

## Missing $\mu$ and $\sigma$

In the last section, you may have thought, “what’s the point of standardising to  $Z$  when I can just use the DISTRIBUTION mode on my calculator?”

Fair point, but both forward and reverse normal lookups on the calculator **required you to specify  $\mu$  and  $\sigma$ .**

[Textbook]  $X \sim N(\mu, 3^2)$ . Given that  $P(X > 20) = 0.2$ , find the value of  $\mu$ .

| $p$    | $z$    | $p$    | $z$    |
|--------|--------|--------|--------|
| 0.5000 | 0.0000 | 0.0500 | 1.6449 |
| 0.4000 | 0.2533 | 0.0250 | 1.9600 |
| 0.3000 | 0.5244 | 0.0100 | 2.3263 |
| 0.2000 | 0.8416 | 0.0050 | 2.5758 |
| 0.1500 | 1.0364 | 0.0010 | 3.0902 |
| 0.1000 | 1.2816 | 0.0005 | 3.2905 |

[Textbook] A machine makes metal sheets with width,  $X$  cm, modelled as a normal distribution such that  $X \sim N(50, \sigma^2)$ .

- (a) Given that  $P(X < 46) = 0.2119$ , find the value of  $\sigma$ .  
(b) Find the 90<sup>th</sup> percentile of the widths.

## When both are missing

If both  $\mu$  and  $\sigma$  are missing, we end up with simultaneous equations which we must solve.

**Edexcel S1 Jan 2011**

The weight,  $Y$  grams, of soup put into a carton by machine  $B$  is normally distributed with mean  $\mu$  grams and standard deviation  $\sigma$  grams.

- (c) Given that  $P(Y < 160) = 0.99$  and  $P(Y > 152) = 0.90$ , find the value of  $\mu$  and the value of  $\sigma$ .

**(6)**

# Test Your Understanding

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## Edexcel S1 May 2013 (R)

The time taken to fly from London to Berlin has a normal distribution with mean 100 minutes and standard deviation  $d$  minutes.

Given that 15% of the flights from London to Berlin take longer than 115 minutes,

(b) find the value of the standard deviation  $d$ .

(4)

## Edexcel S1 Jan 2002

5. The duration of the pregnancy of a certain breed of cow is normally distributed with mean  $\mu$  days and standard deviation  $\sigma$  days. Only 2.5% of all pregnancies are shorter than 235 days and 15% are longer than 286 days.

(a) Show that  $\mu - 235 = 1.96\sigma$ .

(2)

(b) Obtain a second equation in  $\mu$  and  $\sigma$ .

(3)

(c) Find the value of  $\mu$  and the value of  $\sigma$ .

(4)

(d) Find the values between which the middle 68.3% of pregnancies lie.

(2)