

IB Maths: AI HL

Normal Distribution

Topic Questions

These practice questions can be used by students and teachers and is Suitable for IB Maths AI HL Topic Questions

Course	IB Maths
Section	4. Statistics & Probability
Topic	4.8 Normal Distribution
Difficulty	Medium

Level: IB Maths

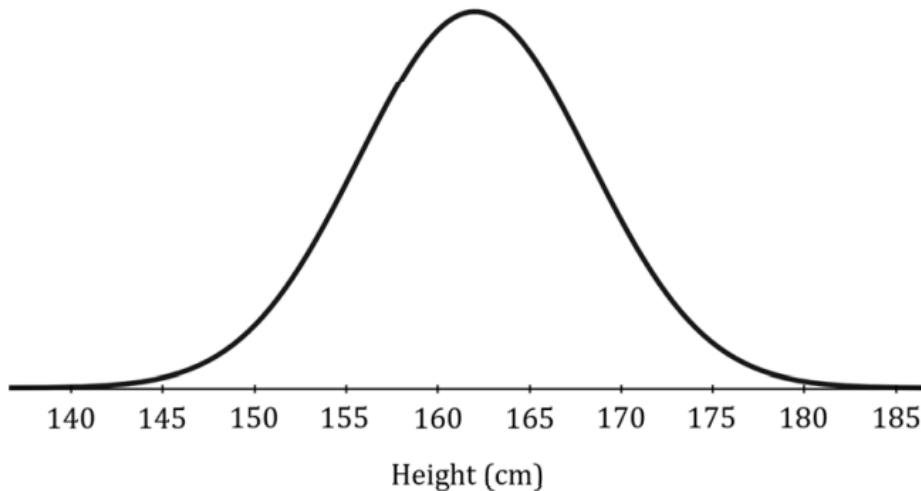
Subject: IB Maths AI HL

Board: IB Maths

Topic: Normal Distribution

Question 1

The random variable, X , is seen on the following diagram which shows the distribution of heights, in cm, of adult women in the UK:



The distribution of heights follows a normal distribution, with a mean of 162 cm and a standard deviation of 6.3 cm.

(a) On the diagram above, shade in the region representing $P(X > 155)$.

[2 marks]

- (b) (i) Find the probability that a randomly selected woman has a height of more than 155cm.
- (ii) Use your answer from part (b)(i) to find the probability that a randomly selected woman has a height of more than 169cm.

[4 marks]

(c) Suggest a range of heights within which the height of approximately

- (i) 68%
- (ii) 95%
- (iii) 99.7%

of adult women in the UK will fall.

[3 marks]

Question 2

(a) For the random variable $X \sim N(23, 4^2)$ find the following probabilities:

- (i) $P(X < 20)$
- (ii) $P(X \geq 29)$
- (iii) $P(20 \leq X < 29)$

[3 marks]

(b) For the random variable $Y \sim N(100, 225)$ find the following probabilities:

- (i) $P(Y \leq 90)$
- (ii) $P(Y > 140)$
- (iii) $P(85 \leq Y \leq 115)$

[3 marks]

Question 3

Heledd buys a pack containing 12 of the chocolate bars. It may be assumed that the 12 bars in the pack represent a random sample.

(b) Find the probability that all of the bars in the pack have a weight of at least 195 g.

[2 marks]

Question 4

The random variable $X \sim N(330, 10^2)$.

(a) Find the value of a , to 2 decimal places, such that:

(i) $P(X < a) = 0.25$

(ii) $P(X > a) = 0.25$

(iii) $P(315 \leq X \leq a) = 0.5$

[4 marks]

The random variable $Y \sim N(10, 10)$.

(b) Find the value of b and the value of c , each to 2 decimal places, such that:

(i) $P(Y < b) = 0.4$

(ii) $P(Y > c) = 0.25$

[2 marks]

(c) Use a sketch of the distribution of Y to explain why $P(b \leq Y \leq c) = 0.35$.

[2 marks]

Question 5

The test scores, X , of a group of RAF recruits in an aptitude test are modelled as a normal distribution with $X \sim N(210, 27.8^2)$.

- (a) (i) Find the values of a and b such that $P(X < a) = 0.25$ and $P(X > b) = 0.25$.
(ii) Hence find the interquartile range of the scores.

[3 marks]

Those who score in the top 30% on the test move on to the next stage of training.

- (b) One of the recruits, Amelia, achieves a score of 231. Determine whether Amelia will move on to the next stage of training.

[2 marks]

Question 6

A machine is used to fill cans of a particular brand of soft drink. The volume, V ml, of soft drink in the cans is normally distributed with mean 330 ml and standard deviation σ ml.

It is known that approximately 16% of the cans contain more than 333.28 ml of soft drink.

(a) Using the properties of the normal distribution, explain why 3.28 ml would provide a good approximation for the value of σ .

[2 marks]

(b) Using $\sigma = 3.28$ ml, find $P(320 \leq V \leq 340)$.

[1 mark]

Six cans of the soft drink are chosen at random.

(c) Again using $\sigma = 3.28$ ml, find the probability that all of the cans contain less than 329 ml of soft drink.

[3 marks]