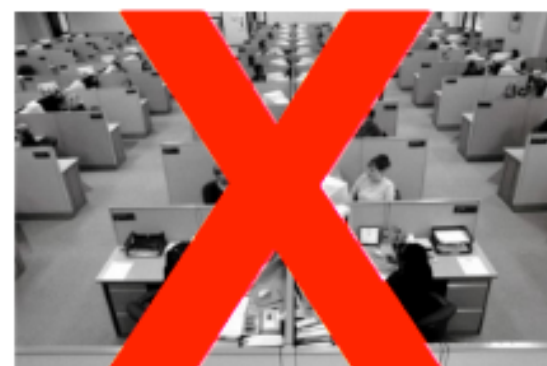


The Need

- US adults rank 21st in numeracy worldwide
- Twelve percent of US adults lack high school diplomas
- Practice tool for adult students preparing to take GED exam

Our Approach



- Automatic generation, not handwritten
- Delivering exercises to students via a browser-based, mobile-compatible interface

Technologies

- Java
- OpenNLP
- SageMath



Outcomes

- Improved mathematical literacy
- High school diploma equivalency
- Higher-paying occupations
- Lower unemployment rate

Our Solution: PEMDAS

PEMDAS is a mathematics study tool for assisting adults who are preparing to take the General Education Development (GED) exam.

The application creates and delivers algorithmically generated, conceptual mathematics practice exercises to students. These exercises test students' core understanding of foundational mathematics concepts, like arithmetic, algebra, geometry, and data analysis.

PEMDAS is a part of LeTR, a research group at The George Washington University that develops algorithms, tools, and technologies for making high-quality learning resources accessible to users of all literacy levels.

Algorithmic Generation

1. Equation to Templates

Equation: $X + Y$

Template 1

[Name] owes $\$(X)$ to the [occupation 1] and [he/she] owes $\$(Y)$ to the [occupation 2]. Which equation shows the total cost of [his/her] bills?

Template 2

$\{X\}$ [animal 1] arrive in a field, and then $\{Y\}$ [animal 2] also arrive in the field. Which equation shows the total number of animals in the field?

Template 3

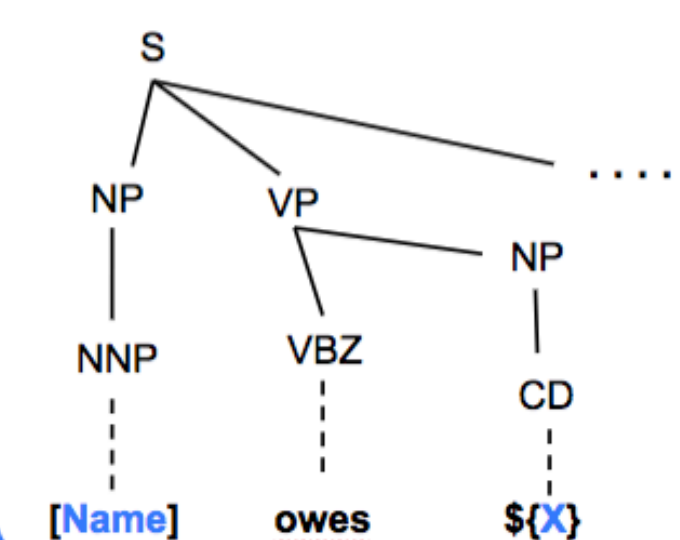
[Name] has $\{X\}$ [food 1], and [he/she] buys $\{Y\}$ [food 2] from the store. Which equation shows the total number of food items [he/she] has?

2. Template to Parse Tree

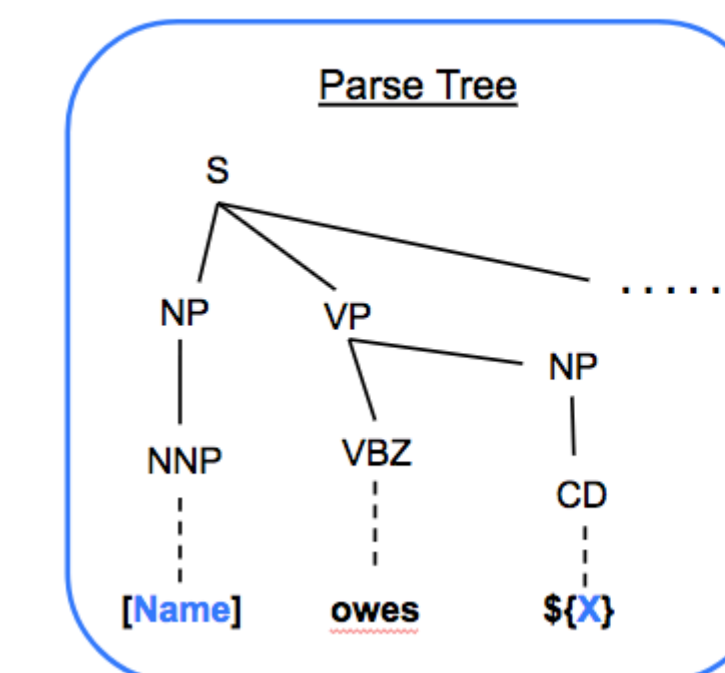
Template

[Name] owes $\$(X)$ to the [occupation 1] and $\$(Y)$ to the [occupation 2]. Which equation shows the total cost of [his/her] bills?

Parse Tree



3. Parse Tree to Questions



Question 1

John owes \$20 to the doctor and he owes \$5 to the dentist. Which equation shows the total cost of his bills?

Question 2

Martha owes \$42 to the accountant and \$12 to the event planner. Which equation shows the total cost of her bills?

4. Question to Answers

Question

John owes **\$20** to the doctor and he owes **\$5** to the dentist. Which equation shows the total cost of his bills?

Answer Choices

- a. $X + Y$ || $Y + X$
- b. $X - Y$ || $Y - X$
- c. $X + X$
- d. $Y + Y$