ASSIGNMENT # 2
Material Requirements Planning (MRP) and Inventory Management

A group of minimum of two (2) and maximum of three (3) students must submit their assignment. Students must work in groups. No individual assignment is allowed unless approved by the professor.

Students are reminded that submitted assignments must be neat, readable, and well-organized. Assignment marks will be adjusted for sloppiness, poor grammar and spelling, as well as for technical errors. Plagiarism on assignments will not be accepted, *each student must sign the statement of integrity.*

E-mail questions related to the assignment should be sent to the Teaching Assistant or posted on the Blackboard Learn course website "Discussion Area" (viewed by all).

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Problem #1

The following table lists the components used in assembling item FG-A. The following information is also included for each component: lead time, the on-hand supply, and direct components.

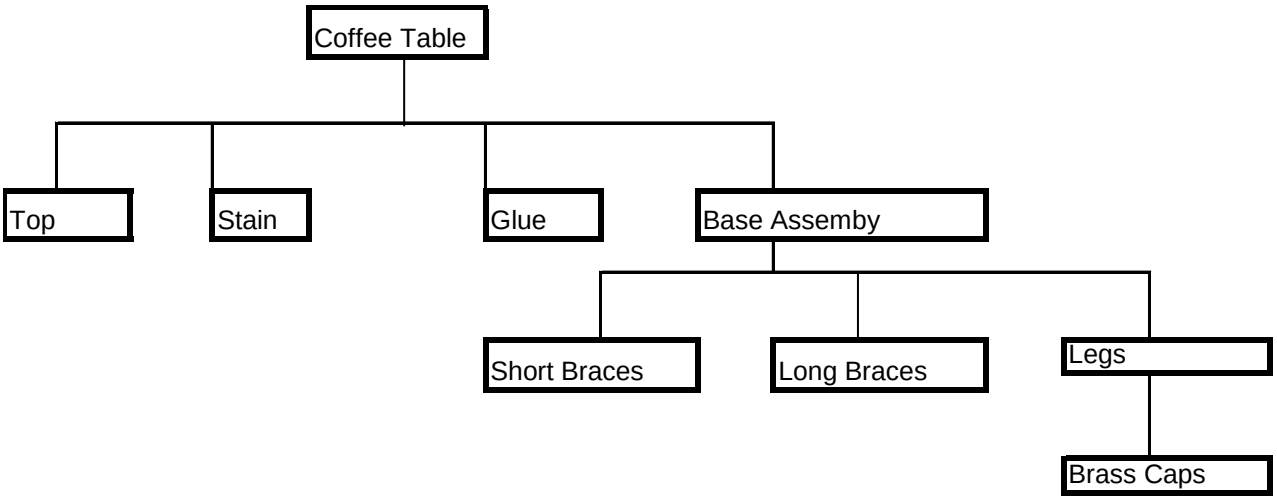
Item	Lead Time (days)	Available Inventory	Direct Components
FG-A	1	0	SA-B(1), SA-C (2), SA-D(2)
SA-B	1	0	SA-D(2)
SA-C	2	0	E (1), F(2)
SA-D	2	0	E(3)
E	1	10	---
F	3	5	---

(a) Construct a product structure tree at a lowest level coding.
(b) Prepare a time-phased product structure.
(c) Given the information above, show the quantities needed for 15 units of FG-A for each of the following 5 components: SA-B, SA-C, SA-D, E and F.
(d) If we wanted to make ONE FG-A, would we need to order any more of either E or F? Why/why not?
(e) What is the total lead time (in days) associated with making an item of FG-A, assuming we had **NO starting on-hand inventory for any component?**

Problem #2

You are scheduling production of your popular *Rustic Coffee Table*. The table requires a top, four legs, 1/8 gallon of stain, 1/16 gallon of glue, 2 short braces between the legs, and 2 long braces between the legs, and a brass cap that goes on the bottom of EACH leg.

You have 100 gallons of glue in inventory, but none of the other items. All items except the brass caps, stain and glue are ordered on a Lot-For-Lot basis. The caps are purchased in quantities of 1,000; stain and glue by the gallon. Lead time is 1 day for each item. Schedule the order releases necessary to produce 640 coffee tables on days 5 and 6, and 128 on day 7 and 8 (i.e. Construct a Materiel Requirements Plan (MRP)).



Problem # 3

A large law firm uses an average of 40 packages of copier paper a day. Each package contains 500 sheets. The firm operates 246 days a year. Holding cost for the paper is $1 a year per pack, and it costs approximately $6 to order and receive a shipment of paper.

a) What order size would minimize total annual ordering and holding costs?
b) Compute the total annual ordering and holding costs using your order size from part a).
c) Except for rounding, are annual ordering and holding costs always equal at the EOQ? Why?
d) The office manager is currently using an order size of 380 packages. The partners of the firm expect the office to be managed "in a cost-efficient manner". Would you recommend that the office manager use the optimal order size instead of 380 packages? Justify your answer.

Problem # 4

A chemical firm produces sodium bisulfate in 100-kg bags. Demand for this product is 20 tonnes per day. The capacity for producing the product is 40 tonnes per day. Setup costs $100, and holding cost is $50 per tonne a year. The firm operates 250 days a year. (Note: 1 tonne = 1,000 kg)

a) How many bags per run are optimal?
b) What would the average inventory be for this lost size? (provide answer in "bags")
c) Determine the approximate length of a production run, in days.
d) About how many runs per year would there be?
e) How much could the company save annually if the setup cost could be reduced to $25 per run?

Problem # 5

Demand for walnut fudge ice cream at a grocery store can be approximated by a normal distribution with a mean of 14 kg per week and a standard deviation of 2.5 kg per week. The new department manager desires a service level policy that has a 95% probability of not stocking out. Lead time from the producer is two days. The store is open seven days a week.

a) If a fixed quantity model is used, what ROP would be consistent with the desired service level?
b) If a fixed-period model is used instead of a fixed quantity model, what order size would be needed for the 95% service level with an order interval of 5 days and a supply of 4 kg on hand at the order time?
c) Suppose that the department manager is using the fixed quantity model described in part a. One day after placing an order with the supplier, the manager receives a call from the supplier that the order will be delayed because of problems with the supplier's plant. The supplier promises to have the order in there in THREE days. After hanging up, the manager checks the supply of the walnut fudge ice cream and finds that 1 kg has been sold since the order was placed. Assuming the supplier's promise is valid, what is the probability that the store will run out of this flavour before the shipments arrives?

Source:
Problem 3, 4 and 5: Stevenson, W.J. and Hojati, C. 2011. *Operations Management* (4th Canadian edition). McGraw-Hill/Ryerson. Mass. 741p.