Binomial

Q1

Kate sometimes takes sandwiches to school for lunch.

The probability that she takes sandwiches to school for lunch on a particular day is 0.37

(a) Write down the probability that Kate does not take sandwiches to school on a particular day.

Answer _____ [1]

Kate wishes to use the Binomial Distribution with $(p + q)^n$ as a model for the number of days she takes sandwiches to school for lunch during a 5-day school week.

(b) For Kate's model, write down the values of n and p.

$n =$ _____ [1]

$p =$ _____ [1]

In part **(c)** you may use

$$(p + q)^5 = p^5 + 5p^4q + 10p^3q^2 + 10p^2q^3 + 5pq^4 + q^5$$

(c) During a 5-day school week, calculate the probability that Kate takes sandwiches to school for lunch:

(i) only once;

Answer _____ [2]

(ii) at least once.

Answer _____ [3]

Members of a large fitness club can use different methods to pay their membership fees.

Q2 Over time, it is estimated that 35% of members pay their fees using cash.

During one afternoon, six members pay their membership fees.

(a) Explain why the binomial distribution can be used to model the number of these six members who will pay their membership fees using cash.

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(b) Calculate the probability that exactly three of these six members will pay their membership fees using cash.

You may use

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

Answer _____ [4]

(c) Calculate the probability that most of these six members will pay their membership fees using cash.

You may use

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

Q3

On a given day, the probability that Michael is on time for work is 0.6

(a) Calculate the probability that Michael is not on time for work on two days in a row.

Answer _____ [2]

(b) **(i)** Write down the name of the most appropriate distribution to model the number of times Michael will be on time for work in a five-day period.

Answer _____ [1]

(ii) For this model, write down the number of trials, n, and the probability of a success, p.

$n =$ _____ [1]

$p =$ _____ [1]

(c) Calculate the probability that Michael will be on time for work twice in a five-day period.

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

(d) Calculate the probability that Michael will be on time for work at least four times in a five-day period.

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

Q4

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

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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)

Q5

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

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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)