

Question 1: A drain pipe can drain a tank in 12 hours, and a fill pipe can fill the same tank in 6 hours. A total of n pipes - which include a few fill pipes and the remaining drain pipes - can fill the entire tank in 2 hours. How many of the following values could n take?

- a. 24 ✓
 - b. 16
 - c. 33 ✓
 - d. 13
 - e. 9 ✓
 - f. 8
- A. 3 ✓
 B. 4
 C. 2
 D. 1

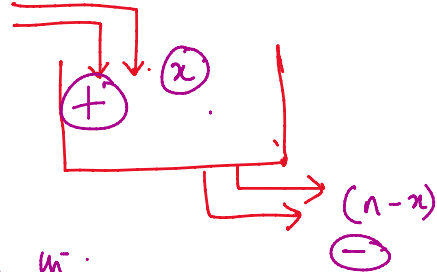
In 1 hr

1 drain pipe $\rightarrow \frac{1}{12}$ hr

1 fill pipe $\rightarrow \frac{1}{6}$ hr

$(n-x)$ drain pipes $\rightarrow (n-x) \times \frac{1}{12}$ hr

x fill pipes $\rightarrow x \times \frac{1}{6}$ hr



$$\text{Net fill} \rightarrow \left[\frac{x}{6} - \frac{(n-x)}{12} \right] = \frac{x}{6} + \frac{x}{12} - \frac{n}{12} = \frac{2x}{12} + \frac{x}{12} - \frac{n}{12}$$

$$= \frac{3x}{12} - \frac{n}{12}$$

$$\frac{3x}{12} - \frac{n}{12} = \frac{1}{2}$$

$$3x - n = 6 \quad \Rightarrow \quad n = 3x - 6 = 3(x-2)$$

Question 2: Pipe A, B and C are kept open and together fill a tank in t minutes. Pipe A is kept open throughout, pipe B is kept open for the first 10 minutes and then closed. Two minutes after pipe B is closed, pipe C is opened and is kept open till the tank is full. Each pipe fills an equal share of the tank. Furthermore, it is known that if pipe A and B are kept open continuously, the tank would be filled completely in t minutes. How long will it take C alone to fill the tank?

- A. 18
- B. 36
- C. 27
- D. 24 ✓

A takes A min to fill

B " B " " "

C " C " " "

In 1 min

A fills $\frac{1}{A}$ of the tank.

B " $\frac{1}{B}$ " " "

C " $\frac{1}{C}$ " " "

$$\frac{1}{A} + \frac{1}{B} + \frac{1}{C} = \frac{1}{t}$$

In t min
 A fills $\frac{t}{A}$ of the tank.

In 10 min
 B fills $\frac{10}{B}$ " " "

together (A+B+C) fills $\frac{1}{t}$ of the tank.

$$\frac{1}{A} = \frac{1}{3t}$$

$$\frac{t}{A} = \frac{1}{3}$$

In t min (A+B) can fill $t \left[\frac{1}{A} + \frac{1}{B} \right] = 1$

In 10 min B falls $\frac{10}{B}$ " " "
 In $(t-12)$ min C falls $\frac{t-12}{C}$ of the fault.

$$\frac{10}{A} = \frac{1}{3}$$

$$\text{Add } t [A+B]^{-1}$$

$$\frac{10}{B} = \frac{1}{3} \quad \frac{1}{B} = \frac{1}{30}$$

$$\frac{1}{A} + \frac{1}{B} = \frac{1}{t}$$

$$\frac{1}{3t} + \frac{1}{30} = \frac{1}{t}$$

$$\frac{1}{t} - \frac{1}{3t} = \frac{1}{30}$$

$$\frac{2}{3t} = \frac{1}{30}$$

$$\frac{20-12}{C} = \frac{1}{3}$$

$$\frac{t-12}{C} = \frac{1}{3}$$

$$t = \frac{10}{\frac{1}{30} \times 2} = 20$$

$$C = 8 \times 3 = 24$$

Principal

5. The compound interest on Rs. 2,000 in 2 years, if the rate of interest is 4% per annum for the first year and 3% per annum for the second year, will be

- (A) Rs. 143.40
- (B) Rs. 141.40
- (C) Rs. 140.40
- (D) Rs. 142.40

Compound interest \rightarrow Interest on the total Amount.

$$\text{Interest in year 1} = \frac{P \times R}{100} = \frac{2000 \times 4}{100} = 80$$

$$\text{Amount at the end of 1st yr} = 2000 + 80 = 2080$$

$$\text{Interest in year 2} = \frac{A \times R}{100} = \frac{2080 \times 3}{100} = 20.8 \times 3 = 62.4$$

6. The difference between the squares of two consecutive even integers is always divisible by

- (A) 3
- (B) 4
- (C) 6
- (D) 7

2, 4 4, 6 6, 8

Even integers $\rightarrow 2n$ where n is any integer.

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

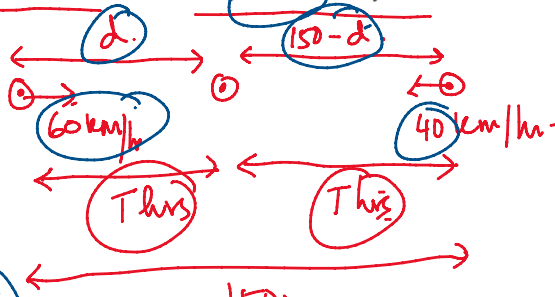
$$2n, 2n+2$$

$$\begin{aligned} (2n+2)^2 - (2n)^2 &= (2n+2+2n)(2n+2-2n) \\ &= (4n+2)(2) \\ &= 2(2n+1)2 = 4(2n+1) \end{aligned}$$

8. Two automobiles are 150 kilometers apart and traveling towards each other. One automobile is moving at 60 km/h and the other is moving at 40 km/h. In how many hours will they meet?

- (A) 2.5
- (B) 2.0
- (C) 1.75
- (D) 1.5

$$\text{Time} = \frac{\text{distance}}{\text{Speed}}$$



$$T = \frac{d}{60} = \frac{90}{60} = 1.5$$

Speed.

$$\frac{d}{60} = \frac{150-d}{40} = T$$

$$2d = 3(150-d)$$

$$2d = 450 - 3d$$

5d = 450

d = 90

1.5

9. Sushant spent 18% of his monthly salary on buying electronic goods and 32% of the monthly salary on repair work in his house. Out of remaining amount he invested 42% in fixed deposit. If he was left with Rs. 12,325, how much is his annual salary?

- (A) Rs. 5,18,000
- (B) Rs. 5,15,600
- (C) Rs. 5,10,000
- (D) Rs. 5,01,000

Yearly Sal. = x

Annual Sal = $12x$

Electronics $\rightarrow 18\% x$

Repair $\rightarrow 32\% x$

Remaining = $(100\% - 50\%)x = 50\% x$

FD = $42\% \times 50\% x = 21\% x$

Sal. left = $29\% x$

$$\frac{29}{100} x = 12325$$

$$x = \frac{12325 \times 100}{29} = 42500$$

12. The compound interest on Rs.30,000 at 7% per annum is Rs.4,347. The period (in years) is

- (A) 2
- (B) 2.5
- (C) 3
- (D) 4

$$\text{Amount (A)} = P \left(1 + \frac{R}{100}\right)^N$$

P = principal R = rate
N = no of years.

CI = Amount - Principal

$$CI = P \left(1 + \frac{R}{100}\right)^N - P$$

P = 30000
R = 7
 $x^3 = x \times x \times x$

$$30000 \left(1 + \frac{7}{100}\right)^N - 30000 = 4347$$

CI = 4347

$$30000 (1.07)^N = 34347$$

$$(1.07)^N = \frac{34347}{30000} = 1.1449$$

$(1.07)^N$

1.07^2

1.07^3

107 x 107

107 + 7 = 114

7 x 7 = 49

11449

16. The ratio of cost price to sale price is 20:23. What is the profit percentage?

- (A) 20%
- (B) 15%**
- (C) 5%
- (D) 6%

$$SP = CP + \text{Profit}$$

$$S = C + P$$

$$C : S = 20 : 23$$

$$\frac{C}{C+P} = \frac{20}{23}$$

$$\left(\frac{P}{C}\right) = \frac{23}{20} - 1 = \left(\frac{3}{20}\right)$$

$$\text{Profit \%} = \frac{\text{Profit}}{CP} \times 100$$

$$= \left(\frac{P}{C}\right) \times 100$$

$$= \frac{3}{20} \times 100$$

$$= 15\%$$

$$\frac{P+C}{C} = \frac{23}{20}$$

$$\frac{P}{C} + 1 = \frac{23}{20}$$

17. A sum of money placed at compound interest doubles itself in 5 years. In how many years it would be 8 times of itself at the same rate of interest?

- (A) 10 years
- (B) 15 years**
- (C) 20 years
- (D) 7 years

↓
Amount = 2x Principal

$$A = P \left(1 + \frac{R}{100}\right)^N$$

$$2P = P \left(1 + \frac{R}{100}\right)^5$$

$$\left(1 + \frac{R}{100}\right)^5 = 2$$

$$\left[\left(1 + \frac{R}{100}\right)^5\right]^3 = 2^3 = 8$$

$$8 = 2^3$$

$$\left(1 + \frac{R}{100}\right)^{15} = 8$$

18. A sum of money at compound interest amounts to Rs.650 at the end of the first year and Rs.676 at the end of the second year. The sum of money is

- (A) Rs.600
- (B) Rs.620
- (C) Rs.580
- (D) Rs.625**

$$A = P \left(1 + \frac{R}{100}\right)^N$$

$$650 = P \left(1 + \frac{R}{100}\right)^1$$

$$676 = P \left(1 + \frac{R}{100}\right)^2$$

$$\left(1 + \frac{R}{100}\right) = \frac{676}{650}$$

$$650 = P \times \frac{676}{650}$$

$$24 \times 26 = 624$$

$$\begin{array}{r} 24 \ 26 \\ 650 \times 650 \\ \hline 675 \\ 27 \end{array}$$

$$P = \frac{650 \times 650}{676}$$