Haemadown is a new drug for reducing blood pressure. It has a number of side effects. These include dry skin with probability 0.01, dizziness with probability 0.12, and swollen joints with probability 0.15.

(a) The proportion of people taking *Haemadown* who suffer from both dizziness **and** swollen joints is 0.018.

By performing a calculation, decide whether the side effects of dizziness and swollen joints occur independently of each other. *(2 marks)*

(b) Lydia, a doctor in general practice, prescribes *Haemadown* to 90 of her patients who suffer from high blood pressure and asks them to complete a questionnaire on any side effects that they have suffered.

(i) Use an approximation to the distribution B(90, 0.01) to estimate the probability that more than 2 of these 90 patients will report suffering from dry skin. *(4 marks)*

(ii) Lydia finds that 21 of the 90 patients reported suffering from dizziness.

Use a distributional approximation to test, at the 1% significance level, whether the proportion of patients taking *Haemadown* who suffer from dizziness differs from the stated value of 0.12. *(8 marks)*

A company which sells tools claims that more than 40 per cent of people admit to having used kitchen cutlery, instead of the appropriate tools, when attempting a 'do it yourself' (DIY) job.

Students at a university were asked to complete a confidential questionnaire when applying for accommodation. The first question was:

Have you ever attempted a DIY job?   Yes/No

Those who answered 'Yes' were then asked the next question:

Have you ever used kitchen cutlery instead of the appropriate tools when attempting a DIY job?   Yes/No

(b) Of the 50 students who answered 'Yes' to the first question, 25 answered 'Yes' to the next question.

Test whether there is evidence, significant at the 5% level, to support the claim that more than 40 per cent of students applying for accommodation who have attempted DIY jobs admit to having used kitchen cutlery instead of the appropriate tools. Use an exact distribution and assume that the sample is random. *(6 marks)*

(c) Summarise your results in the context of the company's claim. *(3 marks)*

At the beginning of 2014, a bank found that 15 per cent of its savings account holders were aged 25 years or under. A new type of savings account was then launched that was intended to appeal specifically to this age group.

At the end of 2014, a random sample of 120 customers who held the new savings account was found to include 29 who were aged 25 years or under.

Use an approximation to the binomial distribution to test, at the 1% significance level, whether the new type of savings account had attracted a higher percentage of customers aged 25 years or under compared to the original savings account. **[8 marks]**

National records show that 35 per cent of train passengers buy their tickets in advance. A random sample of 25 passengers using a particular railway station is selected, and it is found that 13 of them bought their tickets in advance.

(a) Investigate, at the 10% level of significance, whether the data support the view that the percentage of passengers from this station who buy their tickets in advance is different from the national figure of 35 per cent. **[6 marks]**

(b) It was suggested that, for a follow-up survey, it would be easier to collect data from all the passengers in a particular railway carriage. Explain in context why it would **not** be appropriate to then apply the test that you have used in part (a). **[2 marks]**

DEFINITIONS

When the population parameter of interest in a hypothesis test is a P _ _ _ _ _ _ _ _ _ _ _ O _ P _ _ _ _ _ _ _ _ _ rather than a mean,

then a B _ _ _ _ _ _ _ D _ _ _ _ _ _ _ _ _ _ _ _ or an appropriate approximation, provides the basis for the test

CONDITIONS

It is important to remember to conditions which must be satisfied for the binomial distribution to be considered suitable:

- there can only be two possible outcomes; S _ _ _ _ _ _ _ O _ F _ _ _ _ _ _ _
- there must be a S _ _ N _ _ _ _ _ _ O _ T _ _ _ _ _ _
- trials must be I _ _ _ _ _ _ _ _ _ _ _ of each other

  i.e. the probability of success must be the same for each trial

ONE SAMPLE HYPOTHESIS TEST FOR PROPORTION APPROXIMATING TO THE NORMAL

Variables: _____

H_0: _____
H_1: _____

_____ Tailed Test   _____ % Sig Level   n: _____

Approximating to the normal distribution: N(____ , ____)

Test Statistic:

Critical Region: _____
Compare:

Conclude:
Hence we: _____
Therefore there is: _____
_____
_____

ONE SAMPLE HYPOTHESIS TEST FOR PROPORTION

Variables: _____

H_0: _____
H_1: _____

_____ Tailed Test   _____ % Sig Level

Assuming H_0 is true:

B(____ , ____)   HENCE E(X) : _____

r : _____   HENCE r ____ E(X)

Test Statistic : P(X ____ x) = _____

Critical Region: _____
Compare:

Conclude:
Hence we: _____
Therefore there is: _____
_____
_____

Hypothesis Test for One Sample Proportion
Revision Mat

APPROIMATION FORMULA TEST STATISIC (FORMULA BOOKLET)

$$\frac{\boxed{} - \boxed{}}{\sqrt{\boxed{}\left(\boxed{} - \boxed{}\right)}}$$
$$\boxed{}$$

APPROXIMATING TO THE NORMAL DISTRIBUTION

If _n_ is L _ _ _ _ (> 30) the binomial distribution may be approximated by a

N _ _ _ _ _ D _ _ _ _ _ _ _ _ _ _ _ _

When n is large, the T _ _ _ _ S _ _ _ _ _ _ _ _ we would get from a normal distribution would be close enough to the T _ _ _ _ S _ _ _ _ _ _ _ for the binomial distribution that this A _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ I _ A _ _ _ _ _ _ _ _