MIG

**SAVE THIS FILE AS: U5PREREQ3**

**Unit 5 Prerequisite 3** Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Integer Programming Problem

Natty likes making and wearing jewelry. One day she saw an article on Internet talking about the best ways of earning money. After reading it, she decided to turn her skills into money and do some savings in summer holidays. She shared her ideas with her father and he promised to provide her the required budget for a while until she can manage the job on her own. Next week is the start of this summer holiday and Natty has already bought some tools and supplies for her home business.

She is going to make and sell bracelets, earrings, and rings. She is going to use different sizes of beads, clasps, crimps, thread, etc. She wants to work at least 30 hrs a week. The usage amounts from each resources and how much time she is going to spend for making each type of jewelry are given in Table 1.

**Table 1**: Usage amounts from each resources

**Resource Bracelet Earring Ring**

6 mm faceted iridescent bead 4 2 3

4 mm faceted iridescent bead 3 2 2

4 mm silver beads 4 3 2

silver clasp 1 2 1

crimp 2 2 1

thread (Size D) inches 10.5 4 2

thread (Size B) inches 2 2 1

labor hours 3.5 1.5 1

She found a jewelry supplies shop which sells a bit cheaper than the others. The seller made also some discount since she is a student who is trying to do some saving. Table 2 shows the prices of supplies after discount and Table 3 shows the amounts of supplies that Natty purchased.

**Table 2**: Expenses **Table 3**: Available Supplies

**Resource Cost ($) Resource Availability**

**(#)**

6 mm faceted iridescent bead 0.85 6 mm faceted iridescent bead 45

4 mm faceted iridescent bead 0.95 4 mm faceted iridescent bead 40

4 mm silver beads 2.35 4 mm silver beads 60

silver clasp 0.5 silver clasp 30

crimp 0.62 crimp 30

thread (Size D) inches 1.52 thread (Size D) inches 2,592

thread (Size B) inches 1.52 thread (Size B) inches 2,304

Natty is planning to sell each bracelet for $40, each earring for $33.50 and each ring for $22.35. How many of each item should she produce to make the **most weekly profit**? Use the steps on the back side of this page to answer this question.

1. List the Decision Variables *x* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *y* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *z* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Use Table 1 and Table 2 to find the **total cost** to make each item.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Bracelets** | | | **Earrings** | | | **Ring** | | |
| Use | Cost | UseCost | Use | Cost | UseCost | Use | Cost | UseCost |
| 6 mm faceted iridescent bead |  |  |  |  |  |  |  |  |  |
| 4 mm faceted iridescent bead |  |  |  |  |  |  |  |  |  |
| 4 mm silver beads |  |  |  |  |  |  |  |  |  |
| silver clasp |  |  |  |  |  |  |  |  |  |
| crimp |  |  |  |  |  |  |  |  |  |
| thread (Size D) inches |  |  |  |  |  |  |  |  |  |
| thread (Size B) inches |  |  |  |  |  |  |  |  |  |
|  | **Total Cost for a Bracelet** | |  | **Total Cost for an Earring** | |  | **Total Cost for a Ring** | |  |

Because she wants to maximize her profit, **SUBTRACT** HER **SELLING PRICES** FROM THE **TOTAL** **COST** YOU GOT IN THE TABLE ABOVE. THIS IS THE OBJECTIVE FUNCTION!

Write your objective function. TOTAL PROFIT = \_\_\_\_\_\_\_ *x* + \_\_\_\_\_\_\_ *y* + \_\_\_\_\_\_\_ *z*

1. Write your constraints (9 of them!!) using the **usage table**, and the **availability tables**.
   * 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
     2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 7. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
     3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
     4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 9. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
     5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Enter this information into the solver and calculate up the optimum amount of each product she should make to maximum her profit.

Optimal Solution \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Maximum Profit \_\_\_\_\_\_\_\_\_\_\_\_\_

Sentence \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_