

```
(require 2http/image)
(require spd/tags)

;; =====
;; Problem 1
;;
;; The area of a triangle is the (base * height)/2. Design a function
;; that consumes a triangle's base and height and produces its area.
;; Your solution must have all HtDF recipe elements include @tags.

(@Problem 1)
```

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```
;; =====  
;; Problem 2  
;;  
;; The following program runs and all tests pass. But the program has a design  
;; flaw. Correct that design flaw by NEATLY crossing out what is incorrect and  
;; writing what is correct nearby. HINT: The answer calls for very little  
;; crossing out and writing – if you want to cross out and write a lot then you  
;; have not found the right answer.
```

```
(@Problem 2)  
(@HtDD Pos)  
(define-struct pos (x y))  
;; Pos is (make-pos Natural Natural)  
;; interp. An x,y position on a image, in pixels.  
(define P1 (make-pos 3 4))
```

```
(@add-template-rules compound)
```

```
(define (fn-for-pos p)  
  (... (pos-x p)  
        (pos-y p)))
```

```
(@HtDF swap)  
;; Pos -> Pos
```

```
;; Produce new pos with x and y swapped.
```

```
(check-expect (swap (make-pos 1 1)) (make-pos 1 1))  
(check-expect (swap (make-pos 2 2)) (make-pos 2 2))
```

```
;(define (swap p) p) ;stub
```

```
(@template Pos)
```

```
(define (swap p)  
  (make-pos (pos-y p) (pos-x p)))
```

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```
;; =====
;; Problem 3
;; In each part of this problem you will be given a short description of
;; problem domain information. You need to determine what form of data
;; definition is most appropriate to representing that information.
;;
;; In each part of the problem you must:
;;   - first select how many data definitions are required to represent the
;;     problem domain information
;;   - select the form of those data definitions
;;
;; NOTE that if you select 1 data definition then you must only select one
;;     form of definition. If you select more than one form when you mark 1
;;     you will lose all marks for that part of the problem
```

(@Problem 3)

```
;; 3A:
;;
;; A province in Canada. Note that there are 13 provinces and territories
;; in Canada: Alberta, British Columbia, Manitoba, New Brunswick,
;; Newfoundland and Labrador, Northwest Territories, Nova Scotia, Nunavut,
;; Ontario, Prince Edward Island, Quebec, Saskatchewan, and Yukon
;;
;; How many data definitions? (circle one) 1    2

;; form of 1st data definition      form of possible 2nd data definition
;; (circle one)                     (circle one only if you selected 2 above)
;;
;; simple atomic                    simple atomic
;; interval                        interval
;; enumeration                      enumeration
;; itemization                     itemization
;; compound                        compound
;; self-reference                  self-reference
;; reference                       reference
```

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```
;; 3B:
;;
;; A simple transcript, with courses numbers taken and the grade in each course
;;
;;
;; How many data definitions? (circle one) 1    2

;; form of 1st data definition      form of possible 2nd data definition
;; (circle one)                    (circle one only if you selected 2 above)
;;
;; simple atomic                   simple atomic
;; interval                       interval
;; enumeration                     enumeration
;; itemization                    itemization
;; compound                       compound
;; self-reference                 self-reference
;; reference                      reference
```

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```
;; =====  
;; Problem 4  
  
;; Write the complete (@dd-template-rules ...) tag and the template for the  
;; following type comment. Be sure to follow ALL applicable rules, and simplify  
;; the template to the extent that the rules allow. Be sure to keep the cond  
;; Q/A pairs in the same order as the one-of subclasses.  
(@Problem 4)  
  
(@HtDD Farfle)  
;; Farfle is one-of:  
;;   - "low"  
;;   - Number[0, 100]  
;;   - "high"
```

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```
;; =====
;; Problems 5 and 6 both use the following domain information.

;; Different courses in the computer science department have different
;; enrolment numbers. For the 2016 winter term, those numbers were:
;;
;; Course   Enrolment
;; 100       211
;; 103       210
;; 110       1635
;; 121       1042
;; 210       971
;; 213       671
;; 221       912

;; One way to represent an individual course is as follows:
```

```
(@HtDD Course)
(define-struct course (lvl num siz))
;; Course is (make-course Natural Natural Natural)
;; interp. a course with size
;;   lvl (level) is 100, 200 etc.
;;   num (num)   is 03, 10, 21 etc.
;;   siz (size)  is number of students enrolled
(define CPSC-100-2016 (make-course 100 00 211))
(define CPSC-103-2016 (make-course 100 03 210))
(define CPSC-110-2016 (make-course 100 10 1635))
(define CPSC-121-2016 (make-course 100 21 1042))
(define CPSC-210-2016 (make-course 200 10 971))
(define CPSC-213-2016 (make-course 200 13 671))
(define CPSC-221-2016 (make-course 200 21 912))
```

```
(@add-template-rules compound) ;3 fields
```

```
(define (fn-for-course c)
  (... (course-lvl c)
       (course-num c)
       (course-siz c)))
```

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```
;; =====  
;; Problem 5  
;;  
;; We would like to be able to work with an arbitrary number of such courses.  
;; Design a complete data definition for ListOfCourse. You must include type  
;; comment, interpretation, examples, @dd-template-rules tag, and a template.
```

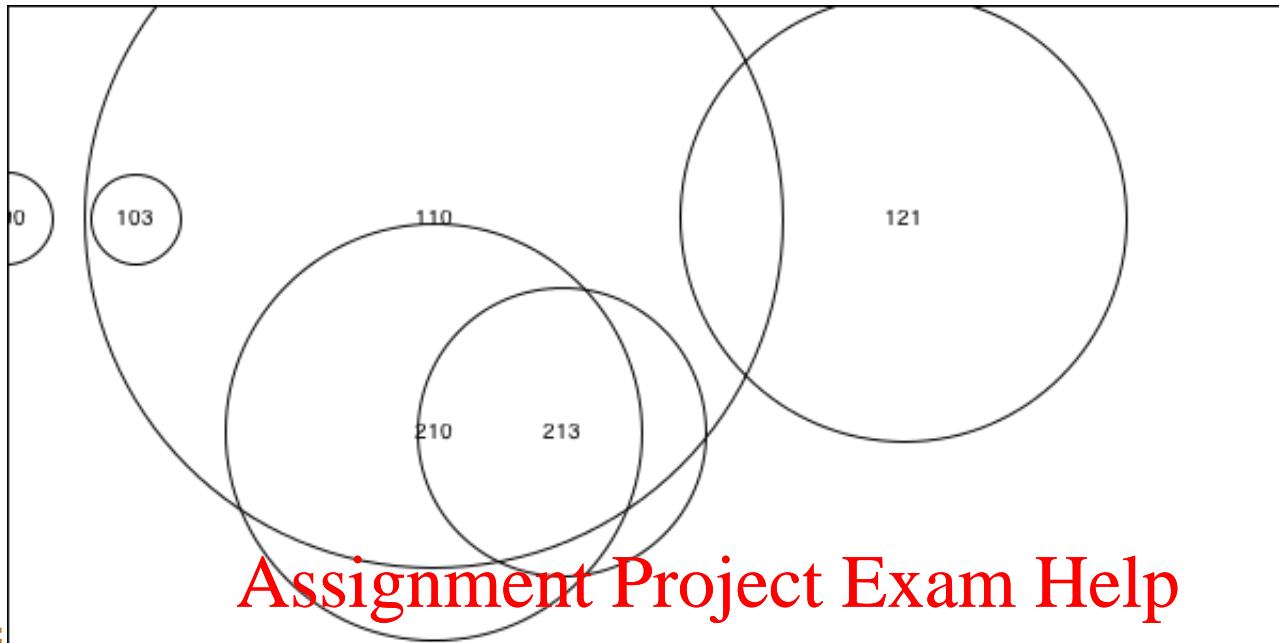
(@Problem 5)

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```
;; =====
;; Problem 6
;;
;; One VERY simple way to visualize such information is as follows:
```



```
;; In the bubble chart above each circle corresponds to a single course. At
;; the center of each circle is the course number. The y position of the circle
;; comes from the course level – all 100 courses have the same y position for
;; example. The x position comes from the course number. The size of the
;; circle is proportional to the size of the course.
;;
;; Design a function that consumes ListOfCourse and produces a SIMPLE bubble
;; chart like the one above. Follow all design rules including helper rules
;; and provide all HtDF recipe elements include @ tags.
;;
;; More points will be awarded to solutions that follow the recipes and produce
;; a rough visualization than to solutions that produce a great visualization
;; but do not follow the recipes. Many more points.
;;
;; HINT: relax and follow the recipes. If you do you will see that this problem
;; is easier than it looks. Don't worry about the exact name of the 2htdp/image
;; functions you will need to call, just make reasonable guesses about those.
```

(@Problem 6)

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