



# Calculus

Calculus treats all the topics normally covered in an Advanced Placement AB-level calculus program, as well as many of the topics required for a BC-level program. The text begins with a thorough review of those mathematical concepts and skills required for calculus. In the early problem sets, students practice setting up word problems they will later encounter as calculus problems. The problem sets contain multiple-choice and conceptually-oriented problems similar to those found on the AP Calculus examination. Whenever possible, students are provided an intuitive introduction to concepts prior to a rigorous examination of them. Proofs are provided for all important theorems.

Prerequisite: Advanced Math.

The following books are needed for this course:

*Calculus* (Saxon)

Contents of Saxon *Calculus with Trigonometry and Analytic Geometry* (textbook and Home Study Packet):

## **Preface**

- A** The real numbers; Fundamental concept review
- B** More concept review; Geometry review

1. Deductive Reasoning; The Contrapositive; Converse and Inverse
2. Radian Measure of angles; Trigonometric ratios; Four quadrant signs; Simplifying trigonometric expressions
3. Word problem review
4. Functions: Their equations and graphs; Functional notation; Domain and range
5. The unit circle; Graphing sinusoids
6. Similar triangles; functions of  $-\theta$
7. Quadratic Equations
8. Pythagorean identities; Trigonometric identities; Cofunctions
9. Abstract word problems
10. Important numbers; Exponential functions
11. Polar coordinates (vectors); Polar coordinates (complex numbers)
12. Absolute value as a distance; The line as a locus; The circle as a locus
13. Special functions
14. The logarithmic form of the exponential; Base 10 and base  $e$ ; Simple logarithm problems

15. Evaluating polynomials
16. Continuity; Left-hand and right-hand limits
17. Sum and difference identities for trigonometric functions; Double-angle identities for sine and cosine
18. Graphs of logarithmic functions; Period of a function
19. Limit of a function
20. The parabola as a locus; Translated parabolas
21. Inverse trigonometric functions; Trigonometric equations
22. Interval notation; Products of linear factors; Tangents; Increasing and decreasing functions
23. Logarithms of products and quotients; Logarithms of powers; Exponential equations
24. Infinity as a limit; Undefined limits
25. Sums, products, and quotients of functions; Composition of functions
26. Locus development; Equation of the ellipse; Foci
27. The derivative
28. Change of base; Logarithmic inequalities
29. Translation of functions; Rational functions I
30. The hyperbola
31. Binomial expansion; Recognizing the equations of conic sections
32. Roots of complex numbers; Trigonometric functions of  $n\theta$
33. The derivative of  $x^n$ ; Notations for the derivative
34. Identities for the tangent function; Area and volume
35. The constant-multiple rule; The derivatives of sums and differences
36. Exponential growth and decay  $x$
37. Derivative of  $e^x$  and  $\ln |x|$ ; Derivative of  $\sin x$  and  $\cos x$
38. Equation of the tangent line; Higher order derivatives
39. Graphs of rational functions II; A special limit
40. Newton and Leibnitz; The differential
41. Graph of  $\tan \theta$ ; Graphs of reciprocal functions
42. Product rule for derivatives and differentials; Proof of the product rule
43. An antiderivative; Integration
44. Factors of polynomial functions; Graphs of polynomial functions
45. Implicit differentiation
46. The integral of a constant; Integral of  $Cf(x)$ ; Integral of  $x^n$
47. Critical numbers
48. Differentiation by  $u$  substitution
49. Integral of a sum; Integral of  $1/x$
50. Units for the derivative; Normal lines
51. Graphs of rational functions III; Repeated factors
52. The derivative of a quotient; Proof of the quotient rule
53. Area under a curve
54. The chain rule; Equivalent forms for the derivative
55. Using  $f'$  to characterize  $f$ ; Using  $f'$  to define max and min
56. Related rate problems
57. Fundamental theorem of integral calculus
58. Derivatives of trigonometric functions; Summary of rules for derivatives and differentials

59. Concavity and inflection points; Applications of the second derivative
60. Derivatives of composite functions; Derivatives of products and quotients
61. Integration by guessing
62. Maximization and minimization problems
63. Riemann sum; The definite integral
64. Velocity and acceleration (motion I); Motion due to gravity
65. More integration by guessing
66. Properties of the definite integral
67. Explicit and implicit equations; Inverse functions
68. Computing areas
69. Area between two curves
70. Game playing with  $f$ ,  $f'$ , and  $f''$
71. Applications of the definite integral I
72. Critical number (closed interval) theorem
73. Derivatives of inverse trigonometric functions; What to memorize
74. Falling body problems
75.  $U$  substitution; Change of variable; Proof of the substitution theorem
76. Functions of  $y$
77. Even and odd functions
78. Integration by parts
79. Properties of limits; Some special limits
80. Solids of revolution
81. Derivatives and integrals of  $a^x$  and  $\log_a x$ ; Derivative of  $|x|$
82. Fluid force
83. Continuity of functions
84. Integration of odd powers of  $\sin x$  and  $\cos x$
85. Applications of the definite integral (work II)
86. Particle Motion III
87. l'Hopital's rule; Proof of l'Hopital's rule
88. Asymptotes of rational functions
89. Balance points
90. Volume by washers
91. Limits and continuity; Differentiability
92. Integration of even powers of  $\sin x$  and  $\cos x$
93. Centroids
94. Logarithmic differentiation
95. The mean value theorem; Application of the mean value theorem; Proof of Rolle's theorem
96. Rules for even and odd functions
97. Volume by shells
98. Separable differential equations
99. Average value of a function; Mean value theorem for integrals
100. Particle motion IV
101. Derivatives of inverse functions
102. Solids of revolution IV

103. Absolute value
104. Integral of  $\tan''x$ ; Integral of  $\cot''x$
105. Second fundamental theorem of integral calculus; The natural logarithm function
106. Approximation with differentials
107. Limit of  $\sin x/x$ ; A note (optional)
108. Integrals of  $\sec u$  and  $\csc u$ ; Trig substitution
109. Polar equations; Polar graphing
110. Partial fractions I
111. Polar graphing II
112. Partial fractions II
113. Integration by parts II
114. Implicit differentiation II
115. Partial fractions II
116. Derivative of  $e^x$  and of  $\ln x$ ; Derivative of  $\sin x$
117. Proofs of the fundamental theorem; Epsilon delta proofs

## Lesson 15

### Evaluating Polynomials

#### 15A. The Remainder Theorem.

To evaluate polynomials, we can make use of the remainder theorem.

#### THE REMAINDER THEOREM

If a constant  $c$  is a zero of a polynomial and if we divide the polynomial by  $x - c$ , the remainder will be zero. If the remainder is not zero, the remainder equals the value of the polynomial when  $x$  equals  $c$ .

To look at a specific example, we will manufacture a cubic polynomial by multiplying the factors  $x + 1$ ,  $x - 2$ , and  $x + 3$ , as we show on the left below. Since one of the factors of the polynomial is  $x - 2$ , then  $x - 2$  will divide the polynomial evenly and will have no remainder, as we show on the right.

$$\begin{aligned} f(x) &= (x + 1)(x - 2)(x + 3) \\ f(x) &= x^3 + 2x^2 - 5x - 6 \end{aligned}$$

$$\begin{array}{r} \phantom{x-2} \overline{) \begin{array}{r} x^3 + 2x^2 - 5x - 6 \\ x^3 - 2x^2 \\ \hline 4x^2 - 5x \\ 4x^2 - 8x \\ \hline 3x - 6 \\ 3x - 6 \\ \hline 0 \end{array}} \end{array}$$

The value of a polynomial is zero if  $x$  is replaced by a number that is a zero of the polynomial. The factored form and the unfactored form of the  $f$  polynomial of this example are equivalent expressions, and both will equal zero if  $x$  is replaced by 2.

$$\begin{array}{ll} f(2) &= (2 + 1)(2 - 2)(2 + 3) & f(2) &= (2)^3 + 2(2)^2 - 5(2) - 6 \\ &= (3)(0)(5) & &= 8 + 8 - 10 - 6 \\ &= 0 & &= 0 \end{array}$$

Now, if we add 10 to the  $f$  polynomial, we get a new polynomial that we call the  $g$  polynomial. The  $g$  polynomial does not have  $x - 2$  as a factor. When we divide the  $g$  polynomial by  $x - 2$ , we get a remainder of 10.

$$g(x) = (x + 1)(x - 2)(x + 3) + 10$$

$$g(x) = x^3 + 2x^2 - 5x + 4$$

$$\begin{array}{r}
 x^2 + 4x + 3 \\
 x - 2 \overline{) x^3 + 2x^2 - 5x + 4} \\
 \underline{x^3 - 2x^2} \phantom{- 5x + 4} \\
 4x^2 - 5x \phantom{+ 4} \\
 \underline{4x^2 - 8x} \phantom{+ 4} \\
 3x + 4 \\
 \underline{3x - 6} \\
 10
 \end{array}$$

Both the factored and unfactored forms of the  $g$  equation have a value of 10 when  $x$  is replaced with 2.

$$\begin{array}{ll}
 g(2) = (2 + 1)(2 - 2)(2 + 3) + 10 & g(2) = (2)^3 + 2(2)^2 - 5(2) + 4 \\
 = (3)(0)(5) + 10 & = 8 + 8 - 10 + 4 \\
 = 10 & = 10
 \end{array}$$

Thus, if we have a polynomial and divide by  $x - 11$ , we can find out one of two things by looking at the remainder. If the remainder is zero, then 11 is a zero of the polynomial. If the remainder is not zero, the remainder equals the value of the polynomial when  $x = 11$ .

### 15B. Synthetic Division.

Because dividing a polynomial by  $x - c$  gives us such useful information, synthetic division was invented to permit this type of division to be done quickly. Synthetic division can be used to divide a polynomial by  $x - 4$  or  $x + 3$ , but cannot be easily used to divide by forms such as  $2x + 4$  or  $x^2 - 5$ . Both the coefficient and the exponent of  $x$  in the divisor must be 1 for this version of synthetic division to be used. To evaluate a polynomial when  $x = c$ , the division is a process of bringing down the lead coefficient, multiplying, adding, multiplying, adding, etc.

**Example 15.1** Use synthetic division to divide  $2x^3 + 3x^2 - 4x - 7$  by  $x + 1$ .

**Solution** To divide by  $x + 1$ , we use -1 as a divisor and write down only the constants in the dividend. The first step is to bring down the first constant, which is 2.

$$\begin{array}{r|rrrr}
 -1 & 2 & 3 & -4 & -7 \\
 & \downarrow & & & \\
 & 2 & & & 
 \end{array}$$

The next step is to multiply 2 by the divisor, -1, for a product of -2, which we record under the 3.

$$\begin{array}{r|rrrr} -1 & 2 & 3 & -4 & -7 \\ & \downarrow & -2 & & \\ \hline & 2 & & & \end{array}$$

Then we add 3 and -2 to get 1. We multiply 1 by the divisor, -1, and record the product under the -4. Then we add, multiply, record, and add again.

$$\begin{array}{r|rrrr} -1 & 2 & 3 & -4 & -7 \\ & \downarrow & -2 & -1 & 5 \\ \hline & 2 & 1 & -5 & -2 \end{array}$$

The first three numbers below the line are the coefficients of the reduced polynomial, and the remainder is -2. The greatest exponent of the reduced polynomial is always 1 less than the greatest exponent of the dividend. Thus we may write

$$2x^3 + 3x^2 - 4x - 7 = (x + 1)(2x^2 + x - 5) - 2$$

**The remainder -2 is the value of the polynomial if  $x = -1$ .** We can see this because the first factor,  $(x + 1)$ , of the factored form equals zero if  $x$  equals -1.

Example 15.2 Use synthetic division to evaluate  $3x^3 - 4x - 2$  when  $x = 2$ .

*Solution* We enter the coefficients and remember to write a zero coefficient for  $x^2$ .

$$\begin{array}{r|rrrr} 2 & 3 & 0 & -4 & -2 \\ & \downarrow & 6 & 12 & 16 \\ \hline & 3 & 6 & 8 & 14 \end{array}$$

The numbers 3, 6, and 8 are the coefficients of the reduced polynomial and 14 is the remainder. Thus, the value of  $3x^3 - 4x - 2$  when  $x = 2$  is 14; so 2 is not a zero of the polynomial.

$$3x^3 - 4x - 2 = (3x^2 + 6x + 8)(x - 2) + 14$$

15C. Rational Zero (Root) Theorem.

If a number is a zero of a polynomial, the number is also a root of the polynomial equation formed by setting the polynomial equal to zero. We know that we can find rational and irrational zeros of quadratic polynomials by completing the square or by using the quadratic formula. We remember that the rational zero theorem allows us to list the possible rational zeros of any polynomial, but does not tell which, if any, of these possible zeros really is a zero. There is no comparable theorem for irrational zeros. This is unfortunate because most of the polynomial equations encountered in real-world problems have irrational roots. Before computers were invented, much time was spent laboriously finding rational roots and estimating irrational roots. To prevent this waste of time, most of the polynomials encountered in this book will be contrived to have integral zeros of  $\pm 1$ ,  $\pm 2$ , or  $\pm 3$ . The rational zero theorem is useful in helping us decide which of these roots to investigate.

We remember that the rational zero (root) theorem tells us that if a polynomial whose coefficients are integers has a rational zero, then this number is a fraction whose numerator is some integral factor of the constant term and whose denominator is some integral factor of the lead coefficient. Thus, the possible rational zeros of  $4x^{14} + 3x^8 + 7x + 3$  can be found by forming a fraction by using one of the integer factors of 3 above the line as a numerator.

$$\begin{array}{lcl} \text{Factors of 3} & = & 1, -1, 3, -3 \\ \hline \text{Factors of 4} & = & 1, -1, 2, -2, 4, -4 \end{array}$$

and one of the integer factors of 4 below the line as a denominator. If we do this, we can list the possible rational zeros as

$$1, -1, \frac{1}{2}, -\frac{1}{2}, \frac{3}{4}, -\frac{3}{4}, \frac{1}{4}, -\frac{1}{4}, \frac{3}{2}, -\frac{3}{2}, 3, -3$$

**Example 15.3** Find the zeros of the function  $f(x) = x^3 + 2x^2 - 2x - 4$ .

*Solution* We could use a computer to estimate the zeros, but since this is a problem in a beginning calculus book, we hope the author put at least one rational zero in the polynomial. If so, the rational root can be found from the following list

$$\frac{+1, -1, +2, -2, +4, -4}{+1, -1} \rightarrow 1, -1, 2, -2, 4, -4$$

We will use synthetic division to see which, if any, of these numbers are zeros.

$$\begin{array}{r|rrrr} 1 & 1 & 2 & -2 & -4 \\ & & 1 & 3 & 1 \\ \hline & 1 & 3 & 1 & -3 \end{array} \qquad \begin{array}{r|rrrr} -1 & 1 & 2 & -2 & -4 \\ & & -1 & -1 & 3 \\ \hline & 1 & 1 & -3 & -1 \end{array}$$

$$\begin{array}{r|rrrr} 2 & 1 & 2 & -2 & -4 \\ & & 2 & 8 & 12 \\ \hline & 1 & 4 & 6 & 8 \end{array} \qquad \begin{array}{r|rrrr} -2 & 1 & 2 & -2 & -4 \\ & & -2 & 0 & 4 \\ \hline & 1 & 0 & -2 & 0 \end{array}$$

The last remainder is zero; so -2 is a zero of the polynomial function and  $x + 2$  is a factor of the polynomial. Now we have

$$x^3 + 2x^2 - 2x - 4 = (x + 2)(x^2 - 2)$$

We will find the roots of the equation  $x^2 - 2 = 0$ . These numbers are the zeros of the polynomial  $x^2 - 2$ .

$$x^2 - 2 = 0 \rightarrow x^2 = 2 \rightarrow x = \pm\sqrt{2}$$

Thus, the factors of the original polynomial are  $(x + 2)$ ,  $(x - \sqrt{2})$ , and  $(x + \sqrt{2})$ , and the zeros are -2,  $\sqrt{2}$ ,  $-\sqrt{2}$ .

**Example 15.4** Find the roots of  $x^3 - 7x - 6 = 0$ .

**Solution** First we list the possible rational roots.

$$+1, -1, +2, -2, +3, -3, +6, -6$$

Now we divide. Note that we write a zero for the coefficient of the  $x^2$  term in the dividend.

$$\begin{array}{r|rrrr} 1 & 1 & 0 & -7 & -6 \\ & & 1 & 1 & -6 \\ \hline & 1 & 1 & -6 & -12 \end{array} \qquad \begin{array}{r|rrrr} -1 & 1 & 0 & -7 & -6 \\ & & -1 & 1 & 6 \\ \hline & 1 & -1 & -6 & 0 \end{array}$$

Zero is the remainder when we divide by -1, so -1 is a zero of the polynomial. The reduced polynomial is  $x^2 - x - 6$ , and we can use the quadratic formula to find the zeros of this polynomial.

$$x = \frac{1 \pm \sqrt{1 - (4)(1)(-6)}}{2} = \frac{1 \pm \sqrt{25}}{2} = -2, 3$$

Thus the roots of the polynomial equation are **-2, -1, and 3**.

# Recordkeeping

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This course introduces students to basic records skills used in business. The course covers: Budget records, credit records, cash receipts records, checking account records, petty cash, accounts receivables, retail sales, purchase orders, accounts payables, financial statements, and payroll records. **This is a two-year course.** The following books are required for this course:

- *Keeping Financial Records for Business*, by Schultheis, Kaliski, and Passalacqua, Southwestern Publishing Co., 1995
- Bookkeeping Workbooks 1-16

Contents of *Keeping Financial Records for Business*:

## Chapter 1: Basic Record Keeping Skills

- 1 Record Keeping and the Computer
- 2 Entering Record Keeping Data
- 3 Verifying Record Keeping Data
- 4 Filing Numeric Data
- 5 Filing Alphabetic Data
- 6 Entering and Filing Electronically

## Chapter 2: Budget Records

- 7 Keeping a Personal Budget
- 8 Keeping a Family Budget
- 9 Keeping a Business Budget
- 10 Analyzing Budgets

## Chapter 3: Credit Records

- 11 Applying for Bank Credit Cards
- 12 Checking Your Credit Card Statement
- 13 Buying on the Installment Plan

- 14     Obtaining a Loan

#### **Chapter 4:     Cash Receipt Records**

- 15     Preparing and Recording Receipts
- 16     Using a Cash Register
- 17     Handling refunds, Coupons, and Checks
- 18     Preparing Proofs of Cash
- 19     Preparing Cashier Reports
- 20     Preparing Bank Deposits

#### **Chapter 5:     Checking Account Records**

- 21     Opening a Bank Checking Account
- 22     Writing Checks
- 23     Keeping a Checkbook
- 24     Using a Check Register
- 25     Endorsing Checks
- 26     Savings Accounts and Other Bank Services
- 27     Reconciling Bank Statements
- 28     Handling Outstanding Deposits
- 29     Handling Bank Service Charges, Interest, and Errors

#### **Chapter 6:     Petty Cash Records**

- 30     Writing Petty Cash Vouchers
- 31     Classifying Business Expenses
- 32     Using a Petty Cash Book
- 33     Replenishing and Maintaining the Petty Cash Fund

#### **Chapter 7:     Record Keeping for Sales Clerks**

- 34     Completing Sales Slips
- 35     Computing Sales Tax on Merchandise
- 36     Computing Sales Tax on Goods and Services
- 37     Handling Charge Sales
- 38     Making Refunds on Charge Card Sales

#### **Chapter 8:     Record Keeping for Retail Charge Sales**

- 39     Keeping Records for Charge Customers
- 40     Handling Sales Returns

- 41     Preparing Customer Statements

**Chapter 9:     Record Keeping for Accounts Receivable Clerks**

- 42     Preparing Sales Invoices
- 43     Keeping Records of Customer Accounts
- 44     Using a Sales Journal
- 45     Using a Cash Receipts Journal
- 46     Using Sales and Cash Receipts Journals
- 47     Using a Sales Returns and Allowances Journal
- The Video Center: A Business Simulation

**Chapter 10:   Record Keeping for Stock Record Clerks**

- 48     Keeping Stock Records
- 49     Checking Stock Records
- 50     Preparing Purchase Requisitions and Open Order Reports

**Chapter 11:   Record Keeping for Purchase Order Clerks**

- 51     Preparing Price Quotation Records
- 52     Preparing Purchase Orders
- 53     Preparing Receiving Reports
- 54     Checking and Filing Purchase Invoices

**Chapter 12:   Record Keeping for Accounts Payable Clerks**

- 55     Keeping Creditor Accounts
- 56     Using a Purchases Journal and an Accounts Payable Ledger
- 57     Using a Cash Payments Journal and an Accounts Payable Ledger
- 58     Using a Purchases Journal, a Cash Payments Journal and an Accounts Payable Ledger
- 59     Using a Purchases Returns and Allowances Journal and an Accounts Payable Ledger

**Chapter 13:   Record Keeping for Small Businesses**

- 60     Recording Income in a Cash Receipts Journal
- 61     Recording Income in the General Ledger
- 62     Using a Cash Receipts Journal and a General Ledger
- 63     Using a Cash Payments Journal
- 64     Recording Expenses in the General Ledger

- 65 Using a Cash Payments and a General Ledger
- 66 Preparing a Trial Balance

#### **Chapter 14: Financial Statements for Small Businesses**

- 67 Preparing an Income Statement
- 68 Using the Income Statement to Compute Taxes
- 69 Preparing a Capital Statement
- 70 Preparing a Balance Sheet
- 71 Preparing a Six-Column Worksheet
- Olympic Cycling: A Business Simulation

#### **Chapter 15: Record Keeping for Payroll Clerks: Computing Gross Pay**

- 72 Handling Time Cards
- 73 Computing Hourly Wages
- 74 Using a Payroll Register
- 75 Computing Overtime
- 76 Recording Overtime Wages in the Payroll Register
- 77 Computing Salaries and Commissions
- 78 Piecework Pay

#### **Chapter 16: Record Keeping for Payroll Clerks: Computing Net Pay**

- 79 Computing Social Security Taxes
- 80 Using the Social Security Tax Table
- 81 Finding Withholding Taxes
- 82 Preparing the Payroll
- 83 Keeping an Employee Earnings Record
- 84 Preparing the Wage and Tax Statement
- 85 Handling Other Deductions

## Chapter 6

### *Petty Cash Records*

In Chapter 5, you learned that a check provides a written record for a cash payment. Businesses use these written records, or checks, to help make decisions about how to spend their money. Sometimes, however, it is not convenient or practical to write a check. For example, would you use a check to buy a piece of bubble gum? In this instance, it is easier to use cash for such a small payment.

In Chapter 6, you will learn how businesses handle small cash payments – through petty cash funds. You will learn how to group these business expenses and prepare special reports for making small cash payments. Finally, you will learn that records of *all* cash payments, whether large or small, are very important to a business. A Calculator Tip will be given for summarizing a petty cash book, which is used to record and classify petty cash payments and receipts.

### **Job 30: Writing Petty Cash Vouchers**

#### Applied Math Preview

Copy and complete these problems.

|           |            |             |             |
|-----------|------------|-------------|-------------|
| 1. \$7.95 | 2. \$12.86 | 3. \$150.00 | 5. \$75.00  |
| 15.80     | 7.24       | - 97.75     | - 39.97     |
| 33.17     | 51.10      |             |             |
| 4.95      | 39.05      | 4. \$125.00 | 6. \$200.00 |
| 18.27     | 6.19       | - 83.16     | - 71.94     |
| + 15.91   | + 18.64    |             |             |

#### BUSINESS TERMS PREVIEW

• **Currency** • **Petty** • **Petty cash box** • **Petty cash clerk** • **Petty cash fund** • **Petty cash voucher** •

### **Goals**

1. To learn the use of a petty cash fund.
2. To learn how to record payments made from a petty cash fund.

### *Understanding the Job*

You learned in Chapter 5 that businesses make most payments by check. Sometimes it is not convenient to write a check to make a small payment. At these and other times, it is necessary to pay in **currency**. Currency means bills and coins. Such payments in currency are made in small, or **petty**, amounts. They are called “petty cash payments.”

Petty cash payments are made from a **petty cash fund**. The fund is the actual currency set aside for these payments. To start the fund, the business will estimate how much currency is needed for a certain time period, such as a week or a month. A check will then be written for the amount of the estimate. The check will be cashed and the actual currency placed in a **petty cash box**.

Careful records must be kept for petty cash payments. The **petty cash clerk** will keep these records. Every time someone is given money from the petty cash fund, that person must sign a printed record. This record is called a **petty cash voucher**.

### Sample Problem

You are Alice Meehan, and you work for Marie Towle, a lawyer. On July 1, Marie starts a petty cash fund by cashing a check for \$100.00. She places the currency in a petty cash box and puts you in charge of the fund. On July 1, Steve O'Leary bought office stationery from Jones Supplies with his own money. On July 2, Steve comes to you and asks for \$9.65 in cash to reimburse him. Here are the steps that you will follow to handle Steve's request:

#### Step 1 Ask for a receipt to prove the request.

Try to collect a receipt for all money paid out of the petty cash fund. For example, when you ask Steve for a receipt, he presents you with the receipt shown in Illustration 30A. (STA stands for stationery.)

| JONES SUPPLIES   |       |
|------------------|-------|
| 07/01/--         |       |
| STA              | 5.15  |
| STA              | 3.87  |
| TAX              | .63   |
| TOTAL            | 9.65  |
| CASH             | 10.00 |
| CHANGE           | .35   |
| 147 2186 9:15 AM |       |

#### Step 2 Fill out the petty cash voucher.

Complete the petty cash voucher by filling in the following spaces (see Illustration 30B):

| PETTY CASH VOUCHER |                  |              |        |
|--------------------|------------------|--------------|--------|
|                    |                  | No. 1        |        |
|                    |                  | Date July 2, | 19 - - |
| Pay to             | Steve O'Leary    | \$           | ¢      |
| For                | Stationery       | 9            | 65     |
| Approved by        | Payment Received |              |        |
| A.M.               | Steve O'Leary    |              |        |

1. **No.** – Write in the number of the voucher, 1. In some cases, the vouchers are printed with numbers, so this step will not be necessary.
2. **Date** – Write “July 2, 19--,” the date on which money is being paid out.
3. **Pay to** – Enter Steve O’Leary’s name, the person who is being paid.
4. **For** – Write “Stationery,” the expense for which you are paying.
5. **\$, ¢** – Enter the amount paid out, \$9.65. Notice that no dollar sign, cents sign, or decimal point is used.
6. **Approved by** – Enter your initials, A.M.
7. **Payment Received** – Have Steve O’Leary sign his name when he is handed the money.

**Step 3      Attach the receipt to the petty cash voucher.**

Attach Steve’s receipt to the voucher and file them both in the petty cash box. The receipt is additional proof of payment. There will be times when a receipt is not available, such as for tips or bus fares. But, when there is a receipt, attach it.

Another responsibility of the petty cash clerk is to check the balance of the fund daily. At the end of the day, count the currency in the box. Then, add the amounts of the petty cash vouchers in the box and find the total. *The sum of the currency and the vouchers should equal the original balance of the fund.*

You began the day with \$100.00 in currency. When you count the currency at the end of the day, you find \$79.90. When you add your vouchers, you get a total of \$20.10. You then add these two figures.

|                          |                 |
|--------------------------|-----------------|
| Currency in box          | \$ 79.90        |
| Plus: Total of vouchers  | <u>20.10</u>    |
| Equals: Original balance | <u>\$100.00</u> |

Because your total is \$100.00, you have done your work accurately. If your total did not add up to \$100.00, an error has been made. Handling errors is discussed in Job 33.

*Building Your Business Vocabulary*

On a sheet of paper, write the headings **Statement Number** and **Words**. Next, choose the words that match the statements. Write each word you choose next to the statement number it matches. Be careful; not all the words listed should be used.

| Statements                                           | Words                   |
|------------------------------------------------------|-------------------------|
| 1. Currency set aside for making small cash payments | currency<br>deposit     |
| 2. Quantity times unit price                         | extension               |
| 3. Bills and coins                                   | outstanding check       |
| 4. Record of payment from the petty cash fund        | petty<br>petty cash box |
| 5. Small                                             | petty cash clerk        |
| 6. A storage box for petty cash                      | petty cash fund         |
| 7. Keeps records of petty cash                       | petty cash voucher      |

**Problem Solving Model For: Writing Petty Cash Vouchers**

- Step 1     *Ask for a receipt to prove the request.*
- Step 2     *Fill out the petty cash voucher.*
- Step 3     *Attach the receipt to the petty cash voucher.*