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TUTGATHER PRACTICE PAPER

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2027

MATHEMATICS Extended Part Module M1
PAPER

Question-Answer Book

Candidate Number

TUTGATHER
PRACTICE PAPER · NOT AN OFFICIAL HKEAA PAPER

1 hour 5 minutes

This paper must be answered in English

Topic practice: Basic Definition and Properties of Normal Distribution

INSTRUCTIONS

(1) This paper consists of THREE sections, A(1), A(2) and B.

(2) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins.

(3) Unless otherwise specified, all working must be clearly shown.

(4) Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

(5) The diagrams in this paper are not necessarily drawn to scale.

(6) Calculators and mathematical drawing instruments may be used.

(7) The marks for each question are shown in brackets.

(8) No extra time will be given after the 'Time is up' announcement.

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SECTION A(1) (16 marks)

1. Let X be a continuous random variable with probability density function $f(x) = kx$ for $0 \leq x \leq 2$, and $f(x) = 0$ otherwise. Find the value of k. **(3 marks)**

2. The random variable X follows a normal distribution with mean 50 and standard deviation 8. Find $P(42 < X < 58)$. **(3 marks)**

3. The weights of apples from an orchard are normally distributed with mean 150 g and standard deviation 12 g. State, with a reason, the proportion of apples that weigh more than 150 g. Hence find the probability that a randomly chosen apple weighs between 138 g and 162 g. **(4 marks)**

Answers written in the margins will not be marked.

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4. Let X be a continuous random variable with probability density function **(6 marks)**

$$f(x) = \begin{cases} c(1 - x^2), & -1 \leq x \leq 1, \\ 0, & \text{otherwise.} \end{cases}$$

(a) Find the value of c.

(b) Find $P(-\frac{1}{2} < X < \frac{1}{2})$.

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SECTION A(2) (24 marks)

5. The lifetimes of a certain brand of light bulb are normally distributed with mean 1200 hours and standard deviation 150 hours. **(7 marks)**

(a) Find the probability that a randomly selected bulb lasts more than 1400 hours.

(b) A bulb is considered defective if its lifetime is less than k hours. Given that 5% of bulbs are defective, find k correct to the nearest hour.

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6. The heights of a group of students are normally distributed with mean 170 cm and standard deviation 10 cm. It is known that 80% of the students have heights between a cm and b cm, where a and b are symmetric about the mean (i.e. $a = 170 - d$ and $b = 170 + d$ for some $d > 0$). **(8 marks)**

(a) Find the value of d correct to 2 decimal places.

(b) Hence find the probability that a randomly selected student has a height greater than b cm.

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7. Let X be a continuous random variable with probability density function **(9 marks)**

$$f(x) = \begin{cases} kx, & 0 \le x \le 2, \\ k(4 - x), & 2 < x \le 4, \\ 0, & \text{otherwise.} \end{cases}$$

(a) Find the value of k.

(b) Find $P(1 < X < 3)$.

(c) Find the median of X.

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SECTION B (10 marks)

8. The scores in a test are normally distributed with mean μ and standard deviation σ. It is known that 10% of the scores are below 40 and 20% are above 80. **(10 marks)**

(a) Show that

$$\mu - 40 = 1.2816\sigma \quad \text{and} \quad 80 - \mu = 0.8416\sigma,$$

correct to 4 decimal places.

(b) Hence find μ and σ correct to 2 decimal places.

(c) Find the probability that a randomly selected score is between 50 and 70.

END OF PAPER

Answers written in the margins will not be marked.

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