

Pearson Edexcel International Advanced Level

Friday 5 June 2026

Afternoon (Time: 1 hour 30 minutes)

**Paper
reference**

WST02/01A

Mathematics

International Advanced Subsidiary/Advanced Level

Statistics S2

Question Paper

You must have:

Answer book (sent separately).

Do not return this question paper with the answer book.

Turn over ►

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Pearson

1. Minor defects occur at random in planks of wood at a mean rate of 1 per 20 cm

- (a) Find the probability that in a randomly chosen 150 cm plank there will be exactly 5 minor defects.

(2)

Planks are sold in packs of 6, with each plank measuring 100 cm in length.

A pack is selected at random.

- (b) Find the probability that exactly 2 of these 6 planks will have fewer than 4 minor defects.

You must show your working.

(4)

- (c) Using a suitable approximation, find the probability that the total number of minor defects in the 6 planks is less than 28

You must show your working.

(4)

(Total for Question 1 is 10 marks)



2. The continuous random variable X has cumulative distribution function given by

$$F(x) = \begin{cases} 0 & x < 0 \\ kx^3 & 0 \leq x \leq b \\ 1 & x > b \end{cases}$$

where k and b are positive constants.

Given that $P(2 < x < 8) = \frac{7}{24}$ and $b > 8$

- (a) show that $k = \frac{1}{1728}$ (3)
- (b) By finding the value of b , specify the probability density function, $f(x)$, for all values of x (4)
- (c) Find the median of X (2)
- (d) State the mode of X (1)
- (e) State, giving a reason, the skewness of the distribution of X (1)

(Total for Question 2 is 11 marks)

3. A hospital wants to carry out a sample survey to obtain patients' opinions about their stay at the hospital.

(a) Suggest a suitable sampling frame for the survey. (1)

(b) Identify the sampling units. (1)

(c) Give one advantage **and** one disadvantage of taking a sample survey rather than a census. (2)

It is known that on average 3 in every 1000 births at this hospital result in identical twins being born. When twins are born this is counted as one birth.

Last year there were 3000 births at this hospital.

(d) Using a Poisson approximation, find the probability that at this hospital last year there were
(i) less than 4 births resulting in identical twins,
(ii) more than 7 but at most 10 births resulting in identical twins. (4)

(e) Explain why the Poisson approximation in part (d) is suitable. (1)

(Total for Question 3 is 9 marks)



4. A company claims that 20% of the electrical components sent to them are faulty.

To test this claim the company takes a random sample of 30 electrical components and records the number that are faulty.

- (a) State, in context, **two** conditions necessary for a binomial distribution to be a suitable model for the number of faulty electrical components in the sample. (2)

- (b) Using a 5% significance level, find the critical region for a two-tailed test of the hypothesis that the probability of an electrical component being faulty is 0.2
The probability of rejection in each tail should be as close as possible to 0.025 (3)

- (c) Find the actual significance level of this test based on your critical region from part (b) (1)

In this sample 4 electrical components were found to be faulty.

- (d) Comment on the company's claim with reference to your answer to part (b)
You must justify your answer. (2)

To try to reduce the number of faulty electrical components being received, the company changes supplier.

After the change of supplier, the company takes a random sample of 25 electrical components and 2 were found to be faulty.

- (e) Test, at the 10% level of significance, whether or not the probability of a faulty electrical component has decreased.
State your hypotheses clearly. (4)

(Total for Question 4 is 12 marks)

5. A bag contains a large number of counters with the numbers 4, 6 or 8 written on each of them in the ratio 5 : 3 : 2 respectively.

A random sample of size 3 is taken from the bag.

M represents the median of the numbers on the 3 counters.

- (a) List all 7 possible samples of size 3 with $M = 4$ (2)
- (b) Find the probability that $M = 4$ (4)
- (c) Find the sampling distribution of M (4)

A random sample of n sets of 3 counters is taken. The random variable Y represents the number of these n sets that have $M = 6$

- (d) Calculate the minimum value of n such that $P(Y \geq 1) > 0.95$ (3)

(Total for Question 5 is 13 marks)

6. The continuous variable X is uniformly distributed over the interval $[a, b]$ where $0 < a < b$

Given that $E(X) = \frac{5a}{2}$

- (a) find $P(X > b - 2a)$ (4)

The continuous variable Y is uniformly distributed over the interval $[3, c]$ where $c > 3$

Given that $E(Y^2) = 549$, find

- (b) (i) the value of c (3)

(ii) the exact value of $P\left(4Y - 14 < \frac{17 - Y}{2}\right)$ (3)

(Total for Question 6 is 10 marks)



7. The random variable $X \sim B(140, p)$

- (a) Find the value of p **and** the value of σ^2 such that X can be approximated by the normal distribution $N(42, \sigma^2)$ (3)

The random variable $W \sim B\left(n, \frac{1}{3}\right)$

- (b) (i) Write down an expression for $P(W = 2)$ in terms of n
(ii) Find the value of n such that $P(W = 2) = P(W = 3)$ (4)

The random variable $Y \sim \text{Po}(\lambda)$

- (c) Find, in terms of r , an expression for λ such that

$$P(Y = r) = (r + 2) \times P(Y = r + 2)$$

(3)

(Total for Question 7 is 10 marks)

TOTAL FOR PAPER IS 75 MARKS

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