**6.19** The elevation of point *C* on the chimney shown in Figure 6.3 is desired. Field angles and distances are observed. Station *A* has an elevation of 345.36 ± 0.03 ft and Station *B* has an elevation of 353.86 ± 0.03. The instrument height, *hiA*, at Station *A* is 5.53 ± 0.02 ft and the instrument height, *hiB*, at Station *B* is 5.52 ± 0.02 ft. Zenith angles are read in the field. The other observations and their estimated errors are

*AB* = 203.56 ± 0.02 ft

*A* = 43∘15′21′′ ± 6*.*8′′

*B* = 42∘02′36′′ ± 5*.*7′′

*z*1 = 79∘22′10′′ ± 12*.*3′′ *z*2 = 83∘00′48′′ ± 9*.*8′′

1. What is the elevation of the stack and the standard deviation in this elevation?

SeC =  
 **0.1544**

Matlab Work/code.

% Elevations  
eA=345.36; eB=353.86;  
% errors in elevations  
SeA=0.03;SeB=0.03;  
% instrument height and their errors  
hiA=5.53; ShiA=0.02;  
hiB=5.52; ShiB=0.02;  
% distance AB and error  
AB=203.56; SAB=0.02;  
  
% A = 43°15’21” ± 6.8” B = 42°02’36” ± 5.7”  
% Angle A and its error  
A=43+15/60+21/3600;  
A=A\*pi/180  
SA=6.8/3600;  
SA=SA\*pi/180  
  
% Angle B and its error  
B=42+02/60+36/3600;  
B=B\*pi/180;  
SB=5.7/3600;  
SB=SB\*pi/180  
  
% v1 = 79°22’10” ± 12.3” v2 = 83°00’48” ± 9.8”  
% Vertical angle v1 and its error  
v1=79+22/60+10/3600;  
v1=v1\*pi/180;  
Sv1=12.3/3600  
Sv1=Sv1\*pi/180;  
% Vertical angle v2 and its error  
v2=83+00/60+48/3600;  
v2=v2\*pi/180  
Sv2=9.8/3600;  
Sv2=Sv2\*pi/180  
%Elevation of C  
eC=0.5\*(eA+hiA+(AB\*sin(B)\*tan(v1)/sin((A+B)))+...  
    eB+hiB+(AB\*sin(A)\*tan(v2)/sin((A+B))));  
deA= 0.5;  
deB= 0.5;  
dhiA= 0.5;  
dhiB= 0.5;  
dAB= 0.5\*((sin(B)\*tan(v1)+sin(A)\*tan(v2))/sin(A+B))  
  
dA=0.5\*AB\*((-cos(A+B)\*(sin(B)\*tan(v1)+...  
    sin(A)\*tan(v2)))/(sin(A+B))^2+(cos(A)\*tan(v2)/sin(A+B)))  
  
dB=0.5\*AB\*((-cos(A+B)\*(sin(B)\*tan(v1)+...  
    sin(A)\*tan(v2))/(sin(A+B))^2+(cos(B)\*tan(v1)/sin(A+B))))  
  
dv1=0.5\*AB\*sin(B)/(sin(A+B)\*(cos(v1))^2)  
  
dv2=0.5\*AB\*sin(A)/(sin(A+B)\*(cos(v2))^2)  
  
% Error in elevation of C  
veC=(deA\*SeA)^2+(deB\*SeB)^2+(dhiA\*ShiA)^2+(dhiB\*ShiB)^2+...  
    (dA\*SA)^2+(dB\*SB)^2+(dv1\*Sv1)^2+(Sv2\*Sv2)^2+(dAB\*SAB)^2  
SeC=sqrt(veC)

------------------------------------------------------------------------------------------------------------------  
>> homework\_06  
  
A =  
  
    0.7550  
  
  
SA =  
  
   3.2967e-05  
  
  
SB =  
  
   2.7634e-05  
  
  
Sv1 =  
  
    0.0034  
  
  
v2 =  
  
    1.4489  
  
  
Sv2 =  
  
   4.7512e-05  
  
  
dAB =  
  
    4.5953  
  
  
dA =  
  
  529.9980  
  
  
dB =  
  
  327.1411  
  
  
dv1 =  
  
   2.0097e+03  
  
  
dv2 =  
  
   4.7298e+03  
  
  
veC =  
  
    0.0238  
  
  
SeC =  
  
    0.1544