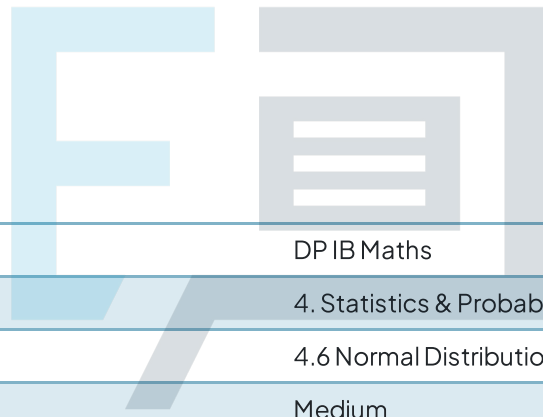




4.6 Normal Distributions

Question Paper



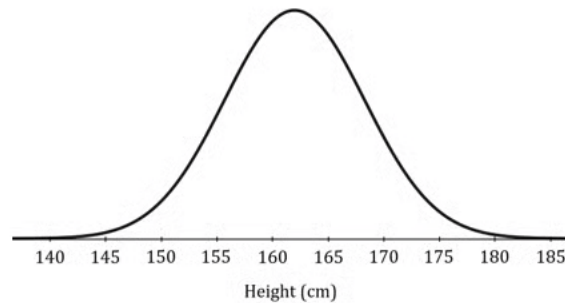
Course	DP IB Maths
Section	4. Statistics & Probability
Topic	4.6 Normal Distributions
Difficulty	Medium

Exam Papers Practice

To be used by all students preparing for DP IB Maths AI SL
Students of other boards may also find this useful

Question 1a

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.

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

[2 marks]

Question 1b

(i)

Find the probability that a randomly selected woman has a height of more than 155 cm.

(ii)

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

[4 marks]

Question 1c

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 2a

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]

Question 2b

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 3a

The weight, W g, of a chocolate bar produced by a certain manufacturer is modelled as $W \sim N(200, 1.75^2)$.

Find:

(i)
 $P(W < 195)$

(ii)
 $P(W > 203)$

[2 marks]

Question 3b

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.

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

[2 marks]

Question 4a

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

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]

Exam Papers Practice

Question 4b

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

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]

Question 4c

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

[2 marks]

Question 5a

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

- (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]

Question 5b

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

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 6a

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.

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

[2 marks]

Question 6b

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

[1 mark]

Question 6c

Six cans of the soft drink are chosen at random.

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

[3 marks]



Exam Papers Practice