Structure

Pass structure to **function as a Parameter**.

1. Define point mid (point a, point b). It finds mid point of A and B.
2. Define vector as follows: typedef struct {float i,j,k;}vector; Using it define following functions float dotproduct (vector a, vector b) and vector crossproduct(vector a , vector b).
3. Define float magnitude(vector v) e.g. magnitude 4**i**+3**j**+12**k** is 13. [Call function dot product].
4. Define vector mul(vector v, float t). It returns a vector by multiplying it by t. If a=4**i**+3**j**+12**k** then mul(a,0.5) will return 2**i**+1.5**j**+6**k**.
5. Define vector unitvector(vector v). It returns unit vector in the direction of **V**. [Call magnitude and mul functions]. Unit vector for 4**i**+3**j**+12**k** is 0.31**i**+0.23**j**+0.92**k**.
6. Using the structures of vector and point define vector direction(point a, point b). It returns vector corresponding to the line segment AB. If points are (2,3,1) and (6,2,8) then direction is 4**i**-**j**+7**k**.
7. Define float area(point a, point b, point c). It finds area of triangle ABC. [Find direction corresponding to AB and AC. Now call cross product and magnitude]. Area of the triangle with end points (3,4,5), (7,3,6) and (6,2,3) is 6.36.
8. Define struct {float x,y} point; and struct {float a,b,c;}line;
   Define function line equation(point p, point q) Using it write program which reads two points and finds the equation of line joining them. Let P=(2,3) and Q=(4,7) then line is 2x-y-1=0.

9. Write program, which reads two lines and finds the point of intersection. To accomplish it define a function point intersection(line g, line h). e.g. Input 2x+3y-26=0 and 4x+7y-54=0 output (10,2).
10. Write program, which reads four points and finds the point of intersection of the line joining first two points and the last two points. Let input points be (4,6), (-2,10), (10,2) and (3,6) then the point of intersection is (10,2). [Hint: use above functions]
11. Define function float distance(point p, line l). Using it write program, which reads a point and a line. The program, finds the distance of the point 'p' from the line 'l'. e.g. input point (2,3) and line 8x+6y-12=0 distance = $(8*2+6*3-12)/(8^2+6^2)^{1/2}$ = 2.2.
12. Write program, which reads three points and finds the distance of first point from the line joining other two points. [Hint: use functions to find equation and distance]
13. Define struct {point c;float r;} circle; Now define following functions
14. void print(circle x). It prints the equation of the circle. Let x be a circle whose centre is (2,3) and radius is 7. Call to a function circle(x) will output $x^2+y^2-4x-6y-36=0$. It is because $(x-2)^2+(y-3)^2=7^2$ is the equation of the circle. [It may be printed as $x^2+y^2+-4x+-6y+-36=0$]
15. circle form(float g,float h,float k). x=form(-4,-6,-36) will make a circle whose centre is (2,3) and radius is 7.
16. float chordlength(circle a,line b). It returns the length of the chord corresponding to circle 'a' and line 'b'. If a circle has centre (1,2) and radius 5 and the line is 5x+12y+10z=0 then chord length is 8. [Method: find distance (d) between centre and line by using appropriate function call now use $(r^2-d^2)^{1/2}$.] Assume that the line intersects with the circle.
17. float intersection(circle a, float b). It returns the y-coordinate of point of intersection of circle (s) and line (x=b). Let a circle (s) has centre (7,2) and radius 5. y=intersection(s,10) will make y as 6 (or -2). It is because circle $(x-7)^2+(y-2)^2=5^2$ intersects with the line x=10 at points (10,6) and (10,-2).

18. Define Complex mul(complex a, complex b) for multiplication of two complex numbers. Similarly define function for addition of complex numbers.
19. Read complex number x and integer n. Find x^n. [Call multiplication function]
20. Read a number n and n complex numbers. Output that complex number, which has maximum magnitude. [Hint: Define function for magnitude of complex number]
21. Write program to find $1 + x + x^2 + x^3 + \ldots + x^n$. Here inputs are x(complex) and n(int). Use functions for multiplication and addition of complex number.
22. Define Complex mult(complex a, float b) for multiplication of a complex number with a float. Using it write program to find $1 + 2x + 3x^2 + 4x^3 + \ldots + nx^{n-1}$.