MATHEMATICS BRIEF CONSTRUCTED RESPONSE RUBRIC

3   The response indicates **application** of a reasonable strategy that leads to a correct solution in the context of the problem. The **representations** are essentially correct. The **explanation** and/or **justification** is logically sound, clearly presented, fully developed, supports the solution, and does not contain significant mathematical errors. The response demonstrates a complete understanding and **analysis** of the problem.

2   The response indicates **application** of a reasonable strategy that may be incomplete or undeveloped. It may or may not lead to a correct solution. The **representations** are fundamentally correct. The **explanation** and/or **justification** supports the solution and is plausible, although it may not be well developed or complete. The response demonstrates a conceptual understanding and **analysis** of the problem.

1   The response indicates little or no attempt to **apply** a reasonable strategy or applies an inappropriate strategy. It may or may not have the correct answer. The **representations** are incomplete or missing. The **explanation** and/or **justification** reveals serious flaws in reasoning. The **explanation** and/or **justification** may be incomplete or missing. The response demonstrates a minimal understanding and **analysis** of the problem.

0   The response is completely incorrect or irrelevant. There may be no response, or the response may state "I don't know."

MATHEMATICS EXTENDED CONSTRUCTED RESPONSE RUBRIC

4   The response indicates **application** of a reasonable strategy that leads to a correct solution in the context of the problem. The **representations** are correct. The **explanation** and/or **justification** is logically sound, clearly presented, fully developed, supports the solution, and does not contain significant mathematical errors. The response demonstrates a complete understanding and **analysis**   of the problem.

3   The response indicates **application** of a reasonable strategy that may or may not lead to a correct solution. The **representations** are essentially correct. The **explanation** and/or **justification** is generally well developed, feasible, and supports the solution. The response demonstrates a clear understanding and **analysis** of the problem.

2   The response indicates an incomplete **application** of a reasonable strategy that may or may not lead to a correct solution. The **representations** are fundamentally correct. The **explanation** and/or **justification** supports the solution and is plausible, although it may not be well developed or complete. The response demonstrates a conceptual understanding and **analysis** of the problem.

1   The response indicates little or no **application** of a reasonable strategy. It may or may not have the correct answer. The **representations** are incomplete or missing. The **explanation** and/or **justification** reveals serious flaws in reasoning. The **explanation** and/or **justification** may be incomplete or missing. The response demonstrates a minimal understanding and **analysis** of the problem.

0   The response is completely incorrect or irrelevant. There may be no response, or the response may state "I don't know."

Explanation refers to the student using the language of mathematics to communicate how the student arrived at the solution.

Justification refers to the student using mathematical principles to support the reasoning used to solve the problem or to demonstrate that the solution is correct. This could include the appropriate definitions, postulates, and theorems.

Essentially correct representations may contain a few minor errors such as missing labels, reversed axes, or scales that are not uniform.

Fundamentally correct representations may contain several minor errors such as missing labels, reversed axes, or scales that are not uniform.

MATHEMATICS RUBRIC CUES FOR STUDENTS

Analysis

- Consider what the question asks you to do.
  - What information is given in the problem?
  - What information do you need to solve the problem?
- Think about what you would do to solve the problem.

* Representation

- Write an equation or inequality.
  - Define the variables. Let $x =$ _____ and/or let $y =$ _____.
- Create a graph, chart, or table.
  - Include titles, axes, labels, and scales.
- Create a drawing or construction.

Application

- Solve the problem.
- Write the answers in the context of the problem.
- Be sure you answer what is asked for in the problem.
- Check to see if the answer is reasonable.

* Explanation

- Write or describe the steps you used to solve the problem.

* Justification

- Use mathematics (definitions, theorems, reasoning, principles) to support your solution and/or process.
  - Write the mathematics concepts you used.
  - Tell why you solved the problem as you did.
  - Demonstrate that the solution is correct.

* Complete as appropriate and required by the problem.

Polygon Angle Formulas
Sum of degree measures of the interior angles of a polygon: $$180(n-2)$$ Degree measure of an interior angle of a regular polygon: $$\frac{180(n-2)}{n}$$ where n is the number of sides of the polygon

Coordinate Geometry Formulas
Let (x_1, y_1) and (x_2, y_2) be two points in the plane. $\text{slope} = \dfrac{y_2 - y_1}{x_2 - x_1}$ where $x_2 \neq x_1$ $\text{midpoint} = \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2} \right)$ $\text{distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Formulas for Area (*A*), Circumference (*C*), and Arc Length (*L*)

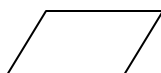Area of a Triangle: $A = \dfrac{1}{2}bh$

Area of a Rectangle: $A = bh$

Area of a Trapezoid: $A = \dfrac{1}{2}(b_1 + b_2)h$
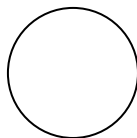
Area of a Parallelogram: $A = bh$

Area of a Circle: $A = \pi r^2$

Circumference of a Circle: $C = 2\pi r = \pi d$

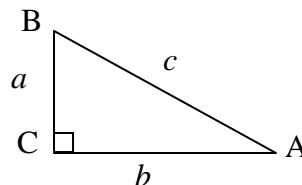Arc Length of a Circle: $L = \dfrac{m^o}{360^o}(2\pi r) = \dfrac{m^o}{360^o}(\pi d)$

Area of a Sector of a Circle: $A = \dfrac{m^o}{360^o}(\pi r^2)$

Area of a Segment of a Circle = Area of sector – Area of Triangle

Area of a Regular Polygon:
$A = \dfrac{1}{2}aP = \dfrac{1}{2} \times \text{apothem} \times \text{perimeter}$

Formulas for Right Triangles

Pythagorean Theorem:
$a^2 + b^2 = c^2$

$\sin A = \dfrac{a}{c} = \dfrac{\text{opposite}}{\text{hypotenuse}}$

$\cos A = \dfrac{b}{c} = \dfrac{\text{adjacent}}{\text{hypotenuse}}$

$\tan A = \dfrac{a}{b} = \dfrac{\text{opposite}}{\text{adjacent}}$

Special Triangles
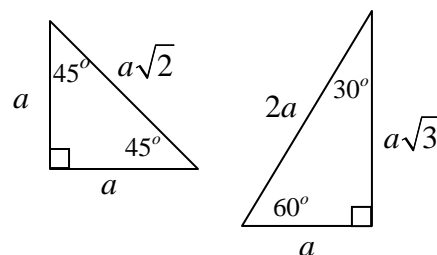
Law of Sines and Cosines

Law of Sines:

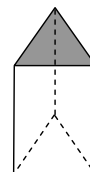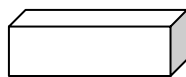$$\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$$

Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab\cos C$$
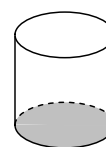
Formulas for Volume (*V*) and Surface Area (*SA*)

Right Prism

$V = Bh =$ area of base $\times$ height

$SA = 2B + Ph = 2 \times$ area of base $+ \left(\text{perimeter} \times \text{height}\right)$
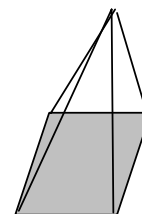
Right Circular Cylinder

$V = Bh =$ area of base $\times$ height $= \pi r^2 h$

$SA = 2B + Ch = 2 \times$ base $+ \left(\text{circumference} \times \text{height}\right) = 2\pi r^2 + 2\pi rh$
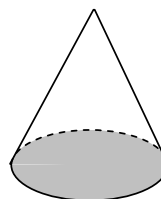
Regular Pyramid

$V = \dfrac{1}{3}Bh = \dfrac{1}{3} \times$ area of base $\times$ height

$SA = B + \dfrac{1}{2}Pl =$ area of base $+ \dfrac{1}{2} \times$ perimeter of base $\times$ slant height
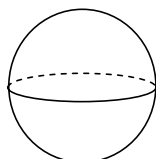
Right Circular Cone

$V = \dfrac{1}{3}Bh = \dfrac{1}{3} \times$ area of base $\times$ height $= \dfrac{1}{3}\pi r^2 h$

$SA = \pi r^2 + \pi rl$

Sphere

$V = \dfrac{4}{3}\pi r^3$

$SA = 4\pi r^2$