Final Exam Review - Solutions

1. a.) Kings - $11+7=18$
Black - $7+5+9=21$
Thievery - $6+5=11$
Ray - 19
} The Black Keys wins plurality

b.) Black - $21+11=32$
Ray - $19+7+6+5=37$
} Ray LaMontagne wins runoff

c.) Kings - $4(18)+3(9+5+19)+2(7+6)+1(5) = 4(18)+3(33)+2(13)+5 = 202$
Black - $4(21)+3(11)+2(7+19)+1(6+5) = 4(21)+3(11)+2(26)+11 = 180$
Thievery - $4(11)+3(7+5)+2(9)+1(11+7+19) = 4(11)+3(12)+2(9)+37 = 135$
Ray - $4(19)+3(7+6)+2(11+5+5)+1(7+9) = 4(19)+3(13)+2(21)+16 = 173$

Kings of Leon wins Borda

d.) $\frac{c(c-1)}{2} = \frac{4(3)}{2} = 6$

1.) Kings - $11+7+6+5+19=48$
Black - $7+5+9=21$
} Kings wins vs. Black

2.) Black - $11+7+7+5+9+6+19=58$
Thievery - $6+5=11$
} Black wins vs. Thievery

3.) Thievery - $7+5+9+6+5=32$
Ray - $11+7+19=37$
} Ray wins vs. Thievery

4.) Kings - $11+7+9+19=46$
Thievery - $7+5+6+5=23$
} Kings wins vs. Thievery

5.) Kings - $11+7+7+9+5=39$
Ray - $5+6+19=30$
} Kings wins vs. Ray

6.) Black - $11+7+5+9=32$
Ray - $7+6+5+19=37$
} Ray wins vs. Black

Kings of Leon is the Condorcet

e.)

original rankings		modified	New Borda counts
Kings	2	→ 3	$202-(3\times19)+(2\times19)=183$
Black	3	→ 4	$180-(2\times19)+(1\times19)=161$
Thievery	4	→ 2	$135-(1\times19)+(3\times19)=173$
Ray	1	→ 1	173 so strategic voting NOT possible

2) a.) Hamilton's Method, natural divisor = 118,284 ÷ 12 = 9857

Store	Shoppers	Nat Quota	In. Alloc	Fin. Alloc
Boston	28,772	2.9189 ✓	2	3
Mansfield	13,472	1.3667	1	1
Providence	32,871	3.3348	3	3
Hartford	43,169	4.3795 ✓	4	5
			10	12
totals:	118,284			

(* final allocation based on largest decimal of natural quota)

b.) Lowndes' Method, natural divisor = 118,284 ÷ 12 = 9857

Store	Shoppers	Nat. Quota	In Alloc	Rel. Frac. Part	Fin Alloc
Boston	28,772	2.9189	2	$0.9189 \div 2 = 0.4595$ ✓	3
Mansfield	13,472	1.3667	1	$0.3667 \div 1 = 0.3667$ ✓	2
Providence	32,871	3.3348	3	$0.3348 \div 3 = 0.1116$	3
Hartford	43,169	4.3795	4	$0.3795 \div 4 = 0.0949$	4
totals:	118,284		10		12

(* final allocation based on largest rel. frac. part)

c.) Jefferson's Method, natural divisor = 118,284 ÷ 12 = 9857

Store	Shoppers	Nat. Quota	In. Alloc	Thres. Div	Mod Quota	Fi Allo
Boston	28,772	2.9189	2	$\frac{28,772}{3} = 9590.6667$ (1)	3.3340	3
Mansfield	13,472	1.3667	1	$\frac{13,472}{2} = 6736.0000$ (4)	1.5611	1
Providence	32,871	3.3348	3	$\frac{32,871}{4} = 8217.7500$ (3)	3.8089	3
Hartford	43,169	4.3795	4	$\frac{43,169}{5} = 8633.8000$ (2)	5.0022	5
totals:	118,284		10	Let md = 8630		12

3)

$$\frac{9 + (4.3)^{-2.9x}}{8} = 44$$

$$9 + (4.3)^{-2.9x} = 352$$

$$(4.3)^{-2.9x} = 343$$

$$-2.9x \log(4.3) = \log(343)$$

$$x = \frac{\log(343)}{-2.9 \log(4.3)} = -1.3801$$

4)

$$6(19-8y)^6 = 817$$

$$(19-8y)^6 = 136.1667$$

$$19-8y = (136.1667)^{1/6}$$

$$19-8y = 2.2682$$

$$-8y = -16.7318$$

$6500 @ 6.1% simple int

$$FV = P(1+rt)$$
$$= 6500(1+(0.061)(10))$$
$$= 6500(1+0.61)$$
$$= 6500(1.61)$$
$$= \$10,465$$

$6500 @ 5.6% cmpd monthly

$$FV = P(1+\frac{r}{n})^{nt}$$
$$= 6500(1+\frac{0.056}{12})^{(12)(10)}$$
$$= 6500(1+0.004667)^{120}$$
$$= 6500(1.004667)^{120}$$
$$= 6500(1.7484)$$
$$= \$11,364.56$$

so $6500 @ 5.6% cmpd monthly is worth more than $6500 @ 6.1% simple.

)

$$FV = P(1+\frac{r}{n})^{nt}$$
$$2500 = 1500(1+\frac{0.0375}{12})^{(12)t}$$
$$2500 = 1500(1+0.003125)^{12t}$$
$$2500 = 1500(1.003125)^{12t}$$
$$1.6667 = (1.003125)^{12t}$$
$$\text{g}(1.6667) = 12t\log(1.003125)$$
$$t = \frac{\log(1.6667)}{12\log(1.003125)} = 13.6433 \text{ yrs}$$

7)

$$FV = P(1+\frac{r}{n})^{nt}$$
$$1,000 = 42(1+\frac{r}{365})^{(365)(6)}$$
$$1,000 = 42(1+\frac{r}{365})^{2190}$$
$$3.8095 = (1+\frac{r}{365})^{2190}$$
$$3.8095)^{1/2190} = (1+\frac{r}{365})$$
$$.001449 = 1+\frac{r}{365}$$
$$.001449 = \frac{r}{365}$$
$$.5287 = r$$

so you would need an interest rate of 52.87%.

8)

$$FV = D\left(\frac{(1+\frac{r}{n})^{nt}-1}{\frac{r}{n}}\right)$$

$$= 150\left(\frac{(1+\frac{0.045}{12})^{(12)(47)}-1}{\frac{0.045}{12}}\right)$$

$$= 150\left(\frac{(1+0.00375)^{564}-1}{0.00375}\right)$$

$$= 150\left(\frac{(1.00375)^{564}-1}{0.00375}\right)$$

$$= 150\left(\frac{8.2569-1}{0.00375}\right)$$

$$= 150\left(\frac{7.2569}{0.00375}\right)$$

$$= 150\,(1935.1624)$$

$$= \$\,290{,}274.36$$

9)

$$FV = D\left(\frac{(1+\frac{r}{n})^{nt}-1}{\frac{r}{n}}\right)$$

$$50{,}000 = D\left(\frac{(1+\frac{0.045}{12})^{(12)(47)}-1}{\frac{0.045}{12}}\right)$$

$$50{,}000 = D\,(1935.1624)$$ ← from above in # 8

$$\$\,387.56 = D$$

10)

$$P = R\left(\frac{1-(1+\frac{r}{n})^{-nt}}{\frac{r}{n}}\right)$$

$$300{,}000 = R\left(\frac{1-(1+\frac{0.053}{12})^{-(12)(35)}}{\frac{0.053}{12}}\right)$$

$$00{,}000 = R\left(\frac{1-(1+0.004417)^{-420}}{0.004417}\right)$$

$$00{,}000 = R\left(\frac{1-(1.004417)^{-420}}{0.004417}\right)$$

$$00{,}000 = R\left(\frac{1-0.1571}{0.004417}\right)$$

$$00{,}000 = R\left(\frac{0.8429}{0.004417}\right)$$

$$00{,}000 = R\,(190.8324)$$

$$1572.06 = R$$