



QUESTION WORKBOOK

Further packing and the knapsack problem

Decision Mathematics 1 · Year FM

6 questions · 25 marks

PRINT EDITION

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SECTION A · Warm-up**A1**
FPK-A1

State what a knapsack problem asks for, and say how it differs from a bin packing problem. [2]

A2
FPK-A2

A van carries 12 kg. The crates are R at 4 kg for £36, S at 5 kg for £42, T at 7 kg for £56 and V at 8 kg for £60. Rank the crates by profit per kilogram and load the van by that ranking. [3]

SECTION B · Standard**B1**
FPK-B1

For the van in question A2, show that the greedy load is not the best, state the best load, and explain in one sentence why the ranking misled you. [4]

B2

FPK-B2

Formulate the van problem of question A2 as an integer programme.

[3]

B3

FPK-B3

A bag carries 7 kg. The items are X at 2 kg for £14, Y at 3 kg for £19 and Z at 4 kg for £26. Build the dynamic programming table for limits 0 to 7 kg and use it to name the best load.

[5]

SECTION C · Stretch

C1
FPK-C1

Six rectangles are to be cut from a roll 10 units wide, without being turned: A 4 by 6, B 3 by 6, C 3 by 4, D 5 by 4, E 5 by 4 and F 3 by 2, width given first. Pack them by shelves of decreasing height, find the area lower bound, and then find a packing that meets the bound. [8]

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