Example

Norwest is a small chain of mini supermarkets serving small towns in the North West of England.

The manager of the head office has ten jobs which need to be completed this week.

Each employee works 30 hours per week. The jobs can be done in any order by any employee.

Each job can only be done by one person. Jobs can not be split or divided.

The jobs

Job	Time required to complete the job (minutes)
A: Organise what is to be delivered to each store this week	16
B: Decide what store will get deliveries each day	12
C: Write down which goods are returned from each store	14
D: Check how much money each store has taken this week	10
E: Order new stock for next week	18
F: Check who is working in each store next week	8
G: Clean the offices	6
H: Write adverts on social media	12
I: Pay all the bills for the goods received last week	10
J: Organise the pay to make sure all workers get paid the correct amount	12

Solution: How many workers are required

Total number of hours required to complete the jobs is 118.

118 is divided by 30 as each worker can work a maximum of 30 hours.

118 divided by 30 gives 3.93 indicating that, in theory, four employees are required to complete the jobs.

However, this relies on most employees working the full 30 hours. As jobs cannot be split it may not be possible for employees to complete exactly 30 hours. We need to allocate the jobs to employeees to confirm how many are required.

	Hours																													
Employee	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Alice								Job A (16)														Job B (12)								
John							Job C (14)													Job D (10)								Job G (6)		
Ali										Job E (18)													Job F (8)							
Jasmin							Job H (12)											Job I (10)												
Robyn							Job J (12)																							

Using a first fit algorithm

Give each job to the first employee who has enough time available.

Alice can do A and B (16 + 12 = 28)

John can do C and D and G (14 + 10 + 6 = 30)

Ali can do E and F (18 + 8 = 26)

Jasmine can do H and I (12 + 10 = 22)

Robyn can do J (12)

Using the first fit algorithm will require 5 workers

Using a first fit decreasing algorithm

Reorder the jobs in order of size starting with the largest.

Job	Time required to complete the job (minutes)
E	18
A	16
C	14
B	12
H	12
J	12
D	10
I	10
F	8
G	6

Solution

Using a first fit decreasing algorithm produces the following solution.

Alice completes job E (18) and job B (12) total 30

John completes job A (16) and job C (14) total 30

Ali completes jobs H(12) and J(12) and G (6) total 30

Jasmin completes jobs D(10) and I(10) and F (8) total 28

	Hours																													
Employee	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Alice									Job E (18)																Job B (12)					
John								Job A (16)																Job C (14)						
Ali							Job H (12)												Job J (12)									Job G (6)		
Jasmin						Job D (10)										Job I (10)									Job F (8)					
Robyn																														

This algorithm shows how the jobs can be completed by 4 workers.

Using a full bin algorithm

Choose combinations which add up to 30, for example.

Employee 1 can do A and C = 16 + 14 = 30

Employee 2 can do B and E = 12 + 18 = 30

Employee 3 can do H and J and G = 12 + 12 + 6 = 30

Employee 4 can do D and I and F = 10 +10 + 8 = 28

This algorithm also shows that 4 workers can complete the four jobs.

It may be useful to discuss why the first fit decreasing algorithm is superior to the full bin algorithm. The first fit decreasing algorithm is relatively easy to program a computer to solve when there are many hundreds of tasks. The full bin algorithm is much less easy to program a computer to carry out.