

Mathematics and Statistics (New Engine)

1

Multiple Choice 1 point

The water content of a soil volume is measured six times gravimetrically by oven drying. The mean value of the water content is 24.3%. If the standard deviation of the six measurements is 1.0%, the 99% confidence interval for the soil water content is most nearly:

- ☐ (20.3%, 28.3%)
- ☐ (22.4%, 26.2%)
- ☐ (21.7%, 26.9%)
- ☐ (20.6%, 28.0%)

2

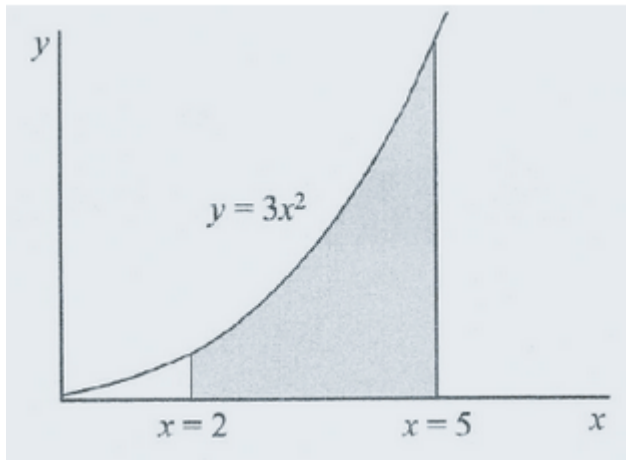
Multiple Choice 1 point

You throw two 6-sided fair dice. The probability that the sum will be less than 10 is most nearly:

- ☐ 0.833
- ☐ 0.750
- ☐ 0.917
- ☐ 0.972

3

Multiple Choice 1 point



The area of the shaded portion of the figure shown above is most nearly:

- ☐ 126
- ☐ 78
- ☐ 18
- ☐ 378

4

Multiple Choice 1 point

Which of the following is a unit vector perpendicular to the plane determined by the vectors $\mathbf{A} = \mathbf{i} + 5\mathbf{j}$ and $\mathbf{B} = 2\mathbf{i} + 3\mathbf{j} - \mathbf{k}$?

Answer Red: $\frac{1}{5\sqrt{3}}(-5\mathbf{i} + \mathbf{j} - 7\mathbf{k})$

Answer Green: $\frac{1}{5\sqrt{3}}(-5\mathbf{i} - \mathbf{j} - 7\mathbf{k})$

Answer Blue: $-5\mathbf{i} - \mathbf{j} - 7\mathbf{k}$

Answer Magenta: $-5\mathbf{i} + \mathbf{j} - 7\mathbf{k}$

- ☐ Answer Green
- ☐ Answer Magenta
- ☐ Answer Blue
- ☐ Answer Red

The indefinite integral of $x^5 - x^2 + x + 1$ is

Answer Emerald: $\frac{x^6}{6} - \frac{x^3}{3} + \frac{x^2}{2} + x + C$

Answer Ruby: $\frac{x^6}{5} - \frac{x^3}{2} + x^2 + x + C$

Answer Sapphire: $5x^4 - 2x + 1 + C$

Answer Diamond: $5x^4 - 2x + 1$

- ☐ Answer Diamond
- ☐ Answer Ruby:
- ☐ Answer Emerald
- ☐ Answer Sapphire

If $y = 6x^4 + 2x^2z + 3xz^3 - 2z^2 + 15$

then $\left(\frac{\partial^2 y}{\partial x^2}\right) =$

Answer Lime: $72x^2 + 4z$

Answer Apple: $18xz - 4$

Answer Orange: $24x^3 + 4xz + 3z^3$

Answer Grapefruit: $24x^2 + 4z$

- ☐ Answer Apple:
- ☐ Answer Lime
- ☐ Answer Grapefruit
- ☐ Answer Orange

7

Multiple Choice 1 point

The following data have been collected:

Test	Average Score
1	85
2	87
3	95
4	90
5	85
6	88
7	90
8	90
9	91

Which of the following statements is true?

- ☐ The mean and the median are equal.
- ☐ The mean and the mode are equal.
- ☐ The median and the mode are equal.
- ☐ The mean is smaller than both the mode and the median.

8

Multiple Choice 1 point

The integral $\int_2^6 \frac{1}{x^3} dx$ equals

- ☐ -5/36
- ☐ 1/9
- ☐ 0
- ☐ 1/4