1.The Tech football coaching staff has six basic offensive plays it runs every game. Tech has an upcoming game against State on Saturday, and the Tech coaches know that State employs five dif­ferent defenses. The coaches have estimated the number of yards Tech will gain with each play against each defense as shown in the following payoff table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | Defense |  |  |
| Play  | 54  | 63  | Wide Tack1e  | Nickel  | Blitz  |
| Off tackle  | 3  | -2  | 9  | 7  | -1  |
| Option  | -1  | 8  | -2  | 9  | 12  |
| Toss sweep  | 6  | 16  | -5  | 3  | 14  |
| Draw  | -2  | 4  | 3  | 10  | -3  |
| Pass  | 8  | 20  | 12  | -7  | -8  |
| Screen  | -5  | -2  | 8  | 3  | 16  |

**A. If the coaches employ an offensive game plan, they will use the maximax criterion. What will their best play be?**

**B. If the coaches employ a defensive plan, they will use the maximin criterion. What will their best play be?**

**C. What will their best offensive play be if State is equally likely to use any of its five defenses?**

**D. The Tech coaches have reviewed game films and have determined the following probabilities that State will use each of its defenses.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Defense | 54 | 63 | Wide tackle | Nickel  | Blitz  |
| Probability | 0.40 | 0.10 | 0.20 | 0.20 | 0.10 |

Using expected value, rank Tech’s plays from best to worst. During the actual game, Tech has a third down and 10 yards to go and the coaches are 60% certain State will blitz, which a 10% chance of any of the other four defenses. **What play should Tech run and is it likely Tech will make the first down?**

**2.** The Omega Shoe Company manufactures a number of different styles in athletic shoes. Its biggest seller is the X-Pacer running shoe. In 2005 Omega implemented a quality management program. The company's shoe production for the past three years and manufacturing costs are as follows:

Year 2005 2006 2007
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. **The Road King Tire Company in Birmingham wants to monitor the quality of the tires it manufactures. Each day the company quality-control manager takes a sample of 100 tires, tests them, an determines the number of defective tires. The results of 20 samples have been recorded as follows:**

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | Number of Defectives | Sample | Number of Defectives |
| 1 | 14 | 11 | 18 |
| 2 | 12 | 12 | 10 |
| 3 | 9 | 13 | 19 |
| 4 | 10 | 14 | 20 |
| 5 | 11 | 15 | 17 |
| 6 | 7 | 16 | 18 |
| 7 | 8 | 17 | 18 |
| 8 | 14 | 18 | 22 |
| 9 | 16 | 19 | 24 |
| 10 | 17 | 20 | 23 |

**Construct a P-chart for this process using 2σlimits and describe the variation in the process.**

**4. How a quality-management program can affect productivity**

**5. Go to the Baldrige Award Web site** [**http://www.quality.nist.gov**](http://www.quality.nist.gov) **and research several companies that have won the Malcolm Baldrige Award. Describe any common characteristics that the quality-management programs in those companies have.**