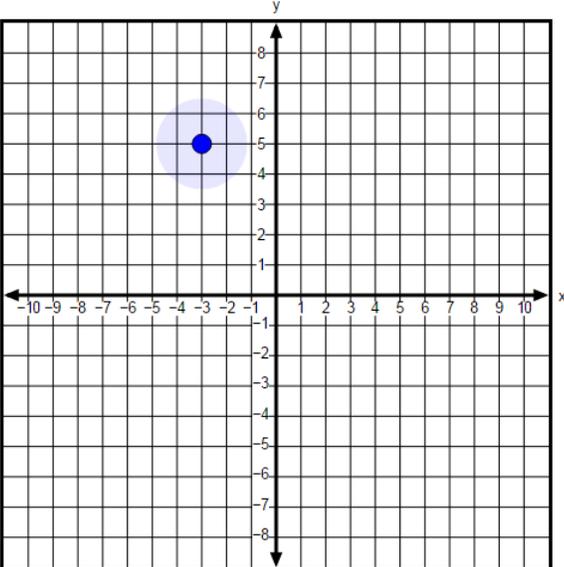
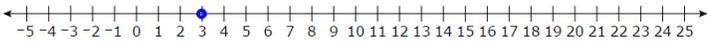


The following pages include the answer key for all machine-scored items, followed by the rubrics for the hand-scored items.

- The rubrics show sample student responses. Other valid methods for solving the problem can earn full credit unless a specific method is required by the item.
- In items where the scores are awarded for full and partial credit, the definition of partial credit will be confirmed during range-finding (reviewing sets of real student work).
- If students make a computation error, they can still earn points for reasoning or modeling.

Item Number	Answer Key	Evidence Statement Key	Integrated Course Alignment
1.	A, B, D, E	G-SRT.2	Math 2
2.	B, D, E	G-SRT.8	Math 2
3.	The set of all points in a plane that are equidistant from a given point is called a <input type="text" value="circle"/> . The given point is called the <input type="text" value="center"/> .	G-CO.1	Math 1
4.		G-SRT.1b	Math 2

5.	A dilation of line ℓ with center A and a scale factor of 3 will produce a new line through point C' , the image of point C , with coordinates $(\boxed{-4}, \boxed{2})$ and with a slope of $\boxed{-2}$.	G-SRT.1a	Math 2
6.	Because each triangle contains a right angle and a 36° angle, the triangles are similar by AA similarity , and $\frac{AB}{AC} = \frac{DE}{DF} = \boxed{GH/GI}$. The proportion shows that the ratio of the length of the leg opposite the 36° angle to the length of the adjacent leg will be the same for any right triangle with a 36° angle. The value of the ratio is defined to be the tangent of 36° .	G-SRT.6	Math 2
7.	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid gray; padding: 5px; width: 45%;"> <p style="text-align: center;">Similar to Triangle ABC</p> <p style="text-align: center;">Multiply each side length by 3.5.</p> <p style="text-align: center;">Divide each side length by 0.75.</p> </div> <div style="border: 1px solid gray; padding: 5px; width: 45%;"> <p style="text-align: center;">Not Similar to Triangle ABC</p> <p style="text-align: center;">Add 12 to each side length.</p> <p style="text-align: center;">Subtract 2 from each side length.</p> </div> </div>	G-SRT.2	Math 2
8.	375.3	G-SRT.8	Math 2
9.		G-GPE.6	Math 3
10.	Given distinct noncollinear points A , B , and C , the set of all points between A and C including A and C is a line segment .	G-CO.1	Math 1
11.	Part A: see rubric Part B: see rubric	HS.D.2-1	Math 2
12.	Part A: see rubric Part B: see rubric	HS.D.3-2	Math 2
13.	See rubric	HS.C.14.2	Math 1
14.	Part A: see rubric Part B: see rubric	HS.D.2-11	Math 2
15.	See rubric	HS.C.15.14	Math 2
16.	Part A: see rubric Part B: see rubric	HS.C.13.3	Math 3
17.	Part A: see rubric Part B: see rubric	HS.C.18.2	
18.	See rubric	HS.D.1-2	Math 2

#11 Part A	
Score	Description
1	<p>Student response includes the following element.</p> <ul style="list-style-type: none"> • Modeling component = 1 point <ul style="list-style-type: none"> ○ Defining the variable and setting up the equation <p>Sample Student Response: $w(w + 20) + 1,280 = (w + 16)(w + 20)$, where w is the width of the queen-sized mattress</p> <p>OR</p> <p>$16(w + 20) = 1,280$, where w is the width of the queen-sized mattress</p> <p>Notes:</p> <ul style="list-style-type: none"> ○ The variable must be defined or the point cannot be awarded. ○ Student should receive credit for any valid model written in terms of length. ○ The student can use one equation for the area of the king-sized mattress, such as $A = (w + 16)(w + 20)$, as long as the variable is defined.
0	Student response is incorrect or irrelevant.
#11 Part B	
Score	Description
2	<p>Student response includes the following 2 elements.</p> <ul style="list-style-type: none"> • Computation component = 1 point <ul style="list-style-type: none"> ○ Correctly solves the equation and provides valid work <p>Note: The student can earn points for Part B if the student correctly solves an incorrect equation from Part A.</p> • Modeling component = 1 point <ul style="list-style-type: none"> ○ Reporting the results <p>Sample Student Response: $w(w + 20) + 1,280 = (w + 16)(w + 20)$ $w^2 + 20w + 1,280 = w^2 + 36w + 320$ $960 = 16w$ $w = 60$</p> <p>The width of the queen-sized mattress is 60 inches. The length is found by adding 20 inches, which gives 80 inches. Queen-sized: 60 in. x 80 in.</p>

	The length of the king-sized mattress is the same as the queen-sized mattress (80 inches). The width is found by adding 16 inches, which gives 76 inches. King-sized: 76 in. x 80 in.
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.

#12 Part A	
Score	Description
2	<p>Student response includes the following 2 elements.</p> <ul style="list-style-type: none"> • Computation component = 1 point <ul style="list-style-type: none"> ○ Correct rate: 62.8 feet per minute • Modeling component = 1 point <ul style="list-style-type: none"> ○ Correct work shown <p>Sample Student Response:</p> <p>If it takes 30 seconds to make one revolution, then the merry-go-round would make 2 revolutions in a minute. The radius is 5 feet. So the circumference is $5(2)\pi = 10\pi$. So 2 revolutions would be 20π.</p> <p>$20\pi \approx 62.8$ feet</p> <p>So the rate is about 62.8 feet per minute.</p>
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.
#12 Part B	
Score	Description
1	<p>Student response includes the following element.</p> <ul style="list-style-type: none"> • Computation component = 1 point <p>Machine Scored: (-5, 0)</p>
0	Student response is incorrect or irrelevant.

#13 Rubric

Score	Description
3	<p>Student response includes the following 3 elements.</p> <ul style="list-style-type: none">• Reasoning component = 3 points<ul style="list-style-type: none">○ Correct and convincing reason explaining why Justine’s claim for lines of symmetry is incorrect○ Correct and convincing reason explaining why Justine’s claim for rotational symmetry is incorrect○ Correct use of notation and vocabulary to explain reasoning <p>Sample Student Response:</p> <p>Justine is incorrect because there are other lines of symmetry and rotational symmetry she did not consider. Each line containing a vertex and O is a line of symmetry. However, she did not account for three more lines of symmetry, the lines containing the midpoints of the sides and O. An angle with measure 60°, such as $\angle BOA$ does show rotational symmetry and so does 120°, 180°, 240°, 300°, and 360°. There are additional angles that show rotational symmetry that Justine did not include.</p>
2	Student includes a response to one or both of Justine’s claims but is not sufficiently convincing.
1	Student response includes a quick assessment of the claims but little to support the response.
0	Student response is incorrect or irrelevant.

#14 Part A

#14 Part A	
Score	Description
4	<p>Student response includes the following 4 elements.</p> <ul style="list-style-type: none"> • Modeling component = 4 points <ul style="list-style-type: none"> ○ Correct distance from the Sports Store to the Food Court: 759.74 feet ○ Correct distance from the Entrance to the Food Court: 1,771.2 feet ○ Correct difference between the total distance from the Entrance to the Sports Store to the Food Court and the distance from the Entrance diagonally to the Food Court: 588.54 feet ○ Correct setup of both equations <p>Sample Student Response:</p> <p>Let x = the distance from the Sports Store to the Food Court.</p> $\tan 25.4 = \frac{x}{1600}$ <p>Using trig ratios, $\tan 25.4(1600) = x$</p> $759.74 = x$ <p>Using the Pythagorean theorem, I can determine the length of the diagonal walkway. Let y = the distance from the Entrance to the Food Court.</p> $1600^2 + 759.74^2 = y^2$ $2560000 + 577205 = y^2$ $3137205 = y^2$ $1771.2 \approx y$ <p>So, the total distance from the Entrance to the Food Court via the Sports Store is about 2359.74 feet ($1600 + 759.74$), and the distance from the Entrance diagonally to the Food Court is about 1771.2 feet. Therefore, the difference is about 588.54 feet.</p>
3	Student response includes 3 of the 4 elements.
2	Student response includes 2 of the 4 elements.
1	Student response includes 1 of the 4 elements.
0	Student response is incorrect or irrelevant.
#14 Part B	
Score	Description
2	<p>Student response includes the following 2 elements.</p> <ul style="list-style-type: none"> • Modeling component = 2 points <ul style="list-style-type: none"> ○ Correct distance of walkway connecting the Electronics Store to the Restroom: 379.87 feet

- o Correct setup of equation or statement of similarity or other valid statement

Sample Student Response 1: Using Trigonometric Ratios

Let x = the distance from the Sports Store to the Food Court.

$$\tan 25.4 = \frac{x}{1600}$$

Using trig ratios, $\tan 25.4(1600) = x$

$$759.74 \approx x$$

Since the triangle formed by the walkways connecting the Entrance, Restroom, and Electronics Store is similar to the triangle formed by the walkways connecting the Entrance, Food Court, and Sports Store, the distance from the Restroom to Electronics Store is half the distance of the Sports Store to the Food Court.

$$\frac{759.74}{2} = 379.87$$

The distance of the walkway connecting the Restroom to the Electronics Store is about 379.87 feet.

Sample Student Response 2: Using Pythagorean Theorem

In the first part, $AD \approx 1771.2$. Because E is the midpoint of AD , $AE = DE$. Therefore, AE is half the distance of AD .

$$AE = 885.6.$$

Given the distance of the long side of the rectangular walkway is 1600 feet. Because B is the midpoint of AC , $AB = CB$. Therefore, AB is half the distance of AC .

$$AB = 800.$$

Substitute these values into the Pythagorean theorem because $\triangle AEB$ is a right triangle (walkway from restroom to Electronics Store is perpendicular and, therefore, 90° to walkway from the Entrance to the Sports Store).

$$(885.6)^2 = (800)^2 + x^2$$

$$784287.36 = 640000 + x^2$$

$$144287.36 = x^2$$

$$379.85 \approx x$$

The distance of the walkway connecting the Restroom to the Electronics Store is about 379.85 feet.

Note: Student can use response from Part A and receive two points for correct computation in Part B.

1 Student response includes 1 of the 2 elements.

0 Student response is incorrect or irrelevant.

#15 Rubric

Score	Description
4	<p>Student response includes the following 4 elements.</p> <ul style="list-style-type: none"> • Computation component = 1 point <ul style="list-style-type: none"> ○ Correct expression for n anchors: $22.1(n - 1)$ feet <p>Note: the coefficient can be rounded or truncated. Values of 22, 22.0, 22.06, and 22.07, etc. are acceptable</p> • Modeling component = 3 points <ul style="list-style-type: none"> ○ Recognition that length of cable between two anchors can be thought of as the hypotenuse of a 65-25 right triangle ○ Use of appropriate trigonometric ratio ○ Recognition of pattern between anchors <p>Sample Student Response:</p> <p>The right triangle formed by a line from the anchor perpendicular to the opposite pole and the cable connecting the two anchors has an angle of 25°. The length of the hypotenuse, h, could be found by using the cosine:</p> $\cos 25^\circ = \frac{20}{h} \text{ so } h = \frac{20}{\cos 25^\circ} \approx 22.1$ <p>So between each pair of anchors, the length of the cable is 22.1 feet. For 2 anchors, the cable needed is 22.1 feet; for 3 anchors, $2(22.1)$ feet; 4 anchors, $3(22.1)$ feet; and so on. So for n anchors, there is $22.1(n - 1)$ feet of cable.</p>
3	Student response includes 3 of the 4 elements.
2	Student response includes 2 of the 4 elements.
1	Student response includes 1 of the 4 elements.
0	Student response is incorrect or irrelevant.

#16 Part A	
Score	Description
1	<p>Student response includes the following element.</p> <ul style="list-style-type: none"> • Computation component = 1 point <ul style="list-style-type: none"> ○ Machine Scored: 5
0	Student response is incorrect or irrelevant.
#16 Part B	
Score	Description
2	<p>Student response includes the following 2 elements.</p> <ul style="list-style-type: none"> • Reasoning component = 2 points <ul style="list-style-type: none"> ○ A correct expression that will guarantee that lines j and k are parallel ○ Correct mathematical support that includes an explanation/proof that the lines are parallel or an explanation of why the expression will guarantee that lines j and k will be parallel <p>Sample Student Response:</p> <p>Two non-vertical lines are parallel if and only if they have the same slope. So lines j and k are parallel if $\frac{b - a}{x_2 - x_1} = \frac{t - (a + n)}{x_2 - x_1}$.</p> <p>AND</p> <p>$t = b - a + (a + n) = b + n$. So the expression that replaces t in order to guarantee the lines are parallel is $b + n$ or $n + b$.</p>
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.

#17 Part A	
Score	Description
1	<p>Student response includes the following element.</p> <ul style="list-style-type: none"> • Computation component = 1 point <ul style="list-style-type: none"> ○ Machine Scored: C
0	Student response is incorrect or irrelevant.
#17 Part B	
Score	Description
3	<p>Student response includes the following 3 elements.</p> <ul style="list-style-type: none"> • Reasoning component = 2 points <ul style="list-style-type: none"> ○ Correct reasoning to find the length of the legs of isosceles triangle ○ Correct reasoning to find the length of the base of the isosceles triangle • Computation component = 1 point <ul style="list-style-type: none"> ○ Correct perimeter <p>Sample Student Response:</p> <p>If A is at the origin and C is at (12, 16), then I can form a right triangle with the base leg being 12 and the height leg being 16. Using the Pythagorean Theorem, I can find the hypotenuse to be 20, which becomes the length of the 2 equal sides of the isosceles triangle. $(12^2 + 16^2 = 400 \Rightarrow \sqrt{400} = 20)$. I can find the length of the base of $\triangle ABC$ by doubling the length of the right triangle I found above. So the length of the base of $\triangle ABC$ is 24 ($2 \cdot 12 = 24$). So the perimeter of $\triangle ABC$ is 64 units. $(20 + 20 + 24 = 64)$.</p> <p>OR</p> <p>If A is at the origin and C is at (12, 16), then I can form an isosceles triangle with leg AC and leg AB congruent. Using the Pythagorean Theorem, AC equals 20, $(12^2 + 16^2 = 400 \Rightarrow \sqrt{400} = 20)$, which becomes the length of the 2 congruent legs of the isosceles triangle. This means B is 20 units away from A at (20, 0). Using the Pythagorean Theorem again, BC equals approximately 17.89 units $(8^2 + 16^2 = 320 \Rightarrow \sqrt{320} \approx 17.89)$. So the perimeter of $\triangle ABC$ is approximately 57.89 units $(20 + 20 + 17.89 = 57.89)$.</p>

#18 Rubric

Score	Description
6	<p>Student response includes the following 6 elements.</p> <ul style="list-style-type: none">• Modeling component: Volumes Part 1 = 2 points<ul style="list-style-type: none">○ The correct volumes for the water currently in the pool and the capacity of the pool are shown with the formulas, setup, and work.○ The correct volume for the part of the pool that is currently without water is shown with work as needed.• Calculation component: Conversion Part 2 = 1 point<ul style="list-style-type: none">○ Correct conversion of cubic feet to gallons or gallons to cubic feet• Modeling component: Draw conclusions Part 3 = 1 point<ul style="list-style-type: none">○ Correct number of people is determined• Modeling component: Interpretation Part 4 = 1 point<ul style="list-style-type: none">○ The number of people rounded to a whole person is given and is supported by work. Note: The interpretation should use a number that has been rounded down from the result of the model the student uses.• Calculation component: Perform operations Part 5 = 1 point<ul style="list-style-type: none">○ All computations are correct. Note: Since incorrect calculations will cause a deduction in Part 1, this is applied to Part 2 – Part 4. Calculations are expected and should be correct. If calculations are missing or incorrect, this part will not receive credit. <p>Sample Student Response 1:</p> <p>The total volume of the pool is $\pi(6^2)(4) \approx 452.39$ cubic feet. The volume of the water in the pool is $\pi(6^2)(3.5) \approx 395.84$ cubic feet. Therefore, there is an additional $452.39 - 395.84 = 56.55$ cubic feet of space in the pool.</p> <p>Given that 1 cubic foot is 7.48 gallons, 56.55 cubic feet is about 422.99 gallons.</p>

Let x represent the number of people in the water.

$$\frac{1}{18} = \frac{x}{422.99}$$

$$x \approx 23.5$$

This means approximately 23 classmates could be in the pool before the water begins to overflow.

Sample Student Response 2:

The total volume of the pool is $\pi(6^2)(4) \approx 452.39$ cubic feet. The volume of the water in the pool is $\pi(6^2)(3.5) \approx 395.84$ cubic feet. Therefore, there is an additional $452.39 - 395.84 = 56.55$ cubic feet of space in the pool.

Given that 1 cubic foot is 7.48 gallons, 1 gallon is about 0.13 cubic feet. Each person would displace about 2.34 cubic feet of water.

Let x represent the number of people in the water.

$$\frac{1}{2.34} = \frac{x}{56.55}$$

$$x \approx 24.2$$

This means approximately 24 classmates could be in the pool before the water begins to overflow.

Note: Because of rounding issues, answers will vary on the task. However, because the gallon conversion was given as 7.48, the response must use 7.48 in the conversion component.

5	Student response includes 5 of the 6 elements
4	Student response includes 4 of the 6 elements
3	Student response includes 3 of the 6 elements.
2	Student response includes 2 of the 6 elements.
1	Student response includes 1 of the 6 elements.
0	Student response is incorrect or irrelevant.