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Section-1

Sec 1

Q.1 [11831809]

In a basket there are a certain number of mangoes and kiwis that costs Rs. 336. If 1 kiwi is added to the basket, the average cost per fruit in the basket increases by Rs. 2 and if 1 mango is added to the basket, the average cost per fruit in the basket decreases by Re. 1. It is also known that if 2 kiwis are replaced with 2 mangoes, the average cost per fruit in the basket becomes Rs. 9. Find the total number of fruits in the basket initially.

Solution:
Correct Answer : 22

Answer key/Solution

Let the price of 1 Kiwi and 1 Mango be 'x' and 'y' respectively. Let the number of Kiwis and Mangoes initially in the basket be 'a' and 'b' respectively.

$$\frac{336+x}{a+b+1}-\frac{336}{a+b}=2 \quad \ldots (i)$$

and $$\frac{336}{a+b}-\frac{336+y}{a+b+1}=1 \quad \ldots (ii)$$

From (i) and (ii), $$\frac{x-y}{a+b+1}=3 \quad \ldots (iii)$$

Also, $$\frac{336+2y-2x}{a+b}=9 \quad \ldots (iv)$$

From (iii) and (iv),

$$\frac{336-6(a+b+1)}{a+b}=9$$

$$\Rightarrow 15(a+b)=330 \Rightarrow a+b=22$$

Hence, total number of fruits = 22.

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Q.2 [11831809]

If $a_0 = 2$, $a_1 = 1$ and $a_{n+1} \times a_{n-1} = a_{n-1} - a_{n+1}$, then the value of a_{1001}/a_{1000} is greater than

1 ◯ a_1

2 ◯ a_{1000}/a_{999}

3 ◯ a_{1002}/a_{1001}

4 ◯ 1004/1005

Solution:

Correct Answer : 2

Answer key/Solution

Given that $a_0 = 2$, $a_1 = 1$ and
For n = 1,
$a_2 \times a_0 = a_0 - a_2$.
$\Rightarrow 2a_2 = 2 - a_2$

$\Rightarrow a_2 = \frac{2}{3}$

Similarly, $a_3 = \frac{1}{2} = \frac{2}{4}$, $a_4 = \frac{2}{5}$, $a_5 = \frac{1}{3} = \frac{2}{6}$, $a_6 = \frac{2}{7}$ etc.

Observing the terms a_2, a_3, a_4, ... etc, one can easily figure out that a_n is $\frac{2}{n+1}$.

$\therefore a_{1000} = \frac{2}{1000+1} = \frac{2}{1001}$.

Hence, $\frac{a_{1001}}{a_{1000}} = \frac{\frac{2}{1002}}{\frac{2}{1001}} = \frac{1001}{1002}$, this is greater than a_{1000}/a_{999} only.

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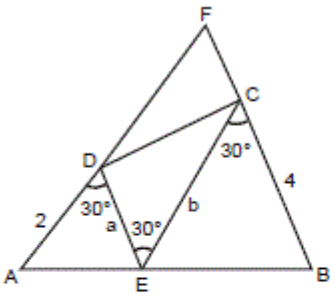
Q.3 [11831809]

In a quadrilateral ABCD, E is a point on AB. If ∠ADE = ∠DEC = ∠ECB = 30°, AD = 2 units and BC = 4 units. If AD and BC are extended to meet at a point F, then what is the area (in sq. units) of the quadrilateral DECF?

Solution:

Correct Answer : 4

Answer key/Solution



Please note that ΔADE is similar to ΔECB since AD is parallel to EC and DE is parallel to BC.
(In both cases alternate angles are equal.)
Let, DE = a and EC = b.
Since ΔADE is similar to ΔECB.
∴ 2/a = b/4 ⇒ ab = 8
Area of ΔDEC = 1/2 × ab × sin 30° = 2 sq. units
Since DF is parallel to EC and DE is parallel to BF, the quadrilateral DECF is a parallelogram.
Hence, the area of parallelogram DECF = 2 × area of ΔDEC = 2 x 2 = 4 sq. units.

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Q.4 [11831809]

A function f is defined such that f(1) = 2, f(2) = 5, and f(n) = f(n – 1) – f(n – 2) for all integer values of n > 2. What is the value of f(100)?

Answer key/Solution

Solution:
Correct Answer : -2
Substitute n = 4 into the function equation and get,
f(4) = f(4 – 1) – f(4 – 2)
= f(3) – f(2)
f(3) = f(2) – f(1) = 5 – 2 = 3
f(4) = 3 – 5 = –2
f(5) = –2 – 3 = –5
f(6) = –5 – (–2) = –3
f(7) = –3 – (–5) = 2
f(8) = 2 – (–3) = 5
And so on, the sequence thus repeats after f(6). 2, 5, 3, –2, –5, –3, 2, 5, …
Hence, f(100) = f(4) = –2.

Bookmark FeedBack

Q.5 [11831809]

A shopkeeper buys 50 kg of apples for Rs.6,000. He marks up the price of the apples such that even after giving a discount of 10%, he will still earn a profit of 12.5%. Later he decides to donate 10% of his apples to an orphanage. He increases his marked price and offers a discount of 6.25% on his remaining apples such that he still earns the same profit. What percentage above the cost price is his new marked price?

1 ◯ 37.5%

2 ◯ 28.5%

3 ◯ 33.33%

4 ◯ 16.67%

Solution:
Correct Answer : 3
Cost price of 1 kg = Rs.120; Selling price of 1 kg = 120 × 1.125 = Rs.135;
Marked price of 1 kg = 135/0.9 = Rs.150
Hence, the apples were marked 25% above the cost price.
After donating 10% of his apples, he has 45 kg left.
For earning the same profit, the selling price of 45 kg of apples should be Rs.6,750.
Hence, selling price per kg = 6750/45 = Rs.150.
After offering a discount of 6.25% he sells at Rs.150 per kg.
So Marked price = 150/0.9375 = Rs.160
Hence, percentage mark up = (160 – 120)/120 × 100 = 33.33%.

Answer key/Solution

Bookmark FeedBack

Q.6 [11831809]

Preet went to a shop to buy a certain number of pencils and erasers. Preet calculated the amount payable to the shopkeeper and offered that amount to him. Preet was surprised when the shopkeeper returned him Rs. 12 as balance. When he came back home, he realized that the shopkeeper had actually transposed the number of pencils with the number of erasers. Which of the following can be a VALID statement?

1 ◯ The number of erasers that Preet wanted to buy was 4 less than the number of pencils.

2 ◯ The number of pencils that Preet wanted to buy was 4 more than the number of erasers.

3 ◯ A pencil costs Rs. 3 more than that of an eraser.

4 ◯ All are valid statements.

Solution:
Correct Answer : 4

x = Price of a Pencil and
y = Price of an eraser
a = Number of Pencils Preet wanted to purchase
b = Number of erasers Preet wanted to purchase
s = bill amount calculated by Preet
We have two equations:
$ax + by = s$ ... (i)
$bx + ay = s - 12$ ... (ii)
Subtracting (i) from (ii), we get
$(a - b)x + (b - a)y = s - s + 12$
$\Rightarrow (a - b)(x - y) = 12$
Clearly, all the statements can be valid.
Hence option (4) is the correct choice.

Answer key/Solution

Bookmark FeedBack

Q.7 [11831809]

For how many integral values of p, both the roots of the equation $2x^2 + (4p - 1)x + 2p^2 - 1 = 0$ are real, negative and unequal?

Solution:

Correct Answer : 1

Answer key/Solution

$2x^2 + (4p - 1)x + 2p^2 - 1 = 0$

Roots are real and unequal:

$\Rightarrow (4p-1)^2 > 4 \times 2 \times (2p^2 - 1)$

$\Rightarrow 8p < 9 \quad \Rightarrow p < \frac{9}{8}$

Roots are negative:

I. Sum of roots $< 0 \Rightarrow \frac{1-4p}{2} < 0 \Rightarrow p > \frac{1}{4}$

II. Product of roots $> 0 \Rightarrow \frac{2p^2-1}{2} > 0 \Rightarrow 2p^2 - 1 > 0$

$\Rightarrow p < -\frac{1}{\sqrt{2}}$ or $p > \frac{1}{\sqrt{2}}$

So, the range of values of p: $\frac{1}{\sqrt{2}} < p < \frac{9}{8}$

Hence, the answer is option (1).

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Q.8 [11831809]

ABCD is a square of side 1 unit. P is a point on AB such that AP : PB = 1 : 3. If PC and BD intersect at a point X inside the square, then find the length of line segment CX.

1 ◯ 3/5 units

2 ◯ 4/7 units

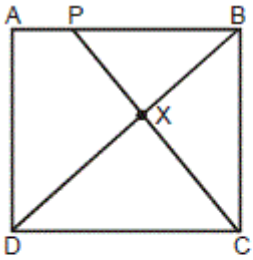
3 ◯ 5/7 units

4 ◯ 7/9 units

Solution:

Answer key/Solution

Correct Answer : 3



ΔPBX is similar to ΔCDX.
PB/CD = BX/DX = XP/CX = 3/4
⇒ (CX + XP)/CX = 7/4 ⇒ PC/CX = 7/4
By Pythagoras theorem: $PC^2 = PB^2 + BC^2$
⇒ $PC^2/BC^2 = PB^2/BC^2 + 1$
(BC = CD = 1 unit)
⇒ PC/BC = √(9/16 + 1) = 5/4
∴ PC/BC × CX/PC = 5/4 × 4/7 = 5/7
⇒ CX/BC = 5/7
Hence, the length of the line segment CX is 5/7 units.

Bookmark FeedBack

Q.9 [11831809]

If (481)x – (bbb)y = 2629, where 'bbb' is a three-digit number and x and y are integers, then find the total number of solutions (x, y) that satisfy the equation.

Solution:

Answer key/Solution

Correct Answer : 0

Note that an equation ax + by = c or ax – by = c cannot have an integral solution if the highest common factor of 'a' and 'b' does not divide 'c'.
Here, 481 = 37 × 13 and 'bbb' = b × 37 × 3.
Now, in this case 37 being the highest common factor does not divide 2629.
Hence, the number of integral solutions of the given equation is 0.

Bookmark FeedBack

Q.10 [11831809]

In the history exam, a candidate is required to answer 6 questions out of 10. The questions are divided into two groups - Indian History and World History - such that there are 5 questions in each group. The candidate has to attempt at least 2 questions from each group. In how many ways can he answer the questions?

Solution:
Correct Answer : 200
Let the two groups IH and WH contain 5 questions each.
A candidate can make his choice in the following ways:
4 from IH and 2 from WH.
3 from IH and 3 from WH.
2 from IH and 4 from WH.
Hence, number of ways = $^5C_4 \times {}^5C_2 + {}^5C_3 \times {}^5C_3 + {}^5C_2 \times {}^5C_4$
$= 5 \times 10 + 10 \times 10 + 10 \times 5 = 200.$

Answer key/Solution

Bookmark FeedBack

Q.11 [11831809]

During Diwali, a clothing store manager offers discounts on a combination of two items, shirt and trousers, which are on sale. He has two schemes, such that the effective amount paid is the same in both schemes.
Scheme 1: On the purchase of a shirt P, 12.5% discount is given on the trousers, if purchased.
Scheme 2: On the purchase of the trousers, 10% discount is given on the shirt, if purchased.
After few days he decided to give a discount of 18% instead of 12.5% on the trousers in scheme 1.
What should be the discount offered on the shirt in scheme 2 such that customers still pay the same amount irrespective of the scheme chosen?

1 ◯ 20%

2 ◯ 14.4%

3 ◯ 16%

4 ◯ 15.6%

Solution:
Correct Answer : 2

Answer key/Solution

Let the marked price of the shirt and trousers be 's' and 't' respectively.
Amount paid by the customer if he/she chooses scheme 1 will be $[s + (1 - 0.125)t]$
Amount paid by the customer if he/she chooses scheme 2 will be $[t + (1 - 0.1)s]$
Now, $[s + (1 - 0.125)t] = [t + (1 - 0.1)s] \Rightarrow 4s = 5t$
New amount paid by the customer if he/she chooses scheme 1 $= s + (1 - 0.18)t$
Let, k% be the discount offered on the shirt in scheme 2.
Amount paid by the customer is $= t + (1 - k/100)s$
$\Rightarrow t + (1 - k/100)s = s + (1 - 0.18)t$ and $s : t = 5 : 4$
$\Rightarrow k = 14.4\%$
Hence, option (2) is the correct choice.

Bookmark FeedBack

Q.12 [11831809]

If S is the set of all four-digit numbers that can be formed using the digits 1, 2, 4, 5, 7 and 8 such that each number is divisible by 5 as well as 9 where repetition of digits is not allowed, then what is the sum of all elements of set S?

1 ◯ 48000

2 ◯ 54000

3 ◯ 72000

4 ◯ 57780

Answer key/Solution

Solution:
Correct Answer : 4
We know that for a four digit number (formed using the given digits) to be divisible by 5, the units' digit must be 5.
Also, for the number to be divisible by 9, the sum of the digits must be divisible by 9.
This can be possible if the four digits are (1, 8, 4, 5) or (2, 7, 4, 5), where the first three digits can be present in any combination and the last digit is 5. n(S) = 12 The sum of all the 12 elements of the set S will be = 1845 + 1485 + 8415 + 8145 + 4185 + 4815 + 2745 + 2475 + 7245 + 7425 + 4275 + 4725 = 57780.

Bookmark FeedBack

Q.13 [11831809]

If $N = (\log_2 x)^2 - 6(\log_2 x) + 12$, then the number of distinct values of x for $x^N = 256$ is

1 ◯ 1

2 ◯ 2

3 ◯ 3

4 ◯ More than 3

Solution:
Correct Answer : 1

Answer key/Solution

$N = (\log_2 x)^2 - 6(\log_2 x) + 12$ ... (i)
$x^N = 256 = 2^8$
Taking log on both sides, we get
$N \log_2 x = 8$

$\Rightarrow [(\log_2 x)^2 - 6(\log_2 x) + 12]\log_2 x = 8$ (From (i))

$\Rightarrow (\log_2 x)^3 - 6(\log_2 x)^2 + 12\log_2 x - 8 = 0$

$\Rightarrow (\log_2 x - 2)^3 = 0$

$\Rightarrow \log_2 x = 2$

Therefore, $x = 4$
Hence, the number of values of x is 1.

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Q.14 [11831809]

A milk vendor has 2 vessels each having a capacity of 120 liters. The first vessel contains 35% water and the rest is pure milk. The second vessel contains 75% pure milk and the rest is water. How much quantity of milk solution should the milk vendor mix from the first and the second vessels respectively such that he gets 170 liters of milk solution having the ratio of water to milk as 7 : 18?

1 ◯ 80 liters, 90 liters

2 ◯ 72 liters, 98 liters

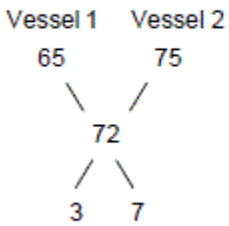
3 ◯ 55 liters, 115 liters

4 ◯ 51 liters, 119 liters

Solution:
Correct Answer : 4

Answer key/Solution

Ratio of milk and water in the final mixture is 18 : 7.
Hence, the solution has 72% milk.
Using aligation we get :



Hence, to get 170 liters of solution he should mix 3 × 17 = 51 liters from vessel 1 and 7 × 17 = 119 liters from vessel 2.

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Q.15 [11831809]

A sheet in the form of a square of side 10 cm is cut only once along a diagonal and the two triangles are placed side by side without overlap to form an isosceles triangle. What is the ratio of the perimeter of the square to the perimeter of the triangle?

1 ◯ 2 : (1 + √2)

2 ◯ 1 : (1 + √2)

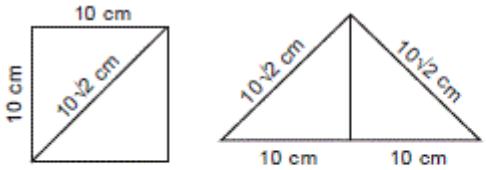
3 ◯ 3 : √2

4 ◯ 1 : (2 – √2)

Answer key/Solution

Solution:

Correct Answer : 1



Given that side of the square is 10 cm. So the diagonal of the square will be 10√2 cm.
The square is cut along the diagonal and an isosceles triangle is formed.
Equal sides of the triangle will be of length 10√2 cm whereas the base will be 20 cm.
Hence, ratio of perimeter of square and isosceles triangle = 40 : 20(1 + √2) = 2 : (1 + √2).

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Q.16 [11831809]

A group containing 2 men and 2 women can complete a piece of work in 30 days. Four men and nine women can complete the work in 10 days. In how many days will 10 men and 15 women complete the work?

Answer key/Solution

Solution:

Correct Answer : 5

Let the time taken by one man and one woman working alone, to complete the work be M days and W days respectively.

According to the question:

2/M + 2/W = 1/30 …(i)

4/M + 9/W = 1/10 …(ii)

Solving (i) and (ii) we get M = 100 days and W = 150 days.

Let time taken by 10 men and 15 women to complete the work be t.

∴ 1/t = 10/100 + 15/150 = 1/5.

Hence, the time taken is 5 days.

Bookmark FeedBack

Q.17 [11831809]

Find the total number of points having integral coordinates inside the region enclosed by 4|x| + 3|y| = 24 in the X-Y plane.

1 ◯ 81

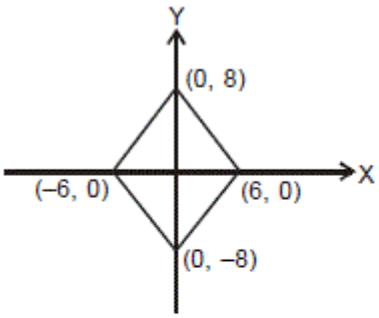
2 ◯ 93

3 ◯ 95

4 ◯ 85

Solution:
Correct Answer : 2

Answer key/Solution



The equation 4|x| + 3|y| = 24 encloses a region that is a rhombus with coordinates (0, 8), (6, 0), (0, –8) and (–6, 0).
There are 10 points having integral coordinates on the X-axis and 14 points with integral coordinates on the Y-axis other than the origin.
In the first quadrant, for x = 1, 2, 3, 4 and 5 we get 6, 5, 3, 2, 1 points respectively, having integral coordinates inside (not on the boundary) the region enclosed by the graph in the first quadrant.
Therefore, there are 1 + 2 + 3 + 5 + 6 = 17 points having integral coordinates in each of the four quadrants other than the points on the Y-axis and X-axis.
Hence, total number of points having integral coordinates inside the region enclosed by the graph = 10 + 14 + 1 + 4 × 17 = 93

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Q.18 [11831809]

In a certain race, A beats B by 100 m or 10 seconds. B beats D by 30 seconds. If the speeds of A, B and C are in the ratio 5 : 4 : 2, by what distance (in meters) does D beat C in the same race?

Solution:

Answer key/Solution

Correct Answer : 100

As A beats B by 100 m or 10 sec, speed of B = 100/10 = 10 m/sec.
Given that the ratio of speeds of A, B and C is 5 : 4 : 2.
C's speed = 5 m/sec
∴ The distances covered by A, B and C will also be in the ratio of 5 : 4 : 2
As A beats B by 100 m, the length of the race is (5 × 100)/(5 – 4) m = 500 m.
Time taken by B to cover 500 m = 500/10 = 50 seconds
D takes 80 seconds to cover 500 m.
∴ D's speed = 500/80 = 6.25 m/s
Ratio of speeds of C and D = 5 : 6.25 = 4 : 5
If D runs a distance of 5k, then C runs a distance of 4k in the same time.
So when D covers 500 m, C would have covered 400 m
Hence, D beats C by 100 m.

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Q.19 [11831809]

At a factory, ice cream is made from only two ingredients – fruit and cream. Fruit costs Rs.54 / kg, while cream costs Rs.44 / kg. The total amount spent on acquiring the two ingredients is Rs.608. If the amount of fruit as well as cream used are integral number of kilograms, what is the weight (in kg) of ice cream obtained?

1 ◯ 12

2 ◯ 14

3 ◯ 16

4 ◯ 15

Solution:

Answer key/Solution

Correct Answer : 1

Suppose x kg of fruit and y kg of cream are bought for a total of Rs.608.
Then, 54x + 44y = 608
⇒ 27x + 22y = 304

$$\Rightarrow x = \frac{304 - 22y}{27} \quad \ldots (i)$$

At y = 4, x = 8 (Only these values of x and y satisfy (i))
Hence, 8 kg of fruit and 4 kg of cream are bought
and a total of 12 kg ice cream is obtained.

Bookmark FeedBack

Q.20 [11831809]

A point P is randomly chosen at a distance of 8 cm from the center of a circle. A chord AB is drawn passing through P. C is a point on the circumference of the circle such that AC = BC. If the radius of the circle is 17 cm, then which of the following cannot be a value of area (in sq. cm) of ΔABC?

1 ◯ 289

2 ◯ 135

3 ◯ 375

4 ◯ 255

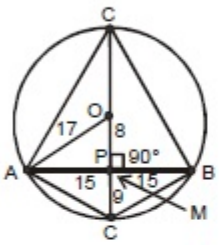
Solution:
Correct Answer : 4

Answer key/Solution

Chord AB passes through point P but its length is not fixed. After choosing the point C, area of ΔABC can be calculated. Let CM, be the altitude on side AB. As AC = BC,

Area of $\Delta ABC = \frac{1}{2} AB \times CM$

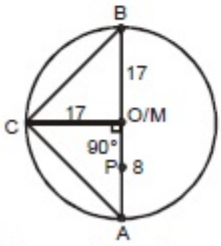
The minimum value of area(ΔABC) is obtained when AB has the shortest possible length, as shown in the figure below. In this case, point M and P are same.



Area of $\Delta ABC = \frac{1}{2} \times (2 \times 15) \times (17 - 8) = 135 \text{ cm}^2$.

In the same figure, if we choose the point C, on the major arc, then $CM = (17 + 8) = 25$ cm. In that case, Area of ΔABC will be $\frac{1}{2} \times 25 \times 30 = 375 \text{ cm}^2$. This is the maximum possible value of the area of ΔABC.

If AB, is a diameter then area of $\Delta ABC = \frac{1}{2} \times 17 \times 34 = 289 \text{ cm}^2$



Hence, (4) is the correct option.

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Q.21 [11831809]

A is the set of first 50 natural numbers. B is a subset of A such that there exist at least 2 pairs of elements in B whose difference is 15. If 'n' is the number of elements in B, then find the maximum value of 'n' such that B contains minimum number of pairs whose difference is 15.

1 ◯ 15

2 ◯ 30

3 ◯ 32

4 ◯ 31

Answer key/Solution

Solution:
Correct Answer : 3
Let us find the maximum selection when there is no pair.
Take a situation of taking the first 15 numbers 1 to 15. In this case we cannot have any other numbers from 16 to 30 otherwise the difference of the two numbers will be 15. We can start from 31 and select till 45. Therefore, there is no selection from 46 to 50.
Hence, we can select 30 numbers, (1, 2, …, 15, 31, 32, …, 45) and still have no pairs with 15 as the difference.
Any new number selected will pair up with an existing number (pair is when difference is 15)
So to get 2 pairs, we must select 32 numbers.
Hence, the maximum value of 'n' will be 32.

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Q.22 [11831809]

Kulbhushan deposited an equal amount of money in two schemes - A and B. Both schemes offer r% interest per annum, but scheme A calculates Simple Interest and Scheme B calculates Compound Interest. The interest earned in the third year and fourth year from Scheme B was Rs.49,650 and Rs.54,615 respectively. Find the total interest (in Rs.) earned from Schemes A at the end of the fifth year.

1 ◯ 65,000

2 ◯ 80,000

3 ◯ 75,000

4 ◯ 90,000

Solution:
Correct Answer : 3

Answer key/Solution

Given that interest earned in the third year and fourth year from Scheme B was Rs.49,650 and Rs.54,615 respectively.
Hence, interest earned on Rs. 49,650 was Rs.4,965.
Rate of interest = r% = (100 × 4965)/(49650 × 1) ⇒ r = 10%
Let the principal be P.
Then, $P \times 1.1^3 - P = 49650$
⇒ P = Rs.1,50,000
Hence, the simple interest = 150000 × 10 × 5/100 = Rs.75,000.

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