Teacher's Work	Formula of Square

01. If $x^2 - \sqrt{3}x + 1 = 0$, $\frac{x^6 + 1}{x^3} = ?$

02. $(p+q)^2 = \sqrt[3]{27}$ and $p^2 = {}_{\sqrt{6}} + q^2, p^3q + pq^3 = ?$

03. If $y = \sqrt{2} + \sqrt{3}$, $\left(y^2 + \frac{1}{y^2}\right)\left(y^3 - \frac{1}{y^3}\right) = ?$

04. If $(p^2 + 1)^2 = 6p^2$ Show, p3 + $\frac{1}{p^3} = 3\sqrt{6}$.

05. Given $\frac{2}{x} + \frac{2}{xy} = \frac{1}{6}$ and $\frac{2}{x} + \frac{2}{y} = 0$, Find 'a' for which $y = ax -$ 4. [21 Based Combined Senior Officer (General): 2023]

06. If $a^2 - \sqrt{5}a + 1 = 0$ then find...

(i) $a^5 + \frac{1}{a^5}$ (ii) $a^6 + \frac{1}{a^6}$

07. If $a^3 + \frac{1}{a^3} = 2$, then find $a + \frac{1}{a}$

08. Given $x = 3+2\sqrt{2}$, find the value of $\sqrt{x} - \frac{1}{\sqrt{x}}$ [Janata Bank–(AEO-RC)-2018 & Standard Bank- (TAO-General)-2018]

09. $x^2+\frac{1}{x^2}=1$, find the value $x^{102}+x^{96}+x^{90}+x^{84}+x^{78}+x^{72}+5$? [Janata Bank (AEO-Teller)-2020]

10. $\sqrt{x} + \frac{1}{\sqrt{x}} = a$, then find the value of $x^2 + \frac{1}{x^2}$.

11. If $x - \frac{1}{x} = \sqrt{5}$ Then, $x^3 - \frac{1}{x^3}$ [Ministry of Food (AP)-2020]

12. If $a = \sqrt{6} + \sqrt{5}$ then Find the value of $\frac{a^6 - 1}{a^3}$

13. Solve the equation $\frac{4}{2x+1} + \frac{9}{3x+2} = \frac{25}{5x+4}$

14. If $x = \frac{4}{5}$, then $= \frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}}$?

15. Factorize $x^2-\left(\frac{2}{a}-3a\right)x-6$ [Ministry of Food (AP)-2020]

16. A bonus of Tk. 1000 is to be divided among three people so that Tamim receives twice as much as Sakib, who receives one-fifth as much as Mahmudullah,. How much money should Mahmudullah receive?

17. In a classroom, there are certain numbers of benches. If 6 students are made to sit on a bench, then to accommodate all of them, one more bench is needed. However, if 7 students are made to sit on a bench, then after accommodating all of them, space for 5 students is left. What is the total number of students in the class?

18. A man engaged a worker on the condition that he would pay him Tk. 30,000 and one uniform after one year of service. The worker served only 9 months and got Tk. 22,000 and a uniform. What is the price of the uniform? [20 Based Combined Officer (General): 2023]

Teacher's Work	Formula of Square

01. If $a^2 + b^2 = 45$ and $ab = 18$ find $\frac{1}{a} + \frac{1}{b}$ [BB- Officer Cash: 2023]

a) 1/3 b) 1/2 c) 2/3 d) 1/4

Here, $a^2+b^2=45$, $ab=18$

$\Rightarrow (a+b)^2 - 2ab = 45$

$\Rightarrow (a+b)^2 = 45 + 2\times 18$

$\Rightarrow (a+b)^2 = 45 + 36$

$\Rightarrow (a+b)^2 = 81 \therefore a+b = 9$

$\frac{1}{a} + \frac{1}{b}$

$= \frac{b+a}{ab} = \frac{a+b}{ab} = \frac{9}{18}$

$= \left(\frac{1}{2}\right)$

$$a^2+b^2=(a+b)^2-2ab$$

$$=(a-b)^2+2ab$$

$$=\left(\frac{a+b}{2}\right)^2-\left(\frac{a-b}{2}\right)^2$$

02. If $x/y = 1/3$, then the value of $(x^2 + y^2) / (x^2 - y^2)$ is- [BB-AD: 2022]

a) $-10/9$ b) $5/4$ c) $-5/4$ d) $-5/3$

$\frac{x}{y} = \frac{1}{3}$

$\Rightarrow \left(\frac{x}{y}\right)^2 = \left(\frac{1}{3}\right)^2$

$\Rightarrow \frac{x^2}{y^2} = \frac{1}{9}$

$\Rightarrow \frac{x^2+y^2}{x^2-y^2} = \frac{1+9}{1-9}$

$= \frac{10}{-8}$

$= \boxed{\frac{5}{-4}}$

$\frac{x^2+y^2}{x^2-y^2} = \frac{1^2+3^2}{1^2-3^2}$

$= \frac{1+9}{1-9}$

$= \frac{10}{-8}$

$-\frac{5}{4}, \frac{-5}{4} = \frac{5}{-4}$

03. If $(3x + 2y) = 8$ and $(2x-2y) = 2$, then find the value of $(4-3x)$ [BB- Officer General: 2022]

a) 1.5 b) 3 c) -2 d) -2.5

$3x + 2y = 8$

$\oplus \quad 2x - 2y = 2$

$5x = 10$

$\Rightarrow x = 2$

$4 - 3x$

$= 4 - 3 \times 2$

$= 4 - 6$

$= -2$

04. If $\frac{x}{y}+\frac{y}{x}=6$, the value of $\frac{x^3}{y^3}+\frac{y^3}{x^3}$ is- [21 Based Combined Officer General: 2024]

a) 198 ✓
b) 176
c) 156
d) 144

$\frac{x}{y}+\frac{y}{x}=6$, $\frac{x^3}{y^3}+\frac{y^3}{x^3}=\left(\frac{x}{y}\right)^3+\left(\frac{y}{x}\right)^3$

$=\left(\frac{x}{y}+\frac{y}{x}\right)^3-3\frac{x}{y}\times\frac{y}{x}\left(\frac{x}{y}+\frac{y}{x}\right)$

$=6^3-3\times6$

$=216-18$

$=198$

$6^3=6\times6\times6$

$=36\times6$

$=216$

1³
2⁷
3⁹
4⁷
10⁷

05. If $x+\frac{1}{x}=3$, then $x-\frac{1}{x}=?$ *[Sonali Bank–(SO)-2018]*

a) $\sqrt{5}$ b) $\sqrt{13}$ c) $\sqrt{7}$ d) 0

Here, $x+\frac{1}{x}=3$

$\left(x+\frac{1}{x}\right)^2=3^2$

$\Rightarrow \left(x-\frac{1}{x}\right)^2+4x\cdot\frac{1}{x}=9$

$\Rightarrow \left(x-\frac{1}{x}\right)^2=9-4$

$\Rightarrow x-\frac{1}{x}=\sqrt{5}$

$x-\frac{1}{x}=?$

$\left(x-\frac{1}{x}\right)^2=\left(x+\frac{1}{x}\right)^2-4x\frac{1}{x}$

06. If $x-\frac{1}{x}=\sqrt{3}$ then $x+\frac{1}{x}$=? [BD House Building FC (SO)-2017] & [BDBL-(SO)-2017]

a) $3\sqrt{3}$ b) $\frac{x}{\sqrt{7}}$ c) $2\sqrt{3}$ d) $\sqrt{7}$

$3+4$

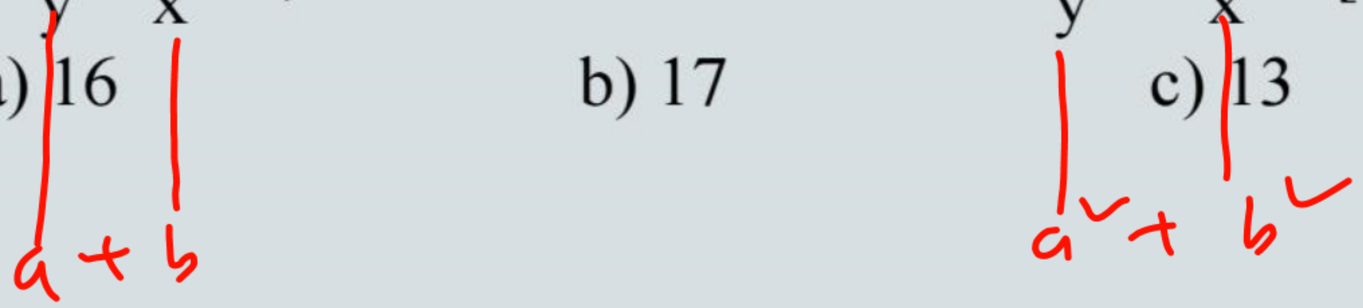
$=\sqrt{7}$

07. $m - \frac{1}{m} = 2$ হলে, $m^4 + \frac{1}{m^4} = ?$ [Agrani Bank Ltd. Seni Offi-2015]

a) 34 b) 32 c) 31 d) 30

08. If $\frac{x}{y}+\frac{y}{x}=4$, then what is the value of $\frac{x^2}{y^2}+\frac{y^2}{x^2}$? [Al-Arafah IBL-(MTO)-2017]

a) 16 b) 17 c) 13 d) 14



09. If $x = a + \frac{1}{a}$ and $y = a - \frac{1}{a}$ then $x^4 + y^4 - 2x^2y^2 = ?$

a) 4 b) 8 c) 16 d) None

$x^4 + y^4 - 2x^2y^2$

$\therefore (x^2)^2 + (y^2)^2 - 2 \cdot x^2 \cdot y^2 = (x^2 - y^2)^2$

x^2 y^2

$= \{(x+y)(x-y)\}^2$

$= \left\{\left(a + \frac{1}{a}\right) + \left(a - \frac{1}{a}\right)\right\}^2 \left\{\left(a + \frac{1}{a}\right) - \left(a - \frac{1}{a}\right)\right\}^2$

$= \left\{\left(a + \frac{1}{a} + a - \frac{1}{a}\right)\left(a + \frac{1}{a} - a + \frac{1}{a}\right)\right\}^2$

$= \left(2a \times \frac{2}{a}\right)^2$

$= 4^2$

$= 16$

$\frac{1}{a} + \frac{1}{a} = \frac{2}{a}$

10. If $\frac{x}{(2x+y+z)} = \frac{y}{(x+2y+z)} = \frac{z}{(x+y+2z)} = a$, then find the value of a if $(x + y + z) \neq 0$ [BB-AD: 20-10-23]

a) $\frac{1}{2}$ b) $\frac{1}{3}$ c) $\frac{1}{4}$ d) $\frac{1}{8}$

$\frac{1}{4}$

Here, $\frac{x}{2x+y+z} = \frac{a}{1}$

$\Rightarrow x = a(2x+y+z)$ ...(i)

$\therefore y = a(x+2y+z)$ ...(ii)

$z = a(x+y+2z)$ ...(iii)

$x+y+z = 4a(x+y+z)$ $\Rightarrow 1 = 4a$

$\therefore a = \frac{1}{4}$

$\therefore 4a(x+y+z) = x+y+z$

$4a = 1$

$\Rightarrow a = \frac{1}{4}$

Formula of Cubes

11. If $\sqrt{3} - \frac{1}{x} = x$ Then $x^3 + x + \frac{1}{x} + \frac{1}{x^3} = ?$

$\sqrt{3} = x + \frac{1}{x}$

$\therefore x + \frac{1}{x} = \sqrt{3}$

$\left(x^3 + \frac{1}{x^3}\right) + \left(x + \frac{1}{x}\right)$

T

12. If $x + y = a$ and $x - y = b$, then $2xy = ?$

* a) $\frac{a^2 - b^2}{2}$ b) $\frac{b^2 - a^2}{2}$ c) $\frac{a - b}{2}$ d) $\frac{ab}{2}$

$2xy$

$2 \times \left(\frac{x+y}{2}\right)^2 - \left(\frac{x-y}{2}\right)^2$

$= 2 \times \left(\frac{a}{2}\right)^2 - \left(\frac{b}{2}\right)^2$

$= 2 \times \frac{a^2}{4} - \frac{b^2}{4} = \cancel{2} \times \frac{a^2 - b^2}{\cancel{4}2}$

$\frac{a^2 - b^2}{2}$

Single Equation & Double Equation

13. If $x + y = 6$, $y + z = 4$ and $z + x = 2$, then $2y - z - x$?

A) 0 B) 2 C) 8 D) 6

14. At a stationary shop, it costs Tk. 185 for 4 gel-pens, 8 ball-point pens and 1 marker pen and tk. 315 for 7 gel-pens. 15 ball-point pens and 1 marker pen. What would be the cost of 1 gel-pen, 1 ball-point pen and 1 marker pen? [BB-AD: 28-10-22]

a) Tk. 45 b) Tk 55 c) Tk. 60 d) Tk. 70

15. For which value of p will the square root of $4x^2 - px + 9$ be an integer? [BD Gas Fields - AM Exam - 2021]

a) 20 b) 9 c) 12 d) 16

16. Babu's income is Tk. 1,000 more than that of Selim. Their total salary is Tk. x. What is Selim's salary? [BPEX - AM Exam - 2017]

a) $\frac{x}{2} - 500$ b) $x - 500$ c) $\frac{(2x-500)}{2}$ d) $2x - 1{,}000$

17. For some value of x, $5(x + 2) = y$. After the value of x is increased by 3, $5(x + 2) = Z$. What is the value of $(z - y)$?

A) 18 B) 12 C) 15 D) 10

18. One third the sum of 13 and a certain number is the same as one more than twice the number. Find out the number.

A) 6 B) 2 C) 5 D) 3

19. If the sum of two numbers is 33 and their difference is 15, the smaller number is:

A) 9 B) 12 C) 15 D) 18

20. A positive number x is multiplied by 2, and this product is then divided by 3. If the positive square root of the result of these two operations equals x, what is the value of x?

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) $\frac{4}{3}$ D) $\frac{2}{3}$

21. The sum of the two numbers is 12 and their product is 35. What is the sum of the reciprocals of these numbers?

A) $\frac{12}{35}$ B) $\frac{1}{35}$ C) $\frac{35}{8}$ D) $\frac{7}{32}$

22. Some chocolates were distributed among three children X, Y and Z. If X gave 8 chocolates to Y & Y gave 5 chocolates to Z, then all of them would have equal number of chocolates. It the total number of chocolates were 45, how many chocolates did Y get?

A) 10 B) 12 C) 14 D) 15

23. In a Cox's Bazar hotel, the daily rate for an economy room, which can accommodate a maximum of three persons' is Taka 800 for one person and Taka Y for each additional person. If 3 friends take the room got one day and each pays Take 450 for the room, what is Taka Y?

A) 200 B) 275 C) 350 D) 425

24. There are 200 questions in a 3-hour examination. Among questions are 50 mathematics problems. It is suggested that twice as much time be allowed for each mathematics problem as for each of the other questions. How many minutes should be spent on the mathematics problems?

A) 36 B) 60 C) 72 D) 100

25. To make an instant coffee drink in a coffee machine, W liters of water is needed for every liter of concentrated liquid coffee mix. In a certain weekday in IBA canteen, C liters of concentrated coffee mix are required and coffee is sold for S taka per liter. If coffee mix is bought for B taka per liter and water us free, what will be the gross profit per day?

A) C (S + W – B)
B) S (C + W – B)
C) S (C + CW – B)
D) C (S + SW – B)

26. 74 is divided into two parts so that 5 times one part and 11 times the other part are together equal to 454. The parts are?

a) 14,60 b) 60,14 c) 30,44 d) 44,30

27. One junior student is asked to divide half a number by 6 and the other half by 4 and then add the quantities. Instead of doing so, the student divides the given number by 5. If the answer is 4 short of the correct answer, then the number is?

a) 320 b) 360 c) 400 d) 480

28. In a group of buffaloes and ducks, the number of legs is 24 more than twice the number of heads. What is the number of buffaloes in the group?

a) 6 b) 8 c) 10 d) 12

29. One third of Aman's marks in Mathematics exceeds a half of his marks in English by 30. If he got 240 marks in the two subjects together, how many marks did he get in English? [BB-AD: 20-10-23]

a) 180 b) 120

c) 90 d) 60

ধরি, $M = x$

$E = 240 - x$

ATQ, $x \times \frac{1}{3} - 30 = \frac{240 - x}{2}$

$\frac{x - 90}{3} = \frac{240 - x}{2}$

$x = 180$

$E = 240 - 180$

$= 60$

30. **A worker was hired for 7 days. Each day, he was paid Tk. 10 more than what he was paid for the previous day of work. The total amount he was paid in the first 4 days of work equaled the total amount he was paid in the last 3 days. What was his starting pay?** [20 Based Combined SO: 20-01-2023]

a) Tk.90 b) Tk. 138

c) Tk. 150 d) Tk. 160

Let, starting pay = Tk. x

ATP, $x + x+10 + x+20 + x+30 = x+40 + x+50 + x+60$

Teacher's Work	Formula of Square

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02. $(p+q)^2 = \sqrt[3]{27}$ and $p^2 = {}_{\sqrt{6}} + q^2, p^3q + pq^3 = ?$

03. If $y = \sqrt{2} + \sqrt{3}$, $\left(y^2 + \frac{1}{y^2}\right)\left(y^3 - \frac{1}{y^3}\right) = ?$

04. If $(p^2 + 1)^2 = 6p^2$ Show, p3 + $\frac{1}{p^3} = 3\sqrt{6}$.

05. Given $\frac{2}{x} + \frac{2}{xy} = \frac{1}{6}$ and $\frac{2}{x} + \frac{2}{y} = 0$, Find 'a' for which $y = ax -$ 4. [21 Based Combined Senior Officer (General): 2023]

06. If $a^2 - \sqrt{5}a + 1 = 0$ then find...

(i) $a^5 + \frac{1}{a^5}$ (ii) $a^6 + \frac{1}{a^6}$

07. If $a^3 + \frac{1}{a^3} = 2$, then find $a + \frac{1}{a}$

08. Given $x = 3+2\sqrt{2}$, find the value of $\sqrt{x} - \frac{1}{\sqrt{x}}$ [Janata Bank–(AEO-RC)-2018 & Standard Bank- (TAO-General)-2018]

09. $x^2+\frac{1}{x^2}=1$, find the value $x^{102}+x^{96}+x^{90}+x^{84}+x^{78}+x^{72}+5$? [Janata Bank (AEO-Teller)-2020]

Sol^n: Given that,

$x^2+\frac{1}{x^2}=1$

$\Rightarrow \left(x+\frac{1}{x}\right)^2-2x\cdot\frac{1}{x}=1$

$\Rightarrow \left(x+\frac{1}{x}\right)^2=3$

$\Rightarrow \left(x+\frac{1}{x}\right)=\sqrt{3}$

$\Rightarrow \left(x+\frac{1}{x}\right)^3=(\sqrt{3})^3$

$\Rightarrow x^3+\frac{1}{x^3}+3x\frac{1}{x}\left(x+\frac{1}{x}\right)=3\sqrt{3}$

$\Rightarrow x^3+\frac{1}{x^3}+3\sqrt{3}=3\sqrt{3}$

$\Rightarrow x^3+\frac{1}{x^3}=0$

$\Rightarrow \frac{x^6+1}{x^3}=0$

$\Rightarrow x^6+1=0$

Now, $x^{96}(x^6+1)+x^{84}(x^6+1)+x^{72}(x^6+1)+5$

$x^{96}\times 0+x^{84}\times 0+x^{72}\times 0+5$

$=5$

Ans: 5

10. $\sqrt{x} + \frac{1}{\sqrt{x}} = a$, then find the value of $x^2 + \frac{1}{x^2}$.

11. If $x - \frac{1}{x} = \sqrt{5}$ Then, $x^3 - \frac{1}{x^3}$ [Ministry of Food (AP)-2020]

12. If $a = \sqrt{6} + \sqrt{5}$ then Find the value of $\frac{a^6 - 1}{a^3}$ $= \frac{a^6}{a^3} + \frac{1}{a^3}$

$\frac{1}{a} = \sqrt{6} - \sqrt{5}$

$a^3 + \frac{1}{a^3} =$

13. Solve the equation $\frac{4}{2x+1}+\frac{9}{3x+2}=\frac{25}{5x+4}$

Sol^{n}: Given that,

$$\frac{4}{2x+1}+\frac{9}{3x+2}=\frac{25}{5x+4}$$

Sq. root

$$\Rightarrow \frac{4}{2x+1}+\frac{9}{3x+2}=\frac{10}{5x+4}+\frac{15}{5x+4}$$

$$\Rightarrow \frac{4}{2x+1}-\frac{10}{5x+4}=\frac{15}{5x+4}-\frac{9}{3x+2}$$

$$\Rightarrow \frac{20x+16-20x-10}{(2x+1)(5x+4)}=\frac{45x+30-45x-36}{(5x+4)(3x+2)}$$

$$\Rightarrow \frac{6}{2x+1}=\frac{-6}{3x+2}$$

$$\Rightarrow 3x+2=-2x-1$$

$$\Rightarrow 3x+2x=-1-2$$

$$\Rightarrow 5x=-3$$

$$\Rightarrow x=-\frac{3}{5}$$

Ans: $-\frac{3}{5}$

$\therefore$ The root of the equation is $-\frac{3}{5}$

$\sqrt{\ } = \frac{1}{n}$

14. If $x = \frac{4}{5}$, then $= \frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}}$?

Sol^{n} : Given that,

$x = \frac{4}{5}$

$\Rightarrow \frac{1}{x} = \frac{5}{4}$

$\Rightarrow \frac{1+x}{1-x} = \frac{5+4}{5-4}$

$\Rightarrow \frac{1+x}{1-x} = \frac{9}{1}$

$\Rightarrow \sqrt{\frac{1+x}{1-x}} = \sqrt{9}$

$\Rightarrow \frac{\sqrt{1+x}}{\sqrt{1-x}} = \frac{3}{1}$

$\Rightarrow \frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}} = \frac{3+1}{3-1}$

$\therefore \frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}} =$

Ans: 2

15. Factorize $x^2 - \left(\frac{2}{a} - 3a\right)x - 6$ [Ministry of Food (AP)-2020]

Solⁿ: Given that,

$$x^2 - \left(\frac{2}{a} - 3a\right)x - 6$$

$$= x^2 - \frac{2x}{a} + 3ax - 6$$

$$= x\left(x - \frac{2}{a}\right) + 3a\left(x - \frac{2}{a}\right)$$

$$= \left(x - \frac{2}{a}\right)(x + 3a)$$

$\frac{3ax}{3a} = x$

$\frac{6}{3a} = \frac{2}{a}$

16. A bonus of Tk. 1000 is to be divided among three people so that Tamim receives twice as much as Sakib, who receives one-fifth as much as Mahmudullah,. How much money should Mahmudullah receive?

Let, Mahmudullah receive = Tk. $5x$

Sakib " = Tk. $5x \times \frac{1}{5}$ = Tk. x

Tamim " = Tk. $2x$

ATP, $2x + x + 5x = 1000$

$\Rightarrow 8x = 1000 \Rightarrow x = \frac{1000}{8}$

$\Rightarrow x = 125$

∴ Required, Mahmudullah receive = Tk. 125×5

$= 625$

Ans: 625

17. In a classroom, there are certain numbers of benches. If 6 students are made to sit on a bench, then to accommodate all of them, one more bench is needed. However, if 7 students are made to sit on a bench, then after accommodating all of them, space for 5 students is left. What is the total number of students in the class?

Let, Total no. of Benches = x

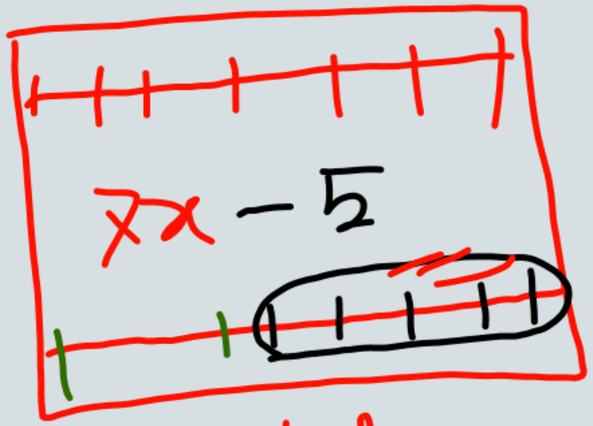
ATP

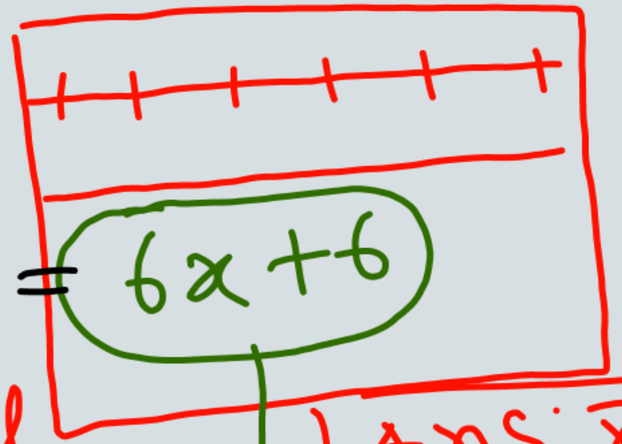
$6x + 6 = 7x - 5$

$\Rightarrow 6x - 7x = -5 - 6$

$\Rightarrow -x = -11$

$\therefore x = 11$





T.S

Required total no. of Students $= (6 \times 11) + 6$

$= 66 + 6 = 72$

Ans: 72

18. A man engaged a worker on the condition that he would pay him Tk. 30,000 and one uniform after one year of service. The worker served only 9 months and got Tk. 22,000 and a uniform. What is the price of the uniform? [20 Based Combined Officer (General): 2023]

30,000 + x

Let, The price of uniform = Tk. x

After '12' months = 30,000 + x

After 9 " = $\frac{(30,000+x) \times 9}{12}$

$= \frac{90,000+3x}{4}$

ATQ,

$22000 + x = \frac{90,000+3x}{4}$

$\Rightarrow 88000 + 4x = 90,000 + 3x$

$\Rightarrow x = 2000$

∴ The price of the uniform is Tk. 2000

Ans: Tk. 2000