



KINGSWAY CHRISTIAN COLLEGE

MATHS DEPARTMENT5

Course: Mathematics Methods Year 12

Assessment Task: Test 5 – Discreet Random Variables and The Binomial Distribution

Student Name: _____

Date: 10 & 11th August 2017

Assessment Score: _____ / 45

Year Score: _____

Comments: _____

Teacher signature: _____

Parent/ Guardian signature: _____

Comments: _____

METHODS YEAR 12 Test 5 2017
Discrete Random variables and Distributions

Calculator Allowed

Time: 45 mins

Marks: / 45

Calculators are allowed for this test, but no notes. Please show work out where needed.

Question 1

(3,4,3 = 10 marks)

The discrete random variable X can only take the values 0, 1, 2, 3, 4, 5. The probability distribution of X is given by the following

$$P(X = 0) = P(X = 1) = P(X = 2) = a$$

$$P(X = 3) = P(X = 4) = P(X = 5) = b$$

$$P(X \geq 2) = 3P(X < 2)$$

where a and b are constants.

(a) Determine the values of a and b .

(b) Show that the expectation of X is $\frac{23}{8}$ and determine the exact variance of X .

- (c) Determine the exact probability that the sum of two independent observations from this distribution exceeds 7.

Question 2

(3,2,2,3= 10 marks)

On a long train journey, a statistician is invited by a gambler to play a dice game. The game uses two ordinary dice which the statistician is to throw.

If the total score is 12, the statistician is paid \$6 by the gambler. If the total score is 8, the statistician is paid \$3 by the gambler. However, if both or either dice show a 1, the statistician pays the gambler \$2. Otherwise, no money changes hands.

Let \$ X be the amount paid to the statistician by the gambler.

- (a) Complete the table below.

x		0	3	6
$P(X = x)$				

- (b) Explain why the table in part (a) describes a probability distribution for the discrete random variable X .
- (c) Show that, if the statistician played the game 100 times, his expected loss would be \$2.78, to the nearest cent.
- (d) Find the amount, \$ a , that the \$6 would have to be changed to in order to make the game unbiased.

Question 3**(3 marks)**

Given that $X \sim B(15, p)$ find the value of p such that $P(X > 13) = 0.4$

Show your working

Question 4**(2,4 = 6 marks)**

In a school of 480 students, 25% said they barracked for the Dockers.

(a) State why “Supported the Dockers” is a Binomial random variable in this context.

(b) Determine μ and σ .

Question 6**(3,2,2,2 = 9 marks)**

A manufacturer of hockey gloves produces 4 times as many left-handed gloves as right-handed ones. The gloves are randomly packed in boxes of 100.

Let the Discrete Random Variable X = the number of right handed gloves per box.

(a) Find the probability that in a box there are

(i) an equal number of left-handed and right-handed gloves

(ii) at least 30 right-handed gloves.

(iii) fewer than 20 right-handed gloves .

(b) A random sample of 8 boxes is taken from the production line. Use your answer from question (iii), to find the probability that exactly 5 of the boxes contain fewer than 20 right-handed gloves.

Let the Discrete Random Variable Y = the number of boxes that contain fewer than 20 right-handed gloves.

EXTRA WORKING

