

## Thinking With Mathematical Models

### Problem 5.3

Use the information about the students to answer these questions.

- A** Make a table to display the data on students and after-school jobs.

|                     | On-time Homework | Missing Homework | Totals |
|---------------------|------------------|------------------|--------|
| After-school Job    | 8                | 12               | 20     |
| No After-school Job | 25               | 15               | 40     |
| Totals              | 33               | 27               | 60     |

- B** Use your table from Question A. Do you think each statement is *true* or *false*? Justify your answers.

- Students without after-school jobs are more likely to have late or missing homework than students with after-school jobs.

|                     | On-time Homework | Missing Homework | Totals |
|---------------------|------------------|------------------|--------|
| After-school Job    | 8                | 12               | 20     |
| No After-school Job | 25               | 15               | 40     |
| Totals              | 33               | 27               | 60     |

With a Job:  $\frac{12}{20} = \frac{3}{5} = 60\%$

No Job:  $\frac{15}{40} = \frac{3}{8} = 37.5\%$

False

- Students with after-school jobs are more likely to have late or missing homework than on-time homework.

|                     | On-time Homework | Missing Homework | Totals |
|---------------------|------------------|------------------|--------|
| After-school Job    | 8                | 12               | 20     |
| No After-school Job | 25               | 15               | 40     |
| Totals              | 33               | 27               | 60     |

Late or missing work:  $\frac{12}{20} = \frac{3}{5} = 60\%$

On-Time work:  $\frac{8}{20} = \frac{2}{5} = 40\%$

True

3. Students without after-school jobs are three times as likely as students with after-school jobs to have on-time homework.

|                     | On-time Homework | Missing Homework | Totals |
|---------------------|------------------|------------------|--------|
| After-school Job    | 8                | 12               | 20     |
| No After-school Job | 25               | 15               | 40     |
| Totals              | 33               | 27               | 60     |

False

They are only 1.6 times as likely.

No Job:  $\frac{25}{40} = \frac{5}{8} = 62.5\%$

With Job:  $\frac{8}{20} = \frac{2}{5} = 40\%$

$\frac{62.5}{40.0} = 1.6$

4. Students with after-school jobs are less likely to have on-time homework than students without after-school jobs.

|                     | On-time Homework | Missing Homework | Totals |
|---------------------|------------------|------------------|--------|
| After-school Job    | 8                | 12               | 20     |
| No After-school Job | 25               | 15               | 40     |
| Totals              | 33               | 27               | 60     |

True

Same ratios as above  $40\% < 62.5\%$

- C 1. The numbers of students with and without after-school jobs are not the same. Rewrite the data in your table as fractions and percents.

|                     | On-time Homework                       | Missing Homework                       | Totals |
|---------------------|--|--|--------|
| After-school Job    | $\frac{8}{20} = \frac{2}{5} = 40\%$    | $\frac{12}{20} = \frac{3}{5} = 60\%$   | 20     |
| No After-school Job | $\frac{25}{40} = \frac{5}{8} = 62.5\%$ | $\frac{15}{40} = \frac{3}{8} = 37.5\%$ | 40     |
| Totals              | 33                                     | 27                                     | 60     |

2. Do the fractions and percents in your table change your answers to Question B? Explain your reasoning.

No, comparing fractions is the same as comparing percentages.

**D** If someone claims that the data and analysis show that after-school jobs cause students to have late or unfinished homework, what alternate explanations would you offer? What do you think could be the cause of late or unfinished homework other than after-school jobs?

What other real life situations could cause a student to have late or missing homework?

It may not just be due to having a job.

Discuss with your group!