Question 1

QUESTION 5

Simple Familiar
Technology Active
2022

A random sample of the petrol price per litre at 50 petrol stations produced a sample mean of \$1.52 and a standard deviation of \$0.14.

Based on this sample and using a z-value of 1.5, an approximate confidence interval for μ is

(A) (\$1.47, \$1.57)

(B) (\$1.48, \$1.56)

(C) (\$1.49, \$1.55)

(D) (\$1.50, \$1.54)

Question 2

QUESTION 10

Simple Familiar
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2021

A random variable is normally distributed with a mean μ. An approximate 95% confidence interval for μ from a sample from this distribution is $(209.7, 221.9)$.

An approximate confidence interval for μ based on the same sample, using a confidence level greater than 95%, could be

(A) $(206.5, 223.3)$

(B) $(208.5, 223.1)$

(C) $(210.6, 221.0)$

(D) $(215.8, 228.0)$

Question 3

QUESTION 2

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The standard deviation for the scores of 1000 students completing an entry test at a certain university is 13.

A researcher takes repeated random samples of the test results, with each sample comprising 40 scores, and calculates the mean score for each sample.

Determine the standard deviation of the distribution of the sample mean scores.

(A) 3.08

(B) 2.06

(C) 0.41

(D) 0.33

Question 4

QUESTION 15 (7 marks)

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The travel time for students attending a certain university is assumed to be normally distributed, with a population mean of 25.2 minutes and standard deviation of 4.7 minutes.

Travel times are collected from a random sample of 120 of these students and used to calculate a sample mean, $\bar{X}_1$, in minutes.

a) Determine $P(\bar{X}_1 \le 25)$. *[2 marks]*

b) Given $P(\bar{X}_1 > k) = 0.9$, determine the value of k. *[1 mark]*

Travel times are collected from a second random sample of the university's students and used to calculate a second sample mean, $\bar{X}_2$, in minutes.

c) Given $P(\bar{X}_2 \le 25) \approx 0.4$, determine the number of students in the second sample. *[4 marks]*

Question 5

QUESTION 17 (7 marks)

Complex Familiar
Technology Active
2021

An object with a mass of 2 kg is released from rest at the top of a 1 metre long frictionless plane inclined at 30° to the horizontal.

A force of $\boldsymbol{P}$ newtons acting parallel to the plane opposes the motion of the object as it travels down the plane.

When the object is x metres from the top of the plane, its velocity is v m s^{-1}.

Given $|\boldsymbol{P}| = \dfrac{4}{\sqrt{4-x^2}}$, determine x when $v = 2$.

Question 6

QUESTION 19 (7 marks)

Complex Unfamiliar
Technology Active
2021

Consider the following information.

Continuous random variable X	mean	$E(X) = \mu = \int_{-\infty}^{\infty} x\,p(x)\,dx$
	variance	$Var(X) = \int_{-\infty}^{\infty} (x-\mu)^2\,p(x)\,dx$

The waiting time (minutes) until workers at a certain call centre receive their nth phone call, where $n \in Z^+$, is a random variable T with probability density function

$$f(t) = \begin{cases} \dfrac{k^n t^{n-1}}{(n-1)!} e^{-\frac{t}{3}}, & t \ge 0 \\ 0, & \text{otherwise} \end{cases}$$

where k is a positive constant.

The waiting time until workers receive their 5th call is collected from a random sample of 80 workers. Determine the probability that the mean waiting time from this sample is more than 16 minutes.