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Prime CAT 05 2022 QA

Scorecard (procreview.jsp?sid=aaaN5tjtX0b7WgArBjowyMon Jan 09 00:05:00 IST 2023&qsetId=dDjlPg1Pmio=&qsetName=Prime CAT 05 2022 QA)

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Qs Analysis (QsAnalysis.jsp?sid=aaaN5tjtX0b7WgArBjowyMon Jan 09 00:05:00 IST 2023&qsetId=dDjlPg1Pmio=&qsetName=Prime CAT 05 2022 QA)

Video Attempt / Solution (VideoAnalysis.jsp?sid=aaaN5tjtX0b7WgArBjowyMon Jan 09 00:05:00 IST 2023&qsetId=dDjlPg1Pmio=&qsetName=Prime CAT 05 2022 QA)

Solutions (Solution.jsp?sid=aaaN5tjtX0b7WgArBjowyMon Jan 09 00:05:00 IST 2023&qsetId=dDjlPg1Pmio=&qsetName=Prime CAT 05 2022 QA)

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Section-1

Sec 1

Q.1 [11831809]

If $(5x + 6y - 39)^2 + (4x - 5y + 8)^2 = 0$ and $3x - 4y = -7$, then the value of $x + y$ is

Answer key/Solution

Solution:
Correct Answer : 7
Given equation is $(5x + 6y - 39)^2 + (4x - 5y + 8)^2 = 0$.
Both the square will yield either positive number or 0.
Since sum of two positive numbers cannot be zero, each of the term must be 0.
$5x + 6y - 39 = 0$ … (i)
$4x - 5y + 8 = 0$ … (ii)
$3x - 4y = -7$ … (iii)
Solving (ii) and (iii), we get $x = 3, y = 4$
Hence, $x + y = 3 + 4 = 7$.

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Q.2 [11831809]

In a survey of 500 people, 20% do not like Tea, Coffee or Milk. 10% like all the three. There are 20% who like Tea and Coffee, 18% who like Coffee and Milk and 18% who like Tea and Milk. If the ratio of the number of people that like only Tea, only Coffee and only Milk is 8 : 5 : 9, then what is the ratio of the number of people who like only Milk to the number of people who like either Tea or Coffee or both but not Milk?

1 ◯ 1 : 2

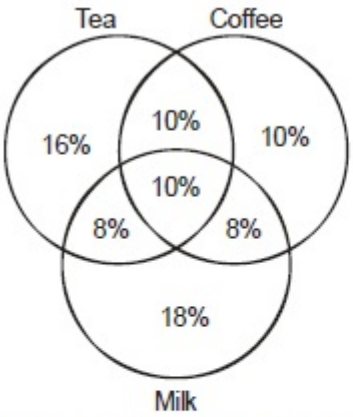
2 ◯ 2 : 3

3 ◯ 1 : 3

4 ◯ 4 : 9

Solution:
Correct Answer : 1

Answer key/Solution



Since 20% do not like Tea, Coffee or Milk.
Therefore, 80% like at least one drink.
So number of people who like only one drink = 80% – (10% + 10% + 8% + 8%) = 44%.
Number of people who like only Tea = 44/(8 + 5 + 9) × 8 = 16%
Similarly, the number of people who like only Coffee or only Milk are 10% and 18% respectively.
Hence, required ratio = 18 : (16 + 10 + 10) = 1 : 2.

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Q.3 [11831809]

Rekha bought two types of muffins – A and B in x and y quantity worth Rs. 1,000 for her daughter's birthday party such that each muffin costs Rs. 5 and Rs. 7 respectively. x and y are as close as possible. On her next birthday, Rekha buys muffins – A and B in y and x quantity respectively. How much (in Rs.) more/less did Rekha pay?

Solution:
Correct Answer : 8

Answer key/Solution

The cost of muffin A = Rs. 5
Number of A muffins bought = x
The cost of muffin B = Rs. 7
Number of B muffins bought = y
Since total amount spent = Rs. 1,000
So 5x + 7y = 1000

$$\Rightarrow x = \frac{(1000 - 7y)}{5}$$

⇒ x = 81 and y = 85 are the closest values.
For the next birthday, the amount reverses
∵ 5(85) + 7(81) = Rs. 992
Hence, less amount paid = 1000 – 992 = Rs. 8.

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Q.4 [11831809]

Nita purchases three dresses from a shop. She got one of them altered for Rs.60 and she paid a total of Rs.2,280. The shopkeeper made an overall profit of 11% on the cost price of all the three items together. The average cost price of the other two items is Rs.400. The altered dress was sold at a profit of 20% after a discount of 10%. What was the marked price of the altered dress?

1 ◯ Rs.1,440

2 ◯ Rs.1,540

3 ◯ Rs.1,780

4 ◯ Rs.1,600

Answer key/Solution

Solution:
Correct Answer : 4
Total price paid for the three dresses = Rs.2,280
The original selling price of all three = 2280 – 60 = Rs.2,220
The SP after profit of 11% on all three is Rs.2,220, so CP = 2220/1.11 × 100 = Rs.2,000
Average SP of other two = Rs.400, total CP of other two = Rs.800
CP of altered dress = 2000 – 800 = Rs.1,200
Given that there was a profit of 20%, so SP = 1.2 × 1200 = Rs.1,440
There was a discount of 10% on the MP,
Hence, Marked Price = 1440/0.9 = Rs.1,600.

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Q.5 [11831809]

A rectangle ABCD inscribed in a semicircle with diameter PQ such that points A and B are on diameter PQ. If AB = 8 cm and PA = QB = 4 cm, then the area (in sq. cm) of rectangle ABCD is

1 ◯ $16\sqrt{3}$

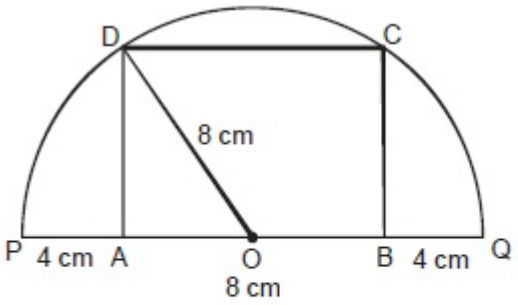
2 ◯ $32\sqrt{3}$

3 ◯ $24\sqrt{3}$

4 ◯ $64\sqrt{3}$

Solution:
Correct Answer : 2

Answer key/Solution



Diameter PQ = 4 + 8 + 4 = 16 cm
So radius OD = 8 cm and AO = 4 cm
Now, in triangle OAD,
AD = $\sqrt{(8^2 - 4^2)} = \sqrt{48} = 4\sqrt{3}$ cm
Hence, area of rectangle ABCD = $8 \times 4\sqrt{3} = 32\sqrt{3}$ sq. cm.

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Q.6 [11831809]

Let $|x| \le \sqrt{|25 - x^2|}$ and $x^2 = |a|$, then the equations are true for what percentage of the interval [–20, 20] for value 'a'?

1 ◯ 50%

2 ◯ 62.5%

3 ◯ 66.67%

4 ◯ 4.75%

Solution:
Correct Answer : 2

Answer key/Solution

$|x| \le \sqrt{|25 - x^2|}$

$\Rightarrow x^2 \le 25 - x^2$

$\Rightarrow x^2 \le \frac{25}{2}$

$\Rightarrow |a| \le \frac{25}{2}$

$\Rightarrow -12.5 \le a \le 12.5$

Hence, required percentage = $\frac{2 \times 12.5}{40} \times 100 = 62.5\%$.

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Q.7 [11831809]

Jiya went shopping for her birthday at the mall, where she purchased a dress for 28% of the money that was there in her wallet. Out of the remaining money Jiya spent 25% to pay for a pair of shoes, which was worth Rs.1,728. Then Jiya spent 12.5% of the remaining money on the purchase of some jewelry. After that she lost her wallet. Find the amount that Jiya lost.

1 ◯ Rs.5,184

2 ◯ Rs.3,546

3 ◯ Rs.4,536

4 ◯ Rs.2,592

Solution:

Correct Answer : 3

Answer key/Solution

Let Jiya have Rs.100x initially in the wallet.
Amount spent on dress = Rs.28x
Remaining amount = Rs.72x
Amount spent on shoes = $0.25 \times 72x = 1728 \Rightarrow x = 96$
Remaining amount = $0.75 \times 72x$ = Rs.5,184.
Amount spent on jewelry = $0.125 \times 0.75 \times 72x$ = Rs.648
Hence, amount lost = 5184 – 648 = Rs.4,536.

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Q.8 [11831809]

Two congruent circles intersect at points A and B, and each circle passes through the center of the other circle. The line containing both the centers is extended to intersect the circles at points C and D. If the radius of the circles is 4 cm, then what is the length of AD (in cm)?

1 ◯ $4\sqrt{3}$

2 ◯ $8\sqrt{2}$

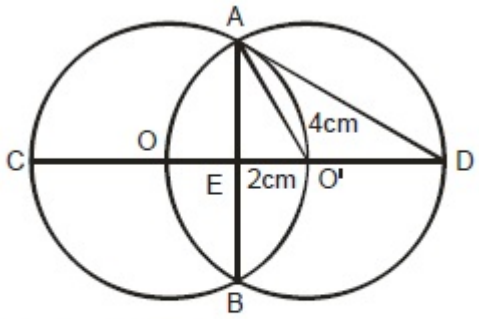
3 ◯ $8\sqrt{3}$

4 ◯ $4\sqrt{2}$

Solution:

Correct Answer : 1

Answer key/Solution



In right angled ΔAEO',
AE = $\sqrt{(4^2 - 2^2)} = 2\sqrt{3}$ cm
Now, in right angled ΔAED,
AD = $\sqrt{[(2\sqrt{3})^2 + (2 + 4)^2]} = 4\sqrt{3}$ cm.

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Q.9 [11831809]

For positive integers m, n and x, $x^m + x^n = 1040$ and $n^2(m^n - n) = 675$, then what is the value of $m^x + n^x$?

Solution:

Correct Answer : 641

Answer key/Solution

Note: $675 = 3^3 \times 5^2 \times 1$ and $n^2(m^n - n) = 675$
So, $n^2 = 1, 9, 25$, or 225

If $n^2 = 1$, then $n^2(m^n - n) = m^1 - 1 \Rightarrow m = 676$.

$x^{676} + x^1 = 1040$. No integer value of x satisfies.
If $n^2 = 9$, then $n^2(m^n - n) = 9(m^3 - 3) \Rightarrow m^3 = 78$.
No integer value of m satisfies.

If $n^2 = 25$, then $n^2(m^n - n) = 25(m^5 - 5) \Rightarrow m^5 = 32 \Rightarrow m = 2$

Here, m = 2 and n = 5.
If $n^2 = 225$, then $n^2(m^m - n) = 225(m^{15} - 15) \Rightarrow m^{15} = 18$
No integer value of m satisfies.

Therefore, for m = 2 and n = 5, $x^m + x^n = 1040$ satisfies for x = 4.

So, $m^x + n^x = 2^4 + 5^4 = 641$.

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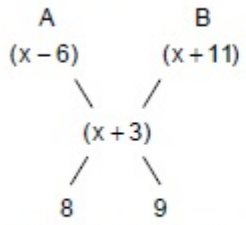
Q.10 [11831809]

There are two containers A and B containing a mixture of milk and water. The concentration of milk in container A and B is (x – 6)% and (x + 11)% respectively. If both mixtures are mixed together in a certain ratio to get 102 liters of mixture in which the concentration of milk is (x + 3)%, find the amount (in liters) of mixture used from container A.

Solution:
Correct Answer : 48

Answer key/Solution

Using alligation:



Ratio of A : B = 8 : 9
Hence, the quantity of mixture from A used = 8/(8 + 9) × 102 = 48 liters.

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Q.11 [11831809]

Amit travels from Agra to Lucknow in 4.8 hours with the same distance at 3 different speeds of 60 km/h, 75 km/h and 100 km/h. The respective mileage per liter of fuel for the above speeds is 16 km, 20 km, 24 km. Since petrol is so expensive; he wants to minimise his car's fuel consumption on the return journey. If he cannot drive his car more than 100 km/h and the price of petrol is Rs. 102 per liter, then how much cost (in Rs.) will he be able to save?

1 ◯ 51

2 ◯ 255

3 ◯ 459

4 ◯ 357

Solution:
Correct Answer : 4

Answer key/Solution

Let the total distance be D km.

Then, $\frac{D/3}{60}+\frac{D/3}{75}+\frac{D/3}{100}=4.8$

$\Rightarrow$ D = 360 km
Fuel consumed when driving at 60 km/h = 120/16 = 7.5 liters
Fuel consumed when driving at 75 km/h = 120/20 = 6 liters
Fuel consumed when driving at 100 km/h = 120/24 = 5 liters
Total fuel consumed = 7.5 + 6 + 5 = 18.5 liters
Fuel consumed when driving at 100 km/h for entire return journey = 360/24 =15 liters
Therefore, difference = 18.5 – 15 = 3.5 liters
Hence, the answer is = 3.5 × 102 = Rs.357.

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Q.12 [11831809]

What is the minimum value of $17 \log_{30} x - 3 \log_x 5 - 3 \log_x 6 + 20 \log_x 10 + 20 \log_x 3$ if $x > 1$?

1 ◯ 17

2 ◯ 28

3 ◯ 34

4 ◯ 1

Solution:

Correct Answer : 3

Answer key/Solution

The equation can be rewritten as:

$$17\log_{30} x - 3\log_x 5 - 3\log_x 6 + 20\log_x 10 + 20\log_x 3$$
$$= 17\log_{30} x - 3(\log_x 5 + \log_x 6) + 20(\log_x 10 + \log_x 3)$$
$$= 17\log_{30} x - 3(\log_x 30) + 20(\log_x 30)$$
$$= 17\log_{30} x + 17(\log_x 30)$$
$$= 17(\log_{30} x + \log_x 30)$$

Since $x > 1$, $\log_{30} x + \log_x 30 \geq 2$ (AM $\geq$ GM)

So, minimum value is $17 \times 2 = 34$.

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Q.13 [11831809]

Surjit lends Rs. 20,000 to two of his friends - Amit and Vinit for two years. He gives Rs.10,000 to Amit at 10% per annum compound interest. Surjit wants to make a profit of 30% on the whole. The simple interest rate at which he should lend the remaining sum of money to Vinit is

1 ◯ 13.5%

2 ◯ 19.5%

3 ◯ 16.5%

4 ◯ 18.5%

Solution:
Correct Answer : 2
Surjit wants to make a profit of 30% on the whole.
So the amount at the end of two years should be = 20000 + (20000 × 30)/100 = Rs.26,000
Amount at the end of 2 years from the sum lent to Amit at compound interest = 10000 × 1.12 = Rs.12,100
Remaining amount = 26000 – 12100 = Rs.13,900
Hence, required rate of interest = (100 × 3900)/(2 × 10000) = 39/2 = 19.5%.

Answer key/Solution

Bookmark FeedBack

Q.14 [11831809]

In a written test of Mathematics, the score of C was one-thirteenth of the sum of the scores of A and B. After an oral test, each of them's scores increased by 4. If the final scores of A, B and C were in the ratio 9 : 8 : 3, then the final score of B was how much less than the sum of the final scores of A and C?

Solution:
Correct Answer : 8

Let the final scores of A, B and C be 9x, 8x and 3x respectively.
Then, their initial scores in written test were 9x – 4, 8x – 4 and 3x – 4 respectively.
According to the question,
$9x - 4 + 8x - 4 = 13(3x - 4)$
$\Rightarrow 17x - 8 = 39x - 52$
$\Rightarrow x = 2$
Hence, required answer = $(9x + 3x) - 8x = 4x = 8$.

Answer key/Solution

Bookmark FeedBack

Q.15 [11831809]

For all natural numbers x, $f(1) + f(2) + f(3) + ... + f(x) = x^3 f(x)$ and $f(8) = 91$, then which of the following numbers is the least possible factor of $f(8) - f(9)$?

1 ◯ 2

2 ◯ 3

3 ◯ 5

4 ◯ A number greater than 5

Solution:
Correct Answer : 2

Answer key/Solution

For x = 8,
$f(1) + f(2) + f(3) + ... + f(8) = 8^3 f(8)$
$\Rightarrow f(1) + f(2) + f(3) + ... + f(7) = 8^3 f(8) - f(8) = 512 \times 91 - 91 = 46501$
Now for x = 9,
$f(1) + f(2) + f(3) + ... + f(9) = 9^3 f(9)$
$\Rightarrow f(1) + f(2) + f(3) + ... + f(7) + f(8) = 9^3 f(9) - f(9)$
$\Rightarrow 46501 + 91 = f(9)(9^3 - 1)$
$\Rightarrow 46592/728 = f(9)$
$\Rightarrow 64 = f(9)$
Therefore, $f(8) - f(9) = 27$
Hence, among the given options, the least possible factor of $f(8) - f(9)$ is 3.

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Q.16 [11831809]

A fruit vendor purchased a box containing 180 mangoes. During transportation 30% of them got damaged. The good mangoes were sold at 20% profit whereas 50% of the damaged mangoes were sold at 10% loss and the remaining at 15% loss. If the total selling price of the box of mangoes was Rs.3,969, then what was the cost (in Rs.) of a dozen mangoes?

Solution:
Correct Answer : 240

Answer key/Solution

Let the cost price of a mango be Rs. 'x'.
The cost price of 180 mangoes = 180x
30% of them are damaged, then the remaining mangoes = 70% of 180 = 126
SP of good mangoes = 1.2x × 126
The selling price of 50% of damaged mangoes = 27 × 0.9x
The selling price of remaining 50% of damaged mangoes = 27 × 0.85x
According to the question $\Rightarrow 1.2x \times 126 + 27 \times 0.9x + 27 \times 0.85x = 3969$
$\Rightarrow 198.45x = 3969 \Rightarrow x = 20$
Hence, required cost of a dozen mangoes = 12 × 20 = Rs.240.

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Q.17 [11831809]

Let the (q – 2)th and (p + 1)th terms of a geometric progression be 4/3 and 108 respectively, where p > q. If the common ratio of the GP is an integer r, then what is the largest possible value of r/(p – q)?

1 ◯ –9

2 ◯ –3

3 ◯ 3

4 ◯ 9

Solution:

Correct Answer : 3

Answer key/Solution

Let first term of the GP be 'a'.
Then, $(p + 1)$th term $= ar^p = 108$ ... (i)
$(q - 2)$th term $= ar^{q-3} = 4/3$ ... (ii)
Dividing (i) by (ii),
$r^{p-q+3} = 81 = 9^2$ or 3^4
So $r = \pm 9$, $p - q = -1$ (not possible)
So $r = \pm 3$, $p - q = 1$
Therefore, $r/(p - q) = 3/1$ or $-3/1$
Hence, the largest possible value is 3.

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Q.18 [11831809]

The ratio of the speeds of Trains A and B is 3 : 5. Both start from station X at the same time and reach station Y, which is 125 km away at the same time. Train B has two stoppages of 15 minutes each in between. If the length of train B is 500 meter, then find the time taken (in seconds) by it to cross a bridge of length 2 km.

1 ◯ 36

2 ◯ 54

3 ◯ 48

4 ◯ 72

Solution:

Correct Answer : 2

Answer key/Solution

Let the speed of Trains A and B be x km/hr and 5x/3 km/hr
According to the question: $125/x - 125/(5x/3) = (15 + 15)/60$
$\Rightarrow 125/x - 75/x = 1/2 \Rightarrow x = 100$ km/hr
Speed of train B = 500/3 km/hr
Hence, time taken to cross 2 km long bridge
$= (2.5 \times 3)/500 \times 3600 = 54$ seconds.

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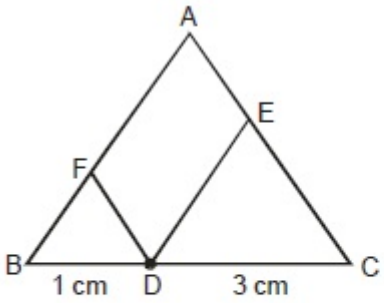
Q.19 [11831809]

In triangle ABC, a point D is on BC such that BD = 1 cm and DC = 3 cm. Point E is on AC such that DE is parallel to AB and point F is on AB such that DF is parallel to AC. If the area of the parallelogram AFDE is 51 sq. cm, then what is the area (in sq. cm) of the triangle ABC?

Solution:
Correct Answer : 136

Answer key/Solution



Since DE is parallel to AB. So, ΔCDE is similar to ΔABC.
Area of ΔCDE = $3^2/4^2$ × Area of ΔABC = 9/16 × Area of ΔABC
Similarly, area of ΔBDF = 1/16 × Area of ΔABC
Therefore, area of parallelogram AEDF = (1 – 1/16 – 9/16) × Area of ΔABC
⇒ 51 = 6/16 × Area of ΔABC
⇒ Area of ΔABC = 51 × 16/6 = 136 sq. cm.

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Q.20 [11831809]

Anu and Binu are running on the boundary on two concentric circular tracks with radii in the ratio 3 : 4. The ratio of the speeds of Anu and Binu is 9 : 10. Anu is running on the inner track and Binu is running on the outer track. Their starting points form a right angle at the center. Both start running in the same direction and after 10 seconds Binu covers a quarter of the outer track. After how much time will the distance between Anu and Binu be minimum?

1 ◯ 3 minutes

2 ◯ 2 minutes

3 ◯ 2.5 minutes

4 ◯ 4.5 minutes

Solution:
Correct Answer : 3

Answer key/Solution

We know that the distance will be minimum when both are along the same radius, or angle between them is 0°.
Let the speeds of Anu and Binu be s1 and s2 (m/sec) respectively.
If w is the angle covered on a circle of radius r, then distance covered = w × r
The distance covered by Anu and Binu will be proportional to their speeds.
⇒ s1/s2 = (w1 × r1)/(w2 × r2)
⇒ w1/w2 = s1/s2 × r2/r1 = 9/10 × 4/3 = 6/5
Angle covered by Binu in 10 seconds = 90°
Angle covered by Anu in 10 seconds = 90° × 6/5 = 108°
Change in angle between the two in 10 seconds = 108° – 90° = 18°
Initially, angle difference between their positions = 270°
Anu moves 18° closer to Binu every 10 seconds.
Hence, time taken for them to cover 270° = 270/18 × 10 = 150 seconds = 2.5 minutes.

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Q.21 [11831809]

In a bag, the ratio of number of pens, pencils and erasers is 2 : 3 : 7. A few erasers are taken out and a few pens and pencils are put into the bag such that the ratio now becomes 4 : 5 : 9. What could be the minimum possible number of pencils that were put into the bag?

Solution:
Correct Answer : 1

Answer key/Solution

Let number of pens, pencils and erasers initially be 2x, 3x and 7x respectively.
Let new number of pens, pencils and erasers be 4y, 5y and 9y respectively.
Number of erasers decreased: $7x > 9y$ which implies, $x > 9y/7$
Number of pens increased: $2x < 4y$ which implies, $x < 2y$
Number of pencils increased: $3x > 5y$ which implies, $x < 5y/3$
Combine the three and get, $9y/7 < x < 5y/3$
For minimizing the number of pens put in the bag minimise $4y – 2x$ or $2(2y – x)$ or minimize $2y – x$.
$9y/7 < x < 5y/3 \Rightarrow 1.28y < x < 1.66y$
For, y = 1, no natural number of x can be found.
For y = 2, x = 3 is possible.
Therefore, initially, number of pens, pencils and erasers were 6, 9 and 21 and later there were 8, 10 and 18 respectively. **1 pencil was added in the bag.**

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Q.22 [11831809]

A group of employees working together at the same rate can complete a project in 45 hours. When the work started, all employees did not start working together. They joined the work over a period of time, one by one, at equal intervals. Once at work, each one stayed till the work was complete. If the first employee worked 5 times as many hours as the last employee, for how many hours did the first employee work?

1 ◯ 60

2 ◯ 75

3 ◯ 81

4 ◯ 90

Solution:
Correct Answer : 2

Answer key/Solution

Let total employee who work together be N. Now, N employee can complete the total work in 45 hours.
The amount of work completed by one employee in 1 hour = 1/45 N.
Let x be the time for which first employee worked.
Also, first employee worked 5 times as many hours as the last employee, which implies, if first employee worked for x hours then last employee worked for x/5 hours in total.
Since they work on equal intervals, therefore, the total work done for each employee starting from the first employee forms a decreasing arithmetic progression.

Therefore, total work done by first employee = $\frac{1}{45N}\left(\frac{N}{2}\left(x+\frac{x}{5}\right)\right)=1$

Hence, first employee worked for $\frac{6x}{450}=1\Rightarrow x=75$ hours.

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