1)

$t = 6, k = 3, b = 6, r = 3$

$\lambda = \frac{r(k-1)}{t-1} = \frac{3(2)}{5} = 1.2$

The design is not balanced because λ is not an integer.

2)

BIBD with 3 of 6 trts appearing in each of the 10 blocks … t = 6 b = 10 r = 5 k =3 lambda = 2 n = 30

```
proc glm;
class Person     Treatment;
model  AreaRed = Person       Treatment / ss3;
lsmeans treatment / pdiff cl;
run;
```

```
Dependent Variable: AreaRed

                                   Sum of
Source                     DF       Squares    Mean Square   F Value   Pr > F

Model                      14    2781.855556     198.703968      6.57   0.0004

Error                      15     453.611111      30.240741

Corrected Total            29    3235.466667


R-Square     Coeff Var      Root MSE    AreaRed Mean

0.859800      13.05180      5.499158        42.13333


Source                     DF    Type III SS    Mean Square   F Value   Pr > F

Person                      9     512.788889      56.976543      1.88   0.1336
Treatment                   5    1747.055556     349.411111     11.55   0.0001
```

Because the p-value for treatment is $0.0001 < 0.05$, there is significant evidence that the treatments are significantly different.

2) continued ,,,

Least Squares Means for Effect Treatment

i	j	Difference Between Means	95% Confidence Limits for LSMean(i)-LSMean(j)		
1	2	3.833333	-4.454791	12.121458	
1	3	-13.833333	-22.121458	-5.545209	***
1	4	5.833333	-2.454791	14.121458	
1	5	9.833333	1.545209	18.121458	***
1	6	-10.166667	-18.454791	-1.878542	***
2	3	-17.666667	-25.954791	-9.378542	***
2	4	2.000000	-6.288125	10.288125	
2	5	6.000000	-2.288125	14.288125	
2	6	-14.000000	-22.288125	-5.711875	***
3	4	19.666667	11.378542	27.954791	***
3	5	23.666667	15.378542	31.954791	***
3	6	3.666667	-4.621458	11.954791	
4	5	4.000000	-4.288125	12.288125	
4	6	-16.000000	-24.288125	-7.711875	***
5	6	-20.000000	-28.288125	-11.711875	***

Significant Differences:

(E,A), (E,F), (E,C), (D,F), (D,C), (B,F), (B,C), (A,F), (A,C)

3)

Test and CI for One Proportion

```
Sample    X    N  Sample p         90% CI
1       229  500  0.458000  (0.420607, 0.495763)
```

Test and CI for One Proportion

```
Sample    X    N  Sample p         90% CI
1       229  500  0.458000  (0.421350, 0.494650)

Using the normal approximation.
```

We are 90% confident that …
… the interval 42.1% to 49.5% contains the true proportion of new product placements for all automobile parts stores.

4)

Chi-Square Goodness-of-Fit Test for Observed Counts in Variable: number

```
Using category names in season


                          Test            Contribution
Category  Observed  Proportion  Expected     to Chi-Sq
winter         328        0.25       375        5.8907
spring         372        0.25       375        0.0240
summer         471        0.25       375       24.5760
fall           329        0.25       375        5.6427


   N  DF   Chi-Sq  P-Value
1500   3  36.1333    0.000
```

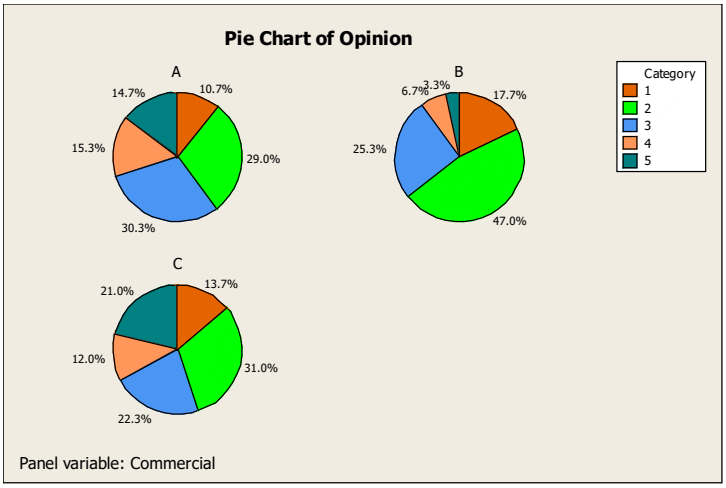
It appears that the homicide rates are different for the four seasons.
The conclusion supports an association, but not a causal relationship, between weather and homicide rates.

5)

Tabulated statistics: Commercial, Opinion

```
Using frequencies in Frequency


Rows: Commercial   Columns: Opinion

                    1       2       3       4       5     All

A                  32      87      91      46      44     300
                42.00  107.00   78.00   34.00   39.00  300.00

B                  53     141      76      20      10     300
                42.00  107.00   78.00   34.00   39.00  300.00

C                  41      93      67      36      63     300
                42.00  107.00   78.00   34.00   39.00  300.00

All               126     321     234     102     117     900
               126.00  321.00  234.00  102.00  117.00  900.00

Cell Contents:      Count
                    Expected count


Pearson Chi-Square = 72.521, DF = 8, P-Value = 0.000
```

There is significant evidence that the commercial viewed and opinions are related.
… opinion distributions differ for the various commercials …



6)

Tabulated statistics: group, tumors

```
Using frequencies in count


Rows: group   Columns: tumors

               none   one+     All

control          90     10     100
              90.00  10.00  100.00
              85.67  14.33  100.00

high dose        81     19     100
              81.00  19.00  100.00
              85.67  14.33  100.00

low dose         86     14     100
              86.00  14.00  100.00
              85.67  14.33  100.00

All             257     43     300
              85.67  14.33  100.00
             257.00  43.00  300.00

Cell Contents:      Count
                    % of Row
                    Expected count


Pearson Chi-Square = 3.312, DF = 2, P-Value = 0.191
```

% rats with one+ tumors:

control: 10%; low dose: 14%; high dose: 19%

Because the p-value is fairly large, conclude there is not significant evidence of a difference in the probability of having one or more tumors for the three rat groups. Insufficient evidence to indicate that as dose is increased, an increase in proportion of rats with tumors follows …