Maximise $P = 2x + 3y + 4z$

The objective function

Subject to

$3x + 2y + z < 10$

$2x + 5y + 3z < 15$

$x, y > 0$

The constraints

$P - 2x - 3y - 4z = 0$

Next, the constraint equations

$3x + 2y + z + s = 10$

$2x + 5y + 3z + t = 15$

P	x	y	z	s	t	values
1	-2	-3	-4	0	0	0
0	3	2	1	1	0	10
0	2	5	3	0	1	15

The pivot column is the column with the greatest negative value in the objective equation

Mark this column with an arrow

P	x	y	z	s	t	values
1	-2	-3	-4	0	0	0
0	3	2	1	1	0	10
0	2	5	3	0	1	15

The next step in identifying the **pivot** is to find the **pivot row**

This is done by dividing the values of the constraints by the value in the pivot column

10 divided by 1 = **10**

15 divided by 3 = **5**

The lowest value gives the **pivot row**

This is marked with an arrow

P	x	y	z	s	t	values
1	-2	-3	-4	0	0	0
0	3	2	1	1	0	10
0	2	5	3	0	1	15

The **pivot** is where the pivot column and pivot row intersect

This is normally marked with a circle

P	x	y	z	s	t	values
1	-2	-3	-4	0	0	0
0	3	2	1	1	0	10
0	2	5	(3)	0	1	15

We now need to make the pivot equal to zero

To do this divide the pivot row by the pivot value

P	x	y	z	s	t	values
1	-2	-3	-4	0	0	0
0	3	2	1	1	0	10
0	2	5	(3)	0	1	15

Next we need to make the pivot column values into zeros

To do this we add or subtract multiples of the pivot column

P	x	y	z	s	t	values
1	-2	-3	-4	0	0	0
0	3	2	1	1	0	10
0	2/3	5/3	(1)	0	1/3	5

The pivot column in the objective function will go to zero if we add four times the pivot row

The pivot column value in the other constraint will go to zero if we subtract the pivot row

P	x	y	z	s	t	values
1	-2	-3	-4	0	0	0
0	3	2	1	1	0	10
0	2/3	5/3	1	0	1/3	5

P	x	y	z	s	t	values
1+ 4(0)	-2+ 4(2/3)	-3+ 4(5/3)	-4+ 4(1)	0+ 4(0)	0+ 4(1/3)	0+ 4(5)
0	3	2	1	1	0	10
0	2/3	5/3	1	0	1/3	5

Subtracting 1 X the pivot row from the other constraint gives:

P	x	y	z	s	t	values
1	2/3	11/3	0	0	4/3	20
0	3- 2/3	2- 5/3	1- 1	1- 0	0- 1/3	10- 5
0	2/3	5/3	1	0	1/3	5

This then is the **first iteration** of the Simplex algorithm

P	x	y	z	s	t	values
1	2/3	11/3	0	0	4/3	20
0	7/3	1/3	0	1	-1/3	5
0	2/3	5/3	1	0	1/3	5

If any values in the objective equation are negative we have to repeat the whole process

Reading the objective function:

$$1P + \frac{2}{3}x + \frac{11}{3}y + \frac{4}{3}t = 20$$

P	x	y	z	s	t	values
1	2/3	11/3	0	0	4/3	20
0	7/3	1/3	1	1	-1/3	5
0	2/3	5/3	1	0	1/3	5

The maximum value for P is then 20

For this to be the case *x*, y and *t* must be zero

In general any variable that has a value in the objective function is zero.

s = 5 and *z* = 5

P	x	y	z	s	t	values
1	2/3	11/3	0	0	4/3	20
0	7/3	1/3	0	1	-1/3	5
0	2/3	5/3	1	0	1/3	5

Solution

$$P = 5$$

$$x = 0, y = 0 \text{ and } z = 5$$