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# Computer Programming: Skills & Concepts (CP1)

## Case Study 1

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# Case Study 1: Drawing a Square

- A little graphics program: drawing a square on the screen
- Include a graphics library
- Let's first take a look the library's header file

## descartes.h

```
/* A point is specified by its x- and y-coordinates. */
typedef struct {int x, y;} point_t;

/* A vector is specified by its x- and y-components. */
typedef struct {point_t initial, final;} lineSeg_t;

/*
 * Waits until the user clicks the mouse,
 * then returns the point that the user is indicating.
 */
point_t GetPoint(void);
```

```
/* Creates a point with given coordinates. */  
point_t Point(int a, int b);
```

```
/* Returns the x-coordinate of the point given as argument. */  
int XCoord(point_t p);
```

```
/* Returns the y-coordinate of the point given as argument. */  
int YCoord(point_t p);
```

```
/* Creates a line segment with given endpoints. */  
lineSeg_t LineSeg(point_t p1, point_t p2);
```

```
/* Returns one endpoint of a line segment... */  
point_t InitialPoint(lineSeg_t l);
```

```
/* ... returns the other endpoint. */  
point_t FinalPoint(lineSeg_t l);  
  
/* Returns the length of a line segment. */  
float Length(lineSeg_t l);  
  
/* Draws a line segment. */  
void DrawLineSeg(lineSeg_t l);  
  
/* Opens and initialises the graphics window. */  
void OpenGraphics(void);  
  
/* Closes the graphics window. */  
void CloseGraphics(void);
```

## Drawing a Square

- Open graphics
- Wait for mouse click
- Draw 100x100 square by drawing 4 edges
- Close graphics

## square.c

```
#include <stdlib.h>
#include <stdio.h>
#include "descartes.h"

/* Draws a square, of side 100, with given NW corner */

int main(void)
{
    point_t  p, q;      /* Two points,          */
    lineSeg_t pq;      /* a line segment      */
    int x, y;          /* and two integers.   */
}
```

```
OpenGraphics();

printf("Indicate NW corner by clicking left mouse button.\n");
p = GetPoint();    /* p stores the point where the user clicked. */

x = XCoord(p);    /* We can take a point apart          */
y = YCoord(p);    /* into its two coordinates...          */
q = Point(x + 100, y); /* and then reassemble.                */
pq = LineSeg(p, q); /* Two points define a line segment.    */
DrawLineSeg(pq);   /* Let's have a look at what we've got. */
```

```
p = q;                /* Start where we left off.*/  
x = XCoord(p);  
y = YCoord(p);  
q = Point(x, y - 100);  
pq = LineSeg(p, q);  
DrawLineSeg(pq);
```

```
/* We can actually express that more tersely... */
```

```
p = q;  
q = Point(XCoord(p) - 100, YCoord(p));  
DrawLineSeg(LineSeg(p, q));
```

```
p = q;  
q = Point(XCoord(p), YCoord(p) + 100);  
DrawLineSeg(LineSeg(p, q));  
  
CloseGraphics();  
return EXIT_SUCCESS;  
}
```