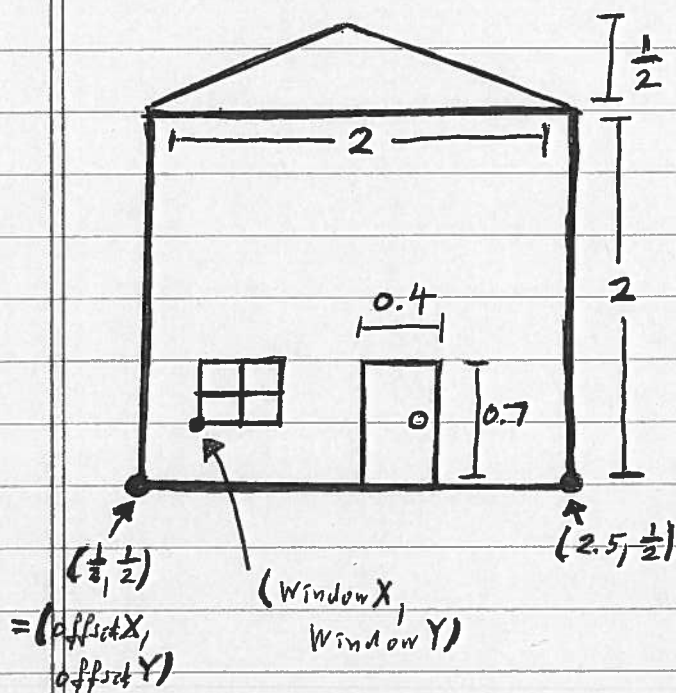


STEPWISE REFINEMENT W4

46

! "Successively refine a complex problem into simpler sub-problems by introducing increasingly basic functions."

EX: House Drawing



#define:

HouseWidth	2.0
HouseHeight	2.0
Rooft Height	0.5
Door Width	0.4
Door Height	0.7
WindowX	0.75
WindowY	0.75
...	
offsetX	0.5
offsetY	0.5

→ "Refining this drawing problem stepwise"

```
main ()
{ offsetX, offsetY;
```

```
InitGraphics();
```

```
offsetX = ...;
```

```
offsetY = ...;
```

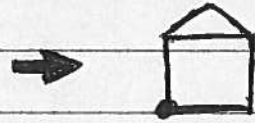
```
DrawHouse(offsetX, offsetY);
```

```
}
```

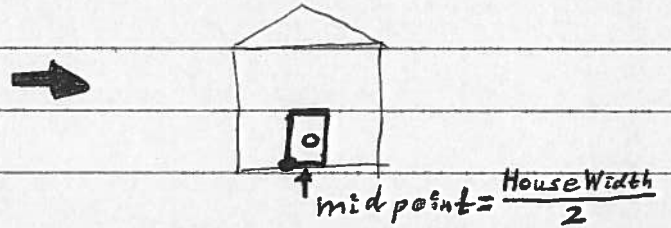
Drawing function
to be refined
stepwise!

void DrawHouse (d offsetX, d offsetY)

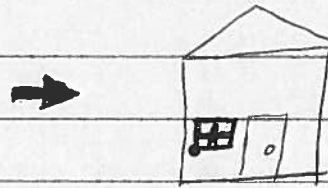
{
① DrawOutline (offsetX, offsetY);



② Draw Door (offsetX + (HouseWidth - DoorWidth) / 2, offsetY);



③ DrawWindow (...);



① void DrawOutline (d offsetX, d offsetY)

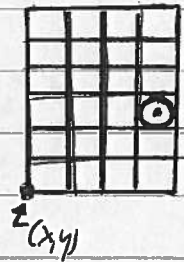
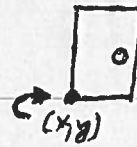
{
DrawGrid (offsetX, offsetY,
HouseWidth, HouseHeight,
2, 2);

DrawTriangle (offsetX, offsetY + HouseHeight,
offsetX + HouseWidth, offsetY + HouseHeight,
offsetX + HouseWidth / 2, offsetY + HouseHeight + RoofHeight);

}

② void DrawDoor (dx, dy)

```
{ DrawGrid (x, y,
             DoorWidth, DoorHeight,
             2, 2);
  DrawCenteredCircle
  (x + 7/8 * DoorWidth,
   y + 5/12 * DoorHeight,
   1/20 * DoorWidth);
```

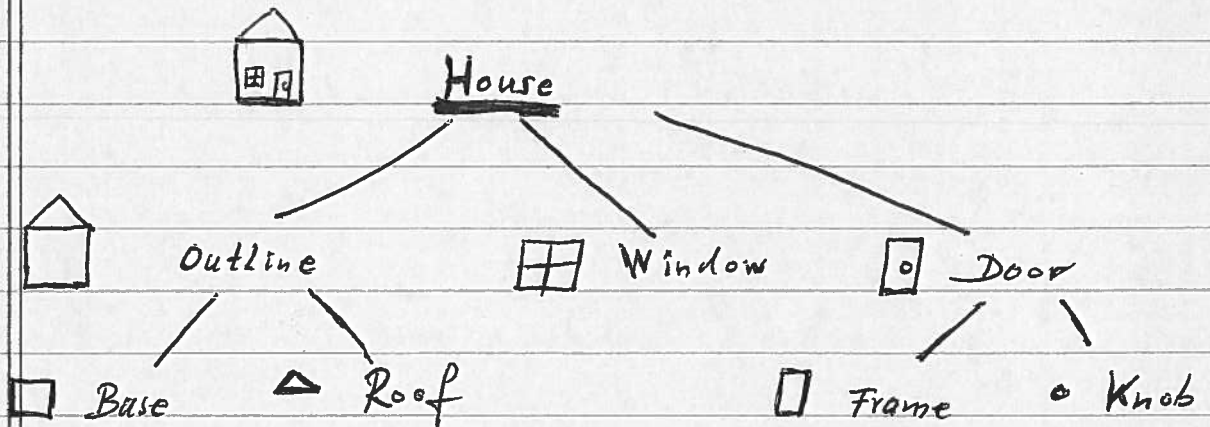


③ void DrawWindow (...)

...

FIG. 7-7

"Lesson": Design TOP-DOWN, implement BOTTOM-UP!



...

→ OBJECT-ORIENTED
HIERARCHY

→ Program / Module / Function Structure:

```
main ()
```

```
{
```

"short sequence of
'high-level' function →
calls "

```
}
```

① High-level functions

↳ calling 'medium-level'
and 'low-level' functions

② Medium-level functions

↳ calling 'low-level'
functions

③ Low-level functions:

- Draw Line

- Draw Box

- Draw Triangle

- Draw Grid etc.

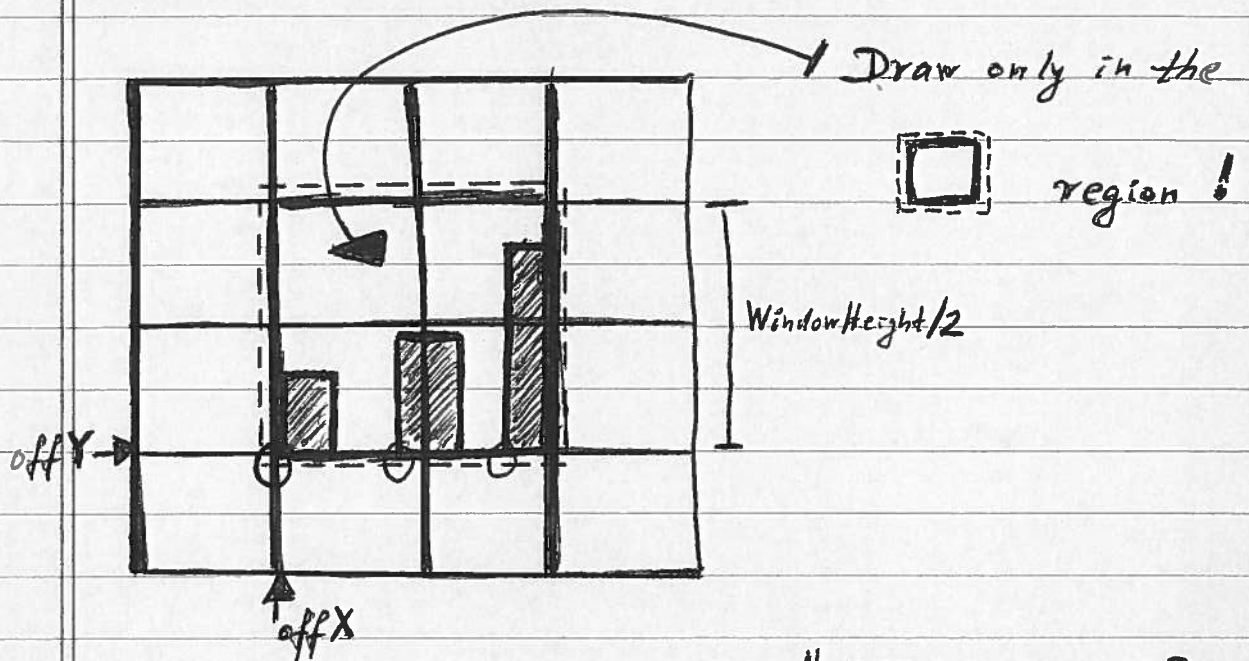
→ PRECISE specification and
VALIDATION of low-level functions
possible → Can 'verify' CORRECTNESS

→ IMPLEMENT and TEST 'low-level' functions first...!

W4

EX: "Draw Bar Diagram"

(50)



Window Width/2

delX

#define NoBoxes 3

" MaxBoxHeight 10.0

/* or ask user to input values */

d HeightOfBox (int box);

main ()

{ int box;

double offX, offY, delX;

InitGraphics ();

offX = GetWindowWidth () / 4.0;

offY = " Height () / 4.0;

delX = (GetWindowWidth () / 2.0) / (2 * NoBoxes - 1);

for (box = 0; box < NoBoxes; box++)

{ DrawBox (offX + (2 * box * delX), offY,

delX,

}

GetWindowHeight () / 2.0 * (HeightOfBox (box) / MaxBoxHeight);

d HeightOfBox (int box) { "returns value between 0.0 and 10.0" }