Clicker #A.1

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	0	5	0	2	7	0	-14
x_1	0	1	-2	0	1	-5	0	9
x_3	0	0	4	1	4	1	0	18
s_3	0	0	-3	0	9	0	1	5

Question: The optimal solution for the dual of this LP has

A. $y_1 = 0$ and $s_3 = 0$

B. $y_3 = 0$ and $y_1 = 2$

C. $y_2 = 0$ and $y_1 = 2$

D. $y_1 = 0$ and $y_2 = 7$

Clicker #A.2

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	0	5	0	2	7	0	-32
x_1	0	1	-2	0	1	-5	0	9
x_3	0	0	0	1	4	1	0	18
s_3	0	0	-3	0	9	0	1	5

Question: The dual of this LP

A. is infeasible

B. is unbounded

C. has optimal objective value 32

D. has optimal objective value -32

Clicker #A.3

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	0	-5	0	2	7	0	-14
x_1	0	1	-2	0	1	-5	0	9
x_3	0	0	0	1	4	1	0	18
s_3	0	0	-3	0	9	0	1	5

Question: The dual of this LP

A. is infeasible

B. is unbounded

C. has optimal objective value 14

D. has optimal objective value -14

Clicker #A.4

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	3	0	17	1	9	0	29
s_1	0	2	0	5	1	-2	0	58
x_2	0	-9	1	3	0	-1	0	80
s_3	0	5	0	1	0	0	1	255

Question: The dual of this LP

A. is infeasible

B. is unbounded

C. has optimal objective value 29

D. has optimal objective value -29

Clicker #B.1

$$\begin{array}{cccccc} 2x_1 & +3x_2 & +x_3 & \leq & 5 \\ 4x_1 & +x_2 & +2x_3 & \leq & 11 \\ 3x_1 & +4x_2 & +2x_3 & \leq & 8 \end{array}$$

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	0	3	0	1	0	1	?
s_2	0	0	-5	0	-2	1	0	?
x_3	0	0	-1	1	-3	0	2	?
x_1	0	1	2	0	$+2$	0	-1	?

Question: (Tableau is optimal for LP with given constraints.)

A. Then one of the four questionmarks is 2

B. Then one of the four questionmarks is 3

C. Then one of the four questionmarks is 4

D. Then one of the four questionmarks is 5

Clicker #B.2

	Z	x_1	x_2	s_1	s_2	s_3	b
Z	1	-3	??	0	0	0	0
s_1	0	1	0	1	0	0	4
s_2	0	0	??	0	1	0	12
s_3	0	3	?!?	0	0	1	18

	Z	x_1	x_2	s_1	s_2	s_3	b
Z	1	0	0	0	$1\frac{1}{2}$	1	36
s_1	0	0	0	1	$\frac{1}{3}$	$-\frac{1}{3}$	2
x_2	0	0	??	0	$\frac{1}{2}$	0	6
x_1	0	1	??	0	$-\frac{1}{3}$	$\frac{1}{3}$	2

Question: (Starting tableau and final tableau)

A. Then ?!? is 1
B. Then ?!? is 2
C. Then ?!? is 3
D. Then ?!? is 4

Clicker #C.1

Consider LP with objective

$$\text{minimize} \;\; 3x_1 - 5x_2 + x_3 + x_4$$

subject to a system of constraints.
The point $(1, 5, 9, 6)$ is feasible for the primal LP.

Question: Which of the following statements could possibly be true?

A. The dual LP is infeasible

B. The dual LP is unbounded

C. The optimal objective value of the dual LP is -6

D. The optimal objective value of the dual LP is at least -5

Clicker #C.2

Consider LP with objective

$$\text{minimize} \quad 2x_1 + x_2 - x_3 + x_4$$

subject to a system of constraints.
The point $(1, 3, 5, 2)$ is feasible for both the primal and the dual LP.

Question: Which objective is possible for the dual LP?

A. maximize $y_1 + y_2 + y_3 + y_4$

B. maximize $2y_1 + y_2 - y_3 - y_4$

C. minimize $2y_1 + y_2 - y_3 + y_4$

D. maximize $2y_1 + 2y_2 - y_3 + y_4$

Clicker #C.3

$$\begin{array}{rrrcr} 2x_1 & +3x_2 & +x_3 & \leq & 3 \\ 4x_1 & +x_2 & +2x_3 & \leq & 1 \\ 3x_1 & +4x_2 & +2x_3 & \leq & 8 \end{array}$$

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	0	3	0	1	0	2	?
s_2	0	0	-5	0	?	1	0	?
x_3	0	0	-1	1	?	0	2	?
x_1	0	1	2	0	?	0	1	?

Question: (Tableau is optimal for LP with given constraints.)

A. Then $2x_1 + 3x_2 + x_3 < 3$ is possible

B. Then $4x_1 + x_2 + 2x_3 < 1$ is possible

C. Then $3x_1 + 4x_2 + 2x_3 < 8$ is possible

D. None of the above

Clicker #C.4

$$\begin{array}{rrrcr} 2x_1 & +3x_2 & +x_3 & \leq & 7 \\ x_1 & +x_2 & +2x_3 & \leq & 13 \\ 3x_1 & +4x_2 & +2x_3 & \leq & ? \end{array}$$

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	0	3	0	1	0	2	?
s_2	0	0	-5	0	-2	1	0	?
x_3	?	?	?	?	?	?	?	?
x_1	?	?	8	?	?	?	?	2

Question: In this optimal tableau,

A. variable x_3 has value 1

B. variable x_3 has value 2

C. variable x_3 has value 3

D. variable x_3 has value 4

Clicker #C.5

$$\begin{array}{rrrcl} x_1 & +3x_2 & +2x_3 & \leq & 13 \\ x_1 & +x_2 & +x_3 & \leq & 11 \\ x_1 & +2x_2 & +3x_3 & \leq & 18 \end{array}$$

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	0	2	0	3	0	2	?
s_2	0	0	-5	0	?	1	0	?
x_3	0	0	?	1	?	0	2	?
x_1	0	1	2	0	?	0	1	?

Question: (Tableau is optimal for LP with given constraints.)

A. Then $x_1 + x_3 = 8$

B. Then $x_1 + x_3 = 9$

C. Then $x_1 + x_3 = 10$

D. None of the above

Clicker #C.6

$$\begin{array}{rrrcr} 2x_1 & +3x_2 & +x_3 & \leq & 6 \\ 4x_1 & +2x_2 & +2x_3 & \leq & 12 \\ x_1 & +4x_2 & +3x_3 & \leq & 7 \end{array}$$

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	0	3	0	1	0	?	17
s_2	0	0	8	0	-2	1	0	?
x_3	0	0	?	1	-3	0	2	2
x_1	0	1	?	0	$+2$	0	1	2

Question: (Final tableau for LP.)

A. Then $y_3 = 1$ is possible

B. Then $y_3 = 2$ is possible

C. Then $y_3 = 3$ is possible

D. None of the above

Clicker #D.1

Consider the transportation problem

8	9	21	6	9
22	1	13	9	3
3	4	5	1	6
5	4	5	d_4	

Question: If total supply equals total demand,

A. then $d_4 = 2$

B. then $d_4 = 3$

C. then $d_4 = 4$

D. none of the above

Clicker #D.2

Here is a basic feasible solution for a transportation problem:

9	?	?	?	9
?	3	2	?	5
?	?	?	4	4
9	3	2	4	

X = number of questionmarks that are in the basis.
Y = number of questionmarks that are non-zero.

Question:

A. Then $X = 1$ and $Y = 5$

B. Then $X = 2$ and $Y = 0$

C. Then $X = 3$ and $Y = 8$

D. Then $X = 3$ and $Y = 6$

Clicker #D.3

Here is a basic feasible solution for a transportation problem:

7	1	?	?	8
?	2	3	?	5
?	?	?	3	4
7	3	3	4	

X = number of questionmarks that are in the basis.
Y = number of questionmarks that are non-zero.

Question:

A. Then $X = 1$ and $Y = 1$

B. Then $X = 1$ and $Y = 2$

C. Then $X = 2$ and $Y = 1$

D. None of the above.

Clicker #D.4

While we are solving an instance of the transportation problem, we encounter a chain reaction that involves exactly R entries.

Question: Which of the following options is a possible value for R?

A. $R = 2$

B. $R = 7$

C. $R = 12$

D. $R = 17$

Clicker #D.5

Consider the transportation problem

1	4	5	7
9	9	1	1
9	1	2	2
3	3	4	

North-West corner rule generates starting solution of cost NW.
Minimum Cost rule generates starting solution of cost MC.

Question:

A. NW$-$MC $= -1$

B. NW$-$MC $= 0$

C. NW$-$MC $= 1$

D. NW$-$MC $= 2$

Clicker #D.6

We use the North-West corner rule to compute a starting solution for an $m \times m$ assignment problem.

Let X denote the number of 0-entries in this solution.
Let Y denote the number of 1-entries in this solution.
Let Z denote the number of entries ≥ 2 in this solution.

Question:

A. Then $X = m$ and $Y = m$ and $Z > 0$.

B. Then $X = m - 1$ and $Y = m$ and $Z = 0$.

C. Then $X = m$ and $Y = m - 1$ and $Z = 0$.

D. Then $X = m - 1$ and $Y = m - 1$ and $Z \neq 0$.