**1.** Hiki has a biased dice.

The probability that the dice will land on a 6 is 0.2.

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 + 5*p*4*q* + 10*p*3*q*2 + 10*p*2*q*3 + 5*pq*4 + *q*5.

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**(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.

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**(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.

Gemma serves 4 times.

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

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

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**(Total for Question 2 is 3 marks)**

**3.** Pens are packed in boxes.

There are 6 pens in each box.

The probability that any pen is defective is 0.1.

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 + 6*p*5*q* + 15*p*4*q*2 + 20*p*3*q*3 + 15*p*2*q*4 + 6*pq*5 + *q*6.

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**(2)**

(*b*) Find the probability that the box contains at most one defective pen.

Give your answer correct to 3 significant figures.

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**(2)**

Suki buys 125 boxes of pens.

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

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**(2)**

**(Total for Question 3 is 6 marks)**

**4** The probability of having blood type O is 0.4.

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 + 6*p*5*q* + 15*p*4*q*2 + 20*p*3*q*3 + 15*p*2*q*4 + 6*pq*5 + *q*6.

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**(Total for Question 4 is 3 marks)**