Do not turn this page until you have received the signal to start.
(In the meantime, please fill out the identification section above, and read the instructions below.)

This test consists of 6 questions on 6 pages (including this one).
When you receive the signal to start, please make sure that your copy of the test is complete.
Please answer questions in the space provided.
You will earn 20% for any question you leave blank or write “I cannot answer this question,” on.

Good Luck!
QUESTION 1.  [9 marks]

PART (A)  [3 marks]

Convert 46 to its binary representation, BRIEFLY showing the steps of your procedure.

PART (B)  [3 marks]

Convert the binary representation 1011001 to its decimal representation, BRIEFLY showing the steps of your procedure.

PART (C)  [3 marks]

Add the numbers whose binary representations are 1001 and 11101 (without converting them to decimal notation). Show your work (i.e. when you “carry” a 1).
QUESTION 2. [5 MARKS]

Assume the following function has been defined:

(define (one whatever)
  1)

Give the result of each of the following expressions:

(one "hello")

(map one (list 1 0 4))

(apply + (map one (list 1 0 4)))

Give a VERY brief description of WHAT the following function does (NOT HOW the function does it):

(define (s a-list)
  (apply + (map one a-list)))

QUESTION 3. [4 MARKS]

Assume the following three definitions have been run:

(define-struct pair (left right))

(define p (make-pair "hi" "hello"))

(define (f p)
  (make-pair
    (+ (pair-right p) 20)
    (+ (pair-left p) 1)))

Give the result of each of the following expressions:

(pair-left p)

(pair-right p)

(pair-left (f (make-pair 4000 300)))
QUESTION 4. [9 marks]

Assume the following function has been defined:

(define (w a-list)
  (cond [(= (length a-list) 1) (first a-list)]
        [else (string-append
                  (w (rest a-list))
                  (first a-list)
                  (w (rest a-list)))]))

PART (A) [5 marks]

Give the result of each of the following expressions:

(w (list "C"))

(w (list "B" "C"))

PART (B) [4 marks]

Give the result of the following expression, briefly showing your steps:

(w (list "A" "B" "C"))
QUESTION 5. [8 marks]
Assume that (require picturing-programs) is in the Definitions pane of DrRacket.

PART (A) [4 marks]
Here are three check-expects for a function birdy:

(check-expect (birdy 0) 0)
(check-expect (birdy 1) 0)
(check-expect (birdy 2) 0)

Complete the following two incomplete check-expects WITHOUT drawing any images manually by hand. Instead, use (birdy 0) in your check-expect for (birdy 1), and use (birdy 1) in your check-expect for (birdy 2).
(check-expect (birdy 1) 0)
(check-expect (birdy 2) 0)

PART (B) [4 marks]
Assume that the following definition is also in the Definitions pane:
(define a-bird)

Write the function birdy, including the contract.
; birdy : ->
QUESTION 6. [4 marks]

Assume the following has been run:

(require picturing-programs)

(define im (beside (triangle 10 "solid" "black")
                  (triangle 10 "outline" "black")))

Recall that the contract for color-list->bitmap is

    list number number -> image

with the two numbers used as the width and height (in that order).

Give the result of each of the following expressions:

im

(color-list->bitmap
 (reverse (image->color-list im))
 (image-width im) (image-height im))

# 1: _____/ 9
# 2: _____/ 5
# 3: _____/ 4
# 4: _____/ 9
# 5: _____/ 8
# 6: _____/ 4

TOTAL: _____/39