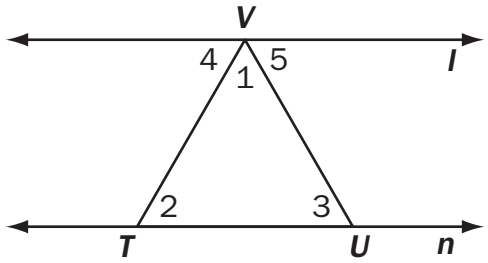
Item 1

Selected-Response: 1 point

In this figure, $l \| n$. Jessie listed the first two steps in a proof that shows $m\angle 1 + m\angle 2 + m\angle 3 = 180°$.



	Step	Justification
1	$\angle 2 \cong \angle 4$	?
2	$\angle 3 \cong \angle 5$	?

Which justification can Jessie give for Steps 1 and 2?

A. Alternate interior angles are congruent.
B. Corresponding angles are congruent.
C. Vertical angles are congruent.
D. Alternate exterior angles are congruent.

Item 2

Selected-Response: 1 point

The points $O(-4, 3)$, $A(x, y)$, and $B(x, 3)$ create a right triangle inside of Circle O. Point A lies on the circle. $OA = 6$ centimeters.

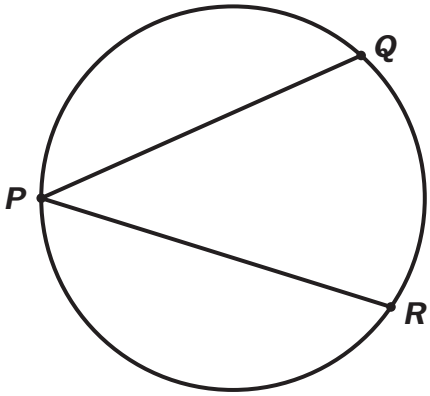
What is the equation of Circle O?

A. $(x + 4)^2 + (y - 3)^2 = 6$
B. $(x - 3)^2 + (y - 3)^2 = 6$
C. $(x - 3)^2 + (y + 4)^2 = 36$
D. $(x + 4)^2 + (y - 3)^2 = 36$

Item 3

Selected-Response: 1 point

In this circle, $m\overset{\frown}{QR} = 72°$.



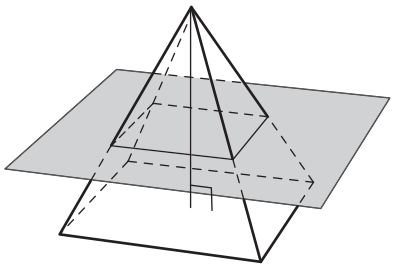
What is $m\angle QPR$?

A. 18°
B. 24°
C. 36°
D. 72°

Item 4

Selected-Response: 1 point

Look at the square pyramid.



If the plane in the figure is parallel to the base of the pyramid, which BEST describes the shape of the intersection?

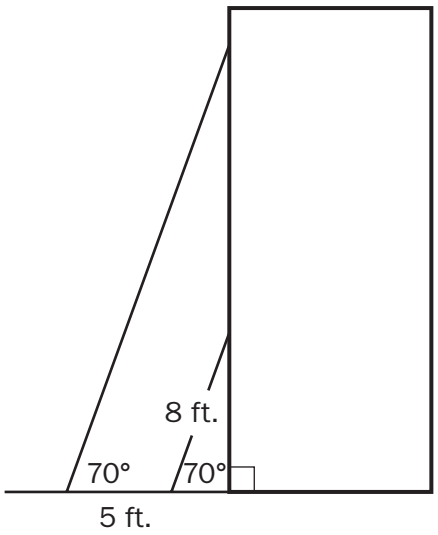
A. a rectangle
B. a trapezoid
C. a triangle
D. a circle

Item 5

Selected-Response: 1 point

This diagram shows two ladders leaning against a building. Each ladder is leaning at an angle of 70 degrees.

- **The length of the short ladder is 8 feet.**
- **The base of the long ladder is 5 feet farther from the base of the building than the base of the short ladder is.**



What is the length, to the nearest foot, of the long ladder?

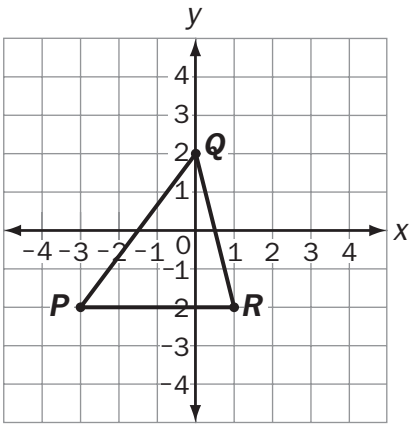
$$\begin{bmatrix} \sin 70° = 0.9397 \\ \cos 70° = 0.3420 \\ \tan 70° = 2.7475 \end{bmatrix}$$

A. 10 ft.
B. 13 ft.
C. 23 ft.
D. 26 ft.

Item 6

Selected-Response: 1 point

Look at the coordinate grid below.



What is the perimeter of ΔPQR?

A. $4 + \sqrt{42}$
B. 14
C. $9 + \sqrt{17}$
D. 17

Item 7

Selected-Response: 1 point

Look at the coordinates of square *ABCD*.

- ***A*(–3, 0)**
- ***B*(2, 4)**
- ***C*(6, –1)**
- ***D*(1, –5)**

What is the perimeter of square *ABCD*?

A. 20 units
B. $4\sqrt{41}$ units
C. $2\sqrt{82}$ units
D. 41 units

Item 8

Selected-Response: 1 point

Paul has a spinner with the colors red, green, blue, orange, and purple on it. He also has a six-sided number cube.

The probability of the arrow of the spinner stopping on green is $\frac{1}{5}$ and the probability of getting a number greater than 2 when tossing the number cube is $\frac{4}{6}$.

What is the probability of landing on green and tossing a number greater than 2?

A. $\frac{2}{15}$

B. $\frac{3}{10}$

C. $\frac{7}{10}$

D. $\frac{13}{15}$

Item 9

Technology-Enhanced: 2 points

Triangle *ABC* is similar but not congruent to triangle *DEF*.

Part A

Which series of transformations could map triangle *ABC* onto triangle *DEF*?

A. translation 4 units up, rotation 75° about the origin
B. reflection across the line $y = 2$, rotation 90° about the origin
C. translation 3 units left, dilation of scale factor 2 centered at the origin
D. reflection across the line $x = 1$, reflection across the line $y = 5$

Part B

Which equation must be true about triangle *ABC* and triangle *DEF*?

A. $AB = DE$
B. $AC = EF$
C. $m\angle A + m\angle B = m\angle D + m\angle F$
D. $m\angle A + m\angle C = m\angle D + m\angle F$

Item 10

Technology-Enhanced: 2 points

Triangle *GHJ* is a right triangle. Angle *G* has a measure of $g°$, angle *H* has a measure of $h°$, and angle *J* is a right angle.

Part A

Select TWO equations that must be true.

A. $\sin(h°) = \sin(g°)$
B. $\cos(g°) = \sin(h°)$
C. $\cos(h°) = \cos(g°)$
D. $\sin(h°) + \cos(h°) = \sin(g°) + \cos(g°)$
E. $\sin(g°) + \cos(h°) = \cos(g°) + \sin(h°)$

Part B

Given that $\tan(g°) = \dfrac{\sin(g°)}{\cos(g°)}$, which ratio must have a value equivalent to the tangent of $g°$?

A. $\dfrac{\cos(h°)}{\sin(g°)}$

B. $\dfrac{\cos(h°)}{\sin(h°)}$

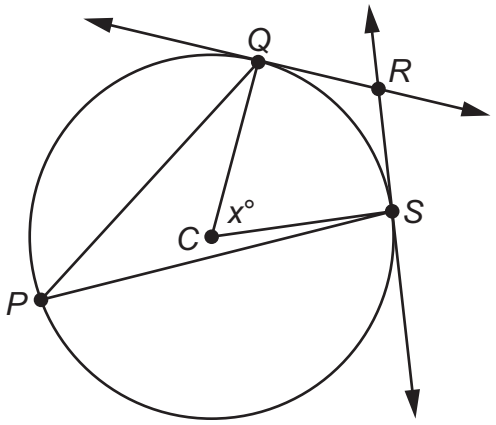
C. $\dfrac{\sin(h°)}{\cos(h°)}$

D. $\dfrac{\sin(h°)}{\cos(g°)}$

Item 11

Technology-Enhanced: 2 points

The figure shows circle *C* with tangent lines $\overleftrightarrow{QR}$ and $\overleftrightarrow{SR}$.



The measure of $\angle QCS$ is $x°$.

Select THREE statements that are true about the figure.

A. The measure of $\angle QPS$ is $(90 - x)°$.

B. The measure of $\angle QPS$ is $\frac{1}{2}x°$.

C. The measure of $\angle PSR$ is 90°.

D. The measure of $\angle CQR$ is 90°.

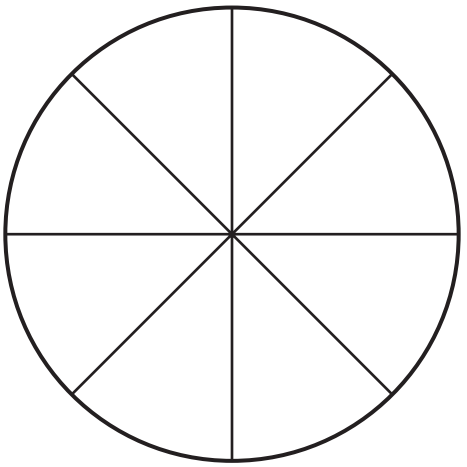
E. The measure of $\angle QRS$ is $(180 - x)°$.

F. The measure of $\angle QRS$ is $2x°$.

Item 12

Constructed-Response: 2 points

Billy is creating a circular garden divided into 8 equal sections. The diameter of the garden is 12 feet.



What is the area, in square feet, of one section of the garden? Use $\pi = 3.14$. Explain how you determined your answer. Write your answer on the lines provided.

Item 13

Extended Constructed-Response: 2 points

Jane and Mark each build ramps to jump their remote-controlled cars.

Both ramps are right triangles when viewed from the side. The incline of Jane's ramp makes a 30-degree angle with the ground, and the length of the inclined ramp is 14 inches. The incline of Mark's ramp makes a 45-degree angle with the ground, and the length of the inclined ramp is 10 inches.

Part A: What is the horizontal length of the base of each ramp? Explain how you found your answers. Write your answers on the lines provided.

$$\begin{bmatrix} \sin 30° = 0.5000 & \sin 45° = 0.7071 \\ \cos 30° = 0.8660 & \cos 45° = 0.7071 \\ \tan 30° = 0.5774 & \tan 45° = 1.0000 \end{bmatrix}$$

Part B: Which car is launched from the highest point? Explain your reasoning. Write your answer on the lines provided.

ADDITIONAL SAMPLE ITEM KEYS

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
1	MGSE9-12G.CO.10	2	A	The correct answer is (A) because each line is an example of alternate interior angles being congruent. Choice (B) is incorrect because the angles shown are not corresponding angles. Choice (C) is incorrect because the angles shown are not vertical angles. Choice (D) is incorrect because the angles shown are not alternate exterior angles.
2	MGSE9-12A.GPE.1	3	D	The correct answer is choice (D). Choice (A) is incorrect because the radius is not squared. Choice (B) is incorrect because it uses the wrong coordinate for the *x*-value and does not square the radius. Choice (C) is incorrect because it confuses the *x*- and *y*-coordinates
3	MGSE9-12G.C.2	1	C	The correct answer is choice (C) because an inscribed angle is one-half the measure of the arc it creates. Choice (A) is incorrect because it is one-quarter the measure of the arc it creates. Choice (B) is incorrect because it is one-third the measure of the arc it creates. Choice (D) is incorrect because it is the full measure of the arc it creates.
4	MGSE9-12 G.GMD.04	2	A	The correct answer is choice (A) because a rectangle is the correct cross-section. Choices (B), (C), and (D) are incorrect because they represent the incorrect cross-sections.
5	MGSE9-12G.SRT.8	3	C	The correct answer is choice (C) 23 ft. The ratio of the distance from the short ladder to the wall to the length of the short ladder is equal to the cosine of the angle the ladder forms with the ground. So, the short ladder is $8\cos(70°) = 2.736$ feet from the wall, and the long ladder is 7.736 feet from the wall. Similarly, the ratio of the distance from the long ladder to the wall to the length of the long ladder is equal to the cosine of the angle the ladder forms with the wall. So, the long ladder is $7.736/\cos(70°) \approx 22.62$ feet. Choice (B) is incorrect because it is the sum of the lengths in the figure. Choices (A) and (D) are incorrect because they use incorrect trigonometric ratios.
6	MGSE9-12G.MG.3	2	C	The correct answer is choice (C) because $PQ = \sqrt{3^2 + 4^2} = 5$, $QR = \sqrt{1^2 + 4^2} = \sqrt{17}$, and $RP = 4$. Choice (A) incorrectly applies the Pythagorean theorem. Choices (B) and (D) are incorrect because they estimate the lengths without the Pythagorean theorem.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
7	MGSE9-12G.GPE.7	2	B	The correct answer is choice (B) $4\sqrt{41}$ units. Apply the distance formula to find the length of one side, which is $\sqrt{41}$. Since this is a square, multiply $\sqrt{41}$ by 4 to obtain the perimeter. Choice (A) is incorrect because the number of unit squares on a line segment were counted to estimate the length and then multiplied by 4. Choice (C) is incorrect because the length of the diagonal is multiplied by 2. Choice (D) is incorrect because it is the approximate area of the square.
8	MGSE9-12S.CP.2	2	A	The correct answer is choice (A). The student multiplied the probabilities of the two independent events. The student divided the probabilities in (B) and in (C) the complement of the probability from (B) was given. The probabilities were added in (D).
9	GSE-1: G.SRT.5	2	Part A: C Part B: D	See scoring rubric on page 34.
10	GSE-1: G.SRT.7	2	Part A: B/D Part B: B	See scoring rubric on page 35.
11	GSE-1: G.C.2	3	B/D/E	See scoring rubric on page 36.
12	MGSE9-12G.C.5	2	N/A	See scoring rubric and exemplar responses on page 37.
13	MGSE9-12G.SRT.8	3	N/A	See scoring rubric and exemplar responses beginning on page 38.

EXAMPLE SCORING RUBRICS AND EXEMPLAR RESPONSES

Item 9

Scoring Rubric

Points	Description
2	The response achieves the following: A score of 2 indicates complete understanding of how to use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. • The student determines that the correct answer for Part A is Choice (C). AND • The student determines that the correct answer for Part B is Choice (D).
1	The response achieves the following: A score of 1 indicates a partial understanding of how to use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. • The student determines that the correct answer for Part A is Choice (C). OR • The student determines that the correct answer for Part B is Choice (D).
0	The response achieves the following: A score of 0 indicates limited to no understanding of how to use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Item 10

Scoring Rubric

Points	Description
2	The response achieves the following: A score of 2 indicates a complete understanding of how to explain and use the relationship between the sine and cosine of complementary angles. • The student determines that the correct answers for Part A are Choice (B) and Choice (D). AND • The student determines that the correct answer for Part B is Choice (B).
1	The response achieves the following: A score of 1 indicates a partial understanding of how to explain and use the relationship between the sine and cosine of complementary angles. • The student determines that the correct answers for Part A are Choice (B) and Choice (D). OR • The student determines that the correct answer for Part B is Choice (B).
0	The response achieves the following: A score of 0 indicates limited to no understanding of how to explain and use the relationship between the sine and cosine of complementary angles.

Item 11

Scoring Rubric

Points	Description
2	The response achieves the following: A score of 2 indicates complete understanding of how to identify and describe relationships among inscribed angles, radii, chords, tangents, and secants. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. • The student selects Choice (B), Choice (D), and Choice (E).
1	The response achieves the following: A score of 1 indicates a partial understanding of how to identify and describe relationships among inscribed angles, radii, chords, tangents, and secants. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. • The student selects Choice (B) and Choice (D), with or without an additional incorrect answer. OR • The student selects Choice (D) and Choice (E), with or without an additional incorrect answer. OR • The student selects Choice (B) and Choice (E), with or without an additional incorrect answer.
0	The response achieves the following: A score of 0 indicates limited to no understanding of how to identify and describe relationships among inscribed angles, radii, chords, tangents, and secants. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. • The student selects Choice (B), with or without any additional incorrect answers. OR • The student selects Choice (D), with or without any additional incorrect answers. OR • The student selects Choice (E), with or without any additional incorrect answers. OR • The student does not select any correct answers.

Item 12

Scoring Rubric

Points	Description
2	The response achieves the following: Student demonstrates full understanding of deriving the area of a sector of a circle. Award 2 points for a student response that contains both the following elements: • An explanation of a valid process for determining the area of one section of the garden • A final answer of 4.5π or 14.13 feet^2
1	The response achieves the following: Student shows partial understanding of deriving the area of a sector of a circle. Award 1 point for a student response that contains only one of the following elements: • An explanation of a valid process for determining the area of one section of the garden • A final answer of 4.5π or 14.13 feet^2
0	The response achieves the following: Student demonstrates little to no understanding of deriving the area of a sector of a circle.

Exemplar Response

Points Awarded	Sample Response
2	I can find the area of the entire circle and divide by 8. This equals 4.5π.
1	4.5π feet^2
0	*Student does not produce a correct response or a correct process.*

Item 13

Scoring Rubric

Points	Description
4	The response achieves the following: Response demonstrates a complete understanding of using trigonometric ratios and the Pythagorean Theorem to solve real-world problems. Give 4 points for correct responses to both Part A and Part B with valid work shown. **Scoring Note**: There are other valid ways of solving. Accept any valid method.
3	The response achieves the following: Response demonstrates a nearly complete understanding of using trigonometric ratios and the Pythagorean Theorem to solve real-world problems. Give 3 points for correct responses to both Part A and Part B with valid work shown for only 1 part. **Scoring Note**: There are other valid ways of solving. Accept any valid method.
2	The response achieves the following: Response demonstrates a partial understanding of using trigonometric ratios and the Pythagorean Theorem to solve real-world problems. Give 2 points for any of the following response types: • Correct responses to both Part A and Part B with no valid work shown • Correct response for Part A with valid work shown with no correct work in Part B • Correct response for Part B with valid work shown with no correct work in Part A (Incorrect results in Part A can be used in a correct method in Part B.) **Scoring Note**: There are other valid ways of solving. Accept any valid method.
1	The response achieves the following: Response demonstrates a minimal understanding of using trigonometric ratios and the Pythagorean Theorem to solve real-world problems. Give 1 point for either of the following: • Correct response to either Part A or Part B with no valid work shown for either • Correct method to one part shown, but it contains a computational error that results in an incorrect solution **Scoring Note**: There are other valid ways of solving. Accept any valid method.
0	The response achieves the following: Response demonstrates no understanding of using trigonometric ratios and the Pythagorean Theorem to solve real-world problems.

Exemplar Response

Points Awarded	Sample Response
4	Part A: Jane's ramp's horizontal length: 14cos(30) = 12.12 inches Mark's ramp's horizontal length: 10cos(45) = 7.1 inches Part B: Jane's car is launched from 14sin(30) = 7 inches Mark's car is launched from 10sin(45) = 7.1 inches So, Mark's car is launched from a higher point.
3	Part A: Jane's ramp's horizontal length = 14cos(30) = 12.1 inches and Mark's ramp = 10cos(45) = 7.1 inches Part B: Mark's car is launched from a higher point.
2	Part A: Jane's ramp's horizontal length = 12.1 inches and Mark's ramp = 7.1 inches Part B: Mark's car is launched from a higher point.
1	Part A: Jane's ramp's horizontal length = 12.1 inches and Mark's ramp = 7.1 inches
0	*Student does not produce a correct response or a correct process.*