

# Homework Assignment #3

GE 1501

Cornerstone of Engineering 1

CRN: 16504

Monday, Wednesday, Thursday from 10:30 AM - 11:35 AM

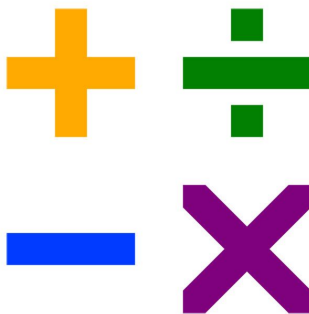
429 Dana Research Center

Wednesday, September 27, 2017

Jordan Lian

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### NOAA's National Weather Service

#### Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	125	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

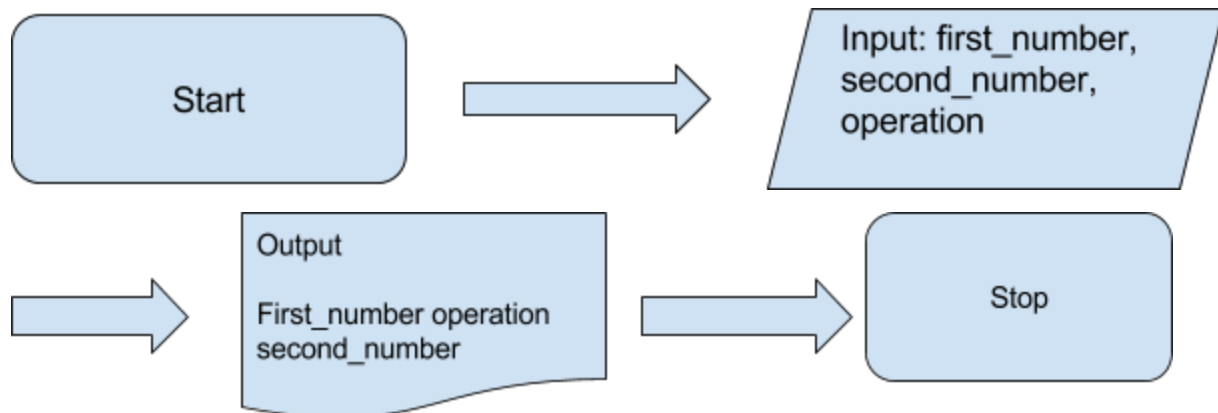
Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution Extreme Caution Danger Extreme Danger

CANADIAN WIND CHILL INDEX		Air Temperature °C																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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4	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66	70	74	78	82	86	90	94	98	102	106	110	114	118	122	126	130	134	138	142	146	150	154	158	162	166	170	174	178	182	186	190	194	198	202	206	210	214	218	222	226	230	234	238	242	246	250	254	258	262	266	270	274	278	282	286	290	294	298	302	306	310	314	318	322	326	330	334	338	342	346	350	354	358	362	366	370	374	378	382	386	390	394	398	402	406	410	414	418	422	426	430	434	438	442	446	450	454	458	462	466	470	474	478	482	486	490	494	498	502	506	510	514	518	522	526	530	534	538	542	546	550	554	558	562	566	570	574	578	582	586	590	594	598	602	606	610	614	618	622	626	630	634	638	642	646	650	654	658	662	666	670	674	678	682	686	690	694	698	702	706	710	714	718	722	726	730	734	738	742	746	750	754	758	762	766	770	774	778	782	786	790	794	798	802	806	810	814	818	822	826	830	834	838	842	846	850	854	858	862	866	870	874	878	882	886	890	894	898	902	906	910	914	918	922	926	930	934	938	942	946	950	954	958	962	966	970	974	978	982	986	990	994	998	1002	1006	1010	1014	1018	1022	1026	1030	1034	1038	1042	1046	1050	1054	1058	1062	1066	1070	1074	1078	1082	1086	1090	1094	1098	1102	1106	1110	1114	1118	1122	1126	1130	1134	1138	1142	1146	1150	1154	1158	1162	1166	1170	1174	1178	1182	1186	1190	1194	1198	1202	1206	1210	1214	1218	1222	1226	1230	1234	1238	1242	1246	1250	1254	1258	1262	1266	1270	1274	1278	1282	1286	1290	1294	1298	1302	1306	1310	1314	1318	1322	1326	1330	1334	1338	1342	1346	1350	1354	1358	1362	1366	1370	1374	1378	1382	1386	1390	1394	1398	1402	1406	1410	1414	1418	1422	1426	1430	1434	1438	1442	1446	1450	1454	1458	1462	1466	1470	1474	1478	1482	1486	1490	1494	1498	1502	1506	1510	1514	1518	1522	1526	1530	1534	1538	1542	1546	1550	1554	1558	1562	1566	1570	1574	1578	1582	1586	1590	1594	1598	1602	1606	1610	1614	1618	1622	1626	1630	1634	1638	1642	1646	1650	1654	1658	1662	1666	1670	1674	1678	1682	1686	1690	1694	1698	1702	1706	1710	1714	1718	1722	1726	1730	1734	1738	1742	1746	1750	1754	1758	1762	1766	1770	1774	1778	1782	1786	1790	1794	1798	1802	1806	1810	1814	1818	1822	1826	1830	1834	1838	1842	1846	1850	1854	1858	1862	1866	1870	1874	1878	1882	1886	1890	1894	1898	1902	1906	1910	1914	1918	1922	1926	1930	1934	1938	1942	1946	1950	1954	1958	1962	1966	1970	1974	1978	1982	1986	1990	1994	1998	2002	2006	2010	2014	2018	2022	2026	2030	2034	2038	2042	2046	2050	2054	2058	2062	2066	2070	2074	2078	2082	2086	2090	2094	2098	2102	2106	2110	2114	2118	2122	2126	2130	2134	2138	2142	2146	2150	2154	2158	2162	2166	2170	2174	2178	2182	2186	2190	2194	2198	2202	2206	2210	2214	2218	2222	2226	2230	2234	2238	2242	2246	2250	2254	2258	2262	2266	2270	2274	2278	2282	2286	2290	2294	2298	2302	2306	2310	2314	2318	2322	2326	2330	2334	2338	2342	2346	2350	2354	2358	2362	2366	2370	2374	2378	2382	2386	2390	2394	2398	2402	2406	2410	2414	2418	2422	2426	2430	2434	2438	2442	2446	2450	2454	2458	2462	2466	2470	2474	2478	2482	2486	2490	2494	2498	2502	2506	2510	2514	2518	2522	2526	2530	2534	2538	2542	2546	2550	2554	2558	2562	2566	2570	2574	2578	2582	2586	2590	2594	2598	2602	2606	2610	2614	2618	2622	2626	2630	2634	2638	2642	2646	2650	2654	2658	2662	2666	2670	2674	2678	2682	2686	2690	2694	2698	2702	2706	2710	2714	2718	2722	2726	2730	2734	2738	2742	2746	2750	2754	2758	2762	2766	2770	2774	2778	2782	2786	2790	2794	2798	2802	2806	2810	2814	2818	2822	2826	2830	2834	2838	2842	2846	2850	2854	2858	2862	2866	2870	2874	2878	2882	2886	2890	2894	2898	2902	2906	2910	2914	2918	2922	2926	2930	2934	2938	2942	2946	2950	2954	2958	2962	2966	2970	2974	2978	2982	2986	2990	2994	2998	3002	3006	3010	3014	3018	3022	3026	3030	3034	3038	3042	3046	3050	3054	3058	3062	3066	3070	3074	3078	3082	3086	3090	3094	3098	3102	3106	3110	3114	3118	3122	3126	3130	3134	3138	3142	3146	3150	3154	3158	3162	3166	3170	3174	3178	3182	3186	3190	3194	3198	3202	3206	3210	3214	3218	3222	3226	3230	3234	3238	3242	3246	3250	3254	3258	3262	3266	3270	3274	3278	3282	3286	3290	3294	3298	3302	3306	3310	3314	3318	3322	3326	3330	3334	3338	3342	3346	3350	3354	3358	3362	3366	3370	3374	3378	3382	3386	3390	3394	3398	3402	3406	3410	3414	3418	3422	3426	3430	3434	3438	3442	3446	3450	3454	3458	3462	3466	3470	3474	3478	3482	3486	3490	3494	3498	3502	3506	3510	3514	3518	3522	3526	3530	3534	3538	3542	3546	3550	3554	3558	3562	3566	3570	3574	3578	3582	3586	3590	3594	3598	3602	3606	3610	3614	3618	3622	3626	3630	3634	3638	3642	3646	3650	3654	3658	3662	3666	3670	3674	3678	3682	3686	3690	3694	3698	3702	3706	3710	3714	3718	3722	3726	3730	3734	3738	3742	3746	3750	3754	3758	3762	3766	3770	3774	3778	3782	3786	3790	3794	3798	3802	3806	3810	3814	3818	3822	3826	3830	3834	3838	3842	3846	3850	3854	3858	3862	3866	3870	3874	3878	3882	3886	3890	3894	3898	3902	3906	3910	3914	3918	3922	3926	3930	3934	3938	3942	3946	3950	3954	3958	3962	3966	3970	3974	3978	3982	3986	3990	3994	3998	4002	4006	4010	4014	4018	4022	4026	4030	4034	4038	4042	4046	4050	4054	4058	4062	4066	4070	4074	4078	4082	4086	4090	4094	4098	4102	4106	4110	4114	4118	4122	4126	4130	4134	4138	4142	4146	4150	4154	4158	4162	4166	4170	4174	4178	4182	4186	4190	4194	4198	4202	4206	4210	4214	4218	4222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# Arithmetics

## Pseudocode/Flowchart



## Test by hand calculation

$$2 + 3 = 5$$

$$2 - 3 = -1$$

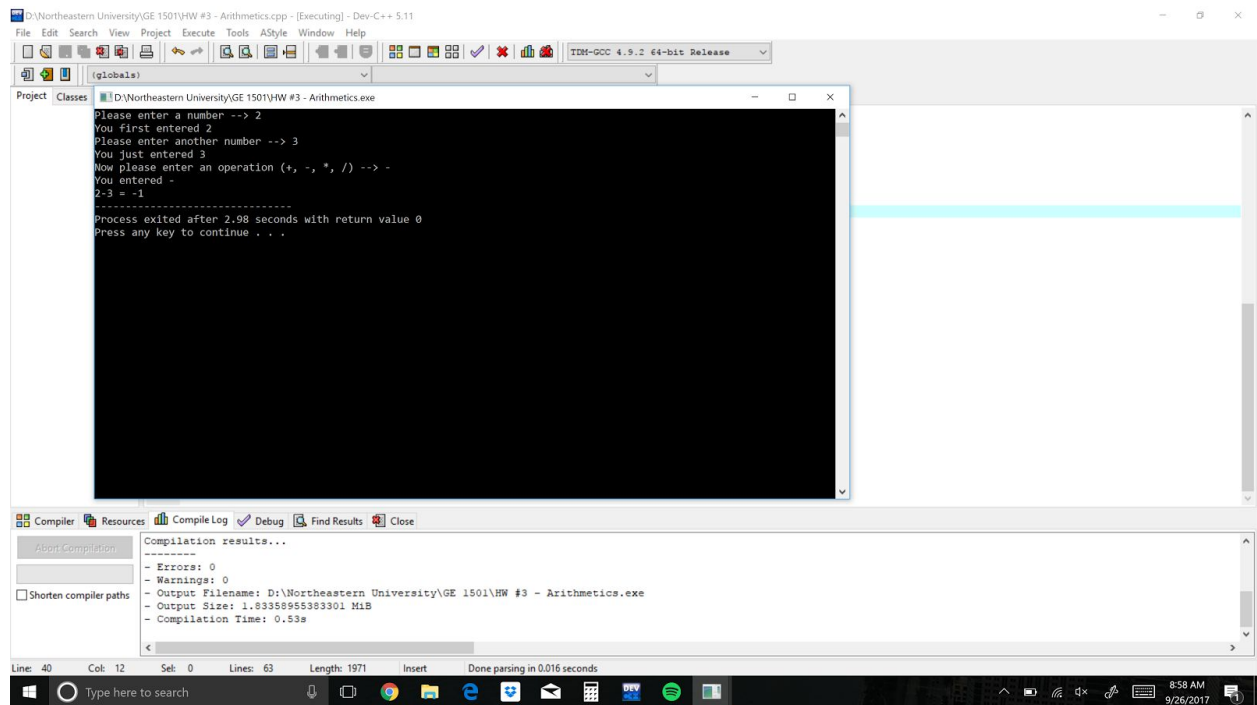
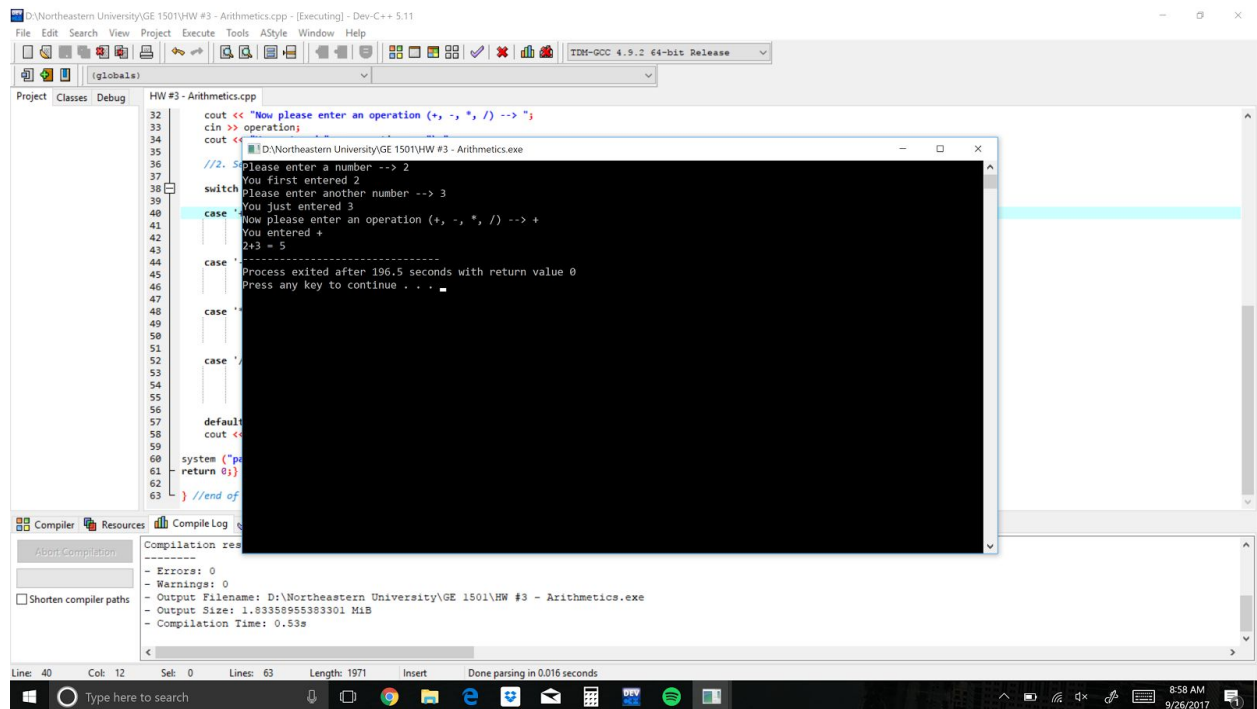
$$2 * 3 = 6$$

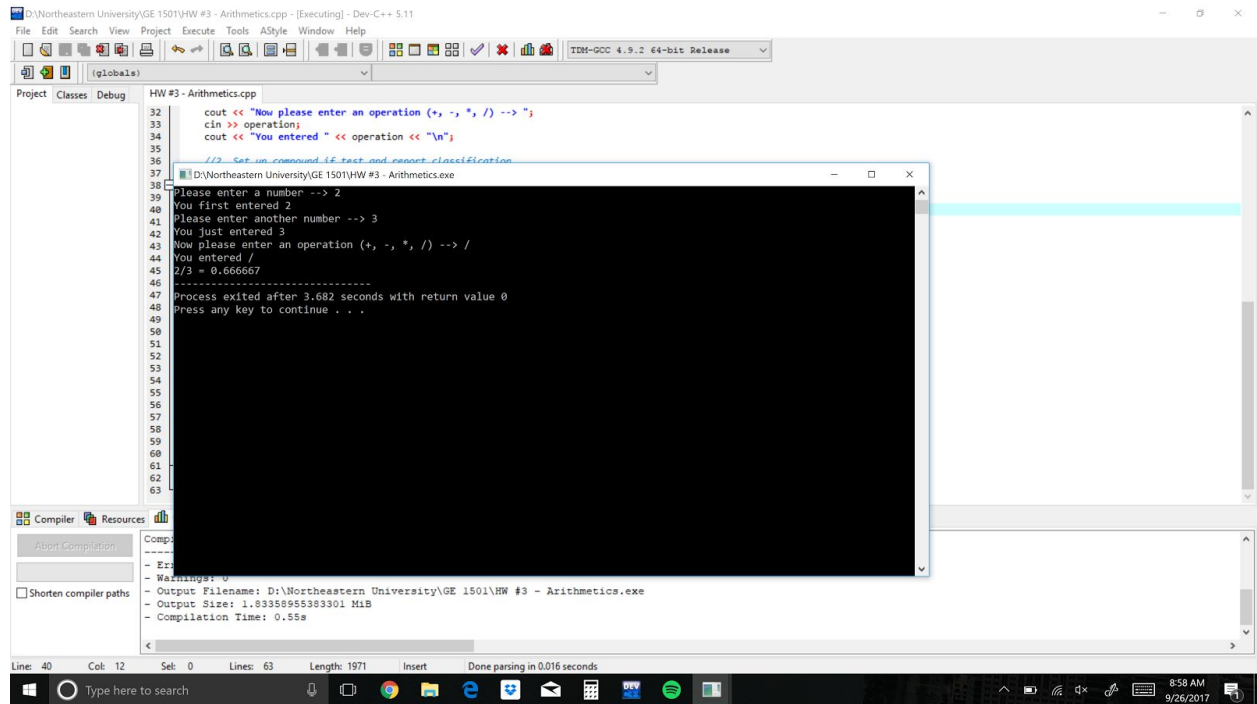
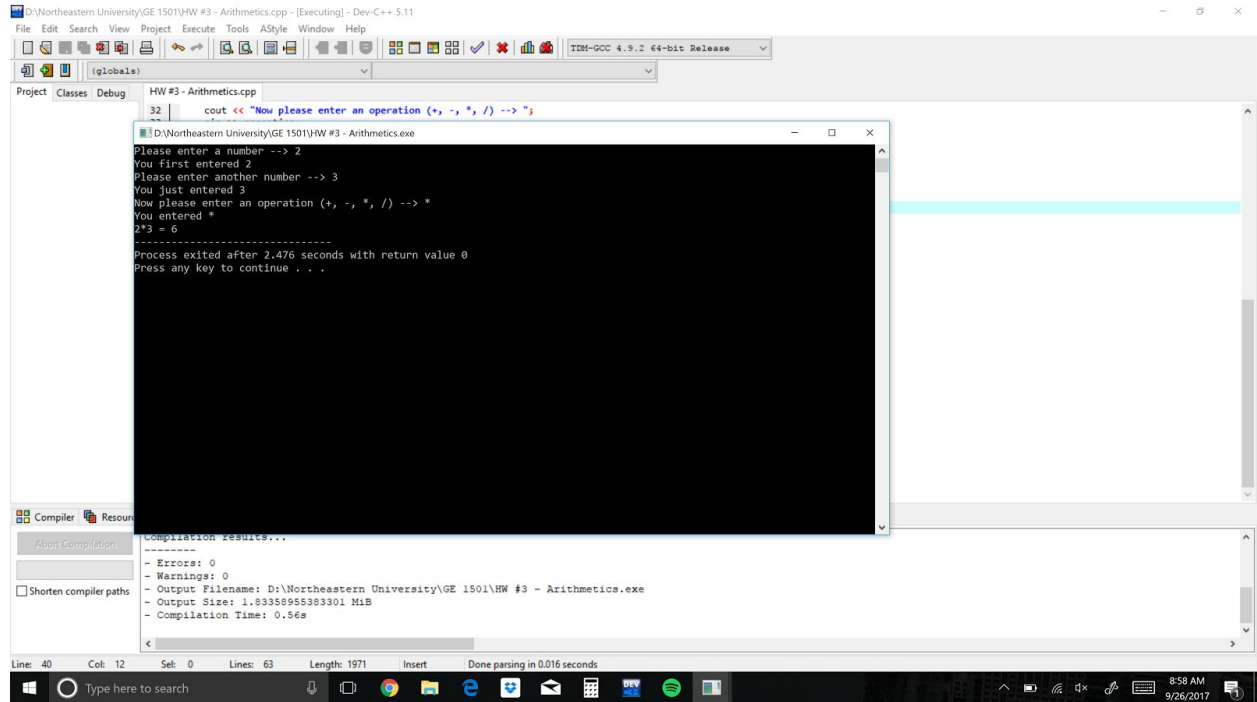
$$2 / 3 = 0.666667$$

## Program source code .cpp file

See attached file

# Screenshot of Outputs





```
D:\Northeastern University\GE 1501\HW #3 - Arithmetics.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
(globals)
HW #3 - Arithmetics.cpp
32 | cout << "Now please enter an operation (+, -, *, /) --> ";

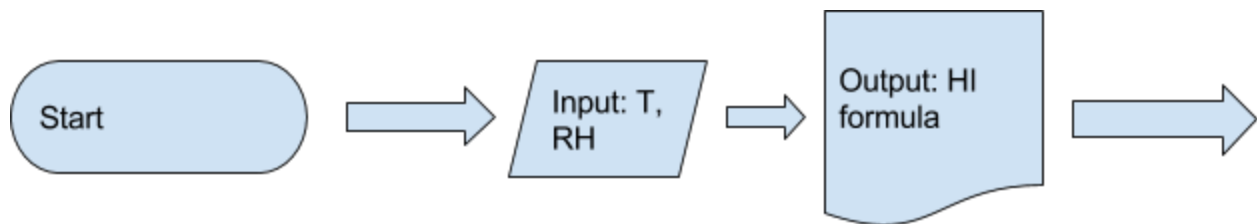
D:\Northeastern University\GE 1501\HW #3 - Arithmetics.exe
Please enter a number --> 2
You first entered 2
Please enter another number --> 3
You just entered 3
Now please enter an operation (+, -, *, /) --> %
You entered %

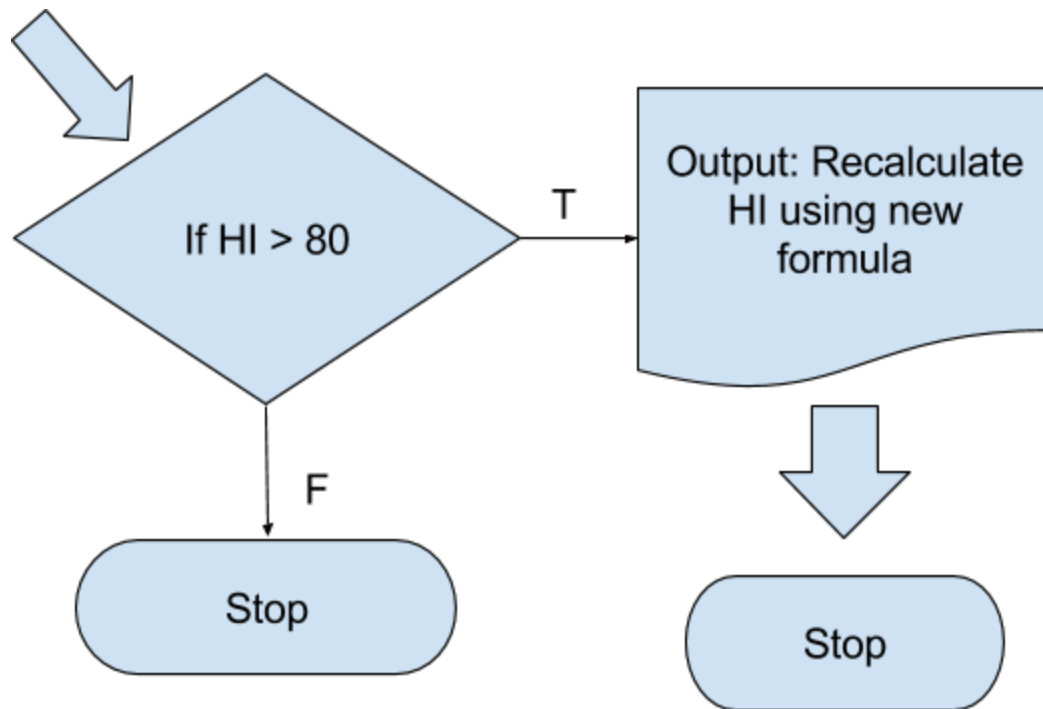
The character you entered is not one of the defined operators
Press any key to continue . . .

Compilation results...
-----
- Errors: 0
- Warnings: 0
- Output Filename: D:\Northeastern University\GE 1501\HW #3 - Arithmetics.exe
- Output Size: 1.83358955383301 MiB
- Compilation Time: 0.53s
Shorten compiler paths
Line: 58 Col: 79 Sel: 0 Lines: 63 Length: 1973 Insert Done parsing in 0.015 seconds
Type here to search 8:59 AM 9/26/2017
```

# Heat Index

## Pseudocode/Flowchart





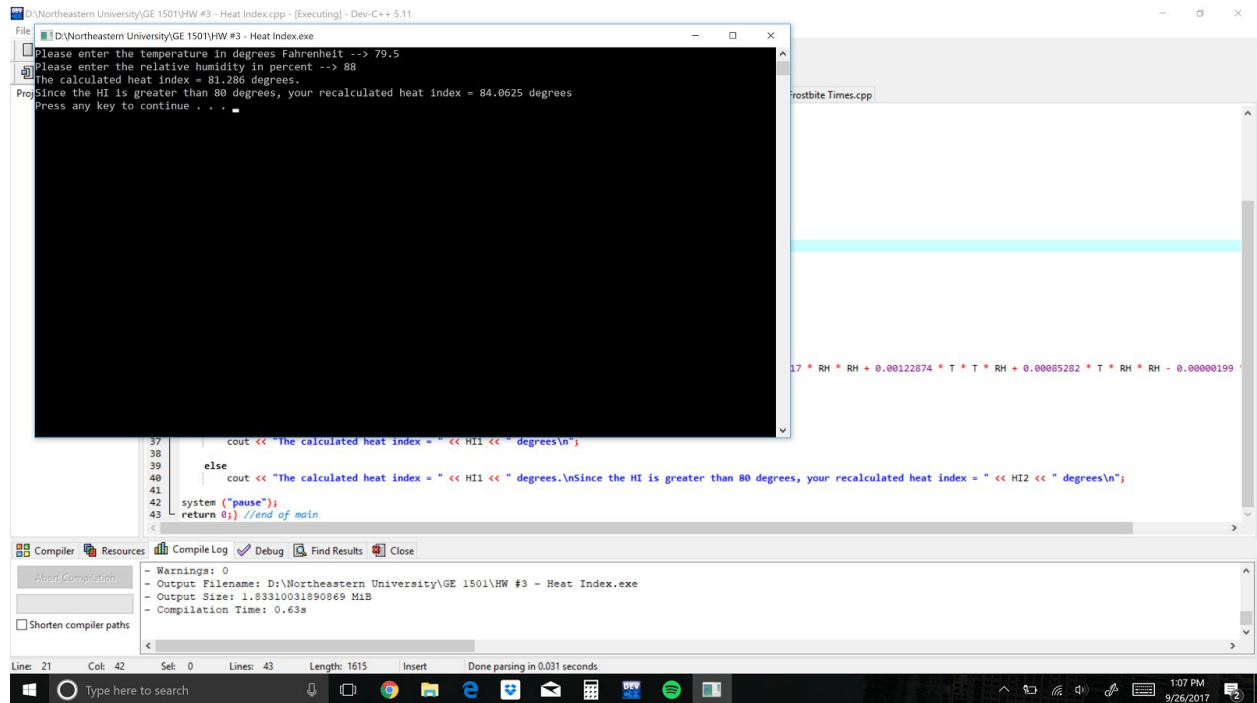
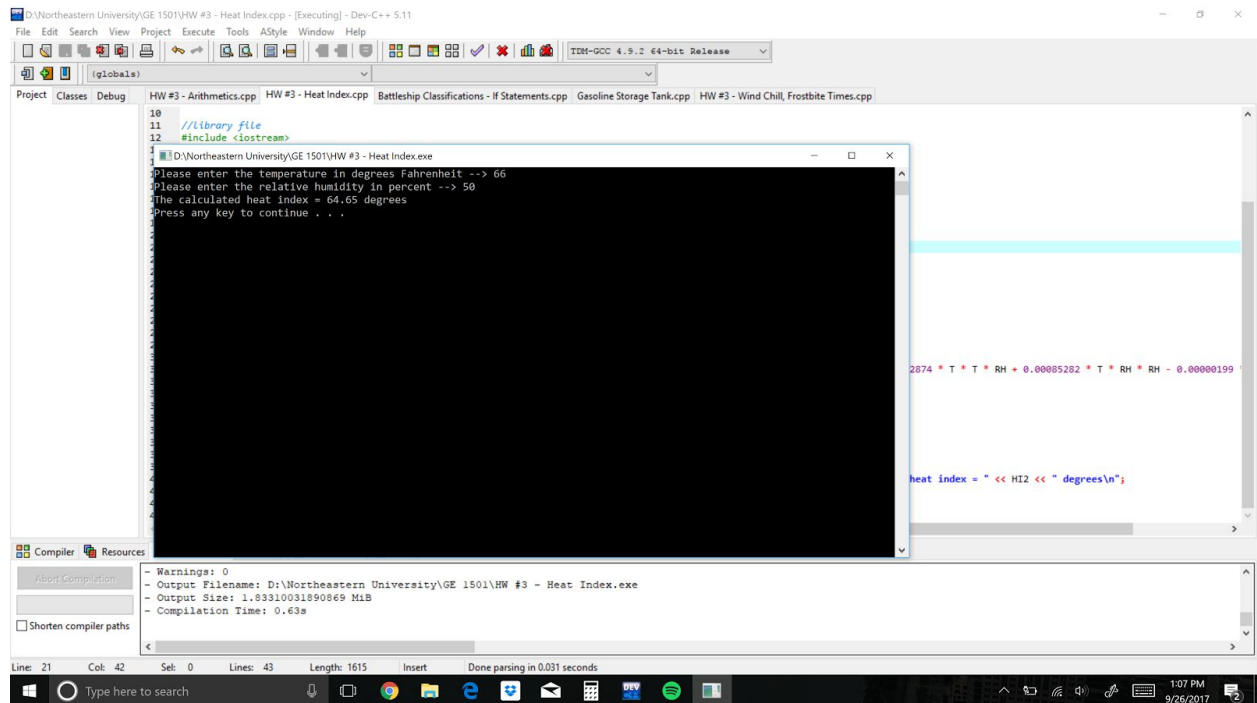
## Test by hand calculation

- $HI(1) = 0.5 * \{T + 61.0 + [(T - 68.0) * 1.2] + (RH * 0.094)\}$
  - $HI(2) = -42.379 + 2.04901523 * T + 10.14333127 * RH - 0.22475541 * T * RH - 0.00683783 * T * T - 0.05481717 * RH * RH + .00122874 * T * T * RH + 0.00085282 * T * RH * RH - 0.00000199 * T * T * RH * RH$
1. T = 66 F, RH = 50%
    - a. HI (1) = 64.65 degrees
    - b. HI < 80 degrees
    - c. **Final Heat Index = 64.65 degrees**
  2. T = 79.5 F, RH = 88%
    - a. HI (1) = 81.286 degrees
    - b. HI > 80 degrees: Recalculate heat index
    - c. HI (2) = 84.0625 degrees
    - d. **Final Heat Index = 84.0625 degrees**

## Program source code .cpp file

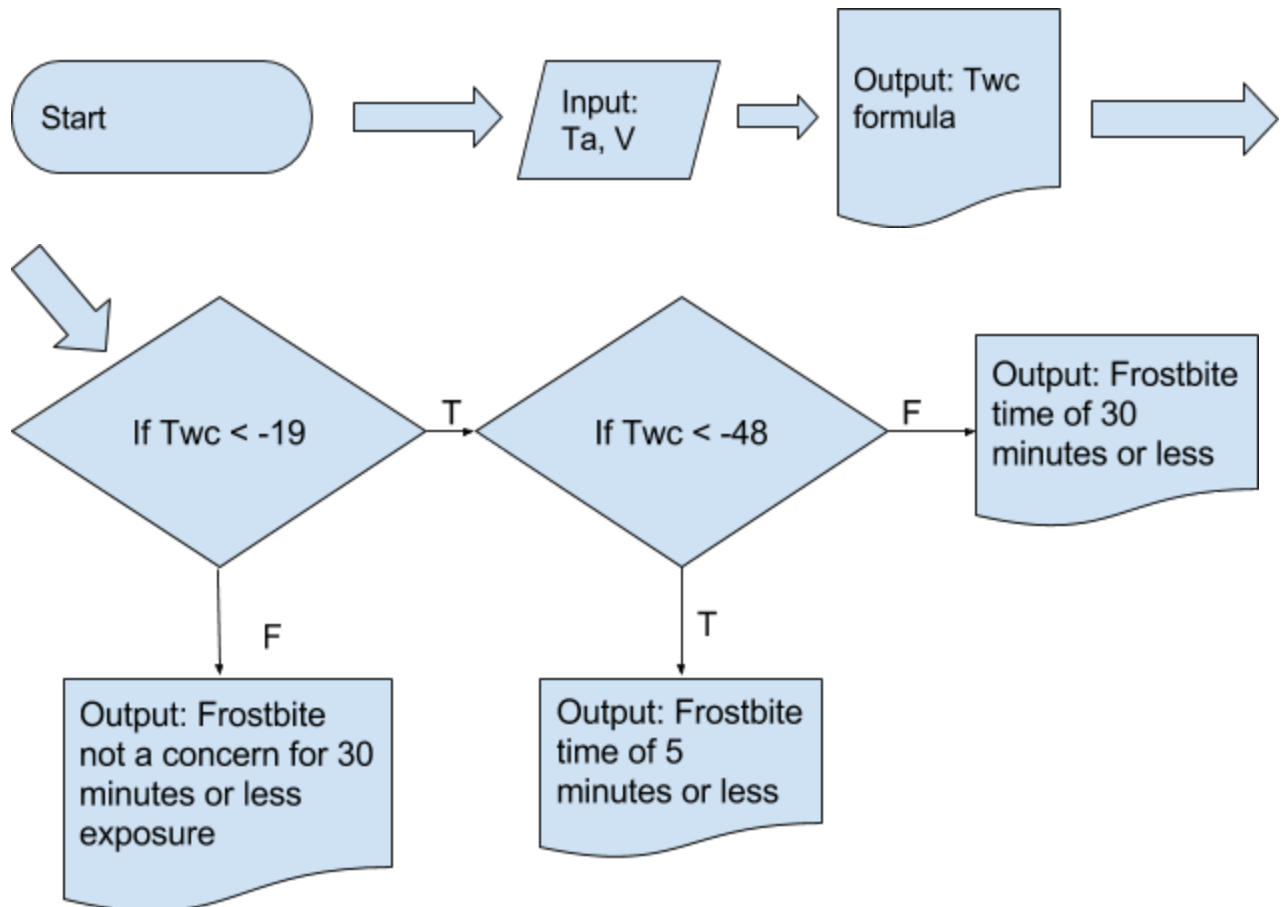
See attached file

# Screenshot of Outputs



# Wind Chill

## Pseudocode/Flowchart



## Test by hand calculation

$$T_{wc} = 35.74 + 0.6215T_a - 35.75V^{+0.16} + 0.4275T_aV^{+0.16}$$

- a.  $T_a = 0$  F,  $V = 35$  mph
  - i.  $T_{wc} = -27.4033$  degrees
  - ii.  $-48 < -27 < -19$ , so reported frostbite time is 30 minutes or less
- b.  $T_a = 6$  F,  $V = 56$  mph
  - i.  $T_{wc} = -23.7215$  degrees
  - ii.  $-48 < -24 < -19$ , so reported frostbite time is 30 minutes or less
- c.  $T_a = 43$  F,  $V = 10$  mph

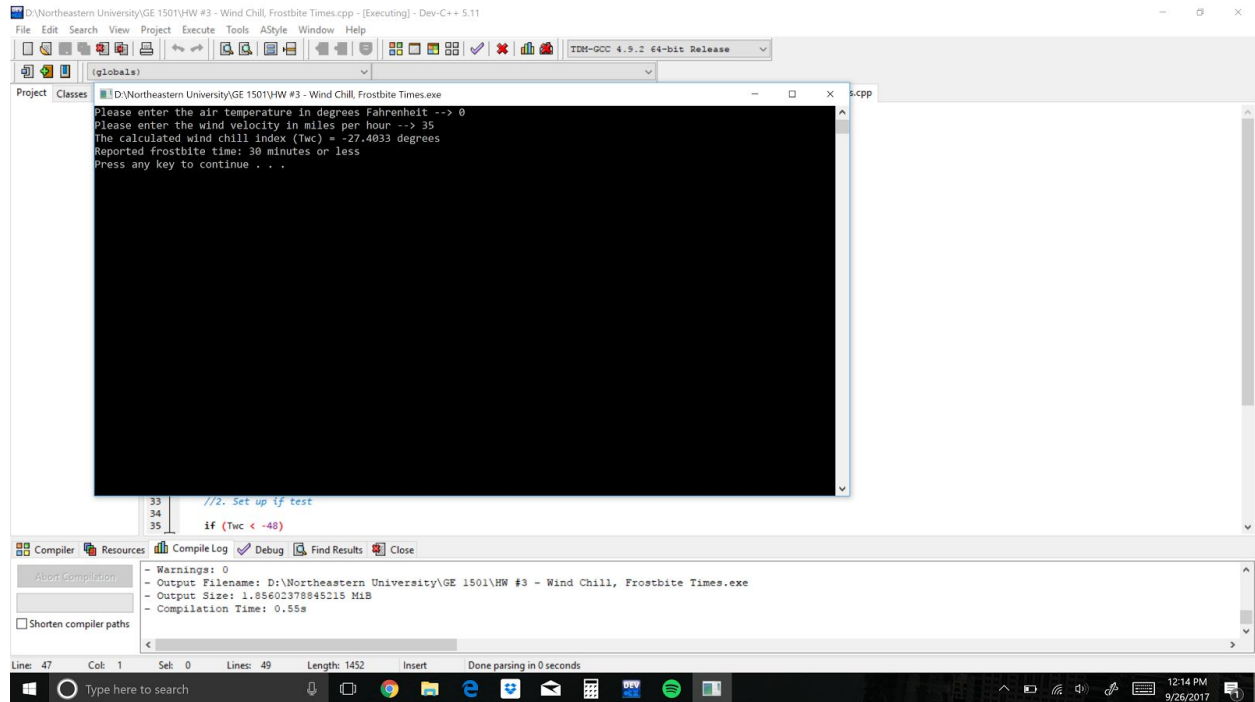


- i.  $T_{wc} = 37.3608$  degrees
- ii.  $37 > -19$ , so frostbite isn't a concern for 30 minutes or less exposure

## Program source code .cpp file

See attached file

## Screenshot of Outputs



```
D:\Northeastern University\GE 1501\HW #3 - Wind Chill, Frostbite Times.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
IDM-GCC 4.9.2 64-bit Release
Project Classes D:\Northeastern University\GE 1501\HW #3 - Wind Chill, Frostbite Times.exe
Please enter the air temperature in degrees Fahrenheit --> 0
Please enter the wind velocity in miles per hour --> 35
The calculated wind chill index (Twc) = -27.4033 degrees
Reported frostbite time: 30 minutes or less
Press any key to continue . . .
33 //2. Set up if test
34
35 if (Twc < -48)
Compiler Resources Compile Log Debug Find Results Close
About Compiler
Shorten compiler paths
- Warnings: 0
- Output Filename: D:\Northeastern University\GE 1501\HW #3 - Wind Chill, Frostbite Times.exe
- Output Size: 1.8560378848218 MiB
- Compilation Time: 0.55s
Line: 47 Col: 1 Sel: 0 Lines: 49 Length: 1452 Insert Done parsing in 0 seconds
Type here to search 12:14 PM 9/26/2017
```

