Name: ______________________________

Directions: **Work only on this sheet** (on both sides, if needed). MAKE SURE TO COPY YOUR ANSWERS TO A SEPARATE SHEET FOR SENDING ME AN ELECTRONIC COPY LATER.

Important note: Remember that in problems calling for R code, you are allowed to use any built-in R function, e.g. **choose()**, **sum()**, etc.

1. Consider the OOP study described at the top of p.281, which was actually a bit different from the description in our book:[1]

$$\text{mean } Y = \beta_0 + \beta_1 X^{(1)} + \beta_2 X^{(2)} + \beta_3 X^{(1)} X^{(2)} \quad (1)$$

The results were:

coef.	betahat	std.err.
β_0	4.37	0.23
β_1	0.49	0.07
β_2	0.56	1.57
β_3	-0.13	-1.34

(a) (10) The last term in (1) is known as the ________________________ term.

(b) (20) Find the estimated difference in mean completion time under OOP and using procedure language (former minus the latter), for 1000-line programs.

(c) (15) Find an approximate 95% confidence interval for β_1, answering with R's **c()** form.

(d) (15) Find $\widehat{Var}(\hat{\beta}_0)$.

2. (15) In the marbles example, p.147, find $m_{Y;B}(2)$.

3. The code below estimates the regression function $m_{Y;X}(t)$ for scalar X, without assuming a linear or other parametric model. The vector parameters **y**, **x**, and the scalar parameter **t**, are self-explanatory. As to the scalar parameter **h**, I'll simply say that we consider one number u "near" another number v if $|u - v| < h$.

```
nonparregest <- function(y,x,t,h) {
   dists <- blank (a)
   xnear <- blank (b)
   blank (c)
}
```

(5) Fill blank (a).

(10) Fill blank (b).

(10) Fill blank (c).

Solutions:

1.a interaction

1.b

```
(4.37 + 0.49*1000 + 0.56*1 - 0.13*1000*1) -
(4.37 + 0.49*1000 + 0.56*0 - 0.13*1000*0)
```

1.c

```
c(0.49 - 1.96 * 0.07, 0.49 + 1.96 * 0.07)
```

1.d

```
0.23 ^ 2
```

2.

```
(0.036*0 + 0.048*1 + 0.006*2) / (0.036 + 0.048 + 0.006)
```

3.

```
nonparregest <- function(y,x,t,h) {
   dists <- abs(x-t)
   xnear <- which(dists < h)
   mean(y[xnear])
}
```

[1] They also used logarithms, but we'll ignore that here.