Ratio - 3

Career Launcher

QA - 06

CEX-Q-0207/18

Contents

- Mixtures and Alligation
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Number of questions : 30

Mixtures and Alligation

1. A solution of 20 L of wine and water contains 80% wine. How much water (in L) must be added to this solution in order to make it a 40% wine solution?

2. In a mixture of 120 L, the ratio of milk and water is 2 : 3. If 30 L of mixture is replaced by 18 L of milk and 12 L of water, then new ratio of milk to water is
   (1) 7 : 9 (2) 9 : 11
   (3) 2 : 3 (4) 11 : 9

3. In what ratio should 30% Phenyl Alcohol should be mixed with 60% of Phenyl Alcohol solution so that the resultant solution has 50% Phenyl Alcohol in it?
   (1) 1 : 2 (2) 2 : 1
   (3) 1 : 3 (4) 3 : 1

4. Two liquids A and B are mixed in the ratio of 3 : 2 respectively and the mixture is sold at Rs. 11 per litre at 10% profit. If the first liquid costs Rs. 2 per litre more than the second, the cost (rupees per litre) of first liquid is
   (1) 10.8 (2) 8.8
   (3) 18.8 (4) 5

5. In a mixture of 105 L, the ratio of milk and water is 8 : 7. If some amount of mixture is removed in which 14 L was water and 5 L of water is added afterwards into the remaining mixture, then the new ratio of milk to water is
   (1) 19 : 20 (2) 4 : 5
   (3) 1 : 1 (4) 2 : 3

6. A milkman mixes 20 litres of water with 80 litres of milk. After selling one-fourth of this mixture, he adds water to replenish the quantity that he had sold. What is the current ratio of water to milk?
   (1) 2 : 3 (2) 1 : 2
   (3) 1 : 3 (4) 3 : 4

7. A can contains a solution of two liquids A and B in the ratio of 7 : 5. When 9 L of solution is drawn off from the solution and the can is filled with B, the proportion of A and B becomes 7 : 9. How many litres of liquid A was there in the can initially?

8. Gold is 18 times as heavy as water and copper is 8 times as heavy as water. The ratio in which copper to gold be mixed so that the mixture is 15 times as heavy as water, is
   (1) 3 : 2 (2) 7 : 3
   (3) 3 : 7 (4) 2 : 3

9. After the addition of 35 liters of water to a can of diluted milk, the concentration of milk in the can becomes 30%. Now, further 40 liters of water is added to the can and the concentration of milk in the can gets reduced by 10 percentage points. How many more liters of water must be added to the can now such that the concentration of milk in the can becomes 8%?

10. Two alloys of iron have different percentages of iron in them. The first of them weighs 6 kg and the second one weighs 12 kg. One piece each, of equal weight, was cut off from both the alloys. The piece from the first was mixed with the leftover part of the second alloy and the piece from the second with the leftover part of the first alloy. As a result the percentage of iron became the same in both the alloys. What was the weight of each cut out pieces?
(1) 4 kg (2) 3.5 kg
(3) 3 kg (4) None of these

11. An empty container is filled with pure alcohol. The alcohol is slowly allowed to run out and when the container is 1/4 empty, it is replaced with water. Next when the container is half empty it is again filled with water. Finally, when it is 3/4 empty, it is again filled with water. Find the percentage of alcohol in the container now.
(1) 37.5% (2) 11.75%
(3) 9.375% (4) 14.375%

12. There is an alloy (A) of silver and copper. A certain weight of this alloy is mixed with 15 kg of pure silver and melted. The new alloy (B) contains 90% of silver. If the alloy (A) is mixed with 10kg of a 90% silver alloy, the new alloy (C) is found to contain 84% silver. Find the percentage of silver in a alloy (A).
(1) 80% (2) 90%
(3) 75% (4) 85%

13. There are two alloys of copper and aluminium in the ratio 7 : 2 and 7 : 11 respectively. If equal quantities of the two alloys are melted to form a third alloy, then find the ratio of copper to aluminium in newly fomed alloy.
(1) 3 : 4 (2) 5 : 3
(3) 7 : 3 (4) 7 : 5

14. An alloy of copper and zinc contains 82% copper. After 18 kg of zinc had been added to the alloy, the copper content gets reduced to 70%. How much copper and zinc does the new alloy contain?
(1) Copper 88 kg, zinc 35 kg
(2) Copper 86.1 kg, zinc 36.9 kg
(3) Copper 80.5 kg, zinc 42.5 kg
(4) Copper 70 kg, zinc 30 kg

15. Beaker A and beaker B contains methanol, ethanol and phenyl in the ratio 1 : 3 : 2 and 2 : 1 : 5 respectively. Some parts of the solutions from beaker A and beaker B are thoroughly mixed and put into another beaker C. Which of the following cannot be the ratio of methanol, phenyl and ethanol in beaker C?
(1) 10 : 23 : 15 (2) 7 : 15 : 16
(3) 6 : 13 : 13 (4) 9 : 20 : 18

16. The concentrations of the milk solutions in three containers A, B and C are in an arithmetic progression, such that $C_A > C_B > C_C$ (C indicates concentration). The volume of the containers are V_A, V_B and V_C.
Which of the following statement(s) is/are true?
I. If $V_A : V_B : V_C = 1 : 1 : 1$, then the volumes of milk are also in arithmetic progression.
II. If the amount of milk in the containers is in AP, it implies that the volumes of the containers are all equal.

III. There exists situations when the concentration of a combined mixture can be independent of the volume V_B (i.e. not affected by V_B).

(1) Statements I and II are correct
(2) Statements I and III are correct
(3) Statements II and III are correct
(4) Only statement II is correct

17. The volume of a sugar solution in three different vessels form an arithmetic progression with a common difference of 5 kg. All the three sugar solutions have the same percentage concentration of sugar. The difference between the numerical values of the concentration (in percentage) of sugar in the sugar solution and the volume of sugar solution in the vessel having the least quantity is 8. The total quantity of sugar in the three vessels is 5.4 litres. What are the quantities of sugar solution in the three vessels?
(1) 5 kg, 10 kg and 15 kg
(2) 6 kg, 11 kg and 16 kg
(3) 7 kg, 12 kg and 17 kg
(4) 8 kg, 13 kg and 18 kg

18. Pipe X pours a mixture of acid and water, and pipe Y pours pure water into a bucket. After 1 hour, the bucket got filled and the concentration of acid in the bucket was noted to be 8%. If pipe Y was closed after 30 minutes and pipe X continued to pour the mixture, concentration of acid in the bucket after 1 hour would have been 10%. What is the ratio of acid to water in the mixture coming out of pipe X?
(1) 13 : 2 (2) 2 : 15
(3) 3 : 20 (4) 2 : 13

19. There are infinite number of containers each of capacity 1 L numbered A_0, A_1, A_2, ... A_∞. A_0 contains 1L alcohol while the other containers are empty. In first operation, half of the contents of A_0 are poured in A_1 and then water is added to A_0 to fill it to the brim. In the 2nd operation, half of the contents of A_0 are equally distributed in A_1 and A_2, and again water is poured in A_0 to fill it up. Subsequently, in (n+1)th operation, half of the contents of A_0 are distributed equally in A_1, A_2, ..., A_n and A_0 is filled with water after that. What is the final concentration of alcohol (approx.) in A_1 after infinite number of such operations?
(1) 62% (2) 66%
(3) 75% (4) 80%

20. Three milkmen Ramu, Kamu and Namu had 5L, 10L and 15L of milk-water solution respectively. In the solution that Kamu and Namu had, the ratio of milk and water were 2 : 3 and 1 : 4 respectively. All of them sat together and mixed their respective solutions together. They sold the combined mixture at Rs. 20 per litre and Ramu got Rs. 2.5 for every litre of mixture sold. What was the milk-water ratio in the solution that Ramu had with him? (Assume water comes free of cost and they share the revenue earned in the ratio of milk content)
(1) 1 : 4 (2) 2 : 3
(3) 1 : 5 (4) 3 : 5

Replacement

21. Two jars contain milk and water in the ratio 5 : 4 and 2 : 1 respectively. What volume should be taken out from the first jar and second jar so as to fill up a third 30 L jar with milk to water in the ratio 1 : 1?
(1) 7.5 L (2) 15 L
(3) 22.5 L (4) Impossible situation

22. One-litre can is full with a mixture of water and alcohol, and alcohol content is 20% of the total mixture. If 10% of this liquid is taken out and pure alcohol is added to fill the can, what will be the percentage of alcohol in the new mixture?

23. A vessel contains 180 L wine. 60 L is taken out of the vessel every day and an equal volume of water is put in it. What volume of wine remains in the vessel at the end of 3 days?
(1) 160/3 L (2) 20/3 L
(3) 80 L (4) 35 L

24. Some amount of acid is taken out of a 54 L vessel full of acid and then an equal amount of water is added to it. The process is repeated once more. As a result, the vessel now contains 24 L pure acid. How much of the acid was taken out initially (in L)?

25. A solution contains 20 L of pure milk. 20% of this is taken out. Another 20% of the remaining solution is taken out and finally 20% of the solution left is taken out. The total amount of solution taken out is replaced with water. Find the ratio of milk to water in the final solution.
(1) 1 : 5 (2) 12 : 38
(3) 488 : 512 (4) 512 : 488

26. Two identical vessels are filled with alcohol. From the first vessel 'a' litres of the solution is taken out and replaced with 'a' litres of water. From the resulting mixture 'a' litres of the mixture is removed and again replaced with 'a' litres of water. Same operation is done in the second vessel the same number of times, but the amount of solution removed and replaced with water is '2a' litres.
What fraction of the volume of the vessels is 'a' if the strength of alcohols in the two vessels finally is in the ratio 25 : 16?
(1) $\frac{1}{4}$ (2) $\frac{5}{6}$
(3) $\frac{2}{3}$ (4) $\frac{1}{6}$

27. A beaker contains milk and water in the ratio 5 : 3. If a person removes 6 L of this mixture and replaces it with pure water, the ratio of milk to water becomes 1 : 1. What is the amount of milk present in beaker initially?
(1) 18.75 L (2) 16.25 L
(3) 20 L (4) 18 L

28. Product M is produced by mixing chemical X and chemical Y in the ratio of 5 : 4. Chemical X is prepared by mixing two raw materials, A and B, in the ratio of 1 : 3. Chemical Y is prepared by mixing raw materials, B and C, in the ratio of 2 : 1. Then the final mixture is prepared by mixing 864 units of product M with water. If the concentration of the raw material B in the final mixture is 50%, how much water was added to product M?
(1) 328 units (2) 368 units
(3) 392 units (4) 616 units

29. A container has 80 L of milk. From this container, 8 L of milk was taken out and replaced by water. The process was further repeated once. How much milk is there in the container now?
(1) 64.8 L (2) 62.8 L
(3) 62 L (4) 64 L

30. A cylindrical container is having the top surface of a liquid at a level of 4/7 of its full level. From this, if x litres is removed, the container is one-fourth full. Finally, 35 L is added to the container from this position, making it half full. Find the value of x and the capacity of the container respectively.
(1) 45 L and 210 L (2) 25 L and 140 L
(3) 45 L and 140 L (4) 40 L and 210 L

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QA - 06 : Ratio - 3
Answers and Explanations

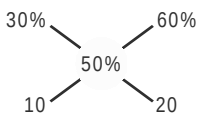
CEX-Q-0207/18

1	–	**2**	2	**3**	1	**4**	1	**5**	3	**6**	1	**7**	–	**8**	3	**9**	–	**10**	1
11	3	**12**	1	**13**	4	**14**	2	**15**	4	**16**	2	**17**	3	**18**	4	**19**	2	**20**	1
21	4	**22**	–	**23**	1	**24**	–	**25**	4	**26**	4	**27**	1	**28**	2	**29**	1	**30**	3

1. In 20 L solution, wine = $20 \times \frac{80}{100}$
= 16 L and water = 4 L
Let x L water be added. Then,
$\Rightarrow \frac{4+x}{16} = \frac{60}{40}$
$\Rightarrow$ x = 20 L

2. 2 30 L of mixture is drawn out.
$\therefore$ In 90 L of mixture, milk = $90 \times \frac{2}{5}$ = 36 L and water
$= 90 \times \frac{3}{5}$ = 54 L
Now, milk = 36 + 18 = 54 L and water = 54 + 12 = 66 L
$\therefore$ New ratio of milk and water = 54 : 66 = 9 : 11

3. 1 By alligation,



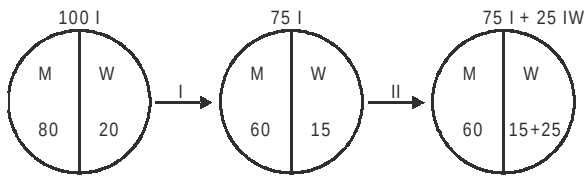
$\therefore$ Required ratio = 10 : 20 i.e. 1 : 2.

4. 1 CP = 10(at 10% profit)
Using alligation,
$\Rightarrow \frac{3}{2} = \frac{10-(x-2)}{x-10}$
$\Rightarrow$ x = 10.8
$\frac{Q_1}{Q_2} = \frac{C_m - C_2}{C_1 - C_m}$

5. 3 Total volume = 105 L
Milk : Water = 8 : 7
14 L of water was removed
$\therefore$ Amount of mixture removed = $\frac{15}{7} \times 14 = 30$ L
Volume of mixture left = 105 – 30 = 75 L
Individual content in the mixture:
Milk = $\frac{8}{15} \times 75 = 40$ L
Water = 75 – 40 = 35 L
5L of water was added afterwards
Now, the new ratio of milk and water is:
40 : 35 + 5 = 40 : 40 = 1 : 1

Alternate Method:
Total volume = 105 L
Total amount of Milk = $\frac{8}{15} \times 105 = 56$ L
and total volume of water = $\frac{7}{15} \times 105 = 49$ L
Now, when 14 L of water is removed, i.e., 16 L of milk is removed.
So, new ratio is 40 : 49 – 14 + 5 = 40 : 40 = 1 : 1.

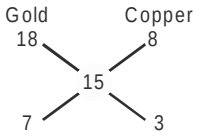
6. 1



The diagram is self explanatory. Removal of 25 litres at stage I will result in volume of milk being reduced by 80% of 25 lit i.e. 20 lit and volume of water being reduced by the remaining 5 lit. So M = 60 lit and W = 15 lit. Addition of 25 lit water will finally given M = 60 lit and W = 40 M. Hence the ratio of W and M = 40 : 60 = 2 : 3.

7. Let initial capacity of the can be x.
After the process, proportion of A = $\frac{\frac{7}{12}(x-9)}{x} = \frac{7}{16}$
$\Rightarrow \frac{7}{12}\left(1-\frac{9}{x}\right) = \frac{7}{16} \Rightarrow 1 - \frac{9}{x} = \frac{3}{4} \Rightarrow x = 36$ L
$\therefore$ A = $\frac{7}{12} \times 36 = 21$ L

8. 3 Use Alligation Method:



Thus the required ratio = 3 : 7.

9. Let I be the initial quantity of diluted milk in the can and the initial concentration of milk be m%.

$$\therefore \quad \frac{ml}{(l+35)} = 30$$

Also $\frac{ml}{(l+75)} = 20$

$\Rightarrow$ 2(l + 75) = 3(l + 35) $\Rightarrow$ l = 45 and ml = 2400.
If w litres of water is required to be added to the can to make the concentration of milk in the can 8% then

$$\frac{ml}{(l+75+w)} = 8 \Rightarrow 120 + w = \frac{2400}{8} = 300 \Rightarrow w = 180.$$

10. 1

	Sample I	Sample II
Wt	6 kg	12 kg
% of Iron	x%	y%
Pieces	w and (6 – w)	w and (12 – w)
After Mixing	$\underbrace{(6-w)}_{x\%} + \underbrace{w}_{y\%}$	$\underbrace{(12-w)}_{y\%} + \underbrace{w}_{x\%}$

The percentage of iron in both the samples is the same i.e.

$$\frac{\left[(6-w)x + wy\right]}{6} = \frac{\left[(12-w)y + wx\right]}{12}$$

$\Rightarrow$ x(12 – 3w) = y(12 – 3w)
as x $\neq$ y; (12 – 3w) must be zero
$\therefore$ w = 4
Hence, each cut off piece weighs 4 kg.

11. 3 Ratio of quantity of alcohol left to total quantity

$$= \frac{1}{1}\times\frac{\frac{3}{4}}{1}\times\frac{\frac{1}{2}}{1}\times\frac{\frac{1}{4}}{1} = \frac{3}{32}$$

Alcohol percentage = $\frac{3}{32} \times 100 = 9\frac{3}{8}\%$

12. 1

	Alloy A	Alloy B	Alloy C
Silver :	x	x + 15	$x + \frac{10\times 90}{100}$
Copper :	y	y	$y + \frac{10\times 10}{100}$

From B : $\frac{x+15}{x+y+15} = \frac{90}{100} \Rightarrow x - 9y = -15$

From C : $\frac{x+9}{x+y+10} = \frac{84}{100} \Rightarrow 4x - 21y = -15$

$\therefore$ x = 12, y = 3
$\therefore$ Percentage of sliver In A

$$= \frac{x}{x+y}\times 100 = \frac{12}{15}\times 100 = 80\%.$$

13. 4 Let the quantity of each alloy be 1.

Copper in first alloy = $\frac{7}{9}$

Copper in second alloy = $\frac{7}{18}$

Copper in third alloy $\frac{7}{9} + \frac{7}{18} = \frac{14+7}{18} = \frac{21}{18}$

Total quantity of third alloy = 2.

Aluminium = $2 - \frac{21}{18} = \frac{15}{18}$

Copper and aluminium in the third alloy = 21 : 15 = 7 : 5.

14. 2 Let the total quantity of alloy be x.

$$\frac{82\% \text{ of } x}{18\% \text{ of } x + 18} = \frac{7}{3} \Rightarrow \frac{246x}{100} = \frac{126x}{100} + 126$$

$$\Rightarrow \frac{120}{100}x = 126,$$

$$\Rightarrow x = 126 \times \frac{10}{12} = 105$$

Quantity of new alloy = 105 + 18 = 123

Copper = $\frac{70}{100} \times 123 = 86.1$

Zinc = 123 – 86.1 = 36.9

15. 4 Let 'x' be the quantity of solution taken from beaker A and 'y' be the quantity of solution taken from beaker B.

Quantity of methanol in beaker C = $\left(\frac{x}{6}\right) + \left(\frac{2y}{8}\right)$

$$= \frac{(4x+6y)}{24}$$

Quantity of phenyl in beaker C = $\left(\frac{2x}{6}\right) + \left(\frac{5y}{8}\right)$

$$= \frac{(8x+15y)}{24}$$

Quantity of ethanol in beaker C = $\left(\frac{3x}{6}\right)+\left(\frac{y}{8}\right)$

$= \frac{(12x+3y)}{24}$

Required Ratio = (4x + 6y) : (8x + 15y) : (12x + 3y)
If x = y = 1, then required ratio = 10 : 23 : 15. so, option (1) is possible

If x = $\left(\frac{1}{4}\right)$ and y = $\left(\frac{1}{15}\right)$ then required tatio

= 7 : 15 : 16.
So, option (2) is possible.

If x = $\left(\frac{1}{2}\right)$ and y = $\left(\frac{1}{6}\right)$ then required tatio

= 6 : 13 : 13.
So, option (3) is possible.

If x = $\left(\frac{1}{8}\right)$ and y = $\left(\frac{1}{15}\right)$ then required tatio

= 9 : 20 : 17.
So only option (4) is not possible.

16. 2 Statement I follows from the fact if volume ratio is 1 : 1 : 1 and C_A, C_B, C_C are in AP then volume of milk in the container will also be in AP.
Statement II need not be true. For example, if the volumes are such that the amount of milk is the same (i.e. in AP with common difference = 0), then the volumes are not equal.
Statement III would always be true if the volumes of V_A and V_B are equal.

17. 3 Let a and b be the quantity and concentration of the sugar solution in the vessel having the least quantity.

$\frac{ab}{100}+\frac{(a+5)b}{100}+\frac{(a+10)b}{100} = 5.4$

Also, b – a = 8
Hence, the required quantities are 7 kg, 12 kg, 17 kg.

18. 4 In one hour,
Let quantity of water from pipe Y = w_1
Let quantity of water from pipe X = w_2 and acid from pipe X = a

$\Rightarrow \frac{a}{w_1+w_2+a} = \frac{8}{100}$ ...(i)

In second case, the bucket is not full.

$\frac{a}{\frac{w_1}{2}+w_2+a} = \frac{10}{100}$ ... (ii)

Comparing (i) and (ii),

When a = 8, w_1 = 40 and w_2 + a = 60.
Hence, ratio of acid to water coming out of

pipe X = $\frac{a}{w_2} = \frac{8}{52}$ = 2 : 13

19. 2 In first operation only $\frac{1}{2}$L of alcohol will be poured into the container A_1.

In the second operation half of $\frac{1}{4}$L will be poured in each of container A_1 and A_2.
If the operations continue till infinite, the amount of alcohol in the container A_1 will be

$= \frac{1}{2}+\frac{1}{8}+\frac{1}{32}+\frac{1}{128}+...\infty$

$\frac{\frac{1}{2}}{1-\frac{1}{4}} = \frac{2}{3}$

In infinite operations, contents in A_1 would be

$\frac{1}{2}+\frac{1}{2^2}+\frac{1}{2^3}+...\infty = 1$

$\Rightarrow$ Concentration of alcohol = $\frac{\frac{2}{3}}{1} \times 100\% \simeq 67\%$.

20. 1 For every litre of mixture sold Ramu received Rs. 2.5. Therefore, the amount of Ramu's share of milk in the final mixture is $\frac{2.5}{20} = \frac{1}{8}$

i.e. Out of 8 litres of milk 1 litre was contributed by Ramu and rest 7 litres was contributed by Kamu and Namu.
Now, amount of milk contributed by

Kamu = $\left(\frac{2}{5}\right) \times 10$ = 4 litres and

Namu = $\left(\frac{1}{5}\right) \times 15$ = 3 litres

Between Kamu and Namu, they contributed 7 litres of Milk and 18 litres of Water
But total mixture is of 5 + 10 + 15 = 30 litres
Hence, Ramu had 1 litre of Milk and 4 litre of water
Required ratio = 1 : 4.

21. 4 In both jars concentration of milk is more than 50%. Therefore, in jar three, concentration of milk can never be 50%.

22. Amount of alcohol that goes out in the 10% liquid taken out is 20 ml. To this mixture, 100 ml of pure alcohol is added. So total volume of alcohol in the new mixture = 200 – 20 + 100 = 280 ml.
Therefore, percentage of alcohol in the new mixture

$= \left(\frac{280}{1000}\right) \times 100 = 28\%.$

23. 1 Each day $\frac{2}{3}$ of wine is remaining.

So, at the end of third day $\left(\frac{2}{3}\right)^3 \times 180L = \frac{8}{27} \times 180$

$= \frac{160}{3}L$ is left

24. $54\left(1-\frac{x}{54}\right)^z = 24$ or $\frac{24}{54} = \left(1-\frac{x}{54}\right)^z$

Therefore, x = 18 L

25. 4 Three successive decreases of 20% in the solution would mean that 51.2% of original amount of the contents is left.
The ratio is 512 : 488.

26. 4 $\left(\frac{x-a}{x-2a}\right)^2 = \frac{25}{16}$ or $a = \frac{x}{6}$

where x is taken as the capacity of the vessels.

27. 1 Let x be the initial amount of the mixture

$\therefore$ Amount of milk in litre $= \frac{5}{8}x$ and

water in litre $= \frac{3}{8}x$

In 6 litre of mixture,

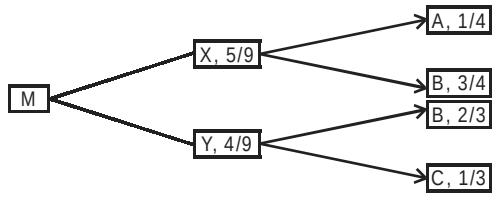
Milk $= 6 \times \frac{5}{8} = \frac{15}{4}$ litre and water $= 6 \times \frac{3}{8} = \frac{9}{4}$ litre

$\therefore \frac{5}{8}x - \frac{15}{4} = \frac{3}{8}x - \frac{9}{4} + 6$

$\Rightarrow 2x = 60 \Rightarrow x = 30$ litre

$\therefore$ Initial amount of milk $= 30 \times \frac{5}{8} = 18.75$ litre

28. 2



Then, fraction of B in Product M

$= \left(\frac{5}{9}\right)\times\left(\frac{3}{4}\right)+\left(\frac{4}{9}\right)\times\left(\frac{2}{3}\right)=\frac{77}{108}$

In 864 units of Product M, amount of B

$= 864\times\left(\frac{77}{108}\right)= 616$

In the final mixture 50% is B. Then amount of final mixture = 616 × 2 = 1232
Water added = 1232 – 864 = 368.

29. 1 Use $x\left(1-\frac{y}{x}\right)^n$, where x is the original quantity, y is the quantity taken out n times.

$\therefore$ Milk left after two operations $= 80\left(1-\frac{8}{80}\right)^2$

= 64.8 L

30. 3 Let v be the initial volume of the cylindrical container.

$\frac{4}{7}v - x = \frac{1}{4}v \Rightarrow 9v = 28x$ or $x = \frac{9v}{28}$

Since by adding 35 L the level rises from a quarter to a half, the volume of the vessel = 35 × 4 = 140 L.

Therefore, $x = \frac{9\times140}{28} = 45L$

Alternate Method:
We can also do this question by picking the options.