```c
// J Hundley
// assign02.c
// February 5, 2015
/*
a) You can use trigonometry to find the height of a building.
   Suppose you measure the angle between the line of sight
   and the horizontal line connecting the measuring point and the building.
   You can calculate the height of the building with the following formulas:
              tan(theta)=h/d        h=d/tan(theta)
   Assume that the distance to the building alone the ground is 120 meters
   and the angle measured alone the line of sight is 30 degrees plus/minus 3
   degrees.
   Find the maximum and minimum heights the building can be.
b) If the building is 200 meters tall and you are 20 meters away, at what
   angle from the ground will you have to tilt your head to see the top of
   the building? (Assume that your head is even with the ground.)
c) How far is it from your head to the top of the building?
*/

#include <stdio.h>
#include <math.h>

//*****CONSTANT*****
#define MAX_ANGLE  33    // degrees
#define MIN_ANGLE  27    // degrees
#define DIST_A     120   // meters
#define DIST_B     20    // meters
#define HEIGHT_B   200   // meters
#define PI         3.14159

int main()
{
//*****INPUT*****
   double radians,
          minHeight,    // meters
          maxHeight,    // meters
          tiltAngle,    // degrees
          distHead2Top; // meters

//*****COMPUTATION*****
// a) convert degrees to radians
// find the maximum and minimum heights the building can be.
   radians   = MIN_ANGLE * (PI/180);
   minHeight = DIST_A * tan(radians);

   radians   = MAX_ANGLE * (PI/180);
   maxHeight = DIST_A * tan(radians);

// b) Find the angle that you will tilt your head to see the top of the building
// convert radians to degrees
   radians   = atan2(HEIGHT_B, DIST_B);
   tiltAngle = radians * (180/PI);

// c) Find how far it is from your head to the top of the building
   distHead2Top = sqrt( HEIGHT_B*HEIGHT_B + DIST_B*DIST_B );

//*****OUTPUT*****
// a) print the minimum and maximum height the building can be
   printf( "The minimum height is %.2f meters. \n", minHeight );
   printf( "The maximum height is %.2f meters. \n", maxHeight );

// b) print the angle that you will tilt your head to see the top of the building
   printf("The angle that you will tilt your head to see the top of the building is %.2f degrees.\n",tiltAngle);

// c) print the distance it is from your head to the top of the building
   distHead2Top = sqrt( HEIGHT_B*HEIGHT_B + DIST_B*DIST_B );
   printf( "The distance from your head to the top of the building is %.2f meters.\n", distHead2Top );
   return 0;
}
```

Read all instructions before beginning your work.

COMP1200-C - Assign 02
Due 11:59 pm – Thursday – February 5, 2015
Submit `assign02.c` via Canvas

NOTE:
Your submitted file(s) MUST be spelled and cased as instructed.
[-5 points for not doing so.]

***Before you start writing your program**:*

Read these instructions including the development plan. A development plan is a process that guides you through solving a problem and creating an algorithm. The algorithm has been added as comments to a guide you when writing the C program file solution for the following problem. Copy the identifying comments and code found at the end of these instructions paste into an empty editor window to start your work.

***Program*: assign02.c**
***Problem*:**

a) Trigonometry can be used to find the height of a building. Suppose you measure the angle between the line of sight and the horizontal line connecting the measuring point and the building. You can calculate the height of the building with the following formulas:

tan(theta)=h/d h=d*tan(theta)

Assume that the distance to the building along the ground is 120 meters and the angle measured along the line of sight is 30 degrees plus/minus 3 degrees. Find the maximum and minimum heights of the building.

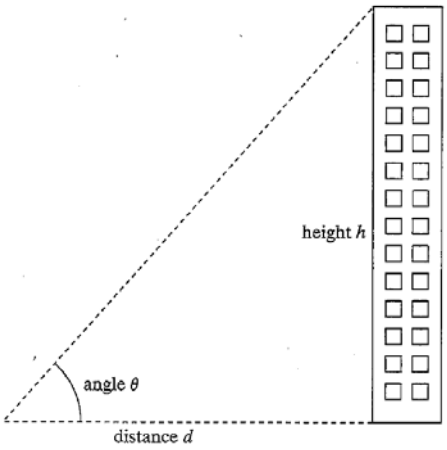
b) If the building is 200 meters tall and you are 20 meters away, at what angle from the ground will you have to tilt your head to see the top of the building? (Assume that your head is even with the ground.)

c) Given the information in (b), how far is the distance (or hypotenuse) from your head to the top of the building?

Write one C program that computes and displays the results of each part above.
Type the identifying comments and copy algorithm found at the end of these instructions and paste into an empty editor window to start your work.

***Problem Constants*:**

```
MAX_ANGLE   33    // degrees
MIN_ANGLE   27
DIST_A      120   // meters
DIST_B      20
HEIGHT_B    200
PI          3.14159
```



***Problem Inputs*:**

Problem Outputs:

a) Minimum and maximum height in meters
b) Tilt of head angle in degrees
c) Distance from head to top of building in meters

Other variables:

angle in radians See `tan()` and `atan2()`.

Equations:

radians = theta * (pi/180)
height =
angle =
distance =

New commands:
`math.h`
`#define`
`tan(), atan2, sqrt()`
`printf()`

Instructions:

- ☐ See Standards for Documentation of C Programs on the Resources page on Canvas.
- ☐ Insert comments at the top and throughout each file.
  - o Include the follow comments at the beginning of this (and ALL) files.
    - `//` submitter's name, **GROUP #** **Grade of ZERO for files with submitter name not part of Canvas group**
    - `//` other group members' names **For your own protection, type "none" if submitting alone.**
    - `//` assignment number **Zero points for comments if no collaboration statement**
    - `//` date you completed the assignment
    - `//` **statement(s) about collaboration**
    - `//` a short narrative about what the file does

-5 points for absence of any of these required comments at the top at the top of each file.

- Use the algorithm given as comments throughout your program.

☐ Use descriptive variable names.
☐ Use Sample Input/Output as a guide.
☐ Use **Generate CSD** to ensure correct indenting.

☐ Represent ALL given values as constants.
☐ Format the output with 2 decimal places.
☐ Label output using the `printf()` function in sentence form.

If you do not submit individually,
there will be a 5 POINTS PENALTY for not joining a group.
Groups can be 2-4 students.
DO NOT join a group unless you have worked with the other members. If you do, you will be removed from the group and given the grade of zero.

Sample Output:

```
The minimum height is 61.14 meters.
The maximum height is 77.93 meters.
The angle that you will tilt your head to see the top of the building is 84.28 degrees.
The distance from your head to the top of the building is 201.00 meters.
```

Submit via Canvas:

`assign02.c` C program file

Your .m script file should begin by typing the following statements into your empty editor window.

- Write your/your group information on the `//` lines.
- Copy and paste the other lines as a guide when writing the C instructions to do the tasks to solve the given problems.

```
// submitter's name, GROUP #
// other group members' names
// assignment number
// date you completed the assignment
// statement(s) about collaboration
// a short narrative about what the file does

#include <stdio.h>
#include <math.h>

//*****CONSTANT*****
#define MAX_ANGLE  33    // degrees
#define MIN_ANGLE  27    // degrees
#define DIST_A     120   // meters
#define DIST_B     20    // meters
#define HEIGHT_B   200   // meters
#define PI         3.14159

int main()
{
   double                // variables with units

//*****COMPUTATION*****
// a) convert degrees to radians
//    find the maximum and minimum heights the building can be.
// b) Find the angle that you will tilt your head to see the top of the building
//    convert radians to degrees
// c) Find how far it is from your head to the top of the building

//*****OUTPUT*****
// a) print the minimum and maximum height the building can be
// b) print the angle that you will tilt your head to see the top of the building
// c) print the distance it is from your head to the top of the building

   return 0;
}
```