

## Appendix C

## Test Problems and Their Equations

*Old Surface Features, Old Solution Procedure*

A chemist combines 5 qts. of a 40% acid solution with 15 qts. of a 20% acid solution. What is the resulting % of acid of the whole 20 qts. of solution?

$$5 * .40 + 15 * .20 = (5 + 15) * X \quad (6)$$

*New Surface Features, Old Solution Procedure*

In a small town with a population of 25,000 people, there are 5,000 long time residents, and their average income is \$40,000 per year. The other 20,000 people are newcomers, and their average income is \$45,000 per year. What is the average yearly income of the entire town?

$$5 * 40 + 20 * 45 = (5 + 20) * X \quad (7)$$

*Old Surface Features, New Solution Procedure*

A wine company has 40 gallons of wine that is 25% alcohol. They need to combine it with some wine that is 4% alcohol, so that the resulting wine will be 10% alcohol. How much of the 4% alcohol wine should be added to the original 40 gallons of wine?

$$40 * .25 + X * .04 = (40 + X) * .10 \quad (8)$$

*New Surface Features, New Solution Procedure*

In an experiment on the effects of smoking on heart rate, the average heart rate for 35 male subjects in the experimental group was 78 beats per minute. The average heart rate for the female subjects in the experimental group was 76. The average heart rate for the entire experimental group was 76.5. How many female subjects were there?

$$35 * 78 + X * 76 = (35 + X) * 76.5 \quad (9)$$