Leave blank

6. A manufacturer has a machine that fills bags with flour such that the weight of flour in a bag is normally distributed. A label states that each bag should contain 1 kg of flour.

(a) The machine is set so that the weight of flour in a bag has mean 1.04 kg and standard deviation 0.17 kg. Find the proportion of bags that weigh less than the stated weight of 1 kg.

(3)

The manufacturer wants to reduce the number of bags which contain less than the stated weight of 1 kg. At first she decides to adjust the mean but not the standard deviation so that only 5% of the bags filled are below the stated weight of 1 kg.

(b) Find the adjusted mean.

(3)

The manufacturer finds that a lot of the bags are overflowing with flour when the mean is adjusted, so decides to adjust the standard deviation instead to make the machine more accurate. The machine is set back to a mean of 1.04 kg. The manufacturer wants 1% of bags to be under 1 kg.

(c) Find the adjusted standard deviation. Give your answer to 3 significant figures.

(3)

$$X \sim N\left(\overset{\mu}{1.04} , \overset{\sigma^2}{0.17} \right)$$

a)
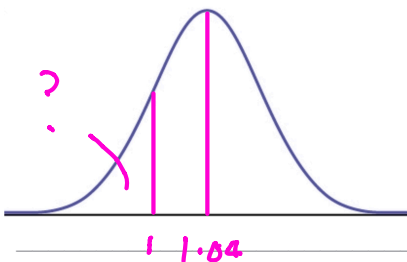
Calculator
Normal CD
Lower — 1000
Upper 1

σ 0.17
μ 1.04

$P(x < 1) = 0.407$

40.7%

P 4 3 1 4 0 A 0 1 8 2 8

Leave blank

Question 6 continued

b)

The manufacturer wants to reduce the number of bags which contain less than the stated weight of 1 kg. At first she decides to adjust the mean but not the standard deviation so that only 5% of the bags filled are below the stated weight of 1 kg.
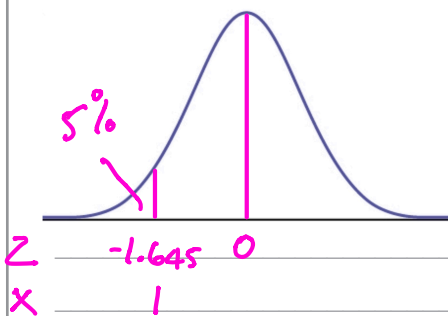
(b) Find the adjusted mean.

(3)

$$X \sim N(\mu, 0.17^2)$$

Calculator
Inverse Normal
Area   0.05
σ 1
μ 0

5%

Z -1.645   0
X 1

$$Z = \frac{x - \mu}{\sigma}$$

$$Z\sigma = x - \mu$$

$$\mu = x - Z\sigma$$

$$\mu = 1 - -1.645 \times 0.17$$

$$\mu = 1 + 1.645 \times 0.17$$

$$\mu = 1.28 \text{ kg}$$
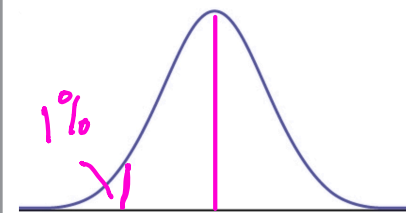
19

Turn over

Leave blank

Question 6 continued

c)

The manufacturer finds that a lot of the bags are overflowing with flour when the mean is adjusted, so decides to adjust the standard deviation instead to make the machine more accurate. The machine is set back to a mean of 1.04 kg. The manufacturer wants 1% of bags to be under 1 kg.

(c) Find the adjusted standard deviation. Give your answer to 3 significant figures.

(3)

$$X \sim N(1.04, \sigma^2)$$

Calculator
Inverse Normal
Area   0.01
σ 1
μ 0

$$Z = \frac{x - \mu}{\sigma}$$

$$\sigma Z = x - \mu$$

$$\sigma = \frac{x - \mu}{Z}$$

$$\sigma = \frac{1 - 1.04}{-2.3263}$$

$$\sigma = 0.1719$$

$$\sigma = 0.0172 \text{ kg}$$

1%

X   1   1.04
Z   -2.3263   0