

# MeTEOR Performance Task

## Algebra I

Mathematics

Polynomials in the Garden

## **Performance Task Item: Polynomials in the Garden**

*Grade Level: Algebra 1*

**Focus Area:** Operations with Polynomials

**Essential Question:** How can we use the polynomial operations of addition, subtraction and multiplication in real life?

**Core Ideas:**

- Understands the laws of exponents.
- Understands the definition of a polynomial.
- Understands polynomials are closed under the operations of addition, subtraction and multiplication.
- Understands how to simplify expressions by combining like terms.

**Learning Targets:**

- Students will perform operations on polynomials.
- Students will follow the laws of exponents.
- Students will interpret the structure and parts of a polynomial expression including terms, factors and coefficients.
- Students will explain their reasoning.

### **STANDARDS**

**Domain: Algebra: Arithmetic With Polynomials & Rational Expressions**

**Content Standard:**

- Understand that polynomials from a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

**Supporting Standards:**

- Know precise definitions of expression's terminology.
- Understand the relationship between zeros and factors of polynomials.

**Math Practice Standards:**

MP 1: Make sense of problems and persevere in solving them.

MP 2: Reason abstractly and quantitatively.

MP 3: Construct viable arguments and critique the reasoning of others.

MP 4: Model with mathematics.

MP 6: Attend to precision.

MP 7: Look for and make use of structure.

**Materials:**

- Performance Task
- Pencil
- Paper
- Calculator



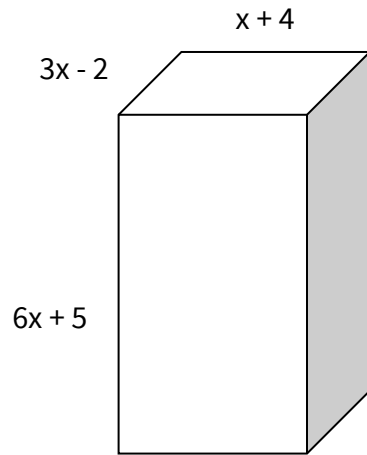
**Task/Question 2:**

**DOK Level 2:** Basic Application of Skills and Concepts

**Math Practice Standards:**

- MP 1: Make sense of problems and persevere in solving them.
- MP 4: Model with mathematics.
- MP 6: Attend to precision.

Kim ordered a new refrigerator from **A+ Appliances**. When the new appliance arrived, it was in a box with the dimensions given in feet listed below:



- What is the perimeter of the top of the box?
- What is the volume of the box?
- How much cardboard was used to make this box?
- Explain how you got your answer in Part C along with how you know you are correct:

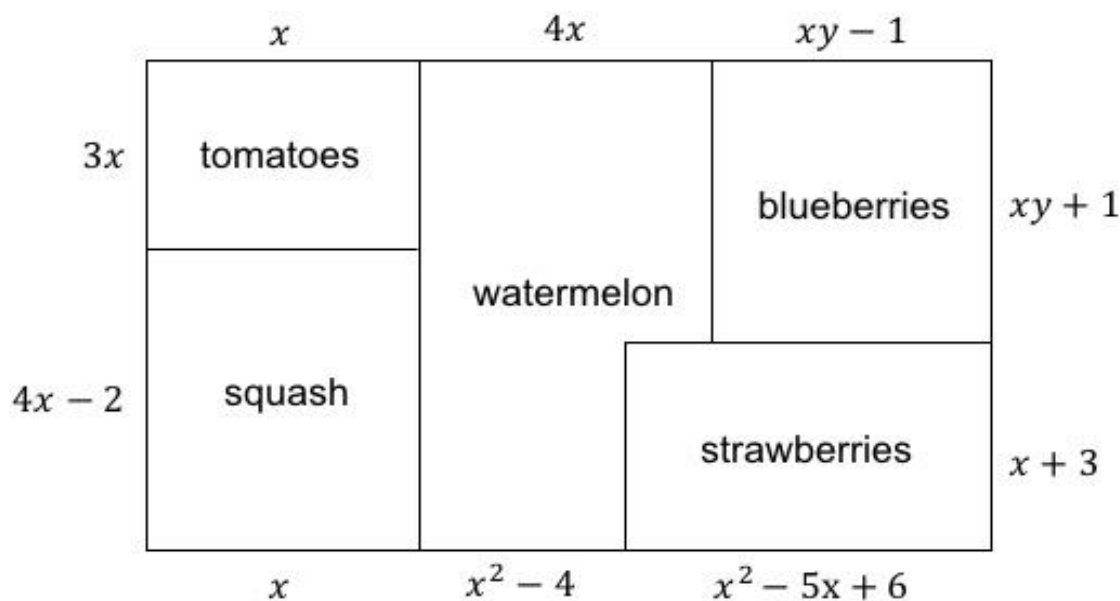
## Task/Question 3:

**DOK Level 2:** Basic Application of Skills and Concepts

### Math Practice Standards:

- MP 1: Make sense of problems and persevere in solving them.
- MP 2: Reason abstractly and quantitatively.
- MP 4: Model with mathematics.
- MP 6: Attend to precision.

Farmer George is planting a garden in an area behind his barn. The garden will have both fruits and vegetables. To begin his garden, he is planting tomatoes, squash, blueberries, strawberries and watermelon. His plan for the field layout in meters is as shown in the diagram below:



- Write a polynomial expression that represents the perimeter of the squash field and simplify your answer:
- What is the area of the strawberry field?
- Which field's area represents the difference of two squares?

**D.** What is the perimeter of Farmer George's total garden?

**E.** Explain how you got your answer to Part D:

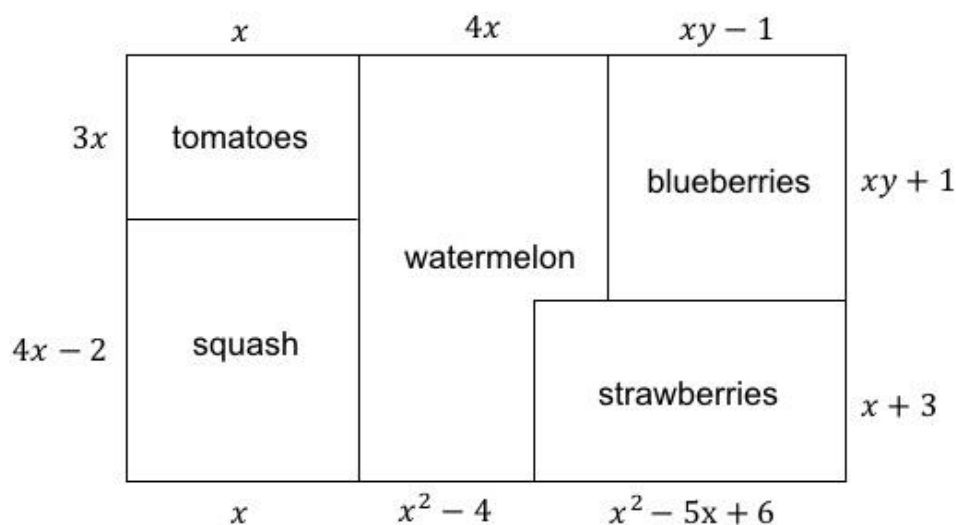
## Task/Question 4:

**DOK Level 3:** Strategic Thinking and Complex Reasoning

### Math Practice Standards:

- MP 1: Make sense of problems and persevere in solving them.
- MP 2: Reason abstractly and quantitatively.
- MP 3: Construct viable arguments and critique the reasoning of others.
- MP 4: Model with mathematics.
- MP 7: Look for and make use of structure.

Farmer George realized that he forgot to include a okra field into his field layout. He plans to use the same amount of area that the tomatoes and squash occupy *together* and will plant right next to them on the west side of the field. He will keep all measurements in meters.



- What will the perimeter of the okra field be?
- Find the total area of the okra, tomato and squash fields:
- If the  $x$  value is 4, what is the area in square meters of the answer from Part B?

- D. Farmer George needs your helping calculating the perimeter and area of the watermelon field as shown in the diagram:

Perimeter: \_\_\_\_\_ Area: \_\_\_\_\_

- E. How did you determine the best approach needed to solve the answer to Part D? Justify and defend how your approach to solving this is the **most efficient** method.



## Complete Performance Task Scoring Rubric *Polynomials in the Garden*

24-26 Proficient   21-23 Good   18-20 Satisfactory   16-17 Poor   0-15 Unsatisfactory

	Depth of Knowledge Level	Points	Total Possible Points for Task	Total Points Earned by Student
<p><b>Task 1:</b></p> <p>A. addition, subtraction, multiplication</p> <p>B. An expression that has no operations other than addition, subtraction and multiplication by or of the variable(s), has one or many terms.</p> <p>C. cubic trinomial</p> <p>D. <math>3^2 + 10x</math>, <math>12x^3 - x - 5</math>,  <math>7x + 3</math>, <math>-5x^2 + 10x + 13</math>  <math>x^2 + 3x - 54</math>, <math>10x^3 - 17x^2 - 6x - 35</math></p> <p>E. <math>P = 2x^2 + 10x + 4</math>   <math>A = 3x^3 + 11x^2 + x - 15</math></p>	<b>1</b>	<p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>3</b></p> <p><b>2</b></p>	<b>8</b>	
<p><b>Task 2:</b></p> <p>A. <math>8x + 4</math> ft.</p> <p>B. <math>18x^3 + 75x^2 + 2x - 40</math> ft<sup>3</sup></p> <p>C. <math>54x^2 + 84x + 4</math> ft<sup>2</sup></p> <p>D. Answers will vary. Possible Explanation: "In finding the amount of cardboard needed, I am being asked to find the total surface area of the box. I elected to find the area of three of the sides. Then, I combined like terms as I added them together. Since that was only half the amount</p>	<b>2</b>	<p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>2</b></p>	<b>5</b>	

<p>needed, I doubled my answer to obtain the total surface area of the cardboard box. To check my work, I could find the area of each face and add them all together</p>				
<p><b>Task 3:</b>  A. <math>2(4x - 2) + 2(x) = 10x - 4</math> meters  B. <math>x^3 - 2x^2 - 9x + 18</math> square meters  C. Blueberries  D. <math>2xy + 2x^2 + 9x + 3</math> meters  E. Answers will vary. Possible Explanation: “To find the total perimeter, I added all the outside measures together. As I added them together, I combined like terms.”</p>	<p><b>2</b></p>	<p><b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b></p>	<p><b>5</b></p>	
<p><b>Task 4:</b>  A. <math>18x - 4</math> meters  B. <math>14x^2 - 4x</math> square meters  C. <math>208 \text{ m}^2</math>  D. <math>P = 2xy + 10x + 8</math> meters  <math>A = 4x^2y + x^3 + 3x^2 - 12</math> square meters  E. Answers will vary. Possible Explanation: “To work with this problem I subdivided the irregular polygon into two rectangles. This allowed me the opportunity to use side lengths from other rectangles to get the lengths needed to calculate the two areas and add them together. However, finding the perimeter caused me to need another dimension. To get this dimension, I had to take the top length of <math>4x</math> and subtract the bottom</p>	<p><b>3</b></p>	<p><b>1</b> <b>1</b> <b>1</b> <b>2</b> <b>3</b></p>	<p><b>8</b></p>	

length of $x^2 - 4$ . Then, this led to following the integer rules for subtracting polynomials. Once I had all the side lengths, I added them altogether by combining like terms.”				
<b>TOTAL POINTS:</b>				



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