1

Ratio Statement Validator On-line

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www.StatLit.org/pdf/2005BurnhamSchieldASA6Up.pdf

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Statistical Literacy Course; Need for Drill in Skills

Goal: Using statistics as evidence in arguments.

Statistics are often ratios (rates and percentages) taken from data in tables and graphs

Arguments should be stated in ordinary English.

Students are not good at using ordinary English to describe or compare ratios, and they are not good at reading tables of ratios.

Drilling on this is a burden on class time so a computer-aided drill program is needed.

3

Strategic Goals: User and Program

User Goal:
- To read a table of rates and percentages, to interpret the meaning, and to write a single sentence in ordinary English that describes a single ratio or compares two ratios and can be quoted out of context without being misunderstood.

Program Goal:
- To analyze a user's sentence, to identify errors and to give *helpful* error messages.

4

Program Specs

- Present problem statement and data table.
- Accept User entry

- Analyze misspelled or extraneous words.
- Analyze errors in part-whole, test-base, pattern or amount.

- Provide appropriate feedback to user.
- Store log of user session.

5

Program Design

Web-based: **www.StatLit.org/RSVP**
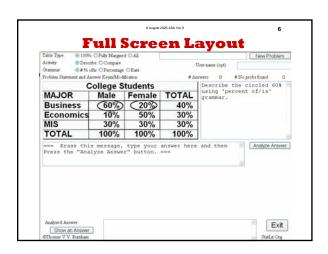
Not just a right-answer lookup.

Not full-blown artificial intelligence (AI).

Handles 23 core patterns with many variations.

Separate "dictionary" for each table.

Not a tutorial. Students must know the rules for the various grammars.

Captures question, user entries, program replies, user comments and use of optional features.

6

Full Screen Layout

Table Type:	⊙100% ○Fully Margined ○All			New Problem
Activity:	⊙Describe ○Compare		User name (opt)	
Grammar:	⊙#% ofis ○Percentage ○Rate			
Problem Statement and Answer Keys/Modification		# Answers: 0	# No probs found 0	

College Students

MAJOR	Male	Female	TOTAL
Business	60%	20%	40%
Economics	10%	50%	30%
MIS	30%	30%	30%
TOTAL	100%	100%	100%

Describe the circled 60% using 'percent of/is' grammar.

=== Erase this message, type your answer here and then Press the "Analyze Answer" button. ===

[Analyze Answer]

Analyzed Answer:
[Show an Answer]   [Exit]

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Program Operation

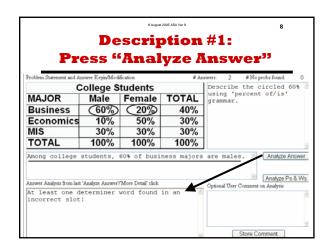**Select table type**: 100%, full, or missing margin
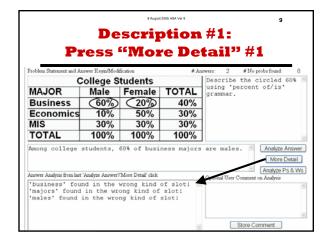**Select operation**: describe or compare
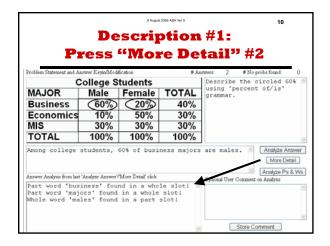**Select grammar**:
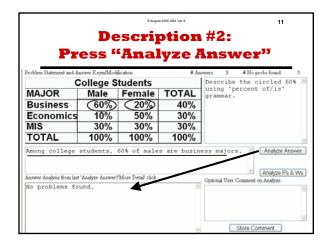 Describe: % of, percentage or rate
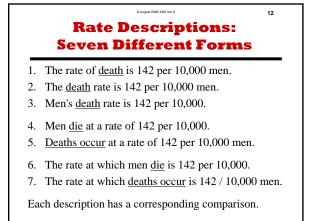 Compare: percentage, rate or likely
OPTIONS:
• **Analyze Answer** *(see following slides)*
• **Show More Detail** *(see following slides)*
• Show A Correct Answer
• Show Part and Whole in User's grammar

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Description #1:
Press "Analyze Answer"

Problem Statement and Answer Keyin/Modification   # Answers: 2   # probs found: 0

College Students

MAJOR	Male	Female	TOTAL
Business	60%	20%	40%
Economics	10%	50%	30%
MIS	30%	30%	30%
TOTAL	100%	100%	100%

Describe the circled 60% using 'percent of/is' grammar.

Among college students, 60% of business majors are males.

Analyze Answer

Analyze Ps & Ws

Answer Analysis from last 'Analyze Answer'/'More Detail' click

At least one determiner word found in an incorrect slot!

Optional User Comment on Analysis

Store Comment

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Description #1:
Press "More Detail" #1

Problem Statement and Answer Keyin/Modification   # Answers: 2   # probs found: 0

College Students

MAJOR	Male	Female	TOTAL
Business	60%	20%	40%
Economics	10%	50%	30%
MIS	30%	30%	30%
TOTAL	100%	100%	100%

Describe the circled 60% using 'percent of/is' grammar.

Among college students, 60% of business majors are males.

Analyze Answer
More Detail
Analyze Ps & Ws

Answer Analysis from last 'Analyze Answer'/'More Detail' click

'business' found in the wrong kind of slot!
'majors' found in the wrong kind of slot!
'males' found in the wrong kind of slot!

Optional User Comment on Analysis

Store Comment

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Description #1:
Press "More Detail" #2

Problem Statement and Answer Keyin/Modification   # Answers: 2   # probs found: 0

College Students

MAJOR	Male	Female	TOTAL
Business	60%	20%	40%
Economics	10%	50%	30%
MIS	30%	30%	30%
TOTAL	100%	100%	100%

Describe the circled 60% using 'percent of/is' grammar.

Among college students, 60% of business majors are males.

Analyze Answer
More Detail
Analyze Ps & Ws

Answer Analysis from last 'Analyze Answer'/'More Detail' click

Part word 'business' found in a whole slot!
Part word 'majors' found in a whole slot!
Whole word 'males' found in a part slot!

Optional User Comment on Analysis

Store Comment

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Description #2:
Press "Analyze Answer"

Problem Statement and Answer Keyin/Modification   # Answers: 3   # probs found: 1

College Students

MAJOR	Male	Female	TOTAL
Business	60%	20%	40%
Economics	10%	50%	30%
MIS	30%	30%	30%
TOTAL	100%	100%	100%

Describe the circled 60% using 'percent of/is' grammar.

Among college students, 60% of males are business majors.

Analyze Answer
Analyze Ps & Ws

Answer Analysis from last 'Analyze Answer'/'More Detail' click

No problems found.

Optional User Comment on Analysis

Store Comment

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Rate Descriptions:
Seven Different Forms

1. The rate of <u>death</u> is 142 per 10,000 men.
2. The <u>death</u> rate is 142 per 10,000 men.
3. Men's <u>death</u> rate is 142 per 10,000.

4. Men <u>die</u> at a rate of 142 per 10,000.
5. <u>Deaths occur</u> at a rate of 142 per 10,000 men.

6. The rate at which men <u>die</u> is 142 per 10,000.
7. The rate at which <u>deaths occur</u> is 142 / 10,000 men.

Each description has a corresponding comparison.

Student Answers:
Right and Wrong

Annual Death Rate per 100,000	
Total of All Causes	945
Major Cardiovascular disease	496
Malignancies (Cancer)	163
Accidents	56
All Other	231

- (OK) the death rate due to cancer
- (OK) the rate of death from malignancies
- (No) the death rate of malignancies
- (No) the rate of malignancies among deaths

Sample
Error Messages

1. 'XXX' not found in dictionary!
2. No ratio keyword found!
3. Answer not in requested form: {some} grammar

4. 'XXX' doesn't fit {some grammar}!
5. End of answer before end of {grammar} pattern!

6. Determiner word found in incorrect slot!
7. {word/phrase} 'XXX' in wrong kind of slot!
8. {part/whole} phrase 'XXX' in {whole/part} slot!
9. Determiner word is missing!

Anonymous
Student Responses

Q. How helpful is the current program?
Not (1), Not very (2), OK (4), Quite (6), Very (2)
Over half said "Quite" or "Very" useful.

Q. How helpful would improved program be?
Not (2), Not very (1), OK (0), Quite (8), Very (4)
Almost all said "Quite" or "Very" helpful.

Student comments on the program:
- Take time to learn it because it is helpful.
- It is the key to really understanding the material.
- It allowed me to practice and get feedback.

Possible Program
Enhancements

Extensions, Additional grammars:
- Chance/probability grammar
- Non part-whole ratios (deaths per miles)
- Distinct part comparisons
- Handling repeated words
- Vary the level of 'pickiness' in error messages

Major Enhancements:
- Analyze phrases as units.
- Requiring appropriate prepositions and articles
- Expand into a computer-aided tutorial

Conclusion

Initial Goal:
- To see if a computer-aided drill program could be written and deployed on the web that would help students learn the grammar needed to describe and compare rates and percentages as presented in tables.

Results:
- Program definitely achieved this goal.