

Edexcel IAL S1 Normal Distribution Practice Exam: Mark Scheme

Pearson Edexcel International A Level Mathematics · 8 questions · 36 marks

- M marks are for a correct method; A marks for an accurate answer that follows a correct method; B marks are independent of method.
- Accept any correct method that reaches a correct answer, unless the question says which method to use.
- Practise these topics online with instant feedback: alevelmathrevision.com/alevel-frontend/alevel-unit.html?course=ial&unit=7

Question 1

2 marks

$$P\left(Z < \frac{35-30}{4}\right) = P(Z < 1.25) \text{ M1}$$

$$= 0.8944 \text{ A1}$$

Question 2

3 marks

$$z = \frac{46-50}{8} = -0.5 \text{ and } z = \frac{58-50}{8} = 1 \text{ M1}$$

$$\Phi(1) - (1 - \Phi(0.5)) = 0.8413 - 0.3085 \text{ M1}$$

$$= 0.5328 \text{ A1}$$

Question 3

3 marks

$$z = \frac{185-175}{6} = 1.67 \text{ (1.6667) M1}$$

$$P(Z > 1.67) = 1 - \Phi(1.67) \text{ M1}$$

$$= 1 - 0.9525 = 0.0475 \text{ from tables (0.0478 by calculator; accept awrt 0.048) A1}$$

Question 4

4 marks

$$P(Z < z) = 0.75 \Rightarrow z = 0.6745 \text{ B1}$$

$$Q_3 = 100 + 0.6745 \times 15 = 110.1 \text{ M1 A1}$$

$$\text{by symmetry IQR} = 2 \times 0.6745 \times 15 = 20.2 \text{ A1}$$

Question 5

4 marks

$$z = \pm \frac{0.3}{0.2} = \pm 1.5 \text{ M1}$$

$$P(Z > 1.5) = 1 - 0.9332 = 0.0668 \text{ A1}$$

$$1000 \times 2 \times 0.0668 \text{ M1}$$

$$= 133.6, \text{ so about 134 bolts A1}$$

Question 6

5 marks

a. $P(Z < z) = 0.7 \Rightarrow z = 0.5244 \text{ B1}$

$$\frac{45-40}{\sigma} = 0.5244 \text{ M1}$$

$$\sigma = 9.53 \text{ A1}$$

b. $P\left(Z < \frac{30-40}{9.53}\right) = P(Z < -1.049) \text{ M1}$

$$= 0.147 \text{ A1}$$



Question 7

6 marks

$z = 1.2816$ for the upper 10% **B1**

$z = -0.8416$ for the lower 20% **B1**

$80 - \mu = 1.2816\sigma$ and $60 - \mu = -0.8416\sigma$ **M1**

subtracting: $20 = 2.1232\sigma$ **M1**

$\sigma = 9.42$ **A1**

$\mu = 67.9$ **A1**

Question 8

9 marks

a. $P\left(Z < \frac{500-502}{4}\right) = P(Z < -0.5)$ **M1**
 $= 1 - 0.6915 = 0.3085$ **A1**

b. $z = -2.3263$ **B1**
 $\frac{500-\mu}{4} = -2.3263$ **M1**
 $\mu = 509.3$ g **A1**

c. $P(X \geq 500) = 0.99$, so 0.99^3 **M1**
 $= 0.9703$ **A1**

d. $z = \frac{515-509.3}{4} = 1.425$ **M1**
 $P(Z > 1.425) = 0.0771$ **A1**

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