Limiting Factor Decisions

Question 1 – Limiting Factor Decision (Single Limiting Factor)

Neal Ltd produces two products using the same machinery. The hours available on this machine are limited to 5000. Information regarding the two products is detailed below:

Products (Per unit data)	M	N
Selling price ($)	40	30
Variable Cost ($)	16	15
Fixed Cost ($)	10	8
Profit ($)	14	7
Machine hours	8	3
Budgeted sales (units)	600	500

Required

Calculate the maximum profit that may be earned.

Question 2 – Two Potential Limiting factors

Lucky manufactures and sells three products, X, Y and Z, for which budgeted sales demand, unit selling prices and unit variable costs are as follows.

	X	Y	Z
Budgeted sales demand (Units)	550	500	400
Sales price per unit ($)	16	18	14
Material cost ($)	8	6	2
Labour cost ($)	4	6	9
Unit contribution ($)	4	6	3

The organisation has existing inventory of 250 units of X and 200 units of Z, which it is quite willing to use up to meet sales demand. All three products use the same direct materials and the same type of direct labour. In the next year, the available supply of materials will be restricted to $4,800 (at cost) and
the available supply of labour to $6,600 (at cost).

Required

Determine what product mix and sales mix would maximise the organisation's profits in the next year.

Question 3 – Make or Buy Decision

Clemence Ltd produces a number of components, two of which he is considering in buying in, components X and Y.

Cost of making ($)	X	y
Variable	14	28
Fixed	4	4
Total	18	32
Purchase Price (From outside supplier)	17	25

Required
Determine whether Clemence Ltd should produce or buy in the components X and Y.

Question 4 – Linear Programming
A company makes two products (R and S), within three departments (X, Y and Z). Production times per unit, contribution per unit and the hours available in each department are shown below:

	Product R	Product S	
Contribution/unit	$4	$8	
	Hours/unit	Hours/unit	Capacity (hours)
Department X	8	10	11000
Department Y	4	10	9000
Department Z	12	6	12000

Required
What is the optimum production plan in order to maximize contribution?

5. The following statements have been made about linear programming analysis.

(1) The sales price of units produced and sold may be a constraint in a linear programming problem.

(2) If a constraint is $0.04x + 0.03y \leq 2,400$, the boundary line for the constraint can be drawn on a graph by joining up the points $x = 80,000$ and $y = 60,000$ with a straight line.

Which of the above statements is/are true?

A 1 only
B 2 only
C Neither 1 nor 2
D Both 1 and 2

6. Production output by a manufacturing company is restricted by a shortage of supplies of Material X and skilled labour Y. Material X costs $10 per kilogram.

It has been determined using linear programming that at the profit-maximising level of output, all available quantities of Material X would be fully utilised and the shadow price (dual price) of Material X would be $6 per kilogram. Skilled labour Y has a shadow price of $0, but existing staff would be willing to work overtime for an additional $2 per hour.

Another supplier has now offered to supply additional quantities of Material X, but at a price of $14 per kilogram.

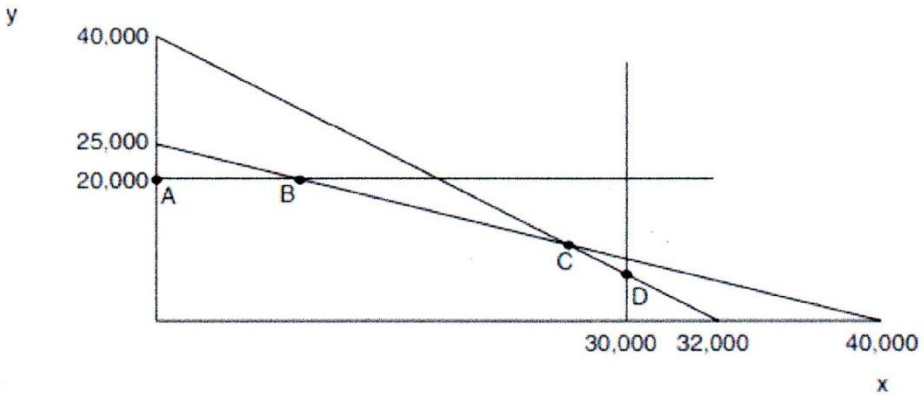
Would the company increase profits by (1) purchasing Material X at the higher price or (2) employing skilled labour Y to work overtime?

	Buy extra Material X	*Pay labour Y to work overtime*
A	No	Yes
B	No	No
C	Yes	Yes
D	Yes	No

7. The constraints in a linear programming problem are as follows:

$3x + 4.8y$	$\leq$	120,000	(Grade A labour hours)
$5x + 4y$	$\leq$	160,000	(Grade B labour hours)
x	$\leq$	30,000	(Sales demand product X)
y	$\leq$	20,000	(Sales demand Product Y)
x, y	$\geq$	0	

The objective function is to maximise total contribution: $20x + 30y$. A graph of the constraints is as follows.



Where is the optimal solution to the linear programming problem?

A Point A
B Point B
C Point C
D Point D

8. The following statements have been made about solving linear programming problems for budgeting purposes.

(1) Slack occurs when less than the maximum available of a limited resource is required.

(2) When the linear programming problem includes a constraint for minimum sales demand for a product, there may be a surplus for sales demand in the optimal solution.

Which of the above statements is/are true?

A 1 only
B 2 only
C Neither 1 nor 2
D Both 1 and 2

9. The following budgeted data has been prepared for a company that manufactures four products.

Product	W	X	Y	Z
	$ per unit	$ per unit	$ per unit	$ per unit
Sales price	9.0	6.0	4.0	8.0
Variable cost	5.5	4.0	2.2	4.0
Budgeted sales units	20,000	25,000	50,000	12,500
Direct labour hours per unit	0.5	0.25	0.3	0.8

If the total available direct labour hours in the period is 24,000 hours and the company plans to maximise profit, which products should it make and sell in the period?

A W, X and Y
B W, X and Z
C W, Y and Z
D Y and Z only

10. The main purpose of sensitivity analysis is to:

A predict the future outcome from an uncertain situation
B determine the outcome from a situation in the event of the worst possible outcome
C determine the expected value of an outcome that is uncertain
D gain insight into which assumptions or variables in a situation are critical

11 A company is selling a product for $180. At this price it sells 50,000 units per month. The variable cost of sale per unit is $125 and monthly fixed costs are $2 million. It has been estimated that for every $10 increase or reduction in price, sales demand will fall or increase by 4,000 units.

At what selling price per unit will the monthly profit be maximised?

A $135
B $180
C $215
D $248.75

12. Cut and Stitch (CS) make two types of suits using skilled tailors (labour) and a delicate and unique fabric (material). Both the tailors and the fabric are in short supply and so the accountant at CS has correctly produced a linear programming model to help decide the optimal production mix.

The model is as follows:

Variables:

Let W = the number of work suits produced
Let L = the number of lounge suits produced

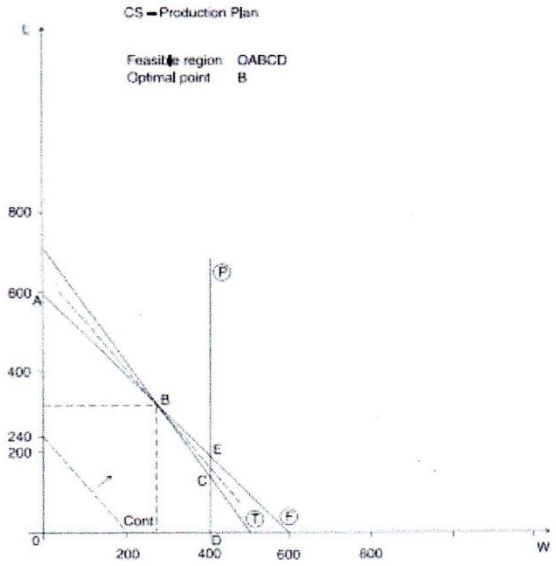
Constraints

Tailors' time: $7W + 5L \leq 3{,}500$ (hours) – this is line T on the diagram
Fabric: $2W + 2L \leq 1{,}200$ (metres) – this is line F on the diagram
Production of work suits: $W \leq 400$ – this is line P on the diagram

Objective is to maximise contribution subject to:

$C = 48W + 40L$

On the diagram provided the accountant has correctly identified OABCD as the feasible region and point B as the optimal point.



Required

(a) Find by appropriate calculation the optimal production mix and related maximum contribution that could be earned by CS. **(4 marks)**

(b) Calculate the shadow prices of the fabric per metre and the tailor time per hour. **(6 marks)**

(10 marks)