Clicker #A.1

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	-9	-5	-1	0	0	0	80
s_1	0	3	4	0	1	0	0	90
s_2	0	-9	4	0	0	1	0	180
s_3	0	0	-3	-1	0	0	1	15

Question: This LP

A. is infeasible

B. is unbounded

C. has infinitely many optimal solutions

D. has a unique optimal solution

Clicker #A.2

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	3	0	7	0	0	0	0
s_1	0	3	4	0	1	0	0	90
s_2	0	-9	4	0	0	1	0	180
s_3	0	0	-3	-1	0	0	1	15

Question: This LP

A. is infeasible

B. is unbounded

C. has infinitely many optimal solutions

D. has a unique optimal solution

Clicker #A.3

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	-3	8	0	0	0	0	54
s_1	0	3	4	0	1	0	0	90
s_2	0	-9	4	0	0	1	0	80
s_3	0	5	-3	0	0	0	1	255

Question: This LP

A. is infeasible

B. is unbounded

C. has infinitely many optimal solutions

D. has a unique optimal solution

Clicker #A.4

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	3	0	17	0	9	0	54
s_1	0	3	0	1	1	-2	0	90
x_2	0	-9	1	1	0	-1	0	80
s_3	0	5	0	0	0	0	1	255

Question: This LP

A. is infeasible

B. is unbounded

C. has infinitely many optimal solutions

D. has a unique optimal solution

Clicker #A.5

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	3	0	17	1	9	0	54
s_1	0	3	0	0	1	-2	0	90
x_2	0	-9	1	0	0	-1	0	80
s_3	0	5	0	0	0	0	1	255

Question: This LP

A. is infeasible

B. is unbounded

C. has infinitely many optimal solutions

D. has a unique optimal solution

Clicker #A.6

	Z	x_1	x_2	x_3	s_1	s_2	s_3	b
Z	1	0	0	0	0	0	1	1
s_1	0	0	0	0	1	0	0	0
x_2	0	0	1	0	0	0	0	0
s_3	0	0	0	0	0	0	1	1

Question: This LP

A. is infeasible

B. is unbounded

C. has infinitely many optimal solutions

D. has a unique optimal solution

Clicker #B.1

	Z	x_1	x_2	x_3	s_1	s_2	a_1	a_2	b
Z	1	1	0	3	0	0	$2+M$	M	$16-M$
s_2	0	5	0	3	0	1	3	-1	4
s_1	0	-1	0	-1	1	0	-1	0	2
x_2	0	2	1	1	0	0	1	0	8

Question: This LP (specified by tableau for Big-M method)

A. is infeasible

B. is unbounded

C. has an optimal solution

D. none of the above

Clicker #B.2

	Z	x_1	x_2	x_3	s_1	s_2	a_1	a_2	b
Z	1	M	0	3	0	0	$2+M$	M	26
s_2	0	5	0	3	0	1	$3+M$	-1	4
s_1	0	-1	0	-1	1	0	$-1+M$	0	2
x_2	0	2	1	1	0	0	$1+M$	0	8

Question: This LP (specified by tableau for Big-M method)

A. is infeasible

B. is unbounded

C. has an optimal solution

D. none of the above

Clicker #B.3

	Z	x_1	x_2	x_3	s_1	s_2	a_1	a_2	b
Z	1	1	0	3	0	0	$2+M$	M	-65
s_2	0	5	0	3	0	1	3	-1	4
s_1	0	-1	0	-1	1	0	-1	0	2
x_2	0	2	1	1	0	0	1	0	8

Question: This LP (specified by tableau for Big-M method)

A. is infeasible

B. is unbounded

C. has an optimal solution

D. none of the above

Clicker #B.4

	W	x_1	x_2	x_3	s_1	s_2	a_1	a_2	b
W	1	0	0	0	0	0	1	1	14
x_1	0	1	0	3	0	1	3	1	4
s_1	0	0	0	-2	1	1	2	1	2
x_2	0	0	1	-1	0	-5	2	2	4

Question: This LP (tableau = end of 1st phase in 2-phase method)

A. is infeasible

B. is unbounded

C. has an optimal solution

D. none of the above

Clicker #B.5

	W	x_1	x_2	x_3	s_1	s_2	a_1	a_2	b
W	1	0	0	0	0	0	5	3	-4
x_1	0	1	0	3	0	1	3	1	4
s_1	0	0	0	-2	1	1	2	1	7
x_2	0	0	1	-1	0	-5	2	2	4

Question: This LP (tableau = end of 1st phase in 2-phase method)

A. is infeasible

B. is unbounded

C. has an optimal solution

D. none of the above

Clicker #C.1

In the primal LP, the goal is to minimize.
The optimal objective value is $\mathrm{Opt}(p)$.

In the dual LP, the goal is to maximize.
There is a feasible solution with value $\mathrm{Feas}(d)$

Question: How many of the following three cases can actually occur?

- $\mathrm{Opt}(p) = 1 \quad \text{and} \quad \mathrm{Feas}(d) = 3$
- $\mathrm{Opt}(p) = 2 \quad \text{and} \quad \mathrm{Feas}(d) = 2$
- $\mathrm{Opt}(p) = 3 \quad \text{and} \quad \mathrm{Feas}(d) = 1$

A. 0 B. 1 C. 2 D. 3

Clicker #C.2

$$\begin{array}{lrrcl}
\max\ Z = & 3x_1 & +5x_2 & & \\
\text{s.t.} & x_1 & -3x_2 & \geq & 4 \\
 & -x_1 & +2x_2 & = & 12 \\
 & 3x_1 & +2x_2 & \leq & 18 \\
 & & x_2 & \geq & 0
\end{array}$$

Question: The dual of this LP contains

A. $3y_1 + 5y_2 \leq 4$ and $y_1 \geq 0$

B. $y_1 - y_2 + 3y_3 \leq 3$ and $y_2 \geq 0$

C. $y_1 - y_2 + 3y_3 = 3$ and y_1 free

D. $-3y_1 + 2y_2 + 2y_3 \geq 5$ and $y_3 \geq 0$

Clicker #C.3

$$
\begin{array}{llrrrr}
\min & Z = & 3x_1 & +5x_2 & & \\
\text{s.t.} & & x_1 & -x_2 & \geq & 4 \\
& & -x_1 & +x_2 & = & 4 \\
& & x_1 & +2x_2 & \leq & 4 \\
& & x_1, & x_2 & \geq & 0
\end{array}
$$

Question: The dual of this LP contains

A. $y_1 - y_2 + y_3 = 3$ and $y_2 \geq 0$

B. $y_1 - y_2 + y_3 \leq 3$ and $y_1 \leq 0$

C. $y_1 - y_2 + y_3 \leq 3$ and $y_3 \leq 0$

D. $y_1 - y_2 + y_3 \geq 3$ and y_2 free

Clicker #C.4

Consider a primal LP with

- 5 free variables $x_1, \dots, x_5$
- 3 variables $x_6, x_7, x_8 \geq 0$
- 3 constraints of type $\leq b_i$
- 4 constraints of type $\geq b_i$
- 5 constraints of type $= b_i$
- goal $=$ min

Question: The dual of this LP contains

A. 3 free variables and 4 constraints of type $\leq c_i$

B. 5 free variables and 4 constraints of type $\geq c_i$

C. 5 free variables and 5 constraints of type $= c_i$

D. 3 free variables and 3 constraints of type $= c_i$

Clicker #D.1

TRUE or FALSE?

There exists an LP that is equal to its dual.

A. True

B. False