphs, or in problem situations; **and generalizes** a linear relationship using words and symbols; generalizes a linear relationship to find a specific case; or writes an expression or equation using words or symbols to express the **generalization** of a nonlinear relationship.

12 What number comes next in the pattern below?

$$\frac{1}{3}, \frac{2}{3}, \frac{4}{3}, \frac{8}{3}, \frac{16}{3}, ?$$

Scoring Guide

Score	Description
1	Student gives correct answer, $\frac{32}{3}$ **or equivalent**.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

SCORE POINT 1
(EXAMPLE A)

⓬ $\frac{32}{3}$

Student's response is correct.

SCORE POINT 1
(EXAMPLE B)

⓬ double the top #

$\frac{1}{3} - \frac{2}{3} - \frac{4}{3} - \frac{8}{3} - \frac{16}{3} - \frac{32}{3}$

Student's response is correct. (Explanation is not required.)

SCORE POINT 0
(EXAMPLE A)

⓬ 32

Student's response is incorrect.

SCORE POINT 0
(EXAMPLE B)

⓬ $\frac{1}{3}$ $\frac{2}{3}$ $\frac{4}{3}$ $\frac{8}{3}$ $\frac{26}{3}$

Student's response is incorrect.

G&M 7.2 **Applies theorems or relationships** (triangle inequality or sum of the measures of interior angles of regular polygons) to solve problems.

13 The lengths of two sides of a triangle are 20 cm and 32 cm.

a. Explain why the third side of the triangle can or cannot have a length of 10 cm.

b. Explain why the third side of the triangle can or cannot have a length of 48 cm.

Scoring Guide

Score	Description
2	Student provides correct answers and explanations for both parts.
1	Student provides correct answer and explanation for one part. OR Student provides explanation that indicates some understanding of the principle of the triangle inequality (e.g., has upper or lower limit correct with explanation).
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Note: The focus of this item is not the yes/no answer. Therefore, for a 1-score, focus on the explanations provided.

Score Point 2
(Example A)

13

a it cant have a leingh of
10 because 20 + 10 is less than 32.

b it can have a leingh of
48 because 20 + 32 = 52.

Student's explanation for each part is correct.

Score Point 2
(Example B)

13

a) It cannot because 32 is 12 cm longer than 20 so it wouldn't be long enough.
b) It can have 48 cm because 32 is only 12 more than 20 cm 48 is weigh longer than 12 it could fit and 48 is only 28 more than 20 and 16 more than 32 so either way it is long enough

Student's explanation for each part is correct.

Score Point 1
(Example A)

13

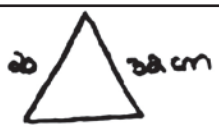
a. The third side can be 10 cm because 20+32>10
b. The third side can be 48 cm becaus 20+32>48

Student's explanation for part b is correct.

Score Point 0
(Example A)

13

A It could have 10 cm as base because the base can be any number



B. It can have 48 cm base because the base can be any number

Student's explanation for each part is incorrect.
(No credit is given for correct answer in part b.)

Score Point 0
(Example B)

13

(A) It cannot be a length of ten because The total degrees have to sum up to 180°.

(B) It cannot be 48° because the total degrees need to sum up to 180°.

Student's explanation for each part is incorrect.

F&A 7.4 **Demonstrates conceptual understanding of equality** by showing equivalence between two expressions (expressions consistent with the parameters of the left- and right-hand sides of the equations being solved at this grade level) using models or different representations of the expressions, solving multi-step linear equations of the form $ax \pm b = c$ with $a \neq 0$, $ax \pm b = cx \pm d$ with $a, c \neq 0$, and $(x/a) \pm b = c$ with $a \neq 0$, where a, b, c and d are whole numbers; or by translating a problem-solving situation into an equation consistent with the parameters of the type of equations being solved for this grade level.

14 Ken wants to earn \$37.50 to buy a computer game. He uses the equation below to calculate the number of hours, h, he needs to babysit to earn the \$37.50.

$$5h + 10 = 37.50$$

How many hours does Ken need to babysit to earn enough money to buy the computer game?

Scoring Guide

Score	Description
2	Student gives correct answer, **5.5** (hours) **or equivalent**.
1	Student demonstrates appropriate strategy, with incorrect or no answer.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Score Point 2
(Example A)

14

$5h + 10 = 37.50$

$5h = 37.50 - 10$

$5h = 27.5$

$h = 27.5 \div 5$

$h = 5.5$ hours.

Student's response is correct.

Score Point 2
(Example B)

14

He needs 5.5 hours

Student's response is correct.

Score Point 1
(Example A)

14

$37.50 = 10 + 5h$
$-10 \qquad -10$
$27.50 \qquad 0$
$5 \qquad 5$

5 hour 50min.

Student's strategy is appropriate, with an incorrect answer.

Score Point 1
(Example B)

14

$\$37.50 = 5h + 10$
$-10 \qquad -10$
$37.40 = 5h \qquad 0$
$5 \qquad 5$
$7.48 = h$

about 7 hours

Student's strategy is appropriate, with an incorrect answer.

Score Point 0
(Example A)

14

$\frac{5K}{5} + 10 = \frac{37.15}{5} = 7.43$

$+10.00$

He has to work 17.43

17.43 to get enough money.

Student's response is incorrect.

Score Point 0
(Example B)

14

Ren need to babysit around 7 hours and 30 minutes to make enough money.

r.0

5) 37.50

35.00

2.50

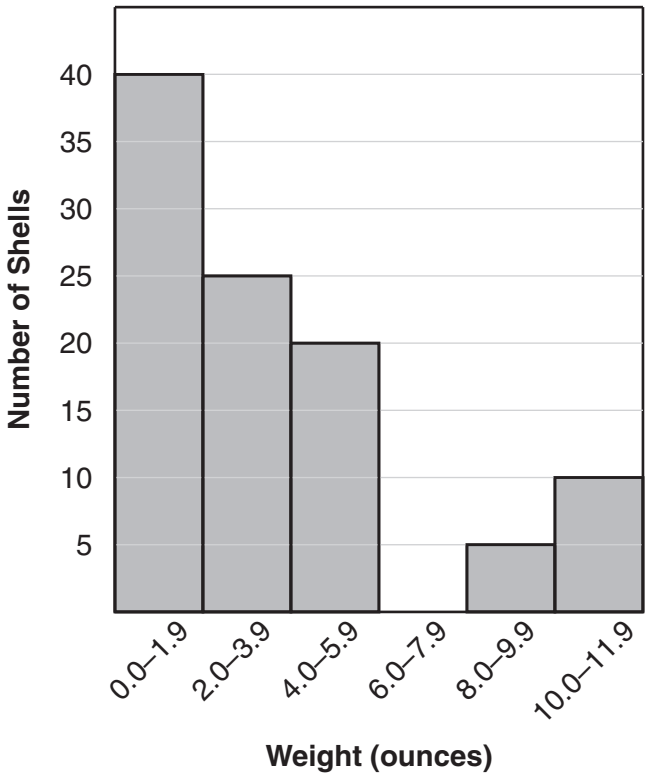
2.50

.00

Student's response is incorrect.

DSP 7.1 **Interprets a given representation** (circle graphs, scatter plots that represent discrete linear relationships, or histograms) to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems. (IMPORTANT: Analyzes data consistent with concepts and skills in M(DSP)-7-2.)

15 Terry weighed each of the seashells in his collection to the nearest tenth of an ounce. This histogram displays his results.



a. How many seashells are in Terry's collection altogether?

b. Explain whether or not the median weight of Terry's seashells is between 4.0 and 5.9 ounces.

Terry adds another seashell to his collection. The new seashell weighs 27.8 ounces.

c. Explain whether or not the **mode** of the weights will change when Terry includes 27.8 ounces.

d. Explain whether or not the **mean** of the weights will change when Terry includes 27.8 ounces.

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 correct answer, **100** (seashells)

Part b: 1 point for correct explanation that shows an understanding of median, or correct explanation based on incorrect answer in part a

Part c: 1 point for explanation that shows an understanding of why the mode will not change

Part d: 1 point for explanation that shows an understanding of why the mean will change

Notes:

If student gets the correct answers only to parts c and d without sufficient explanation, award 1 point total for the two parts.

Providing a definition for “mode” or “mean” in parts c or d is not a sufficient explanation as definitions are given on reference sheets.

SCORE POINT 4
(EXAMPLE A)

15

a. 40 + 25 + 20 + 5 + 10 = 100 seashells

a) Student's response is correct. (Showing work is not required.)

b. The median does not between 4.0 and 5.9 ounces because there are more seashells that weigh under 4 ounces than there are that weigh more than 4 ounces.

c. The mode will not change because the new weight is not the same as any previous weight.

d. The mean will change because now there is a new number to include when you add all the numbers together and then divide by the number of seashells there are. It will be affected a lot because the number is high.

d) Student's explanation is correct.

c) Student's explanation is correct.

b) Student's explanation is correct.

Score Point 3
(Example A)

15

a. 100

b. It isn't, because the 50th seashell in weight is in 2.0-3.9.

c. No, because there are no other 27.8 ounce seashells.

d. The mean will rise when Terry adds a 27.8 ounce seashell because every seashell affects the mean.

d) Student's explanation demonstrates a misconception about the mean.

c) Student's explanation is correct.

b) Student's explanation is correct.

a) Student's response is correct.

SCORE POINT 3
(EXAMPLE B)

15

a) 40+25+20+5+10 = (100 Shells)

b) The median is not between 4.0 and 5.9 ounces because the median is the middle value and there are many many more values less than 4.0 and 5.9 so they are not the median

c) The mode will not change because mode is the value that occurs most often and adding an outlying wieght won't effect that.

d) The mean will change because the mean is all the numbers added together than divided by the number of values. adding the new shell will increase the mean

d) Student's explanation is insufficient. (Providing the definition of "mean" is not enough to receive credit.)

c) Student's explanation is correct.

b) Student's explanation is correct.

a) Student's response is correct. (Showing work is not required.)

Score Point 2
(Example A)

15

(A) There are 100 seashells in Terry's collection altogether.

(B) 0.0, 1.9, 2.0, 3.9, 4.0, 5.9, 6.0, 7.9, 8.0, 9.9, 10.0, 11
the median weight is between 5.9 and 6.0. I know this because I lined them up in order and crossed them off.

(C) The mode will not change because to be the mode you need more than one seashell the same weight.

(D) 71.4 1st mean
99.2 2nd mean
Yes, the mean will change because your adding another number in to be added.

d) Student's explanation is incorrect.

c) Student's explanation is correct.

b) Student's explanation is incorrect.

a) Student's response is correct.

Score Point 2
(Example B)

15

a. There are 100 seashells total in Terry's collection.

b. The median weight is between 4.0 and 5.9 ounces.

c. The mode would not change because the mode is which weight occurs the most. (the one with the highest frequency). So 1 seashell would not change this.

d. The mean of the weights would change because the mean is all numbers added divided by how many in the data set. Therefor the mean would change.

c and d) Student's answers to both parts are correct, with insufficient explanation.

b) Student's response is incorrect.

a) Student's response is correct.

Score Point 1
(Example A)

15

a

40
25
+20
5
10
100

d) Student's explanation is incorrect.

d NO Because OF The same numer

b I would say 4.0

b) Student's response is incorrect.

c yes The mode will change TO a differnt number

c) Student's response is incorrect.

a) Student's response is correct.
(Showing work is not required.)

Score Point 0
(Example A)

15

A.) 40 Seashells are in Terrys collection

B.) yes it is in the middle

C.) yes the mode will change when Terry adds a 27.8 ounce seashell

D.) yes it will.

Student's response to each part is incorrect.