Part 1 - Normal Probability

1. The gestation period is approximately normally distributed with a mean of 275 days and a standard deviation of 4.5 days.

   Estimate the probability that the gestation period is

i) greater than 280 days
ii) less than 265 days
iii) between 272 and 282 days.

iv) What gestation period is surpassed by 2.5% of the population?

2. The length of the jump of an athlete has a normal distribution with mean 7m and standard deviation 0.1m.

   Calculate the probability that he jumps

i) at least 7.15m
ii) between 6.9 and 7.05m
iii) Find the probability that if he jumps 3 times all the jumps will be less than 7.15m (assume the lengths of the jumps are independent and use the answer to part i).

3. A blood factor measurement is defined to have a normal distribution with mean 100 and standard deviation 15.

   Calculate the probability that a person's blood factor is

i) greater than 130
ii) less than 110
iii) between 82 and 120

Also, calculate the blood factor leve that is exceeded by 15% of the population.

Question 4 (old exam question)

(d) ***Inference Procedures with R (4 Marks)***
Consider the following inference procedure performed on data set X.

```
> shapiro.test(X)

        Shapiro-Wilk normality test

data:  X
W = 0.9619, p-value = 0.6671
```

(i) (1 Mark) Describe what is the purpose of this statistical procedure.

(ii) (2 Marks) What are the null and alternative hypotheses?

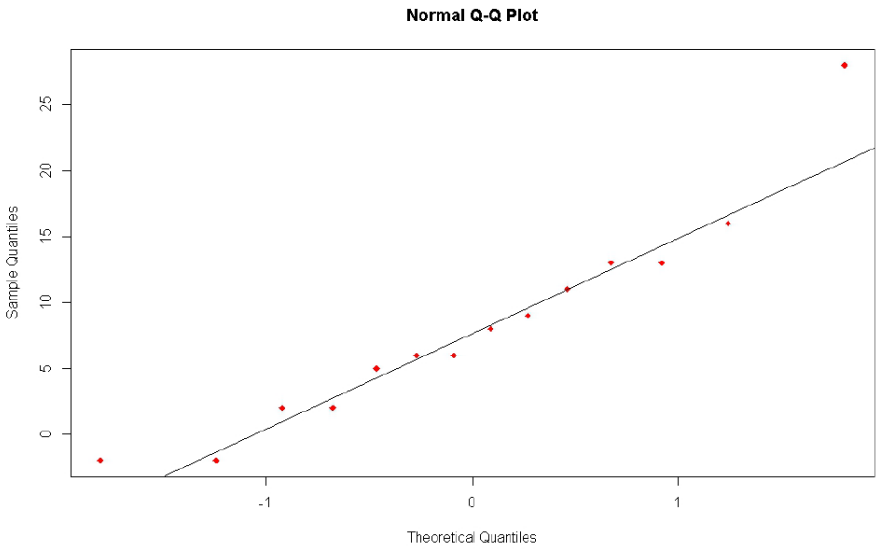
(iii) (1 Mark) Write the conclusion that follows from the code output, displayed above.

Question 5 (old exam question)

(e) ***Graphical Procedures (3 Marks)***

(i) (2 Marks) The graph below depicts a normal probability plot. Describe what this plot is used for and how to interpret one.

(ii) (1 Mark) What is your conclusion for the data used to construct the normal probability plot below?



Question 6 (Grubbs' Test)

6.98	8.49	7.97	6.64
8.80	8.48	5.94	6.94
6.89	7.47	7.32	4.01

```
> grubbs.test(x, two.sided=T)

        Grubbs test for one outlier

data:  x
G = 2.4093, U = 0.4243, p-value = 0.05069
alternative hypothesis: lowest value 4.01 is an outlier
```

i. (2 marks) Describe what is the purpose of this procedure.

ii. (2 marks) Write the conclusion that follows from it.

Question 7 (Outlier Testing Procedures)

1) For the data set in question 6, Compute the test statistic for the Dixon Q' Test.
2) There are three variants of the Grubbs Test. Provide a brief description for all three.
3) What are the required assumptions for the Grubb's Test and the Dixon Test, if any?

Question 8 - Transforming Data

What is the purpose of the following Analysis?

```
> Y
 [1]  307.92   235.61  198.95   63.46  253.24  175.82
 [7] 1595.03    81.57  354.25  102.88  316.36  169.86
[13]  219.99   200.69 1216.13 1018.16   84.93  382.34
[19]   56.15  5224.33
>
>
>
> shapiro.test(Y)

        Shapiro-Wilk normality test

data:  Y
W = 0.4831, p-value = 2.244e-07

>
>
> shapiro.test(log(Y))

        Shapiro-Wilk normality test

data:  log(Y)
W = 0.9226, p-value = 0.1113

>
```