ten packets. Calculate

(a) the expected number of packets in the sample which are under-weight,

(b) the probability that none of the packets in the sample are under-weight.

(c) the probability that more than one of the packets in the sample is underweight.

2. Compute and plot the binomial distributions when $n = 4$ for

(a) $p = \frac{1}{4}$,

(b) $p = \frac{1}{2}$,

(c) $p = \frac{3}{4}$.

3. It has been found in the past that 4 per cent of the screws produced in a certain factory are defective. A sample of ten is drawn randomly from each hour's production and the number of defectives is noted. In what fraction of these hourly samples would there be at least two defectives? What doubts would you have if a particular sample contained six defectives?

4. One per cent of a certain type of car has a defective tail light. How many cars must be inspected in order to have a better than even chance of finding a defective tail light?

5. An electronic component is mass-produced and then tested unit by unit on an automatic testing machine which classifies the unit as 'good' or 'defective'. But there is a probability 0·1 that the machine will mis-classify the unit, so that each component is in fact tested five times and regarded as good if so classified three or more times. What now is the probability of a mis-classification?

6. A recent court decision supported a pilot's decision to continue to his destination with a four-engine jet aircraft after an engine failure at midrange on a two-hour flight, rather than land at the midway point. His argument was that the aircraft will fly on two engines and that the probability of two additional failures was quite small. If the one-hour reliability of a single engine is 0·9999, do you agree with the pilot's

decision? If the aircraft was a three-engine jet that will fly on one engine would you agree? Comment on the comparative reliability of the three- and four-engine jets in this situation.

7. The new 'Tigercat' sports car has an idle loping problem as about 10 per cent of the Tigercats have an unstable fluctuating engine speed when they are idling. An engineering 'fix' is put in a production pilot lot of a hundred cars.

(a) If the fix has no effect on the problem, how many cars would you expect to have the fault?

(b) If only two of the pilot lot have the idling fault, and the other ninety-eight cars are not defective, would you conclude that the fix has a significant effect? (Hint: Show that the probability of getting two or less defectives in a sample size of a hundred, given that the fix has no effect, is very small indeed.)

8. The average number of calls that a hospital receives for an ambulance during any half-hour period is 0·3. Considering a reasonable cost per ambulance and crew and presuming that any ambulance will return to the hospital in half an hour, how many ambulances would you recommend for this hospital? Comment on the idea of ambulance pools which are shared by several hospitals.

9. A manned interplanetary space vehicle has four engines each with reliability 0·99. Each engine has a failure detection system which may

11. A construct number inopera Two standby b mended within probability tha

(a) no standby

(b) the number

12. There are m and Poisson dis arises as follow finite populati failures. Show sample is giver

$$P(x) = \frac{{}^{Np}C_x \cdot {}^{N(1}}{N}$$

If N is very l tion can be app

$$P(x) \simeq {}^{n}C_x p^x (1$$

13. A series of probability tha depend on the