UPCATET Agriculture Statistics & Mathematics Sample Paper-9

Duration: 20 Minutes **Maximum Marks: 80**

Instructions

- This paper contains **20** Multiple Choice Questions.
- Each correct answer carries **+4** mark. Incorrect answer: **−1** marks. Only **one** correct option.
- Unattempted questions carry **0** marks.
- Use of mobile phones, smartwatches, or any electronic gadgets is strictly prohibited.

Q1. The average yield of rice crops across five experimental agriculture plots is measured to be 42, 48, 55, 50, and 45 quintals per hectare. Calculate the exact value of the Arithmetic Mean for this distribution.

(A) 46.0 quintals per hectare
(B) 48.0 quintals per hectare
(C) 47.5 quintals per hectare
(D) 49.2 quintals per hectare

Q2. In a heavily skewed frequency distribution representing the organic matter percentage of regional soil samples, the Median is calculated as 32 units and the Mode is found to be 38 units. Using the standard empirical relationship, estimate the calculated Mean value for this soil data.

(A) 29 units
(B) 35 units
(C) 30 units
(D) 33 units

Q3. The recorded root depths in centimeters of seven distinct wheat samplings are collected as follows: 12, 15, 22, 18, 14, 25, and 30. What is the precise Median value of this collected agronomic sample set?

(A) 18 cm

(B) 15 cm

(C) 22 cm

(D) 19 cm

Q4. A researcher counts the occurrence of a particular weed per square meter quadrant across eleven field observations: 4, 7, 6, 4, 8, 9, 4, 6, 7, 4, and 5. Identify the statistical Mode for this dataset.

(A) 6

(B) 7

(C) 4

(D) 5

Q5. An analyst updates a sample set tracking rainfall distributions across isolated agricultural zones. If the calculated variance of the recorded local precipitation dataset is equal to 64, what is its corresponding Standard Deviation?

(A) 8

(B) 32

(C) 4

(D) 16

Q6. The total numbers of aphids observed on five specific plant leaves are noted as 2, 4, 6, 8, and 10. Compute the exact population standard deviation for this small group of data points.

(A) 2

(B) 6

(C) $\sqrt{10}$

(D) $\sqrt{8}$

Q7. Determine the mean deviation about the mean for the data set representing daily milk yields in liters from a controlled dairy unit given by the values: 3, 6, 6, 7, 8, and 12.

(A) 2.33 liters

(B) 2.00 liters

(C) 7.00 liters

(D) 1.67 liters

Q8. The data points 5, 9, 11, 15, and 20 represent the moisture retention percentages of five distinct soil mixtures. If every single moisture observation is scaled up by being multiplied by 3, what will be the updated value of the new arithmetic mean?

(A) 12.0

(B) 36.0

(C) 15.0

(D) 33.0

Q9. The uniform weekly growth height of a specific legume crop forms an arithmetic progression. If the first week's base height is 7 cm and the uniform common difference is 3 cm, what will be the computed height of the crop at the 12th week?

(A) 40 cm

(B) 43 cm

(C) 37 cm

(D) 34 cm

Q10. Calculate the exact roots for the quadratic equation $2x^2 - 7x + 3 = 0$ which models the rate of microbial population decay under a specific soil chemical application.

(A) $x = -3$ and $x = -\frac{1}{2}$

(B) $x = 2$ and $x = \frac{3}{2}$

(C) $x = 3$ and $x = \frac{1}{2}$

(D) $x = 6$ and $x = \frac{1}{2}$

Q11. The sum of the first three terms of a geometric progression tracking a local pest population expansion is 21, and their continuous common product is 64. Identify the first term (a) and the common ratio (r) for this scenario.

(A) $a = 1, r = 4$ or $a = 16, r = \frac{1}{4}$

(B) $a = 4, r = 2$ or $a = 2, r = 4$

(C) $a = 3, r = 2$ or $a = 12, r = \frac{1}{2}$

(D) $a = 2, r = 3$ or $a = 18, r = \frac{1}{3}$

Q12. For the quadratic expression $x^2 - px + 8 = 0$, the roots describe two distinct biological equilibrium thresholds. If one root is known to be exactly double the value of the other root, find the positive value of the parameter p.

(A) 4

(B) 6

(C) 3

(D) 8

Q13. The fifth term of an arithmetic progression tracking row spacing adjustments is 30, and its eleventh term is 60. Determine the first term (a) of this progressive sequence.

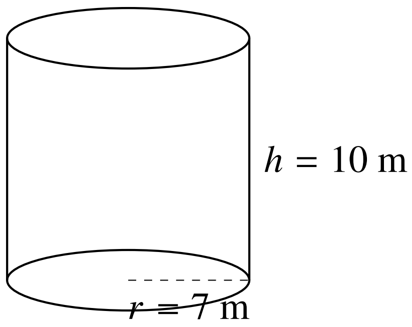
(A) 10

(B) 15

(C) 5

(D) 20

Q14. A grain storage silo is constructed perfectly in the shape of a right circular cylinder as illustrated below. The base diameter is 14 meters and its vertical height is 10 meters. Calculate the total volumetric storage capacity of this silo.



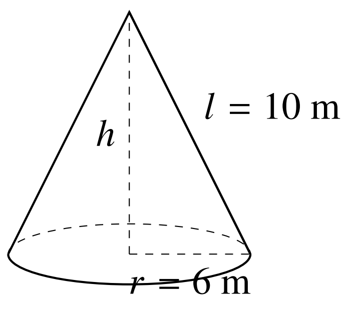
(A) 1540 cubic meters

(B) 6160 cubic meters

(C) 770 cubic meters

(D) 2140 cubic meters

Q15. A conical tent is pitched at an agricultural exhibition site to store dynamic biological samples as shown below. The radius of the base is 6 meters and its slant height is 10 meters. Find the curved surface area of the canvas cloth used to construct this tent.



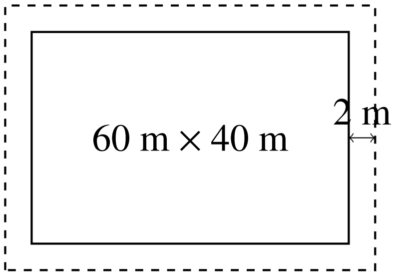
(A) 96π square meters

(B) 48π square meters

(C) 120π square meters

(D) 60π square meters

Q16. A rectangular plot designed for vegetable cultivation measures 60 meters in length and 40 meters in width. A concrete irrigation and walking pathway of uniform width equal to 2 meters is built outside along its boundary as shown. Determine the isolated total area of this boundary track.



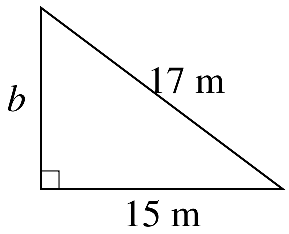
(A) 400 square meters

(B) 416 square meters

(C) 2400 square meters

(D) 2816 square meters

Q17. A uniform piece of agricultural land is bounded in the shape of a right-angled triangular drainage field segment as diagrammed below. The base is 15 meters and the hypotenuse boundary line is 17 meters. Compute the total surface area of this plot.



(A) 60 square meters

(B) 120 square meters

(C) 68 square meters

(D) 127.5 square meters

Q18. A surveyor measures the inclination angle from the edge of a flat field boundary to the top of an adjacent water tower. If the evaluated trigonometric tangent value of the configuration is given by $\tan\theta = \frac{3}{4}$, determine the corresponding value of the product sequence $\sin\theta \cdot \cos\theta$.

(A) $\frac{12}{25}$

(B) $\frac{7}{25}$

(C) $\frac{5}{12}$

(D) $\frac{12}{7}$

Q19. Simplify and evaluate the absolute numeric value of the mathematical logarithmic expression tracking chemical concentration decay scales given by: $\log_{10} 25 + \log_{10} 4$.

(A) 10

(B) 1

(C) 2

(D) 100

Q20. If an algebraic log expression relating to greenhouse climate modeling steps is presented as $\log_a 243 = 5$, isolate and determine the exact value of the unknown base variable a.

(A) 3

(B) 9

(C) 5

(D) 7

Detailed Solutions

Q1.

Solution

Concept:
The arithmetic mean is a fundamental measure of central tendency representing the numerical average of an agronomic dataset. It is calculated by taking the sum of all individual observations and dividing that sum by the total number of observations.

Solution:

(a) Gather the observed rice crop yields from the five experimental plots: 42, 48, 55, 50, and 45 quintals per hectare.

(b) Sum these individual yield values together to find the total combined output across all sample plots: $42 + 48 + 55 + 50 + 45 = 240$.

(c) Identify the total count of experimental plots involved in this distribution, which is given as $n = 5$.

(d) Divide the total combined sum of yields by the total plot count to isolate the exact arithmetic mean: $\frac{240}{5} = 48.0$.

(e) This value represents the central baseline for evaluating regional performance under uniform agricultural conditions.

Final Answer: The Arithmetic Mean is 48.0 quintals per hectare.

Answer: (B)

Go Back to Question 1

Q2.

Solution

Concept:
For an asymmetric or skewed frequency distribution, the central tendency measures do not coincide. They follow a predictable empirical rule stating that the distance between the mean and the median is half the distance between the median and the mode.

Solution:

(a) State the standard empirical formula mapping these relationships: $\text{Mode} = 3 \cdot \text{Median} - 2 \cdot \text{Mean}$.

(b) Substitute the calculated values provided from the regional soil samples into the formula: $\text{Median} = 32$ and $\text{Mode} = 38$.

(c) Set up the algebraic equation with the known values to isolate the mean: $38 = 3 \cdot (32) - 2 \cdot \text{Mean}$.

(d) Expand the product term on the right side of the equation: $38 = 96 - 2 \cdot \text{Mean}$.

(e) Rearrange the terms to solve for the unknown parameter directly: $2 \cdot \text{Mean} = 96 - 38$, which simplifies to $2 \cdot \text{Mean} = 58$.

(f) Divide by 2 to find the estimated baseline mean value: $\text{Mean} = 29$.

Final Answer: The calculated Mean value is 29 units.

Answer: (A)

Go Back to Question 2

Q3.

Solution

Concept:
The median is the structural center of an ordered data distribution. It splits an arranged sample set into two equal parts so that exactly half the observations lie below it and half lie above it.
Solution:

(a) Retrieve the raw, unorganized dataset containing the measured root depths of the seven wheat samplings: 12, 15, 22, 18, 14, 25, 30.

(b) Arrange these values in a strictly ascending sequence to prepare for positional analysis: 12, 14, 15, 18, 22, 25, 30.

(c) Determine the total count of data points in this agronomic sample set, which is an odd number: $n = 7$.

(d) Use the position formula for an odd dataset to locate the median element: $\frac{n+1}{2}$-th term = $\frac{7+1}{2}$-th term = 4-th term.

(e) Identify the value occupying the fourth position in your ordered sequence, which is exactly 18.

Final Answer: The precise Median value is 18 cm.

Answer: (A)

Go Back to Question 3

Q4.

Solution

Concept:
The statistical mode represents the value that appears with the highest frequency in a given distribution. It highlights the most typical or dense clustering point among the field observations.
Solution:

(a) Tally the frequency of each distinct integer within the researcher's recorded weed count distribution: 4, 7, 6, 4, 8, 9, 4, 6, 7, 4, 5.

(b) Count the individual occurrences: the value 4 appears 4 times; 5 appears 1 time; 6 appears 2 times; 7 appears 2 times; 8 appears 1 time; 9 appears 1 time.

(c) Compare the frequencies to determine which observation has the highest count.

(d) Note that the count of 4 occurrences for the value 4 surpasses all other data point frequencies in this specific agronomic dataset.

(e) This highest frequency identifies the integer 4 as the dominant structural mode of the field sample.

Final Answer: The statistical Mode for this dataset is 4.

Answer: (C)

Go Back to Question 4

Q5.

Solution

Concept:
Standard deviation is a crucial metric that measures the amount of dispersion or variation in a set of values. It is mathematically defined as the principal square root of the variance.
Solution:

(a) Identify the given statistical value for the variance of the recorded local precipitation dataset, which is 64.

(b) Recall the algebraic identity linking these two measures of dispersion: Standard Deviation = $\sqrt{\text{Variance}}$.

(c) Substitute the given variance into the structural relationship to compute the value: Standard Deviation = $\sqrt{64}$.

(d) Evaluate the square root to obtain the absolute positive value: $\sqrt{64} = 8$.

(e) This demonstrates that the standard deviation scales directly back to the original linear dimensions of the rainfall data.

Final Answer: The corresponding Standard Deviation is 8.

Answer: (A)

Go Back to Question 5

Q6.

Solution

Concept:

Population standard deviation quantifies absolute dispersion. It requires finding the arithmetic mean, computing squared deviations from that mean, averaging those squares, and extracting the square root.

Solution:

(a) Gather the observed aphid counts from the five sample leaves: 2, 4, 6, 8, 10. The sample count is $n = 5$.

(b) Calculate the arithmetic mean of these values: Mean $= \frac{2+4+6+8+10}{5} = \frac{30}{5} = 6$.

(c) Determine the deviation of each individual value from this calculated mean: $(2-6), (4-6), (6-6), (8-6), (10-6)$, which yields $-4, -2, 0, 2, 4$.

(d) Square each individual deviation to eliminate negative signs: $16, 4, 0, 4, 16$.

(e) Sum these squared values to compute the total sum of squares: $16 + 4 + 0 + 4 + 16 = 40$.

(f) Find the variance by dividing this sum by n: Variance $= \frac{40}{5} = 8$.

(g) Compute the final population standard deviation by taking the square root: $\sqrt{8}$.

Final Answer: The exact population standard deviation is $\sqrt{8}$.

Answer: (D)

Go Back to Question 6

Q7.

Solution

Concept:
Mean deviation about the mean measures variability by calculating the arithmetic average of the absolute differences between each individual data point and the central arithmetic mean of the distribution.

Solution:

(a) Extract the daily milk yields from the controlled unit: 3, 6, 6, 7, 8, 12. The count of elements is $n = 6$.

(b) Find the baseline arithmetic mean of this group: Mean $= \frac{3+6+6+7+8+12}{6} = \frac{42}{6} = 7$ liters.

(c) Compute the absolute differences between each observation and this mean: $|3 - 7| = 4$, $|6 - 7| = 1$, $|6 - 7| = 1$, $|7 - 7| = 0$, $|8 - 7| = 1$, $|12 - 7| = 5$.

(d) Sum these absolute deviations together to find the total variance value: $4+1+1+0+1+5 = 12$.

(e) Divide this total sum of absolute deviations by the number of observations: $\frac{12}{6} = 2.00$.

Final Answer: The mean deviation about the mean is 2.00 liters.

Answer: (B)

Go Back to Question 7

Q8.

Solution

Concept:
A key algebraic property of the arithmetic mean is its linear reactivity to scaling. If every individual element in a dataset is multiplied by a constant factor, the resulting mean changes by that exact multiple.

Solution:

(a) Extract the baseline moisture retention percentages of the five soil mixtures: 5, 9, 11, 15, 20.

(b) Calculate the initial baseline arithmetic mean: Mean $= \frac{5+9+11+15+20}{5} = \frac{60}{5} = 12.0$.

(c) Review the modification rule stating that every single observation is scaled up by a multiplication factor of 3.

(d) Apply the linearity property of averages, which dictates that the new mean equals the old mean multiplied by the scale factor.

(e) Compute the final shifted value directly using this relationship: New Mean $= 12.0 \cdot 3 = 36.0$.

Final Answer: The updated value of the new arithmetic mean is 36.0.

Answer: (B)

Go Back to Question 8

Q9.

Solution

Concept:
An arithmetic progression is a sequence of numbers in which the consecutive terms change by a constant value known as the common difference. The general term can be located using an explicit index equation.

Solution:

(a) Identify the parameters provided for the legume growth progression: first week height $a = 7$ cm and common difference $d = 3$ cm.

(b) State the standard structural equation for finding the n-th term of any arithmetic sequence: $a_n = a + (n - 1) \cdot d$.

(c) Substitute the targeted weekly index value, $n = 12$, into the equation to find the final height.

(d) Write out the expression with these active values: $a_{12} = 7 + (12 - 1) \cdot 3$.

(e) Simplify the expression step by step inside the brackets: $a_{12} = 7 + 11 \cdot 3 = 7 + 33 = 40$ cm.

Final Answer: The computed height of the crop at the 12th week is 40 cm.

Answer: (A)

Go Back to Question 9

Q10.

Solution

Concept:
The roots of a second-degree polynomial or quadratic equation represent the values of the variable that satisfy the equation. These values can be isolated through splitting the middle term or using the quadratic formula.

Solution:

(a) Write down the quadratic expression tracking microbial decay: $2x^2 - 7x + 3 = 0$.

(b) Multiply the leading coefficient by the constant term to find the factorization target: $2 \cdot 3 = 6$.

(c) Split the linear middle term $(-7x)$ into two components whose product is 6 and whose sum is -7: $-6x$ and $-1x$.

(d) Rewrite the expanded polynomial expression: $2x^2 - 6x - x + 3 = 0$.

(e) Group the terms and extract common factors from each pairs: $2x \cdot (x - 3) - 1 \cdot (x - 3) = 0$.

(f) Collect the shared binomial terms together: $(2x - 1) \cdot (x - 3) = 0$.

(g) Set each linear factor to zero to isolate the independent roots: $x = 3$ and $x = \frac{1}{2}$.

Final Answer: The exact roots are $x = 3$ and $x = \frac{1}{2}$.

Answer: (C)

Go Back to Question 10

Q11.

Solution

Concept:

A geometric progression is an ordered sequence of numerical values where each consecutive term is found by multiplying the previous one by a constant multiplier known as the common ratio. Systems of equations can track population models.

Solution:

(a) Define the first three consecutive terms of the geometric progression using standard algebraic notation: $\frac{a}{r}$, a, and ar.

(b) Use the given cumulative product condition to formulate an equation for the sequence: $\frac{a}{r} \cdot a \cdot ar = 64$.

(c) Simplify the expression by canceling out the variable r across the terms, which results in: $a^3 = 64$.

(d) Solve for the central parameter a by extracting the cubic root: $a = 4$.

(e) Substitute $a = 4$ into the given cumulative sum condition to determine the common ratio: $\frac{4}{r} + 4 + 4r = 21$.

(f) Subtract 4 from both sides and multiply the entire expression by r to yield the quadratic equation: $4r^2 - 17r + 4 = 0$.

(g) Factorize this expression to reveal two valid solutions for the common ratio: $r = 4$ or $r = \frac{1}{4}$.

Final Answer: The first term and common ratio are $a = 1, r = 4$ or $a = 16, r = \frac{1}{4}$.

Answer: (A)

Go Back to Question 11

Q12.

Solution

Concept:
The structural behavior of a second-degree polynomial equation is determined by the relationships between its root values and its coefficients. For any standard expression, the sum and product of the roots match set algebraic ratios.

Solution:

(a) Identify the given quadratic expression modeling the biological threshold boundaries: $x^2 - px + 8 = 0$.

(b) Define the two distinct roots of the equation as α and β, where one root is exactly double the other: $\beta = 2\alpha$.

(c) State the algebraic product relationship for the roots based on the constant coefficient: $\alpha \cdot \beta = \frac{c}{a} = 8$.

(d) Substitute the root equivalence into the product relationship to form a single-variable expression: $\alpha \cdot (2\alpha) = 8$.

(e) Simplify the expression to find the root value: $2\alpha^2 = 8$, which means $\alpha^2 = 4$, yielding a positive root value of $\alpha = 2$.

(f) Calculate the second root using the doubling relationship: $\beta = 2 \cdot 2 = 4$.

(g) Use the algebraic sum relationship to isolate the unknown parameter p: $\alpha + \beta = p$, leading to $2 + 4 = 6$.

Final Answer: The positive value of parameter p is 6.

Answer: (B)

Go Back to Question 12

Q13.

Solution

Concept:
An arithmetic progression exhibits a constant rate of linear change between consecutive elements. Any specific term within the progression can be determined by using its structural position index along with the first term and common difference.

Solution:

(a) State the standard structural equation for finding any term in an arithmetic progression: $a_n = a + (n-1) \cdot d$.

(b) Translate the two given field data points into linear equations: $a + 4d = 30$ and $a + 10d = 60$.

(c) Align these two expressions into a system of simultaneous equations to isolate the common difference parameter.

(d) Subtract the first linear equation from the second equation to eliminate the variable a: $(a + 10d) - (a + 4d) = 60 - 30$.

(e) Simplify the resulting expression to solve for the common difference: $6d = 30$, which gives $d = 5$.

(f) Substitute $d = 5$ back into the first equation to solve for the first term: $a + 4 \cdot (5) = 30$.

(g) Isolate the final target value by subtracting the product: $a = 30 - 20 = 10$.

Final Answer: The first term of this sequence is 10.

Answer: (A)

Go Back to Question 13

Q14.

Solution

Concept:

The capacity of a three-dimensional geometric structure is determined by its volume formula. For a perfect right circular cylinder, the total internal space depends on the radius of its circular base and its vertical height.

Solution:

(a) Extract the dimensional parameters from the given grain storage silo problem: base diameter $d = 14$ m and height $h = 10$ m.

(b) Calculate the operational radius of the circular base by halving the given diameter: $r = \frac{14}{2} = 7$ m.

(c) State the standard geometric formula used to evaluate the total volume of a cylinder: $V = \pi \cdot r^2 \cdot h$.

(d) Substitute the calculated radius, height, and the fractional approximation of pi ($\frac{22}{7}$) into the formula.

(e) Write out the expanded numerical expression: $V = \frac{22}{7} \cdot 7 \cdot 7 \cdot 10$.

(f) Cancel out the common factor of 7 from the numerator and denominator: $V = 22 \cdot 7 \cdot 10$.

(g) Perform the final multiplications to determine the total cubic capacity: $154 \cdot 10 = 1540$.

Final Answer: The total volumetric storage capacity is 1540 cubic meters.

Answer: (A)

Go Back to Question 14

Q15.

Solution

Concept:

The curved surface area of a right circular cone represents the total area of its sloped outer walls, excluding its base. This area depends on the radius of the circular footprint and the lateral slant height.

Solution:

(a) Extract the geometric dimensions provided for the exhibition tent structure: base radius $r = 6$ m and slant height $l = 10$ m.

(b) State the standard mathematical equation used to evaluate the curved surface area of a cone: $A = \pi \cdot r \cdot l$.

(c) Substitute the given spatial values directly into the variables of the geometric equation.

(d) Arrange the terms to complete the algebraic multiplication step: $A = \pi \cdot 6 \cdot 10$.

(e) Multiply the numerical constants together while keeping the answer in terms of pi: $A = 60\pi$.

(f) This total matches the required amount of canvas cloth needed to construct the outer sloped walls of the tent.

Final Answer: The curved surface area of the tent is 60π square meters.

Answer: (D)

Go Back to Question 15

Q16.

Solution

Concept:
The area of a uniform rectangular border or pathway running outside a central region is found by calculating the difference between the total area of the larger outer rectangle and the area of the smaller inner rectangle.

Solution:

(a) Compute the surface area of the inner vegetable field plot using its given dimensions: $A_{\text{inner}} = 60 \cdot 40 = 2400 \text{ m}^2$.

(b) Determine the expanded linear dimensions of the outer boundary by adding the uniform track width of 2 meters to both sides.

(c) Calculate the total length of the expanded outer rectangle: $L_{\text{outer}} = 60 + 2 + 2 = 64$ m.

(d) Calculate the total width of the expanded outer rectangle: $W_{\text{outer}} = 40 + 2 + 2 = 44$ m.

(e) Compute the total combined surface area of the outer rectangle: $A_{\text{outer}} = 64 \cdot 44 = 2816 \text{ m}^2$.

(f) Isolate the area of the concrete pathway by subtracting the inner field area from the outer area: $A_{\text{track}} = 2816 - 2400$.

(g) Complete the subtraction to find the final value: $A_{\text{track}} = 416 \text{ m}^2$.

Final Answer: The isolated total area of the boundary track is 416 square meters.

Answer: (B)

Go Back to Question 16

Q17.

Solution

Concept:

The total surface area of a right-angled triangle is equal to half the product of its base and perpendicular height. If one of these lateral sides is unknown, it can be found using the Pythagorean theorem.

Solution:

(a) Identify the given spatial parameters for the drainage field segment: base $a = 15$ m and hypotenuse $c = 17$ m.

(b) State the Pythagorean theorem to set up an equation for the missing perpendicular side b: $a^2 + b^2 = c^2$.

(c) Substitute the known values into the equation: $15^2 + b^2 = 17^2$, which expands to $225 + b^2 = 289$.

(d) Isolate the squared variable by subtracting the values: $b^2 = 289 - 225 = 64$.

(e) Extract the square root to find the positive length of the perpendicular side: $b = \sqrt{64} = 8$ m.

(f) State the standard geometric equation used to calculate the area of a right triangle: $A = \frac{1}{2} \cdot \text{base} \cdot \text{height}$.

(g) Substitute the values to find the final area: $A = \frac{1}{2} \cdot 15 \cdot 8 = 15 \cdot 4 = 60 \text{ m}^2$.

Final Answer: The total surface area of this plot is 60 square meters.

Answer: (A)

Go Back to Question 17

Q18.

Solution

Concept:

Trigonometric functions map the ratios of a right-angled triangle's sides based on an angle of inclination. The sine function tracks the opposite side over the hypotenuse, while the cosine tracks the adjacent side over the hypotenuse.

Solution:

(a) Use the given tangent value to define the side ratios of the right triangle: $\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}} = \frac{3}{4}$.

(b) Express the lengths of the opposite and adjacent sides using a scalar constant: Opposite = 3 and Adjacent = 4.

(c) Calculate the length of the missing hypotenuse side using the Pythagorean relationship: Hypotenuse $= \sqrt{3^2 + 4^2}$.

(d) Simplify the terms inside the radical sign to solve for the length: Hypotenuse $= \sqrt{9 + 16} = \sqrt{25} = 5$.

(e) Determine the exact value of the sine function using these calculated side lengths: $\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{3}{5}$.

(f) Determine the exact value of the cosine function using these calculated side lengths: $\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{4}{5}$.

(g) Multiply the two individual trigonometric fractions together to find the final product value: $\frac{3}{5} \cdot \frac{4}{5} = \frac{12}{25}$.

Final Answer: The value of the product sequence is $\frac{12}{25}$.

Answer: (A)

Go Back to Question 18

Q19.

Solution

Concept:
Logarithms simplify multi-factored numbers by tracking power scales relative to a constant base. A fundamental algebraic rule states that the sum of two separate logarithms with identical bases equals the logarithm of their product.

Solution:

(a) Write down the raw logarithmic expression tracking the concentration decay scales: $\log_{10} 25 + \log_{10} 4$.

(b) Recall the standard logarithmic identity for addition: $\log_b M + \log_b N = \log_b(M \cdot N)$.

(c) Apply this identity to combine the two separate log expressions into a single term: $\log_{10}(25 \cdot 4)$.

(d) Calculate the product of the values inside the parentheses: $25 \cdot 4 = 100$.

(e) Rewrite the simplified expression with the new product value: $\log_{10} 100$.

(f) Express the number 100 as an exponential power with a base of 10 to match the log base: $100 = 10^2$.

(g) Evaluate the final base-10 logarithmic expression to find its absolute numerical value: $\log_{10}(10^2) = 2$.

Final Answer: The absolute numeric value of the expression is 2.

Answer: (C)

Go Back to Question 19

Q20.

Solution

Concept:
A logarithmic equation can be rewritten in its equivalent exponential form. The base of the logarithm raised to the power of the independent value on the opposite side of the equation equals the argument of the logarithm.

Solution:

(a) Identify the given logarithmic equation used in the climate modeling steps: $\log_a 243 = 5$.

(b) Convert this equation from its logarithmic form into its equivalent exponential form: $a^5 = 243$.

(c) Analyze the constant integer value 243 to determine its prime factors.

(d) Break down the number 243 into its lowest prime base components: $243 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$.

(e) Express this prime factorization product using exponential notation: $243 = 3^5$.

(f) Rewrite the exponential equation by substituting this value back into the expression: $a^5 = 3^5$.

(g) Equate the bases since the exponential powers on both sides are identical, which isolates the unknown variable: $a = 3$.

Final Answer: The exact value of the unknown base variable is 3.

Answer: (A)

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Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	A	3	A	4	C	5	A
6	D	7	B	8	B	9	A	10	C
11	A	12	B	13	A	14	A	15	D
16	B	17	A	18	A	19	C	20	A