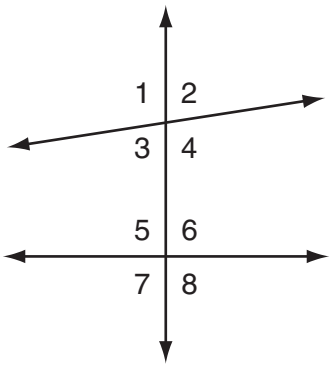
New England Common Assessment Program

Released Items Support Materials 2010

Grade 8 Mathematics

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.

1 Look at the angles formed by the intersecting lines.



Which angles must be congruent?

A. $\angle 2$ and $\angle 7$

B. $\angle 4$ and $\angle 6$

C. $\angle 5$ and $\angle 8$

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

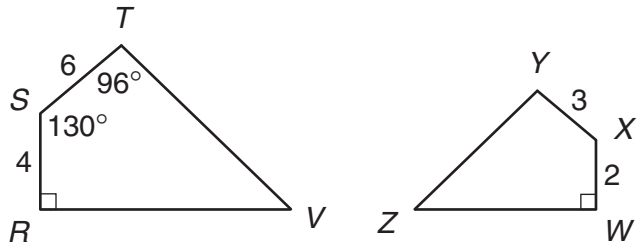
G&M 7.2 **Applies theorems or relationships** (triangle inequality or sum of the measures of interior angles of regular polygons) to solve problems.

2 In triangle FGH, the measure of $\angle G$ is 60°. The measure of $\angle F$ is twice the measure of $\angle H$. What is the measure of $\angle F$?

A. 80°
B. 90°
C. 100°
D. 120°

G&M 7.5 **Applies concepts of similarity** by solving problems involving scaling up or down and their impact on angle measures, linear dimensions and areas of polygons, and circles when the linear dimensions are multiplied by a constant factor. Describes effects using models or explanations.

3 Quadrilateral $RSTV$ is similar to quadrilateral $WXYZ$ (quadrilateral $RSTV \sim$ quadrilateral $WXYZ$).



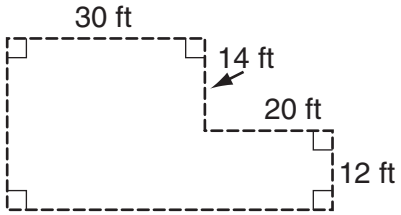
not drawn to scale

What is the degree measure of $\angle Y$?

A. 96°
B. 90°
C. 65°
D. 48°

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.

4 Judi built the fence shown below.



The fence costs $12 per foot. What was the total cost for the fence?

A. $ 152
B. $ 912
C. $1344
D. $1824

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.

5 In addition to paying an employee a salary, a company deposits money in a savings plan for the employee.

Salary	Deposit in Savings Plan
$200.00	$20.00
$250.00	$25.00
$300.00	$30.00
$350.00	$35.00

Which expression represents the amount of money deposited in the savings plan of an employee whose salary is x dollars?

A. $\frac{1}{5}x$

B. $\frac{1}{10}x$

C. $x + 5$

D. $x + 50$

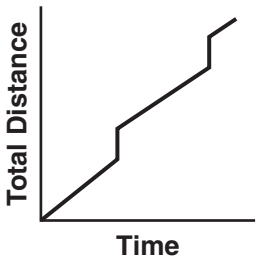
F&A 7.2 **Demonstrates conceptual understanding of linear relationships** ($y = kx$; $y = mx + b$) **as a constant rate of change** by solving problems involving the relationship between slope and rate of change, by describing the meaning of slope in concrete situations, or informally determining the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

6 During a bike ride, Zack rested for ten minutes each hour. Which graph could represent the total distance Zack traveled over time?

A.

B.

C.

D.


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 $y = 5x^3 - 2$).

7 Look at this equation.

$$y = -4x - 6$$

What is the value of y when $x = -7$?

A. –34
B. –22
C. 22
D. 34

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.

8 On her reading quiz, Sara earned 20 more than half the number of points she earned on her math quiz.

Which equation shows the relationship between r, the number of points Sara earned on her reading quiz, and m, the number of points she earned on her math quiz?

A. $r = \frac{1}{2}m + 20$

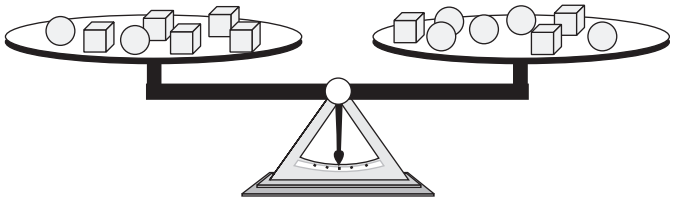
B. $m = \frac{1}{2}r + 20$

C. $r = 20\left(m + \frac{1}{2}\right)$

D. $m = 20\left(r + \frac{1}{2}\right)$

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.

9 The scale below is balanced.



Which statement is true?

A. ◯◯ weighs the same as ▢

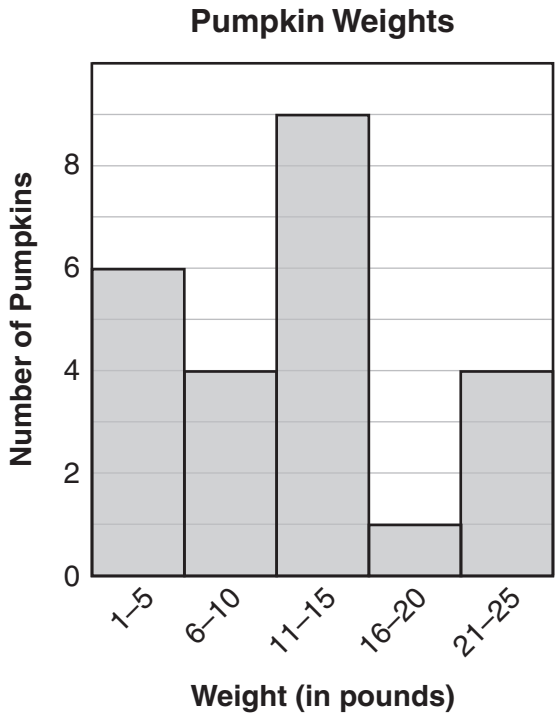
B. ▢▢ weighs the same as ◯

C. ◯◯ weighs the same as ▢▢▢

D. ▢▢ weighs the same as ◯◯◯

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.)

10 Each student in Colin's class picked a pumpkin. This histogram shows the distribution of weights, to the nearest pound, of the pumpkins the students picked.



Based on the information in this histogram, which statement **must** be true?

A. One pumpkin weighs 16 pounds.

B. The lightest pumpkin weighs 1 pound.

C. Half of the pumpkins weigh less than 13 pounds.

D. One-fourth of the pumpkins weigh less than 6 pounds.

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

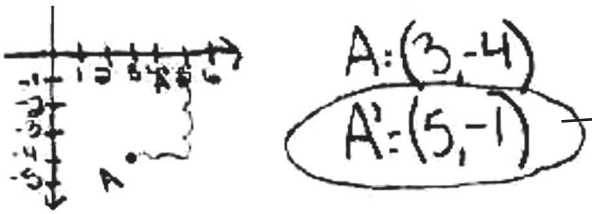
11 The point (3, –4) is translated 2 units to the right and 3 units up. What are the coordinates of the image of (3, –4)?

Scoring Guide

Score	Description
1	for correct answer, **(5, –1)**
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

11



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

Score Point 0
(Example A)

11

The student's response is incorrect.

Score Point 0
(Example B)

11

(3,-1) and (5,-1) including (3,-4)

The student's response is incorrect.

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.

12 This table shows the relationship between time, in minutes, and the number of steps Joel took on a stair-climbing machine.

Time (in minutes)	Number of Steps
2	160
5	400
12	960
15	1200

Joel took steps at a constant rate. What is Joel's rate in steps per minute?

Scoring Guide

Score	Description
1	for correct answer, **80**
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)

12

160 ÷ 2 = 80
400 ÷ 5 = 80
960 ÷ 12 = 80
1200 ÷ 15 = 80

80 steps per minute

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

Score Point 1
(Example B)

12

80 steps/minute

The student's answer is correct.

Score Point 0

12

The pattern is plus 3 then plus 7 then plus three

2+3=5 5+7=12 12+3=15

The 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.

13 Look at this pattern.

126, 62, 30, 14, 6, . . .

a. What is the next number in the pattern?

b. Use words or symbols to describe the pattern.

Scoring Guide

Score	Description
2	both parts correct
1	part a correct but invalid reason in part b **OR** part a incorrect but student shows understanding of pattern in part b
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Sample Responses:

a. 2

b. Divide by 2 then subtract 1.

OR

I divided the last difference by 2 and subtracted that from the last number to get the next number.

OR

Subtract 2 then divide by 2.

SCORE POINT 2
(EXAMPLE A)

13

A) the next number is 2

B) divide by 2, then subtract 1

The student's answers to both parts are correct.

SCORE POINT 2
(EXAMPLE B)

13

a. The next number is 2.

b. The pattern is $\frac{x}{2} - 1$.

x = the # before

The student's answers to both parts are correct.

SCORE POINT 1
(EXAMPLE A)

13

a. 2

b You subtract the seond number from the first to find out how much the pattern is taking away each time.

The student's answer to part a is correct. The student's explanation in part b is insufficient.

SCORE POINT 1
(EXAMPLE B)

13

a.) n ÷ 2 - 1
b. take the number and divide by two then minus one.

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

SCORE POINT 0
(EXAMPLE A)

13

a. 1
b. You divide by two and subtract two.

The student's answers to both parts are incorrect.

SCORE POINT 0
(EXAMPLE B)

13

a) -2
B) -8 (Subtract 8)

The student's answers to both parts are incorrect.

DSP 7.3 **Identifies or describes representations or elements of representations that best display a given set of data or situation,** consistent with the representations required in M(DSP)–7–1.

14 Nicole is writing an article for the school newspaper about how students use computers. She plans to survey 100 randomly chosen students with this question.

What are all the ways you use a computer?

Nicole plans to display her data in a circle graph.

a. Explain why a circle graph would **not** be a good choice for the data she will collect.

b. Rewrite Nicole's question so that the results could be displayed in a circle graph.

Scoring Guide

Score	Description
2	for correct explanation in part a and appropriate question in part b
1	for correct explanation in part a **OR** for appropriate question in part b
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Sample Responses:

a. The question allows for too many different answers to be displayed in a circle graph.

b. Which way do you use your computer most? (choose one)

a. Schoolwork b. Games c. E-mail d. Other

Score Point 2
(Example A)

14

a.) a circle graph is not a good graph for Nicole's project because there wont be enough room for everything so it will look confusing.
b.) What do you use the computer for most?

The student's responses to both parts are appropriate.

Score Point 2
(Example B)

14

(A) A circle graph will not be a good way to show all her data because she will have tons of data from each person and won't have enough room.
(B) What is one way that you can use a Computor

The student's responses to both parts are appropriate.

Score Point 1
(Example A)

14

A) Well with the question it would be hard to organize all those answers in a circle graph.

B) What ways could you use a computer?

The student's response to part a is appropriate. The student's question in part b is equivalent to the question given in the problem.

Score Point 1
(Example B)

14

a. people may say more than other people do.

b. What is the one thing you mostly use a computer for?

The student's response to part a is insufficient. The student's question in part b is appropriate.

Score Point 0
(Example A)

14

a. The circle graph is a bad idea because it wont show you what you need it would be better to use a bar graph.
b. Ways people use the computer.

The student's response to part a does not appropriately address why a circle graph would not be a good choice. The student's response to part b is not phrased as a question, nor does it imply a question that would limit the data enough to make a circle graph appropriate.

Score Point 0
(Example B)

14

A. A circle graph is not a good graph to use Cause some people Don't Know how to read a circle graph.

B. What are all the ways to Know how to use a Computer?

The student's response to part a is not relevant. The student's question in part b is equivalent to the question given in the problem.

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.*)

15 Each day, Aidan skates laps around an ice rink. The length of each lap Aidan skates is $\frac{1}{8}$ mile.

a. On Saturday, Aidan skated 12 laps. What is the distance, in miles, that Aidan skated?

b. On Sunday, Aidan skated $2\frac{1}{2}$ miles. How many laps did he skate on Sunday? Show your work or explain how you know.

c. On Monday and Tuesday, Aidan skated a total of 40 laps around the ice rink. On Tuesday, he skated $\frac{2}{5}$ of the total distance he skated on both days. How many miles did Aidan skate on Monday? Show your work or explain how you know.

Scoring Guide

Score	Description
4	5 points
3	4 points or 3 points with at least one point from each part
2	2 or 3 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, $\mathbf{1\frac{1}{2}}$ (miles) **or equivalent**

Part b: 2 points for the correct answer, **20** (laps), with sufficient explanation or work shown to indicate correct strategy

OR

1 point for the correct answer with insufficient or no explanation or work shown

or

for appropriate strategy with incorrect or no answer

Part c: 2 points for the correct answer, **3** (miles), with sufficient explanation or work shown to indicate correct strategy

OR

1 point for the correct answer with insufficient or no explanation or work shown

or

for appropriate strategy with incorrect or no answer

Sample Responses:

a. $1\frac{1}{2}$ miles

b. $2\frac{1}{2} \div \frac{1}{8} = \frac{5}{2} \times 8 = 20$ laps

c. $40 \times \frac{2}{5} = 16$ laps skated on Tuesday

$40 - 16 = 24$ laps skated on Monday

24 laps $\times \frac{1}{8}$ mile $= 3$ miles skated on Monday

OR

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

$\frac{3}{5} \times 40 \times \frac{1}{8} = \frac{3 \times 40}{40} = 3$ miles skated on Monday

Score Point 4
(Example A)

15

A.) $\frac{1}{8} \times \frac{12}{1}$ $\frac{12}{8}$

$\begin{array}{r} 12 \\ -8 \\ \hline 4 \end{array}$

$1\frac{4}{8} = 1\frac{1}{2}$

Aidan skated 1 and 1/2 miles.

Showing my work

Aidan skated 20 laps

B.) 12 laps = $1\frac{1}{2}$ miles

1 lap = 1/8 mile → $\frac{1}{8} \times \frac{8}{1} = 1$

$1 + 1\frac{1}{2} = 2\frac{1}{2}$ → $\times \frac{12}{8}$

20

C) work

$M + T = 40$

$M = \frac{3}{5}$ $T = \frac{2}{5}$

$5\overline{)40}$ 8

$M = 8+8+8$ $T = 8+8$

$M = 24$ $T = 16$

Aidan skated 3 miles on monday.

$\frac{24}{1} \times \frac{1}{8} = \frac{3}{1}$

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

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

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

Score Point 4
(Example B)

15

a) $\frac{1}{8} \cdot \frac{12}{1} = \frac{12}{8} = \frac{3}{2} = 1\frac{1}{2} = 1.5$

He skated 1.5 miles

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

b) $\frac{1}{8} \cdot \frac{20}{1} = \frac{20}{8} = \frac{5}{2} = 2\frac{1}{2} = 2.5$

He skated 20 laps

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

c) $\frac{3}{5} \cdot \frac{40}{1} = \frac{120}{5} = \frac{24}{1}$ He skated 24 laps on monday

$\frac{1}{8} \cdot \frac{24}{1} = \frac{24}{8} = 3$

He skated 3 miles monday

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

Score Point 4
(Example C)

15

a. 1 lap = $\frac{1}{8}$ mile. 1 mile = 8 laps
12 laps is equal to $1\frac{1}{2}$ miles. 1 mile is 8 laps and $\frac{1}{2}$ mile is 4 laps 8+4=12.

b. Since 1 mile = 8 laps, If Aidan Skated $2\frac{1}{2}$ miles than he skated 20 laps 2 miles is 16 laps + $\frac{1}{2}$ mile (4 laps).

c. $\frac{2}{5}$ of 40 is 16. 16 laps = 2 miles. 40-16= 24. 24 is the number of laps he skated on Monday. 24 laps = 3 miles. Aidan Skated 3 miles on Monday.

a) The student's answer is correct. (Explanation is not required.)

b) The student's answer is correct, with sufficient explanation.

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

Score Point 3
(Example A)

15

(A) $\frac{1}{8} \cdot \frac{12}{1} = \frac{12}{8} = \frac{6}{4} = \frac{3}{2} = 1\frac{1}{2}$ miles

a) The student's answer is correct. (Explanation is not required.)

(B) $2\frac{1}{2} = \frac{5}{2} \cdot \frac{8}{1}\ \frac{40}{2} = 20$ laps

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

(C) $\frac{40}{1} \cdot \frac{2}{5} = \frac{80}{5} = \frac{18}{1}$

Tuesday 18 laps Monday 22 laps

$\frac{22}{1} \cdot \frac{1}{8} = \frac{22}{8} = 2\frac{3}{4}$ miles on Monday

8 | 22 | 2
16 | .5
6 | .2
4 | .05
2.75
1.6
.4
.4
0

c) The student's strategy is correct, with an incorrect answer due to a computation error.

Score Point 3
(Example B)

15

a) A mile and a half

a) The student's answer is correct.

B) $1 = \frac{8}{8}$ $\frac{8}{8} + \frac{8}{8} + \frac{4}{8} = \frac{20}{8} = 20$ laps

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

c) 3 miles

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

Score Point 2
(Example A)

15

A) 12 laps = 1/8 mile each = 12/8 = 1 5/8 miles

a) The student's answer is incorrect.

B) 2 1/2 miles = 2 4/8 = 20/8 = 20 laps

2 1/2 miles is equal to 2 4/8 miles. 2 times 8 is 16 plus 4 is 20. If each lap is 1/8 of a mile then he skated 20 laps.

b) The student's answer is correct, with sufficient explanation.

C) 40 ÷ 5 = 8 × 2 = 16 = 2/5 (Tuesday) 40 − 16 = 24 = 3/5 (Monday)

40 divided by 5 equals 8. 8 times 2 equals 16 or 2/5 of 40. If Aidan skated 2/5 on Tuesday, then he skated 3/5 on Monday. 40 minus 16 (2/5) equals 24 (3/5). Aidan skated 24 laps on Monday.

c) The student's strategy is correct, with answer that is expressed in laps instead of miles.

Score Point 2
(Example B)

15

a. ☺ = 1 lap

1/8 2/8 3/8 4/8 5/8 6/8 7/8 8/8 11/8 12/8 13/8 14/8

On Saturday Aiden skated 14/8 of a mile.

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

b. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

14/8 15/8 16/8 17/8 2 2 1/8 2 2/8

14/8 miles.

20 21

2 3/8 2 9/8

Aidan skated 21 laps.

b) The student's strategy is appropriate, with incorrect answer due to a counting error.

c. On Monday, Aiden skated 22 laps.

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

Score Point 1

15

A=) $\frac{12}{8}$

$$\begin{array}{r} 0.5 \\ 8\overline{)12.0} \\ 8 \\ \hline 40 \\ 40 \\ \hline 0 \end{array}$$

1.5 miles

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

B=) 6 laps = .5 miles

12 laps = 1.5 miles

18 laps = 2.5 miles

18 laps

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

24 = 3.5
30 = 4.5
36 = 5.5
42 = 6.5

C=) $\frac{2}{5}$

$$\begin{array}{r} 25 \\ 2\overline{)51} \\ -4\ \ \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

25%

6 miles

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

Score Point 0

15

A. $\frac{1}{8} \times 12 = \frac{12}{20}$. Aidan has skated a distance of 12/20 miles, in simpalist form though it would be $\frac{12}{20} \div \frac{2}{2} = \frac{6}{10} \div 2 = \frac{3}{5}$ miles So Aidan skated 3/5 miles on Saturday.

B. $2\frac{1}{12} \times 2 = \frac{12}{144} \div \frac{2}{2} = \frac{6}{22} \div 2 = \frac{3}{11} = 2\frac{3}{11}$, So on Sunday Aidan skated 2 3/11 miles.

C. $\frac{1}{8} \times 40 = \frac{40}{32} \div 2 = \frac{20}{6} \div 2 = \frac{10}{3}$ So on monday Aidan must have skated 10/3 miles

The student's response to each part is incorrect.

Grade 8 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]	GM	GM	GM	GM	FA	FA	FA	FA	FA	DP	GM	FA	FA	DP	NO
GLE Code	7-1	7-2	7-5	7-6	7-1	7-2	7-3	7-4	7-4	7-1	7-4	7-2	7-1	7-3	7-4
Depth of Knowledge Code	1	2	1	2	2	2	1	1	2	2	2	1	2	2	2
Item Type[2]	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	SA	SA	SA	SA	CR
Answer Key	C	A	A	D	B	C	C	A	D	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