## Question 8

 (16 marks)A company produces a type of fruit-filled chocolate called Choc-pricots. They are produced on an automated assembly line that can result in imperfect Choc-pricots.
(a) The probability is 0.15 that a Choc-pricot randomly selected off the assembly line is imperfect.

Use the binomial distribution to determine the probability that, in a random sample of 80 Choc-pricots:


Source: © Hendrik Schmidt 2015 | Alamy.com
(i) exactly 6 Choc-pricots will be imperfect.

(ii) more than 20 Choc-pricots will be imperfect.

(2 marks)

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The manager of the assembly line can adjust the rate of production of Choc-pricots, resulting in a change in the probability that a randomly selected Choc-pricot is imperfect. This probability can be modelled by the function

$$
p(x)=\sin \left(0.00392 x^{2}\right)+e^{-x}, \text { for } 0<x \leq 20
$$

where $p(x)$ represents the probability that a randomly selected Choc-pricot is imperfect, and $x$ represents the rate of production measured in Choc-pricots per second.
(b) On the axes in Figure 8, sketch the graph of $y=p(x)$.


Figure 8
(c) Using the function $p(x)$, determine the possible rate(s) of production that resulted in the given probability of 0.15 stated in part (a).

(d) The minimum probability that a randomly selected Choc-pricot is imperfect, according to the function $p(x)$, is 0.0781 (correct to three significant figures).

State the corresponding rate of production that would result in this probability.


