

1. In a football game, a touch down with an extra point is worth 7 points and a field goal is worth 3 points. Suppose that in a game the only scoring done by teams are touchdowns with extra points and field goals. Which of the scores from 1 to 25 are impossible for a team to score? List all ways for a team to score 40 points.

2. I only have 5¢ and 13¢ stamps. What postages can I make, given a sufficient numbers of each kind of stamp? What is the largest postage that I cannot make? For example, I obviously cannot make 6¢.

3. A customer wants to mail a package. The postal clerk determines the cost of the package to be \$2.86, but only 6¢ and 15¢ stamps are available. Can the available stamps be used for the exact amount of the postage? Why or why not?

4. Joe counts 48 heads and 134 legs among the chickens and dogs on his farm. How many dogs and how many chickens does he have?

5. A cow is worth 10 pieces of gold, a pig is worth 5 pieces of gold and a hen is worth 1 piece of gold. 220 gold pieces are used to buy a total of 100 cows, pigs and hens. How many of each animal is bought?

6. Terry has some 5 oz. weights, some 7 oz weights and a two-pan balance. Show how she can weigh out 1 ounce, 2 ounces, 3 ounces, 4 ounces, 11 ounces and 12 ounces chocolates. For example, she could put a 5 oz. weight on one side of the balance and a 7 oz weight on the other side,; then she could add chocolate to the 5-oz side until it balanced the other side. Is there any weight she could not weigh out given that she has sufficient 5-oz and 7-oz weights?

7. **Fountain of Knowledge** (Adapted from The Heart of Mathematics, by Starbird and Burger)

During an incredibly elaborate hazing stunt during pledge week, Trey Sheik suddenly found himself alone in the Sahara desert. His desire to become a fraternity brother was now overshadowed by his desire to find something to drink (these desires, of course, are not unrelated). As he wandered aimlessly through the desert sands, he suddenly came upon an oasis.

There, sitting in a shaded kiosk beside a small pool of mango nectar, was an old man named Al Donte. Big Al ran the mango bar and informed Trey that the juice was sold only in 8-ounce servings and that the cost for one serving was \$3.50. Trey searched his pockets for change and discovered that he had exactly \$3.50.

Trey's jubilation at the thought of liquid coating his dried and chapped throat was quickly shattered when Al casually announced that there were no 8-ounce glasses available. Al had only a 6-ounce glass and a 10-ounce glass - neither of which had any markings on them. Al, being a man of his word, would not hear of selling any more or any less than an 8-ounce serving of mango juice. Do you think it is possible to use only the unmarked 6- and 10-ounce glasses to produce exactly 8 ounces of juice in the 10-ounce glass? Explain.

8. On a 6, 8 Combination Chart will a $\uparrow\uparrow\rightarrow$ cricket, starting at 0, ever land on 1027? Will he land on one of these four squares:

1056	1062
1048	1054

9. On a 13, 5 combination chart, what kind of cricket will get you from one 0 to another 0? What kind of cricket can jump on the arithmetic sequence 18, 59, 100, . . . ? Will this cricket land on one of these four squares:

-230	-227
-235	-222

10. Complete the rest of this section of a combination chart. Make an EXCEL version that includes a space that contains zero.

	181			
			172	
109				125

11. On a 4, 7 combination chart a $\rightarrow\rightarrow\uparrow$ cricket starts at 4 and goes on a long trip. How close will this cricket get to the square that contains 209? Draw out the relevant section of the chart.

12. I only have 31¢ and 37¢ stamps. What postages can I make, given a sufficient numbers of each kind of stamp? What is the largest postage that I cannot make?

13. You have some 12 oz. weights, some 15 oz weights and a two-pan balance. What other weights can you determine?