ALMS8

TAILORED LEARNING, PERSONALIZED PROGRESS

LEARNING MODULE 3

Model Real-Life Situations Using Algebraic Expressions

GRADE 8

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MODEL REAL-LIFE SITUATIONS USING ALGEBRAIC EXPRESSIONS.

Hey there, amazing learner! Welcome to our exciting journey into the world of modeling real-life situations using algebraic expressions. Throughout this course, we'll embark on an adventure filled with fun and practical math challenges. Get ready to explore scenarios from everyday life. Together, we'll sharpen our analytical skills, unlock the mysteries of algebraic expressions, and become masters of problem-solving! So, let's dive in and discover the fascinating world of algebraic modeling!

Learning Objectives:

At the end of this module, students will be able to:

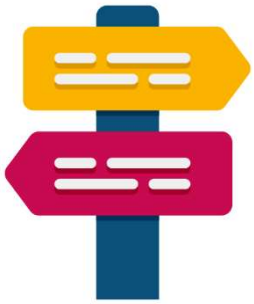
1. evaluate various real-life scenarios and determine appropriate algebraic expressions to model these situations;
2. construct and manipulate algebraic models with precision; and
3. develop a sense of achievement as they successfully model complex real-world situations using algebraic expressions.

We've explored how to translate real-life situations into algebraic expressions. Now, let's take it a step further. This discussion focuses on evaluating existing models and creating your own to tackle complex scenarios.

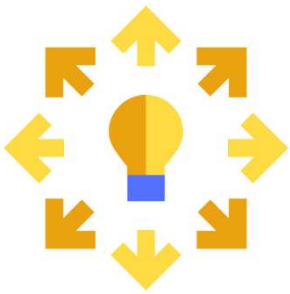
Evaluating Existing Models:

- ***Strengths and Weaknesses:*** Consider a real-life situation modeled by an existing expression (e.g., calculating travel time based on speed and distance). What factors does it consider? Are there any limitations or assumptions built into the model? How might it be inaccurate in certain situations (e.g., traffic, road conditions)?

- ***Alternative Approaches:*** Can you think of alternative ways to model the same situation using different variables or expressions? What are the advantages and disadvantages of each approach?



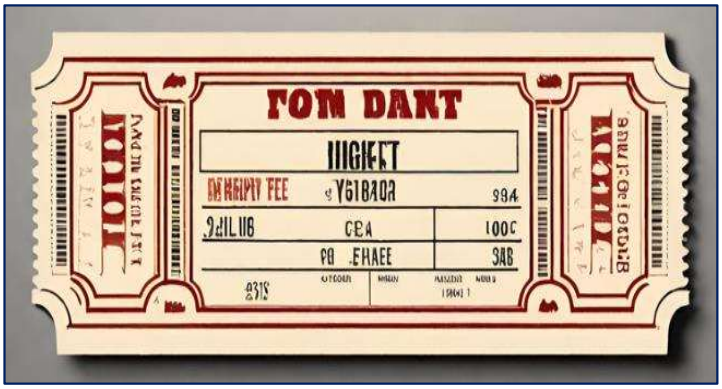
- ***Expanding the Scope:*** Can you modify the existing model to take into account additional factors (e.g., fuel efficiency for travel time, ingredient costs for recipes)? How does this change the complexity of the expression and its interpretability?



Creating Your Own Models	
Real-World Inspiration	Identify a personal interest or challenge from your daily life that can be modeled algebraically. It could be anything from managing your budget to optimizing workout routines.
Define Variables and Relationships	What are the key quantities involved? How do they interact with each other? Can you identify any relevant constants or constraints?
Translate into Expressions	Write down algebraic expressions that capture these relationships. Consider different ways to represent the same concept and choose the most appropriate based on clarity and usefulness.
Test and Refine	Apply your model to specific scenarios and compare the results to real-world observations. Does it produce reasonable outputs? How can you improve its accuracy or adapt it to different contexts?

Scenario: Movie Ticket Sales

You are given the following model for movie ticket sales:



$$\boldsymbol{Sales = Price \times Tickets + Fixed\ Cost}$$

$$S = P \times T + F$$

Analyze this model and answer the following questions:

1. What are the strengths and weaknesses of this model?

2. What factors does it not consider?

Analyzing the Movie Ticket Sales Model

Strengths:

- ***Simplicity:*** The model is easy to understand and interpret.
- ***Flexibility***: It can be easily applied to different scenarios by adjusting parameters.
- ***Key factors:*** It captures the fundamental relationship between price, ticket sales, and fixed costs.

Weaknesses:

- ***Oversimplification:*** It ignores important factors like marketing, movie popularity, and customer preferences.
- ***Static nature:*** It doesn't account for dynamic changes like price sensitivity, competition, or promotional periods.
- ***Linearity:*** It assumes a linear relationship between price and sales, which may not hold true in reality.

Factors not considered:

- ***Movie popularity:*** Popularity significantly impacts sales, regardless of price.
- ***Marketing efforts:*** Effective marketing can boost sales beyond the model's prediction.
- ***Customer preferences:*** Some viewers prioritize low prices while others value specific genres or actors.
- ***Competition:*** The presence of similar movies, especially at different prices, affects sales.

- ***Dynamic pricing:*** Ticket prices vary based on time, day, and seat location.

How would the model change if there were discounts for students or seniors?

Represent it algebraically:

If there were discounts for students or seniors, the model for movie ticket sales would need to be adjusted to incorporate these discounts.

Let's denote:

p as the original price of the ticket

d_s as discount for students

d_{sr} as discount for senior

t_r as tickets purchased by the regular

t_s as tickets purchased by the students

t_{sr} as tickets purchased by the senior

f as any fixed costs associated with running the movie theater.

The adjusted model for the sales of the movie tickets will be:

$$(p - d_s p)t_s + (p - d_{sr} p)t_{sr} + (pt_r) + f$$

Hence, the algebraic equation for the movie ticket sales, denoting s as the sales would be:

$$s = (p - d_s p)t_s + (p - d_{sr} p)t_{sr} + (pt_r) + f$$

This adjusted model accounts for the different prices charged to students, seniors, and regular customers, based on the discounts applied.