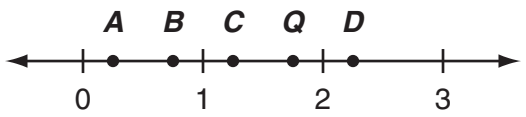
New England Common Assessment Program

Released Items Support Materials 2012

Grade 11 Mathematics

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.

1 Look at this number line.



Which point is closest to $\sqrt{Q}$?

A. point *A*
B. point *B*
C. point *C*
D. point *D*

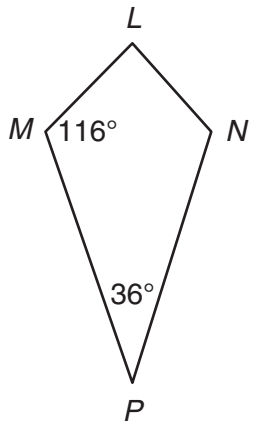
N&O 10.4 **Accurately solves problems involving** rational numbers within mathematics, across content strands, disciplines or contexts (with emphasis on, but not limited to, proportions, percents, ratios, and rates).

2 The current value of an investment is 125% of its initial value. The increase in value was \$10 million. What was the initial value of the investment?

A. \$ 25 million
B. \$ 40 million
C. \$100 million
D. \$115 million

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).

3 In quadrilateral $LMPN$, $\overline{LM}$ is congruent to $\overline{LN}$ ($\overline{LM} \cong \overline{LN}$) and $\overline{MP}$ is congruent to $\overline{NP}$ ($\overline{MP} \cong \overline{NP}$).



The measure of $\angle M$ is 116°. The measure of $\angle P$ is 36°. What is the measure, in degrees, of $\angle L$?

A. 64

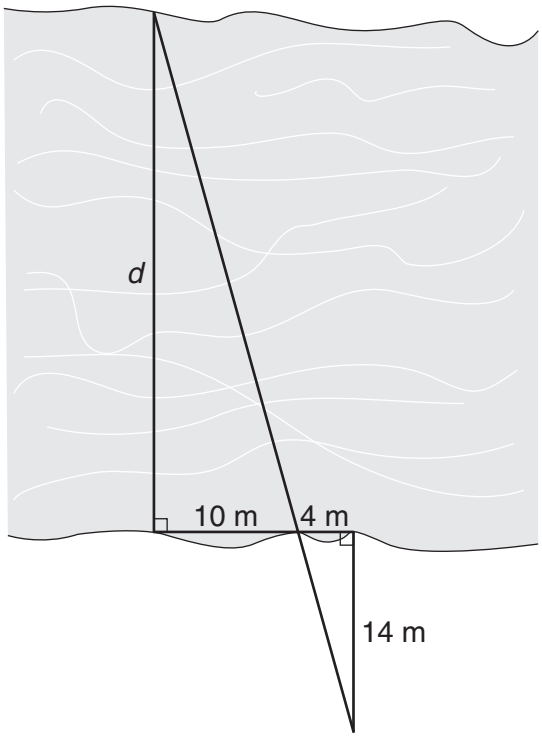
B. 76

C. 88

D. 92

G&M 10.7 **Applies concepts of similarity by solving problems** within mathematics or across disciplines or contexts.

4 This drawing shows the measurements Eduardo made along a river.



not drawn to scale

What is the distance, *d*, across the river?

A. 56 meters
B. 35 meters
C. 24 meters
D. 20 meters

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

5 The center of circle P is located at (5, –2).

- $\overline{ST}$ is a diameter of circle P.
- Point T is located at (–3, 3).

What are the coordinates of point S?

A. (1, 0.5)
B. (4, 2.5)
C. (8, –5)
D. (13, –7)

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 The first term in this pattern is $\frac{3}{5}$.

$$\mathbf{\frac{3}{5}, \frac{2}{5}, \frac{4}{15}, \frac{8}{45}, \ldots}$$

Which expression represents the 20th term in the pattern?

A. $\frac{3}{5} \cdot \left(\frac{2}{3}\right)^{19}$

B. $\frac{3}{5} \cdot \left(\frac{2}{3}\right)^{20}$

C. $\frac{3}{5} \cdot \left(\frac{2}{3} \cdot 19\right)$

D. $\frac{3}{5} \cdot \left(\frac{2}{3} \cdot 20\right)$

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 Alana drew the graph of a function, $f(x)$. She gave these three clues about the graph of her function:

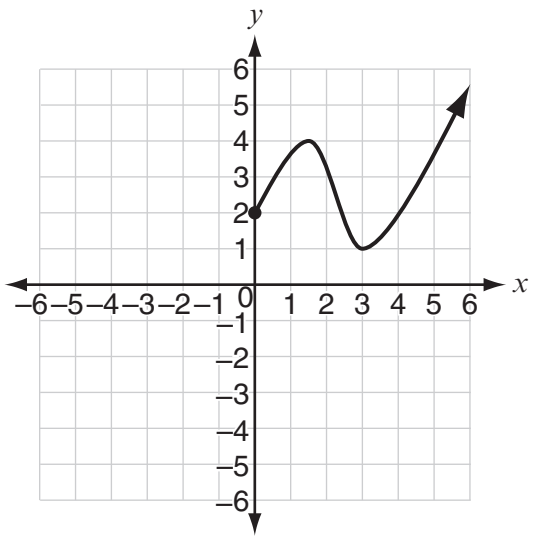
- The function is linear.
- The x-coordinate of the x-intercept is positive.
- The y-coordinate of the y-intercept is positive.

What could be Alana's function?

A. $f(x) = |x - 3|$
B. $f(x) = |3 - x|$
C. $f(x) = 3x - 3$
D. $f(x) = 3 - 3x$

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).

8 This coordinate plane shows the graph of a function.



What is the range of the function?

A. $y \geq 1$

B. $y \geq 2$

C. $x \geq 0$

D. $x \geq 3$

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 Which expression is equivalent to $2(x^2 + y)$?

A. $x^2 + x^2 + y + y$

B. $x^4 + y + y$

C. $2x^2 + y^2$

D. $2x^2 + y$

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.

10 Which expression is equivalent to $3x^{-2}$?

A. $-9x^2$

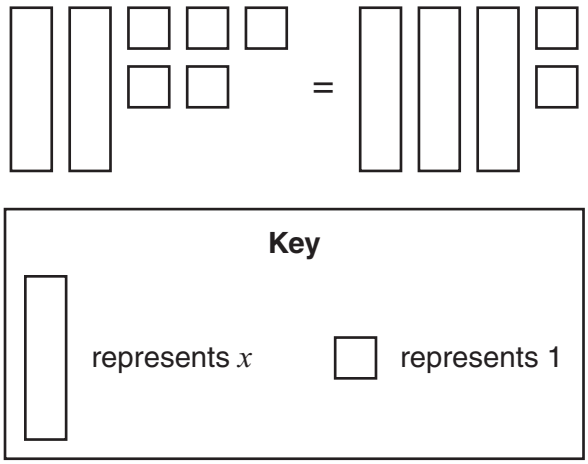
B. $-3x^2$

C. $\frac{1}{9x^2}$

D. $\frac{3}{x^2}$

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 Look at these tiles.



What is the value of x in this equation?

A. 2
B. 3
C. 5
D. 7

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

12 The distance between r and t on a number line is 10. Which equation **must** be true?

A. $\frac{r+t}{2} = 10$

B. $t - r = 10$

C. $|r - t| = 10$

D. $|t + 10| = r$

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).

13 A real-estate agent receives a 3.5% commission on the sale of a house that costs $200,000. What is the amount, in dollars, of the commission? [commission = sale price × rate]

Scoring Guide:

Score	Description
1	for correct answer, ($)**7000**
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)

13

$7,000

The student's response is correct.

Score Point 1
(Example B)

13

200
x .035
1000
6000
7,000

$ 7,000

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

Score Point 0

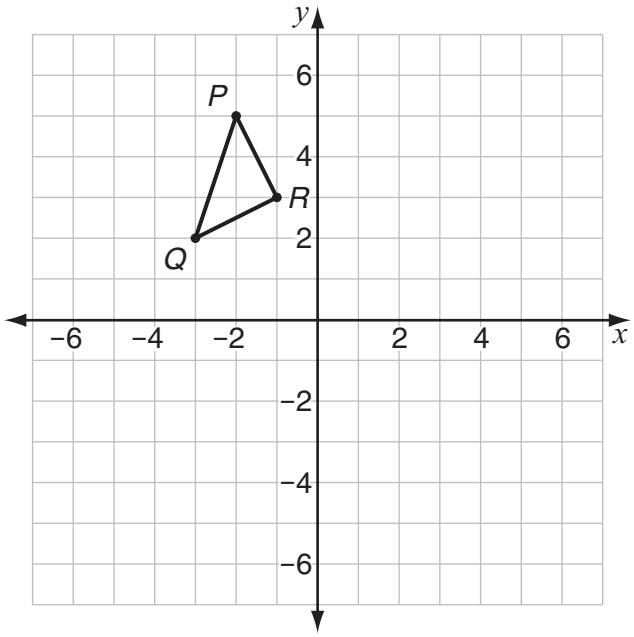
13

200,000 x .35 = $70,000

The student's response is incorrect.

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.

14 Look at ΔPQR on this grid.



Triangle PQR is reflected over the horizontal line $y = b$, where b is an integer. The coordinates of the image of point Q are (–3, –4). What must be the value of b?

Scoring Guide:

Score	Description
1	for correct answer, **–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
(Example A)

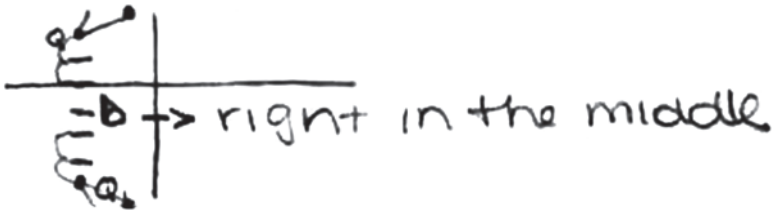
14

-1

The student's response is correct.

Score Point 1
(Example B)

14



$b = -1$

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

Score Point 0
(Example A)

14

$M = \left(\frac{2+(-3)}{2}, \frac{-3+-4}{2}\right)$ $m = \left(\frac{-1}{2}, \frac{-7}{2}\right)$

$\boxed{b = \frac{-7}{2}}$

The student's response is incorrect.

Score Point 0
(Example B)

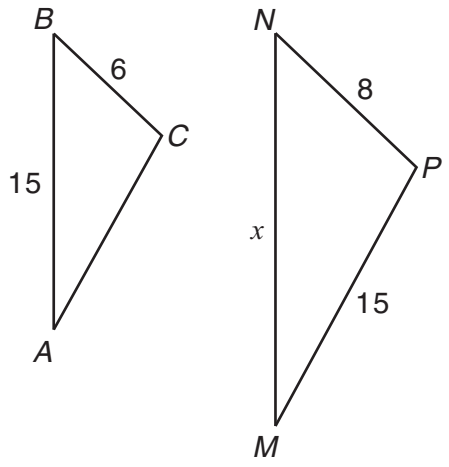
14

$b = -4$

The student's response is incorrect.

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

15 Triangle ABC is similar to triangle MNP ($\Delta ABC \sim \Delta MNP$).



not drawn to scale

What is the value of x?

Scoring Guide:

Score	Description
1	for correct answer, **20**
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

$\frac{6}{8} = \frac{15}{x}$

$\frac{180}{6} = \frac{6x}{6}$ $\boxed{x = 20}$

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

Score Point 1
(Example B)

15

$6\overline{)8}$ $1\frac{1}{3}$

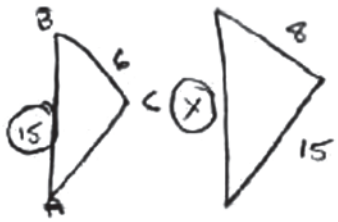
$15 \times 1\frac{1}{3} = 20$

$x = 20$

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

Score Point 0
(Example A)

15



8-2
=6

180°

15+2
17

x=17

$\overline{AC} = 13$

The student's response is incorrect.

Score Point 0
(Example B)

15

$\triangle ABC$

$a^2 = c^2 - b^2$

$a^2 = 15^2 - 6^2$

$225 - 36$

189

$\sqrt{189} = a = 13.7 \rightarrow 14 = x$

$c^2 = 8^2 + 15^2$

$64 + 225$

289

$\sqrt{289} =$

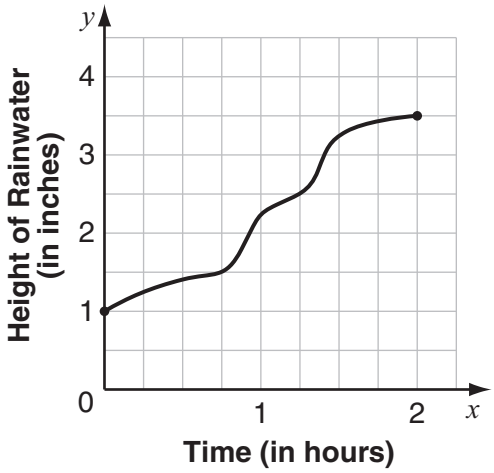
$x = 17$

$\triangle MNP$

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 graph shows the height of rainwater collected in a plastic tube over a period of 2 hours.



What is the average rate of change, in inches per hour, of the height of rainwater in the tube during this time period?

Scoring Guide:

Score	Description
1	for correct answer, $\frac{5}{4}$, **1.25**, 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 1 1/4 inches of water per hour

The student's response is correct.

Score Point 1
(Example B)

16

(0,1)
(2,3.5)

$\frac{3.5-1}{2-0} = \frac{2.5}{2}$

Average = $\frac{2.5}{2}$

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

Score Point 1
(Example C)

16 $\frac{1-3.5}{0-2} = \frac{2.5}{2} = 1.25$

1.25 in per hour

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

Score Point 0

16 $\frac{3.5-1}{2-0}$ $\frac{2.5}{2} = \boxed{1.5}$

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 The formula below is used to approximate the boiling point of water, b, in degrees Fahrenheit, at altitudes, a, above 1000 feet.

$$b = 210.2 - 0.9\left(\frac{a - 1000}{500}\right)$$

Use the formula to approximate the boiling point of water, to the nearest tenth of a degree Fahrenheit, at an altitude of 4500 feet.

Scoring Guide:

Score	Description
1	for correct answer, **203.9 (°F)**
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

17

$\boxed{b = 203.9}$

The student's response is correct.

Score Point 0
(Example A)

17

$210.2 - .9\left(\frac{9500-1000}{500}\right)$

$210.2 - .63 = 209.57^{\circ}F$

$\begin{array}{r} 7 \\ \times .9 \\ \hline .63 \end{array}$

The student's response is incorrect.

Score Point 0
(Example B)

17

$b = 210.2 - 0.9\left(\frac{a-1000}{500}\right)$

$b = 210.2 - 0.9\left(\frac{4500-1000}{500}\right) = 209.3\left(\frac{3500}{500}\right) = 209.3 \cdot 7 =$

$\boxed{1465.1}$

The student's response is incorrect.

DSP 10.5 Solves problems involving experimental or theoretical probability.

18 This table shows the number of available lockers at a gym.

Locker Numbers	Number of Available Lockers
100–199	40
200–299	35
300–399	25
400–499	20

One of the available lockers is randomly assigned to a new member at the gym. What is the probability that the locker number starts with a 3 or a 4?

Scoring Guide:

Score	Description
1	for correct answer, $\frac{3}{8}$ 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)

18 $\frac{45}{120}$

The student's response is correct.

Score Point 1
(Example B)

18 1, 2 = 75
3, 4 = 45
45 : 120, $\boxed{3:8}$

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

Score Point 0
(Example A)

18 $\frac{1}{45}$ chances the locker will start with a 3 or a 4.

The student's response is incorrect.

Score Point 0
(Example B)

18 3:5

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 For what values of x is this inequality true?

$$x > |x|$$

Show your work or explain how you know.

Scoring Guide:

Score	Description
2	for correct answer, "**no values**" or **equivalent**, 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

Score Point 2
(Example A)

19 this inequality is never true because x and the absolute value of x will always be equal if x is positive and if x is negative than the absolute value will always be greater than x not less than.

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

Score Point 2
(Example B)

19 This inequality will never be true because if x = a positive number the x's will be equal
ex $x = 4$ $4 > |4| \rightarrow 4 > 4$ = not true
$x = \frac{1}{2}$ $\frac{1}{2} > |\frac{1}{2}| \rightarrow \frac{1}{2} > \frac{1}{2}$ = not true
This inequality will not for for negative numbers because ... if $x = -2$ then $-2 > |-2| \rightarrow -2 > 2$ which is <u>not true</u>

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

Score Point 1
(Example A)

19 There are no values that can make this inequality true.

The student's response is correct with no explanation or work shown.

Score Point 1
(Example B)

19

No value of x can make this inequality true because x can not be greater than itself and if it is a negitive the absolute zero bars will caneel it out

The student's response is correct with insufficient explanation given.

Score Point 0
(Example A)

19

The values of x that make the inequality true is any value greater than 1 or smaller than −1. This true because to get rid of absolute value you must square each side.

$2^2 > |2|^2 = 4 > 2$ ✓ $1 > |1|^2 = 1 > 1$ X $-2^2 > |-2|^2 = 4 > -2$ ✓

The student's response is incorrect with insufficient explanation given.

Score Point 0
(Example B)

19

x = any negative numbers, makes this inequality true. for example:

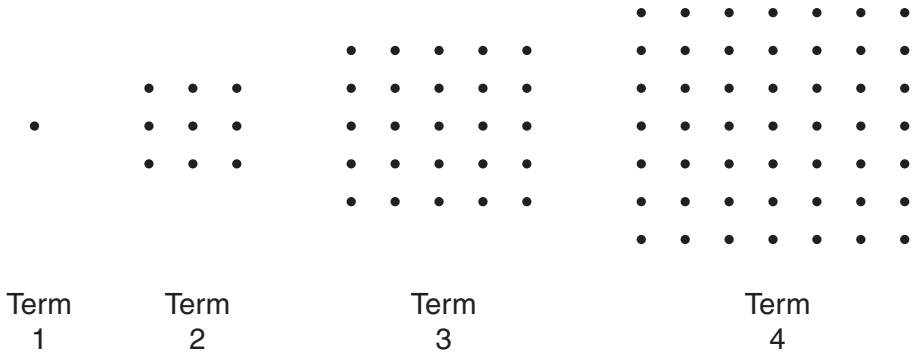
if $x = -6$ then $-6 > |-6| = -6 > 6$

false

The student's response is incorrect with insufficient explanation given.

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.

20 Look at this pattern.



a. How many dots are in Term 6 of the pattern?

b. Write an expression using n that represents the number of dots in Term n of the pattern.

Scoring Guide:

Score	Description
2	for correct answer to part a, **121**, and correct answer to part b, $(2n - 1)^2$ or **equivalent**
1	for correct answer to part a only OR for correct answer to part b only
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

121

Part a: The student's response is correct.

a.

$(2n-1)^2$

Part b: The student's response is correct.

b.

Score Point 2
(Example B)

20

a $(6+5)^2 = 121$ dots

Part a: The student's response is correct.

b $\cancel{(x+x-1)}$ $f(n) = (n+n-1)^2$

Part b: The student's response is correct.

Score Point 2
(Example C)

20

Term	dots
1	1
2	9
3	25
4	49
5	
6	

b:) $((n-1)+n)^2$

Part b: The student's response is correct.

a) 121 dots in term 6

Part a: The student's response is correct.

Score Point 1
(Example A)

20

A) 11
×11
11
110
120

121 dots

B) $d = (n(n-1))^2$

Part a: The student's response is correct.

Part b: The student's response is incorrect.

Score Point 1
(Example B)

20

1 3 5 7 9 12

A. 144 dots

B. $(n+(n-1))^2$ = number of dots

Part a: The student's response is incorrect.

Part b: The student's response is correct.

Score Point 0

20

a. 221 dots

Part a: The student's response is incorrect.

b. $N = 2N$

Part b: 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.

21 The number of a certain bacteria doubles every hour. What is the ratio of the number of bacteria after 10 hours to the number of bacteria after 5 hours? Show your work or explain how you know.

Scoring Guide:

Score	Description
2	for correct answer, **32:1**, 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

Score Point 2
(Example A)

21

1:2 2:4 4:8 8:16 16:32 32:64 64:128
128:256 256:512 512:1024

1024:32 → $\boxed{32:1}$

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

Score Point 2
(Example B)

21

$y=2^x$

after 10 hrs: $y=2^{10}=$ 1024 bacteria

after 5 hrs: $y=2^5=$ 32 bacteria

Ratio $=\frac{1024}{32}\frac{32}{1}=\boxed{\frac{32}{1}}$

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

Score Point 1

21

32/1

The student's response is correct, with no work shown.

Score Point 0
(Example A)

21

$10 \times 2 = 20$

$5 \times 2 = 10$

$1/2$

bacteria double every hour making 2x as much 5/10 have a 1:2 ratio already

The student's response is incorrect, with incorrect explanation.

Score Point 0
(Example B)

21

$\frac{x^5}{5} \quad \frac{x^{10}}{10}$

The student's response is incorrect, with no work shown.

G&M 10.7	**Uses units of measure appropriately and consistently when solving problems across content strands; makes conversions within or across systems and makes decisions concerning an appropriate degree of accuracy in problem situations** involving measurement in other GEs.

22 Each wheel of Sue's bicycle has a diameter of 2 feet 3 inches.

a. Approximately how many **feet** will the bicycle have traveled when each wheel completes 1 revolution? [1 foot = 12 inches]

b. If each wheel completes 100 revolutions per minute, what is the approximate speed of Sue's bicycle in miles per hour? Show your work or explain how you know. [1 mile = 5280 feet]

Sue rode her bicycle to school. She traveled $2\frac{1}{2}$ miles in $\frac{1}{4}$ hour.

c. On average, how many revolutions per minute did each wheel complete during Sue's ride to school? Show your work or explain how you know.

Scoring Guide:

Score	Description
4	5 points
3	4 points
2	2 points 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 correct answer, ≈ **7** (feet)

Part b: 2 points for correct answer, ≈ **8** (miles per hour) or **correct based on incorrect part a**, with sufficient explanation or work shown

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: 2 points for correct answer, ≈ **126** (revolutions per minute) or **correct based on incorrect part a**, with sufficient explanation or work shown

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: Accept any answer that is based on a reasonable approximation of π (e.g., 7.1, 7.07, 2.25π, $2\frac{1}{4}\pi$, $\frac{5}{4}\pi$)

Part b: $\frac{100\text{ rev}}{1\text{ min}} \times \frac{7\text{ ft}}{1\text{ rev}} \times \frac{1\text{ mile}}{5280\text{ ft}} \times \frac{60\text{ min}}{1\text{ hour}} = \frac{42,000}{5280} \approx 7.95 \approx 8$ miles per hour

Part c: Average speed of bicycle: $\frac{\frac{5}{2}}{\frac{1}{4}} = \frac{5}{2} \times \frac{4}{1} = 10$ miles per hour

$\frac{10\text{ miles}}{1\text{ hour}} \times \frac{5280\text{ ft}}{1\text{ mile}} \times \frac{1\text{ rev}}{7\text{ ft}} \times \frac{1\text{ hour}}{60\text{ min}} = \frac{52,800}{420} \approx 125.7 \approx 126$ revolutions per minute

Score Point 4

22

A. 7 ft. approximately

B. 700 feet per minute
×60
42,000 feet per hour
×60
ABOUT 8 MILES PER HOUR

$\frac{42000}{5280}$

C. 13,200 FEET IN 15 MINUTES

7ft • x • 15 = 13200

x → AMOUNT OF REV

105x = 13200

x = 125.7

ABOUT 125.7 REVOLUTIONS PER MINUTE

Part a: The student's response is correct.

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

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

Score Point 3
(Example A)

22

a) about 7 feet

b) about 7.9 mph

c) 2.5 mi 15 mins

84 inches / revolution
= 7 feet / revolution

= 13200 feet

= 880 feet / min

she did $\boxed{125}$ revolutions / min

Part a: The student's response is correct.

Part b: The student's response is correct, with no work shown.

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

Score Point 3
(Example B)

22

$r = 1.7$
$C = 2\pi r$
$A = \pi r^2$

a. $C = 2\pi r$
$C = 2\pi 1.7$
$C = 10.68$

b. 100×10.68 $\frac{ft}{min}$
1068 ft/min
64080 ft/hr
12.1 mph

c. 10 mph
52800 ft/hr
880 ft/min
82 revolutions

Part a: The student's response is incorrect.

Part b: The student's response is correct based on an incorrect answer in part a, with sufficient work shown.

Part c: The student's response is correct based on an incorrect answer in part a, with sufficient work shown.

a. 10.68ft
b. 12.1mph
c. 82 revolutions

Score Point 2

22

a.

radius of 13.5" $2 \times \pi \times 13.5 =$ Circumferance 85"

Bike travles 7 feet in one revolution

B. 700 feet a minute

$700 \times 60 = \frac{42{,}000}{5{,}280} =$ 8 mpH

C. $5280 + 5280 = 10560 + 2640 = 13200$ feet in 2.5 miles

$\frac{13200}{7} = 1885$ revolutions on way to School.

Part a: The student's response is correct.

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

Part c: The student's response is incorrect, with incomplete strategy.

Score Point 1

22

a.

radius = 13.5 inches

$C = 2\pi r$

$2\pi 13.5 = \frac{84.8}{12} = 7'$ traveled for one rotation

b 100 rev in 1min

$100 \times 7 = 700$ ft

$\frac{700 ft}{1} \times \frac{1 mi}{5280 ft} = .13 = 13$ mph

c

Part a: The student's response is correct.

Part b: The student's response is incorrect.

Part c: The student did not attempt.

Score Point 0

22

A) 720 feet

B) 720
× 100
72,000

72,000 ÷ 5,280
13mph

Answer = 13mph

C) 2 ½ mi = 13,200 feet

13,200 ÷ 720 = 18.33̄

Answer = Averge of 18 revolutions per minute

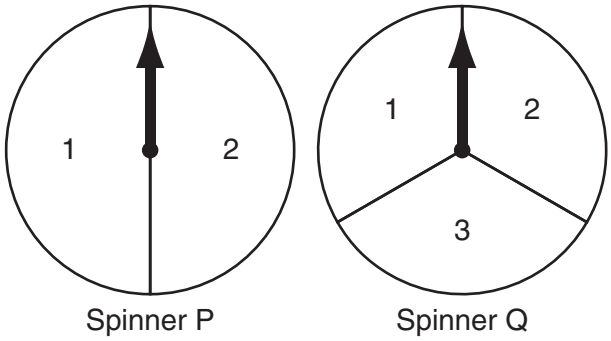
Part a: The student's response is incorrect.

Part b: The student's response is incorrect.

Part c: The student's response is incorrect.

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).

23 Emily has these two spinners.

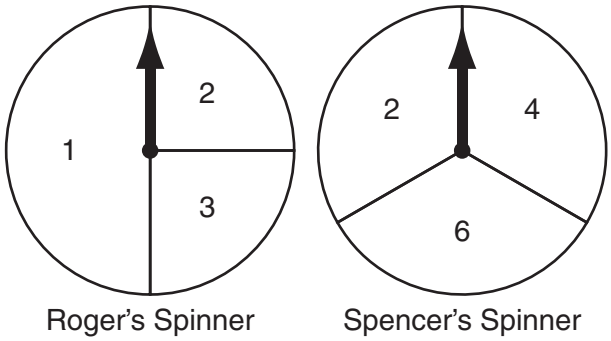


She will spin the arrow on Spinner P once and on Spinner Q once. Then she will record the numbers from the sections in which the arrows stop.

a. List all the possible outcomes when each arrow is spun once. Write the outcomes as ordered pairs in the form (number on Spinner P, number on Spinner Q).

b. What is the probability that the sum of the numbers Emily spins will be greater than 4?

Roger and Spencer will use the two spinners below to play a game.



On a turn, each of them will spin the arrow on his spinner once. They will record the sum of the numbers from the sections in which the arrows stop. In this game, Roger will receive 1 point if the sum is odd. Spencer will receive 3 points if the sum is even. The player with the greatest number of points wins.

c. A game is fair when each player has an equal probability of winning. Explain whether or not this game is fair.

Scoring Guide:

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

Training Notes:

Part a: 1 point for the correct answer, **(1, 1), (1, 2), (1, 3), (2, 1), (2, 2), (2, 3)**

Part b: 1 point for correct answer, $\mathbf{\frac{1}{6}}$ or **equivalent**, or correct based on incorrect part a

Part c: 2 points for sufficient explanation

OR

1 point for sufficient understanding of the concept of expected value but explanation may be partially correct or incomplete
or
for correct probabilities of an odd sum (75%) and an even sum (25%)

Sample Responses:

Part c: Treat spinner R as having four equal sections showing 1, 1, 2, and 3. The possible sums are:

1 + 2 = 3	1 + 2 = 3	2 + 2 = 4	3 + 2 = 5
1 + 4 = 5	1 + 4 = 5	2 + 4 = 6	3 + 4 = 7
1 + 6 = 7	1 + 6 = 7	2 + 6 = 8	3 + 6 = 9

There are 9 odd sums and only 3 even sums. For each odd sum, Roger gets 1 point. The probability Roger scores on a given turn is $\frac{9}{12} \times 1 = \frac{3}{4}$. For each even sum, Spencer gets 3 points. The probability Spencer scores on a given turn is $\frac{3}{12} \times 3 = \frac{3}{4}$. This game is fair because the probability each player will score on a given turn is the same.

Score Point 4

23

a) (1,1), (1,2), (1,3), (2,1), (2,2), (2,3)

b) 1/6 (only possibility is (2,3)).

c) This game is fair because Roger scores a point every time his spinner lands on a 1 or 3, a 3/4 chance. This is because a 1 or 3 plus one of Spencer's even numbers (he has only even numbers) results in an odd number. Similarly, Roger must spin a 2 for Spencer to score 3 points, a 1/4 chance. Spencer scores thrice what Roger does, but Roger scores thrice as often, so the game is fair.

Part a: The student's response is correct.

Part b: The student's response is correct.

Part c: The student's explanation is correct.

Score Point 3

23

A.

P	1	1	1	2	2	2
Q	1	2	3	1	2	3

B. 1 out of 6

C. It is a fair game because Roger should end up with a point 3 of 4 times with 1 of the 4 being Spencer gaining 3 points.

Part a: The student's response is correct.

Part b: The student's response is correct.

Part c: The student finds the correct probabilities of an odd sum and an even sum.

Score Point 2

23

(P, Q) a. 1,1 2,1
1,2 2,2
1,3 2,3

b. probability $= \frac{1}{6}$

P = once
Q = once

c. 1,2 2,2 3,2
1,4 2,4 3,4 > roger
1,6 2,6 3,6
6 = odd

2,1 4,1 6,1
2,2 4,2 6,2 > spencer
2,3 4,3 6,3
6 = odd

This game isn't fair because they both will always have an equal probability of winning so it'll only equal a tie.

Part a: The student's response is correct.

Part b: The student's response is correct.

Part c: The student's explanation is incorrect.

Score Point 1

23

Spinner P

a 1
2

Spinner Q

1
2
3

b. 1+1= 2
1+2=3
1+3=4
2+1=3
2+2=4
2+3=5

1/6

C. This game is unfair because Roger's board isn't even and has a more likely chance of getting a winning number then Spencer

Part a: The student's response is incorrect.

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

Part c: The student's explanation is incorrect.

Score Point 0

23

a) Spinner P:

1, 2

(2,1) (2,2)

Spinner Q:

1, 2, 3

(3,1) (3,2) (3,3)

b.) 0%

c.) It isn't fair because there are two spinners odd & even, if the evens are worth more points then Spencer will wins he has a bigger chance seeing as his spinner is only evens.

Part a: The student's response is incorrect.

Part b: The student's response is incorrect.

Part c: The student's explanation is incorrect.

Grade 11 Mathematics Released Item Information – 2012

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