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Section-1

Sec 1

Q.1 [11831809]

Rajiv can do a piece of work in 15 days working 8 hours per day. If Sanjiv works with three-fifth of the efficiency with which his friend Rajiv works, then in how many days can Sanjiv do the same piece of work, working 10 hours per day?

Answer key/Solution

Solution:
Correct Answer : 20
Rajiv can do a piece of work in 120 hours.
Sanjiv works with three-fifths of the efficiency with which Rajiv works.
So time taken by Sanjiv to do the same piece of work in = 120 x 5/3 = 200 hours.
Hence, number of working days = 200/10 = 20 days.

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Q.2 [11831809]

If the sum of two distinct natural numbers is 60, then what is the maximum possible HCF of these 2 numbers?

1 ◯ 30

2 ◯ 20

3 ◯ 15

4 ◯ 24

Answer key/Solution

Solution:
Correct Answer : 2
20 could be the maximum possible HCF in the given condition. The possible pair is (20, 40) will have an HCF of 20.

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Q.3 [11831809]

In a box, there are only four types of toffees, namely Coffy Bite, Pulse, Mango Bite and Pan Pasand. There are 25% more toffees of Coffy Bite than Mango Bite, 10% fewer toffees of Pulse than Coffy Bite, and 10% of the toffees are of Pan Pasand. If there are 90 toffees of Pulse, then how many toffees are there in the box?

Answer key/Solution

Solution:
Correct Answer : 300
Since there are 10% fewer Pulse than Coffy Bite.
So Coffy Bite : Pulse = 10 : 9
So number of toffees of Coffy Bite = 90 × 10/9 = 100
Since there are 25% more Coffy Bite than Mango Bite,
Coffy Bite : Mango Bite = 5 : 4
Or, number of toffees of Mango Bite = 100 × 4/5 = 80
Since there are (100 + 90 + 80) = 270 toffees which are Coffy Bite, Pulse or Mango Bite, and these account for 90
percent of toffees in the box, the box must have 270 × 100/90 = 300.

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Q.4 [11831809]

Let for all real values of x, f(2x) = 4f(x) + 6, f(x + 2) = f(x) + 12x + 12 and f(1) = 1. What is the value of f(42)?

1 ◯ 5290

2 ◯ 6468

3 ◯ 4240

4 ◯ 4678

Answer key/Solution

Solution:
Correct Answer : 1
There is more than one way to solve this, one of the methods is:
f(1) = 1; f(2) = 4(f(1) + 6 = 10
f(3) = f(1 + 2) = f(1) + 12(1) + 12 = 25
f(5) = f(3 + 2) = f(3) + 12(3) + 12 = 73
f(10) = 4(f(5) + 6
f(20) = 4^2f(5) + 24 + 6 = 1198
f(22) = 1198 + 12 × 20 + 12 = 1450
f(20) = 1198
f(40) = 4f(20) + 6 = 4798
Hence, f(42) = 4798 + 12 × 40 + 12 = 5290.

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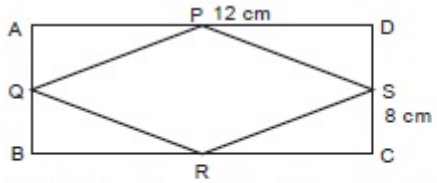
Q.5 [11831809]
Find the area (in sq. cm) of a quadrilateral which is formed by joining the mid points of a rectangle of length 12 cm and breadth 8 cm.

Answer key/Solution

Solution:
Correct Answer : 48



Quadrilateral formed by joining the mid points of the sides of a rectangle is a rhombus.
Diagonals of the rhombus are 12 cm and 8 cm.
Hence, area of rhombus (PQRS) = 1/2 × 12 × 8 = 48 cm^2.

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Q.6 [11831809]
Rohit has three types of boxes large, medium and small. He plays a game in which he placed 5 large boxes on the table. He puts 3 medium boxes each, in few of the large boxes then he puts 3 small boxes each, in few of the medium boxes. If the number of boxes that have been left empty in the game is 21, then how many boxes were used in the game by Rohit?

1 ◯ 23

2 ◯ 29

3 ◯ 35

4 ◯ 39

Answer key/Solution

Solution:
Correct Answer : 2
Let the total number of large boxes that have been left empty in the game be 'x'.
Therefore, the total number of medium boxes used by Rohit is 3 × (5 – x) = 15 – 3x.
Let the total number of medium boxes that have been left empty in the game be 'y'.
Therefore, the total number of small boxes used by Rohit is 3 × (15 – 3x – y) = 45 – 9x – 3y
It is also known that total number of boxes that have been left empty = 21.
So x + y + 45 – 9x – 3y = 21
⇒ 4x + y = 12
Total number of boxes used by Rohit in the game is 5 + 15 – 3x + 45 – 9x – 3y
= 65 – 3(4x + y) = 65 – 3 × 12 = 29.

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Q.7 [11831809]

In a shop sanitizer is available only in sealed bottles of volume 1 liter. The alcohol concentration in the mentioned sanitizer is one or the other of three concentrations 20%, 30% and 50%. The cost per 1 liter of the sanitizer having alcohol concentration 20%, 30% and 50% is Rs.30, Rs.40 and Rs.60 respectively. Aman wants to prepare a solution of 10 liters of sanitizer having alcohol concentration 40% using the bottles of sanitizer available in the shop. What is amount (in Rs.) Aman must spend in buying the bottles of sanitizer?

1 ◯ 360

2 ◯ 400

3 ◯ 500

4 ◯ 420

Solution:
Correct Answer : 3
Let x ml of sanitizer having alcohol concentration 20%, y ml of sanitizer having alcohol concentration 30% and (10 – x – y) liters of sanitizer having alcohol concentration 50% are mixed by Aman to get a final alcohol concentration of 40%.
Then, (0.2x + 0.3y + (10 – x – y) × 0.5) = 4
⇒ 3x + 2y = 10
The only possible solutions are (x = 0, y = 5) or (x = 2, y = 2)
Hence, amount spent = 0 × 30 + 5 × 40 + 5 × 60 = 2 × 30 + 2 × 40 + 6 × 60 = Rs. 500.

Answer key/Solution

Bookmark FeedBack

Q.8 [11831809]
The number of factors of the number $K = 8^6 + 6^8$ is

1 ◯ 72

2 ◯ 36

3 ◯ 18

4 ◯ 144

Solution:
Correct Answer : 1
$K = 8^6 + 6^8 = 2^{18} + 2^8 \times 3^8 = 2^8 \times (2^{10} + 3^8)$
$= 2^8 \times (1024 + 6561) = 2^8 \times 7585 = 2^8 \times 5 \times 1517 = 28 \times 5 \times 37 \times 41$
Hence, the number of factors of K is (8 + 1) × (1 + 1) × (1 + 1) × (1 + 1) = 72.

Answer key/Solution

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Q.9 [11831809]
A triangular field has to be fenced with a barbed wire. The cost incurred on fencing the triangular field is Rs.20 per meter of barbed wire used. If the sum of length of any two sides of the triangular field is 28 meters and 3 lengths of wire are used along each side, then which of the following cannot be the total cost (in Rs.) incurred on fencing the triangular field with the barbed wire?

1 ◯ 1,800

2 ◯ 2,100

3 ◯ 2,520

4 ◯ 3,360

Answer key/Solution

Solution:
Correct Answer : 4
Given that the sum of length of any two sides of the triangular field = 28 m
Let the length of sides of the triangular field be a, b and c.
If a + b = 28 m, then 0 < c < 28.
⇒ 28 < (a + b + c) < 56
So the range of length of the barbed wire used is 3 × 28 < Length of wire < 56 × 3
Therefore, the range of values of the cost incurred on fencing the triangular field is
Rs. 20 × 3 × 28 < Cost < Rs. 56 × 3 × 20.
Or, Rs. 1,680 < Cost < Rs. 3,360
Hence, option (4) is the correct option.

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Q.10 [11831809]
Find the maximum value of |x − y| among all integral solutions (x, y) for $x(2x^2 + y) = 7$.

Answer key/Solution

Solution:
Correct Answer : 104
For $x(2x^2 + y) = 7$ to have integral solutions , x can take four values = 1, 7, −1, −7
If x = 1, then y = 5
If x = 7, then y = −97
If x = −1, then y = −9
If x = −7, then y = −99
So, the maximum value of |x − y| will be for x = 7 and y = −97.
Hence, |x − y| = 104.

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Q.11 [11831809]
My current age is 7 years more than five times the age of one of my two daughters named Anu. After N years, I will be 7 years more than five times the age of my other daughter named Sonu. What is the minimum possible integral difference (in years) between the ages of my two daughters? (N is a natural number.)

1 ◯ 5

2 ◯ 6

3 ◯ 4

4 ◯ 2

Answer key/Solution

Solution:
Correct Answer : 3
Let my current age be 'm'.
Let the current age of Anu and Sonu be 'x' and 'y' respectively.
As per the information given in the question,
m = 5x + 7 ...(i)
After 'N' years: m + N = 5(y + N) + 7 ...(ii)
Solving equation (i) and (ii), we get 5x – 5y = 4N
⇒ (x – y) = 4N/5
For the minimum possible integral difference, 'N' has to be 5.
Hence, x – y = 4 years.

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Q.12 [11831809]

There are five friends A, B, C, D and E. The weights of A, B and C are 92%, 111% and 93% respectively of the average weight of all five. The ratio of the weights of D and E is 7 : 10. The difference between the weights of D and E is 18 kg. What is the average weight (in kg) of B and C?

Answer key/Solution

Solution:
Correct Answer : 51
Let the average weight of all five be 100k kg.
So, weight of A = 92k, B = 111k and C = 93k
Let the weight of D = d and that of E = e
92k + 111k + 93k + d + e = 100k × 5
⇒ d + e = 204k ⇒ d : e = 7 : 10
⇒ d = 7/17 × 204 = 84k and e = 10/17 × 204 = 120k
Difference = 120k – 84k = 36k
Given that 36k = 18 ⇒ k = 0.5
Hence, average weight of B and C = (111 + 93) × 0.5/ 2 = 51 kg.

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Q.13 [11831809]

A trapezium ABCD is inscribed in a circle with center O. AB is parallel to CD and the tangent at the point C intersects the line AB produced at E. If BE = 4 units, CE = 6 units and ΔBCE is an isosceles triangle where BC = CE, then what is the area (in sq. units) of the trapezium ABCD?

1 ◯ 32

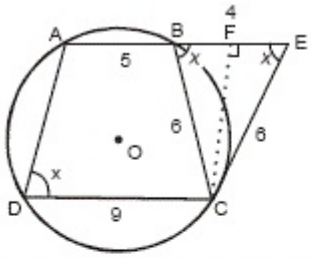
2 ◯ 56√2

3 ◯ 28√2

4 ◯ 24

Solution:
Correct Answer : 3

Answer key/Solution



We know from the tangent secant theorem that $EC^2 = EA \times EB$.
$\Rightarrow 36 = EA \times 4 \Rightarrow EA = 9$ units
Since ΔBEC is an isosceles triangle, therefore the length of BC will be equal to 6.
Also, $\angle ADC = \angle CBE$ (Since ABCD is also a cyclic quadrilateral.) and $\angle CBE = \angle BEC$.
Therefore, $\angle AEC = \angle ADC$.
Hence, AECD is a parallelogram.
Therefore, AE = DC = 9 units.
Perpendicular distance between AB and CD = perpendicular from C to base BE of the isosceles triangle
$= \sqrt{(36 - 4)} = \sqrt{32} = 4\sqrt{2}$ units
Hence, area of the trapezium ABCD = $1/2 \times (AB + DC) \times 4\sqrt{2} = 1/2 \times (5 + 9) \times 4\sqrt{2}$
$= 28\sqrt{2}$ square units.

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Q.14 [11831809]
Copper and Tin are the only elements in the alloys A and B. The ratio of copper and tin in the alloys A and B is 3 : 5 and 4 : 1 respectively. An alloy C is made by mixing alloys A and B. Which of the following can be a possible ratio of tin and copper in the alloy C?

1 ◯ 7 : 35

2 ◯ 11 : 5

3 ◯ 12 : 7

4 ◯ 6 : 5

Solution:

Correct Answer : 4

Answer key/Solution

Let 'x' and 'y' be the amount of alloys A and B that were taken to make alloy C.
Amount of copper in alloy C = 0.375x + 0.8y
Amount of tin in alloy C = 0.625x + 0.2y
Let 'k' be the ratio of tin and copper in the alloy C.

Therefore, $\frac{(0.625x + 0.2y)}{(0.375x + 0.8y)} = k$

Or, $25x + 8y = k(15x + 32y)$

Or, $\left(\frac{x}{y}\right) = \frac{1.6(4k - 1)}{(5 - 3k)}$

Or, $4k - 1 > 0$ and $5 - 3k > 0$.

Therefore, $\left(\frac{1}{4}\right) < k < \left(\frac{5}{3}\right)$.

Hence, only 6 : 5 lies within the permissible limits.

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Q.15 [11831809]

If $2^{\log_{256}(9-7x)^8} \geq (x-4)^2$, then the number of integral values of 'x' that satisfy the given inequality is

Solution:

Correct Answer : 12

Answer key/Solution

Case 1: $2^{\log_{256}(9-7x)^8} \geq (x-4)^2$

Or, $9 - 7x \geq x^2 - 8x + 16$

Or, $x^2 - x + 7 \leq 0$

The above inequality is not true for any real value of 'x'.

Case 2: $2^{\log_{256}(9-7x)^8} \geq (x-4)^2$

Or, $7x - 9 \geq x^2 - 8x + 16$

Or, $x^2 - 15x + 25 \leq 0$

Or, $\frac{15 - 5\sqrt{5}}{2} \leq x \leq \frac{15 + 5\sqrt{5}}{2}$ are –1, 0, 1, 2, ..., 13

–1, 0 and 1 will not satisfy the inequality.

Hence, there are 12 integer values of 'x' that satisfy the given logarithmic inequality.

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Q.16 [11831809]

A man invested Rs.20,000 at a rate of 7.5% per annum at simple interest. He withdraws the final amount after 'T' years. He keeps half of the withdrawn amount with him and invests the remaining. This invested amount kept on reducing at a simple rate of 25% per annum for a period of 3 years. If the aggregate sum with the man after 'T + 3' years is Rs.20,000, then find the value of 'T' (in years).

1 ◯ 10

2 ◯ 8

3 ◯ 12

4 ◯ 6

Answer key/Solution

Solution:
Correct Answer : 2
Total amount with the man after first T years = 20000 + 1500T
Amount invested again = 10000 + 750T
Amount lost due to the investment = (3 × 25)/100 × [10000 + 750T] = 3/4 × [10000 + 750T]
Total amount with the man after (T + 3) years
= 10000 + 750T + 1/4 × [10000 + 750T] = 20000
⇒ 5/4 × [10000 + 750T] = 20000
⇒ 750T = 16000 – 10000
⇒ T = 6000/750 = 8 years.

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Q.17 [11831809]

The coefficients a, b and c in the quadratic equation $ax^2 + bx + c = 0$, are three consecutive terms of a geometric progression in that order. If c = 2(5b – 12a), then which of the following can be the product of the roots of this equation?

1 ◯ 15

2 ◯ 25

3 ◯ 36

4 ◯ 24

Solution:

Correct Answer : 3

Answer key/Solution

Given that a, b and c are in G. P.
Let b = ar
Then, $c = a.r^2$
As c = 2(5b – 12a) we will have:-
$a.r^2 = 2(5ar - 12a)$
or $ar^2 - 10ar + 24a = 0$
or $r^2 - 10r - 24 = 0 \quad (as, a \neq 0)$
$\Rightarrow r = 4$ or $r = 6$
$\Rightarrow$ Two quadratic equations are possible,
$ax^2 + 4ax + 16a = 0$
or $ax^2 + 6ax + 36a = 0$

Accordingly, the product of the roots can either be $\frac{16a}{a} = 16$ or $\frac{36a}{a} = 36$.

Hence, (3) is the correct option.

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Q.18 [11831809]

How many four-digit numbers with distinct digits among 1 to 9 are there such that the sum of the digits is even?

1 ◯ 2374

2 ◯ 2256

3 ◯ 1656

4 ◯ 1584

Solution:

Correct Answer : 4

Answer key/Solution

The sum of digits of the four-digit number can be even in the following cases.
Case I: All the four digit selected are odd
Four digits out of five odd digits (1, 3, 5, 7, 9) can be selected in $^5C_4 = 5$ ways.
These 4 digits can arrange among themselves in 4! ways.
Total ways = 5 × 4! = 120 ways.
Case II: All the four digit selected are even
There can be two sub cases:
All four digits are (2, 4, 6, 8).
The number of ways 4 digit number can be formed = 4! = 24 ways.
Case III: Two digits are even and the other two digits are odd.
There can be two sub cases:
Two odd digits are out of (1, 3, 5, 7, 9) and two even digits are out of (2, 4, 6, 8).
$^5C_2 \times {}^4C_2$ and these four digits can be arranged in 4! ways.
Total ways = $^5C_2 \times {}^4C_2 \times 4!$
Total number of all such four-digit numbers = 120 + 24 + 1440 = 1584.

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Q.19 [11831809]

If $S_n = 2 - 4 + 6 - 8 + 10 - 12 + \ldots$ up to 'n' terms, then what is the value of $S_{101} - S_{102} + S_{103}$?

Answer key/Solution

Solution:

Correct Answer : 308

$S_n = (2 - 4) + (6 - 8) + (10 - 12) + \ldots = (-2) + (-2) + (-2) + \ldots$

$S_{101} = (-2) + (-2) + (-2) + \ldots + 202 = 50 \times (-2) + 202 = 102$

$S_{102} = (-2) + (-2) + (-2) + \ldots = 51 \times (-2) = -102$

$S_{103} = (-2) + (-2) + (-2) + \ldots + 206 = 51 \times (-2) + 206 = -102 + 206 = 104$

Hence, $S_{101} - S_{102} + S_{103} = 102 - (-102) + 104 = 308$.

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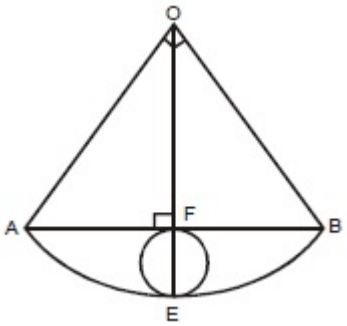
Q.20 [11831809]

In the figure given below AOB is a quadrant of a circle having radius 4 cm. Find the radius (in cm) of the smaller circle with diameter FE.



1 ◯ $(2 + \sqrt{2})$

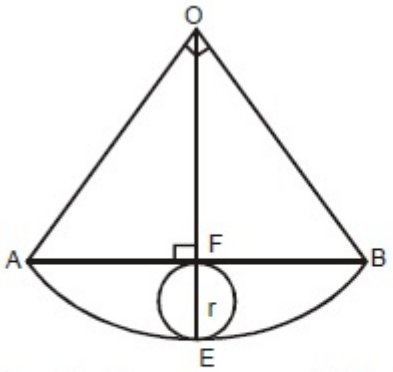
2 ◯ $(1 + \sqrt{2})$

3 ◯ $(2 - \sqrt{2})$

4 ◯ $(4 - 2\sqrt{2})$

Solution:
Correct Answer : 3

Answer key/Solution



From the figure, we can say that in triangle AOB,
$AB^2 = AO^2 + OB^2 \Rightarrow AB = 4\sqrt{2}$ cm (By Pythagoras theorem)
In triangle AFO,
$OA^2 = OF^2 + AF^2$
$\Rightarrow 4^2 = (4 - 2r)^2 + (2\sqrt{2})^2$
$\Rightarrow r = (2 - \sqrt{2})$ cm.

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Q.21 [11831809]

If $z = (x - 5)(x - 3) \neq 0$ and $y = 4^x + 4^{1-x}$, where x, y, z are all real numbers, then what is the maximum value of 1/(yz)?

1 ◯ 1/5

2 ◯ 1/15

3 ◯ 1

4 ◯ 1/40

Solution:
Correct Answer : 4

Answer key/Solution

To find the maximum possible value of 1/(yz) we need to find the minimum possible value of the product of y and z.
$y = 4^x + 4^{1-x}$ will have its minimum value at x = 0 and x = 1.
The value of 'z' at x = 1 is 8.
Since the value of 'z' is not equal to 0, therefore the product of 'y' and 'z' will be minimum at x = 1.
Therefore, the maximum possible value of the expression

$$\frac{1}{(yz)} = \frac{1}{(8 \times 5)} = \frac{1}{40}.$$

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Q.22 [11831809]

Train X and train Y travel at 54 km/h and 60 km/h respectively. The time taken by train X to completely cross a tree is 24 seconds. The time taken by train X and train Y to completely cross a railway platform is 90 seconds and 72 seconds respectively. What is the length (in meter) of train Y?

Answer key/Solution

Solution:

Correct Answer : 210

Speed of Train X = 54 km/h = 15 m/s

Speed of Train Y = 60 km/h = 50/3 m/s

Length of train X = 15 × 24 = 360 m

Since train X and train Y take 90 seconds and 72 sec to completely cross the platform.

So, total distance traveled by train X = 15 × 90 = 1350 m

⇒ Length of the platform = 1350 – 360 = 990 m

Let the length of train Y be = 'y' m

⇒ (990 + y) = 72 × 50/3

⇒ y = 1200 – 990 = 210 m.

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