3-1. Backwoods American, Inc., produces expensive water-repellent, down-lined parkas. The company implemented a total quality-management program in 2000. Following are quality-related accounting data that have been accumulated for the five-year period after the program's start.

	Year				
	2000	2001	2002	2003	2004
Quality Costs (000s)					
Prevention	$ 3.2	10.7	28.3	42.6	50.0
Appraisal	26.3	29.2	30.6	24.1	19.6
Internal failure	39.1	51.3	48.4	35.9	32.1
External failure	118.6	110.5	105.2	91.3	65.2
Accounting Measures (000s)					
Sales	$2,700.6	2,690.1	2,705.3	2,810.2	2,880.7
Manufacturing cost	420.9	423.4	424.7	436.1	435.5

a. Compute the company's total failure costs as a percentage of total quality costs for each of the five years. Does there appear to be a trend to this result? If so, speculate on what might have caused the trend.
b. Compute prevention costs and appraisal costs, each as a percentage of total costs, during each of the five years. Speculate on what the company's quality strategy appears to be.
c. Compute quality-sales indices and quality-cost indices for each of the five years. Is it possible to assess the effectiveness of the company's quality-management program from these index values?
d. List several examples of each quality-related cost—that is, prevention, appraisal, and internal and external failure—that might result from the production of parkas.

3-2. The Backwoods American company in Problem 3-1 produces approximately 20,000 parkas annually. The quality-management program the company implemented was able to improve the average percentage of good parkas produced by 2% each year, beginning with 83% good-quality parkas in 2000. Only about 20% of poor-quality parkas can be reworked.
a. Compute the product yield for each of the five years.
b. Using a rework cost of $12 per parka, determine the manufacturing cost per good parka for each of the five years. What do these results imply about the company's quality-management program?

3-3. The Colonial House Furniture Company manufactures two-drawer oak file cabinets that are sold unassembled through catalogues. The company initiates production of 150 cabinet packages each week. The percentage of good-quality cabinets averages 83% per week, and the percentage of poor-quality cabinets that can be reworked is 60%.
a. Determine the weekly product yield of file cabinets.
b. If the company desires a product yield of 145 units per week, what increase in the percentage of good-quality products must result?

3-4. In Problem 3-3, if the direct manufacturing cost for cabinets is $27 and the rework cost is $8, compute the manufacturing cost per good product. Determine the manufacturing cost per product if the percentage of good-quality file cabinets is increased from 83% to 90%.

3-5. The Omega Shoe Company manufactures a number of different styles of athletic shoes. Its biggest seller is the X-Pacer running shoe. In 2002 Omega implemented a quality-management program. The company's shoe production for the past three years and manufacturing costs are as follows.

	Year		
	2002	2003	2004
Units produced/input	32,000	34,600	35,500
Manufacturing cost	$278,000	291,000	305,000
Percent good quality	78%	83%	90%

Only one-quarter of the defective shoes can be reworked, at a cost of $2 apiece. Compute the manufacturing cost per good product for each of the three years and indicate the annual percentage increase or decrease resulting from the quality-management program.

3-6. The Colonial House Furniture Company manufactures four-drawer oak filing cabinets in six stages. In the first stage, the boards forming the walls of the cabinet are cut; in the second stage, the front drawer panels are woodworked; in the third stage, the boards are sanded and finished; in the fourth stage, the boards are cleaned, stained, and painted with a clear finish; in the fifth stage, the hardware for pulls, runners, and fittings is installed; and in the final stage, the cabinets are assembled. Inspection occurs at each stage of the process, and the average percentages of good-quality units are as follows.

Stage	Average Percentage Good Quality
1	87%
2	91%
3	94%
4	93%
5	93%
6	96%

The cabinets are produced in weekly production runs with a product input for 300 units.
a. Determine the weekly product yield of good-quality cabinets.
b. What would weekly product input have to be in order to achieve a final weekly product yield of 300 cabinets?

3-7. In Problem 3-6, the Colonial House Furniture Company has investigated the manufacturing process to identify potential improvements that would improve quality. The company has identified four alternatives, each costing $15,000, as follows.

Alternative	Quality Improvement
1	Stage 1: 93%
2	Stage 2: 96%, Stage 4: 97%
3	Stage 5: 97%, Stage 6: 98%
4	Stage 2: 97%

a. Which alternative would result in the greatest increase in product yield?

b. Which alternative would be the most cost effective?

3-8. The Backwoods American company operates a telephone order system for a catalogue of its outdoor clothing products. The catalogue orders are processed in three stages. In the first stage, the telephone operator enters the order into the computer; in the second stage, the items are secured and batched in the warehouse; and in the final stage, the ordered products are packaged. Errors can be made in orders at any of these stages, and the average percentage of errors that occurs at each stage are as follows.

Stage	% Errors
1	12%
2	8%
3	4%

If an average of 320 telephone orders are processed each day, how many errorless orders will result?

3-9. The total processing cost for producing the X-Pacer running shoe in Problem 3-5 is \$18. The Omega Shoe Company starts production of 650 pairs of the shoes weekly, and the average weekly yield is 90%, with 10% defective shoes. One quarter of the defective shoes can be reworked at a cost of \$3.75.

a. Compute the quality–productivity ratio (QPR).

b. Compute the QPR if the production rate is increased to 800 pairs of shoes per week.

c. Compute the QPR if the processing cost is reduced to \$16.50 and the rework cost to \$3.20.

d. Compute the QPR if the product yield is increased to 93% good quality.

3-10. Airphone, Inc., manufactures cellular telephones at a processing cost of \$47 per unit. The company produces an average of 250 phones per week and has a yield of 87% good-quality phones, resulting in 13% defective phones, all of which can be reworked. The cost of reworking a defective telephone is \$16.

a. Compute the quality-productivity ratio (QPR).

b. Compute the QPR if the company increased the production rate to 320 phones per week while reducing the processing cost to \$42, reducing the rework cost to \$12, and increasing the product yield of good-quality telephones to 94%.

3-11. Burger Doodle is a fast-food restaurant that processes an average of 680 food orders each day. The average cost of each order is \$6.15. Four percent of the orders are incorrect, and only 10% of the defective orders can be corrected with additional food items at an average cost of \$1.75. The remaining defective orders have to be thrown out.

a. Compute the average product cost.

b. In order to reduce the number of wrong orders, Burger Doodle is going to invest in a computerized ordering and cash register system. The cost of the system will increase the average order cost by \$0.05 and will reduce defective orders to 1%. What is the annual net cost effect of this quality-improvement initiative?

c. What other indirect effects on quality might be realized by the new computerized order system?

3-12. Compute the quality–productivity ratio (QPR) for the Burger Doodle restaurant in parts (a) and (b) in Problem 3-11.