1. Hiki has a biased dice.

The probability that the dice will land on a 6 is 0.2. Not 6 = 0.8

Hiki is going to roll the dice 5 times.

(*a*) Work out the probability that the dice will land on a 6 exactly 3 times.
Give your answer correct to 3 decimal places.

You may use $(p + q)^5 = p^5 + 5p^4q + 10p^3q^2 + 10p^2q^3 + 5pq^4 + q^5$.

$p = 0.2$

$q = 0.8$

$10(0.2)^3(0.8)^2$

$= 0.051$ 3dp

0.051

(3)

(*b*) Work out the probability that the dice will land on a 6 at least once.
Give your answer correct to 3 decimal places.

$P(\text{No 6s}) = 0.8^5$

$= 0.32768$

$1 - 0.32768 = 0.672$ 3dp

0.672

(2)

(Total for Question 1 is 5 marks)

2. When practising her tennis serves, the probability that any one of Gemma's serves is in court is 0.3.

out = 0.7

Gemma serves 4 times.

Assuming a binomial distribution, calculate the probability that exactly ~~3~~ 2 of these serves are in court.

You may use $(p + q)^4 = p^4 + 4p^3q + 6p^2q^2 + 4pq^3 + q^4$.

p = 0.3

q = 0.7

$6(0.3)^2(0.7)^2$

$= 0.2646$

0.2646

(Total for Question 2 is 3 marks)

3. Pens are packed in boxes.
There are 6 pens in each box.

p q

The probability that any pen is defective is 0.1. Not Defective = 0.9

A box of pens is picked at random.

(*a*) Find the probability that the box contains exactly one defective pen.
Give your answer correct to 3 significant figures.

You may use $(p + q)^6 = p^6 + 6p^5q + 15p^4q^2 + 20p^3q^3 + 15p^2q^4 + 6pq^5 + q^6$.

$6(0.1)(0.9)^5$

$= 0.354294$

0.354

(2)

(*b*) Find the probability that the box contains at most one defective pen.
Give your answer correct to 3 significant figures.

Not defective pens $= (0.9)^6$

$= 0.531441$

$0.531441 + 0.354294$

$= 0.886$ (3sf)

0.886

(2)

Suki buys 125 boxes of pens.

(*c*) Find an estimate for the number of boxes that contain less than two defective pens.

$0.886 \times 125 = 110.75$

111

111

(2)

(Total for Question 3 is 6 marks)

4 The probability of having blood type O is 0.4.

Not O = 0.6

A doctor tests the blood type of 6 patients.

Assuming a binomial distribution, calculate the probability that exactly 2 of these patients have blood type O.

You may use $(p + q)^6 = p^6 + 6p^5q + 15p^4q^2 + 20p^3q^3 + 15p^2q^4 + 6pq^5 + q^6$.

$q = 0.4 \quad p = 0.6$

$15(0.6)^4(0.4)^2$

0.31104

(Total for Question 4 is 3 marks)