1) The probability that at least one computer is available at any time in an Internet Café is 0.75.

a) Mr Jackson makes 16 visits to the café. Calculate the probability that, on entry, at least one computer is available on exactly 10 occasions.

*(3 marks)*

b) Mrs Wood makes 30 visits to the café. Determine the probability that, on entry, at least one computer is available on 20 or more occasions.

*(4 marks)*

2) The proportions of people with blood groups O, A, B and AB in a particular population are in the ratio 48 : 35 : 12 : 5 respectively.

Determine the probability that a random sample of 20 people from the population contains:

a) exactly 10 with blood group O;

*(4 marks)*

b) at most 2 with blood group AB;

*(2 marks)*

c) at least 8 with blood group A.

*(3 marks)*

3) At a particular supermarket, 85% of customers have the supermarket rewards card.

a) Determine the probability that, in a random sample of 5 customers, exactly 4 customers have the supermarket rewards card.

*(2 marks)*

b) Determine the probability that, in a random sample of 40 customers, more than 30 customers have the supermarket rewards card.

*(3 marks)*

4) Twenty per cent of coloured beads used in costume jewellery are blue.

 a) Determine the probability that:

 i) in a string of 20 beads, more than 3 beads are blue;

*(3 marks)*

 ii) in a string of 28 beads, exactly 4 beads are blue.

*(3 marks)*

 b) State **one** assumption that you have made about the beads in answering part (a).

*(1 mark)*

5) The probability that Adam, who always walks to work, arrives late on any day is 0.11.

a) Calculate the probability that, during a period of 20 working days, he is late on exactly 4 days.

*(3 marks)*

 The probability that Phil, who always cycles to work, arrives late on any day is 0.15.

 b) Find the probability that, during a period of 50 working days, he is late on at most 10 days.

*(2 marks)*

6) A bin contains 400 coloured erasers that fit on the ends of pencils. The number of erasers of each colour is as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Colour** | Green | Blue | Red | Yellow |
| **Number** | 88 | 60 | 160 | 92 |

a) A random sample of 25 erasers is selected, **with replacement**, from the bin. Find the probability that:

 i) exactly 2 erasers are green;

*(4 marks)*

 ii) at most 3 erasers are blue;

*(2 marks)*

 iii) between 8 and 12 erasers, inclusive, are red.

*(4 marks)*

b) Erasers are selected at random, **without replacement**, from the bin until 5 yellow erasers are obtained.

Give **two** reasons why a binomial distribution does **not** model the number of erasers selected.

*(2 marks)*

7) A Tourist Information Office organises guided walks. An analysis shows that 68% of its customers reserve places on Walk A, 45% of its customers reserve places on Walk B, and 25% of customers reserve places on Walk C. Reservations may be assumed to be independent.

a) Calculate the probability that, in a random sample of 15 customers, exactly 10 reserve places on Walk A.

*(3 marks)*

b) Determine the probability that, in a random sample of 40 customers, at least 15 but at most 20 reserve places on Walk B.

*(3 marks)*

8) Toothbrushes have bristles that are either firm, medium or sensitive. The proportions of toothbrushes with these bristles are 0.12, 0.53 and 0.35 respectively.

 A random sample of 50 toothbrushes is selected.

a) Calculate the probability that the sample contains exactly 6 toothbrushes with firm bristles.

*(3 marks)*

b) Determine the probability that the sample contains at most 20 toothbrushes with sensitive bristles.

*(2 marks)*

9) Paper clips are produced in a variety of different colours.

 The proportion of red paper clips produced is 0.20.

Determine the probability that, in a random sample of 50 coloured paper clips, the number of red clips is:

a) fewer than 10;

*(3 marks)*

b) at least 8 but less than 12.

*(3 marks)*

10) A recent large-scale survey established that 15 per cent of cars have faulty brake lights.

a) Calculate the probability that, in a random sample of 18 cars, exactly 2 cars have faulty brake lights.

*(3 marks)*

b) Determine the probability that, in a random sample of 50 cars, more than 5 cars but fewer than 10 cars have faulty brake lights.

*(3 marks)*