CONTINUOUS PROBABILITY DISTRIBUTIONS

1 For the continuous random variable with probability density function:

$$f(x) = \begin{cases} \frac{3}{13}\left(x^2 + 4\right), & 0 \le x \le 1 \\ 0, & \text{otherwise} \end{cases}$$

find, correct to four decimal places:

(a) $P(X \le 0.75)$ **(b)** $P(X \le 0.9)$ **(c)** $P(X \ge 0.25)$ **(d)** $P(X \ge 0.65)$

3 For the continuous random variable with probability density function:

$$f(x) = \begin{cases} \frac{3}{13}\left(x^2 + 4\right), & 0 \le x \le 1 \\ 0, & \text{otherwise} \end{cases}$$

find, correct to four decimal places, the following values:

(a) the mean

(b) the standard deviation.

6 For the continuous random variable with probability density function:

$$f(x) = \begin{cases} \dfrac{15000(x-50)}{x^4}, & x \geq 50 \\ 0, & \text{otherwise} \end{cases}$$

find the median, correct to the nearest whole number.

7 If $f(x) = \begin{cases} \frac{x}{45} + k, & 0 \leq x \leq 6 \\ 0, & \text{otherwise} \end{cases}$

defines a probability density function, then the value of k is:

A 0 **B** $-\frac{1}{10}$ **C** $\frac{1}{10}$ **D** $\frac{1}{2}$

8 For the continuous random variable with probability density function:

$$f(x) = \begin{cases} \frac{2x}{25}, & 0 \leq x \leq 5 \\ 0, & \text{otherwise} \end{cases}$$

find, correct to four decimal places:

(a) $P(1.5 \leq X \leq 2.5)$

9 If $f(x) = \begin{cases} \frac{\pi}{12}\sin\left(\frac{\pi x}{6}\right), & 0 \le x \le 6 \\ 0, & \text{otherwise} \end{cases}$

then $P(X \le 3)$ is equal to:

A 0.45 **B** 0.5 **C** 0.55 **D** 0.6

10 For the uniform continuous random variable with probability density function:

$$f(x) = \begin{cases} k, & 0 \le x \le 6 \\ 0, & \text{otherwise} \end{cases}$$

find the following values:

(a) k **(b)** $P(X \le 3)$ **(c)** $P(X \le 5)$

12 In the javelin competition at a primary schools athletics carnival, it is found that the distance s metres that the javelin is thrown is a continuous random variable with probability density function:

$$f(s) = \begin{cases} \frac{1}{486}\left(81 - s^2\right), & 0 \le x \le 9 \\ 0, & \text{otherwise} \end{cases}$$

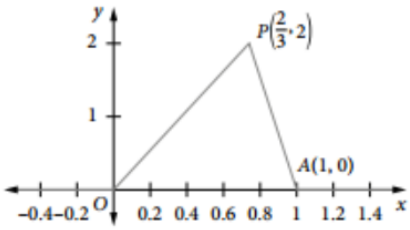
Find:

(a) the mean distance the javelin is thrown

(b) the standard deviation for the distance the javelin is thrown

(c) the median distance the javelin is thrown.

16 Consider the function f whose graph is shown.



(a) Show that the function could be used to represent a probability density function. Explain your answer using mathematical reasoning.

(b) Specify the rule of f.

(c) Consider a continuous random variable, X, with probability density function f. Calculate $P\left(X < \frac{2}{3}\right)$ and $P\left(X > \frac{2}{3}\right)$ using the areas of the triangles.

(d) Consider a continuous random variable X with probability density function f. Calculate $P\left(X < \frac{2}{3}\right)$ and $P\left(X > \frac{2}{3}\right)$ using integration. Comment on the results from parts **(c)** and **(d)**.

(e) Calculate $P\left(\frac{1}{2} < X < \frac{5}{6}\right)$, using integration.

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