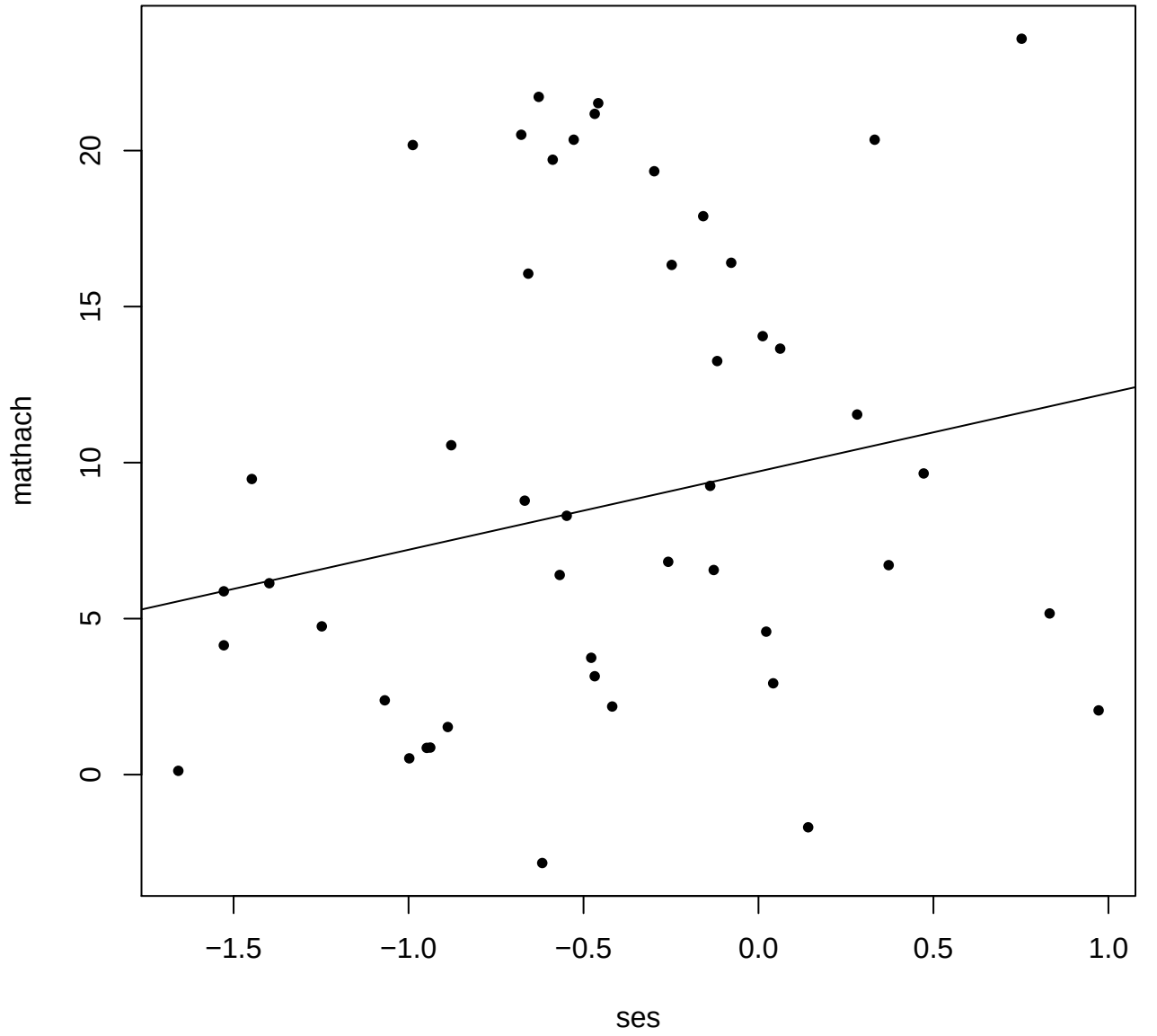
School 1224

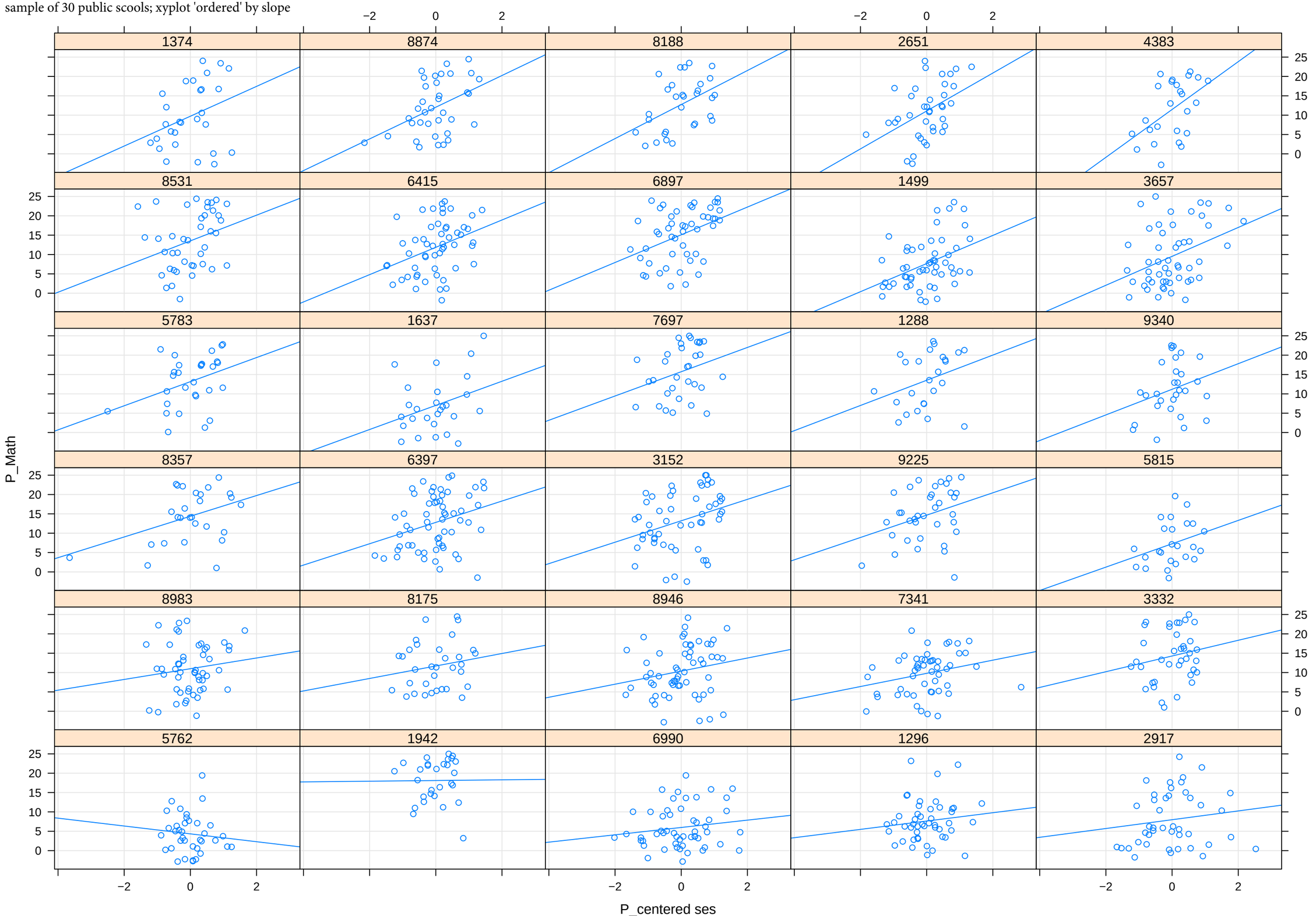


Catholic$_c$

C_Math

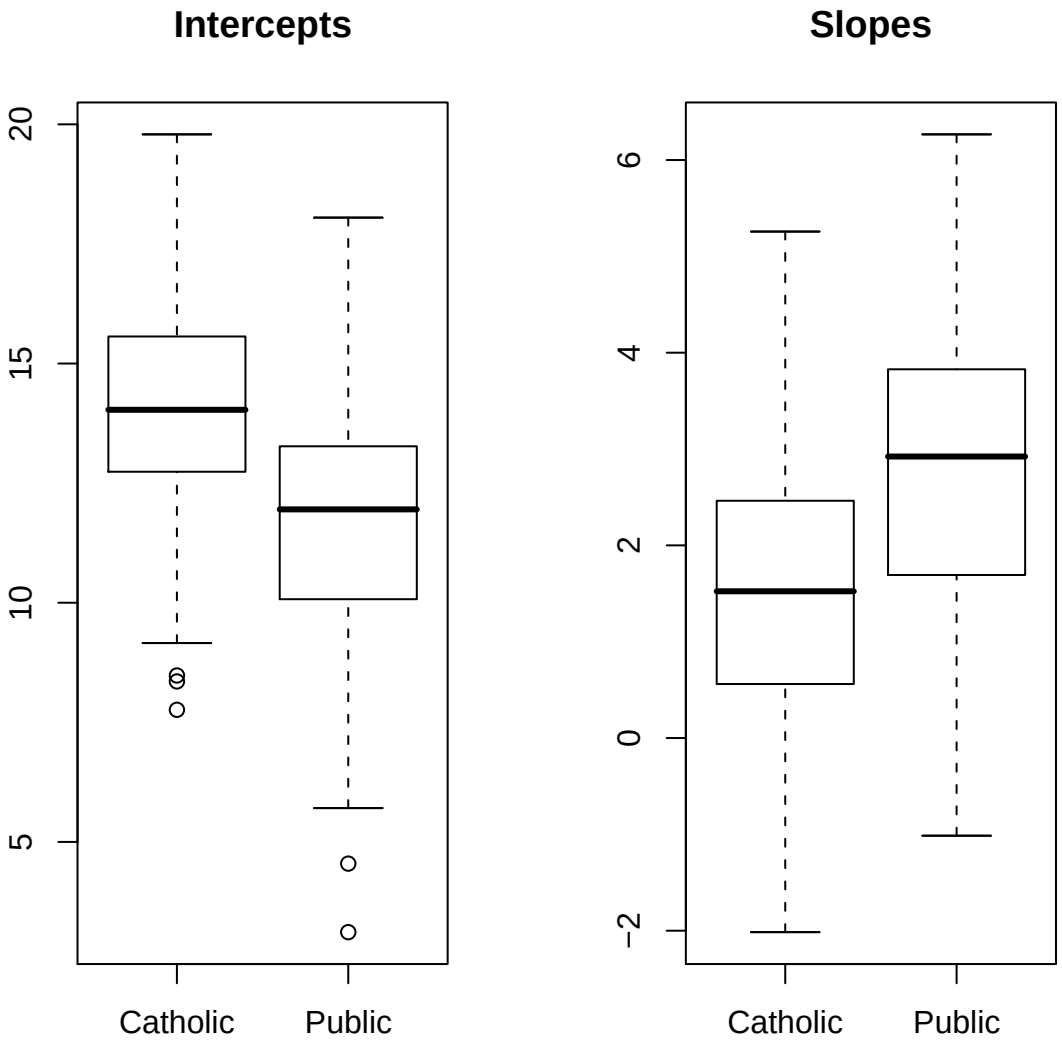
C_centered ses

sample of 30 public scools; xyplot 'ordered' by slope



```
>  attach(Bryk) #we can refer to variables by simple name
>  table(sector) #get the student breakdown
sector
  Public Catholic
    3642     3543
>  cathRegC = lmList(mathach ~ cses| school, subset = sector == "Catholic", data = Bryk)
>  pubRegC = lmList(mathach ~ cses| school, subset = sector == "Public", data = Bryk)
> length(cathRegC); length(pubRegC)
[1] 70
[1] 90
> pubcoef= coef(pubRegC)
> cathcoef= coef(cathRegC)
>  par( mfrow = c(1,2)) # opens a graphics window, creates the figure shown in lecture
>  boxplot(cathcoef[,1], pubcoef[,1], main = 'Intercepts', names = c('Catholic', 'Public'))
>  boxplot(cathcoef[,2], pubcoef[,2], main = 'Slopes', names = c('Catholic', 'Public'))
>
> # order the sector factor
>  Bryk$sector = factor(Bryk$sector, levels = c('Public', 'Catholic'))


####here is the main event, fitting the random effects model using lmer,
           note change in syntax, same output values

> bryklmer = lmer(mathach ~ meanses*cses + sector*cses + (1 +  cses|school), data = Bryk)
> summary(bryklmer)
Linear mixed model fit by REML
Formula: mathach ~ meanses * cses + sector * cses + (1 + cses | school)
   Data: Bryk
   AIC   BIC logLik deviance REMLdev
 46524 46592 -23252    46496   46504
Random effects:
 Groups   Name        Variance Std.Dev. Corr
 school   (Intercept)  2.37958 1.54259
          cses         0.10122 0.31814  0.391
 Residual             36.72116 6.05980
Number of obs: 7185, groups: school, 160

Fixed effects:
                   Estimate Std. Error t value
(Intercept)          12.1279     0.1993   60.86
meanses               5.3329     0.3692   14.45
cses                  2.9450     0.1556   18.93
sectorCatholic        1.2266     0.3063    4.00
meanses:cses          1.0392     0.2989    3.48
cses:sectorCatholic  -1.6427     0.2398   -6.85

Correlation of Fixed Effects:
            (Intr) meanss cses   sctrCt mnss:c
meanses      0.256
cses         0.075  0.019
sectorCthlc -0.699 -0.356 -0.052
meanses:css  0.019  0.074  0.293 -0.026
css:sctrCth -0.052 -0.027 -0.696  0.077 -0.351
>
```

From Level 1 model, SFYS analysis



From the 160 w/in school OLS fits (lmList Lab2)
cath schools have higher means and flatter slopes

```
> bryklme = lme(mathach ~ meanses*cses + sector*cses, random = ~ cses|school,
              data = Bryk)
> summary(bryklme)
Linear mixed-effects model fit by REML
 Data: Bryk
       AIC      BIC    logLik
  46523.66 46592.45 -23251.83

Random effects:
 Formula: ~cses | school
 Structure: General positive-definite, Log-Cholesky parametrization
            StdDev    Corr
(Intercept) 1.5426150 (Intr)
cses        0.3182015 0.391
Residual    6.0597955

Fixed effects: mathach ~ meanses * cses + sector * cses
                        Value Std.Error   DF  t-value p-value
(Intercept)         12.127931 0.1992919 7022 60.85510   0e+00
meanses              5.332875 0.3691684  157 14.44564   0e+00
cses                 2.945041 0.1556005 7022 18.92694   0e+00
sectorCatholic       1.226579 0.3062733  157  4.00485   1e-04
meanses:cses         1.039230 0.2988971 7022  3.47688   5e-04
cses:sectorCatholic -1.642674 0.2397800 7022 -6.85076   0e+00
 Correlation:
                    (Intr) meanss cses   sctrCt mnss:c
meanses              0.256
cses                 0.075  0.019
sectorCatholic      -0.699 -0.356 -0.053
meanses:cses         0.019  0.074  0.293 -0.026
cses:sectorCatholic -0.052 -0.027 -0.696  0.077 -0.351

Standardized Within-Group Residuals:
       Min         Q1        Med         Q3        Max
-3.1592608 -0.7231893  0.0170471  0.7544510  2.9582205

Number of Observations: 7185
Number of Groups: 160
```

From Lab 2, Level 2 parameter estimates

```
bryklmer = lmer(mathach ~ meanses*cses + sector*cses + (1 +  cses|school), data = Bryk)
```