# UNIVERSITY OF NEWCASTLE UPON TYNE <br> <br> Premedical course <br> <br> Premedical course <br> MOCK Examination I 

## 2 hours

## Answer all questions

## 1. Write short notes on

a) methods of graphical representation of the distribution of a continuous variable;
b) the relative merits of hypothesis testing and confidence intervals;
c) Simpson's paradox.
2. A case-control study was carried out to see whether children with peptic ulcer differed genetically from other children. The following results were obtained in relation to the Rhesus D blood group:

|  | Rh+ | Rh- |  |
| :--- | :---: | :---: | :---: |
| Peptic ulcer | 36 | 6 | 42 |
| Control | 28 | 12 | 40 |
|  | 64 | 18 | 82 |

What proportion of a) children with peptic ulcer, b) control children are Rhesus positive?

For the table

|  | Factor present | Factor absent |  |
| :--- | :---: | :---: | :---: |
| Cases | $a$ | $b$ |  |
| Controls | $c$ | $d$ | $n_{1}$ <br> $n_{2}$ |
|  | $n_{3}$ | $n_{4}$ | $N$ |

the odds ratio is $\hat{\psi}=a d / b c$ and $95 \%$ confidence limits for $\hat{\psi}$ may be obtained through the formula for the standard error of $\log \hat{\psi}$ which is $\sqrt{1 / a+1 / b+1 / c+1 / d}$. Calculate and interpret the odds ratio, with its $95 \%$ confidence limits, for the table given.
3. Use the following MINITAB output (some of which may be inappropriate) to analyse and interpret data from a study which tries to establish whether there is a relationship between a croquet player sustaining an injury and various potential risk factors. Describe critically what the analyst has or has not done. Some of the MINITAB output has been deleted for clarity.

The variable 'anywrist' has value 1 if the subject has reported at least one sufficiently serious injury to hand, wrist or arm, and 0 otherwise; 'agestart' is the age (in years) the subject began to play, 'ngames' is the average number of games he or she played per season when most active; 'sex' is coded 1 for males and 2 for females.

```
MTB > Stem-and-Leaf 'agestart' 'ngames';
SUBC> By 'anywrist'.
Stem-and-leaf of agestart anywrist = 0 N = 138
                568
            1 4
            1 5679
            2 0011223
            2577888899
            3 0002344
                        355677778889
                        4 01234
                        4 55567999
                        5 0000000122223333333344
                        555566667777778889
                        60000000000001111222233344444
                        6555557777888
                70004
Stem-and-leaf of agestart anywrist = 1 N = 76
            1 0}
            4 1 334
            1 567789
            2 02234
            2 }577
                        3 0011233
            3 55667
            4 000222222334444
            4559
                        5 0011134
                        5 556699999
                        600022334
                        6}
            700
Stem-and-leaf of ngames anywrist = 0 N = 138
    42 0 0222222233333333333333333444444444444444444
    (60) 0 555555555555555555555556666666666666666677777777888888889999
    36 1 00000000000000000012233
    13 1 5555555
    6 2 00003
        1 2
        1
        1
Stem-and-leaf of ngames anywrist = 1 N = 76
    18 0 112223333334444444
    (32) 0 55555555556666666677888888889999
    26 1 0000000000012222
    10 1 555567
    4 2 000
    1 2
    30
```

```
MTB > Describe 'agestart' 'ngames';
SUBC> By 'anywrist'.
\begin{tabular}{lrrrrrr} 
& anywrist & N & MEAN & MEDIAN & STDEV & SEMEAN \\
agestart & 0 & 138 & 47.97 & 53.00 & 16.09 & 1.37 \\
& 1 & 76 & 41.01 & 42.00 & 16.06 & 1.84 \\
ngames & 0 & 138 & 71.45 & 60.00 & 50.99 & 4.34 \\
& 1 & 76 & 80.76 & 72.50 & 51.54 & 5.91
\end{tabular}
MTB > TwoT 95.0 'agestart' 'anywrist';
SUBC> Alternative 0;
SUBC> Pooled.
TWOSAMPLE T FOR agestart
\begin{tabular}{lrrrr} 
anywrist & N & MEAN & STDEV & SE MEAN \\
1 & 76 & 41.0 & 16.1 & 1.8 \\
0 & 138 & 48.0 & 16.1 & 1.4
\end{tabular}
95 PCT CI FOR MU 1 - MU 0: ( -11.5, -2.4)
TTEST MU 1 = MU 0 (VS NE): T= -3.03 P=0.0028 DF= 212
POOLED STDEV = 16.1
MTB > TwoT 95.0 'ngames' 'anywrist';
SUBC> Alternative 0;
SUBC> Pooled.
\begin{tabular}{lrrrr} 
TWOSAMP LE & T FOR & ngames & & \\
anywrist & N & MEAN & STDEV & SE MEAN \\
1 & 76 & 80.8 & 51.5 & 5.9 \\
0 & 138 & 71.4 & 51.0 & 4.3
\end{tabular}
95 PCT CI FOR MU 1 - MU 0: ( -5.1, 23.7)
TTEST MU 1 = MU 0 (VS NE): T= 1.27 P=0.20 DF= 212
POOLED STDEV = 51.2
MTB > Table 'sex' 'anywrist';
SUBC> Counts;
SUBC> ChiSquare.
ROWS: sex COLUMNS: anywrist
\begin{tabular}{crccc} 
& 0 & 1 & ALL & \\
1 & 110 & 59 & 169 & \\
2 & 28 & 17 & 45 & \\
ALL & 138 & 76 & 214 & \\
CHI-SQUARE \(=\) & 0.128 & WITH D.F. \(=\) & 1 \\
MTB \(>\) & Plot 'ngames'*'agestart'; & \\
SUBC \(>\) & Symbol.
\end{tabular}
```



```
MTB > Regress 'ngames' 1 'agestart'.
The regression equation is
ngames = 71.4 + 0.073 agestart
\begin{tabular}{lrrrr} 
Predictor & Coef & Stdev & t-ratio & \(p\) \\
Constant & 71.42 & 10.38 & 6.88 & 0.000 \\
agestart & 0.0734 & 0.2148 & 0.34 & 0.733 \\
& & & & \\
\(s=51.37\) & \(R-s q\) & \(=0.1 \%\) & \(R-s q(\) adj \()=0.0 \%\)
\end{tabular}
Analysis of Variance
\begin{tabular}{lrrrrr} 
SOURCE & DF & SS & MS & F & P \\
Regression & 1 & 308 & 308 & 0.12 & 0.733 \\
Error & 212 & 559401 & 2639 & & \\
Total & 213 & 559709 & & &
\end{tabular}
```

4. Discuss some of the problems you might encounter in writing the protocol for a clinical trial comparing two analgesics for their efficacy in relieving pain after extraction of wisdom teeth.
