C++ Challenge Sheet #4

Needed Knowledge

1) Using the ctime and cstdlib
2) You should know to use if, else if and else statements
3) You should know how to nest these logic statements
4) You should know how to use a switch statement
5) Logic operators such as AND, NOT and OR.

Questions

1) *Point in a Rectangle*

   Write a program that prompts the user to enter a point (x, y) and checks whether the point is within the rectangle centered at (0, 0) with width 10 and height 5. For example, (2, 2) is inside the rectangle and (6, 4) is outside the rectangle.

   Hint: A point is in the rectangle if its horizontal distance to (0, 0) is less than or equal to 10 / 2 and its vertical distance to (0, 0) is less than or equal to 5 / 2. Test your program to cover all cases.

2) *Two Rectangles*

   Write a program that prompts the user to enter the center x-, y-coordinates, width, and height of two rectangles and determines whether the second rectangle is inside the first or overlaps with the first. Test your program to cover all cases.

   Test Cases

Case	***Input***	***x − value***	***y − value***	***width***	***height***	***Output***
1	*rect* 1	2.5	4	2.5	43	*rect* 2 *is inside rect* 1
	rect 2	1.5	5	0.5	3	
2	*rect* 1	1	2	3	5.5	*rect* 2 *overlaps rect* 1
	rect 2	3	4	4.5	5	
3	*rect* 1	1	2	3	3	*rect* 2 *does not overlap rect* 1
	rect 2	40	45	3	2	

3) *Day of the week*

   Zeller's Congruence is an algorithm developed by Christian Zeller to calculate the day of the week. The formula is

$$h = \left(q + \frac{26(m+1)}{10} + k + \frac{k}{4} + \frac{j}{4} + 5j\right) \% 7$$

   where

   h is the day of the week (0: Saturday, 1: Sunday, 2: Monday, 3: Tuesday, 4: Wednesday, 5: Thursday, 6: Friday)

   q is the day of the month

   m is the month (3: March 4: April, …, December:12). January and February are counted as months 13 and 14 of the previous year.

   j is the century (i.e. $\frac{year}{100}$)

k is the year of the century (i.e. year % 100)

Note that the division in the formula performs an integer division. Write a program that prompts the user to enter a year, month and day of the month and displays the name of the day of the week.