

**TG 10** It is estimated that approximately 45% of Australian people will experience a mental illness in their lifetime. If a random sample of 120 mature adults were surveyed, what is the probability of 50 or more having experienced a mental illness?

Projectmaths has provided this probability table extract:

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389

$$n = 120 \text{ and } p = 0.45$$

$$\begin{aligned} np &= 120 \times 0.45 \\ &= 54 \end{aligned}$$

$$\mu_{\hat{p}} = p = 0.45$$

$$\begin{aligned} \sigma_{\hat{p}} &= \sqrt{\frac{p(1-p)}{n}} \\ &= \sqrt{\frac{0.45(1-0.45)}{120}} \\ &= 0.0454 \text{ (4 dec pl)} \end{aligned}$$

Now 50 out of 120 is 0.4167. (4 dec pl)

$$\begin{aligned} z &= \frac{x - \mu}{\sigma} \\ &= \frac{0.4167 - 0.45}{0.0454} \\ &= -0.73 \text{ (2 dec pl)} \end{aligned}$$

For  $z = 0.73$ , the table provides 0.7673.

This means  $z = -0.73$  gives  $0.7673 - 0.5 = 0.2673$ .

As  $P(z \geq 50) = 1 - 0.2673 = 0.7327$ .

The probability is 0.73 (2 dec pl).

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

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