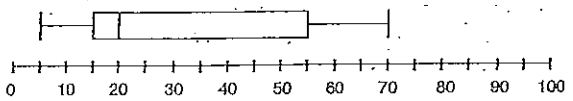
ST CATHERINE'S SCHOOL

Year 10 TEST Probability and Statistics September 2006

Name: _____

Question 1: 27 marks

(a) The results of a yearly examination were summarised in the box-and-whisker plot shown below:



(i) Write down the median score. 1

(ii) What is the range. 1

(iii) Calculate the interquartile range of this distribution. 1

(b) The blood alcohol content of 50 drivers ages between 17 and 25 who tested positive when breathalysed are recorded in the table below.

Blood Alcohol Content	Class Centre (x)	Frequency (f)	Cumulative Frequency ($c.f.$)	fx
0.00 – 0.04	0.02	7		
0.05 – 0.09	0.07	14		
0.10 – 0.14	0.12	8		
0.15 – 0.19	0.17	11		
0.20 – 0.24	0.22	7		
0.25 – 0.29	0.27	3		
		$\sum f =$		$\sum fx =$

(i) Complete the missing columns on this sheet 2

(ii) Calculate the mean blood alcohol content. 1

(iii) What is the modal class? 1

(iv) Draw a cumulative frequency histogram and polygon. Use your ruler! 3

(v) Using your graph from (iv), estimate the median. 1

(c) A shoe manufacturer, after looking at a frequency distribution table of the sizes of shoes that people buy in his shop, decides to stock one size of shoe only, for reasons of economy. Will the size be the median size, the modal size or the mean size? Give reasons for your answer. 2

(d) The stem-and-leaf plot below shows the mass in kilograms of a catch of 30 fish that were caught by a trawler.

Stem	*Leaf*
1	8 9 9
2	0 2 5 6 6 8 8 8 9
3	0 0 1 1 2 3 6 9 9 9
4	1 3 3 5 6 8
5	1 3

Key 4 | 6 = 4.6 kg

Find the mean, median and mode of the catch 3

(e) The standard deviation of the data set 3, 7, 6, 3, 2, 7, 4, 5, 9, 6 is:

A 2.09 B 2.2 C 5.2 D 7 2

(f) The data in the back-to-back stem-and-leaf plot shows the number of CDs sold in two music stores, one in Newcastle and the other in Wollongong.

Key 4 | 3 = 43

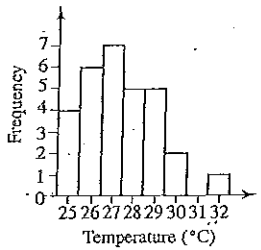
Newcastle *Leaf*	*Stem*	*Wollongong* *Leaf*
9 8 7	1	2 4 8 9 9
7 4 2 1	2	1 2 2 5
8 2 1	3	0 0 7
9 7 6 0	4	9
1	5	

(i) Compare the range of scores in the two cities 1

(ii) Which city sells the highest median number of CDs and what is this median? 2

(iii) Comment on the statement "*generally, more CDs are sold in Wollongong than in Newcastle*". Support your answer with appropriate reasoning. 2

(g) Consider the data shown in the graph below which shows the temperature each day over a one-month period.



Is the data skewed? If it is, is it positively or negatively skewed? 1

(h) Aretha wants to compare the marks that she has obtained in three subjects.

In **English**, the mean of her class was 60 and the standard deviation was 9.7. She gained a mark of 70.
In **Maths**, the mean of her class was 63 and the standard deviation was 5.2. She gained a mark of 70.
In **Art**, the mean of her class was 75 and the standard deviation was 11.6. She gained a mark of 85.

What is her best mark? Support your answer with appropriate reasoning. 3

Question 2: **24 marks**

(a) In a drawer there are 12 socks of which 8 are white and 4 are black.
If Brianna selects a white sock first, find the probability that she selects a white sock second. 1

(b) In her drawer, Mary has 9 blue socks and 5 red socks.
What is the probability of Mary randomly selecting matching socks of the same colour ? 1

(c) A medical test that is designed to diagnose patients with a certain disease is tested on 500 patients. Some of the patients are known to have the disease while others are known not to have the disease. The results are shown in the two-way table below.

	Test results		
	Positive	Negative	Total
Person has disease	92	8	100
Person does not have disease	16	384	400
Total	108	392	500

(i) What is the probability that a person with the disease is not detected by the test? 2

(ii) If a person does not have the disease what is the the probability that the test shows that they do have the disease? 2

(d) A coin is tossed and a die is rolled.

(i) How many possible outcomes are there to this experiment? 1

(ii) What is the probability of throwing a tail and getting a number less than 5? 2

(e) Three coins are tossed.

(i) Draw a tree diagram to show the possible outcomes to this experiment. 1

(ii) What is the probability of both a head and a tail showing on at least one coin? 2

(f) Amanda is a netball player who can shoot a goal 5 times out of every 8 throws. Amanda has two shots at goal.

(i) Draw a probability tree that will show all possible outcomes to this situation 2

(ii) What is the probability that Amanda is successful with both shots at goal? 2

(iii) What is the probability that Amanda scores at least one goal? 2

(g) Chrissie is late for work once in every 4 days. Gavin, her assistant, is late for work once in every 10 days.

(i) Draw a tree diagram to show the possibilities of each being late. 2

(ii) What is the probability that both Chrissie and Gavin are on time on a particular day? 2

(iii) What is the probability that one is late and the other on time? 2

Put your answers inside this booklet
Make sure you put your name on your answers!

Emily Chen

Probability & Statistics

1. a)

(i) median = 20 ✓

(ii) 70 − 5 = 65 ✓

(iii) 55 − 15 = 40 ✓

b)

(i) on paper

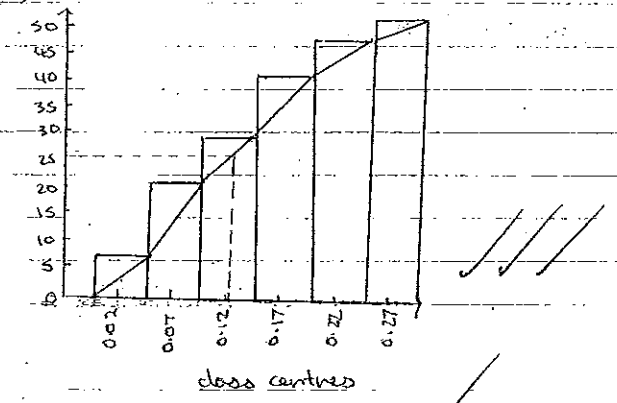
(ii) mean $= \frac{\Sigma fx}{\Sigma f}$

$= \frac{63}{50}$ ✓

$= 0.126$

(iii) modal class − 0.05–0.09 ✓

(iv)



✓✓✓

v) median = approx 0.12 ✓

c) It would be the modal size as this data is categorical. The most popular or the size that most people buy would be the size he will stock.

d) mean = 33.2666...

$\doteq$ 33.3 (1dp) ✓

median $= \frac{1+1}{2}$

$= 1$ ✗

mode = 28, 39 ✓

Emily Chen

e) A ✓✓

f) The range of scores between the two cities are reasonably similar. How Newcastle − 34

Wollongong − 37 ✓

However the range of scores for Wollongong is larger.

ii) Newcastle 31 Newcastle sells the highest median of CDs.

Wollongong − 22 ✓

iii) This statement is false as Newcastle sells more cds than Wollongong. This can be seen through the median where it shows Newcastle sells the highest median of CDs. Newcastle also has a higher mean (32.1) compared to Wollongong (24.5) of the number of CDs sold.

24.5
32.1

g) Yes, the data is positively skewed ✓

h) Art because the standard deviation is larger meaning the scores are more spread out and less students would ha.

Maths, because the standard deviation is much lower in this tesst 5.2, compared to English and Art. She is also above mean, through she achieved the highest score in maths art however the average was also higher the the standard deviation higher at 11.6 meaning the scores were more spread out. Therefore compared with other students high best marks are maths.

a diagram ✓

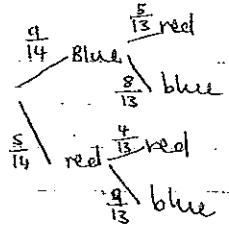
21

Emily Chen

Q2

a) $P(\text{white sock}) = \frac{7}{11}$ ✓

b)



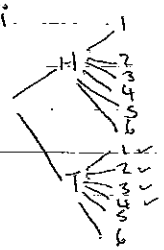
$\frac{9}{14} \times \frac{8}{13} + \frac{5}{14} \times \frac{4}{13} = \frac{46}{91}$ ✓✓

c) (i) $P(E) = \frac{8}{100} = \frac{2}{25}$ ✓✓

(ii) $P(E) = \frac{16}{400} = \frac{1}{25}$ ✓✓

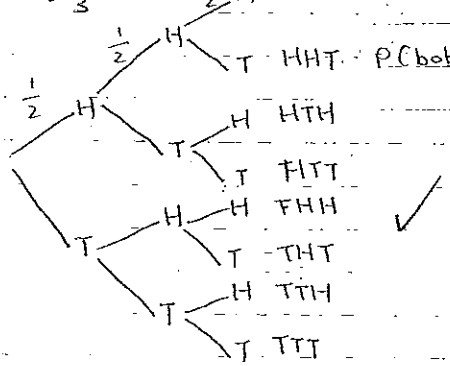
d) i $2 \times 6 = 12$ ✓

ii



$P(E) = \frac{4}{12} = \frac{1}{3}$ ✓✓

e) i

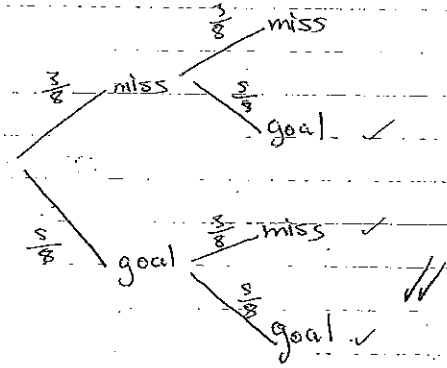


$P(\text{both head and a tail}) = 1 - \frac{1}{4} = \frac{3}{4}$ ✓

ii $P(\text{all heads, all tails}) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$.

Emily Chen

f) i



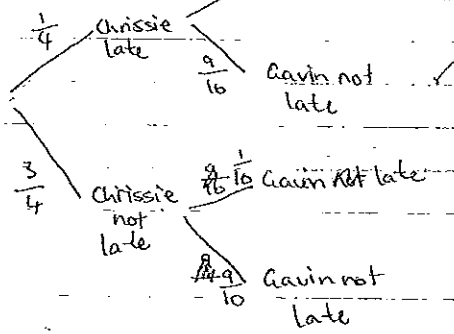
✓ ✓ ✓ ✓

ii) $\frac{5}{8} \times \frac{5}{8} = \frac{25}{64}$ ✓✓

iii $P(\text{no goal}) = \frac{5}{8} \times \frac{5}{8} = \frac{9}{64}$

$P(\text{at least one goal}) = 1 - \frac{9}{64} = \frac{55}{64}$ ✓✓

g)



✓ ✓ ✓

i $\frac{3}{4} \times \frac{9}{10} = \frac{27}{40}$ $P(\text{both on time}) = \frac{27}{40}$ ✓✓

ii $\frac{1}{4} \times \frac{9}{10} + \frac{3}{4} \times \frac{1}{10} = \frac{3}{10}$ $P(\text{one late, one on time}) = \frac{3}{10}$ ✓✓

Super!