For the BOSS program shown,

Problem 1) For the BOSS program shown,
   a) Determine the final value for "clocks" at the end of the following simulation.
   b) During the simulation, how many minutes is the clockgate closed? \(= 0\)
   c) How many entities were born during the simulation? \(-1+2+1 = 4\)
   d) At what time did the value of clocks last change? \(-20\)

PROGRAM
DEFINITION
  clocks = 5;
  LABELS = \{potato, banana\};
  clockgate: GATE = \{STATUS = CLOSE\};
CONTROL
  STOPTIME = 21; "Time in Minutes"
LOGIC
  ARRIVE (TIME = 0, LIMIT = 1);
  banana: clocks = clocks + 2;
  WAIT (TIME = 5);
  GOTO banana;
  ARRIVE (TIME = 8);
  TESTGATE [NAME = clockgate];
  clocks = clocks + 5;
  DEPART;
  ARRIVE (TIME = 0, LIMIT = 1);
  potato: SETGATE [NAME = clockgate, STATUS = OPEN];
  WAIT (TIME = 5);
  SETGATE [NAME = clockgate, STATUS = CLOSE];
  GOTO potato;
END.

MOR/DS 1.00

PROGRAM
DEFINITION
  clocks = 5;
  LABELS = \{potato, banana\};
  clockgate: GATE = \{STATUS = CLOSE\};
CONTROL
  STOPTIME = 21; "Time in Minutes"
LOGIC
[ 1]  ARRIVE (TIME = 0, LIMIT = 1);
[ 2]  banana: clocks = clocks + 2;
[ 3]  WAIT (TIME = 5);
[ 4]  GOTO banana;
[ 5]  ARRIVE (TIME = 8);
[ 6]  TESTGATE [NAME = clockgate];
[ 7]  clocks = clocks + 5;
[ 8]  DEPART;
[ 9]  ARRIVE (TIME = 0, LIMIT = 1);
[10]  potato: SETGATE [NAME = clockgate, STATUS = OPEN];
[11]  WAIT (TIME = 5);
For the BOSS program shown,

```
[ 12] SETGATE (NAME = clockgate, STATUS = CLOSE);
[ 13] GOTO potato;
[ 14] END.
[ 15] END.
[ 16] END.
[ 17] END.

Block Information

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```

--------------- Gates ---------------
CLOCKGATE

Default Queue Statistics
No entries.

--------------- Global Variables ---------------
CLOCKS = 25.00

Problem 2) Write a COMPLETE, READY TO RUN, BOSS program to give me some idea how often a pair of dice will come up 7, if they are crooked. These crooked dice are each weighted such that the first die has the following chances: rolling a 1,2,4,5,6 = 10% each, and rolling a 3 = 50%. The second die has the following chances of coming up: rolling a 1,2,3,5,6 = 10% each, and rolling a 4 = 50%. Write the program such that the dice are rolled 600 times, and record the number of 7's that result.

```
PROGRAM
 DEFINITION
  result1 = 0;
  result2 = 0;
  result7 = 0;
  LABELS = {poto, banana};
  dice1:DISTRIBUTION(DISCRETE) =
  ((0.1,1), (0.2,2), (0.7,3), (0.8,4), (0.9,5), (1.0,6));
  dice2:DISTRIBUTION(DISCRETE) =
  ((0.1,1), (0.2,2), (0.3,3), (0.8,4), (0.9,5), (1.0,6));
  dice1history:HISTOGRAM = {CELLS = 6, PROTECT = ON, MINVALUE = 0, MAXVALUE = 6};
  dice2history:HISTOGRAM = {CELLS = 6, PROTECT = ON, MINVALUE = 0, MAXVALUE = 6};
 CONTROL
  STOPTIME = 600; "Time in Minutes"
 LOGIC
 [ 1] ARRIVE {TIME = 1};
 [ 2] result1 = dice1(RANDOM);
 [ 3] result2 = dice2(RANDOM);
 [ 4] dice1history = result1;
 [ 5] dice2history = result2;
 [ 6] IF (result1 + result2) = 7 THEN RESULT7 = RESULT7+1;
 [ 7] DEPART;
 [ 8] END.
 [ 9] END.
```
For the BOSS program shown,

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------------------- Histograms -------------------

Histogram name: DICE1HISTO

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<th>Smallest</th>
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Number Upper Limit: Number Upper Limit: Number Upper Limit
50 1.00 51 2.00 323 3.00
61 4.00 52 5.00 63 6.00

Number too Small: Number too Large: 0

Histogram name: DICE2HISTO

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</table>

Number Upper Limit: Number Upper Limit: Number Upper Limit
55 1.00 60 2.00 63 3.00
303 4.00 70 5.00 49 6.00

Number too Small: Number too Large: 0

------------------- Global Variables -------------------

RESULT1 = 5.00
RESULT2 = 3.00
RESULT7 = 191.00

Problem 3) What is the most probable value of cows, pigs, and animals at the end of the following simulation?

PROGRAM
"Final Exam 8-13-03"

DEFINITION

cows = 0; pigs = 0; animals = 0; "It is legal to write these on one line"

LABELS = {dog};

CONTROL

STOPTIME = 4*60*60; <= 14400

LOGIC

ARRIVE {TIME=0 MAX NORMAL(30,5)}; 14400/30 x 480
IF CLOCKTIME <= 3*60*60 THEN DEPART{}; 3/4 of 480 depart

cows = cows+1;

DEPART{};

ARRIVE {TIME=EXPD(10)}; 14400/10 <= 1440

IF RANDOM >= 0.2 THEN GOTO dog; 1440 x 0.2 = 288 move on pigs=288

pigs = pigs+1;

dog: IF CLOCKTIME >= 3*60*60 THEN DEPART{}; (1152 + 288) * 1/4 depart

(1152 + 288) + 3/490 on = 1080

Page 3
For the BOSS program shown,

\[
\text{animals} = \text{animals} + 1; \quad \text{Animals} = 1080
\]

END.

MOR/DS 1.00

PROGRAM

"Final Exam 8-13-03"

DEFINITION

cows = 0; pigs = 0; animals = 0;
LABELS = {dog};

CONTROL

STOPTIME = 4*60*60;

LOGIC

[ 1] ARRIVE \{TIME=0 MAX NORMAL(30,5)\};
[ 2] IF CLOCKTIME <= 3*60*60 THEN DEPART();
[ 3] cows = cows+1;
[ 4] DEPART();
[ 5] ARRIVE \{TIME=EXPD(10)\};
[ 6] IF RANDOM >= 0.2 THEN GOTO dog;
[ 7] pigs = pigs+1;
[ 8] dog; IF CLOCKTIME >= 3*60*60 THEN DEPART();
[ 9] animals = animals + 1;
[10] DEPART();
[11]

END.

[12]

[13]

[14]

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</table>

Global Variables

\[
COWS = 122.00 \\
PIGS = 273.00 \\
ANIMALS = 1080.00
\]

Problem 4) Determine the approximate value for "count" and "boresize", when the program below is run. Tell me EVERYTHING you know about those variables and their value or values.

PROGRAM

DEFINITION

LABELS = {station1, station2, imfinished};

count = 0; \textbf{NOTE! VARIABLE!}
For the BOSS program shown,

ATTRIBUTES = {boresize = 10};

CONTROL
STOPTIME=300;
RANDOMIZE = ON;

LOGIC
ARRIVE (TIME=expd(3));
IF RANDOM <= 0.2 THEN GOTO station2;
station1: boresize = boresize + 1;  — boresize = 11 for all 80
        count = count+1;  — 80
        GOTO imfinished;
station2: boresize = boresize + 2;  — boresize = 12 for all 20
        count = count + 2;  — 40
        imfinished: DEPART;

END.

MOR/DS 1.00

DEFINITION
LABELS = {station1, station2, imfinished};
count = 0;
ATTRIBUTES = {boresize = 10};

CONTROL
STOPTIME=300;
RANDOMIZE = ON;

LOGIC
[ 1] ARRIVE (TIME=expd(3));
[ 2] IF RANDOM <= 0.2 THEN GOTO station2;
[ 3] station1: boresize = boresize + 1;
[ 4]     count = count+1;
[ 5]     GOTO imfinished;
[ 6] station2: boresize = boresize + 2;
[ 7]     count = count + 2;
[ 8]     imfinished: DEPART;
[ 9] END.
[10]
[11]
[12]

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----------------------------- Global Variables -----------------------------

COUNT = 136.00.