Lecture 11 problem 1

Inbreeding data (Data set 1) Averaged Over 20 Reps (see program next slide)

- Fit the Generation Means for each trait to a second order model against F
  - Use IML
  - Use GLM
- Plot each trait against F
- Why do you get a different relationships for each trait?

Gen	Y1	Y2	Y3	F
1	110.4	137.5	2.28	0.000
2	147.4	136.8	2.06	0.157
3	122.0	130.6	1.70	0.281
4	102.0	129.9	2.02	0.333
5	64.2	122.9	1.40	0.396
6	38.5	121.0	1.20	0.459
7	12.8	120.0	1.22	0.491
8	-21.8	118.4	0.66	0.584
9	-20.0	115.2	1.03	0.624
10	-56.5	115.1	1.06	0.657

Lecture 11 Problem 2

Estimate Between Replicate Variance at Each Generation

```
data a1;
input Rep Gen sire dam animal y1 y2 y3;
cards;
1 1 2 10001 20001 341.561 140.218 -1.32
1 1 3 10002 20002 316.23 143.202 -0.598
```

```
proc means noprint;by rep gen;var y1 y2 y3;
output out=m1 mean=y1 y2 y3;

proc sort;by gen;
proc means noprint;by gen;var y1 y2 y3;
output out=m2 mean=my1 my2 my3 std=sb1 sb2 sb3;
proc print; run;
```

Lecture 11 Problem 3: Estimate Within Replicate Variance for Each Generation

```
data a1;
input Rep Gen sire dam animal y1 y2 y3;
cards;

1    1    2    10001    20001    341.561    140.218    -1.32
1    1    3    10002    20002    316.23     143.202    -0.598

proc means noprint;by rep gen;var y1 y2 y3;
output out=m1 std=swy1 swy2 swy3;

proc sort data=m1;by gen;
proc means noprint;by gen;var swy1 swy2 swy3;
output out=m2 mean= mswy1 mswy2 mswy3;
proc print; run;
```


Lecture 11 problem 4:

For Each Trait Find Empirical Relationship Between the within and between population variance and F

$$V(Within) = F + e \quad V(Between) = F + e$$

```
Data a1;
input Gen Mean SW  SB F;
VW=SW**2;
VB=SB**2;
CARDS;
 1   2.28460   4.71875   0.84600  0.000
 2   2.06908   4.34407   2.45756  0.157
 3   1.70690   4.07810   3.52271  0.281
 4   2.02030   3.72556   3.37658  0.333
 5   1.40335   3.73361   4.11996  0.396
 6   1.20441   3.86685   4.40742  0.459
 7   1.22212   3.59145   4.84650  0.491
 8   0.66843   3.47721   5.79003  0.584
 9   1.03762   3.11475   6.35566  0.624
10   1.06027   3.06278   5.87509  0.657
PROC GLM;
MODEL VW VB=F;
RUN;
QUIT;
```

- From the linear regression of within or between variance on F is it possible to estimate the additive and environmental variance?
- What are these?

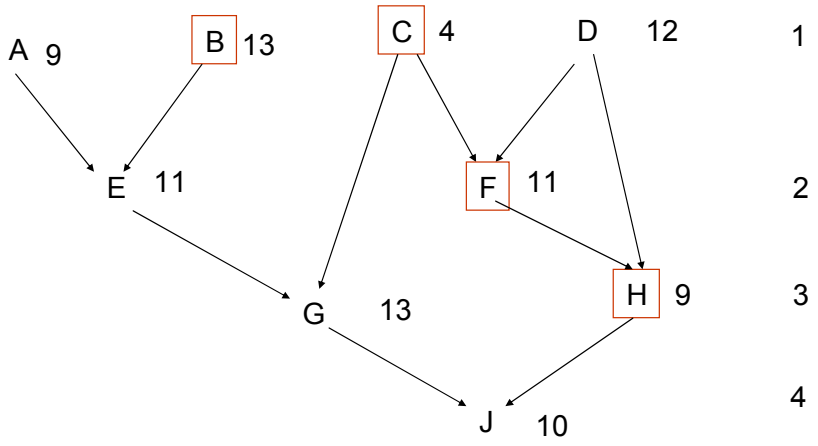
Lecture 12 Problem 1

- How does changing the heritability affect the estimates and PEV and PE variance? Set to each of the following and compare results

$$\frac{\sigma_e^2}{\sigma_a^2} = 100 \qquad \frac{\sigma_e^2}{\sigma_a^2} = .1$$

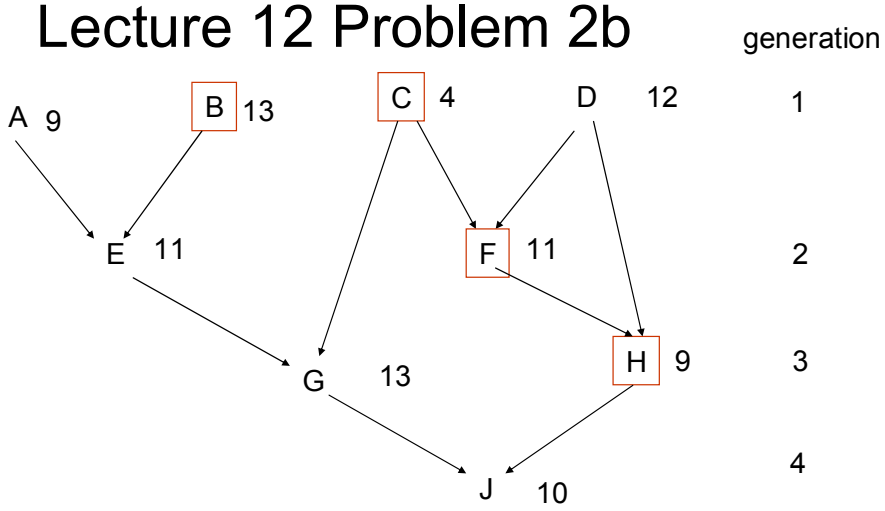
Interpret the results

Lecture 12 Problem 2a



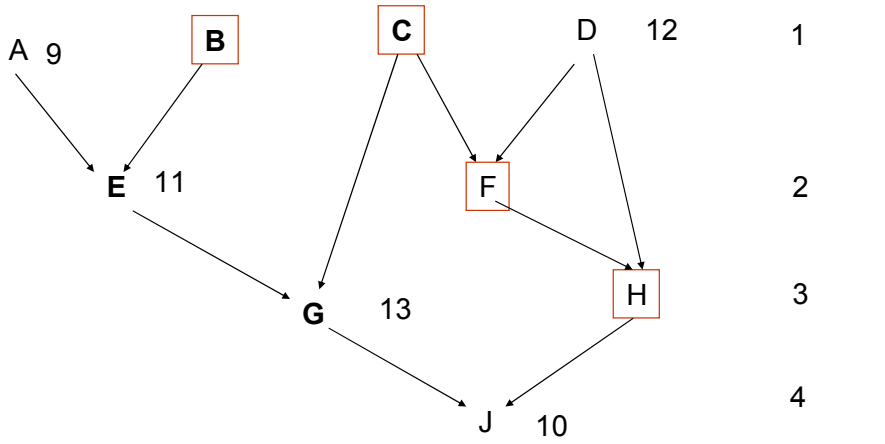
Find the best estimate of the genetic worth of each animal, additive and error variance, PEV, and PV. Assume a heritability of .5

Lecture 12 Problem 2b



Environmental trend can be found by fitting generation number as a covariate. Genetic trend is found by taking the average of all EBV's in that generation and fitting the means to a linear regression. What are the genetic and environmental trend for this data

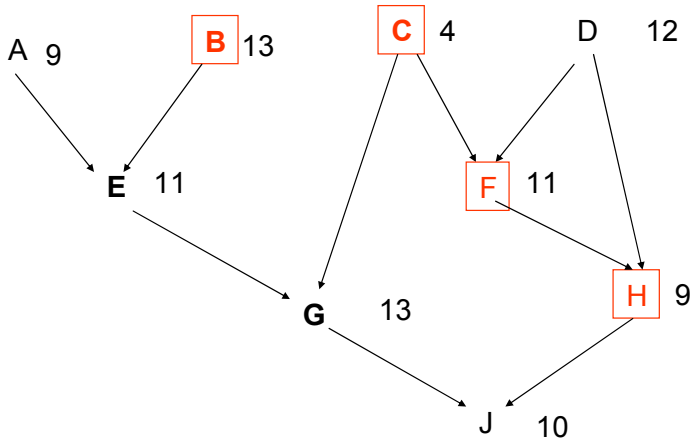
Lecture 12 Problem 3: Sex Limited Trait



Estimate breeding values for the males

$$\frac{\sigma_e^2}{\sigma_a^2} = 1$$

Lecture 13 Problem 1 PE

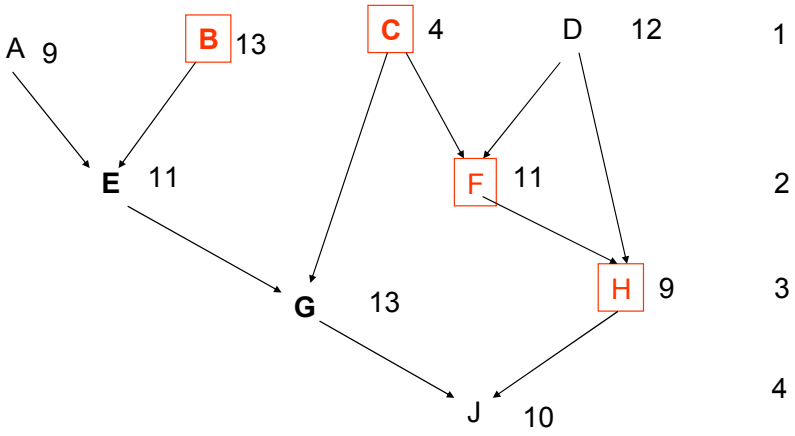


Fit an animal model with permanent environmental effects, assume error variance as previously estimated and

$\frac{\sigma_e^2}{\sigma_a^2} = 1$ $\frac{\sigma_e^2}{\sigma_p^2} = .1$ or $\frac{\sigma_e^2}{\sigma_p^2} = 15$

What impact does it have on ranking of animals for breeding

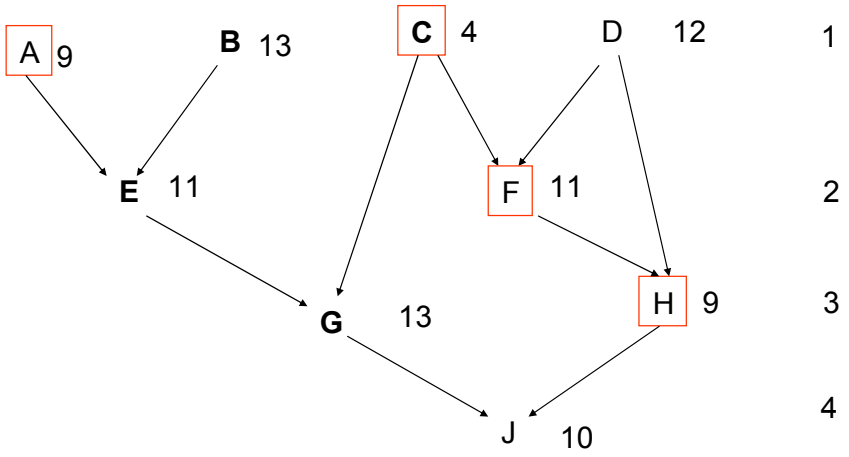
Lecture 14 Problem 1



Find the best estimate of the environmental trend, genetic worth of each animal, Maternal Genetic Effect (males are in boxes), assume error variance as previously estimated in 12.2a and

$\frac{\sigma_e^2}{\sigma_a^2} = 1$ $\frac{\sigma_e^2}{\sigma_m^2} = .5$ $\frac{\sigma_{a,m}}{\sigma_e^2} = -.25$

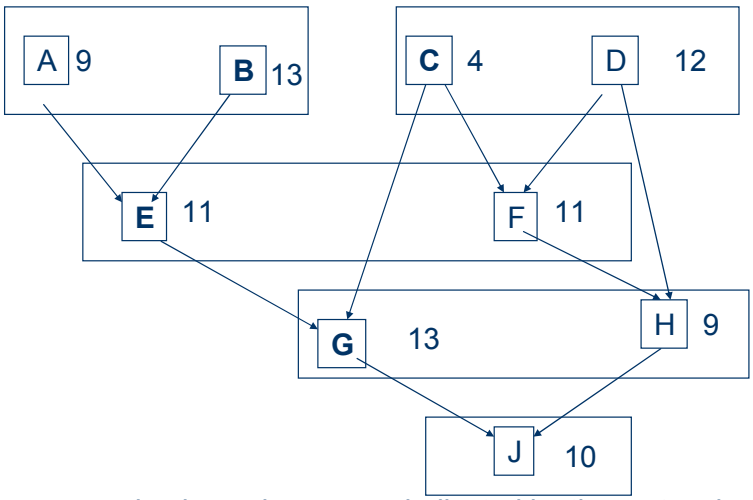
Lecture 14 Problem 2



Find the best estimate of the environmental trend, genetic worth of each animal, and cytogenetic effects. Assume error variance as previously estimated in 12.2a and

$$\frac{\sigma_e^2}{\sigma_a^2} = 1 \qquad \frac{\sigma_e^2}{\sigma_c^2} = .5$$

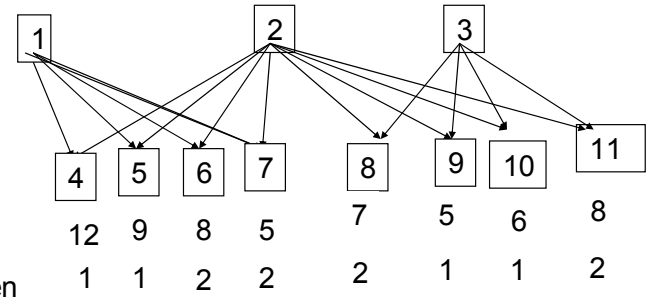
Lecture 15 Problem 1 Competition



Assume animals are in pens as indicated by the rectangles above. Fit an animal model with competitive effects, assume

$$\frac{\sigma_e^2}{\sigma_a^2} = 1 \qquad \frac{\sigma_e^2}{\sigma_p^2} = .1 \qquad \frac{\sigma_e^2}{\sigma_p^2} = 15$$

Lecture 15 Problem 2 Competition
Impact of GxG effects on Breeding program



	4	5	6	7	8	9	10	11
	12	9	8	5	7	5	6	8
Pen	1	1	2	2	2	1	1	2

Index

Assume animals are in pens as indicated.

a) Fit an animal model with and without competitive effects
b) Rank Individuals for breeding using the following indexes
c) Discuss results relative to breeding program

Without Competitive Effects

With Competitive Effects

67

Lecture 16 Problem 1

- From the Following Barley Data, Each Group Chose 2 different genotypes. Partition the GxE interaction for the pair and interpret the results.

Table 9. Yields of five barley genotypes in six environments (locations) summed over 2 years and three plots[a]

Genotype	Environment					
	1	2	3	4	5	6
Manchuria	161.7	247.0	185.4	218.7	165.3	154.6
Svansota	187.7	257.5	182.4	183.3	138.9	143.8
Velvet	200.1	262.9	194.9	220.2	165.8	146.3
Trebi	196.9	339.2	271.2	266.3	151.2	193.6
Peatland	182.5	253.8	219.2	200.5	184.4	190.1

[a] Summarized from Yates and Cochran (1938)

Lecture 17 Problem 1

- If one measure Wt6, VLDL(fat), and PR
  - A. What are the optimal weights
  - B. What is the expected change in aggregate economic gain considering all traits of economic importance
- If one measured all traits except RR
  - A. What are the optimal Weight
  - B. What is the expected change in aggregate economic gain considering all traits of economic importance
- Considering the costs of both programs which one do you think would be more profitable?

Lecture 17 Problem 2

- For the traits given on page 41-43 for broilers, compare alternative Multi-Stage selection programs to optimize profits
- Which one maximizes Profit?
- Which one maximizes Genetic Gain?

Lecture 18 Problem 1

- Each Group Chose A Different Commodity Group from below.
  - Fish, Shellfish, Dairy, Beef, Swine, Sheep (wool), Sheep (meat), Horse, Broiler, Layer, Swine
  - What are the critical traits for each commodity group?
  - Subdivide Traits into categories where you feel MAS will be Highly, Moderate, or Minor effective in improving the trait. Give Reason for putting into each category.

Lecture 18 Problem 2

- From the paper by Dekkers and Hospital
  - List the top 3 most important conclusions, opinions, or findings
  - Discuss why you listed those in the top 3

Lecture 19 Problem 1

- Chose one of the commodity groups below
- Design an optimal breeding program
  - What traits to select on
  - What method of selection would you utilize
  - How many animals be utilized
  - How many breeders would be chosen (How many of each sex would you save)
  - What mating system would be employed (how would you determine who mates to whom and how many offspring would be kept per mating ?