Algebra II

This course covers topics typically treated in a second-year algebra course. Students integrate topics from Algebra I and Geometry and begin the study of trigonometry. The course provides opportunities for continued practice of the fundamental concepts of algebra, geometry, and trigonometry to enable students to develop a foundation for the study of Advanced Mathematics. The following book is required for this course:

- *Saxon Algebra II: An Incremental Development* (textbook and Home Study Packet), 2nd Edition, by John H. Saxon, Jr., Saxon Publishers, Inc., 1997

Contents of *Saxon Algebra II: An Incremental Development*:

20. Simplification of radicals; Line parallel to a given line
21. Scientific notation; Two statements of equality
22. Uniform motion problems-equal distances; Similar triangles and proportions
23. Graphical solutions
24. Fractional equations; Overlapping triangles
25. Monomial factoring; Cancellation; Parallel lines
26. Trinomial factoring; Overlapping right angles
27. Rational expressions
28. Complex fractions; Rationalizing the denominator
29. Uniform motion problems: $D_1 + D_2 = k$
30. Deductive reasoning; Euclid; Vertical angles are equal; Corresponding interior and exterior angles; 180° in a triangle
31. Negative reciprocals; Perpendicular lines; Remote interior angles
32. Quotient theorem for square roots; Congruency; Congruent triangles
33. Major rules of algebra; Complex fractions
34. Uniform motion problems: $D_1 + k = D_2$
35. Angles in Polygons; Inscribed quadrilaterals; Fractional exponents
36. Contrived problems; Multiplication of rational expressions; Division of rational expression
37. Chemical compounds; Parallelograms
38. Power of sums; Solving by factoring; Only zero equals zero
39. Difference of two squares; Parallelogram proof; Rhombus
40. Abstract fractional equations
41. Units; Unit multipliers
42. Estimating with scientific notation
43. Sine, cosine, and tangent; Inverse functions
44. Solving right triangles
45. Difference-of-two-squares theorem
46. More on radical expressions; radicals to fractional exponents
47. Rate unit conversions; More on fractional exponents
48. Radical equations
49. Linear intercepts; Transversals
50. Quadratic equations; Completing the square
51. Imaginary numbers; Product–of-square-roots theorem; Euler's notation; complex numbers
52. Chemical mixture problems
53. Metric unit conversions; English units to metric units; Weight combination by percent
54. Polar coordinates; Similar triangles
55. Advanced abstract equations; Word problems and quadratic equations
56. Angles in circles; Proofs
57. Ideal gas laws
58. Lead coefficients; More on completing the square
59. Experimental data; Simultaneous equations with fractions and decimals; Rectangular form to polar form
60. Direct and inverse variation
61. Chemical mixture problems, type B

62. Complex roots of quadratic equations
63. Addition of vectors
64. Complex fractions; Complex numbers
65. Advanced substitution
66. Signs of fractions; 30-60-90 triangles
67. Radical denominators
68. Scientific calculator; Scientific notation; Powers and roots
69. Gas law problems
70. Advanced abstract equations
71. Quadratic formula
72. Lines from experimental data; Negative angles
73. More on radical denominators
74. Uniform motion with both distances given
75. Factorable denominators and sign changes
76. Using both substitution and elimination; Negative vectors
77. Advanced radical equations; Multiple radicals
78. Force vectors at a point
79. Metric volume; 45-45-90 triangles
80. Direct and inverse variation as ratios
81. Complex numbers
82. Algebraic simplifications
83. Variable exponents
84. Solutions of equations
85. Systems of nonlinear equations
86. Greater than; Trichotomy and transitive axioms; irrational roots
87. Slope formula
88. The distance formula; The relationship $PV = nRT$
89. Conjunctions; Disjunctions; Products of chords and secants
90. Systems of three equations
91. Linear equalities; Greater than or equal to; less than or equal to; Systems of linear inequalities
92. Boat-in-the-river problems
93. The discriminant
94. Dependent and independent variables; Functions; Functional notation
95. More nonlinear systems
96. Joint and combined variation; More on irrational roots
97. Advanced substitution
98. Relationships of numbers
99. Absolute value inequalities; Negative numbers and absolute value
100. Graphs of parabolas
101. Percent markups
102. Sums of functions; Products of functions
103. Advanced polynomial division
104. Complex numbers, rational numbers, and decimal numerals
105. Advanced factoring

106. More on systems of three equations
107. Numbers, numerals, and value; Number word problems
108. Sum and difference of two cubes
109. More on fractional exponents
110. Quadratic inequalities (greater than)
111. Three statements of equality
112. Quadratic inequalities (less than)
113. Logarithms; Antilogarithms
114. Nonlinear inequalities
115. Exponential equations; Exponential functions; Compound interest
116. Fundamental counting principle and permutations; Probability; Independent events
117. Letter symbols for sets; Set-builder notation
118. Logarithmic equations
119. Absolute value inequalities
120. Age word problems
121. Rational inequalities
122. Laws of logarithms; Intersection of sets; Union of sets; Venn diagrams
123. Locus; Basic construction
124. Conditions of congruence; Proofs of congruence; Isosceles triangles
125. Distance defined; Equidistance; Circle proofs
126. Rectangles; Squares; Isosceles trapezoids; Chords and arcs
127. Lines and planes in space
128. Circumscribed and inscribed; Inscribed triangles; Inscribed circles; proof of the Pythagorean theorem; Inscribed angles
129. Stem and leaf plots; Measures of central tendency; The normal curve; Standard deviation

Lesson 36

Deductive reasoning • Euclid • Vertical angles are equal • Corresponding interior and exterior angles • 180° in a triangle

30A. Deductive Reasoning.

Deductive reasoning is a term that we apply to a process of reasoning from a nonreversible statement, called the **major premise**, to a result called the **conclusion**. The major premise is always an **if-then statement**. We identify nonreversible statements by using an arrow that points in just one direction.

$$A \rightarrow B$$

This tells us that if *A* is true then *B* is true. It does not say that if *B* is true then *A* is true.

If a quadrilateral is a square, then the quadrilateral is also a rectangle.

If square → then rectangle

We say that this premise is not reversible because we cannot say

If rectangle → then square **FALSE**

since all rectangles are not squares. A three-step deductive reasoning process consisting of a major premise, a minor premise, and a conclusion is called a **syllogism**. Note that the major premise can be stated without using the words *if* and *then*. The premise, "If a polygon is a square, then the polygon is also a rectangle," is stated without using *if* and *then* in the following syllogism.

(1) Major premise	All squares are rectangles.
(2) Minor premise	Quadrilateral *ABCD* is a square.
(3) Conclusion	Quadrilateral *ABCD* is a rectangle.

Syllogistic reasoning is tricky, and we must be careful. Consider the following syllogism.

(1) All poets are poor.	
(2) Roger is poor.	
(3) Roger is a poet.	(Not valid)

This is not a valid conclusion because we have reversed the major premise. The premise we were given was

Poet → Poor

The major premise did not tell us

Poor → Poet **FALSE**

An argument is a **valid argument** if we reason correctly. A valid argument does not lead to a true conclusion if one of the premises is false. Consider the following syllogism.

(1) Major premise	All chickens have three legs.
(2) Minor premise	Henny is a chicken.
(3) Conclusion	Henny has three legs. (Valid)

This is a **valid argument** because the reasoning process from (1) to (3) is correct. The conclusion is false because one of the premises is false. Now consider the following syllogism.

(1) Major premise	If it rains, I will go to town.
(2) Minor premise	It did not rain.
(3) Conclusion	I did not go to town. (Invalid)

This conclusion is false because the reasoning process is invalid. The major premise says that I go to town on the days that it rains. It makes no statements about what I will do on the days it does not rain. Therefore, the reasoning process is flawed and the conclusion is invalid. From this we see that we have to be careful when we try to use deductive reasoning.

30B. Euclid.

The first mathematics in the western world was that of the Egyptians and the Babylonians. Compared with the mathematics of their successors, the Greeks, the mathematics of the Egyptians and Babylonians was primitive at best.

The classical period of ancient Greece was from about 600 B.C. to 300 B.C., and the chief cultural center was Athens. The Greeks were the originators of philosophy and of the pure and the applied sciences. They were the first in political thought and institutions and were the first historians. Many new ideals, such as the freedom of the individual, are Greek contributions to western culture. Among the more important contributions of the Greeks were their emphasis on a human being's ability to reason and their belief in cause and effect as opposed to superstition and the supernatural. Their belief in reason allowed them to develop geometry as a deductive reasoning process.

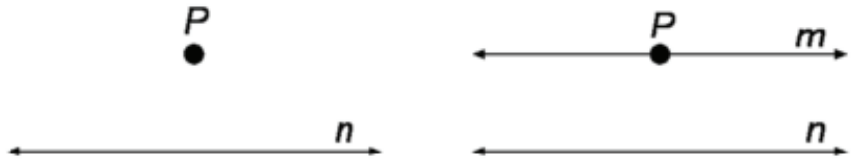
We know the names of quite a few Greek mathematicians. The Pythagorean theorem is named after Pythagoras, a Greek believed to have been born on the isle of Samos and who later lived in Kroton in southern Italy circa 525 B.C. The first recorded work on geometric proofs is that of Hippocrates of Chios, circa 425 B.C. Other Greeks, including Eudoxos of Knidos, made major contributions to geometry.

Eukleides (whom we now call Euclid) was a Greek scholar who probably lived in Alexandria, Egypt, during the reign of Ptolemy I, the first Greek king of Egypt (323-285 B.C.). He compiled the work of his predecessors and expanded on it in his treatise on geometry called the *Elements*. In this treatise, Euclid stated that some facts about mathematics were true because they were true and that their truth could be accepted without proof. He called these self-evident truths **axioms** or **postulates**. Then he proved 467 other assertions by using deductive reasoning based on his self-evident truths. Because the reasoning was logical and was based on self-evident truths, the assertions that he proved were believed to be true even though their truth may not have been self-evident. These provable assertions are called **theorems**.

Definitions are the **names** that we give to ideas. Definitions are not proved. For example, Euclid defined parallel lines to be any two lines in the same plane that do not intersect. This definition does not imply the existence or the nonexistence of parallel lines. It just says that if two lines are in the same plane and if they do not intersect, we call the lines parallel lines. **It is important to remember that all definitions are reversible.** Thus, if we have a pair of parallel lines, they **must** be in the same plane and they **must not** intersect. Theorems, axioms, and postulates are not necessarily reversible. For instance, if two angles are right angles, their measures are equal. But, two angles whose measures are equal are not necessarily right angles.

Euclid was able to reduce his list of postulates or axioms to 10. The essence of Euclid's postulates is contained in the following statements. The wording of Postulate 5 shown here is attributed to John Playfair (1748-1819) and is the wording usually used in high school geometry texts in the early 1900s.

Postulate 1. **Two points determine a unique straight line.**
Postulate 2. **A straight line extends indefinitely far in either direction.**
Postulate 3. **A circle may be drawn with any given center and any given radius.**
Postulate 4. **All right angles are equal.**
Postulate 5. **Given a line *n* and a point *P* not on that line, there exists in the plane of *P* and *n* and through *P* one and only one line *m*, which does not meet the given line *n*.**



Postulate 6. **Things equal to the same thing are equal to each other.**
Postulate 7. **If equals be added to equals, the sums are equal.**
Postulate 8. **If equals be subtracted from equals, the remainders are equal.**
Postulate 9. **Figures which can be made to coincide are equal (congruent).**
Postulate 10. **The whole is greater than any part.**

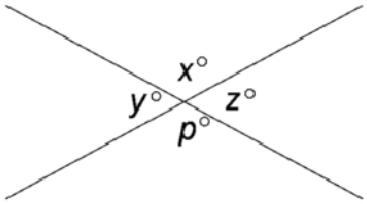
The modern wording of some of these postulates is different, and mathematicians have found it necessary to add other postulates to the 10 postulates of Euclid. One of the postulates concerns betweenness and another concerns continuity. We will not discuss these additional postulates in this book, nor will we try to build a geometric structure based on postulates and proofs.

We will do a few simple proofs to familiarize the reader with the process of deductive reasoning. The major emphasis in this book, however, will be on learning and using the fundamental properties of geometric figures. Long-term practice with these fundamental properties will make the properties familiar, and then the proofs of the properties will be meaningful and easy, as you will see toward the end of the book.

30C. Vertical Angles are Equal.

We can use the sixth and eighth postulates of Euclid to prove that vertical angles are equal.

Consider the following figure with angles x, y, z, and p whose measures are $x°$, $y°$, $z°$, and $p°$.



We see that $x°$ plus $y°$ equals 180°. Also, we see that $x°$ plus $z°$ equals 180°. So

$$x + y = 180 \qquad \text{and} \qquad x + z = 180$$

Both $x + y$ and $x + z$ equal 180, so they are equal to each other by Euclid's sixth postulate.

$$x + y = x + z$$

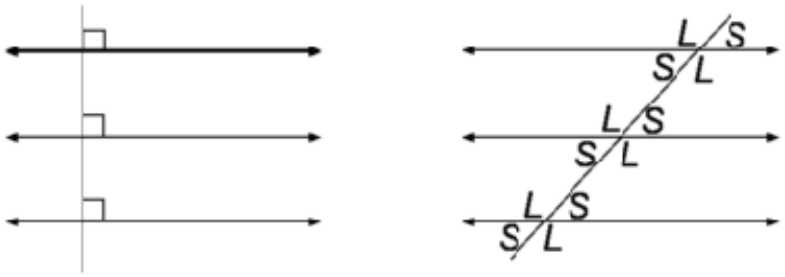
Postulate 8 tells us that if equals are subtracted from equals the results are equal. So we subtract x from both sides of this equality and find that y is equal to z.

$$\begin{array}{rcl} x + y & = & x + z \\ -x & & -x \\ \hline y & = & z \end{array}$$

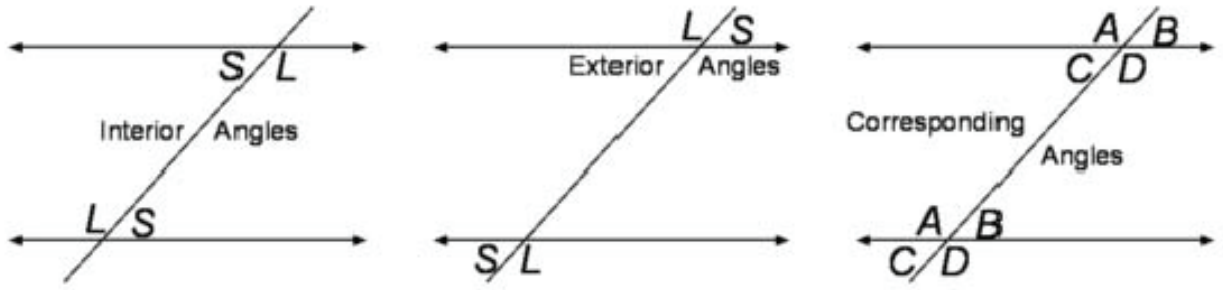
The same procedure can be used to prove that x equals p. Thus, we have used two postulates of Euclid and reasoned deductively from these postulates to prove a theorem.

30D. Corresponding Interior and Exterior Angles.

In Lesson1, we postulated that when parallel lines are cut by a transversal that is perpendicular to one of the lines, all the angles formed are right angles, as we see in the left-hand figure.



If the angles are not right angles, we have postulated that half the angles are small angles whose measures are equal and half the angles are large angles whose measures are equal, as we see in the right-hand figure. To discuss this topic, it is customary to use only two parallel lines and to give the angles special names. The angles between the parallel lines are called **interior angles** and the angles outside the parallel lines are called **exterior angles**. Angles on opposite sides of the transversal are called **alternate angles**. In the figure on the left, we note that **alternate interior angles are equal**.



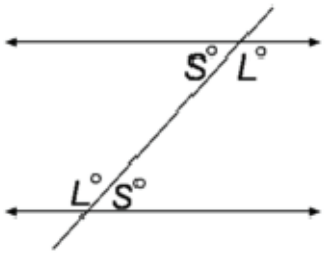
In the center figure, we note that alternate exterior angles are equal. In the figure on the right, we show four pairs of **corresponding angles**. Corresponding angles occupy corresponding positions in the figure, as indicated by the letters *A*, *B*, *C*, and *D*. Corresponding angles are equal.

Euclid used his postulates and deductive reasoning to develop a lengthy four-part argument that proves that if two parallel lines are cut by a transversal, the alternate interior angles are equal. The proof is above the level of this book. But because the assertion can be proved, we call it a theorem.

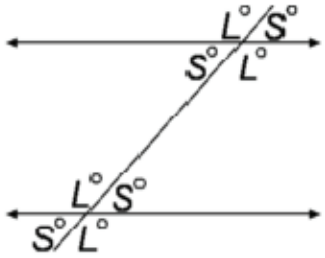
THEOREM

When parallel lines are cut by a transversal, the pairs of alternate interior angles are equal.

This theorem permits us to label alternate interior large angles and small angles as having equal measures, as we do in the following figure.



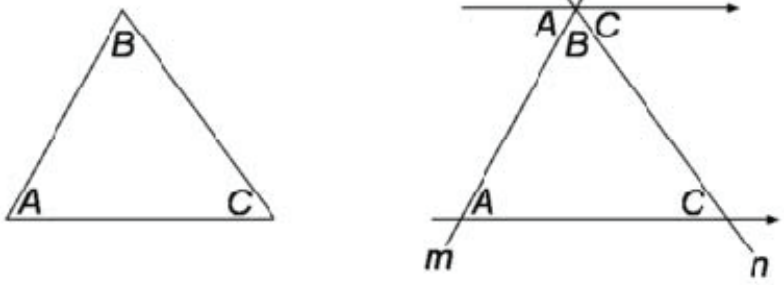
Now, because vertical angles are equal, we can label the other four angles.



We can extend this procedure to any number of parallel lines cut by a transversal to prove that all the small angles are equal and all the large angles are equal.

30E. 180° in a Triangle.

The proof that the sum of the angles in a triangle is 180° is a simple proof that uses the knowledge we have about the angles formed when transversals intersect parallel lines. We can call this proof the *ABC* proof because we use these letters in the proof. On the left we show triangle *ABC*. On the right we draw a line through vertex *B* that is parallel to side *AC*, and we also extend the sides of the triangle as shown to form lines *m* and *n*.



The angles marked *A* are equal because they are equal small angles (alternate interior) formed by the parallel lines and transversal *m*. The angles marked *C* are equal because they are equal small angles (alternate interior) formed by the parallel lines and transversal *n*. At the vertex we see that angles *A*, *B*, and *C* form a straight angle whose measure is 180°. Thus the three angles of the triangle *A*, *B*, and *C* also have a sum of 180°.

Applied Business Math

This course presents fundamental mathematics in the context of business and consumer applications to help provide a strong link between math skills and business applications. Each chapter includes activities designed to help students develop a personal collection of career-oriented projects while emphasizing critical thinking, problem-solving, and workplace competencies. The following books are used:

- *Applied Business Mathematics*, by Schultheis and Kaczmarski, Southwestern Educational Publishing, 14th Edition, 1997
- Workbook
- Test Packet

Contents of *Applied Business Mathematics*:

Unit 1: Managing Your Money

Chapter 1: Money Records

Design Your Own: Spreadsheet to Compare Job Offers
Chapter Review
Workplace Knowhow: Organize and Maintain Information
Chapter Test
Unit 1 Test

Unit 2: Spending Wisely

Chapter 5: Metric Measurement

Career Profile: Actress
5-1 Length
5-2 Area
5-3 Capacity and Weight
Put It All Together: Using Metrics to Describe Something
Explore Technology
Template: Customer Service Database
Design Your Own: Enhanced Customer Service Database
Chapter Review
Workplace Knowhow: Seeing Things in the Mind's Eye
Chapter Test

Chapter 6: Buying for You and Your Home

Career Profile: Waiter/Food Service Industry
6-1 Planning a Budget
6-2 Checking Sales Receipts
6-3 More Sales Extensions
6-4 Finding Unit Prices
6-5 Buying Wisely
Put It All Together: Rent-to-Own Offers
6-6 Checking Energy Costs
6-7 Reducing Energy Costs
6-8 Checking & Reducing Water Costs
6-9 Checking & Reducing Telephone Costs
Put It All Together: Procedures to Check Bills for Accuracy
Explore Technology
Template: Spreadsheet to Compare Renting and Owning
Design Your Own: Spreadsheet to Calculate Payback on Energy Saving Appliances
Chapter Review
Workplace Knowhow: Problem Solving
Chapter Test

Workplace Knowhow: Decision Making
Chapter Test
Unit 2 Test

Unit 3: Making Money Grow

Chapter 10: Saving and Borrowing Money

Career Profile: Court Reporter
10-1 Passbook Savings Account
10-2 Special Savings Account
10-3 Promissory Notes
Put It All Together: Mixed Application
10-4 Interest and Date Tables
Put It All Together: Mixed Application
10-5 Installment Buying
10-6 Credit Cards
Put It All Together: Compare Interest on Savings and Borrowing
Can You Save by Borrowing?
Explore Technology
Template: Spreadsheet to Compare Savings Options
Design Your Own: Loan Comparison Spreadsheet
Chapter Review
Workplace Knowhow: Managing Time
Chapter Test

Chapter 11: Investments

Career Profile: Printing Press Operator
11-1 Investing in Bonds
11-2 Investing in Stocks
11-3 Investing in Mutual Funds
11-4 Investing in Real Estate
Put It All Together: Can Passbook Savings Be a Risky Investment?
Explore Technology
Template: Spreadsheet to Monitor Personal Investments
Design Your Own: Investment Tracking Spreadsheet
Chapter Review
Workplace Knowhow: Acquire and Evaluate Information
Chapter Test

Chapter 9

Managing Your Insurance Needs

Career Profile: Radiologic Technologist

Do you have a desire to contribute to someone's health and well-being? Can you remain calm and focused in tense situations? Those are critical qualifications for a health care professional.

Malcolm explored several different types of health careers. He decided on the x-ray field because of the salary potential and because he liked the idea that he could help physicians diagnose and treat medical problems.

Becoming a Radiologic Technologist usually required a two-year program at either a technical college or community college with "hands-on" training at a hospital. After graduation, Malcolm passed the test to become a Registered Radiologic Technician (RT). That certification, confidence, hard work, and teamwork earned him a full-time job at the hospital where he did his training. RTs may also work in special clinics or private doctors' offices. But, as Malcolm points out, hospitals usually offer higher pay (and a heavier work load).

As an RT, Malcolm helps prepare patients for their x-ray procedures and takes and processes the x-rays. He works closely with radiologists who read the film and help diagnose problems. Malcolm usually works in the emergency room, although he sometimes works in orthopedics, oncology, and surgery. Some emergency procedures are scary, but there is no time to hesitate in crisis situations.

Math (especially percentages and fractions) and science skills are important in training to be an RT. Since these were not Malcolm's strongest subject areas, he admits he had some problems with the course work the first year. A helpful teacher, determination to be successful, extra study, and on-the-job experience all helped him fulfill the math and science requirements. On the job, he uses his knowledge of ratios, angles, measurements, decimals, and averages to position patients and to set the x-ray machines in order to produce reliable films.

Experience and training have been important in Malcolm's professional development. He has learned to do a variety of specialized x-ray procedures, and he takes advantage of technology training offered by the hospital. Newer technologies, such as nuclear medicine, MRT scans, angiography, and sonograms, are replacing more traditional x-rays in some situations. Malcolm aggressively pursues this training because the more skills he has, the more valuable he is to the hospital.

The health care field is booming, and continued growth is expected. A wide variety of technical and service careers exist in the health field. For more information on health care careers, check your local library.

9.1: Life Insurance

objectives

In this lesson, you will learn to

- *identify different types of life insurance and their benefits;*
- *calculate life insurance premiums;*
- *identify cash value of a life insurance policy; and*
- *calculate the value of dividends on a policy.*

The main purpose of life insurance is to prevent financial hardship by providing income to people who are dependent on you when you die.

Think about the previous sentence. Then working in a small group, determine how important, on a scale of 1-10, life insurance is in each of the following cases. Explain your ratings.

- A single person who attends school and has no dependents.
- A single person with an aging parent who he or she helps support.
- A married couple, both employed, with one young child.
- A married couple with no children. One spouse works full time; the other, part time.
- A married couple with two children. One spouse works; the other takes care of the home and children.
- A widow with two self-supporting adult children.

Warm Up

a. 17.5 x 0.86
b. 527.859 ÷ 0.009
c. $4.50 + $189.00 + $57.82 + $0.87
d. 800.5 – 30.986
e. Round to the nearest cent: $617.297
f. Round to the nearest thousand: 340,284.2973
g. Find the cost of 180 bolts @ $0.10

Life Insurance

If your income supports your family, your family will need to replace your income when you die. If you are a homemaker, your surviving spouse may need to pay someone to care for your children and home. In both cases, money is needed to pay funeral costs. Life insurance may also be bought to repay, upon death, debts, such as money that has been borrowed to buy a home or a car. **Life insurance** is the usual way of protecting your family from financial loss when you die. When a person decides to buy life insurance, he or she should determine how much insurance is needed.

Critical Thinking Work in small groups. Look again at the list of situations in the beginning of this lesson. How would you determine how much life insurance protection is needed in each situation? Is it good to buy more life insurance than you need?

Insurance Terminology A life insurance **policy** is the contract between the insured and the insurer. The contract states how much insurance and under what circumstances insurance will be paid. The money paid to an insurance company for life insurance is the **premium**. The person whose life is covered by the policy is the **insured**. The insurance company is the **insurer**. When the insured dies, **death benefits**, usually equal to the face amount of the policy, are paid to the beneficiary. The **beneficiary** is the person named in the policy to receive the death benefits. A life insurance policy may be canceled at any time by the insured. If premiums are not paid, the policy may be canceled by the insurer.

Types of Life Insurance Policies

There are many types of life insurance policies designed to meet different needs and budgets. Three of the most common types are:

- **Term life insurance:** Offers protection for a fixed period of time, such as 1, 5, or 10 years. Insurance can usually be renewed for current face value at a higher premium after the fixed term expires. Term insurance does not include a savings component. Therefore, term insurance is usually less expensive, especially for younger people, than other kinds of insurance.
- **Whole life insurance:** Insures you for a fixed amount for as long as you live. Premiums must be paid for your whole life. In addition to the death benefit, there is a savings component that earns interest and cash value over time. Some companies pay dividends as well. The premium for this type of insurance is usually higher than for term insurance.
- **Limited-payment life insurance:** Gives protection for life, but you pay premiums only for a fixed time, such as 20 years. Monthly payments are higher, and cash values increase at a faster rate.

You will find that individual insurance companies offer slightly different policies. The features, costs, and benefits must be compared to find the policy that is best for your needs.

Life Insurance Premiums

Illustration 9-1.1 shows the premiums an insurance company might charge for each $1,000 units of life insurance purchased. (Note that different rates are given for men and women at different ages. In addition, the rates shown are for nonsmokers.) For example, if you are a female who buys a $15,000 whole life insurance policy at the age of 20, your annual premium would be for 15, $1,000 units. The cost would be calculated as ($15,000 ÷ $1,000) x $6.22 or $93.30.

In addition to the premium, some insurance companies charge a *policy fee* or *administrative fee* to cover the costs of processing an application and issuing a policy.

ANNUAL PREMIUMS PER $1,000 UNITS OF LIFE INSURANCE						
	1-Year Term		Whole Life		20-Payment Life	
Age of Insured	Male	Female	Male	Female	Male	Female
20	$1.39	$1.22	$7.07	$6.22	$25.29	$23.27
25	1.41	1.24	8.37	7.37	27.77	25.54
30	1.45	1.28	10.16	8.94	30.75	28.29
35	1.62	1.43	12.58	11.07	34.15	31.42
40	1.91	1.68	16.30	14.34	38.89	35.78
45	2.45	2.16	20.02	17.62	44.72	41.14

* Note: Rates shown are for nonsmokers.

Illustration 9-1.1. Sample Life Insurance Premiums Per $1,000 Units

Notice that women pay a lower premium than males do at the same age. This is because women as a group live longer than men. Some states, however, have laws that do not allow insurers to charge different rates for males and females.

Exercise Your Skills

Use the annual premium table in Illustration 9-1.1 to solve these problems. Find the annual premium for each policy.

	Kind of Policy	Age and Sex	Face of Policy	Premium
1.	Whole Life	25, male	$10,000	
2.	1-Year Term	30, female	80,000	
3.	20-Payment Life	40, male	12,000	
4.	Whole Life	45, female	14,000	

5. How much more is the annual premium on a $20,000, 20-payment life policy for a male at age 45 than at age 25?

6. A 20-payment life policy for $9,000 is taken out by a female at age 25. What total amount will she pay in premiums by the end of 20 years?

7. Sam Pontel, age 30, is comparing the total premium cost of a $30,000, 20-payment life policy he may take now and the cost of the same policy at age 35. Find the difference in premium costs over 20 years for this policy at the two age levels.

8. Because he smokes, Bert pays 20% more for life insurance. How much more will Bert pay for $50,000 of 1-year term insurance at age 45 than a nonsmoker would pay at the same age?

9. To the nearest percent, what percent greater is the cost of a whole life policy taken out by a male at age 45 than at age 35?

Mary Crane, age 20, wants to invest no more than $600 a year in life insurance. In even thousands of dollars, what is the largest policy she can buy without spending more than $600 annually on a

10. whole-life policy?

11. 1-year term insurance policy?

Life Insurance Benefits

The main benefit of having life insurance is its protection. Some policies have a savings feature.

Cash Value

Whole life and limited-payment life policies build a cash value after premiums have been paid for a few years. **Cash value** is the money that you get if you cancel the policy. (If you cancel a term policy, you get nothing.) The terms of the policy may give you a choice of using the cash value in these ways:

- **Policy Loan.** You can borrow an amount up to the cash value from the insurance company and still keep insurance coverage. You must repay the money you borrow, but you usually pay a lower rate of interest than other lenders would charge.
- **Paid-Up Life Insurance.** The cash value may be used to make a one-time payment to buy a smaller amount of insurance that covers you until you die. You do not pay any more premiums.
- **Extended Term Life Insurance.** You may trade the cash value for term insurance. You will be covered for the original amount of the insurance for a fixed, shorter period of time.

Table of Cash Values A policy that builds cash value would have a table much like the one shown in Illustration 9-1.2.

Year	Cash/Loan Values per $1,000 Units	Paid-Up Whole Life per $1,000 Units	Extended Term	
			Years	Days
1	$ 0	$ 0	0	0
5	17.80	119	8	274
10	76.09	403	19	115
15	170.72	716	21	80
20	327.50	1,087	22	107
25	564.33	1,599	22	312

Illustration 9-1.2. Sample Cash Value Table

If you had paid premiums on a $10,000 policy for 20 years, you could borrow up to $3,275 on the policy ($10,000 ÷ $1,000 = 10 units; 10 x $327.50 = $3,275). You could also buy $10,870 of paid-up life insurance (10 x $1,087 = $10,870). Or you could buy a $10,000 term insurance policy that would cover you for 22 years and 107 days.

Dividends After you have had a policy for a few years, your insurance company may return part of your premium to you as a **dividend**, which is usually shown on the premium notice. You may deduct the dividend from the premium due or leave the dividend with the company to buy more insurance or to earn interest. The cost of the premium minus the dividends is the net cost of the insurance. The way in which a dividend is used is decided when the policy is written.

Exercise Your Skills

12. How much cash would you get if you canceled a $50,000 policy after paying premiums for five years?

13. You have paid annual premiums of $212 on a $25,000 policy for ten years. What amount could you borrow on your policy?

Alfred Buckley has made payments for 15 years on a $33,000 policy. If he canceled the policy,

1. Estimate the cash payment he could get. Then find the actual cash payment he could get.

2. How much paid-up whole-life insurance could he buy?

3. How many years and days of term coverage could Alfred get?

4. What amount of insurance would Alfred get if he traded the cash value of this policy for extended term insurance?

5. Miriam pays a premium of $12.80 per $1,000 for an $8,000 life insurance policy. Her policy paid a dividend of $18.90, which she uses to reduce her premium. How much should Miriam send to the insurance company when she pays her premium?

6. Ben paid annual premiums on a $25,000 whole life policy at a rate of $17.20 per $1,000. After ten years, he canceled the policy and found that its cash value was $97 per $1,000. Over the ten years, he received dividends of $318.55. For the time Ben had the policy, find the net cost of the insurance.

7. Three different types of life insurance were discussed in this lesson. Return to the list of insurance situations presented at the start of this lesson. Which type of life insurance, if any, would you recommend in each situation and why?

Mixed Review

1. Write 248⅖% as a decimal.

2. Find 12½% of $384.

3. $15.10 increased by 30% of itself is?

4. The regional park system tax rate in Odell County is 2.3 mills per dollar of assessed value. Find the tax to be paid on property assessed at $70,000.

5. Iris earned $2,500 last year at her part-time job. Her parents claimed her as a dependent on their federal income tax return. What taxable income did Iris have last year?

6. You want to borrow money on a $60,000 life insurance policy that you have held for 17 years. The loan value of the policy is $175 per $1,000. What is the maximum amount you can borrow?

7. Roger paid annual premiums on a $35,000 whole life policy at a rate of $14.76 per $1,000. At the end of five years, he canceled the policy and received the cash value of $35 per $1,000. Over the five years, he had received total dividends of $62, which was kept in the account. What was the net cost of this policy?

8. Letitia's check register balance on March 31 was $764.20. In making a reconciliation statement, she found that a check for $19 was incorrectly recorded in the register as $91; and she had no record in her register of a service charge of $4.80, earned interest of $1.21, and a deposit of $78.34. What was her correct check register balance?

9.2: Health Insurance

objectives

In this lesson, you will learn to

- *identify different types of health insurance coverage;*
- *calculate medical expenses; and*
- *calculate what health insurance will and will not pay for.*

How many friends or relatives in your age group have had surgery, have been hospitalized, or have needed long-term medical care?

What would you estimate to be the chances of your having a serious medical problem? Considering your current age, do you need health insurance? Are your health insurance needs different from those whom we term the elderly?

Warm Up

a. Find 80% of $4,500.
b. ⅝ is ?% of 0.625?
c. $15,000 - ? = $6,000
d. ? x 0.76 = 1.14
e. Find 80.5 increased by 25% of itself.
f. What percent of $120 is $54?
g. Round 850,379 to the nearest hundred.

Health Insurance

When a person has serious health problems, the cost of medical care can add up to thousands of dollars. Instead of using their savings or current income to pay health care bills, most people rely on health insurance. The insurance company then pays most of the cost of certain kinds of health care up to a specified maximum. **Health insurance**, like other insurance, protects against financial loss.

Employers often provide *group health insurance* for their employees and their families. In most cases, the employee pays for part of the cost of the *group policy*. If you are not covered by a group policy, you may buy *individual health insurance* for yourself and your family, which is usually more expensive than group coverage.

Older and disabled persons have health insurance through the Medicare programs of the federal government. They may also buy additional private health insurance coverage. State governments provide Medicaid health insurance to people with low incomes, regardless of age.

Kinds of Health Insurance

The three basic kinds of health insurance are **basic health coverage**, **major medical insurance**, and **disability insurance**. Other kinds of health insurance policies include supplemental insurance policies, long-term health care policies, and dread disease policies.

Basic health coverage, usually offered as an insurance package, provides:

Hospitalization benefits, which help pay expenses of a hospital stay, such as hospital room, medicine, lab tests, X-rays, operating room.

Surgical benefits, which cover the fees of doctors who do surgery or who help with surgery in or out of a hospital.

Medical insurance, which pays the fees of other doctors who see you in or out of the hospital, as well as some other medical expenses, such as physical therapy.

Major medical insurance usually supplements basic health coverage. It is designed to help pay the hospital costs and surgical, medical, or other health care expenses due to a major illness or an injury. Often basic and major medical insurance policies are combined into one comprehensive health package.

Disability income insurance replaces part of the income you lose if you are unable to work for an extended period of time because of illness or accident. Usually coverage starts after a specified period, such as 30 days.

Health Insurance Plans

All health insurance plans have policies that state in writing your maximum coverage or benefits. The maximums determine how long each service will be provided or give a maximum dollar amount of coverage. Three common types of health insurance plans are:

- **Traditional plans** that place no restrictions on the doctors or hospitals you choose for medical care. However, you may have to pay a fixed dollar amount or a percentage of all medical bills, depending on the terms of the policy.

- **Health Maintenance Organizations** (HMOs). In an HMO, a small fee is usually charged each time you use a service. You must get all your medical care from doctors, hospitals, laboratories, and drugstores who participate in the HMO.

- **Preferred Provider Plans (PPOs)** combine features of traditional plans and HMOs. A PPO has a network of recommended medical care providers, known as **preferred providers**, who have agreed to take a specified amount of money for their services. PPOs also allow customers to choose a doctor or hospital not in the network. However, customers pay a higher part of the medical service charge when they do not use a preferred provider.

Limits of Coverage A limit is usually set on the number of days of hospital care that are paid by insurance. A limit may also be set on the amount of money paid for a hospital room per day, for doctors' fees, or for the total cost of a health service. You must pay for the cost of health services above the limits.

Exercise Your Skills

Lela Zerkin's hospital bill for 6 days was $1,900. Her surgeon's bill was $1,250. Lela's insurance covered $1,740 of the hospital bill and $1,175 of the surgeon's bill. How much was paid by

1. the insurance company? **2.** Lela?

Gerald Brinson's insurance pays all hospital charges except for a maximum limit of $140 a day for a hospital room. Gerald stayed in a hospital for 9 days and had a private room that cost $210 a day. During his stay, other hospital charges amounted to $738. How much was paid by

3. the insurance company? **4.** Gerald?

Despana Stavros needed hospital care after an accident. Her medical bills for 15 days of care were hospital room, $3,045; X-rays, $590; medicine, $260; operating room, $520; surgeon, $950. Despana's insurance paid $190 a day for the room, $545 for X-rays, $900 to the surgeon, and the full amount of all other charges. Despana paid the amount not covered by her insurance.

5. What was the total of Despana's medical bills?

How much was paid by

6. the insurance company? **7.** Despana?

Ed has disability income insurance that pays 70% of his regular wages if he can't work because of illness or injury. His insurance starts after he has missed 30 days of work. Due to an accident at home, Ed has lost 39 days of work. His total medical expenses were $3,200. If Ed's regular daily wage is $148,

8. what estimated amount of disability income will he get?

9. what actual amount of disability income will he get?

Major Medical Insurance Payments

Many major medical insurance policies require you to pay a part of health care expenses. In a policy with a **deductible** feature, you have to pay a fixed amount each time you get health services. For example, you may have to pay for the first $10 of every X-ray charge. The insurance company pays the rest.

In a policy with a **coinsurance** feature, the insured and the insurer share the cost of health care above the deductible amount. For example, if your policy has an 80% coinsurance feature, the insurance company pays 80% of a health care bill after subtracting the deductible amount. You pay the other 20% of the bill plus the deductible amount.

EXAMPLE Costella has a major medical insurance policy with a $500 deductible feature and an 80% coinsurance feature. Her policy covers the hospital, surgical, and medical expenses of $14,500 that Costella has been charged after being injured in an accident. How much will be paid by the insurance company? By Costella?

SOLUTION

Total covered expenses	$14,500
Less: deductible amount	- 500
Balance to be shared	$14,000
Company's share: 80% of $14,000 balance =	$11,200
Costella's share: 20% of $14,000 balance =	$2,800
Deductible amount	+ 500
Costella's amount to pay	$3,300

Exercise Your Skills

Your major medical policy has an $800 deductible feature and a 90% coinsurance feature. You are injured in an accident and your health care bills amount to $36,000.

10. What amount will be paid by your insurance company?

11. What amount will you pay?

Molly Denard had 6 X-rays taken at a total cost of $360. Under her major medical coverage, the insurance company paid 80% of the cost of X-rays after a $10 deductible fee for *each* X-ray.

12. What was the company's share of the cost of the X-rays?

13. What was Molly's share of the cost?

Adele and Jim Emmet's major medical policy pays 90% of covered expenses for each of them in any year. A $500 deductible feature applies to *each* person's claim. Last year the Emmets made two medical claims. Adele's claim was for $530; Jim's claim was for $950. The insurance company did not allow $70 of Adele's claim as a covered expense. What amount did the insurance company pay for

14. Adele's covered expenses? **15.** Jim's covered expenses?

16. Howard Laird's injury required lengthy hospital and medical care. The fees of his doctors were $8,700 and covered at 100% by his major medical policy. His hospital expenses were $34,460, and the policy covered 90% of the hospital bills beyond a $250 deductible. After Howard left the hospital, a physical therapist made 30 visits to his home at $75 a visit. Howard's policy paid 70% of the therapy bills. Of the total expenses, what amount did Howard have to pay?

Daniel Sparks received medical care in the emergency room of a hospital. His bill for this care included these items: emergency room use, $200; doctor's fee, $85; lab tests, $90; medical supplies, $18. For emergency care, Daniel's major medical coverage had a 70% coinsurance feature with a deductible of $25 for doctors' fees.

17. How much did the insurance company pay?

18. How much did Daniel pay?

Ivy Gould was hospitalized for 17 days. Her total bill for medical care was $24,490. Ivy's major medical coverage pays for 85% of medical expenses above a $750 deductible. Ivy has a disability income insurance policy with another company that pays her $65 each day that she is hospitalized.

19. How much of the bill for medical care does Ivy owe after the insurance company pays its share?

20. After using the disability insurance to pay her medical bill, how much will Ivy still owe?

21. The costs of health care and insurance have gone up sharply in recent years. Make a list of suggestions for reducing health insurance costs.

Mixed Review

1. $6.65 is what percent greater than $5.32?

2. 36.2 increased by 75% of itself is?

3. $192 is what percent less than $288?

4. $55,600 decreased by 8% of itself is?

5. Sabrina Wooten canceled her $25,000 life insurance policy after 8 years and took the cash value of $62 per $1,000. The annual premiums on the policy were $350. While the policy was in effect, she received a total of $187.40 in dividends. What was the net cost of the policy for the 8 years?

6. John Stroble had a lot that was 20m by 50m. He used ¼ of the lot for a garden. He planted flowers in ½ of his garden. How many square meters are planted in flowers?

Nannette Fry worked 48 hours last week. She earned $12.52 per hour for the first 37.5 hours. For time over 37.5 hours, she earned time-and-a-half. Deductions of $152.24 were taken out of her paycheck.

7. Find Nannette's gross pay for the week.

8. Find her net pay for the week.