

www.m4ths.com D1 Bin Packing Algorithm

(1) Boxes can hold a total of 10kg. A the weights below need to be put in as few boxes as possible:

5kg 3kg 6kg 7kg 4kg 5kg 2kg 8kg 1kg

- (a) Find the lower bound for the number of boxes required.
- (b) Use the first fit bin packing algorithm to fit the weights in as few boxes as possible.
- (c) Use a sort to put the weights in descending order
- (d) Use the first fit decreasing bin packing algorithm to place the weights in as few boxes as possible.
- (e) Use the full bins algorithm to place the weights in as few boxes as possible.
- (f) Are any of your answers in parts (b), (c) or (d) the optimal solution?

(2) Fred is buying lengths of wood. Each length is 2m long. He needs to cut the following lengths for a project.

110cm 95cm 120cm 70cm 140cm 110cm 105cm 45cm

- (a) Find the lower bound of the number of lengths he needs,
- (b) Explain why the value found in part (a) is not sufficient for the job.
- (c) Use the first fit algorithm to find an initial number of lengths he needs.
- (d) Use the quick sort to put the lengths in order.
- (e) Use the first fit decreasing algorithm to find an improved solution.
- (f) Use the full bins algorithm on the lengths.
- (g) Write down the shortest length he could omit from his project to use the lower bound found in part (a)

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- (g) Find the lower bound for the number of boxes required.
- (h) Use the first fit bin packing algorithm to fit the weights in as few boxes as possible.
- (i) Use a sort to put the weights in descending order
- (j) Use the first fit decreasing bin packing algorithm to place the weights in as few boxes as possible.
- (k) Use the full bins algorithm to place the weights in as few boxes as possible.
- (l) Are any of your answers in parts (b), (c) or (d) the optimal solution?

(2) Fred is buying lengths of wood. Each length is 2m long. He needs to cut the following lengths for a project.

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- (h) Find the lower bound of the number of lengths he needs,
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- (l) Use the first fit decreasing algorithm to find an improved solution.
- (m) Use the full bins algorithm on the lengths.
- (n) Write down the shortest length he could omit from his project to use the lower bound found in part (a)