

- 1) (6 pts) Write a Fortran90 program that does the following:
- Asks the user to input three lengths  $a$ ,  $b$ , and  $c$
  - Tests to determine if these lengths are capable of forming a triangle.
  - If a triangle cannot be formed, an error message should be printed out. If (and only if) a triangle can be formed, your program should compute the area of the triangle using *Heron's formula*

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

where  $s$  is the semi-perimeter of the triangle

$$s = \frac{a+b+c}{2}.$$

Test your program with the 3 sets of data:  $a = 4.1, b = 6.4, c = 10.1$ ;  $a = 7.8, b = 12.0, c = 3.4$  and  $a = 1.1, b = 2.2, c = 3.3$ . Extra credit (1 pts) if you can do this problem with only 1 IF statement with no compound testing.

- 2) (5 pts) (Problem 3-9 in the book). The income tax in Australia is computed according to the following table: In addition, a 1.5% tax is charged on all income regardless of the taxable amount. Write

Taxable Income	Tax Owed
\$0 - \$6,000	\$0
\$6,001 - \$20,000	\$0.17 for each \$1 over \$6,000
\$20,001 - \$50,000	\$2,380 plus \$0.30 for each \$1 over \$20,000
\$50,001 - \$60,000	\$11,380 plus \$0.42 for each \$1 over \$50,000
over \$60,000	\$15,580 plus \$0.47 for each \$1 over \$60,000

a program that will compute the income tax owed given the amount of taxable income. Test your program for income amounts of \$5,015, \$14,678, \$55,784 and \$75,000.

- 3) (6 pts) When a light ray passes from one medium to another, the light ray gets bent. Snell's Law of Refraction is the relationship that determines how much a light ray will bend. It states

$$\frac{\sin(\theta_1)}{\sin(\theta_2)} = \frac{n_2}{n_1}$$

where  $\theta_1$  is the angle of incidence through a medium with a refractive index of  $n_1$  and  $\theta_2$  is the angle of refraction through a medium with a refractive index of  $n_2$ .

Write an F90 program that will ask the user to input values of  $\theta_1$  (in degrees),  $n_1$  and  $n_2$  and computes the value of  $\theta_2$  (provided the calculation is feasible). The value of  $\theta_2$  should be printed out in degrees. In the event that the calculation is not feasible, an error message should be printed out.

Test your program using the 2 cases

- $\theta_1 = 45^\circ, n_1 = 0.73, n_2 = 1.44$
- $\theta_1 = 45^\circ, n_1 = 0.58, n_2 = 0.13$