Aptitude Assignment 2

1. What quantity of water should be added to the milk water mixture so that the milk water ratio changes from 2:3 to 4:11. The quantity of milk in the mixture is 40 litres?

Solution:
Quantity of milk = 40 litters
Milk-water ratio = 2:3
The initial milk-water ratio of 2:3 implies that the total mixture can be divided into 2 parts milk and 3 parts waters. Let's calculate the initial quantities of milk and water.

Milk quantity = (2 / (2+3)) * Total quantity
= (2 / 5) * 40 litters
= 16 litters

Water quantity = (3 / (2+3)) * Total quantity
= (3 / 5) * 40 litters
= 24 litters

Now, we want to change the milk-water ratio to 4:11. This new ratio implies that the total mixture can be divided into 4 parts milk and 11 parts waters.

Let's assume we need to add 'x' litters of water to achieve the desired ratio.

New milk quantity = 4 * (Total quantity + x) / (4+11)
= 4 * (40 + x) / 15

New water quantity = 11 * (Total quantity + x) / (4+11)
= 11 * (40 + x) / 15

According to the problem, the new milk quantity should be equal to the initial milk quantity, i.e.,

New milk quantity = Initial milk quantity
4 * (40 + x) / 15 = 16

Solving this equation for 'x', we can find the amount of water to be added.

4 * (40 + x) = 16 * 15
160 + 4x = 240
4x = 240 - 160
4x = 80
x = 80 / 4
x = 20

Therefore, 20 litters of water should be added to the milk-water mixture to change the milk-water ratio from 2:3 to 4:11.

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2. Linear equation 2x+3y=0 meets the x & y-axis at the point

Solution:

To find the points where the equation 2x + 3y = 0 intersects the x-axis and y-axis, we can set one of the variables to 0 and solve for the other variable.

When the equation intersects the x-axis, y = 0. Let's substitute y = 0 into the equation:

2x + 3(0) = 0
2x = 0
x = 0

So, the point where the equation intersects the x-axis is (0, 0).

When the equation intersects the y-axis, x = 0. Let's substitute x = 0 into the equation:

2(0) + 3y = 0
3y = 0
y = 0

So, the point where the equation intersects the y-axis is also (0, 0).

Therefore, the equation 2x + 3y = 0 intersects both the x-axis and y-axis at the point (0, 0).

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3. a & b are positive integers such that a^2-b^2=19. Find a & b?

Solution:

Now, let's consider the factors of 19: 1 and 19.

Since a and b are positive integers, we can set up the following equations:

a + b = 19 ---- (Equation 1)
a - b = 1 ---- (Equation 2)

Solving Equation 1 and Equation 2 simultaneously will give us the values of a and b.

Adding Equation 1 and Equation 2:

(a + b) + (a - b) = 19 + 1
2a = 20
a = 20 / 2
a = 10

Substituting the value of an into Equation 2:

10 - b = 1
b = 10 - 1
b = 9

Therefore, the values of a and b that satisfy the equation a^2 - b^2 = 19 are:
a = 10
b = 9

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4. Find a^3+b^3+c^3+3abc , where a+ b+ c=5 & , a^2+b^2+c^2=10?

Solutions:
To find the value of a^3 + b^3 + c^3 + 3abc, we can use the identity:

(a + b + c)(a^2 + b^2 + c^2 - ab - ac - bc) = a^3 + b^3 + c^3 - 3abc

Given:
a + b + c = 5
a^2 + b^2 + c^2 = 10

Let's substitute these values into the identity:

(5)(10 - ab - ac - bc) = a^3 + b^3 + c^3 - 3abc

We can rewrite the equation as:

50 - 5(ab + ac + bc) = a^3 + b^3 + c^3 - 3abc

Now, we need to find the value of ab + ac + bc.

To find ab + ac + bc, we can square the equation a + b + c = 5 and the equation a^2 + b^2 + c^2 = 10, and then subtract the second equation from the first:

(a + b + c)^2 - (a^2 + b^2 + c^2) = (5)^2 - 10
a^2 + b^2 + c^2 + 2(ab + ac + bc) - a^2 - b^2 - c^2 = 25 - 10
2(ab + ac + bc) = 15
ab + ac + bc = 15/2

Substituting this value back into the equation, we get:

50 - 5(15/2) = a^3 + b^3 + c^3 - 3abc
50 - 75/2 = a^3 + b^3 + c^3 - 3abc
(100 - 75)/2 = a^3 + b^3 + c^3 - 3abc

25/2 = a^3 + b^3 + c^3 - 3abc

Therefore, the value of a^3 + b^3 + c^3 + 3abc is 25/2.

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5. Sum of two, two-digit numbers is a perfect square. The digits of the first two-digit number are two consecutive positive integers; also, when the digits of the first number are reversed, the second number is formed. Find these numbers & the square root of their sum

Solution:
Let's solve this problem step by step.

Let's assume the first two-digit number is represented as "10a + b," where 'a' and 'b' are the two consecutive positive integers.

When the digits of the first number are reversed, the second number is formed, which means the second two-digit number is "10b + a."

Given that the sum of these two numbers is a perfect square, we can write the equation:

(10a + b) + (10b + a) = k^2

Simplifying the equation, we have:

11a + 11b = k^2
11(a + b) = k^2

Since 11 is a prime number, the sum (a + b) must also be a multiple of 11. This means 'a' and 'b' are either both multiples of 11 or both not multiples of 11.

Let's consider both cases:

Case 1: 'a' and 'b' are multiples of 11:
The only consecutive positive integers that are multiples of 11 are 11 and 22. Therefore, 'a' must be 11, and 'b' must be 22.

So the first two-digit number is 110 + 22 = 132, and the second two-digit number is 220 + 11 = 231.

The sum of these numbers is 132 + 231 = 363, which is a perfect square. The square root of 363 is approximately 19.07.

Case 2: 'a' and 'b' are not multiples of 11:
Let's consider the consecutive positive integers 1 and 2. In this case, 'a' is 1, and 'b' is 2.

So the first two-digit number is 10 + 2 = 12, and the second two-digit number is 20 + 1 = 21.

The sum of these numbers is 12 + 21 = 33, which is a perfect square. The square root of 33 is approximately 5.74.

Therefore, we have two possibilities:

1. **The first two-digit numbers are 132 and 231, and the square root of their sum is approximately 19.07.**
2. **The first two-digit numbers are 12 and 21, and the square root of their sum is approximately 5.74.**