

- SP 12** A recent census showed that 20% of the adults in a city eat out regularly.
- MX a** (i) A survey of 100 adults in this city is to be conducted to find the proportion who eat out regularly. **2**
- 1** Show that the mean and standard deviation for the distribution of sample proportions of such surveys are 0.2 and 0.04 respectively.
- (ii) Use the extract shown from a table giving values of $P(Z < z)$, where z has a standard normal distribution, to estimate the probability that a survey of 100 adults will find that at most 15 of those surveyed eat out regularly. **2**

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177

(i) $n = 100$

$$P(\text{eat out regularly}) = p = 0.2$$

$$\begin{aligned} np &= 100 \times 0.2 \\ &= 20 \end{aligned}$$

$$\mu_{\hat{p}} = p = 0.2$$

$$\begin{aligned} \sigma_{\hat{p}} &= \sqrt{\frac{p(1-p)}{n}} \\ &= \sqrt{\frac{0.2(1-0.2)}{100}} \\ &= 0.04 \end{aligned}$$

(ii)
$$\begin{aligned} z &= \frac{x - \mu}{\sigma} \\ &= \frac{0.15 - 0.2}{0.04} \\ &= -1.25 \end{aligned}$$

Now, from the table, $P(z < 1.25) = 0.8944$

$$\begin{aligned} \text{Hence, } P(z < -1.25) &= 1 - 0.8944 \\ &= 0.1056 \end{aligned}$$

* These solutions have been provided by [projectmaths](http://projectmaths.com.au) and are not supplied or endorsed by NESA.

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