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HW 9 -- Jason Dove - Liam Hood

```
%6/7/19
```

Clear Up

```
close all ; clear all ; clc ;
```

Givens and Knowns

```
muearth = 398600 ; %km^3/s^2
mu = muearth ; %Satellite is Earth orbiting
%Given orbital values
h = 53335.2 ; %km^2/s
ecc = 0 ; %deg
RAAN = 0 ; %deg
inc = 98.43 ; %deg
ArgOfPerigee = 0 ; %deg
TrueAnom = 0 ; %deg
Period = 100*60 ; %seconds
% Generate the R and V vectors
StateOrb = OrbitElem2State(h,mu,ecc,TrueAnom,RAAN,inc,ArgOfPerigee) ;
r = StateOrb( 1:3 ) ;
v = StateOrb( 4:6 ) ;
% This is the State Vector in ECI

%Omega Vector Initial
wsc0 = [ 0.5 ; -2 ; 3 ]*1e-3 ; %rad/s - This is in body frame
ww0 = [ 0 ; 0 ; 0 ] ;
```

Defining the Spacecraft Geometry and MOI

```
%Calculating Moments of Inertia
sx = 1.5 ; % side length in m
```

```
sy = 1.5 ;
sz = 3 ;
m = 500 ; % mass of bus in kg

% Rxn Wheel info
It = 0.6 ;
Is = 1.2 ;
mw = 1 ;

% moments of inertia of s/c
Ix = (1/12)*m*( sz^2 + sy^2 ) ;
Iy = (1/12)*m*( sz^2 + sx^2 ) ;
Iz = (1/12)*m*( sx^2 + sy^2 ) ;
J = [ Ix 0 0 ; 0 Iy 0 ; 0 0 Iz ] ;
Isc = J + ( 2*It + Is )*eye(3) ;
Iw = Is*eye(3) ;

%Find Initial Attitude relative to ECI
% body to LVLH
eps = [ 0 0 0 ] ;
eta = 1 ;
quat0b = [ eta , eps ] ;
Cblvlh = quat2rotm( quat0b ) ;

% LVLH to ECI
Clvlhg = ECItoLVLH( r , v ) ;
% Quat defining ECI to Body
quat0 = dcm2quat( Cblvlh*Clvlhg )' ;

%Initial Euler
[Yaw0 , Pitch0, Roll0]  = quat2angle( quat0' ) ; %Finds initial Euler
 Angles
Angles = [Roll0 , Pitch0, Yaw0]' ; %Places them into vector

% Control Law Constants
zeta = .7 ; % Damping coefficient
wn = .5 ;  % Wanted Natural Freq

% Found Gains
kp = 2.*Isc.*wn^2 ;
kd = Isc.*2*zeta*wn ;
```

General ODE Solver - Must Contain All Pertur-bations

Establish State

```
State = [ quat0 ; wsc0 ; ww0 ; r ; v ; Angles ; quat0 ] ;
options = odeset( 'RelTol' , 1e-8 , 'AbsTol' , 1e-8 ) ;
tend = 60*100 ;
[ Time , StateNew ] = ode45( @RxnWheels , [0,tend] , State , options ,
 Isc , Iw , muearth , kp , kd ) ;
```

```matlab
% State 1 -> 4 are the quaternions, scalar first
% State 5 -> 7 is the angular velocity of s/c
% State 8 -> 10 is the angular velocity of wheels
% State 11 -> 13 is the position in ECI in km
% State 14 -> 16 is the veloctiy in ECI in km/s
% State 17 -> 19 is the Euler Angles in ECI in
```

Plots

Plots

```matlab
Time = Time/(60^2) ;
for ii = 1:length( Time )
    hsc(:,ii) = Isc*StateNew(ii,5:7)' ;
end
% Relative to LVLH
% Quaternion
    figure
    subplot( 2 , 1 , 1 )
    hold on
    plot(Time,StateNew(:,20))
    plot(Time,StateNew(:,21))
    plot(Time,StateNew(:,22))
    plot(Time,StateNew(:,23))
    title( 'Quaternions of LVLH Relative to ECI' )
    legend( 'Eta' , 'Eps(1)' , 'Eps(2)' , 'Eps(3)' , 'Location'
 , 'eastoutside')
    ylabel( 'Quaternion Value Magnitude' )
    xlabel( 'Time [Hours]' )
    hold off

% Relative to ECI
    % Quaternion
    subplot( 2 , 1 , 2 )
    hold on
    plot(Time,StateNew(:,1))
    plot(Time,StateNew(:,2))
    plot(Time,StateNew(:,3))
    plot(Time,StateNew(:,4))
    title( 'Quaternions of Spacecraft Relative to ECI' )
    legend( 'Eta' , 'Eps(1)' , 'Eps(2)' , 'Eps(3)' , 'Location'
 , 'eastoutside' )
    ylabel( 'Quaternion Value Magnitude' )
    xlabel( 'Time [Hours]' )
    hold off

    % Euler angles
    figure
    subplot(2,1,1)
    hold on
    plot(Time,StateNew(:,17)*(180/pi))
    plot(Time,StateNew(:,18)*(180/pi))
```

```matlab
    plot(Time,StateNew(:,19)*(180/pi))
    title( 'Euler Angle of Spacecraft Relative to ECI' )
    legend( 'Roll' , 'Pitch' , 'Yaw' ,'Location' , 'eastoutside')
    ylabel( 'Euler Angles [Degrees]' )
    xlabel( 'Time [Hours]' )
    hold off


    % Angular Velocity of S/C
    StateNew(ii,5:7)
    subplot(2,1,2)
    hold on
    plot(Time,StateNew(:,5)*(180/pi))
    plot(Time,StateNew(:,6)*(180/pi))
    plot(Time,StateNew(:,7)*(180/pi))
    title( 'Angular Velocity of Spacecraft' )
    legend( 'x-axis' , 'y-axis' , 'z-axis' ,'Location'
, 'eastoutside')
    ylabel( 'Angular Momentum [deg/s]' )
    xlabel( 'Time [Hours]' )
    hold off

    % Angular Momentum of S/C
    for pp = 1:length(Time)
        normalhsc(pp) = norm(hsc(:,pp)) ;
    end
    figure
    hold on
    plot(Time,hsc(1,:))
    plot(Time,hsc(2,:))
    plot(Time,hsc(3,:))
    plot(Time,normalhsc,'LineWidth',3)
    title( 'Angular Momentum of Spacecraft' )
    legend( 'x-axis' , 'y-axis' , 'z-axis' , 'Magnitude' )
    ylabel( 'Angular Momentum [kg*m^2/s]' )
    xlabel( 'Time [Hours]' )
    hold off

    % Angular Velocity of Reaction Wheels
    figure
    hold on
    plot(Time,StateNew(:,8)*(1/(2*pi)))
    plot(Time,StateNew(:,9)*(1/(2*pi)))
    plot(Time,StateNew(:,10)*(1/(2*pi)))
    title( 'Spin Rate of Each Axis'' Reaction Wheel' )
    legend( 'x-axis' , 'y-axis' , 'z-axis' )
    ylabel( 'Spin Rate [revolutions/s]' )
    xlabel( 'Time [Hours]' )
    hold off


ans =

    -0.0000   -0.0010   -0.0000
```
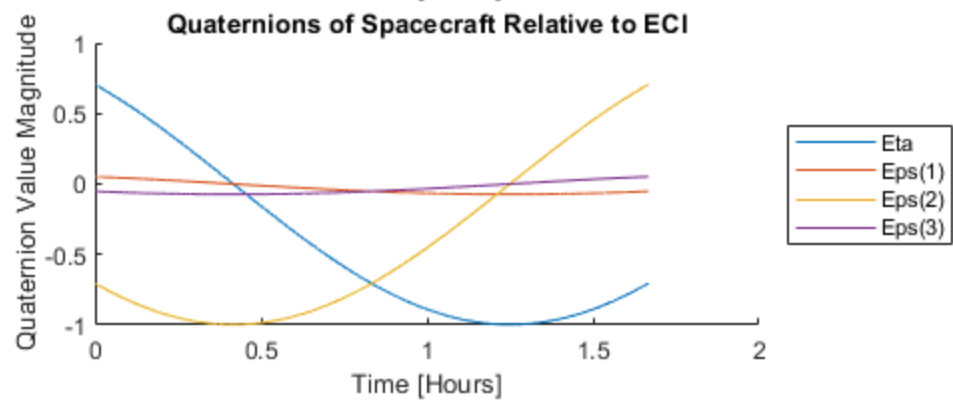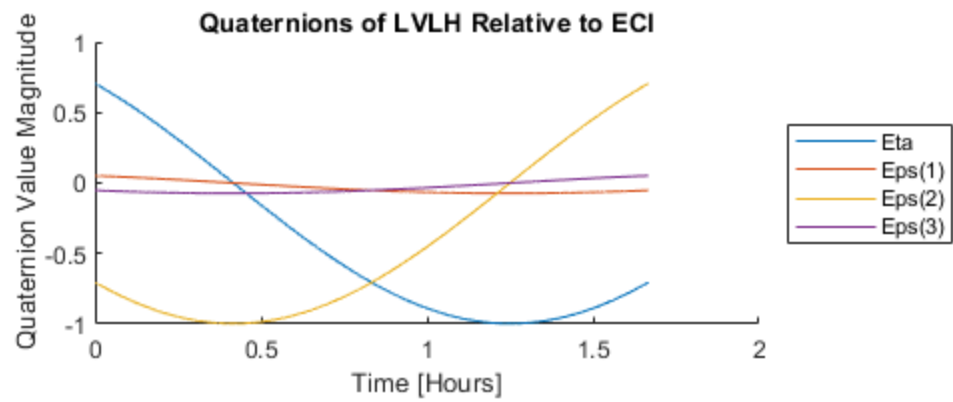
Quaternions of LVLH Relative to ECI

Quaternions of Spacecraft Relative to ECI

Euler Angle of Spacecraft Relative to ECI

Angular Velocity of Spacecraft

Angular Momentum of Spacecraft

Spin Rate of Each Axis' Reaction Wheel
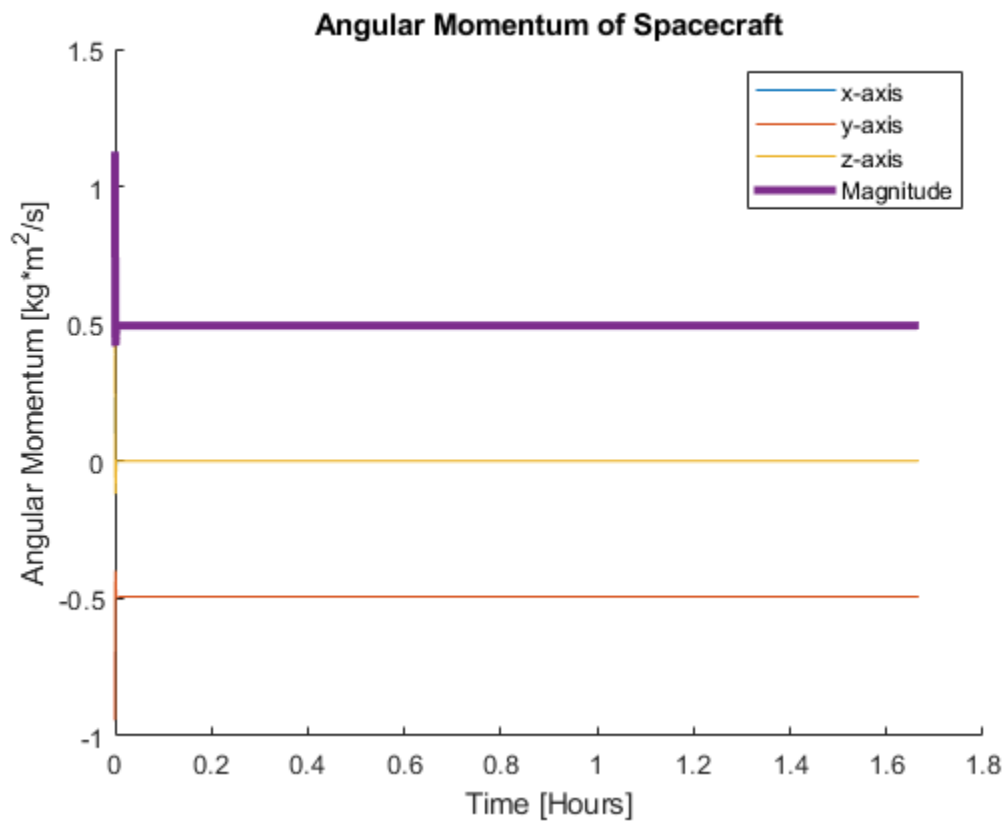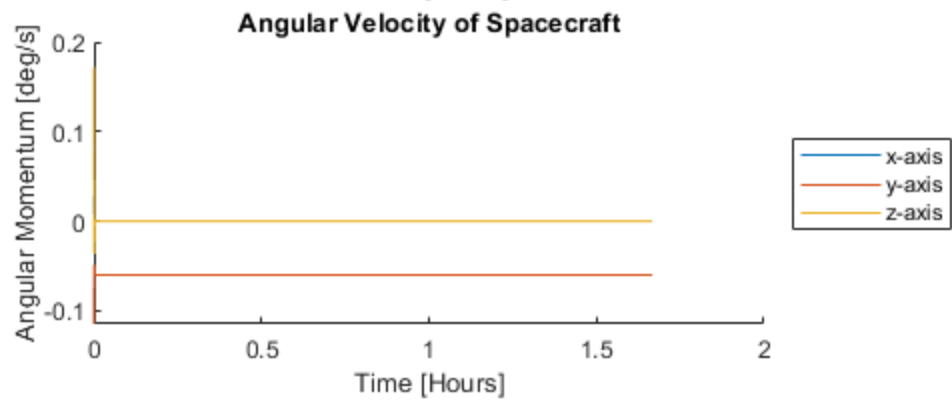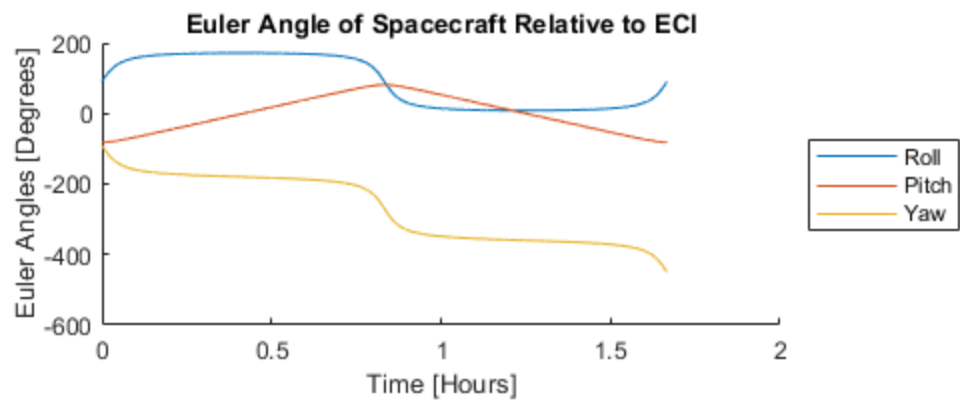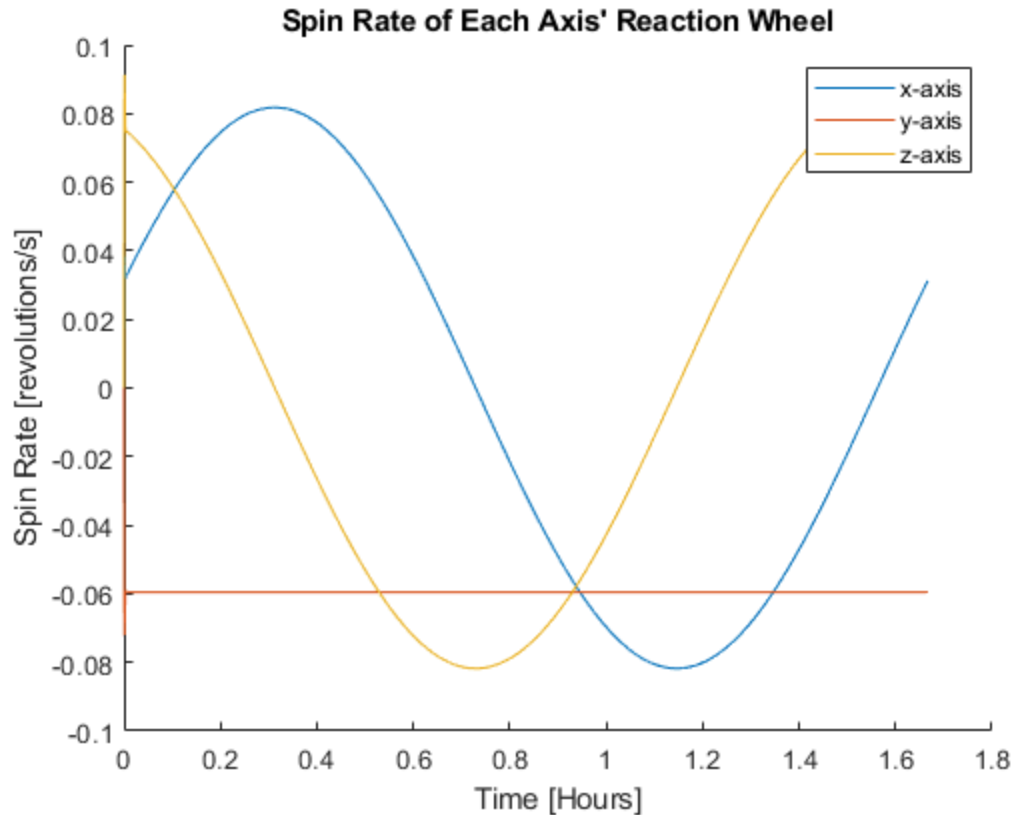
Helpful Functions

```matlab
%Rotation Fcn in degrees
function Mat = xRot(Angle)
Mat = [1,0,0;0,cosd(Angle),sind(Angle);0,-
sind(Angle),cosd(Angle)] ; %defines the x rotation matrix
end
function Mat = yRot(Angle)
Mat = [cosd(Angle),0,-
sind(Angle);0,1,0;sind(Angle),0,cosd(Angle)] ; %defines the y rotation
 matrix
end
function Mat = zRot(Angle)
Mat = [cosd(Angle),sind(Angle),0;-
sind(Angle),cosd(Angle),0;0,0,1] ; %defines the z rotation matrix
end
function State = OrbitElem2State(h,mu,ecc,TA,RAAN,inc,ArgOfPerigee)
%Input all orbital elements to get position and velocity states
%State(1:3) = position (km)
%State(4:6) = velocity (km/s)
State(1:3,1) = h^2/
(mu*(1+ecc*cosd(TA)))*[cosd(TA);sind(TA);0] ; %position in perifocal
State(4:6,1) = mu/h*[-sind(TA);(ecc+cosd(TA));0] ; %Velocity in
 Perifocal
%state is now in perifocal, must rotate accordingly
```

```
State(1:3,1) = zRot(-RAAN)*xRot(-inc)*zRot(-
ArgOfPerigee)*State(1:3) ; %transforms the position into perifocal
State(4:6,1) = zRot(-RAAN)*xRot(-inc)*zRot(-
ArgOfPerigee)*State(4:6) ; %transforms the velocity into perifocal
end
```

Command Rotation Finder

```
function ControlQuat = ComRotFind(qnow,qwant)
% Input the quaternion you want to get too and the initial quat, to
 get the
% control quat between them.
% ReOrder the quaternions
qconj = quatconj(qwant) ; %Finds the quaternion conjugate
ControlQuat = quatmultiply(qconj,qnow) ; % Finds the quaternion to
 rotate from qnow to qwant
end
```

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t =

   1.3594e+03


t =

   1.3601e+03


t =

   1.3601e+03


t =

   1.3615e+03


t =

   1.3623e+03
```

```
t =

   1.3659e+03


t =

   1.3666e+03


t =

   1.3674e+03


t =

   1.3674e+03


t =

   1.3689e+03


t =

   1.3696e+03


t =

   1.3733e+03


t =

   1.3740e+03


t =

   1.3748e+03


t =
```

```
     1.3748e+03


t =

     1.3761e+03


t =

     1.3767e+03


t =

     1.3798e+03


t =

     1.3804e+03


t =

     1.3811e+03


t =

     1.3811e+03


t =

     1.3823e+03


t =

     1.3829e+03


t =

     1.3859e+03
```

```
t =

   1.3864e+03


t =

   1.3871e+03


t =

   1.3871e+03


t =

   1.3883e+03


t =

   1.3888e+03


t =

   1.3918e+03


t =

   1.3923e+03


t =

   1.3929e+03


t =

   1.3929e+03
```

```
t =

   1.3943e+03


t =

   1.3950e+03


t =

   1.3986e+03


t =

   1.3992e+03


t =

   1.4000e+03


t =

   1.4000e+03


t =

   1.4015e+03


t =

   1.4023e+03


t =

   1.4060e+03


t =
```

1.4067e+03

t =

1.4075e+03

t =

1.4075e+03

t =

1.4088e+03

t =

1.4095e+03

t =

1.4128e+03

t =

1.4134e+03

t =

1.4141e+03

t =

1.4141e+03

t =

1.4154e+03

```
t =

   1.4160e+03


t =

   1.4191e+03


t =

   1.4197e+03


t =

   1.4204e+03


t =

   1.4204e+03


t =

   1.4215e+03


t =

   1.4221e+03


t =

   1.4249e+03


t =

   1.4254e+03
```

```
t =

   1.4260e+03


t =

   1.4260e+03


t =

   1.4274e+03


t =

   1.4281e+03


t =

   1.4314e+03


t =

   1.4320e+03


t =

   1.4328e+03


t =

   1.4328e+03


t =

   1.4342e+03


t =
```

```
    1.4349e+03


t =

    1.4386e+03


t =

    1.4392e+03


t =

    1.4400e+03


t =

    1.4400e+03


t =

    1.4414e+03


t =

    1.4421e+03


t =

    1.4455e+03


t =

    1.4461e+03


t =

    1.4469e+03
```

```
t =

   1.4469e+03


t =

   1.4482e+03


t =

   1.4489e+03


t =

   1.4523e+03


t =

   1.4529e+03


t =

   1.4536e+03


t =

   1.4536e+03


t =

   1.4547e+03


t =

   1.4553e+03
```

```
t =

    1.4582e+03


t =

    1.4587e+03


t =

    1.4593e+03


t =

    1.4593e+03


t =

    1.4606e+03


t =

    1.4612e+03


t =

    1.4644e+03


t =

    1.4650e+03


t =

    1.4657e+03


t =
```

```
   1.4657e+03


t =

   1.4671e+03


t =

   1.4678e+03


t =

   1.4712e+03


t =

   1.4718e+03


t =

   1.4726e+03


t =

   1.4726e+03


t =

   1.4739e+03


t =

   1.4746e+03


t =

   1.4781e+03
```

```
t =

   1.4787e+03


t =

   1.4795e+03


t =

   1.4795e+03


t =

   1.4809e+03


t =

   1.4816e+03


t =

   1.4852e+03


t =

   1.4859e+03


t =

   1.4867e+03


t =

   1.4867e+03
```

```
t =

   1.4879e+03


t =

   1.4885e+03


t =

   1.4915e+03


t =

   1.4920e+03


t =

   1.4927e+03


t =

   1.4927e+03


t =

   1.4939e+03


t =

   1.4945e+03


t =

   1.4976e+03


t =
```

```
    1.4981e+03


t =

    1.4988e+03


t =

    1.4988e+03


t =

    1.5001e+03


t =

    1.5008e+03


t =

    1.5040e+03


t =

    1.5046e+03


t =

    1.5053e+03


t =

    1.5053e+03


t =

    1.5067e+03
```

```
t =

   1.5074e+03


t =

   1.5107e+03


t =

   1.5113e+03


t =

   1.5121e+03


t =

   1.5121e+03


t =

   1.5136e+03


t =

   1.5143e+03


t =

   1.5180e+03


t =

   1.5187e+03
```

```
t =

    1.5195e+03


t =

    1.5195e+03


t =

    1.5208e+03


t =

    1.5214e+03


t =

    1.5246e+03


t =

    1.5252e+03


t =

    1.5259e+03


t =

    1.5259e+03


t =

    1.5271e+03


t =
```

```
        1.5277e+03


t =

        1.5309e+03


t =

        1.5314e+03


t =

        1.5321e+03


t =

        1.5321e+03


t =

        1.5334e+03


t =

        1.5340e+03


t =

        1.5371e+03


t =

        1.5377e+03


t =

        1.5384e+03
```

```
t =

    1.5384e+03


t =

    1.5397e+03


t =

    1.5403e+03


t =

    1.5435e+03


t =

    1.5441e+03


t =

    1.5448e+03


t =

    1.5448e+03


t =

    1.5462e+03


t =

    1.5470e+03
```

```
t =

   1.5507e+03


t =

   1.5513e+03


t =

   1.5522e+03


t =

   1.5522e+03


t =

   1.5535e+03


t =

   1.5542e+03


t =

   1.5575e+03


t =

   1.5581e+03


t =

   1.5588e+03


t =
```

```
    1.5588e+03


t =

    1.5601e+03


t =

    1.5608e+03


t =

    1.5641e+03


t =

    1.5647e+03


t =

    1.5654e+03


t =

    1.5654e+03


t =

    1.5667e+03


t =

    1.5673e+03


t =

    1.5705e+03
```

```
t =

   1.5710e+03


t =

   1.5717e+03


t =

   1.5717e+03


t =

   1.5729e+03


t =

   1.5735e+03


t =

   1.5765e+03


t =

   1.5770e+03


t =

   1.5777e+03


t =

   1.5777e+03
```

```
t =

   1.5791e+03


t =

   1.5798e+03


t =

   1.5833e+03


t =

   1.5839e+03


t =

   1.5846e+03


t =

   1.5846e+03


t =

   1.5860e+03


t =

   1.5867e+03


t =

   1.5901e+03


t =
```

```
        1.5907e+03


t =

    1.5914e+03


t =

    1.5914e+03


t =

    1.5929e+03


t =

    1.5936e+03


t =

    1.5971e+03


t =

    1.5978e+03


t =

    1.5986e+03


t =

    1.5986e+03


t =

    1.5999e+03
```

```
t =

   1.6006e+03


t =

   1.6039e+03


t =

   1.6045e+03


t =

   1.6052e+03


t =

   1.6052e+03


t =

   1.6063e+03


t =

   1.6069e+03


t =

   1.6097e+03


t =

   1.6102e+03
```

```
t =

   1.6109e+03


t =

   1.6109e+03


t =

   1.6121e+03


t =

   1.6128e+03


t =

   1.6160e+03


t =

   1.6165e+03


t =

   1.6172e+03


t =

   1.6172e+03


t =

   1.6185e+03


t =
```

1.6192e+03

t =

1.6225e+03

t =

1.6230e+03

t =

1.6238e+03

t =

1.6238e+03

t =

1.6253e+03

t =

1.6260e+03

t =

1.6298e+03

t =

1.6305e+03

t =

1.6314e+03

```
t =

   1.6314e+03


t =

   1.6328e+03


t =

   1.6335e+03


t =

   1.6372e+03


t =

   1.6378e+03


t =

   1.6386e+03


t =

   1.6386e+03


t =

   1.6325e+03


t =

   1.6331e+03
```

```
t =

   1.6359e+03


t =

   1.6364e+03


t =

   1.6371e+03


t =

   1.6371e+03


t =

   1.6382e+03


t =

   1.6388e+03


t =

   1.6416e+03


t =

   1.6421e+03


t =

   1.6428e+03


t =
```

```
        1.6428e+03


t =

        1.6443e+03


t =

        1.6451e+03


t =

        1.6489e+03


t =

        1.6496e+03


t =

        1.6505e+03


t =

        1.6505e+03


t =

        1.6520e+03


t =

        1.6527e+03


t =

        1.6565e+03
```

```
t =

   1.6572e+03


t =

   1.6580e+03


t =

   1.6580e+03


t =

   1.6594e+03


t =

   1.6601e+03


t =

   1.6636e+03


t =

   1.6642e+03


t =

   1.6650e+03


t =

   1.6650e+03
```

```
t =

   1.6661e+03


t =

   1.6667e+03


t =

   1.6696e+03


t =

   1.6701e+03


t =

   1.6707e+03


t =

   1.6707e+03


t =

   1.6718e+03


t =

   1.6723e+03


t =

   1.6749e+03


t =
```

1.6754e+03

t =

1.6760e+03

t =

1.6760e+03

t =

1.6774e+03

t =

1.6781e+03

t =

1.6815e+03

t =

1.6821e+03

t =

1.6829e+03

t =

1.6829e+03

t =

1.6843e+03

```
t =

   1.6850e+03


t =

   1.6886e+03


t =

   1.6892e+03


t =

   1.6900e+03


t =

   1.6900e+03


t =

   1.6915e+03


t =

   1.6922e+03


t =

   1.6960e+03


t =

   1.6966e+03
```

```
t =

   1.6975e+03


t =

   1.6975e+03


t =

   1.6987e+03


t =

   1.6994e+03


t =

   1.7025e+03


t =

   1.7031e+03


t =

   1.7038e+03


t =

   1.7038e+03


t =

   1.7049e+03


t =
```

```
    1.7055e+03


t =

    1.7082e+03


t =

    1.7087e+03


t =

    1.7093e+03


t =

    1.7093e+03


t =

    1.7106e+03


t =

    1.7113e+03


t =

    1.7145e+03


t =

    1.7151e+03


t =

    1.7158e+03
```

```
t =

    1.7158e+03


t =

    1.7172e+03


t =

    1.7178e+03


t =

    1.7211e+03


t =

    1.7217e+03


t =

    1.7224e+03


t =

    1.7224e+03


t =

    1.7239e+03


t =

    1.7247e+03
```

```
t =

    1.7284e+03


t =

    1.7291e+03


t =

    1.7299e+03


t =

    1.7299e+03


t =

    1.7313e+03


t =

    1.7319e+03


t =

    1.7353e+03


t =

    1.7359e+03


t =

    1.7367e+03


t =
```

```
    1.7367e+03


t =

    1.7379e+03


t =

    1.7385e+03


t =

    1.7415e+03


t =

    1.7420e+03


t =

    1.7426e+03


t =

    1.7426e+03


t =

    1.7439e+03


t =

    1.7446e+03


t =

    1.7478e+03
```

```
t =

   1.7484e+03


t =

   1.7491e+03


t =

   1.7491e+03


t =

   1.7503e+03


t =

   1.7509e+03


t =

   1.7540e+03


t =

   1.7546e+03


t =

   1.7553e+03


t =

   1.7553e+03
```

t =

   1.7567e+03

t =

   1.7574e+03

t =

   1.7610e+03

t =

   1.7617e+03

t =

   1.7625e+03

t =

   1.7625e+03

t =

   1.7638e+03

t =

   1.7645e+03

t =

   1.7680e+03

t =

```
    1.7686e+03


t =

    1.7694e+03


t =

    1.7694e+03


t =

    1.7707e+03


t =

    1.7713e+03


t =

    1.7745e+03


t =

    1.7751e+03


t =

    1.7758e+03


t =

    1.7758e+03


t =

    1.7771e+03
```

```
t =

    1.7777e+03


t =

    1.7811e+03


t =

    1.7816e+03


t =

    1.7824e+03


t =

    1.7824e+03


t =

    1.7836e+03


t =

    1.7842e+03


t =

    1.7872e+03


t =

    1.7877e+03
```

```
t =

   1.7884e+03


t =

   1.7884e+03


t =

   1.7897e+03


t =

   1.7904e+03


t =

   1.7938e+03


t =

   1.7944e+03


t =

   1.7952e+03


t =

   1.7952e+03


t =

   1.7965e+03


t =
```

```
    1.7972e+03


t =

    1.8007e+03


t =

    1.8013e+03


t =

    1.8020e+03


t =

    1.8020e+03


t =

    1.8033e+03


t =

    1.8040e+03


t =

    1.8073e+03


t =

    1.8079e+03


t =

    1.8086e+03
```

```
t =

    1.8086e+03


t =

    1.8100e+03


t =

    1.8107e+03


t =

    1.8142e+03


t =

    1.8148e+03


t =

    1.8156e+03


t =

    1.8156e+03


t =

    1.8168e+03


t =

    1.8174e+03
```

t =

   1.8204e+03

t =

   1.8210e+03

t =

   1.8216e+03

t =

   1.8216e+03

t =

   1.8229e+03

t =

   1.8236e+03

t =

   1.8268e+03

t =

   1.8274e+03

t =

   1.8281e+03

t =

```
        1.8281e+03


t =

        1.8294e+03


t =

        1.8301e+03


t =

        1.8334e+03


t =

        1.8340e+03


t =

        1.8347e+03


t =

        1.8347e+03


t =

        1.8360e+03


t =

        1.8367e+03


t =

        1.8400e+03
```

```
t =

   1.8406e+03


t =

   1.8413e+03


t =

   1.8413e+03


t =

   1.8428e+03


t =

   1.8435e+03


t =

   1.8472e+03


t =

   1.8478e+03


t =

   1.8486e+03


t =

   1.8486e+03
```

```
t =

   1.8499e+03


t =

   1.8505e+03


t =

   1.8536e+03


t =

   1.8542e+03


t =

   1.8549e+03


t =

   1.8549e+03


t =

   1.8562e+03


t =

   1.8568e+03


t =

   1.8600e+03


t =
```

1.8606e+03

t =

1.8613e+03

t =

1.8613e+03

t =

1.8625e+03

t =

1.8632e+03

t =

1.8663e+03

t =

1.8669e+03

t =

1.8676e+03

t =

1.8676e+03

t =

1.8689e+03

```
t =

   1.8695e+03


t =

   1.8728e+03


t =

   1.8733e+03


t =

   1.8740e+03


t =

   1.8740e+03


t =

   1.8755e+03


t =

   1.8763e+03


t =

   1.8800e+03


t =

   1.8806e+03
```

```
t =

   1.8814e+03


t =

   1.8814e+03


t =

   1.8827e+03


t =

   1.8834e+03


t =

   1.8867e+03


t =

   1.8872e+03


t =

   1.8880e+03


t =

   1.8880e+03


t =

   1.8893e+03


t =
```

1.8899e+03

t =

1.8932e+03

t =

1.8938e+03

t =

1.8945e+03

t =

1.8945e+03

t =

1.8958e+03

t =

1.8964e+03

t =

1.8995e+03

t =

1.9001e+03

t =

1.9008e+03

```
t =

   1.9008e+03


t =

   1.9020e+03


t =

   1.9026e+03


t =

   1.9056e+03


t =

   1.9062e+03


t =

   1.9069e+03


t =

   1.9069e+03


t =

   1.9083e+03


t =

   1.9090e+03
```

t =

   1.9126e+03

t =

   1.9132e+03

t =

   1.9140e+03

t =

   1.9140e+03

t =

   1.9154e+03

t =

   1.9160e+03

t =

   1.9194e+03

t =

   1.9200e+03

t =

   1.9208e+03

t =

```
  1.9208e+03


t =

  1.9222e+03


t =

  1.9229e+03


t =

  1.9263e+03


t =

  1.9270e+03


t =

  1.9277e+03


t =

  1.9277e+03


t =

  1.9290e+03


t =

  1.9297e+03


t =

  1.9329e+03
```

```
t =

   1.9335e+03


t =

   1.9342e+03


t =

   1.9342e+03


t =

   1.9353e+03


t =

   1.9359e+03


t =

   1.9388e+03


t =

   1.9393e+03


t =

   1.9399e+03


t =

   1.9399e+03
```

```
t =

   1.9412e+03


t =

   1.9419e+03


t =

   1.9452e+03


t =

   1.9458e+03


t =

   1.9466e+03


t =

   1.9466e+03


t =

   1.9479e+03


t =

   1.9486e+03


t =

   1.9519e+03


t =
```

```
    1.9525e+03


t =

    1.9532e+03


t =

    1.9532e+03


t =

    1.9547e+03


t =

    1.9555e+03


t =

    1.9592e+03


t =

    1.9599e+03


t =

    1.9607e+03


t =

    1.9607e+03


t =

    1.9621e+03
```

```
t =

    1.9628e+03


t =

    1.9662e+03


t =

    1.9668e+03


t =

    1.9676e+03


t =

    1.9676e+03


t =

    1.9687e+03


t =

    1.9693e+03


t =

    1.9721e+03


t =

    1.9726e+03
```

```
t =

   1.9732e+03


t =

   1.9732e+03


t =

   1.9744e+03


t =

   1.9750e+03


t =

   1.9781e+03


t =

   1.9786e+03


t =

   1.9793e+03


t =

   1.9793e+03


t =

   1.9806e+03


t =
```

1.9812e+03

t =

   1.9844e+03

t =

   1.9849e+03

t =

   1.9856e+03

t =

   1.9856e+03

t =

   1.9872e+03

t =

   1.9879e+03

t =

   1.9918e+03

t =

   1.9925e+03

t =

   1.9933e+03

```
t =

   1.9933e+03


t =

   1.9948e+03


t =

   1.9955e+03


t =

   1.9992e+03


t =

   1.9999e+03


t =

   2.0007e+03


t =

   2.0007e+03


t =

   1.9945e+03


t =

   1.9951e+03
```

```
t =

   1.9980e+03


t =

   1.9985e+03


t =

   1.9992e+03


t =

   1.9992e+03


t =

   2.0004e+03


t =

   2.0009e+03


t =

   2.0039e+03


t =

   2.0044e+03


t =

   2.0051e+03


t =
```

```
2.0051e+03


t =

   2.0066e+03


t =

   2.0074e+03


t =

   2.0113e+03


t =

   2.0120e+03


t =

   2.0128e+03


t =

   2.0128e+03


t =

   2.0143e+03


t =

   2.0150e+03


t =

   2.0187e+03
```

```
t =

   2.0193e+03


t =

   2.0202e+03


t =

   2.0202e+03


t =

   2.0215e+03


t =

   2.0222e+03


t =

   2.0256e+03


t =

   2.0262e+03


t =

   2.0270e+03


t =

   2.0270e+03
```

```
t =

   2.0281e+03


t =

   2.0287e+03


t =

   2.0316e+03


t =

   2.0321e+03


t =

   2.0327e+03


t =

   2.0327e+03


t =

   2.0338e+03


t =

   2.0343e+03


t =

   2.0371e+03


t =
```

```
2.0375e+03
```

```
t =
```

```
2.0381e+03
```

```
t =
```

```
2.0381e+03
```

```
t =
```

```
2.0396e+03
```

```
t =
```

```
2.0403e+03
```

```
t =
```

```
2.0438e+03
```

```
t =
```

```
2.0445e+03
```

```
t =
```

```
2.0452e+03
```

```
t =
```

```
2.0452e+03
```

```
t =
```

```
2.0467e+03
```

```
t =

   2.0474e+03


t =

   2.0509e+03


t =

   2.0516e+03


t =

   2.0524e+03


t =

   2.0524e+03


t =

   2.0538e+03


t =

   2.0546e+03


t =

   2.0582e+03


t =

   2.0589e+03
```

```
t =

   2.0597e+03


t =

   2.0597e+03


t =

   2.0609e+03


t =

   2.0615e+03


t =

   2.0646e+03


t =

   2.0652e+03


t =

   2.0659e+03


t =

   2.0659e+03


t =

   2.0670e+03


t =
```

```
    2.0675e+03


t =

    2.0703e+03


t =

    2.0708e+03


t =

    2.0714e+03


t =

    2.0714e+03


t =

    2.0727e+03


t =

    2.0734e+03


t =

    2.0768e+03


t =

    2.0774e+03


t =

    2.0781e+03
```

```
t =

   2.0781e+03


t =

   2.0795e+03


t =

   2.0801e+03


t =

   2.0835e+03


t =

   2.0841e+03


t =

   2.0849e+03


t =

   2.0849e+03


t =

   2.0863e+03


t =

   2.0871e+03
```

```
t =

   2.0908e+03


t =

   2.0914e+03


t =

   2.0922e+03


t =

   2.0922e+03


t =

   2.0936e+03


t =

   2.0942e+03


t =

   2.0975e+03


t =

   2.0981e+03


t =

   2.0988e+03


t =
```

```
    2.0988e+03


t =

    2.1000e+03


t =

    2.1005e+03


t =

    2.1035e+03


t =

    2.1040e+03


t =

    2.1046e+03


t =

    2.1046e+03


t =

    2.1059e+03


t =

    2.1066e+03


t =

    2.1099e+03
```

```
t =

    2.1105e+03


t =

    2.1112e+03


t =

    2.1112e+03


t =

    2.1125e+03


t =

    2.1132e+03


t =

    2.1164e+03


t =

    2.1169e+03


t =

    2.1176e+03


t =

    2.1176e+03
```

```
t =

   2.1191e+03


t =

   2.1198e+03


t =

   2.1234e+03


t =

   2.1241e+03


t =

   2.1249e+03


t =

   2.1249e+03


t =

   2.1262e+03


t =

   2.1269e+03


t =

   2.1303e+03


t =
```

2.1309e+03

t =

2.1316e+03

t =

2.1316e+03

t =

2.1328e+03

t =

2.1334e+03

t =

2.1365e+03

t =

2.1371e+03

t =

2.1377e+03

t =

2.1377e+03

t =

2.1391e+03

```
t =

   2.1398e+03


t =

   2.1431e+03


t =

   2.1437e+03


t =

   2.1444e+03


t =

   2.1444e+03


t =

   2.1457e+03


t =

   2.1463e+03


t =

   2.1494e+03


t =

   2.1500e+03
```

```
t =

   2.1506e+03


t =

   2.1506e+03


t =

   2.1520e+03


t =

   2.1527e+03


t =

   2.1562e+03


t =

   2.1568e+03


t =

   2.1576e+03


t =

   2.1576e+03


t =

   2.1590e+03


t =
```

```
    2.1596e+03


t =

    2.1630e+03


t =

    2.1636e+03


t =

    2.1644e+03


t =

    2.1644e+03


t =

    2.1656e+03


t =

    2.1663e+03


t =

    2.1694e+03


t =

    2.1700e+03


t =

    2.1707e+03
```

```
t =

   2.1707e+03


t =

   2.1721e+03


t =

   2.1728e+03


t =

   2.1762e+03


t =

   2.1768e+03


t =

   2.1776e+03


t =

   2.1776e+03


t =

   2.1788e+03


t =

   2.1794e+03
```

```
t =

   2.1825e+03


t =

   2.1831e+03


t =

   2.1837e+03


t =

   2.1837e+03


t =

   2.1851e+03


t =

   2.1858e+03


t =

   2.1892e+03


t =

   2.1898e+03


t =

   2.1905e+03


t =
```

2.1905e+03

t =

2.1918e+03

t =

2.1925e+03

t =

2.1958e+03

t =

2.1964e+03

t =

2.1972e+03

t =

2.1972e+03

t =

2.1985e+03

t =

2.1991e+03

t =

2.2023e+03

```
t =

   2.2029e+03


t =

   2.2036e+03


t =

   2.2036e+03


t =

   2.2050e+03


t =

   2.2057e+03


t =

   2.2092e+03


t =

   2.2098e+03


t =

   2.2106e+03


t =

   2.2106e+03
```

```
t =

   2.2118e+03


t =

   2.2124e+03


t =

   2.2156e+03


t =

   2.2161e+03


t =

   2.2168e+03


t =

   2.2168e+03


t =

   2.2182e+03


t =

   2.2189e+03


t =

   2.2222e+03


t =
```

```
    2.2228e+03


t =

    2.2236e+03


t =

    2.2236e+03


t =

    2.2249e+03


t =

    2.2255e+03


t =

    2.2288e+03


t =

    2.2294e+03


t =

    2.2302e+03


t =

    2.2302e+03


t =

    2.2314e+03
```

```
t =

   2.2320e+03


t =

   2.2351e+03


t =

   2.2357e+03


t =

   2.2364e+03


t =

   2.2364e+03


t =

   2.2378e+03


t =

   2.2385e+03


t =

   2.2420e+03


t =

   2.2426e+03
```

```
t =

   2.2434e+03


t =

   2.2434e+03


t =

   2.2447e+03


t =

   2.2453e+03


t =

   2.2485e+03


t =

   2.2491e+03


t =

   2.2498e+03


t =

   2.2498e+03


t =

   2.2512e+03


t =
```

```
   2.2519e+03


t =

   2.2553e+03


t =

   2.2559e+03


t =

   2.2567e+03


t =

   2.2567e+03


t =

   2.2580e+03


t =

   2.2587e+03


t =

   2.2620e+03


t =

   2.2626e+03


t =

   2.2634e+03
```

```
t =

   2.2634e+03


t =

   2.2646e+03


t =

   2.2652e+03


t =

   2.2682e+03


t =

   2.2687e+03


t =

   2.2693e+03


t =

   2.2693e+03


t =

   2.2707e+03


t =

   2.2714e+03
```

```
t =

   2.2747e+03


t =

   2.2753e+03


t =

   2.2760e+03


t =

   2.2760e+03


t =

   2.2773e+03


t =

   2.2780e+03


t =

   2.2812e+03


t =

   2.2818e+03


t =

   2.2825e+03


t =
```

```
    2.2825e+03


t =

    2.2840e+03


t =

    2.2847e+03


t =

    2.2883e+03


t =

    2.2890e+03


t =

    2.2898e+03


t =

    2.2898e+03


t =

    2.2912e+03


t =

    2.2919e+03


t =

    2.2953e+03
```

```
t =

   2.2960e+03


t =

   2.2967e+03


t =

   2.2967e+03


t =

   2.2979e+03


t =

   2.2985e+03


t =

   2.3014e+03


t =

   2.3019e+03


t =

   2.3025e+03


t =

   2.3025e+03
```

```
t =

   2.3038e+03


t =

   2.3044e+03


t =

   2.3075e+03


t =

   2.3081e+03


t =

   2.3087e+03


t =

   2.3087e+03


t =

   2.3100e+03


t =

   2.3106e+03


t =

   2.3138e+03


t =
```

2.3143e+03

t =

2.3150e+03

t =

2.3150e+03

t =

2.3165e+03

t =

2.3173e+03

t =

2.3211e+03

t =

2.3218e+03

t =

2.3226e+03

t =

2.3226e+03

t =

2.3241e+03

```
t =

   2.3248e+03


t =

   2.3285e+03


t =

   2.3292e+03


t =

   2.3300e+03


t =

   2.3300e+03


t =

   2.3238e+03


t =

   2.3244e+03


t =

   2.3273e+03


t =

   2.3278e+03
```

```
t =

   2.3284e+03


t =

   2.3284e+03


t =

   2.3296e+03


t =

   2.3302e+03


t =

   2.3331e+03


t =

   2.3336e+03


t =

   2.3343e+03


t =

   2.3343e+03


t =

   2.3358e+03


t =
```

```
    2.3366e+03


t =

    2.3405e+03


t =

    2.3412e+03


t =

    2.3421e+03


t =

    2.3421e+03


t =

    2.3435e+03


t =

    2.3443e+03


t =

    2.3480e+03


t =

    2.3486e+03


t =

    2.3495e+03
```

```
t =

   2.3495e+03


t =

   2.3509e+03


t =

   2.3515e+03


t =

   2.3550e+03


t =

   2.3556e+03


t =

   2.3564e+03


t =

   2.3564e+03


t =

   2.3575e+03


t =

   2.3581e+03
```

```
t =

   2.3610e+03


t =

   2.3615e+03


t =

   2.3621e+03


t =

   2.3621e+03


t =

   2.3632e+03


t =

   2.3637e+03


t =

   2.3664e+03


t =

   2.3668e+03


t =

   2.3674e+03


t =
```

```
    2.3674e+03


t =

    2.3688e+03


t =

    2.3695e+03


t =

    2.3730e+03


t =

    2.3736e+03


t =

    2.3743e+03


t =

    2.3743e+03


t =

    2.3758e+03


t =

    2.3765e+03


t =

    2.3800e+03
```

```
t =

   2.3807e+03


t =

   2.3815e+03


t =

   2.3815e+03


t =

   2.3830e+03


t =

   2.3837e+03


t =

   2.3875e+03


t =

   2.3881e+03


t =

   2.3890e+03


t =

   2.3890e+03
```

```
t =

   2.3903e+03


t =

   2.3909e+03


t =

   2.3941e+03


t =

   2.3946e+03


t =

   2.3953e+03


t =

   2.3953e+03


t =

   2.3964e+03


t =

   2.3970e+03


t =

   2.3997e+03


t =
```

```
    2.4002e+03


t =

    2.4008e+03


t =

    2.4008e+03


t =

    2.4021e+03


t =

    2.4027e+03


t =

    2.4059e+03


t =

    2.4065e+03


t =

    2.4072e+03


t =

    2.4072e+03


t =

    2.4085e+03
```

```
t =

   2.4092e+03


t =

   2.4125e+03


t =

   2.4131e+03


t =

   2.4138e+03


t =

   2.4138e+03


t =

   2.4153e+03


t =

   2.4161e+03


t =

   2.4199e+03


t =

   2.4206e+03
```

```
t =

   2.4214e+03


t =

   2.4214e+03


t =

   2.4228e+03


t =

   2.4235e+03


t =

   2.4269e+03


t =

   2.4275e+03


t =

   2.4283e+03


t =

   2.4283e+03


t =

   2.4294e+03


t =
```

```
    2.4300e+03


t =

    2.4329e+03


t =

    2.4335e+03


t =

    2.4341e+03


t =

    2.4341e+03


t =

    2.4354e+03


t =

    2.4360e+03


t =

    2.4391e+03


t =

    2.4397e+03


t =

    2.4404e+03
```

```
t =

   2.4404e+03


t =

   2.4416e+03


t =

   2.4423e+03


t =

   2.4454e+03


t =

   2.4459e+03


t =

   2.4466e+03


t =

   2.4466e+03


t =

   2.4481e+03


t =

   2.4488e+03
```

```
t =

   2.4525e+03


t =

   2.4531e+03


t =

   2.4539e+03


t =

   2.4539e+03


t =

   2.4554e+03


t =

   2.4561e+03


t =

   2.4596e+03


t =

   2.4602e+03


t =

   2.4610e+03


t =
```

2.4610e+03

t =

2.4622e+03

t =

2.4629e+03

t =

2.4660e+03

t =

2.4666e+03

t =

2.4673e+03

t =

2.4673e+03

t =

2.4686e+03

t =

2.4692e+03

t =

2.4724e+03

```
t =

   2.4730e+03


t =

   2.4737e+03


t =

   2.4737e+03


t =

   2.4749e+03


t =

   2.4755e+03


t =

   2.4785e+03


t =

   2.4790e+03


t =

   2.4797e+03


t =

   2.4797e+03
```

```
t =

   2.4811e+03


t =

   2.4818e+03


t =

   2.4852e+03


t =

   2.4858e+03


t =

   2.4866e+03


t =

   2.4866e+03


t =

   2.4880e+03


t =

   2.4887e+03


t =

   2.4922e+03


t =
```

```
          2.4928e+03


t =

          2.4936e+03


t =

          2.4936e+03


t =

          2.4949e+03


t =

          2.4955e+03


t =

          2.4988e+03


t =

          2.4994e+03


t =

          2.5002e+03


t =

          2.5002e+03


t =

          2.5015e+03
```

```
t =

   2.5022e+03


t =

   2.5056e+03


t =

   2.5063e+03


t =

   2.5070e+03


t =

   2.5070e+03


t =

   2.5082e+03


t =

   2.5088e+03


t =

   2.5118e+03


t =

   2.5123e+03
```

```
t =

   2.5130e+03


t =

   2.5130e+03


t =

   2.5143e+03


t =

   2.5149e+03


t =

   2.5182e+03


t =

   2.5188e+03


t =

   2.5195e+03


t =

   2.5195e+03


t =

   2.5208e+03


t =
```

```
    2.5215e+03


t =

    2.5248e+03


t =

    2.5254e+03


t =

    2.5262e+03


t =

    2.5262e+03


t =

    2.5275e+03


t =

    2.5282e+03


t =

    2.5315e+03


t =

    2.5321e+03


t =

    2.5329e+03
```

```
t =

   2.5329e+03


t =

   2.5343e+03


t =

   2.5350e+03


t =

   2.5387e+03


t =

   2.5393e+03


t =

   2.5401e+03


t =

   2.5401e+03


t =

   2.5414e+03


t =

   2.5420e+03
```

```
t =

   2.5450e+03


t =

   2.5456e+03


t =

   2.5463e+03


t =

   2.5463e+03


t =

   2.5475e+03


t =

   2.5482e+03


t =

   2.5514e+03


t =

   2.5519e+03


t =

   2.5526e+03


t =
```

2.5526e+03

t =

2.5539e+03

t =

2.5545e+03

t =

2.5577e+03

t =

2.5582e+03

t =

2.5589e+03

t =

2.5589e+03

t =

2.5603e+03

t =

2.5609e+03

t =

2.5642e+03

```
t =

   2.5648e+03


t =

   2.5655e+03


t =

   2.5655e+03


t =

   2.5670e+03


t =

   2.5677e+03


t =

   2.5715e+03


t =

   2.5722e+03


t =

   2.5730e+03


t =

   2.5730e+03
```

```
t =

   2.5743e+03


t =

   2.5749e+03


t =

   2.5782e+03


t =

   2.5788e+03


t =

   2.5795e+03


t =

   2.5795e+03


t =

   2.5808e+03


t =

   2.5814e+03


t =

   2.5846e+03


t =
```

```
2.5852e+03
```

```
t =
```
```
2.5859e+03
```

```
t =
```
```
2.5859e+03
```

```
t =
```
```
2.5871e+03
```

```
t =
```
```
2.5877e+03
```

```
t =
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```
2.5908e+03
```

```
t =
```
```
2.5913e+03
```

```
t =
```
```
2.5920e+03
```

```
t =
```
```
2.5920e+03
```

```
t =
```
```
2.5933e+03
```

```
t =

   2.5939e+03


t =

   2.5970e+03


t =

   2.5975e+03


t =

   2.5982e+03


t =

   2.5982e+03


t =

   2.5997e+03


t =

   2.6004e+03


t =

   2.6041e+03


t =

   2.6048e+03
```

```
t =

   2.6056e+03


t =

   2.6056e+03


t =

   2.6070e+03


t =

   2.6077e+03


t =

   2.6111e+03


t =

   2.6117e+03


t =

   2.6124e+03


t =

   2.6124e+03


t =

   2.6138e+03


t =
```

```
    2.6144e+03


t =

    2.6178e+03


t =

    2.6184e+03


t =

    2.6192e+03


t =

    2.6192e+03


t =

    2.6204e+03


t =

    2.6210e+03


t =

    2.6241e+03


t =

    2.6246e+03


t =

    2.6253e+03
```

```
t =

   2.6253e+03


t =

   2.6265e+03


t =

   2.6271e+03


t =

   2.6300e+03


t =

   2.6305e+03


t =

   2.6311e+03


t =

   2.6311e+03


t =

   2.6325e+03


t =

   2.6332e+03
```

```
t =

   2.6368e+03


t =

   2.6374e+03


t =

   2.6382e+03


t =

   2.6382e+03


t =

   2.6395e+03


t =

   2.6402e+03


t =

   2.6437e+03


t =

   2.6443e+03


t =

   2.6450e+03


t =
```

```
     2.6450e+03
```

```
t =
```

```
     2.6465e+03
```

```
t =
```

```
     2.6472e+03
```

```
t =
```

```
     2.6508e+03
```

```
t =
```

```
     2.6515e+03
```

```
t =
```

```
     2.6523e+03
```

```
t =
```

```
     2.6523e+03
```

```
t =
```

```
     2.6535e+03
```

```
t =
```

```
     2.6542e+03
```

```
t =
```

```
     2.6574e+03
```

```
t =

   2.6580e+03


t =

   2.6587e+03


t =

   2.6587e+03


t =

   2.6598e+03


t =

   2.6604e+03


t =

   2.6632e+03


t =

   2.6637e+03


t =

   2.6643e+03


t =

   2.6643e+03
```

```
t =

   2.6656e+03


t =

   2.6662e+03


t =

   2.6695e+03


t =

   2.6701e+03


t =

   2.6708e+03


t =

   2.6708e+03


t =

   2.6721e+03


t =

   2.6728e+03


t =

   2.6761e+03


t =
```

2.6767e+03

t =

2.6774e+03

t =

2.6774e+03

t =

2.6790e+03

t =

2.6797e+03

t =

2.6835e+03

t =

2.6842e+03

t =

2.6850e+03

t =

2.6850e+03

t =

2.6864e+03

```
t =

   2.6871e+03


t =

   2.6906e+03


t =

   2.6912e+03


t =

   2.6919e+03


t =

   2.6919e+03


t =

   2.6931e+03


t =

   2.6936e+03


t =

   2.6965e+03


t =

   2.6970e+03
```

```
t =

   2.6976e+03


t =

   2.6976e+03


t =

   2.6988e+03


t =

   2.6995e+03


t =

   2.7025e+03


t =

   2.7031e+03


t =

   2.7037e+03


t =

   2.7037e+03


t =

   2.7050e+03


t =
```

2.7056e+03

t =

2.7087e+03

t =

2.7093e+03

t =

2.7100e+03

t =

2.7100e+03

t =

2.7115e+03

t =

2.7123e+03

t =

2.7161e+03

t =

2.7167e+03

t =

2.7176e+03

```
t =

   2.7176e+03


t =

   2.7191e+03


t =

   2.7198e+03


t =

   2.7234e+03


t =

   2.7241e+03


t =

   2.7249e+03


t =

   2.7249e+03


t =

   2.7261e+03


t =

   2.7267e+03
```

```
t =

   2.7297e+03


t =

   2.7302e+03


t =

   2.7309e+03


t =

   2.7309e+03


t =

   2.7321e+03


t =

   2.7327e+03


t =

   2.7358e+03


t =

   2.7363e+03


t =

   2.7370e+03


t =
```

```
2.7370e+03


t =

    2.7381e+03


t =

    2.7387e+03


t =

    2.7417e+03


t =

    2.7422e+03


t =

    2.7428e+03


t =

    2.7428e+03


t =

    2.7443e+03


t =

    2.7450e+03


t =

    2.7487e+03
```

```
t =

   2.7494e+03


t =

   2.7502e+03


t =

   2.7502e+03


t =

   2.7517e+03


t =

   2.7524e+03


t =

   2.7561e+03


t =

   2.7567e+03


t =

   2.7575e+03


t =

   2.7575e+03
```

```
t =

   2.7588e+03


t =

   2.7595e+03


t =

   2.7627e+03


t =

   2.7633e+03


t =

   2.7640e+03


t =

   2.7640e+03


t =

   2.7652e+03


t =

   2.7659e+03


t =

   2.7690e+03


t =
```

```
    2.7696e+03


t =

    2.7703e+03


t =

    2.7703e+03


t =

    2.7714e+03


t =

    2.7720e+03


t =

    2.7749e+03


t =

    2.7754e+03


t =

    2.7760e+03


t =

    2.7760e+03


t =

    2.7774e+03
```

```
t =

    2.7781e+03


t =

    2.7815e+03


t =

    2.7821e+03


t =

    2.7829e+03


t =

    2.7829e+03


t =

    2.7843e+03


t =

    2.7850e+03


t =

    2.7886e+03


t =

    2.7892e+03
```

```
t =

   2.7900e+03


t =

   2.7900e+03


t =

   2.7914e+03


t =

   2.7920e+03


t =

   2.7954e+03


t =

   2.7960e+03


t =

   2.7968e+03


t =

   2.7968e+03


t =

   2.7981e+03


t =
```

2.7988e+03

t =

2.8022e+03

t =

2.8028e+03

t =

2.8036e+03

t =

2.8036e+03

t =

2.8047e+03

t =

2.8053e+03

t =

2.8082e+03

t =

2.8087e+03

t =

2.8094e+03

```
t =

   2.8094e+03


t =

   2.8106e+03


t =

   2.8113e+03


t =

   2.8145e+03


t =

   2.8151e+03


t =

   2.8158e+03


t =

   2.8158e+03


t =

   2.8172e+03


t =

   2.8178e+03
```

```
t =

   2.8212e+03


t =

   2.8218e+03


t =

   2.8225e+03


t =

   2.8225e+03


t =

   2.8239e+03


t =

   2.8246e+03


t =

   2.8280e+03


t =

   2.8286e+03


t =

   2.8293e+03


t =
```

```
    2.8293e+03


t =

    2.8308e+03


t =

    2.8315e+03


t =

    2.8352e+03


t =

    2.8359e+03


t =

    2.8367e+03


t =

    2.8367e+03


t =

    2.8379e+03


t =

    2.8385e+03


t =

    2.8415e+03
```

```
t =

   2.8421e+03


t =

   2.8427e+03


t =

   2.8427e+03


t =

   2.8440e+03


t =

   2.8446e+03


t =

   2.8477e+03


t =

   2.8483e+03


t =

   2.8490e+03


t =

   2.8490e+03
```

```
t =

  2.8502e+03


t =

  2.8509e+03


t =

  2.8540e+03


t =

  2.8546e+03


t =

  2.8553e+03


t =

  2.8553e+03


t =

  2.8566e+03


t =

  2.8573e+03


t =

  2.8606e+03


t =
```

```
2.8612e+03
```

```
t =
```

```
2.8619e+03
```

```
t =
```

```
2.8619e+03
```

```
t =
```

```
2.8634e+03
```

```
t =
```

```
2.8642e+03
```

```
t =
```

```
2.8680e+03
```

```
t =
```

```
2.8687e+03
```

```
t =
```

```
2.8695e+03
```

```
t =
```

```
2.8695e+03
```

```
t =
```

```
2.8708e+03
```

```
t =

   2.8715e+03


t =

   2.8747e+03


t =

   2.8753e+03


t =

   2.8760e+03


t =

   2.8760e+03


t =

   2.8773e+03


t =

   2.8779e+03


t =

   2.8810e+03


t =

   2.8816e+03
```

```
t =

   2.8823e+03


t =

   2.8823e+03


t =

   2.8835e+03


t =

   2.8841e+03


t =

   2.8871e+03


t =

   2.8877e+03


t =

   2.8884e+03


t =

   2.8884e+03


t =

   2.8896e+03


t =
```

```
    2.8902e+03


t =

    2.8933e+03


t =

    2.8939e+03


t =

    2.8946e+03


t =

    2.8946e+03


t =

    2.8961e+03


t =

    2.8969e+03


t =

    2.9006e+03


t =

    2.9013e+03


t =

    2.9021e+03
```

```
t =

   2.9021e+03


t =

   2.9035e+03


t =

   2.9042e+03


t =

   2.9076e+03


t =

   2.9082e+03


t =

   2.9090e+03


t =

   2.9090e+03


t =

   2.9103e+03


t =

   2.9110e+03
```

```
t =

   2.9143e+03


t =

   2.9149e+03


t =

   2.9156e+03


t =

   2.9156e+03


t =

   2.9168e+03


t =

   2.9174e+03


t =

   2.9204e+03


t =

   2.9210e+03


t =

   2.9216e+03


t =
```

```
    2.9216e+03


t =

    2.9228e+03


t =

    2.9234e+03


t =

    2.9263e+03


t =

    2.9268e+03


t =

    2.9275e+03


t =

    2.9275e+03


t =

    2.9289e+03


t =

    2.9296e+03


t =

    2.9332e+03
```

```
t =

   2.9339e+03


t =

   2.9347e+03


t =

   2.9347e+03


t =

   2.9361e+03


t =

   2.9368e+03


t =

   2.9402e+03


t =

   2.9408e+03


t =

   2.9416e+03


t =

   2.9416e+03
```

```
t =

   2.9430e+03


t =

   2.9437e+03


t =

   2.9473e+03


t =

   2.9479e+03


t =

   2.9487e+03


t =

   2.9487e+03


t =

   2.9500e+03


t =

   2.9506e+03


t =

   2.9537e+03


t =
```

```
                    2.9543e+03


t =

                    2.9550e+03


t =

                    2.9550e+03


t =

                    2.9561e+03


t =

                    2.9567e+03


t =

                    2.9595e+03


t =

                    2.9600e+03


t =

                    2.9606e+03


t =

                    2.9606e+03


t =

                    2.9619e+03
```

```
t =

   2.9626e+03


t =

   2.9660e+03


t =

   2.9666e+03


t =

   2.9673e+03


t =

   2.9673e+03


t =

   2.9687e+03


t =

   2.9693e+03


t =

   2.9727e+03


t =

   2.9733e+03
```

```
t =

   2.9741e+03


t =

   2.9741e+03


t =

   2.9756e+03


t =

   2.9763e+03


t =

   2.9800e+03


t =

   2.9807e+03


t =

   2.9815e+03


t =

   2.9815e+03


t =

   2.9829e+03


t =
```

```
2.9835e+03
```

$t =$

```
2.9869e+03
```

$t =$

```
2.9875e+03
```

$t =$

```
2.9882e+03
```

$t =$

```
2.9882e+03
```

$t =$

```
2.9893e+03
```

$t =$

```
2.9899e+03
```

$t =$

```
2.9927e+03
```

$t =$

```
2.9932e+03
```

$t =$

```
2.9938e+03
```

```
t =

   2.9938e+03


t =

   2.9951e+03


t =

   2.9957e+03


t =

   2.9989e+03


t =

   2.9995e+03


t =

   3.0002e+03


t =

   3.0002e+03


t =

   3.0015e+03


t =

   3.0021e+03
```

```
t =

   3.0053e+03


t =

   3.0059e+03


t =

   3.0066e+03


t =

   3.0066e+03


t =

   3.0081e+03


t =

   3.0089e+03


t =

   3.0126e+03


t =

   3.0133e+03


t =

   3.0142e+03


t =
```

3.0142e+03

t =

   3.0156e+03

t =

   3.0163e+03

t =

   3.0198e+03

t =

   3.0204e+03

t =

   3.0212e+03

t =

   3.0212e+03

t =

   3.0224e+03

t =

   3.0230e+03

t =

   3.0260e+03

```
t =

   3.0265e+03


t =

   3.0271e+03


t =

   3.0271e+03


t =

   3.0284e+03


t =

   3.0290e+03


t =

   3.0321e+03


t =

   3.0326e+03


t =

   3.0333e+03


t =

   3.0333e+03
```

```
t =

   3.0345e+03


t =

   3.0351e+03


t =

   3.0382e+03


t =

   3.0387e+03


t =

   3.0394e+03


t =

   3.0394e+03


t =

   3.0408e+03


t =

   3.0416e+03


t =

   3.0453e+03


t =
```

3.0459e+03

t =

3.0468e+03

t =

3.0468e+03

t =

3.0482e+03

t =

3.0489e+03

t =

3.0526e+03

t =

3.0532e+03

t =

3.0540e+03

t =

3.0540e+03

t =

3.0553e+03

```
t =

   3.0559e+03


t =

   3.0590e+03


t =

   3.0596e+03


t =

   3.0603e+03


t =

   3.0603e+03


t =

   3.0615e+03


t =

   3.0622e+03


t =

   3.0653e+03


t =

   3.0659e+03
```

```
t =

   3.0666e+03


t =

   3.0666e+03


t =

   3.0677e+03


t =

   3.0683e+03


t =

   3.0713e+03


t =

   3.0718e+03


t =

   3.0724e+03


t =

   3.0724e+03


t =

   3.0738e+03


t =
```

```
    3.0745e+03


t =

    3.0781e+03


t =

    3.0787e+03


t =

    3.0795e+03


t =

    3.0795e+03


t =

    3.0809e+03


t =

    3.0816e+03


t =

    3.0852e+03


t =

    3.0858e+03


t =

    3.0866e+03
```

```
t =

   3.0866e+03


t =

   3.0879e+03


t =

   3.0886e+03


t =

   3.0919e+03


t =

   3.0925e+03


t =

   3.0932e+03


t =

   3.0932e+03


t =

   3.0945e+03


t =

   3.0952e+03
```

```
t =

   3.0985e+03


t =

   3.0991e+03


t =

   3.0998e+03


t =

   3.0998e+03


t =

   3.1010e+03


t =

   3.1016e+03


t =

   3.1045e+03


t =

   3.1050e+03


t =

   3.1056e+03


t =
```

```
    3.1056e+03


t =

    3.1070e+03


t =

    3.1077e+03


t =

    3.1110e+03


t =

    3.1116e+03


t =

    3.1123e+03


t =

    3.1123e+03


t =

    3.1137e+03


t =

    3.1144e+03


t =

    3.1178e+03
```

```
t =

   3.1184e+03


t =

   3.1192e+03


t =

   3.1192e+03


t =

   3.1205e+03


t =

   3.1212e+03


t =

   3.1246e+03


t =

   3.1252e+03


t =

   3.1259e+03


t =

   3.1259e+03
```

```
t =

   3.1273e+03


t =

   3.1280e+03


t =

   3.1315e+03


t =

   3.1321e+03


t =

   3.1329e+03


t =

   3.1329e+03


t =

   3.1341e+03


t =

   3.1347e+03


t =

   3.1377e+03


t =
```

```
    3.1383e+03


t =

    3.1389e+03


t =

    3.1389e+03


t =

    3.1402e+03


t =

    3.1409e+03


t =

    3.1441e+03


t =

    3.1447e+03


t =

    3.1454e+03


t =

    3.1454e+03


t =

    3.1467e+03
```

```
t =

   3.1474e+03


t =

   3.1507e+03


t =

   3.1512e+03


t =

   3.1520e+03


t =

   3.1520e+03


t =

   3.1533e+03


t =

   3.1539e+03


t =

   3.1572e+03


t =

   3.1578e+03
```

```
t =

   3.1585e+03


t =

   3.1585e+03


t =

   3.1600e+03


t =

   3.1607e+03


t =

   3.1644e+03


t =

   3.1650e+03


t =

   3.1658e+03


t =

   3.1658e+03


t =

   3.1671e+03


t =
```

```
    3.1677e+03


t =

    3.1709e+03


t =

    3.1714e+03


t =

    3.1721e+03


t =

    3.1721e+03


t =

    3.1734e+03


t =

    3.1741e+03


t =

    3.1774e+03


t =

    3.1779e+03


t =

    3.1787e+03
```

```
t =

   3.1787e+03


t =

   3.1799e+03


t =

   3.1806e+03


t =

   3.1838e+03


t =

   3.1843e+03


t =

   3.1850e+03


t =

   3.1850e+03


t =

   3.1863e+03


t =

   3.1869e+03
```

```
t =

   3.1900e+03


t =

   3.1906e+03


t =

   3.1913e+03


t =

   3.1913e+03


t =

   3.1927e+03


t =

   3.1934e+03


t =

   3.1970e+03


t =

   3.1976e+03


t =

   3.1984e+03


t =
```

3.1984e+03

t =

3.1998e+03

t =

3.2004e+03

t =

3.2037e+03

t =

3.2043e+03

t =

3.2051e+03

t =

3.2051e+03

t =

3.2064e+03

t =

3.2071e+03

t =

3.2106e+03

```
t =

   3.2112e+03


t =

   3.2119e+03


t =

   3.2119e+03


t =

   3.2132e+03


t =

   3.2139e+03


t =

   3.2171e+03


t =

   3.2177e+03


t =

   3.2184e+03


t =

   3.2184e+03
```

```
t =

   3.2196e+03


t =

   3.2202e+03


t =

   3.2231e+03


t =

   3.2236e+03


t =

   3.2242e+03


t =

   3.2242e+03


t =

   3.2256e+03


t =

   3.2262e+03


t =

   3.2296e+03


t =
```

```
        3.2302e+03


t =

        3.2310e+03


t =

        3.2310e+03


t =

        3.2323e+03


t =

        3.2329e+03


t =

        3.2363e+03


t =

        3.2369e+03


t =

        3.2376e+03


t =

        3.2376e+03


t =

        3.2391e+03
```

```
t =

   3.2398e+03


t =

   3.2435e+03


t =

   3.2442e+03


t =

   3.2450e+03


t =

   3.2450e+03


t =

   3.2464e+03


t =

   3.2471e+03


t =

   3.2505e+03


t =

   3.2511e+03
```

```
t =

   3.2519e+03


t =

   3.2519e+03


t =

   3.2530e+03


t =

   3.2536e+03


t =

   3.2564e+03


t =

   3.2569e+03


t =

   3.2575e+03


t =

   3.2575e+03


t =

   3.2587e+03


t =
```

```
     3.2593e+03
```

```
t =
```

```
     3.2624e+03
```

```
t =
```

```
     3.2629e+03
```

```
t =
```

```
     3.2636e+03
```

```
t =
```

```
     3.2636e+03
```

```
t =
```

```
     3.2649e+03
```

```
t =
```

```
     3.2655e+03
```

```
t =
```

```
     3.2687e+03
```

```
t =
```

```
     3.2692e+03
```

```
t =
```

```
     3.2699e+03
```

```
t =

    3.2699e+03


t =

    3.2715e+03


t =

    3.2723e+03


t =

    3.2761e+03


t =

    3.2768e+03


t =

    3.2777e+03


t =

    3.2777e+03


t =

    3.2792e+03


t =

    3.2799e+03
```

```
t =

   3.2836e+03


t =

   3.2843e+03


t =

   3.2851e+03


t =

   3.2851e+03


t =

   3.2788e+03


t =

   3.2794e+03


t =

   3.2823e+03


t =

   3.2828e+03


t =

   3.2835e+03


t =
```

3.2835e+03

t =

3.2846e+03

t =

3.2852e+03

t =

3.2881e+03

t =

3.2886e+03

t =

3.2892e+03

t =

3.2892e+03

t =

3.2908e+03

t =

3.2916e+03

t =

3.2955e+03

```
t =

   3.2962e+03


t =

   3.2970e+03


t =

   3.2970e+03


t =

   3.2985e+03


t =

   3.2993e+03


t =

   3.3030e+03


t =

   3.3037e+03


t =

   3.3045e+03


t =

   3.3045e+03
```

```
t =

   3.3059e+03


t =

   3.3066e+03


t =

   3.3100e+03


t =

   3.3106e+03


t =

   3.3114e+03


t =

   3.3114e+03


t =

   3.3125e+03


t =

   3.3131e+03


t =

   3.3159e+03


t =
```

```
    3.3165e+03


t =

    3.3171e+03


t =

    3.3171e+03


t =

    3.3181e+03


t =

    3.3187e+03


t =

    3.3213e+03


t =

    3.3218e+03


t =

    3.3224e+03


t =

    3.3224e+03


t =

    3.3238e+03
```

```
t =

    3.3245e+03


t =

    3.3280e+03


t =

    3.3286e+03


t =

    3.3294e+03


t =

    3.3294e+03


t =

    3.3308e+03


t =

    3.3315e+03


t =

    3.3351e+03


t =

    3.3357e+03
```

```
t =

   3.3365e+03


t =

   3.3365e+03


t =

   3.3380e+03


t =

   3.3388e+03


t =

   3.3425e+03


t =

   3.3431e+03


t =

   3.3440e+03


t =

   3.3440e+03


t =

   3.3452e+03


t =
```

```
    3.3458e+03


t =

    3.3489e+03


t =

    3.3495e+03


t =

    3.3502e+03


t =

    3.3502e+03


t =

    3.3513e+03


t =

    3.3518e+03


t =

    3.3546e+03


t =

    3.3551e+03


t =

    3.3557e+03
```

```
t =

   3.3557e+03


t =

   3.3570e+03


t =

   3.3577e+03


t =

   3.3610e+03


t =

   3.3616e+03


t =

   3.3623e+03


t =

   3.3623e+03


t =

   3.3637e+03


t =

   3.3643e+03
```

```
t =

   3.3677e+03


t =

   3.3683e+03


t =

   3.3690e+03


t =

   3.3690e+03


t =

   3.3705e+03


t =

   3.3712e+03


t =

   3.3750e+03


t =

   3.3756e+03


t =

   3.3765e+03


t =
```

3.3765e+03

t =

3.3778e+03

t =

3.3784e+03

t =

3.3817e+03

t =

3.3823e+03

t =

3.3831e+03

t =

3.3831e+03

t =

3.3842e+03

t =

3.3848e+03

t =

3.3878e+03

```
t =

   3.3883e+03


t =

   3.3889e+03


t =

   3.3889e+03


t =

   3.3903e+03


t =

   3.3909e+03


t =

   3.3942e+03


t =

   3.3948e+03


t =

   3.3955e+03


t =

   3.3955e+03
```

```
t =

   3.3968e+03


t =

   3.3974e+03


t =

   3.4006e+03


t =

   3.4011e+03


t =

   3.4019e+03


t =

   3.4019e+03


t =

   3.4033e+03


t =

   3.4040e+03


t =

   3.4076e+03


t =
```

```
3.4082e+03


t =

  3.4090e+03


t =

  3.4090e+03


t =

  3.4104e+03


t =

  3.4111e+03


t =

  3.4145e+03


t =

  3.4151e+03


t =

  3.4158e+03


t =

  3.4158e+03


t =

  3.4170e+03
```

```
t =

   3.4177e+03


t =

   3.4208e+03


t =

   3.4213e+03


t =

   3.4220e+03


t =

   3.4220e+03


t =

   3.4234e+03


t =

   3.4241e+03


t =

   3.4274e+03


t =

   3.4280e+03
```

```
t =

   3.4288e+03


t =

   3.4288e+03


t =

   3.4300e+03


t =

   3.4306e+03


t =

   3.4337e+03


t =

   3.4342e+03


t =

   3.4349e+03


t =

   3.4349e+03


t =

   3.4363e+03


t =
```

```
3.4370e+03
```

t =

```
3.4404e+03
```

t =

```
3.4410e+03
```

t =

```
3.4418e+03
```

t =

```
3.4418e+03
```

t =

```
3.4431e+03
```

t =

```
3.4438e+03
```

t =

```
3.4472e+03
```

t =

```
3.4477e+03
```

t =

```
3.4485e+03
```

```
t =

   3.4485e+03


t =

   3.4498e+03


t =

   3.4504e+03


t =

   3.4537e+03


t =

   3.4542e+03


t =

   3.4549e+03


t =

   3.4549e+03


t =

   3.4563e+03


t =

   3.4570e+03
```

```
t =

    3.4605e+03


t =

    3.4612e+03


t =

    3.4619e+03


t =

    3.4619e+03


t =

    3.4632e+03


t =

    3.4638e+03


t =

    3.4669e+03


t =

    3.4674e+03


t =

    3.4681e+03


t =
```

```
    3.4681e+03


t =

    3.4694e+03


t =

    3.4701e+03


t =

    3.4734e+03


t =

    3.4740e+03


t =

    3.4747e+03


t =

    3.4747e+03


t =

    3.4760e+03


t =

    3.4767e+03


t =

    3.4800e+03
```

```
t =

   3.4805e+03


t =

   3.4813e+03


t =

   3.4813e+03


t =

   3.4826e+03


t =

   3.4832e+03


t =

   3.4864e+03


t =

   3.4870e+03


t =

   3.4877e+03


t =

   3.4877e+03
```

```
t =

   3.4892e+03


t =

   3.4899e+03


t =

   3.4935e+03


t =

   3.4941e+03


t =

   3.4949e+03


t =

   3.4949e+03


t =

   3.4962e+03


t =

   3.4968e+03


t =

   3.5000e+03


t =
```

3.5006e+03

t =

3.5013e+03

t =

3.5013e+03

t =

3.5026e+03

t =

3.5032e+03

t =

3.5065e+03

t =

3.5071e+03

t =

3.5079e+03

t =

3.5079e+03

t =

3.5091e+03

```
t =

   3.5098e+03


t =

   3.5130e+03


t =

   3.5135e+03


t =

   3.5142e+03


t =

   3.5142e+03


t =

   3.5155e+03


t =

   3.5161e+03


t =

   3.5192e+03


t =

   3.5198e+03
```

```
t =

   3.5205e+03


t =

   3.5205e+03


t =

   3.5219e+03


t =

   3.5227e+03


t =

   3.5263e+03


t =

   3.5269e+03


t =

   3.5277e+03


t =

   3.5277e+03


t =

   3.5290e+03


t =
```

```
    3.5297e+03


t =

    3.5329e+03


t =

    3.5335e+03


t =

    3.5342e+03


t =

    3.5342e+03


t =

    3.5356e+03


t =

    3.5363e+03


t =

    3.5397e+03


t =

    3.5403e+03


t =

    3.5411e+03
```

```
t =

    3.5411e+03


t =

    3.5423e+03


t =

    3.5430e+03


t =

    3.5462e+03


t =

    3.5468e+03


t =

    3.5475e+03


t =

    3.5475e+03


t =

    3.5487e+03


t =

    3.5492e+03
```

```
t =

   3.5522e+03


t =

   3.5527e+03


t =

   3.5534e+03


t =

   3.5534e+03


t =

   3.5548e+03


t =

   3.5555e+03


t =

   3.5589e+03


t =

   3.5595e+03


t =

   3.5603e+03


t =
```

```
3.5603e+03


t =

   3.5616e+03


t =

   3.5623e+03


t =

   3.5656e+03


t =

   3.5662e+03


t =

   3.5670e+03


t =

   3.5670e+03


t =

   3.5684e+03


t =

   3.5691e+03


t =

   3.5727e+03
```

```
t =

   3.5734e+03


t =

   3.5742e+03


t =

   3.5742e+03


t =

   3.5755e+03


t =

   3.5762e+03


t =

   3.5795e+03


t =

   3.5801e+03


t =

   3.5809e+03


t =

   3.5809e+03
```

```
t =

   3.5820e+03


t =

   3.5826e+03


t =

   3.5854e+03


t =

   3.5859e+03


t =

   3.5865e+03


t =

   3.5865e+03


t =

   3.5878e+03


t =

   3.5885e+03


t =

   3.5917e+03


t =
```

```
    3.5922e+03


t =

    3.5929e+03


t =

    3.5929e+03


t =

    3.5942e+03


t =

    3.5949e+03


t =

    3.5981e+03


t =

    3.5987e+03


t =

    3.5994e+03


t =

    3.5994e+03


t =

    3.6009e+03
```

```
t =

   3.6017e+03


t =

   3.6055e+03


t =

   3.6062e+03


t =

   3.6070e+03


t =

   3.6070e+03


t =

   3.6084e+03


t =

   3.6092e+03


t =

   3.6127e+03


t =

   3.6134e+03
```

```
t =

   3.6142e+03


t =

   3.6142e+03


t =

   3.6082e+03


t =

   3.6087e+03


t =

   3.6116e+03


t =

   3.6121e+03


t =

   3.6127e+03


t =

   3.6127e+03


t =

   3.6139e+03


t =
```

3.6144e+03

t =

3.6173e+03

t =

3.6178e+03

t =

3.6184e+03

t =

3.6184e+03

t =

3.6200e+03

t =

3.6208e+03

t =

3.6246e+03

t =

3.6253e+03

t =

3.6262e+03

```
t =

   3.6262e+03


t =

   3.6277e+03


t =

   3.6284e+03


t =

   3.6322e+03


t =

   3.6328e+03


t =

   3.6337e+03


t =

   3.6337e+03


t =

   3.6350e+03


t =

   3.6357e+03
```

```
t =

   3.6392e+03


t =

   3.6399e+03


t =

   3.6406e+03


t =

   3.6406e+03


t =

   3.6418e+03


t =

   3.6424e+03


t =

   3.6452e+03


t =

   3.6457e+03


t =

   3.6463e+03


t =
```

```
    3.6463e+03


t =

    3.6474e+03


t =

    3.6479e+03


t =

    3.6506e+03


t =

    3.6510e+03


t =

    3.6516e+03


t =

    3.6516e+03


t =

    3.6530e+03


t =

    3.6537e+03


t =

    3.6572e+03
```

```
t =

   3.6578e+03


t =

   3.6586e+03


t =

   3.6586e+03


t =

   3.6600e+03


t =

   3.6607e+03


t =

   3.6642e+03


t =

   3.6649e+03


t =

   3.6657e+03


t =

   3.6657e+03
```

```
t =

   3.6672e+03


t =

   3.6679e+03


t =

   3.6717e+03


t =

   3.6723e+03


t =

   3.6732e+03


t =

   3.6732e+03


t =

   3.6744e+03


t =

   3.6750e+03


t =

   3.6782e+03


t =
```

```
3.6787e+03


t =

   3.6794e+03


t =

   3.6794e+03


t =

   3.6805e+03


t =

   3.6811e+03


t =

   3.6838e+03


t =

   3.6843e+03


t =

   3.6849e+03


t =

   3.6849e+03


t =

   3.6862e+03
```

```
t =

    3.6869e+03


t =

    3.6902e+03


t =

    3.6908e+03


t =

    3.6915e+03


t =

    3.6915e+03


t =

    3.6928e+03


t =

    3.6935e+03


t =

    3.6968e+03


t =

    3.6974e+03
```

```
t =

   3.6982e+03


t =

   3.6982e+03


t =

   3.6997e+03


t =

   3.7004e+03


t =

   3.7041e+03


t =

   3.7048e+03


t =

   3.7056e+03


t =

   3.7056e+03


t =

   3.7070e+03


t =
```

```
    3.7076e+03


t =

    3.7109e+03


t =

    3.7115e+03


t =

    3.7123e+03


t =

    3.7123e+03


t =

    3.7135e+03


t =

    3.7140e+03


t =

    3.7170e+03


t =

    3.7175e+03


t =

    3.7182e+03
```

```
t =

   3.7182e+03


t =

   3.7195e+03


t =

   3.7201e+03


t =

   3.7234e+03


t =

   3.7240e+03


t =

   3.7247e+03


t =

   3.7247e+03


t =

   3.7260e+03


t =

   3.7266e+03
```

```
t =

    3.7298e+03


t =

    3.7303e+03


t =

    3.7310e+03


t =

    3.7310e+03


t =

    3.7325e+03


t =

    3.7332e+03


t =

    3.7368e+03


t =

    3.7374e+03


t =

    3.7382e+03


t =
```

```
    3.7382e+03


t =

    3.7396e+03


t =

    3.7402e+03


t =

    3.7436e+03


t =

    3.7442e+03


t =

    3.7450e+03


t =

    3.7450e+03


t =

    3.7463e+03


t =

    3.7469e+03


t =

    3.7500e+03
```

```
t =

   3.7506e+03


t =

   3.7513e+03


t =

   3.7513e+03


t =

   3.7526e+03


t =

   3.7533e+03


t =

   3.7567e+03


t =

   3.7573e+03


t =

   3.7580e+03


t =

   3.7580e+03
```

t =

　3.7592e+03

t =

　3.7598e+03

t =

　3.7629e+03

t =

　3.7634e+03

t =

　3.7641e+03

t =

　3.7641e+03

t =

　3.7655e+03

t =

　3.7662e+03

t =

　3.7696e+03

t =

```
3.7702e+03
```

$t =$

```
3.7710e+03
```

$t =$

```
3.7710e+03
```

$t =$

```
3.7723e+03
```

$t =$

```
3.7730e+03
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$t =$

```
3.7763e+03
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$t =$

```
3.7769e+03
```

$t =$

```
3.7777e+03
```

$t =$

```
3.7777e+03
```

$t =$

```
3.7790e+03
```

```
t =

   3.7796e+03


t =

   3.7829e+03


t =

   3.7834e+03


t =

   3.7842e+03


t =

   3.7842e+03


t =

   3.7856e+03


t =

   3.7863e+03


t =

   3.7898e+03


t =

   3.7904e+03
```

```
t =

   3.7912e+03


t =

   3.7912e+03


t =

   3.7924e+03


t =

   3.7930e+03


t =

   3.7961e+03


t =

   3.7966e+03


t =

   3.7973e+03


t =

   3.7973e+03


t =

   3.7986e+03


t =
```

3.7993e+03

t =

   3.8026e+03

t =

   3.8032e+03

t =

   3.8039e+03

t =

   3.8039e+03

t =

   3.8052e+03

t =

   3.8059e+03

t =

   3.8091e+03

t =

   3.8097e+03

t =

   3.8104e+03

```
t =

   3.8104e+03


t =

   3.8117e+03


t =

   3.8124e+03


t =

   3.8156e+03


t =

   3.8162e+03


t =

   3.8169e+03


t =

   3.8169e+03


t =

   3.8184e+03


t =

   3.8191e+03
```

```
t =

    3.8227e+03


t =

    3.8234e+03


t =

    3.8242e+03


t =

    3.8242e+03


t =

    3.8254e+03


t =

    3.8261e+03


t =

    3.8292e+03


t =

    3.8298e+03


t =

    3.8305e+03


t =
```

```
        3.8305e+03


t =

        3.8318e+03


t =

        3.8325e+03


t =

        3.8357e+03


t =

        3.8363e+03


t =

        3.8371e+03


t =

        3.8371e+03


t =

        3.8383e+03


t =

        3.8390e+03


t =

        3.8421e+03
```

```
t =

   3.8427e+03


t =

   3.8434e+03


t =

   3.8434e+03


t =

   3.8447e+03


t =

   3.8453e+03


t =

   3.8484e+03


t =

   3.8490e+03


t =

   3.8497e+03


t =

   3.8497e+03
```

```
t =

   3.8511e+03


t =

   3.8518e+03


t =

   3.8555e+03


t =

   3.8561e+03


t =

   3.8569e+03


t =

   3.8569e+03


t =

   3.8582e+03


t =

   3.8589e+03


t =

   3.8622e+03


t =
```

3.8628e+03

t =

3.8635e+03

t =

3.8635e+03

t =

3.8649e+03

t =

3.8655e+03

t =

3.8689e+03

t =

3.8695e+03

t =

3.8703e+03

t =

3.8703e+03

t =

3.8715e+03

```
t =

   3.8722e+03


t =

   3.8754e+03


t =

   3.8759e+03


t =

   3.8766e+03


t =

   3.8766e+03


t =

   3.8778e+03


t =

   3.8784e+03


t =

   3.8814e+03


t =

   3.8819e+03
```

```
t =

   3.8826e+03


t =

   3.8826e+03


t =

   3.8840e+03


t =

   3.8847e+03


t =

   3.8881e+03


t =

   3.8887e+03


t =

   3.8895e+03


t =

   3.8895e+03


t =

   3.8909e+03


t =
```

```
    3.8915e+03


t =

    3.8949e+03


t =

    3.8955e+03


t =

    3.8962e+03


t =

    3.8962e+03


t =

    3.8977e+03


t =

    3.8984e+03


t =

    3.9020e+03


t =

    3.9026e+03


t =

    3.9034e+03
```

```
t =

   3.9034e+03


t =

   3.9047e+03


t =

   3.9054e+03


t =

   3.9087e+03


t =

   3.9093e+03


t =

   3.9100e+03


t =

   3.9100e+03


t =

   3.9112e+03


t =

   3.9117e+03
```

```
t =

   3.9146e+03


t =

   3.9151e+03


t =

   3.9157e+03


t =

   3.9157e+03


t =

   3.9170e+03


t =

   3.9176e+03


t =

   3.9208e+03


t =

   3.9214e+03


t =

   3.9221e+03


t =
```

```
    3.9221e+03


t =

    3.9234e+03


t =

    3.9241e+03


t =

    3.9274e+03


t =

    3.9279e+03


t =

    3.9287e+03


t =

    3.9287e+03


t =

    3.9302e+03


t =

    3.9309e+03


t =

    3.9347e+03
```

```
t =

   3.9354e+03


t =

   3.9363e+03


t =

   3.9363e+03


t =

   3.9377e+03


t =

   3.9384e+03


t =

   3.9419e+03


t =

   3.9426e+03


t =

   3.9433e+03


t =

   3.9433e+03
```

```
t =

    3.9445e+03


t =

    3.9451e+03


t =

    3.9479e+03


t =

    3.9484e+03


t =

    3.9490e+03


t =

    3.9490e+03


t =

    3.9502e+03


t =

    3.9508e+03


t =

    3.9538e+03


t =
```

```
3.9544e+03


t =

  3.9550e+03


t =

  3.9550e+03


t =

  3.9563e+03


t =

  3.9569e+03


t =

  3.9599e+03


t =

  3.9605e+03


t =

  3.9612e+03


t =

  3.9612e+03


t =

  3.9627e+03
```

```
t =

   3.9635e+03


t =

   3.9673e+03


t =

   3.9680e+03


t =

   3.9688e+03


t =

   3.9688e+03


t =

   3.9703e+03


t =

   3.9711e+03


t =

   3.9748e+03


t =

   3.9755e+03
```

```
t =

   3.9763e+03


t =

   3.9763e+03


t =

   3.9775e+03


t =

   3.9781e+03


t =

   3.9811e+03


t =

   3.9817e+03


t =

   3.9823e+03


t =

   3.9823e+03


t =

   3.9835e+03


t =
```

```
       3.9841e+03


t =

       3.9871e+03


t =

       3.9876e+03


t =

       3.9883e+03


t =

       3.9883e+03


t =

       3.9894e+03


t =

       3.9900e+03


t =

       3.9929e+03


t =

       3.9934e+03


t =

       3.9940e+03
```

```
t =

   3.9940e+03


t =

   3.9955e+03


t =

   3.9962e+03


t =

   3.9999e+03


t =

   4.0006e+03


t =

   4.0014e+03


t =

   4.0014e+03


t =

   4.0029e+03


t =

   4.0036e+03
```

```
t =

   4.0074e+03


t =

   4.0080e+03


t =

   4.0089e+03


t =

   4.0089e+03


t =

   4.0102e+03


t =

   4.0108e+03


t =

   4.0141e+03


t =

   4.0146e+03


t =

   4.0154e+03


t =
```

```
    4.0154e+03
```

```
t =
```

```
    4.0166e+03
```

```
t =
```

```
    4.0172e+03
```

```
t =
```

```
    4.0204e+03
```

```
t =
```

```
    4.0209e+03
```

```
t =
```

```
    4.0216e+03
```

```
t =
```

```
    4.0216e+03
```

```
t =
```

```
    4.0228e+03
```

```
t =
```

```
    4.0233e+03
```

```
t =
```

```
    4.0261e+03
```

```
t =

   4.0266e+03


t =

   4.0272e+03


t =

   4.0272e+03


t =

   4.0286e+03


t =

   4.0293e+03


t =

   4.0327e+03


t =

   4.0333e+03


t =

   4.0341e+03


t =

   4.0341e+03
```

```
t =

   4.0355e+03


t =

   4.0362e+03


t =

   4.0398e+03


t =

   4.0404e+03


t =

   4.0412e+03


t =

   4.0412e+03


t =

   4.0426e+03


t =

   4.0433e+03


t =

   4.0467e+03


t =
```

```
        4.0473e+03


t =

        4.0481e+03


t =

        4.0481e+03


t =

        4.0495e+03


t =

        4.0501e+03


t =

        4.0536e+03


t =

        4.0542e+03


t =

        4.0549e+03


t =

        4.0549e+03


t =

        4.0561e+03
```

```
t =

   4.0567e+03


t =

   4.0595e+03


t =

   4.0600e+03


t =

   4.0607e+03


t =

   4.0607e+03


t =

   4.0619e+03


t =

   4.0626e+03


t =

   4.0657e+03


t =

   4.0663e+03
```

```
t =

   4.0670e+03


t =

   4.0670e+03


t =

   4.0683e+03


t =

   4.0690e+03


t =

   4.0723e+03


t =

   4.0729e+03


t =

   4.0736e+03


t =

   4.0736e+03


t =

   4.0750e+03


t =
```

```
    4.0757e+03


t =

    4.0792e+03


t =

    4.0798e+03


t =

    4.0806e+03


t =

    4.0806e+03


t =

    4.0821e+03


t =

    4.0829e+03


t =

    4.0866e+03


t =

    4.0873e+03


t =

    4.0881e+03
```

```
t =

   4.0881e+03


t =

   4.0893e+03


t =

   4.0899e+03


t =

   4.0929e+03


t =

   4.0935e+03


t =

   4.0941e+03


t =

   4.0941e+03


t =

   4.0953e+03


t =

   4.0960e+03
```

```
t =

   4.0990e+03


t =

   4.0995e+03


t =

   4.1002e+03


t =

   4.1002e+03


t =

   4.1014e+03


t =

   4.1020e+03


t =

   4.1051e+03


t =

   4.1056e+03


t =

   4.1063e+03


t =
```

```
    4.1063e+03


t =

    4.1077e+03


t =

    4.1084e+03


t =

    4.1118e+03


t =

    4.1124e+03


t =

    4.1131e+03


t =

    4.1131e+03


t =

    4.1147e+03


t =

    4.1155e+03


t =

    4.1194e+03
```

```
t =

   4.1201e+03


t =

   4.1210e+03


t =

   4.1210e+03


t =

   4.1223e+03


t =

   4.1230e+03


t =

   4.1262e+03


t =

   4.1268e+03


t =

   4.1275e+03


t =

   4.1275e+03
```

```
t =

   4.1287e+03


t =

   4.1293e+03


t =

   4.1323e+03


t =

   4.1329e+03


t =

   4.1335e+03


t =

   4.1335e+03


t =

   4.1347e+03


t =

   4.1353e+03


t =

   4.1381e+03


t =
```

```
    4.1387e+03


t =

    4.1393e+03


t =

    4.1393e+03


t =

    4.1406e+03


t =

    4.1412e+03


t =

    4.1444e+03


t =

    4.1450e+03


t =

    4.1457e+03


t =

    4.1457e+03


t =

    4.1473e+03
```

```
t =

   4.1481e+03


t =

   4.1521e+03


t =

   4.1529e+03


t =

   4.1538e+03


t =

   4.1538e+03


t =

   4.1551e+03


t =

   4.1558e+03


t =

   4.1592e+03


t =

   4.1598e+03
```

```
t =

   4.1606e+03


t =

   4.1606e+03


t =

   4.1619e+03


t =

   4.1625e+03


t =

   4.1656e+03


t =

   4.1661e+03


t =

   4.1668e+03


t =

   4.1668e+03


t =

   4.1680e+03


t =
```

```
    4.1685e+03
```

```
t =
```

```
    4.1713e+03
```

```
t =
```

```
    4.1718e+03
```

```
t =
```

```
    4.1724e+03
```

```
t =
```

```
    4.1724e+03
```

```
t =
```

```
    4.1736e+03
```

```
t =
```

```
    4.1742e+03
```

```
t =
```

```
    4.1773e+03
```

```
t =
```

```
    4.1778e+03
```

```
t =
```

```
    4.1785e+03
```

```
t =

    4.1785e+03


t =

    4.1801e+03


t =

    4.1809e+03


t =

    4.1848e+03


t =

    4.1855e+03


t =

    4.1863e+03


t =

    4.1863e+03


t =

    4.1878e+03


t =

    4.1885e+03
```

```
t =

   4.1920e+03


t =

   4.1926e+03


t =

   4.1934e+03


t =

   4.1934e+03


t =

   4.1947e+03


t =

   4.1954e+03


t =

   4.1986e+03


t =

   4.1992e+03


t =

   4.1999e+03


t =
```

```
    4.1999e+03


t =

    4.2011e+03


t =

    4.2016e+03


t =

    4.2044e+03


t =

    4.2049e+03


t =

    4.2055e+03


t =

    4.2055e+03


t =

    4.2067e+03


t =

    4.2073e+03


t =

    4.2103e+03
```

```
t =

   4.2108e+03


t =

   4.2115e+03


t =

   4.2115e+03


t =

   4.2130e+03


t =

   4.2137e+03


t =

   4.2174e+03


t =

   4.2181e+03


t =

   4.2189e+03


t =

   4.2189e+03
```

```
t =

   4.2203e+03


t =

   4.2210e+03


t =

   4.2246e+03


t =

   4.2252e+03


t =

   4.2260e+03


t =

   4.2260e+03


t =

   4.2274e+03


t =

   4.2281e+03


t =

   4.2315e+03


t =
```

4.2321e+03

t =

4.2329e+03

t =

4.2329e+03

t =

4.2341e+03

t =

4.2346e+03

t =

4.2375e+03

t =

4.2380e+03

t =

4.2387e+03

t =

4.2387e+03

t =

4.2399e+03

```
t =

   4.2405e+03


t =

   4.2434e+03


t =

   4.2439e+03


t =

   4.2446e+03


t =

   4.2446e+03


t =

   4.2460e+03


t =

   4.2467e+03


t =

   4.2503e+03


t =

   4.2509e+03
```

```
t =

   4.2517e+03


t =

   4.2517e+03


t =

   4.2531e+03


t =

   4.2537e+03


t =

   4.2572e+03


t =

   4.2578e+03


t =

   4.2586e+03


t =

   4.2586e+03


t =

   4.2600e+03


t =
```

```
    4.2607e+03


t =

    4.2643e+03


t =

    4.2649e+03


t =

    4.2657e+03


t =

    4.2657e+03


t =

    4.2669e+03


t =

    4.2675e+03


t =

    4.2706e+03


t =

    4.2711e+03


t =

    4.2718e+03
```

```
t =

   4.2718e+03


t =

   4.2730e+03


t =

   4.2736e+03


t =

   4.2765e+03


t =

   4.2771e+03


t =

   4.2777e+03


t =

   4.2777e+03


t =

   4.2791e+03


t =

   4.2798e+03
```

```
t =

   4.2833e+03


t =

   4.2839e+03


t =

   4.2847e+03


t =

   4.2847e+03


t =

   4.2860e+03


t =

   4.2867e+03


t =

   4.2900e+03


t =

   4.2906e+03


t =

   4.2914e+03


t =
```

```
    4.2914e+03


t =

    4.2928e+03


t =

    4.2935e+03


t =

    4.2970e+03


t =

    4.2976e+03


t =

    4.2984e+03


t =

    4.2984e+03


t =

    4.2997e+03


t =

    4.3003e+03


t =

    4.3034e+03
```

```
t =

   4.3040e+03


t =

   4.3047e+03


t =

   4.3047e+03


t =

   4.3059e+03


t =

   4.3065e+03


t =

   4.3096e+03


t =

   4.3102e+03


t =

   4.3108e+03


t =

   4.3108e+03
```

```
t =

   4.3122e+03


t =

   4.3129e+03


t =

   4.3165e+03


t =

   4.3171e+03


t =

   4.3179e+03


t =

   4.3179e+03


t =

   4.3192e+03


t =

   4.3198e+03


t =

   4.3230e+03


t =
```

```
    4.3236e+03


t =

    4.3243e+03


t =

    4.3243e+03


t =

    4.3257e+03


t =

    4.3264e+03


t =

    4.3298e+03


t =

    4.3304e+03


t =

    4.3312e+03


t =

    4.3312e+03


t =

    4.3324e+03
```

```
t =

   4.3330e+03


t =

   4.3362e+03


t =

   4.3367e+03


t =

   4.3374e+03


t =

   4.3374e+03


t =

   4.3387e+03


t =

   4.3394e+03


t =

   4.3425e+03


t =

   4.3431e+03
```

```
t =

    4.3438e+03


t =

    4.3438e+03


t =

    4.3453e+03


t =

    4.3460e+03


t =

    4.3497e+03


t =

    4.3503e+03


t =

    4.3512e+03


t =

    4.3512e+03


t =

    4.3524e+03


t =
```

```
    4.3531e+03


t =

    4.3563e+03


t =

    4.3568e+03


t =

    4.3575e+03


t =

    4.3575e+03


t =

    4.3588e+03


t =

    4.3595e+03


t =

    4.3627e+03


t =

    4.3633e+03


t =

    4.3640e+03
```

```
t =

    4.3640e+03


t =

    4.3652e+03


t =

    4.3658e+03


t =

    4.3689e+03


t =

    4.3694e+03


t =

    4.3701e+03


t =

    4.3701e+03


t =

    4.3714e+03


t =

    4.3721e+03
```

```
t =

   4.3753e+03


t =

   4.3759e+03


t =

   4.3766e+03


t =

   4.3766e+03


t =

   4.3782e+03


t =

   4.3789e+03


t =

   4.3828e+03


t =

   4.3835e+03


t =

   4.3843e+03


t =
```

```
      4.3843e+03


t =

      4.3856e+03


t =

      4.3863e+03


t =

      4.3895e+03


t =

      4.3901e+03


t =

      4.3908e+03


t =

      4.3908e+03


t =

      4.3921e+03


t =

      4.3927e+03


t =

      4.3958e+03
```

```
t =

   4.3964e+03


t =

   4.3971e+03


t =

   4.3971e+03


t =

   4.3982e+03


t =

   4.3988e+03


t =

   4.4017e+03


t =

   4.4023e+03


t =

   4.4029e+03


t =

   4.4029e+03
```

```
t =

   4.4042e+03


t =

   4.4048e+03


t =

   4.4081e+03


t =

   4.4087e+03


t =

   4.4094e+03


t =

   4.4094e+03


t =

   4.4110e+03


t =

   4.4118e+03


t =

   4.4157e+03


t =
```

4.4164e+03

t =

4.4173e+03

t =

4.4173e+03

t =

4.4186e+03

t =

4.4193e+03

t =

4.4227e+03

t =

4.4233e+03

t =

4.4240e+03

t =

4.4240e+03

t =

4.4253e+03

```
t =

   4.4259e+03


t =

   4.4290e+03


t =

   4.4295e+03


t =

   4.4302e+03


t =

   4.4302e+03


t =

   4.4313e+03


t =

   4.4319e+03


t =

   4.4347e+03


t =

   4.4352e+03
```

```
t =

   4.4358e+03


t =

   4.4358e+03


t =

   4.4371e+03


t =

   4.4377e+03


t =

   4.4409e+03


t =

   4.4415e+03


t =

   4.4422e+03


t =

   4.4422e+03


t =

   4.4437e+03


t =
```

```
    4.4445e+03


t =

    4.4484e+03


t =

    4.4491e+03


t =

    4.4500e+03


t =

    4.4500e+03


t =

    4.4513e+03


t =

    4.4520e+03


t =

    4.4555e+03


t =

    4.4561e+03


t =

    4.4569e+03
```

```
t =

   4.4569e+03


t =

   4.4582e+03


t =

   4.4588e+03


t =

   4.4620e+03


t =

   4.4626e+03


t =

   4.4633e+03


t =

   4.4633e+03


t =

   4.4645e+03


t =

   4.4650e+03
```

```
t =

   4.4678e+03


t =

   4.4683e+03


t =

   4.4689e+03


t =

   4.4689e+03


t =

   4.4702e+03


t =

   4.4708e+03


t =

   4.4739e+03


t =

   4.4744e+03


t =

   4.4751e+03


t =
```

```
    4.4751e+03


t =

    4.4766e+03


t =

    4.4773e+03


t =

    4.4811e+03


t =

    4.4817e+03


t =

    4.4826e+03


t =

    4.4826e+03


t =

    4.4840e+03


t =

    4.4847e+03


t =

    4.4882e+03
```

```
t =

   4.4888e+03


t =

   4.4896e+03


t =

   4.4896e+03


t =

   4.4909e+03


t =

   4.4916e+03


t =

   4.4950e+03


t =

   4.4956e+03


t =

   4.4963e+03


t =

   4.4963e+03
```

```
t =

   4.4975e+03


t =

   4.4981e+03


t =

   4.5010e+03


t =

   4.5015e+03


t =

   4.5021e+03


t =

   4.5021e+03


t =

   4.5033e+03


t =

   4.5039e+03


t =

   4.5069e+03


t =
```

```
    4.5075e+03


t =

    4.5081e+03


t =

    4.5081e+03


t =

    4.5096e+03


t =

    4.5103e+03


t =

    4.5139e+03


t =

    4.5145e+03


t =

    4.5153e+03


t =

    4.5153e+03


t =

    4.5167e+03
```

```
t =

   4.5174e+03


t =

   4.5208e+03


t =

   4.5215e+03


t =

   4.5222e+03


t =

   4.5222e+03


t =

   4.5236e+03


t =

   4.5243e+03


t =

   4.5278e+03


t =

   4.5284e+03
```

```
t =

   4.5292e+03


t =

   4.5292e+03


t =

   4.5304e+03


t =

   4.5310e+03


t =

   4.5340e+03


t =

   4.5345e+03


t =

   4.5352e+03


t =

   4.5352e+03


t =

   4.5364e+03


t =
```

```
    4.5370e+03


t =

    4.5400e+03


t =

    4.5406e+03


t =

    4.5412e+03


t =

    4.5412e+03


t =

    4.5427e+03


t =

    4.5434e+03


t =

    4.5469e+03


t =

    4.5475e+03


t =

    4.5483e+03
```

```
t =

   4.5483e+03


t =

   4.5496e+03


t =

   4.5503e+03


t =

   4.5537e+03


t =

   4.5543e+03


t =

   4.5550e+03


t =

   4.5550e+03


t =

   4.5564e+03


t =

   4.5571e+03
```

```
t =

    4.5606e+03


t =

    4.5612e+03


t =

    4.5620e+03


t =

    4.5620e+03


t =

    4.5632e+03


t =

    4.5638e+03


t =

    4.5669e+03


t =

    4.5675e+03


t =

    4.5682e+03


t =
```

```
    4.5682e+03


t =

    4.5694e+03


t =

    4.5700e+03


t =

    4.5731e+03


t =

    4.5736e+03


t =

    4.5743e+03


t =

    4.5743e+03


t =

    4.5757e+03


t =

    4.5765e+03


t =

    4.5800e+03
```

```
t =

   4.5806e+03


t =

   4.5814e+03


t =

   4.5814e+03


t =

   4.5827e+03


t =

   4.5834e+03


t =

   4.5867e+03


t =

   4.5872e+03


t =

   4.5880e+03


t =

   4.5880e+03
```

```
t =

   4.5893e+03


t =

   4.5900e+03


t =

   4.5934e+03


t =

   4.5940e+03


t =

   4.5948e+03


t =

   4.5948e+03


t =

   4.5960e+03


t =

   4.5966e+03


t =

   4.5997e+03


t =
```

```
    4.6003e+03


t =

    4.6010e+03


t =

    4.6010e+03


t =

    4.6022e+03


t =

    4.6029e+03


t =

    4.6060e+03


t =

    4.6066e+03


t =

    4.6073e+03


t =

    4.6073e+03


t =

    4.6088e+03
```

```
t =

   4.6095e+03


t =

   4.6132e+03


t =

   4.6139e+03


t =

   4.6147e+03


t =

   4.6147e+03


t =

   4.6160e+03


t =

   4.6166e+03


t =

   4.6198e+03


t =

   4.6204e+03
```

```
t =

   4.6211e+03


t =

   4.6211e+03


t =

   4.6224e+03


t =

   4.6231e+03


t =

   4.6263e+03


t =

   4.6269e+03


t =

   4.6276e+03


t =

   4.6276e+03


t =

   4.6288e+03


t =
```

```
        4.6294e+03


t =

        4.6325e+03


t =

        4.6330e+03


t =

        4.6337e+03


t =

        4.6337e+03


t =

        4.6350e+03


t =

        4.6356e+03


t =

        4.6388e+03


t =

        4.6394e+03


t =

        4.6401e+03
```

```
t =

   4.6401e+03


t =

   4.6417e+03


t =

   4.6424e+03


t =

   4.6463e+03


t =

   4.6470e+03


t =

   4.6478e+03


t =

   4.6478e+03


t =

   4.6491e+03


t =

   4.6498e+03
```

```
t =

   4.6531e+03


t =

   4.6537e+03


t =

   4.6544e+03


t =

   4.6544e+03


t =

   4.6556e+03


t =

   4.6563e+03


t =

   4.6594e+03


t =

   4.6600e+03


t =

   4.6607e+03


t =
```

```
    4.6607e+03


t =

    4.6618e+03


t =

    4.6624e+03


t =

    4.6653e+03


t =

    4.6658e+03


t =

    4.6665e+03


t =

    4.6665e+03


t =

    4.6678e+03


t =

    4.6684e+03


t =

    4.6716e+03
```

```
t =

   4.6722e+03


t =

   4.6729e+03


t =

   4.6729e+03


t =

   4.6745e+03


t =

   4.6753e+03


t =

   4.6792e+03


t =

   4.6799e+03


t =

   4.6808e+03


t =

   4.6808e+03
```

```
t =

   4.6821e+03


t =

   4.6828e+03


t =

   4.6862e+03


t =

   4.6868e+03


t =

   4.6875e+03


t =

   4.6875e+03


t =

   4.6888e+03


t =

   4.6894e+03


t =

   4.6925e+03


t =
```

```
    4.6931e+03


t =

    4.6938e+03


t =

    4.6938e+03


t =

    4.6949e+03


t =

    4.6955e+03


t =

    4.6983e+03


t =

    4.6988e+03


t =

    4.6994e+03


t =

    4.6994e+03


t =

    4.7007e+03
```

```
t =

   4.7013e+03


t =

   4.7045e+03


t =

   4.7050e+03


t =

   4.7057e+03


t =

   4.7057e+03


t =

   4.7073e+03


t =

   4.7080e+03


t =

   4.7119e+03


t =

   4.7126e+03
```

```
t =

   4.7135e+03


t =

   4.7135e+03


t =

   4.7148e+03


t =

   4.7155e+03


t =

   4.7190e+03


t =

   4.7196e+03


t =

   4.7204e+03


t =

   4.7204e+03


t =

   4.7217e+03


t =
```

```
    4.7223e+03


t =

    4.7256e+03


t =

    4.7262e+03


t =

    4.7269e+03


t =

    4.7269e+03


t =

    4.7280e+03


t =

    4.7286e+03


t =

    4.7314e+03


t =

    4.7319e+03


t =

    4.7325e+03
```

```
t =

   4.7325e+03


t =

   4.7338e+03


t =

   4.7344e+03


t =

   4.7374e+03


t =

   4.7380e+03


t =

   4.7387e+03


t =

   4.7387e+03


t =

   4.7402e+03


t =

   4.7409e+03
```

```
t =

   4.7446e+03


t =

   4.7453e+03


t =

   4.7461e+03


t =

   4.7461e+03


t =

   4.7475e+03


t =

   4.7482e+03


t =

   4.7517e+03


t =

   4.7523e+03


t =

   4.7531e+03


t =
```

```
   4.7531e+03


t =

   4.7544e+03


t =

   4.7551e+03


t =

   4.7585e+03


t =

   4.7591e+03


t =

   4.7599e+03


t =

   4.7599e+03


t =

   4.7610e+03


t =

   4.7616e+03


t =

   4.7645e+03
```

```
t =

   4.7650e+03


t =

   4.7657e+03


t =

   4.7657e+03


t =

   4.7669e+03


t =

   4.7675e+03


t =

   4.7705e+03


t =

   4.7710e+03


t =

   4.7717e+03


t =

   4.7717e+03
```

```
t =

   4.7732e+03


t =

   4.7739e+03


t =

   4.7775e+03


t =

   4.7781e+03


t =

   4.7789e+03


t =

   4.7789e+03


t =

   4.7803e+03


t =

   4.7810e+03


t =

   4.7844e+03


t =
```

```
    4.7850e+03


t =

    4.7858e+03


t =

    4.7858e+03


t =

    4.7872e+03


t =

    4.7879e+03


t =

    4.7913e+03


t =

    4.7920e+03


t =

    4.7927e+03


t =

    4.7927e+03


t =

    4.7939e+03
```

```
t =

    4.7945e+03


t =

    4.7975e+03


t =

    4.7981e+03


t =

    4.7987e+03


t =

    4.7987e+03


t =

    4.8000e+03


t =

    4.8006e+03


t =

    4.8036e+03


t =

    4.8041e+03
```

```
t =

   4.8048e+03


t =

   4.8048e+03


t =

   4.8062e+03


t =

   4.8069e+03


t =

   4.8105e+03


t =

   4.8111e+03


t =

   4.8119e+03


t =

   4.8119e+03


t =

   4.8132e+03


t =
```

```
    4.8139e+03


t =

    4.8173e+03


t =

    4.8179e+03


t =

    4.8186e+03


t =

    4.8186e+03


t =

    4.8200e+03


t =

    4.8207e+03


t =

    4.8241e+03


t =

    4.8248e+03


t =

    4.8255e+03
```

```
t =

   4.8255e+03


t =

   4.8268e+03


t =

   4.8274e+03


t =

   4.8305e+03


t =

   4.8310e+03


t =

   4.8317e+03


t =

   4.8317e+03


t =

   4.8329e+03


t =

   4.8335e+03
```

```
t =

   4.8366e+03


t =

   4.8372e+03


t =

   4.8379e+03


t =

   4.8379e+03


t =

   4.8393e+03


t =

   4.8400e+03


t =

   4.8436e+03


t =

   4.8442e+03


t =

   4.8450e+03


t =
```

```
    4.8450e+03


t =

    4.8463e+03


t =

    4.8470e+03


t =

    4.8503e+03


t =

    4.8509e+03


t =

    4.8516e+03


t =

    4.8516e+03


t =

    4.8529e+03


t =

    4.8536e+03


t =

    4.8570e+03
```

```
t =

   4.8576e+03


t =

   4.8583e+03


t =

   4.8583e+03


t =

   4.8596e+03


t =

   4.8602e+03


t =

   4.8633e+03


t =

   4.8638e+03


t =

   4.8645e+03


t =

   4.8645e+03
```

```
t =

    4.8657e+03


t =

    4.8664e+03


t =

    4.8695e+03


t =

    4.8701e+03


t =

    4.8708e+03


t =

    4.8708e+03


t =

    4.8723e+03


t =

    4.8730e+03


t =

    4.8768e+03


t =
```

```
    4.8774e+03



t =

    4.8782e+03



t =

    4.8782e+03



t =

    4.8795e+03



t =

    4.8802e+03



t =

    4.8835e+03



t =

    4.8840e+03



t =

    4.8848e+03



t =

    4.8848e+03



t =

    4.8860e+03
```

```
t =

    4.8867e+03


t =

    4.8899e+03


t =

    4.8905e+03


t =

    4.8912e+03


t =

    4.8912e+03


t =

    4.8924e+03


t =

    4.8930e+03


t =

    4.8960e+03


t =

    4.8966e+03
```

```
t =

   4.8972e+03


t =

   4.8972e+03


t =

   4.8985e+03


t =

   4.8991e+03


t =

   4.9024e+03


t =

   4.9029e+03


t =

   4.9036e+03


t =

   4.9036e+03


t =

   4.9052e+03


t =
```

```
    4.9060e+03


t =

    4.9098e+03


t =

    4.9105e+03


t =

    4.9114e+03


t =

    4.9114e+03


t =

    4.9127e+03


t =

    4.9133e+03


t =

    4.9167e+03


t =

    4.9172e+03


t =

    4.9180e+03
```

```
t =

   4.9180e+03


t =

   4.9192e+03


t =

   4.9199e+03


t =

   4.9230e+03


t =

   4.9236e+03


t =

   4.9243e+03


t =

   4.9243e+03


t =

   4.9254e+03


t =

   4.9260e+03
```

```
t =

   4.9289e+03


t =

   4.9294e+03


t =

   4.9300e+03


t =

   4.9300e+03


t =

   4.9313e+03


t =

   4.9320e+03


t =

   4.9352e+03


t =

   4.9357e+03


t =

   4.9364e+03


t =
```

```
                  4.9364e+03


t =

                  4.9380e+03


t =

                  4.9388e+03


t =

                  4.9427e+03


t =

                  4.9434e+03


t =

                  4.9443e+03


t =

                  4.9443e+03


t =

                  4.9456e+03


t =

                  4.9463e+03


t =

                  4.9497e+03
```

```
t =

   4.9503e+03


t =

   4.9510e+03


t =

   4.9510e+03


t =

   4.9523e+03


t =

   4.9529e+03


t =

   4.9561e+03


t =

   4.9567e+03


t =

   4.9574e+03


t =

   4.9574e+03
```

```
t =

   4.9585e+03


t =

   4.9591e+03


t =

   4.9619e+03


t =

   4.9624e+03


t =

   4.9630e+03


t =

   4.9630e+03


t =

   4.9643e+03


t =

   4.9649e+03


t =

   4.9680e+03


t =
```

4.9686e+03

t =

4.9693e+03

t =

4.9693e+03

t =

4.9708e+03

t =

4.9716e+03

t =

4.9754e+03

t =

4.9761e+03

t =

4.9769e+03

t =

4.9769e+03

t =

4.9783e+03

```
t =

   4.9790e+03


t =

   4.9825e+03


t =

   4.9831e+03


t =

   4.9839e+03


t =

   4.9839e+03


t =

   4.9852e+03


t =

   4.9858e+03


t =

   4.9891e+03


t =

   4.9897e+03
```

```
t =

   4.9904e+03


t =

   4.9904e+03


t =

   4.9916e+03


t =

   4.9922e+03


t =

   4.9950e+03


t =

   4.9955e+03


t =

   4.9961e+03


t =

   4.9961e+03


t =

   4.9974e+03


t =
```

```
    4.9980e+03


t =

    5.0010e+03


t =

    5.0016e+03


t =

    5.0022e+03


t =

    5.0022e+03


t =

    5.0037e+03


t =

    5.0045e+03


t =

    5.0082e+03


t =

    5.0088e+03


t =

    5.0097e+03
```

```
t =

   5.0097e+03


t =

   5.0110e+03


t =

   5.0117e+03


t =

   5.0152e+03


t =

   5.0158e+03


t =

   5.0166e+03


t =

   5.0166e+03


t =

   5.0180e+03


t =

   5.0186e+03
```

t =

   5.0220e+03

t =

   5.0227e+03

t =

   5.0234e+03

t =

   5.0234e+03

t =

   5.0246e+03

t =

   5.0252e+03

t =

   5.0281e+03

t =

   5.0286e+03

t =

   5.0293e+03

t =

```
    5.0293e+03
```

```
t =
```

```
    5.0305e+03
```

```
t =
```

```
    5.0311e+03
```

```
t =
```

```
    5.0341e+03
```

```
t =
```

```
    5.0346e+03
```

```
t =
```

```
    5.0353e+03
```

```
t =
```

```
    5.0353e+03
```

```
t =
```

```
    5.0367e+03
```

```
t =
```

```
    5.0374e+03
```

```
t =
```

```
    5.0410e+03
```

```
t =

    5.0417e+03


t =

    5.0425e+03


t =

    5.0425e+03


t =

    5.0439e+03


t =

    5.0445e+03


t =

    5.0480e+03


t =

    5.0486e+03


t =

    5.0493e+03


t =

    5.0493e+03
```

```
t =

   5.0507e+03


t =

   5.0514e+03


t =

   5.0549e+03


t =

   5.0555e+03


t =

   5.0563e+03


t =

   5.0563e+03


t =

   5.0575e+03


t =

   5.0581e+03


t =

   5.0611e+03


t =
```

```
5.0616e+03
```

t =

```
5.0623e+03
```

t =

```
5.0623e+03
```

t =

```
5.0635e+03
```

t =

```
5.0641e+03
```

t =

```
5.0671e+03
```

t =

```
5.0677e+03
```

t =

```
5.0684e+03
```

t =

```
5.0684e+03
```

t =

```
5.0698e+03
```

```
t =

   5.0705e+03


t =

   5.0741e+03


t =

   5.0747e+03


t =

   5.0755e+03


t =

   5.0755e+03


t =

   5.0768e+03


t =

   5.0775e+03


t =

   5.0808e+03


t =

   5.0814e+03
```

```
t =

   5.0822e+03


t =

   5.0822e+03


t =

   5.0836e+03


t =

   5.0842e+03


t =

   5.0877e+03


t =

   5.0883e+03


t =

   5.0891e+03


t =

   5.0891e+03


t =

   5.0903e+03


t =
```

```
        5.0909e+03


t =

        5.0940e+03


t =

        5.0945e+03


t =

        5.0952e+03


t =

        5.0952e+03


t =

        5.0964e+03


t =

        5.0971e+03


t =

        5.1002e+03


t =

        5.1007e+03


t =

        5.1014e+03
```

```
t =

   5.1014e+03


t =

   5.1028e+03


t =

   5.1036e+03


t =

   5.1072e+03


t =

   5.1078e+03


t =

   5.1086e+03


t =

   5.1086e+03


t =

   5.1099e+03


t =

   5.1106e+03
```

```
t =

   5.1139e+03


t =

   5.1145e+03


t =

   5.1152e+03


t =

   5.1152e+03


t =

   5.1165e+03


t =

   5.1172e+03


t =

   5.1205e+03


t =

   5.1211e+03


t =

   5.1219e+03


t =
```

```
    5.1219e+03


t =

    5.1231e+03


t =

    5.1237e+03


t =

    5.1268e+03


t =

    5.1273e+03


t =

    5.1280e+03


t =

    5.1280e+03


t =

    5.1293e+03


t =

    5.1299e+03


t =

    5.1331e+03
```

```
t =

   5.1336e+03


t =

   5.1343e+03


t =

   5.1343e+03


t =

   5.1358e+03


t =

   5.1366e+03


t =

   5.1403e+03


t =

   5.1410e+03


t =

   5.1418e+03


t =

   5.1418e+03
```

```
t =

   5.1431e+03


t =

   5.1438e+03


t =

   5.1471e+03


t =

   5.1476e+03


t =

   5.1484e+03


t =

   5.1484e+03


t =

   5.1497e+03


t =

   5.1503e+03


t =

   5.1535e+03


t =
```

```
        5.1541e+03


t =

        5.1548e+03


t =

        5.1548e+03


t =

        5.1560e+03


t =

        5.1566e+03


t =

        5.1596e+03


t =

        5.1601e+03


t =

        5.1608e+03


t =

        5.1608e+03


t =

        5.1620e+03
```

```
t =

   5.1627e+03


t =

   5.1659e+03


t =

   5.1664e+03


t =

   5.1672e+03


t =

   5.1672e+03


t =

   5.1687e+03


t =

   5.1695e+03


t =

   5.1733e+03


t =

   5.1740e+03
```

```
t =

   5.1749e+03


t =

   5.1749e+03


t =

   5.1762e+03


t =

   5.1769e+03


t =

   5.1802e+03


t =

   5.1808e+03


t =

   5.1816e+03


t =

   5.1816e+03


t =

   5.1828e+03


t =
```

```
       5.1834e+03


t  =

       5.1866e+03


t  =

       5.1872e+03


t  =

       5.1879e+03


t  =

       5.1879e+03


t  =

       5.1890e+03


t  =

       5.1896e+03


t  =

       5.1925e+03


t  =

       5.1930e+03


t  =

       5.1936e+03
```

```
t =

   5.1936e+03


t =

   5.1949e+03


t =

   5.1955e+03


t =

   5.1987e+03


t =

   5.1993e+03


t =

   5.2000e+03


t =

   5.2000e+03


t =

   5.2015e+03


t =

   5.2023e+03
```

```
t =

   5.2062e+03


t =

   5.2069e+03


t =

   5.2078e+03


t =

   5.2078e+03


t =

   5.2091e+03


t =

   5.2098e+03


t =

   5.2132e+03


t =

   5.2138e+03


t =

   5.2146e+03


t =
```

```
    5.2146e+03


t =

    5.2159e+03


t =

    5.2165e+03


t =

    5.2197e+03


t =

    5.2203e+03


t =

    5.2210e+03


t =

    5.2210e+03


t =

    5.2221e+03


t =

    5.2227e+03


t =

    5.2255e+03
```

```
t =

   5.2260e+03


t =

   5.2266e+03


t =

   5.2266e+03


t =

   5.2279e+03


t =

   5.2285e+03


t =

   5.2316e+03


t =

   5.2321e+03


t =

   5.2328e+03


t =

   5.2328e+03
```

```
t =

   5.2344e+03


t =

   5.2351e+03


t =

   5.2389e+03


t =

   5.2396e+03


t =

   5.2405e+03


t =

   5.2405e+03


t =

   5.2418e+03


t =

   5.2425e+03


t =

   5.2460e+03


t =
```

```
    5.2466e+03


t =

    5.2474e+03


t =

    5.2474e+03


t =

    5.2487e+03


t =

    5.2494e+03


t =

    5.2527e+03


t =

    5.2533e+03


t =

    5.2540e+03


t =

    5.2540e+03


t =

    5.2552e+03
```

```
t =

   5.2557e+03


t =

   5.2586e+03


t =

   5.2591e+03


t =

   5.2597e+03


t =

   5.2597e+03


t =

   5.2609e+03


t =

   5.2616e+03


t =

   5.2646e+03


t =

   5.2651e+03
```

```
t =

    5.2658e+03


t =

    5.2658e+03


t =

    5.2673e+03


t =

    5.2680e+03


t =

    5.2717e+03


t =

    5.2724e+03


t =

    5.2732e+03


t =

    5.2732e+03


t =

    5.2746e+03


t =
```

```
    5.2753e+03


t =

    5.2787e+03


t =

    5.2793e+03


t =

    5.2801e+03


t =

    5.2801e+03


t =

    5.2815e+03


t =

    5.2822e+03


t =

    5.2856e+03


t =

    5.2862e+03


t =

    5.2870e+03
```

```
t =

   5.2870e+03


t =

   5.2881e+03


t =

   5.2887e+03


t =

   5.2917e+03


t =

   5.2922e+03


t =

   5.2928e+03


t =

   5.2928e+03


t =

   5.2940e+03


t =

   5.2946e+03
```

```
t =

   5.2977e+03


t =

   5.2982e+03


t =

   5.2989e+03


t =

   5.2989e+03


t =

   5.3003e+03


t =

   5.3010e+03


t =

   5.3046e+03


t =

   5.3052e+03


t =

   5.3060e+03


t =
```

```
    5.3060e+03


t =

    5.3074e+03


t =

    5.3081e+03


t =

    5.3115e+03


t =

    5.3121e+03


t =

    5.3129e+03


t =

    5.3129e+03


t =

    5.3143e+03


t =

    5.3150e+03


t =

    5.3184e+03
```

```
t =

   5.3190e+03


t =

   5.3198e+03


t =

   5.3198e+03


t =

   5.3210e+03


t =

   5.3216e+03


t =

   5.3246e+03


t =

   5.3252e+03


t =

   5.3258e+03


t =

   5.3258e+03
```

```
t =

   5.3271e+03


t =

   5.3277e+03


t =

   5.3307e+03


t =

   5.3313e+03


t =

   5.3319e+03


t =

   5.3319e+03


t =

   5.3334e+03


t =

   5.3341e+03


t =

   5.3376e+03


t =
```

5.3383e+03

t =

5.3391e+03

t =

5.3391e+03

t =

5.3404e+03

t =

5.3411e+03

t =

5.3444e+03

t =

5.3450e+03

t =

5.3457e+03

t =

5.3457e+03

t =

5.3471e+03

```
t =

   5.3478e+03


t =

   5.3512e+03


t =

   5.3518e+03


t =

   5.3526e+03


t =

   5.3526e+03


t =

   5.3538e+03


t =

   5.3544e+03


t =

   5.3575e+03


t =

   5.3581e+03
```

```
t =

   5.3587e+03


t =

   5.3587e+03


t =

   5.3600e+03


t =

   5.3606e+03


t =

   5.3637e+03


t =

   5.3643e+03


t =

   5.3649e+03


t =

   5.3649e+03


t =

   5.3664e+03


t =
```

```
    5.3671e+03


t =

    5.3708e+03


t =

    5.3714e+03


t =

    5.3722e+03


t =

    5.3722e+03


t =

    5.3735e+03


t =

    5.3742e+03


t =

    5.3775e+03


t =

    5.3781e+03


t =

    5.3788e+03
```

```
t =

   5.3788e+03


t =

   5.3801e+03


t =

   5.3808e+03


t =

   5.3841e+03


t =

   5.3847e+03


t =

   5.3854e+03


t =

   5.3854e+03


t =

   5.3867e+03


t =

   5.3873e+03
```

```
t =

   5.3903e+03


t =

   5.3909e+03


t =

   5.3915e+03


t =

   5.3915e+03


t =

   5.3928e+03


t =

   5.3934e+03


t =

   5.3966e+03


t =

   5.3972e+03


t =

   5.3979e+03


t =
```

```
    5.3979e+03


t =

    5.3994e+03


t =

    5.4001e+03


t =

    5.4039e+03


t =

    5.4045e+03


t =

    5.4054e+03


t =

    5.4054e+03


t =

    5.4067e+03


t =

    5.4074e+03


t =

    5.4106e+03
```

```
t =

   5.4112e+03


t =

   5.4120e+03


t =

   5.4120e+03


t =

   5.4132e+03


t =

   5.4139e+03


t =

   5.4171e+03


t =

   5.4177e+03


t =

   5.4184e+03


t =

   5.4184e+03
```

```
t =

    5.4196e+03


t =

    5.4202e+03


t =

    5.4231e+03


t =

    5.4237e+03


t =

    5.4243e+03


t =

    5.4243e+03


t =

    5.4256e+03


t =

    5.4262e+03


t =

    5.4294e+03


t =
```

```
          5.4300e+03


t  =

          5.4307e+03


t  =

          5.4307e+03


t  =

          5.4322e+03


t  =

          5.4330e+03


t  =

          5.4369e+03


t  =

          5.4376e+03


t  =

          5.4384e+03


t  =

          5.4384e+03


t  =

          5.4398e+03
```

```
t =

   5.4404e+03


t =

   5.4438e+03


t =

   5.4444e+03


t =

   5.4451e+03


t =

   5.4451e+03


t =

   5.4464e+03


t =

   5.4470e+03


t =

   5.4502e+03


t =

   5.4507e+03
```

```
t =

   5.4515e+03


t =

   5.4515e+03


t =

   5.4526e+03


t =

   5.4532e+03


t =

   5.4560e+03


t =

   5.4565e+03


t =

   5.4572e+03


t =

   5.4572e+03


t =

   5.4584e+03


t =
```

```
    5.4591e+03


t =

    5.4622e+03


t =

    5.4628e+03


t =

    5.4635e+03


t =

    5.4635e+03


t =

    5.4650e+03


t =

    5.4658e+03


t =

    5.4697e+03


t =

    5.4704e+03


t =

    5.4713e+03
```

```
t =

   5.4713e+03


t =

   5.4726e+03


t =

   5.4733e+03


t =

   5.4767e+03


t =

   5.4774e+03


t =

   5.4781e+03


t =

   5.4781e+03


t =

   5.4794e+03


t =

   5.4800e+03
```

```
t =

   5.4833e+03


t =

   5.4838e+03


t =

   5.4845e+03


t =

   5.4845e+03


t =

   5.4857e+03


t =

   5.4862e+03


t =

   5.4891e+03


t =

   5.4896e+03


t =

   5.4902e+03


t =
```

```
    5.4902e+03


t =

    5.4914e+03


t =

    5.4921e+03


t =

    5.4952e+03


t =

    5.4957e+03


t =

    5.4964e+03


t =

    5.4964e+03


t =

    5.4979e+03


t =

    5.4987e+03


t =

    5.5024e+03
```

```
t =

   5.5031e+03


t =

   5.5040e+03


t =

   5.5040e+03


t =

   5.5054e+03


t =

   5.5060e+03


t =

   5.5095e+03


t =

   5.5101e+03


t =

   5.5109e+03


t =

   5.5109e+03
```

```
t =

   5.5122e+03


t =

   5.5129e+03


t =

   5.5162e+03


t =

   5.5168e+03


t =

   5.5176e+03


t =

   5.5176e+03


t =

   5.5187e+03


t =

   5.5193e+03


t =

   5.5222e+03


t =
```

```
    5.5227e+03


t =

    5.5233e+03


t =

    5.5233e+03


t =

    5.5245e+03


t =

    5.5251e+03


t =

    5.5282e+03


t =

    5.5287e+03


t =

    5.5294e+03


t =

    5.5294e+03


t =

    5.5308e+03
```

```
t =

   5.5316e+03


t =

   5.5352e+03


t =

   5.5359e+03


t =

   5.5367e+03


t =

   5.5367e+03


t =

   5.5381e+03


t =

   5.5388e+03


t =

   5.5423e+03


t =

   5.5429e+03
```

```
t =

   5.5436e+03


t =

   5.5436e+03


t =

   5.5450e+03


t =

   5.5457e+03


t =

   5.5491e+03


t =

   5.5497e+03


t =

   5.5505e+03


t =

   5.5505e+03


t =

   5.5517e+03


t =
```

```
    5.5523e+03


t =

    5.5552e+03


t =

    5.5557e+03


t =

    5.5564e+03


t =

    5.5564e+03


t =

    5.5576e+03


t =

    5.5582e+03


t =

    5.5612e+03


t =

    5.5618e+03


t =

    5.5624e+03
```

```
t =

   5.5624e+03


t =

   5.5639e+03


t =

   5.5646e+03


t =

   5.5682e+03


t =

   5.5688e+03


t =

   5.5696e+03


t =

   5.5696e+03


t =

   5.5710e+03


t =

   5.5717e+03
```

```
t =

   5.5751e+03


t =

   5.5757e+03


t =

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```

```
t =

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t =

      6000
```

Reference Frame Functions

```
function Clvlhg = ECItoLVLH( r , v )
% Take in ECI state and generate LVLH vectrix. Uses this vectrix to
 create
% direction cosine matrix to rotate ECI to LVLH
    rd = r/norm(r) ;
    vd = v/norm(v) ;
    zLVLH = -rd ;
    yLVLH = -cross( r , v )/norm( cross( r , v ) ) ;
    xLVLH = cross( yLVLH , zLVLH ) ;
    Flvlh = [ xLVLH , yLVLH , zLVLH ] ;
    Clvlhg = Flvlh' ;
end
```

HomeMade Quat2Rotm

```
function C = quat2rotm(quat)
% Input the quat in the [eta , eps ] form
eta = quat(1) ;
eps = quat(2:4)' ;
epsx = [0,-eps(3),eps(2);eps(3),0,-eps(1);-eps(2),eps(1),0] ;
C = (2*eta-1)*eye(3)+2*eps*eps'-2*eta*epsx ; % Defines the rotation
 matrix for the given quat
end
```

HomeMade Rotm2Quat

```
function quat = rotm2quat(C)
% Input 3x3 rotation and get [eta , eps] out
eta = sqrt(trace(C)+1)/2 ;
eps(1) = (C(2,3)-C(3,2))/(4*eta) ;
eps(2) = (C(3,1)-C(1,3))/(4*eta) ;
eps(3) = (C(1,2)-C(2,1))/(4*eta) ;
quat = [eta , eps] ;
end
```

General ODE Function

```
function dstate = RxnWheels(t,state,Isc,Iw,mu,kp,kd)
```

```matlab
% State 1 -> 4 are the quaternions, scalar first
% State 5 -> 7 is the angular velocity of s/c
% State 8 -> 10 is the angular velocity of wheels
% State 11 -> 13 is the position in ECI in km
% State 14 -> 16 is the veloctiy in ECI in km/s
% State 17 -> 19 is the Euler Angles in ECI in
% State 20 -> 23 is the quaternion of ECI to LVLH
% Remove before turning in, just for seeing progress
t

    dstate = zeros(13,1) ;
% Set up names

    quat = state( 1:4 )' ;
    wsc = state( 5:7 ) ;
    ww = state( 8:10 ) ;
    r = state( 11:13 ) ;
    v = state( 14:16 ) ;
    quatLVLH = state(20:23)' ;


% Define Rotation based off of quat
    eta = quat( 1 ) ;
    eps = quat( 2:4 )' ;
    etaLVLH = quatLVLH( 1 ) ;
    epsLVLH = quatLVLH( 2:4 )' ;
% Determine LVLH frame
    Clvlhg = ECItoLVLH( r , v ) ;
    cquat = quatLVLH  ;
    CbG = quat2dcm(quat) ;
    qerr = ComRotFind(quat,cquat) ;
    epse(1:3,1) = qerr( 2:4 ) ;
    wlvlh = CbG*( cross( r , v ) / norm(r)^2 ) ;

    werror = (wsc - wlvlh) ;

% change quaternions body to eci
    epsdot = .5*(eta*eye(3)+[0,-eps(3),eps(2);eps(3),0,-eps(1);-
eps(2),eps(1),0])*wsc ;
    etadot = -.5*eps'*wsc ;
    dstate(1:4) = [ etadot , epsdot' ]' ;
% eci to LVLH
    epsdotLVLH = .5*(etaLVLH*eye(3)+[0,-
epsLVLH(3),epsLVLH(2);epsLVLH(3),0,-epsLVLH(1);-
epsLVLH(2),epsLVLH(1),0])*wlvlh ;
    etadotLVLH = -.5*epsLVLH'*wlvlh ;
    dstate(20:23) = [etadotLVLH , epsdotLVLH']  ;

%Simplified Orbital Solver, dState 4 -> 6 is the acceleration
dstate(14:16) = -mu*r/norm(r)^3 ; %Position to Acceleration Function
dstate(11:13) = v ; %velocity in velocity out

% Define the control Torque needed
    %CTorque = 0;
    CTorque = -kp*epse - kd*werror ;
```

```matlab
%Use Torques to find the proper omegadot in body frame
wcross = [ 0 -wsc(3) wsc(2) ; wsc(3) 0 -wsc(1) ; -wsc(2) wsc(1) 0 ] ;
dwsc = ( Isc )\( CTorque - wcross*Isc*wsc ) ;
dww = ( Iw )\( -CTorque - wcross*Iw*ww ) ;
dstate(5:7) = dwsc ; %Inputs the omega dot due to given torques and
 motion
dstate(8:10) = dww ;

% Euler Angles Change Rates
roll = state(17) ;
pitch = state(18) ;
dstate(17:19) =
 [1,sin(roll)*tan(pitch),cos(roll)*tan(pitch);0,cos(roll),-
sin(roll);0,sin(roll)*sec(pitch),cos(roll)*sec(pitch)]*wsc ; %Euler
 angle change rate ; % Euler Body to ECI

end


t =

     0
```

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