New England Common Assessment Program

Released Items Support Materials 2010

Grade 11 Mathematics

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).

1 The athletic director of a school will distribute money from the budget to fall sports, winter sports, and spring sports in a ratio of 4:3:2, respectively. The total budget for the three sport seasons is $180,000. How much money will go to **spring sports**?

A. $40,000

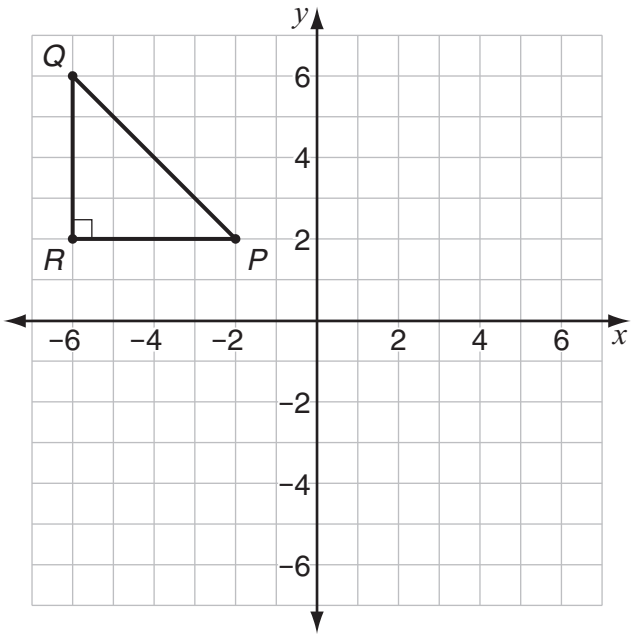
B. $60,000

C. $80,000

D. $90,000

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.

2 Look at ΔPQR on this grid.

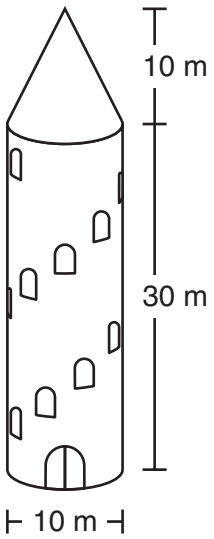


What are the coordinates of the image of point R after a 90° counterclockwise rotation about the origin?

A. (–6, –2)
B. (–2, –6)
C. (6, –2)
D. (6, 2)

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.

3 This diagram represents a tower. The tower is in the shape of a cone on top of a cylinder.



Which measurement is closest to the total volume of the tower?

A. 2,200 cubic meters

B. 2,600 cubic meters

C. 9,400 cubic meters

D. 10,500 cubic meters

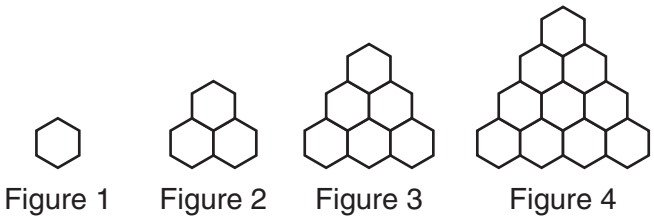
G&M 10.9 Solves problems on and off the coordinate plane involving distance, midpoint, perpendicular and parallel lines, or slope.

4 Circle C has its center at the coordinates (3, 8). The coordinates of one point on the circle are (–1, 6). What are the coordinates of another point on the circle?

A. (–1, 5)
B. (0, 0)
C. (5, 4)
D. (6, –1)

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.

5 Look at this pattern.



If this pattern continues, Figure 20 will have 210 hexagons. How many hexagons will Figure 21 have?

A. 220
B. 230
C. 231
D. 232

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.

6 A rug store is going out of business. The price of every rug will be reduced each week by 10% of the previous week's price. One rug has an original price of $500. This table shows the price of that rug during the first three weeks of the sale.

Rug Sale

Week	Sale Price of Rug
0	$500.00
1	$450.00
2	$405.00
3	$364.50

During which week will the price of this rug be less than 50% of its original price?

A. Week 4
B. Week 5
C. Week 6
D. Week 7

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).

7 The table below shows the relationship between x and $f(x)$ for the linear function $f(x)$.

x	$f(x)$
0	10
2	2
4	–6
6	–14

What is the slope of $f(x)$?

A. –8
B. –4
C. 4
D. 8

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.

8 Which expression is equivalent to $(6x^2 - 9x) - (2x - 3)$?

A. $(3x - 1)(2x - 3)$

B. $(3x + 1)(x - 4)$

C. $(4x - 1)(x - 2)$

D. $(6x + 1)(x - 3)$

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.

9 This month Doris is scheduled to work 5 fewer hours than twice the number of hours she worked last month. Last month Doris worked h hours. Which expression represents the number of hours Doris is scheduled to work this month?

A. $2h - 5$

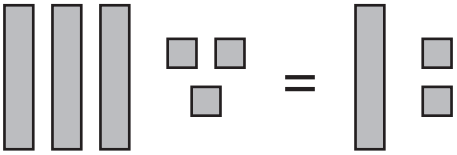
B. $5 - 2h$

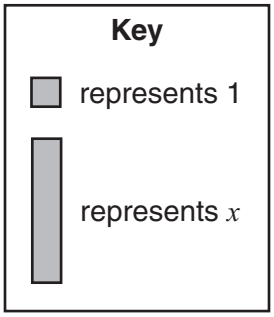
C. $2(h - 5)$

D. $2(5 - h)$

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.

10 Look at these tiles.





Which equation is modeled by the tiles?

A. $x + 3 = x + 2$

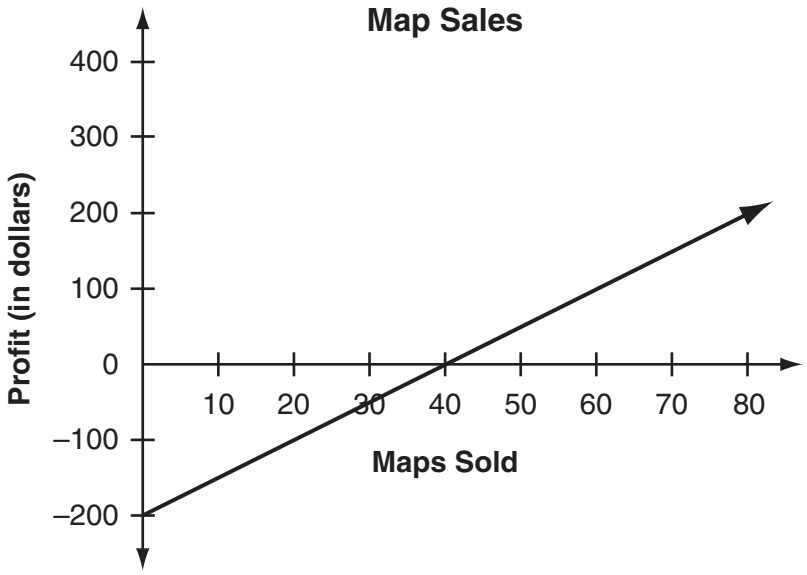
B. $x + 3 = 2x + 1$

C. $3x + 3 = x + 2$

D. $3x + 3 = 2x + 1$

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 Brian started a business selling maps of hiking trails. His initial expense was $200. The graph below shows Brian's profit from selling different numbers of maps. [profit = revenue – expense]



What does the ***x*-intercept** of the graph represent?

A. the amount of revenue before any maps were sold

B. the amount of revenue when all the maps were sold

C. the number of maps sold when the revenue was equal to the expense

D. the number of maps sold when the revenue was greater than the expense

DSP 10.4 **Uses counting techniques to solve problems** in context involving combinations or permutations using a variety of strategies (e.g., organized lists, tables, tree diagrams, models, Fundamental Counting Principle, or others).

12 Brenda must create a password according to these rules:

- The password must consist of 2 letters followed by 2 digits.
- There are a total of 26 letters and 10 digits that she may use.
- The letters may be repeated.
- The digits may **not** be repeated.

How many different passwords are possible?

A. 4680
B. 5148
C. 60,840
D. 66,924

N&O 10.2 **Demonstrates understanding of the relative magnitude of real numbers** by solving problems involving ordering or comparing rational numbers, common irrational numbers (e.g., $\sqrt{2}$, π), rational bases with integer exponents, square roots, absolute values, integers, or numbers represented in scientific notation using number lines or equality and inequality symbols.

13 Look at the inequality below.

$$0 < b^c < \left(\frac{1}{2}\right)^0$$

Write a value for b and a value for c that will make the inequality true. Write your answer in the form b^c.

Scoring Guide:

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

Note: Answers may vary, but $0 < b < 1$ and $0 < c$ OR $b > 1$ and $c < 0$.

Score Point 1
(Example A)

13

$(\frac{1}{2})^0 = 1$ $\quad 0 < b^c < 1$, $b^c = 2^{-1}$

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

Score Point 1
(Example B)

13

$0 < B^c < (\frac{1}{2})^0$

$0 < \frac{1}{4}^1 < (\frac{1}{2})^0$

The student's response is correct.

Score Point 0
(Example A)

13

$b^c = \frac{1^0}{4}$

The student's response is incorrect.

Score Point 0
(Example B)

13

$0 < b^c < \frac{1}{2}^0$ $\quad 0 < -1^1 < \frac{1}{2}^0$ $\quad b^c = -1^1$

The student's response is incorrect.

G&M 10.2 **Makes and defends conjectures, constructs geometric arguments, uses geometric properties, or uses theorems to solve problems** involving angles, lines, polygons, circles, or right triangle ratios (sine, cosine, tangent) within mathematics or across disciplines or contexts (e.g., Pythagorean Theorem, Triangle Inequality Theorem).

14 Sketch a right triangle in which $\tan\theta = \frac{5}{12}$, where θ represents the measure of an angle of the triangle. Be sure to label θ and the right angle in your sketch.

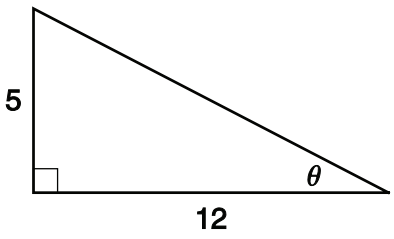
Scoring Guide:

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

Note:

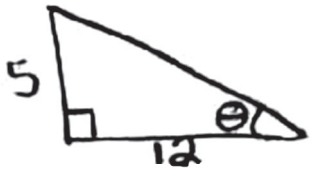
- Any leg lengths with a ratio of 5 : 12 where the 5 is opposite θ, are acceptable.
- Do not penalize for an incorrectly calculated hypotenuse.

Sample Response:



Score Point 1

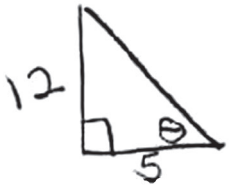
14



The student's response is correct.

Score Point 0

14



The student's response is incorrect.

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.

15 Look at this pattern.

$$36, \underline{\ ?\ }, 16, \frac{32}{3}, \frac{64}{9}, \frac{128}{27}, \ldots$$

What is the missing number in the pattern?

Scoring Guide:

Score	Description
1	for the correct answer, **24**
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)

15

$16 \cdot \frac{2}{3} = \frac{32}{3}$ $\frac{32}{3} \cdot \frac{2}{3} = \frac{64}{4}$

$36 \cdot \frac{2}{3} = 24$

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

Score Point 1
(Example B)

15

36, $\boxed{24}$, 16

The student's response is correct.

Score Point 1
(Example C)

15

36 6 16 32 64 128

$.\overline{11} \times 3 = .\overline{33}$ $\times 2 = 1 \times 3 = 3 \times 3 = 9 \times 3 = 27$

$\boxed{\frac{8}{.\overline{33}}}$

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

Score Point 0
(Example A)

⓯

$36, \underline{26}, 16, \frac{32}{3}, \frac{64}{9}, \frac{128}{27}, \ldots$ 26 is the missing number

The student's response is incorrect.

Score Point 0
(Example B)

⓯

$36, \_\_\_, 16, \frac{32}{3}, \frac{64}{9}, \frac{128}{27}$

$\frac{36}{3} = 12$

The student's response is incorrect.

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).

16 This table shows a relationship between x and y.

x	y
–1	0
1	4
3	16
5	36

Write an equation that shows the relationship between x and y.

Scoring Guide:

Score	Description
1	for correct answer, $y = (x + 1)^2$ **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)

16

$y = (x + 1)^2$

The student's response is correct.

Score Point 1
(Example B)

16

$1 \cdot 3 = 3 + 1 = 4$
$3 \cdot 5 = 15 + 1 = 16$
$5 \cdot 7 = 35 + 1 = 36$
$7 \cdot 9 = 63 + 1 = 64$

$x \cdot (x+2) + 1 = y$

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

Score Point 0
(Example A)

16

$y = (x+2)2$

The student's response is incorrect.

Score Point 0
(Example B)

16

$(x+1)^2$

The student's response is incorrect.

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.

17 Look at this expression.

$$\frac{x^7 y^{-5}}{x^3 y}$$

Simplify the expression so that each variable is written once and all exponents are positive.

Scoring Guide:

Score	Description
1	for correct answer, $\frac{x^4}{y^6}$
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)

17

$$\frac{x^4}{y^6}$$

The student's response is correct.

Score Point 1
(Example B)

17

$$\frac{x^7y^{-5}}{x^3y} = x^4\left(\frac{1}{y^6}\right)$$

The student's response is correct.

Score Point 0
(Example A)

17

$$\frac{x^2}{y^3}$$

The student's response is incorrect.

Score Point 0
(Example B)

17

x^4y^6

The student's response is incorrect.

Score Point 0
(Example C)

17

$\frac{x^4}{y^4}$

The student's response is incorrect.

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.

18 Look at this equation.

$$5p - 1 = 9 + 3(p - 6)$$

What value of p makes this equation true?

Scoring Guide:

Score	Description
1	for the correct answer, **–4**
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)

18

$p = -4$

The student's response is correct.

Score Point 1
(Example B)

18

$5p - 1 = 9 + 3(p - 6)$
$5p - 1 = 9 + 3p - 18$
$-3p \qquad -3p$

$2p - 1 = 9 - 18$
$2p - 1 = -9$
$+1 \qquad +1$

$\frac{2p}{2} = \frac{-8}{2}$

$p = -4$

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

Score Point 0

18

$5p - 1 = 9 + 3(p - 6)$
$5p - 1 = 9 + 3p - 18$
$-5p + 1 \quad -9 \quad -5p + 1$
-9
$8 = -2p$

$\frac{8}{-2} = \frac{-2p}{-2}$

$4 = p$

$p = 4$

The student's response is incorrect.

N&O 10.2 **Demonstrates understanding of the relative magnitude of real numbers** by solving problems involving ordering or comparing rational numbers, common irrational numbers (e.g., $\sqrt{2}$, π), rational bases with integer exponents, square roots, absolute values, integers, or numbers represented in scientific notation using number lines or equality and inequality symbols.

19 Look at the equation below.

$$|x + 6| = 4$$

For what values of x is the equation true? Show your work or explain how you know.

Scoring Guide:

Score	Description
2	for correct answers, **–10 and –2**, with sufficient explanation or work shown to indicate correct strategy
1	for correct answer with insufficient or no explanation or work shown or for 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

Sample Response:

$x + 6 = -4$ $\quad$ $x + 6 = 4$

$x = -10$ $\quad$ $x = -2$

Score Point 2
(Example A)

19

$|x+6|=4$

$x+6=4$ or $-(x+6)=4$

$-6 \quad -6$

$x=-2$

$-x-6=4$

$+6 \quad +6$

$-x=10$

$x=-10$

$\boxed{x=-2 \text{ or } -10}$

The student's response is correct, with sufficient work shown.

Score Point 2
(Example B)

19

$|x+6|=4$

$-10, -2$

$|-10+6|=4$

$|-4|=4$

$4=4$ ✓

$|-2+6|=4$

$|4|=4$

$4=4$ ✓

The student's response is correct, with sufficient explanation.

Score Point 1
(Example A)

19

$x+6=4$ $\quad$ $x+6=-4$

$x=-2$ $\quad$ $x=-10$

$x>-10$ and $x<-2$

because of the absolute value the options need to be greater than -10 and less than -2

The student's strategy is correct, with an incorrect interpretation of the result.

Score Point 1
(Example B)

19

$|x+6| = 4$ $\qquad$ $|x+6| = -4$

$x+6=4$ $\qquad$ $x+6=-4$

$-6 \quad -6$ $\qquad$ $+6 \quad +6$

$x=-2$ $\qquad$ $x=2$

The student's strategy is appropriate, with an incorrect answer due to a procedural error.

Score Point 0
(Example A)

19

$x+6=4$

$-6 \quad -6$

$\boxed{x=-2}$

The student's strategy is insufficient.

Score Point 0
(Example B)

19

$|x+6|=4$

$|x|+|6|=4$

$|x|+6=4$

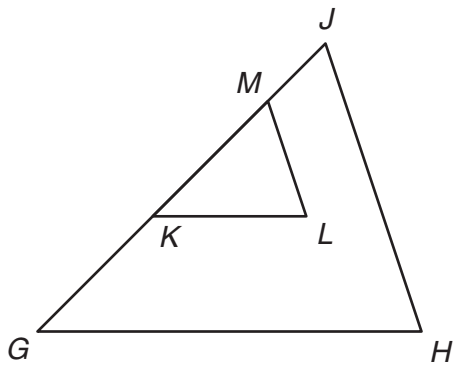
$|x|=-2$

$x=\pm 2$

The student's strategy is incorrect.

G&M 10.5 Applies concepts of similarity by solving problems within mathematics or across disciplines or contexts.

20 Triangle *KLM* is similar to triangle *GHJ* ($\Delta KLM \sim \Delta GHJ$).



The perimeter of triangle *KLM* is 16 centimeters. The perimeter of triangle *GHJ* is 40 centimeters.

a. What is the ratio of side $\overline{ML}$ to side $\overline{JH}$?

b. What is the ratio of the area of triangle *KLM* to the area of triangle *GHJ*?

Scoring Guide:

Score	Description
2	for correct side ratio, **2 to 5 or equivalent**, and correct area ratio, **4 to 25 or equivalent**
1	for correct side ratio but not correct area ratio OR for correct area ratio but not correct side ratio OR for correct solution to part b based on an incorrect solution to part a OR for reciprocals of each ratio
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)

20

KLM = 16cm GHJ = 40cm

$\frac{16}{40} = \frac{2}{5}$

a) $\frac{2}{5}$

b. $\frac{2^2}{5^2} = \frac{4}{25}$

The student's answer to each part is correct.

Score Point 2
(Example B)

20

a) 2 : 5

b) 4 : 25

The student's answer to each part is correct.

Score Point 2
(Example C)

20

A) $\frac{16}{40} = \frac{4}{10}$

B) $\frac{16^2}{40^2}$

The student's answer to each part is correct.

Score Point 1

20

A 5.3/13.3

b 5/2

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

Score Point 0

20

a $\frac{16}{40} = \frac{4}{10} = \frac{2^2}{5^2}$ $\frac{4}{25}$ ML-)H

b. $\frac{16^3}{40^3}$ $\frac{3000}{64000}$ = area.

The student's answers to both parts are incorrect.

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.

21 What are the coordinates of the point where the lines $y = 2x - 1$ and $y = 4x + 13$ intersect? Show your work or explain how you know.

Scoring Guide:

Score	Description
2	for correct answer, **(–7, –15)**, with sufficient explanation or work shown to indicate correct strategy
1	for correct answer with insufficient or no explanation or work shown OR for 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

Training Notes:

$2x - 1 = 4x + 13$
$2x = -14$
$x = -7$
$y = 2(-7) - 1 = -14 - 1 = -15$

Score Point 2

21

$2x-1=4x+13$
$2x=4x+14$
$-2x=14$
$x=-7$

$y=2(-7)-1$
$y=-14-1$
$y=-15$

$y=4(-7)+13$
$y=-28+13$
$y=-15$

$(-7,-15)$

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

Score Point 1

21

Lines intersect at $(-2,-5)$

$y=4x+13$
$y=2x-1$

$2x-1=4x+13$
$-4=2x$
$-2=x$

$y=2(-2)-1$
$y=-4-1$
$y=-5$

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

SCORE POINT 0
(EXAMPLE A)

21

The points intercect at (-8, -16) because that where it looks like the lines are heading.

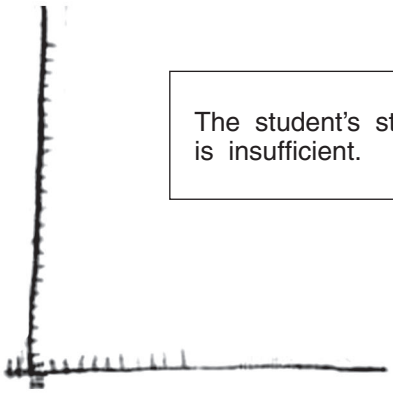
The student's strategy is insufficient, with an incorrect answer.

SCORE POINT 0
(EXAMPLE B)

21

x	y=2x-1	y
0	y=2(0)-1	-1
1	y=2(1)-1	1
2	y=2(2)-1	3
3	y=2(3)-1	5

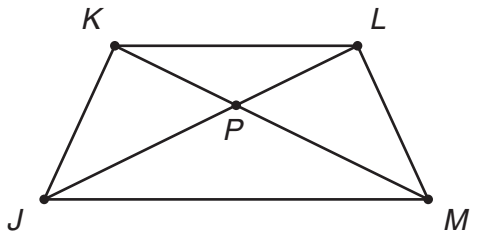
x	y=4x+13	y
0	y=4(0)+13	13
1	y=4(1)+13	17
2	y=4(2)+13	21
3	y=4(3)+13	25



The student's strategy is insufficient.

G&M 10.2 **Makes and defends conjectures, constructs geometric arguments, uses geometric properties, or uses theorems to solve problems** involving angles, lines, polygons, circles, or right triangle ratios (sine, cosine, tangent) within mathematics or across disciplines or contexts (e.g., Pythagorean Theorem, Triangle Inequality Theorem).

22 Quadrilateral *JKLM* has diagonals $\overline{JL}$ and $\overline{KM}$ that intersect at point *P*, as shown below.



Quadrilateral *JKLM* is an isosceles trapezoid with $\overline{KL}$ parallel to $\overline{JM}$.

a. Given $\angle LKM$ is congruent to $\angle KLJ$, what other angle is congruent to $\angle LKM$? Use geometric reasoning to explain how you know.

b. Use geometric reasoning to explain why triangle *KPL* is similar to triangle *MPJ* ($\Delta KPL \sim \Delta MPJ$).

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: 2 points for a correct answer, $\angle LJM$ **or** $\angle KMJ$, with sufficient justification

OR

1 point for a correct answer with insufficient or no justification
or
for sufficient justification with incorrect or no answer

Part b: 2 points for correct and complete geometric reasoning why $\Delta KPL \sim \Delta MPJ$

OR

1 point for correct but incomplete reasoning
or
for reasoning that demonstrates correct strategy but may contain an error

Note: Reasoning in part b may be based on error in response to part a.

Sample Responses:

a. $\angle LJM$
$\overline{KL} \parallel \overline{JM}$ by definition of trapezoid.
$\angle KLJ \cong \angle LJM$ because alternate angles of a transversal that cuts parallel lines are congruent.
Since $\angle KLJ \cong \angle LJM$ and $\angle LKM \cong \angle KLJ$ (given), $\angle LKM \cong \angle LJM$ by the transitive property.

OR

$\angle KMJ$ because the diagonals of the trapezoid are transversals that intersect parallel lines $\overline{KL}$ and $\overline{JM}$ (definition of trapezoid). This means that alternate interior angles, $\angle LKM$ and $\angle KMJ$, are congruent.

b. We already know that $\angle LKM \cong \angle LJM$ [or other angle pair] from part a.
The vertex angles of ΔKPL and ΔMPJ are congruent because they are vertical angles, and all vertical angles are congruent.
Since 2 pairs of corresponding angles are congruent, $\Delta KPL \sim \Delta MPJ$ (because of the AA Similarity Theorem).

SCORE POINT 4
(EXAMPLE A)

22

a. $\angle KMJ \cong \angle LKM$ because of alternate interior angle congruence theorem

a) The student's answer is correct, with appropriate justification.

b. 1. $\overline{KL}$ & $\overline{JM}$ are // — 1. given

$\angle LKM \cong \angle KLJ \cong \angle LKM$

2. $\angle KLJ \cong \angle LJM$ — 2. Alternate interior angle congruence Thm

3. $\angle KPL \cong \angle JPM$ — 3. Vertical angle Theorem

4. $\triangle KPL \sim \triangle MPJ$ — 4. angle-angle-angle similarity Thm

b) The student's reasoning is correct and complete.

Score Point 4
(Example B)

22

a. It's given that ∡LKM ≅ ∡KLJ, and that quadrilateral JKLM is an isosceles trapezoid, which, by definition implies that $\overline{KL} \parallel \overline{JM}$. Because $\overline{KM}$ is a straight line intersecting parallel lines $\overline{KL}$ and $\overline{JM}$, it is a transversal, and ∡LKM ≅ ∡KMJ because they are ≅ alternate interior angles.

b. As we just proved (↗), ∡LKM ≅ ∡KMJ because they are alternate interior angles of ∥ lines cut by a transversal. Also, ∡KPL ≅ ∡MPJ because they are vertical ∡s (vertical angle theorem). Therefore △KPL ~ △MPJ due to AA~.

a) The student's answer is correct, with appropriate justification.

b) The student's reasoning is correct and complete.

Score Point 3
(Example A)

22

a. ∠LKM is also congruent to ∠KMJ. This is because KM intersects two parallel lines, so these two angles are corresponding interior angles, so they must be the same.

b. I already proved that ∠LKM is = ∠KMJ, and ∠KLJ = ∠LJM for the same reason. ∠JPM and ∠KPL are also equal because they are verticle angles. Therefore, all the corresponding angles are equal to each other, meaning the triangles are similar.

a) The student's answer is correct, with an error in the justification.

b) The student's reasoning is correct and complete.

Score Point 3
(Example B)

22

a) ∠KMJ is also congruent to ∠LKM because alternate interior ∠s are ≅.

a) The student's answer is correct, with appropriate justification.

b) The two triangles are similar because 2 angles of one triangle are ≅ to 2 angles of the other triangle & $\overline{KL}$ is parallel to $\overline{JM}$.

b) The student's reasoning is correct, but the student does not specify which angles are congruent.

Score Point 2
(Example A)

22

a) ∠KMJ because they're alternate interior angles

a) The student's answer is correct, with appropriate justification.

b) ΔKPL and ΔMPJ are similar because they have parralel lines and they are apart of one shape

b) The student's reasoning is insufficient.

Score Point 2
(Example B)

22

a.) $\boxed{\angle LJM}$ because the other angles are too big to be congruent

b.) ΔKPL is similar to ΔMPJ because all the angles are congruent to one another (AAA).

a) The student's answer is correct, with inappropriate justification.

b) The student's reasoning is correct, but the student does not specify which angles are congruent.

Score Point 1

22

a) $\angle KMJ$

a) The student's answer is correct, with no justification.

b) 2 lines cut by a transversal make $\angle LJM$ and $\angle KMJ$ $\cong$ and $\angle KPL$ and $\angle JPM$ are $\cong$ because of the refective property

b) The student's reasoning is incorrect.

Score Point 0

22

(a) ∠LKM is not congruent to any other angle because ∠JPM is a different type of triangle than ∠LKM.

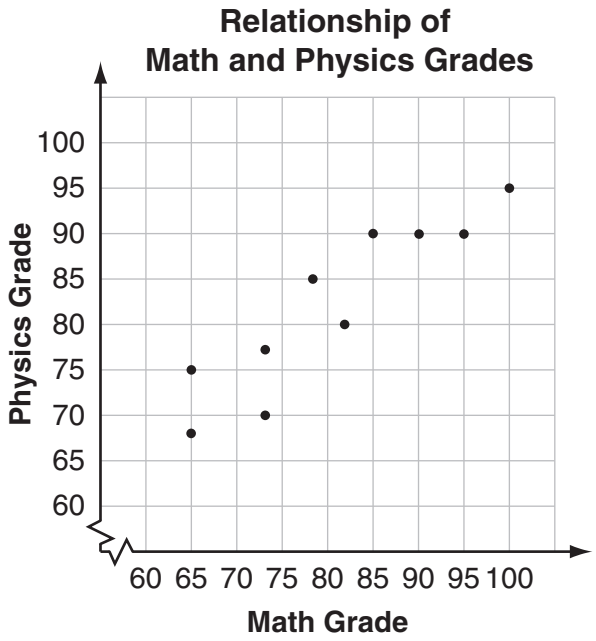
(b) Triangle KPL is similar to triangle MPJ because triangle MPJ is just increased by size to triangle KPL.

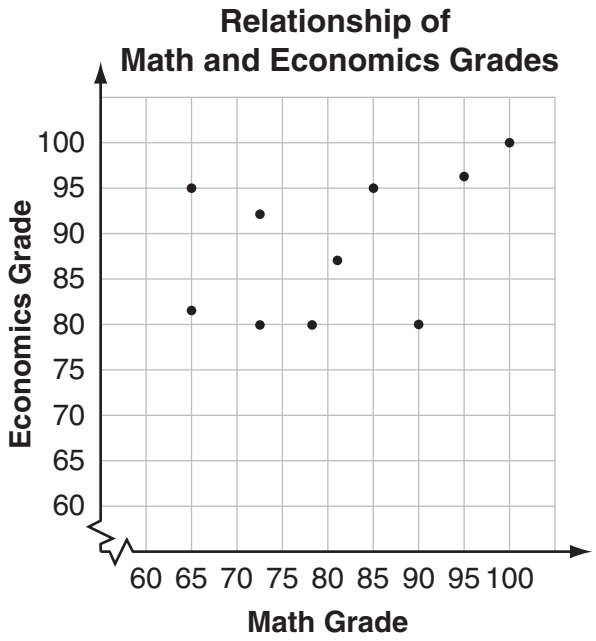
a) The student's response is incorrect.

b) The student's reasoning is inappropriate.

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 M(DSP)-10-2.*)

23 A guidance counselor compared the final grades in a math class with the final grades in both a physics class and an economics class for the same group of students. The scatter plots below show the relationships between the final grades.





a. Based on the data in the first scatter plot, what is the mode of the final grades in the physics class?

b. Based on the data in the second scatter plot, how much greater is the range of the final grades in the math class than the range of the final grades in the economics class? Show your work or explain how you know.

The guidance counselor wants to determine whether the final grade in the math class is a better predictor of the final grade in the physics class or the economics class.

c. Based on the data in the two scatter plots, explain whether the final grade in the math class is a better predictor of the final grade in the physics class or the economics class.

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, **90**

Part b: 2 points for correct answer, **15**, with sufficient explanation or work shown 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

Part c: 1 point for correct and reasonable justification, based on the data in the graphs, why the math grade would be a more accurate prediction of physics achievement

Sample Responses:

Part b: The range of the economics grades is 20 (100–80) while the range of the math grades is 35 (100–65) so the difference is 15.

Part c: The math grade would be a better way to predict student physics achievement because the data has a stronger correlation than the data in the economics scatter plot.

Score Point 4

23

a. 90 is the mode of the final grade in physics.

b. Lowest math = 65
Highest " " = 100
Range(math) = 100 - 65 = 35

Lowest econ = 80
Highest econ = 100
range(econ) = 100 - 80 = 20

35 - 20 = 15
Math range is 15 points greater than economics range.

c. The final math grade is a better predictor of final physics grade because the points in that graph show a definite trend, while the econ. vs math plot is fairly random.

a) The student's answer is correct.

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

c) The student's explanation is appropriate.

Score Point 3
(Example A)

23

A. mode=average

69
70
75
77
80
85
10
90
90
95
851

85.1
10 ⟌ 851.0
80
51
50
10

85.1=mode

B MATH: 65 to 100
eco: 80 to 100

RANGE OF MATH 100-65 = 35
RANGE OF ECO 100-80 = 20
15

The RANGE OF MATH GRADES IS 15 GREATER THAN ECONOMICS

The physics grade is a better predictor of the math grade because people who did bad in physics Also did bad in MATH And people who did good in physics, did good in MATH. But every one did well in economics regardless of how the did in MATH.

a) The student's answer is incorrect.

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

c) The student's explanation is appropriate.

Score Point 3
(Example B)

23

a) 90

B) math: 100 − 65 = 35

Economics: 100 − 80 = 20

15 greater

c) I think the physics class final grade for math is a better predictor. Because its shows progress.

a) The student's answer is correct.

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

c) The student's explanation is insufficient.

Score Point 2

23

A. 90 is the mode

B. 15

C. Economic class

a) The student's answer is correct.

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

c) The student's response is incorrect.

Score Point 1

23

a. mode 90

b.

$$\begin{array}{r} 95 \\ -65 \\ \hline 30 \end{array} \qquad \begin{array}{r} 90 \\ -65 \\ \hline 35 \end{array}$$

math is greater only by 5 points

c. The economics class is better because it has more grades to go by.

a) The student's answer is correct.

b) The student's strategy is incorrect.

c) The student's explanation is inappropriate.

Score Point 0

23

A Mode = 73.5 ish

a) The student's answer is incorrect.

b) The student's strategy is insufficient.

B
$$\begin{array}{r} 100 \\ -65 \\ \hline 35 \end{array}$$
35 is the range.

c) The student's explanation is inappropriate.

C The physics/math grades are better

Grade 11 Mathematics Released Item Information - 2010

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

Released Item Number	13	14	15	16	17	18	19	20	21	22	23
No Tools Allowed	✓	✓		✓		✓		✓	✓	✓	
Content Strand[1]	NO	GM	FA	FA	FA	FA	NO	GM	FA	GM	DP
GSE Code	10-2	10-2	10-1	10-2	10-3	10-4	10-2	10-5	10-4	10-2	10-1
Depth of Knowledge Code	2	1	2	2	1	1	2	2	2	3	2
Item Type[2]	SA	SA	SA	SA	SA	SA	SA	SA	SA	CR	CR
Answer Key											
Total Possible Points	1	1	1	1	1	1	2	2	2	4	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