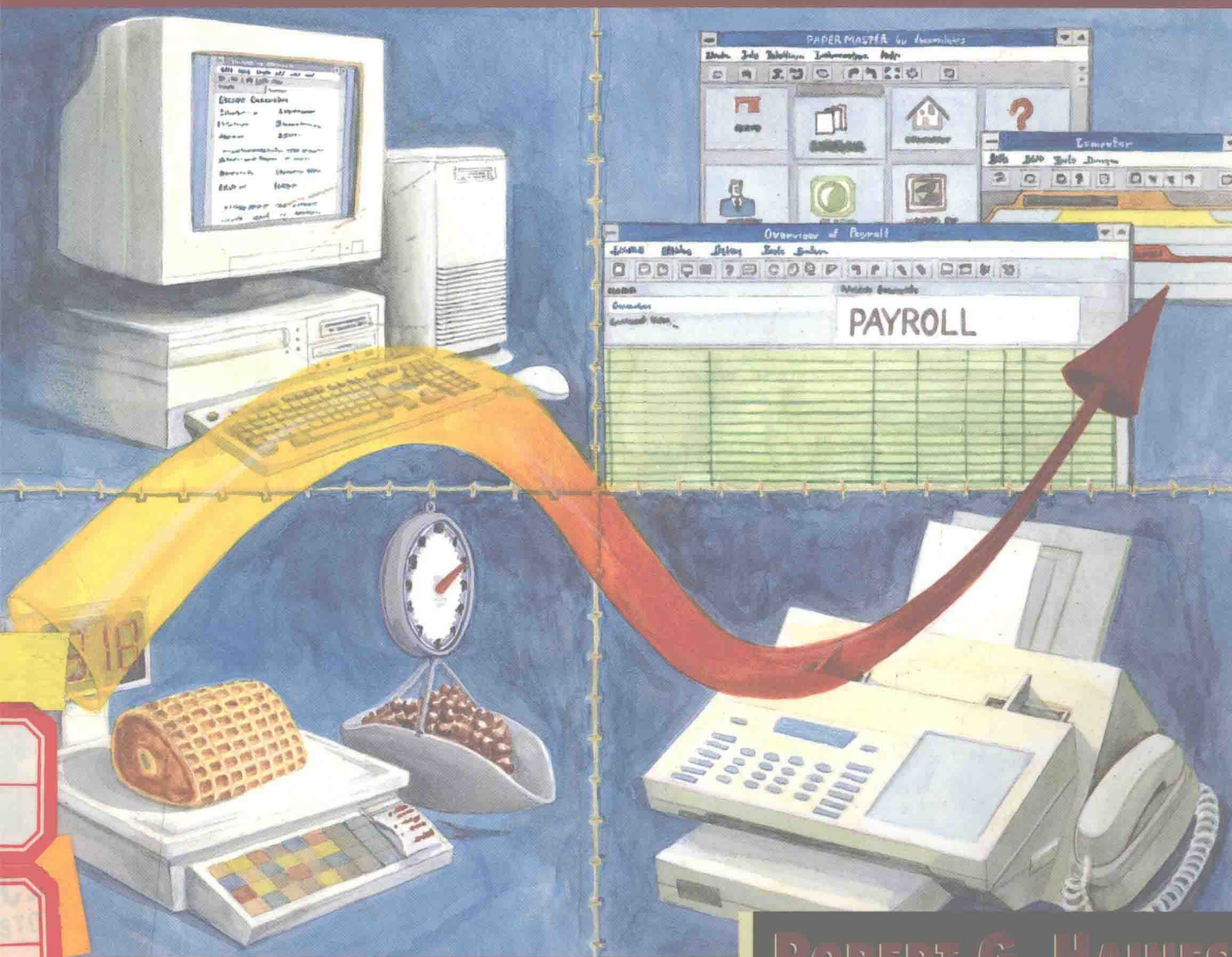
MATH PRINCIPLES FOR FOOD SERVICE OCCUPATIONS

3rd EDITION



ROBERT G. HAINES

Math Principles for Food Service Occupations

Third Edition

Robert G. Haines

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Delmar Staff
Acquisitions Editor: Christopher Anzalone
Developmental Editor: Jeffrey D. Litton
Project Editor: Eugenia L. Orlandi

Production Coordinator: Jennifer Gaines
Art & Design Coordinator: Douglas J. Hyldelund

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For more information, contact:

Delmar Publishers
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Math Principles for Food Service Occupations

Preface

Knowledge of mathematical principles in the food service industry becomes more critical year after year. The business is complex, competitive, and fast paced, with escalating food and labor costs always a concern that it is necessary for all employees to be cost conscious and understand basic mathematical concepts. Awareness and application of math skills which will contribute to the overall strength and profit of a food service operation are often a major factor when consideration is given for employment and advancement in the field. It takes math skills to control cost and the modern food service operation must control cost to succeed.

When a textbook is considered for a third edition, it has proven to be an excellent teaching tool. *Math Principles for Food Service Occupations* has achieved that distinction. All the information and concepts of the first two editions are retained. In addition, all the chapters have been updated and expanded. Information concerning **computers, FAXing,** and **payroll** have been introduced. **Mathematical topics** have also been added. All these additions have created a more complete, up-to-date food service math worktext and a more effective teaching tool.

Math Principles for Food Service Occupations opens with an expanded **Pretest** and concludes with an expanded **Posttest** for the purpose of evaluating the students math skills prior to and upon completing the course in order to determine the extent of student knowledge. The Pretest and Posttest consist of forty different math skills that are associated with a food service career. A **Profile Sheet** for both tests can be kept on file for reference.

The content has been divided into four coordinated parts to demonstrate subject association and simplify learning.

Part One, **Review of Math Fundamentals,** consists of three chapters intended to refresh and sharpen the student's math skills. The emphasis is placed on methods used to solve mathematical problems related to food service situations. This information should be thoroughly

reviewed and exercise problems worked and referred back to whenever necessary during the study of subsequent parts of the text.

Part Two, **Math Essentials in Food Preparation,** consists of five chapters which focuses on the math necessary to function as part of the preparation crew. This part includes weights and measures, portion control, converting and yielding recipes, production and baking formulas, and an expanded chapter on the metric system of measurement.

Part Three, **Math Essentials in Food Service Record Keeping,** consists of six chapters concentrating on the math necessary for keeping important records accurate and current. This part includes daily production reports, purchasing and receiving (which has been expanded to include information on FAXing), using the calculator, waiting tables, guest checks and tipping, daily cash receipts and bank deposits, and a new chapter on computer applications in a food service operation.

Part Four, **Essentials of Managerial Math,** deals with those math procedures that are typically the responsibility of management. It consists of six chapters intended to assist managerial decision making. Included are chapters exploring recipe and food costing, pricing the menu, inventory procedures, financial statements and budgeting, personal tax and payroll, and simple and compound interest.

It is the author's hope that the material contained in the worktext will provide the student with information and enough math knowledge to demonstrate confidence and display skills that will lead to rapid advancement in their food service career. Keep in mind, there is more to operating a successful food service operation than putting quality food before the guest.

Acknowledgments

When I undertook the task of writing the third edition of *Math Principles for Food Service Occupations* I knew I would need help acquiring examples, information, and illustrations. Many of my previous contacts were no longer available to provide the help needed. Fortunately, I found former students, companies, food service operators, and some nice people that were more than willing to assist me in accomplishing this task.

Undertaking a revision requires a patient, knowledgeable, experienced editor. I was fortunate to have two assigned to this project. Mary McGarry and Bob Nirkind guided me through the first draft displaying all the necessary qualities mentioned above, while at the same time providing encouragement when the task became difficult. They coordinated my writing efforts with several reviewers: Jill Zanke, DuPage Area Occupational Education System, Addison, IL; Gus Econompouly, Duchess County BOCES, Clinton Corners, NY; Douglas Fisher, Spokane Community College, Spokane, WA; Frank Welch, Parks College, Tucson, AZ.

These reviews resulted in improvements and changes that are evident in the text. I am grateful to them all for making this third edition a successful effort.

A special thanks must be given to the six people who have provided the most help. My keyboardist, Ruth Little, provided me with a print out and placed each chapter on a computer disk. The effort resulted in getting quality material to me and meeting my deadlines. Terry Clark did the photography of all the new photographs appearing in the text. Karen Long and Dale Warren, culinary instructors at Scarlet Oaks Career Development in Cincinnati, Ohio, provided access to their kitchen classroom so photographs could be taken to illustrate certain activities involving mathematical procedures. Betty O'Toole provided necessary addresses and researched information requiring verification. Ted Kirkpatrick, a math instructor, provided the material for the chapter on computer applications.

Other individuals who were most willing to help and provided important material or illustrations are as follows:

Shirley Berstein	Proprietor, Mike Fink's Restaurant
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To all of the above and any others I may have unintentionally omitted I extend a grateful and sincere thank you.

Robert G. Haines

PRETEST

Pretest: Math Skills

The pretest evaluates a student's math skills before the student begins the food service math course. This pretest helps both the student and the instructor to focus on areas of greatest concern.

To earn a competency in each of the forty math exercises presented, a student must work three of the four problems of each type presented correctly. If this is achieved, the student will earn a + (plus) for that particular exercise. If this goal is not achieved, a - (minus) will be recorded. A profile sheet on both the pretest and posttests are kept on file by the instructor for reference by either the student or instructor. The pluses are recorded in either blue or black ink on the profile sheet under the proper exercise. The minuses are recorded in red ink.

1. Add the following numbers.

27	17	6555
+49	46	2265
	+13	+8085

38 + 127 + 5,678 + 42,975 = _____

2. Subtract the following numbers.

48	658	82,723
− 26	− 96	− 3,430

34,228 − 16,767 = _____

3. Change the mill to the nearest cent.

$0.034 _____ $6,857 _____

$0.126 _____ $725.683 _____

4. Multiply the following numbers.

$$\begin{array}{r} 54 \\ \times\ 9 \\ \hline \end{array} \qquad \begin{array}{r} 68 \\ \times\ 45 \\ \hline \end{array} \qquad \begin{array}{r} 981 \\ \times\ 127 \\ \hline \end{array}$$

$2520 \times 36 =$ _____

5. Divide the following numbers.

$12\overline{)192}$ $\qquad$ $18\overline{)1350}$

$122\overline{)76{,}860}$ $\qquad$ $2125\overline{)518{,}750}$

6. Reduce the fractions to the lowest terms.

$\frac{4}{12}$ _____ $\quad \frac{16}{96}$ _____ $\quad \frac{56}{64}$ _____ $\quad \frac{60}{108}$ _____

7. Convert each mixed number to an improper fraction.

$6\frac{1}{8}$ _____ $\quad 16\frac{3}{7}$ _____ $\quad 7\frac{3}{8}$ _____ $\quad 41\frac{5}{8}$ _____

8. Convert each improper fraction to a whole number or a mixed number.

$\frac{41}{9}$ _____ $\quad \frac{192}{64}$ _____ $\quad \frac{27}{6}$ _____ $\quad \frac{270}{24}$ _____

9. Find the equivalent fractions.

$\frac{5}{6} = \frac{\quad}{30}$ $\qquad$ $\frac{6}{15} = \frac{\quad}{60}$

$\frac{5}{9} = \frac{\quad}{36}$ $\qquad$ $\frac{2}{3} = \frac{\quad}{21}$

10. Add the following fractions and reduce each answer to its lowest terms.

$$\begin{array}{r} \frac{3}{7} \\ +\ \frac{2}{7} \\ \hline \end{array} \qquad \begin{array}{r} 3\frac{7}{8} \\ +1\frac{1}{4} \\ \hline \end{array} \qquad \begin{array}{r} 1\frac{3}{16} \\ +4\frac{3}{4} \\ \hline \end{array} \qquad \begin{array}{r} 2\frac{1}{2} \\ 4\frac{3}{4} \\ +8\frac{1}{12} \\ \hline \end{array}$$

11. Subtract the following fractions and reduce each answer to its lowest terms.

$\begin{array}{r} \frac{9}{12} \\ -\ \frac{5}{12} \\ \hline \end{array}$ $\quad$ $\begin{array}{r} 8 \\ -3\frac{5}{8} \\ \hline \end{array}$ $\quad$ $\begin{array}{r} 12\frac{1}{4} \\ -\ 6\frac{5}{16} \\ \hline \end{array}$ $\quad$ $\begin{array}{r} 42\frac{23}{32} \\ -26\frac{15}{16} \\ \hline \end{array}$

12. Multiply the following fractions and reduce each answer to its lowest terms.

$\frac{3}{5} \times \frac{5}{6} =$ _____ $\quad$ $1\frac{3}{4} \times 2\frac{3}{8} =$ _____

$8 \times \frac{4}{9} =$ _____ $\quad$ $8\frac{2}{3} \times 2\frac{1}{4} =$ _____

13. Divide the following fractions and reduce each answer to its lowest terms.

$\frac{2}{9} \div \frac{1}{3} =$ _____ $\quad$ $1\frac{3}{4} \div \frac{2}{3} =$ _____

$1\frac{1}{4} \div \frac{3}{8} =$ _____ $\quad$ $12\frac{3}{4} \div \frac{1}{3} =$ _____

14. Convert each decimal to a fraction.

0.7 _____ 0.009 _____ 4.15 _____ 0.89 _____

15. Convert each fraction to a decimal.

$\frac{3}{10}$ _____ $5\frac{1}{6}$ _____ $\frac{3}{8}$ _____ $14\frac{5}{8}$ _____

16. Convert each fraction to a percent.

$\frac{3}{5}$ _____ $\frac{7}{8}$ _____ $1\frac{2}{5}$ _____ $\frac{3}{10}$ _____

17. Convert each decimal to a percent.

23.4 _____ 0.67 _____ 0.0065 _____ 49.3 _____

18. Convert each percent to a decimal.

8.5% _____ 12.6% _____ 228% _____ 25% _____

19. Add the decimals.

$$\begin{array}{r} 9.6 \\ 4.6 \\ +\ 0.8 \\ \hline \end{array} \qquad \begin{array}{r} 8.085 \\ +12 \\ \hline \end{array}$$

$0.6 + 8.4 + 10 =$ _____

$0.9946 + 0.023 + 0.0425 =$ _____

20. Subtract the decimals.

$$\begin{array}{r} 9.08 \\ -\ 3.57 \\ \hline \end{array} \qquad \begin{array}{r} 221.06 \\ -\ 9.2 \\ \hline \end{array}$$

$42.3 - 10.63 =$ _____

$8 - 0.04 =$ _____

21. Multiply the decimals.

$$\begin{array}{r} .275 \\ \times\ 15 \\ \hline \end{array} \qquad \begin{array}{r} 7.38 \\ \times\ 2.9 \\ \hline \end{array}$$

$6.5 \times .043 =$ _____

$10.85 \times .034 =$ _____

22. Divide the decimals.

$0.06\overline{)0.855}$ $\qquad$ $9.5\overline{)0.4832}$

$0.44\overline{)5853}$ $\qquad$ $18\overline{)9.683}$

23. Use percents to find the total number.

    20% of what number is 10? _____

    18% of what number is 36? _____

    60% of what number is 45? _____

    40% of what number is 20? _____

24. Find the following numbers.

    36% of 8 = _____

    6.8% of 36 = _____

    112% of 200 = _____

    14.5% of 85 = _____

25. Find the following percentages.

    What percent of 40 is 20? _____

    What percent of 200 is 88? _____

    What percent of 150 is 90? _____

    What percent of 360 is 126? _____

26. Find the measurement equivalents — ounces.

    32 ounces = How many quarts? _____

    128 ounces = How many gallon? _____

    16 ounces = How many pints? _____

    8 ounces = How many cups? _____

27. Find the measurement equivalents — cups.

    2 cups = How many pints? _____

    4 cups = How many quarts? _____

    6 cups = How many quarts? _____

    16 cups = How many gallon? _____

28. Find the measurement equivalents — spoons.

    3 teaspoons = How many tablespoons? _____

    48 teaspoons = How many cups? _____

    8 tablespoons = How many cups? _____

    16 tablespoons = How many cups? _____

29. Find the measurement equivalents — pounds.

    1 pound = How many pints? _____

    2 pounds = How many quarts? _____

    4 pounds = How many gallon? _____

    8 pounds = How many gallon? _____

30. Using a comma, separate the following numbers into periods.

    2 4 5 8 3 2 4 2 5

    5 2 4 6 1 3 6 4 7 5

    4 6 2 2 8 9 7 4 5 2 3 6 0 7

    6 9 0 0 0 0 0 0 0 0 0

31. Find the cost per serving.

    A 5-pound box of frozen peas costs $2.90. How much does a 3-ounce serving cost? _____

    A 2 1/2-pound box of frozen corn costs $2.10. How much does a 3 1/2-ounce serving cost? _____

    A 2 1/2-pound box of frozen carrots costs $0.55 per pound. How much does a 3-ounce serving cost? _____

    If frozen asparagus spears cost $10.90 for a 5-pound box, how much does a 3-ounce serving cost? _____

32. Use a calculator for these four basic functions.

    48 + 54 + 97 = _____

    48922.56 − 31825.67 = _____

    1628 × 52 = _____

    7135 ÷ 145 = _____

33. Determine the total cost of each meal.

    A tip of $2.00 was 15% of the cost of the meal. _____

    A tip of $8.00 was 20% of the cost of the meal. _____

    A tip of $5.00 was 20% of the cost of the meal. _____

    A tip of $12.00 was 15% of the cost of the meal. _____

34. Using ratios, find how much water is required in each of the following:

How much water is required to cook 1 1/4 quarts of barley using a ratio of 4 to 1? _____

How much water is required to bake 3/4 quart of rice using a ration of 2 to 1? _____

How much water is required to soak 3/4 gallon navy beans using a ratio of 3 to 1? _____

How much water is required to convert 1 3/4 quarts of orange concentrate to orange juice using a ratio of 3 to 1? _____

35. What are the customary measures?

1 gram = _____ ounces

1 kilogram = _____ pounds

28 grams = _____ ounce or ounces

1 liter = _____ quart or quarts

36. How much interest is paid?

Find the simple interest on $425.00 at 6 percent interest for 1 year.

_____

Find the simple interest on $980.00 at 5 1/2 percent of interest for 1 year. _____

Find the amount of compound interest at the end of 2 years on a principle of $3,000.00 compounded annually at 3 percent interest.

_____

Find the amount of compound interest at the end of 3 years on a principle of $2500.00 compounded annually at 3.5 percent interest.

_____

37. Use a calculator for these chain calculations.

$69 + 225 - 68 \div 2 =$ _____

$1250 - 685 + 245 \div 2 \times 4 =$ _____

$265 \times 21 - 180 + 442 =$ _____

$\$32584.50 - 21522.25 \times 0.05 =$ _____

38. Determine the following serving portions.

How many 5-ounce Swiss steaks can be cut from a beef round weighing 48 pounds (A.P.) if 6 pounds 5 ounces are lost in boning and trimming? _____

A 13-pound (E.P.) pork loin is roasted, 1 pound 6 ounces are lost through shrinkage. How many 3-ounce servings can be obtained from the cooked loin? _____

A 1-pound (A.P.) beef tenderloin is trimmed, 8 ounces are lost. How many 6-ounce filet mignons can be cut from the tenderloin?

_____

A 6-pound (E.P.) beef tenderloin is roasted, 14 ounces are lost through shrinkage. How many 2 1/2 ounce servings can be obtained from the roasted loin? _____

39. Using 1 cup of gelatin powder for each quart of liquid, determine the amount needed when preparing the following amounts:

2 gallon flavored gelatin: _____

2 1/2 quarts flavored gelatin: _____

3 pints flavored gelatin: _____

3 quarts flavored gelatin: _____

40. Determine each menu price:

Raw food cost is $1.85 and mark-up rate is 3/4. _____

Raw food cost is $2.25 and mark-up rate is 35 percent. _____

Raw food cost is $2.58 and mark-up rate is 2/3. _____

Raw food cost is $2.95 and mark-up rate is 45 percent. _____

MATH SKILLS — PROFILE SHEET

The following should be listed on the profile sheet:

1. Addition
2. Subtraction
3. Mills
4. Multiplication
5. Division
6. Reducing fractions
7. Converting to improper fractions
8. Improper fractions to mixed numbers
9. Finding equivalent fractions
10. Addition of fractions
11. Subtraction of fractions
12. Multiplication of fractions
13. Division of fractions
14. Converting decimals to fractions
15. Converting fractions to decimals
16. Converting fractions to percent
17. Converting decimals to percent
18. Converting percent to decimals
19. Addition of decimals
20. Subtraction of decimals
21. Multiplication of decimals
22. Division of decimals
23. Percents to find number
24. Finding percent of a number
25. Finding percent of two given numbers
26. Measurement equivalents — ounces
27. Measurement equivalents — cups
28. Measurement equivalents — spoons
29. Measurement equivalents — pounds
30. Separating periods
31. Cost per serving
32. Basic functions — calculator
33. Cost of meal
34. Ratio
35. Metric conversion
36. Interest, simple/compound
37. Chain calculations — calculator
38. Serving portions
39. Using a formula
40. Menu price