CS2100 COMPUTER ORGANISATION

http://www.comp.nus.edu.sg/~cs2100/

Lecture #4b

Pointers and Functions

Questions?

IMPORTANT: DO NOT SCAN THE QR CODE IN THE VIDEO RECORDINGS. THEY NO LONGER WORK

Ask at
https://sets.netlify.app/module/676ca3a07d7f5ffc1741dc65

OR

Scan and ask your questions here!
(May be obscured in some slides)

1.7 Tracing Pointers (1/2)

- Trace the code below manually to obtain the outputs.
- Compare your outputs with your neighbours.

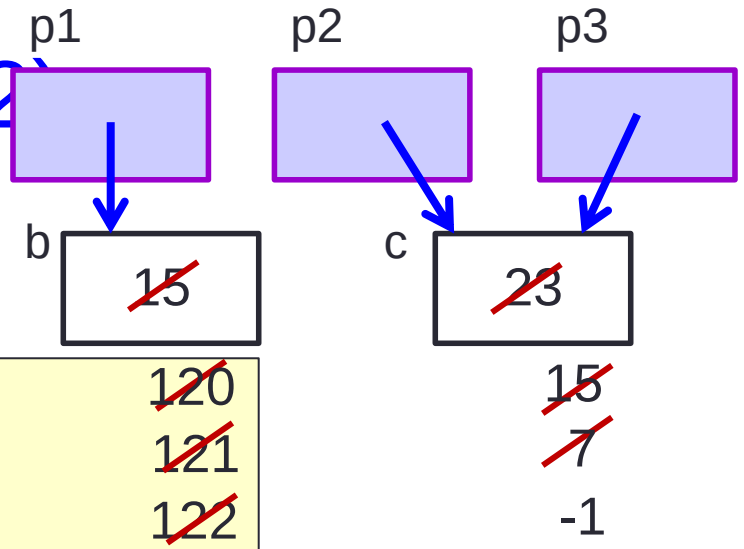
TracePointers.c

```
int a = 8, b = 15, c = 23;
int *p1, *p2, *p3;

p1 = &b;
p2 = &c;
p3 = p2;
printf("1: %d %d %d\n", *p1, *p2, *p3);

*p1 *= a;
while (*p2 > 0) {
  *p2 -= a;
  (*p1)++;
}
printf("2: %d %d %d\n", *p1, *p2, *p3);
printf("3: %d %d %d\n", a, b, c);
```

1.7 Tracing Pointers (2/2)




```
int a = 8, b = 15, c = 23;
int *p1, *p2, *p3;

p1 = &b;
p2 = &c;
p3 = p2;
printf("1: %d %d %d\n", *p1, *p2, *p3);

*p1 *= a;
while (*p2 > 0) {
  *p2 -= a;
  (*p1)++;
}
printf("2: %d %d %d\n", *p1, *p2, *p3);
printf("3: %d %d %d\n", a, b, c);
```

```
1: 15 23 23
```

```
2: 123 -1 -1
```

```
3: 8 123 -1
```

1.8 Incrementing a Pointer

- If p is a pointer variable, what does p = p + 1 (or p++) mean?

```
int a; float b; char c; double d;
int *ap; float *bp;
char *cp; double *dp;

ap = &a; bp = &b; cp = &c; dp = &d;
printf("%p %p %p %p\n", ap, bp, cp, dp);

ap++; bp++; cp++; dp++;
printf("%p %p %p %p\n", ap, bp, cp, dp);

ap += 3;
printf("%p\n", ap);
```

```
ffbff0a4 ffbff0a0 ffbff09f ffbff090
```

+4 +4 +1 +8

```
ffbff0a8 ffbff0a4 ffbff0a0 ffbff098
```

+12

```
ffbff0b4
```

Recall Lect#2a slide 16:
int takes up 4 bytes
float takes up 4 bytes
char takes up 1 byte
double takes up 8 bytes

IncrementPointers.c

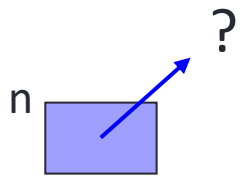
1.9 Common Mistake

CommonMistake.c

```
int *n;

*n = 123;
printf("%d\n", *n);
```

What's wrong with this?
Can you draw the picture?



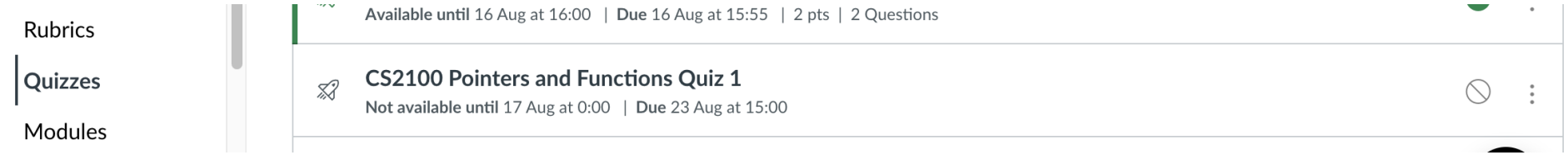
- Where is the pointer n pointing to?
- Where is the value 123 assigned to?
- Result: Segmentation Fault (core dumped)
  - Remove the file "core" from your directory. It takes up a lot of space!

1.10 Why Do We Use Pointers?

- It might appear that having a pointer to point to a variable is redundant since we can access the variable directly
- The purpose of pointers is apparent later when we pass the address of a variable into a function, for example, in the following scenarios:
  - To pass the addresses of two or more variables to a function so that the function can pass back to its caller new values for the variables
  - To pass the address of the first element of an array to a function so that the function can access all elements in the array

Quiz

- Please complete Pointers and Functions Quiz 1 before 3 pm on 23 August 2022.



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