

# Revision Age

## Important Formulas

Given below are a few formulas related to the Problems on ages which may help to answer the questions quicker and also get a better idea of the concept:

- If you are assuming the current age to be  $x$ , then the age after  $n$  years will be  $(x+n)$  years.
- If you are assuming the current age to be  $x$ , then the age before  $n$  years will be  $(x-n)$  years.
- If the age is given in the form of a ratio, for example,  $p:q$ , then the age shall be considered as  $qx$  and  $px$
- If you are assuming the current age to be  $x$ , then  $n$  times the current age will be  $(x \times n)$  years
- If you are assuming the current age to be  $x$ , then  $1/n$  of the age shall be equal to  $(x/n)$  years

Solving problems on ages is a two step process.

- Create linear equations based on statements provided.
- Solve the equations to get the values as required ages.

**Q 1 -** If the ratio of ages of two persons Ram and sham is 5:4 . After Three years their age ratio changes and becomes 11:9. In that case tell about the present age of mr. sham.

- A - 23 years
- B - 24 years
- C - 25 years
- D - 26 years

**Answer - B**

**Explanation**

If the age of Mr. Ram  $5x$  and  $4x$  is the age of Mr. sham.

Then,  $(5x+3)/(4x+3) = 11/9 \Rightarrow 9(5x+3) = 11(4x+3) \Rightarrow x = (33-27) = 6$   
So the present age of Mr. sham  $= 6*4 = 24$  years.

**Q 2 -** A mother is 30 time older in the comparison of her daughter. After the period of 18 year , the mother age would be thrice in the comparison of his daughter . In that case tell about the present age of mother.

- A - 40 years
- B - 41 years
- C - 42 years
- D - 43 years

**Answer - A**

**Explanation**

Let daughter present age be  $x$  year .

in that case mother present age would be  $= 30x$  years

$$30x + 18 = 3(x + 18) \Rightarrow 27x = 36 \Rightarrow x = 4/3$$

$\therefore$  so the present age of mother  $= (30 * 4/3) = 40$  years.

**Q 3 -** The ratio of present ages of three persons ajay , vijay and sanjay are in the proportion of 4: 7: 9. Before 8 year total sum of their age is 56. What should be the present ages?

- A - 28 and 36 years
- B - 28 and 38 years
- C - 30 and 36 years
- D - 36 and 28 years

**Answer - A**

**Explanation**

If the present age of ajay , vijay and sanjay is  $4x$  ,  $7x$  and  $9x$  years.

Total sum of ages of ajay, vijay and sanjay before 8 years ago

$$= (4x-8)+(7x-8)+(9x-8)$$

$$=(20x-24) \text{ years.}$$

$$\therefore 20x-24 = 56 \Rightarrow 20x = 80 \Rightarrow x=4$$

Hence, it proves that age of ajay is  $4*4 = 16$  years,  
vijay  $(7*4) = 28$  years and sanjay  $(9* 4) = 36$  years.

**Q 4 -** Daughter's present age is  $2/5$  in the comparison of her mother .8 year later , age of her daughter will be  $1/2$  in the comparison of her mother. Find out mother present age?

- A - 39 years.
- B - 40 years
- C - 41 years
- D - 42 years

**Answer - B**

**Explanation**

If the present age of mother is equal to  $x$  year.

In that situation the daughter present age would be  $= 2x/5$  years.

$$2x/5 + 8 = 1/2 (x+8) \Rightarrow 4x+ 80 = 5x+40 \Rightarrow x = 40.$$

The mother age at the present time is  $= 40$  years.

**Q 5 - Ajay age was double in the comparison of bhuvan before 3 years. Seven years hence, the sum of both ages would be 83 years. What should be the age at the present time of both?**

- A - 43 years
- B - 44 years
- C - 45 years
- D - 46 years

**Answer - C**

**Explanation**

Before 3 year let bhuvan age be  $x$  years.

3 years before , ajay age will be  $2x$  years.

Now Bhuwan's age  $=(x+3)$  years and ajay age  $=(2x+3)$  years.

$$(x+3)+7+(2x+3)+7 = 83 \Rightarrow 3x+20 = 83 \Rightarrow 3x = 63 \Rightarrow x = 21$$

Now the bhuvan present age  $=(21+3) = 24$  years

Now the ajay present age  $=(2 * 21 + 3)$  years  $= 45$  years.

**Q 6 - I am 4 year older in the comparison of my sister, but my brother who is the youngest among us is 7 year younger to myself. My father is three times in the comparison of my brother. The present age of my sister 18 year and my father is 3 year older in the comparison of my mother. In that situation what should be the present age of my mother?.**

- A - 42 years
- B - 43 years
- C - 44 years
- D - 45 years

**Answer - A**

**Explanation**

If my sister age is  $x$  years. Then,

Sister -  $x$

I -  $x+4$

Brother -  $(x+4-7) = x-3$

Father -  $3(x-3)$

Given  $x = 18$

$\therefore$  Father's age  $= 3(18-3) = 45$  years.

Mother age  $= (45-3) = 42$  years.

**Q 7 -** Ajay is as much younger to vijay as he is older to vinay. If 48 years is the sum of the ages of vijay and buwan . Then find out the present age of Mr. ajay ?

- A - 21 years
- B - 22 years
- C - 23 years
- D - 24 years

**Answer - D**

**Explanation**

$$V-A = A-B \Rightarrow V+B = 2A = 48 \Rightarrow 24$$

Now, We can say that the present age of Mr. Ajay is 24 years.

**Q 8 -** If 100 year is equal to the sum of the ages of father and son. 2:1 was the ratio of father and son before the period of 5 years. Find out the ratio of ages which would be after the period 10 year.

- A - 3:4
- B - 3:5
- C - 4:3
- D - 5:3

**Answer - D**

**Explanation**

If the age of father at the present time = x years

His son age at the present time =  $(100-x)$  years.

$$x-5 / (100-x-5) = 2/1 \Rightarrow (x-5) = 2(95-x) \Rightarrow 3x = 195 \Rightarrow x = 65$$

Ratio of the ages of man and son after 10 years =  $(65+10)/(35+10) = 75/45 = 5/3 = 5:3$

**Q 9.** The present age of Aradhana and Aadrika is in the ratio 3:4. 5 years back, the ratio of their ages was 2:3. What is the present age of Aradhana?

- 12 years
- 15 years
- 20 years
- 22 years
- 10 years

**Answer: (2) 15 years**

**Solution:**

Let the present age of Aradhana be  $3x$

Let the present age of Aadrika be  $4x$

5 years back, Aradhana's age =  $(3x-5)$  years

5 years back, Aadrika's age =  $(4x-5)$

According to the question,  $(3x-5) : (4x-5) = 2:3$

$$\Rightarrow (3x-5) \div (4x-5) = 2/3$$

$$\Rightarrow 3(3x-5) = 2(4x-5)$$

$$\Rightarrow 9x-15 = 8x-10$$

$$\Rightarrow x = 5$$

Therefore, Aradhana's current age =  $3 \times 5 = 15$  years

**Q 10.** If the total ages of Iqbal and Shikhar is 12 years more than the total age of Shikhar and Charu. Charu is how many years younger than Iqbal?

11 years

13 years

15 years

None of the above

Cannot be Determined

**Answer: (4) None of the Above**

**Solution:**

Let the age of Iqbal be  $x$

Let the age of Shikhar be  $y$

Let the age of Charu be  $z$

Then, according to question,

$$(x+y) - (y+z) = 12$$

$$\Rightarrow x+y-y-z = 12$$

$$\Rightarrow x-z = 12$$

Thus, Charu is 12 years younger than Iqbal

**Q 11.** A father is twice as old as his daughter. If 20 years ago, the age of the father was 10 times the age of the daughter, what is the present age of the father?

- 40 years
- 32 years
- 33 years
- 45 years
- 22 years

**Answer: (4) 45 years**

**Solution:**

Let the present age of the father be  $2x$

So, the present age of the daughter =  $x$

According to the question,

$$\Rightarrow 2x - 20 = 10(x - 20)$$

$$\Rightarrow 2x - 20 = 10x - 200$$

$$\Rightarrow 8x = 180$$

$$\Rightarrow x = 22.5$$

Thus, the present age of father =  $22.5 \times 2 = 45$  years

**Q 12.** Arun is 2 years older than Bharat who is twice as old as Charat. If the total of the ages of Arun, Bharat and Charat be 27, then how old is Bharat?

- 10 years
- 12 years
- 15 years
- 13 years
- 11 years

**Answer: (1) 10 years**

**Solution:**

Let the present age of Charat be  $x$

So, Bharat's present age =  $2x$

And Arun's present age =  $2+2x$

According to the question,

$$x + 2x + 2 + 2x = 27$$

$$\Rightarrow 5x + 2 = 27$$

$$\Rightarrow 5x = 25$$

$$\Rightarrow x = 5$$

So, Bharat's age =  $2 \times 5 = 10$  years

## **Important Formulas**

Given below are a few formulas related to the Problems on ages which may help to answer the questions quicker and also get a better idea of the concept:

- If you are assuming the current age to be  $x$ , then the age after  $n$  years will be  $(x+n)$  years.
- If you are assuming the current age to be  $x$ , then the age before  $n$  years will be  $(x-n)$  years.
- If the age is given in the form of a ratio, for example,  $p:q$ , then the age shall be considered as  $qx$  and  $px$
- If you are assuming the current age to be  $x$ , then  $n$  times the current age will be  $(x \times n)$  years
- If you are assuming the current age to be  $x$ , then  $1/n$  of the age shall be equal to  $(x/n)$  years

Mazi iccha ashi aahe ki he formula dile aahet pan aapan hya way ne nako jayala.

Aapan normal equation tayar karun te solve karu ase mala vatat aahe So tumhi formula pan bagha he khalche 6 and solve karayche try karu.

1) t years ago the age of A was  $n_1$  times the age of B, and at present A's age is  $n_2$  times that of B, then;

$$\text{A's present age} = \left( \frac{n_1 - 1}{n_1 - n_2} \right) n_2 * t \text{ years}$$

$$\text{And, B's present age} = \left( \frac{n_1 - 1}{n_1 - n_2} \right) t \text{ years}$$

2) The present age of A is  $n_1$  times the present age of B. After t years, age of A becomes  $n_2$  times the age of B, then;

$$\text{A's present age} = \left( \frac{n_2 - 1}{n_1 - n_2} \right) n_2 * t \text{ years}$$

$$\text{And, B's present age} = \left( \frac{n_2 - 1}{n_1 - n_2} \right) t \text{ years}$$

3)  $t_1$  years ago, the age of A was X times the age of B and after  $t_2$  years age of A becomes Y times the age of B, then;

$$\text{A's present age} = \frac{x(t_1+t_2)(Y-1)}{X-Y} + t_1 \text{ years}$$

$$\text{And B's present age} = \frac{t_2(Y-1)+t_1(X-1)}{X-Y} \text{ years}$$

4) The sum of present ages of A and B is X years, t years ago, the age of A was Y times the age of B, then;

$$\text{Present age of A} = \frac{XY - t(Y-1)}{Y+1} \text{ Years}$$

$$\text{And, the present age of B} = \frac{X + t(Y-1)}{Y+1} \text{ Years}$$

5) The sum of present ages of A and B is X years, t years after, the age of A becomes Y times the age of B, then;

$$\text{A's present age} = \frac{XY + t(Y-1)}{Y+1} \text{ Years}$$

$$\text{And B's present age} = \frac{x - t(y-1)}{y+1} \text{ Years}$$

6) The ratio of the present ages of A and B is p: q and after t years, it becomes r: s, then;

$$\text{A's present age} = \frac{pt(r-s)}{ps-qr} \text{ Years}$$

$$\text{And, B's present age} = \frac{qt(r-s)}{ps-qr} \text{ Years}$$

1) A mother is twice as old as her son. If 20 years ago, the age of the mother was 10 times the age of the son, what is the present age of the mother?

- A. 38 years
- B. 40 years
- C. 43 years
- D. 45 years

The Correct answer is (D)

**Explanation:**

Let the age of son = X years

∴ Age of mother would be = 2X

As per question 20 years ago;

$$10(X - 20) = 2X - 20$$

$$10X - 200 = 2X - 20$$

$$10X - 2X = -20 + 200$$

$$8X = 180$$

$$X = \frac{180}{8} = 22.5 \text{ years}$$

∴ Age of mother =  $22.5 * 2 = 45$  years

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2) Four years ago a man was 6 times as old as his son. After 16 years he will be twice as old as his son. What is the present age of man and his son?

- A. 34, 9
- B. 33, 7
- C. 35, 5
- D. 36, 6

The Correct answer is (A)

**Explanation:**

Let age of son 4 years ago be = X

So, age of man 4 years ago would be = 6X

As per question after 16 years;

$2 * \text{age of son} = \text{age of man}$

$$2(X + 4 + 16) = (6X + 4 + 16)$$

$$2X + 40 = 6X + 20$$

$$2X - 6X = 20 - 40$$

$$-4X = -20$$

$$X = 5 \text{ years}$$

$\therefore$  Present age of son =  $5 + 4 = 9$  years

Present age of man =  $6X + 4 = 6 * 5 + 4 = 30 + 4 = 34$  years

**Solution 2:**

Apply formula; A's (man) present age  $\frac{x(t_1+t_2)(Y-1)}{x-y} + t_1$

$$\begin{aligned}&= \frac{6(4+16)(2-1)}{6-2} + 4 \\&= \frac{6*20*1}{4} + 4 \\&= \frac{120}{4} + 4 = 34 \text{ years}\end{aligned}$$

And, B's (son) present age =  $\frac{t_2(Y-1)+t_1(X-1)}{X-Y}$  years

$$\begin{aligned}&= \frac{16(2-1)+4(6-1)}{6-2} \\&= \frac{16*1+4*5}{4}\end{aligned}$$

$$\begin{aligned}&= \frac{16+20}{4} = 9 \text{ years}\end{aligned}$$

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3) The ratio of the ages of Minu and Meera is 4:2. If the sum of their ages is 6 years, find the ratio of their ages after 8 years.

- A. 8:6
- B. 6:5
- C. 6:4
- D. 7:5

The Correct answer is (B)

**Explanation:**

Let the age of Minu is  $4X$  and age of Meera  $2X$ .

As per question;  $4X + 2X = 6$

$$6X = 6$$

$$X = 1$$

$\therefore$ Minu's age =  $4*1= 4$  years

Meera's age =  $2*1= 2$  years

Ratio of their ages after 8 years;

$$= (4+8): (2+8)$$

$$= 12: 10$$

$$= 6:5$$

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4) The ratio of the ages of Seeta and Geeta is 2:7. After 6 years, the ratio of their ages will be 1:2. What is the difference in their present ages?

- A. 8 years
- B. 9 years
- C. 10 years
- D. 11 years

The Correct answer is (C)

**Explanation:**

Let the age of Seeta is  $2X$  and age of Geeta  $7X$ .

As per question after 6 years;

$$\frac{2X+6}{7X+6} = \frac{1}{2}$$

$$4X + 12 = 7X + 6$$

$$-3X = -6$$

$$X = 2$$

$$\therefore \text{Age of Seeta} = 2 * 2 = 4 \text{ years}$$

$$\text{Age of Geeta} = 7 * 2 = 14 \text{ years}$$

$$\text{Difference in their ages} = 14 - 4 = 10 \text{ years}$$

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5) Ten years ago, the sum of ages of a father and his son was 34 years. If the ratio of present ages of the father and son is 7:2, find the present age of the son.

- A. 12 years
- B. 11 years
- C. 10 years
- D. 8 years

The Correct answer is (A)

**Explanation:**

Let the present age of the father is  $7X$  and present age of son is  $2X$ .

As per question, ten years ago;

$$(7X - 10) + (2X - 10) = 34$$

$$7X - 10 + 2X - 10 = 34$$

$$9X = 34 + 20$$

$$9X = 54$$

$$X = 6$$

$\therefore$  Present age of son =  $2 * 6 = 12$  years

6) The sum of the ages of father and his son is 44 years. If 6 years after the father will be 3 times as old as his son, what are their present ages?

- A. 36, 8
- B. 38, 6

C. 35, 9

D. 37, 7

The Correct answer is (A)

**Explanation:**

Let present age of son is  $X$  and present age of father is  $(44 - X)$ .

As per question, after 6 years;

$$3(X+6) = (44 - X) + 6$$

$$3X + 18 = 50 - X$$

$$4X = 50 - 18$$

$$4X = 32$$

$$X = 8 \text{ years}$$

$\therefore$  Present age of son = 8 years

And, present of father =  $44 - 8 = 36$  years

**Solution 2;**

**Apply formula;**

$$\text{A's (father) present age} = \frac{XY + t(Y-1)}{Y+1} \text{ years}$$

$$= \frac{44*3 + 6(3-1)}{3+1}$$

$$= \frac{132 + 18 - 6}{4} = 36 \text{ years}$$

$$\text{B's (son) present age} = \frac{X - t(Y-1)}{Y+1} \text{ years}$$

$$= \frac{44 - 6(3 - 1)}{3+1}$$

$$= \frac{44 - 18 + 6}{4} = \frac{32}{4} = 8 \text{ years}$$

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7) Ten years ago, Ajay was  $\frac{1}{3}$ rd as old as Vijay. If Ajay is 18 years old now, how old is Vijay now?

- A. 32 years
- B. 34 years
- C. 36 years
- D. 38 years

The Correct answer is (B)

**Explanation:**

Let Vijay is X years old now.

As per question, 10 years ago;

$$\frac{1}{3}(X-10) = 18 - 10$$

$$\frac{X}{3} - \frac{10}{3} = 8$$

$$\frac{X-10}{3} = 8$$

$$X - 10 = 24$$

$$X = 24 + 10 = 34 \text{ years}$$

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8) Age of father is seven times the age of his son. In the next 10 years, the age of father will be three times the age of his son. What is the age of father now?

- A. 35 years
- B. 37 years
- C. 39 years
- D. 41 years

The Correct answer is (A)

**Explanation:**

Let the age of son is  $X$  and age of father  $7X$

Age of son after 10 years =  $X+10$

Age of father after 10 years =  $7X + 10$

As per question, after 10 years;

$$3(X+10) = 7X + 10$$

$$3X + 30 = 7X + 10$$

$$4X = 20$$

$$X = 5 \text{ years}$$

$\therefore$  Age of father now =  $7 * 5 = 35$  years

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9) Twelve years ago, Budh was twice as old as Badri. If the ratio of their present ages is 4:3 respectively, find the difference between their present ages.

- A. 5 years
- B. 6 years
- C. 7 years
- D. 8 years

The Correct answer is (B)

**Explanation:**

Let 12 years ago age of Badri was  $X$  years and age of Budh was  $2X$ .

So, present age of Badri =  $X + 12$

And, present age of Budh =  $2X + 12$

As per question;

$$\frac{2X+12}{X+12} = \frac{4}{3}$$

$$6X + 36 = 4X + 48$$

$$2X = 12$$

$$X = 6$$

Present age of Badri =  $6 + 12 = 18$  years

Present age of Budh =  $2*6 + 12 = 24$  years

Required difference between their ages =  $24 - 18 = 6$  years

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10) Two years ago the ratio of ages of Naresh and Suresh was 3:2. If one year hence, the ratio of their ages will be 7:5, what is the sum of their present ages?

- A. 30 years
- B. 32 years
- C. 34 years
- D. 36 years

The Correct answer is (C)

**Explanation:**

Let two years ago, the ages of Naresh and Suresh was  $3X$  and  $2X$ .

So one year hence, the ages of Naresh and Suresh would be  $3X+3$  and  $2X+3$  respectively.

As per question;

$$\frac{3X+3}{2X+3} = \frac{7}{5}$$

$$15X + 15 = 14X + 21$$

$$X = 6$$

Present age of Naresh =  $3*6 + 2 = 20$  years

Present age of Suresh =  $2*6 + 2 = 14$  years

$\therefore$  Sum of their present ages =  $20 + 14 = 34$  years

11) The sum of the present age of mother and her son is 60 years. Six years ago, the age of the mother was five times the age of her son. What will be the age of her son after 6 years?

- A. 23 years
- B. 22 years
- C. 20 years
- D. 21 years

**Answer: C**

**Explanation:**

Let the present age of the son = $x$

Then, the present age of the mother = $(60-x)$

As per question:

Six years ago mother's age was 5 times the age of her son:

$$\text{So, } (60-x) - 6 = 5(x-6)$$

$$54 - x = 5x - 30$$

$$84 = 6x$$

$$x = 84/6$$

$$x = 14 \text{ Years}$$

Age of son after 6 years

$$= x + 6$$

$$= 14 + 6$$

$$= 20 \text{ Years}$$

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12) Simran is younger than Simarjeet by 7 years, and the ratio of their ages is 7:9. What is the age of Simran?

- A. 24 years
- B. 23.5 years
- C. 24.5 years
- D. 25 years

**Answer:** C

**Explanation:**

Let the age of Simran and Simarjeet be  $7x$  and  $9x$  respectively

According to the Question-

$$7x = 9x - 7$$

$$x = 7/2 = 3.5$$

So, Simran's age =  $7x = 7 \times 3.5 = 24.5$  years.

## Important Formulas

Given below are a few formulas related to the Problems on ages which may help to answer the questions quicker and also get a better idea of the concept:

- If you are assuming the current age to be  $x$ , then the age after  $n$  years will be  $(x+n)$  years.
- If you are assuming the current age to be  $x$ , then the age before  $n$  years will be  $(x-n)$  years.
- If the age is given in the form of a ratio, for example,  $p:q$ , then the age shall be considered as  $qx$  and  $px$
- If you are assuming the current age to be  $x$ , then  $n$  times the current age will be  $(x \times n)$  years
- If you are assuming the current age to be  $x$ , then  $1/n$  of the age shall be equal to  $(x/n)$  years

**Q 1.** The present age of Aradhana and Aadrika is in the ratio 3:4. 5 years back, the ratio of their ages was 2:3. What is the present age of Aradhana?

1. 12 years
2. 15 years
3. 20 years
4. 22 years
5. 10 years

**Answer: (2) 15 years**

**Solution:**

Let the present age of Aradhana be  $3x$

Let the present age of Aadrika be  $4x$

5 years back, Aradhana's age =  $(3x-5)$  years

5 years back, Aadrika's age =  $(4x-5)$

According to the question,  $(3x-5) : (4x-5) = 2:3$

$$\Rightarrow (3x-5) \div (4x-5) = 2/3$$

$$\Rightarrow 3(3x-5) = 2(4x-5)$$

$$\Rightarrow 9x-15 = 8x-10$$

$$\Rightarrow x = 5$$

Therefore, Aradhana's current age =  $3 \times 5 = 15$  years

**Q 2.** If the total ages of Iqbal and Shikhar is 12 years more than the total age of Shikhar and Charu. Charu is how many years younger than Iqbal?

1. 11 years
2. 13 years
3. 15 years
4. None of the above
5. Cannot be Determined

**Answer: (4) None of the Above**

**Solution:**

Let the age of Iqbal be  $x$

Let the age of Shikhar be  $y$

Let the age of Charu be  $z$

Then, according to question,

$$(x+y) - (y+z) = 12$$

$$\Rightarrow x + y - y - z = 12$$

$$\Rightarrow x - z = 12$$

Thus, Charu is 12 years younger than Iqbal

**Q 3.** A father is twice as old as his daughter. If 20 years ago, the age of the father was 10 times the age of the daughter, what is the present age of the father?

1. 40 years
2. 32 years
3. 33 years
4. 45 years
5. 22 years

**Answer: (4) 45 years**

**Solution:**

Let the present age of the father be  $2x$

So, the present age of the daughter =  $x$

According to the question,

$$\Rightarrow 2x - 20 = 10(x - 20)$$

$$\Rightarrow 2x - 20 = 10x - 200$$

$$\Rightarrow 8x = 180$$

$$\Rightarrow x = 22.5$$

Thus, the present age of father =  $22.5 \times 2 = 45$  years

**Q 4.** Arun is 2 years older than Bharat who is twice as old as Charat. If the total of the ages of Arun, Bharat and Charat be 27, then how old is Bharat?

1. 10 years
2. 12 years
3. 15 years
4. 13 years
5. 11 years

**Answer: (1) 10 years**

**Solution:**

Let the present age of Charat be  $x$

So, Bharat's present age =  $2x$

And Arun's present age =  $2+2x$

According to the question,

$$x+2x+2+2x = 27$$

$$\Rightarrow 5x+2 = 27$$

$$\Rightarrow 5x=25$$

$$\Rightarrow x=5$$

So, Bharat's age =  $2 \times 5 = 10$  years

**Q 5 -** If the ratio of ages of two persons Ram and sham is 5:4 . After Three years their age ratio changes and becomes 11:9. In that case tell about the present age of mr. sham.

- A - 23 years
- B - 24 years
- C - 25 years
- D - 26 years

**Answer - B**

### **Explanation**

If the age of Mr. Ram  $5x$  and  $4x$  is the age of Mr. sham.

Then,  $(5x+3)/(4x+3) = 11/9 \Rightarrow 9(5x+3) = 11(4x+3) \Rightarrow x = (33-27) = 6$   
So the present age of Mr. sham  $= 6*4 = 24$  years.

**Q 6 -** A mother is 30 time older in the comparison of her daughter. After the period of 18 year , the mother age would be thrice in the comparison of his daughter . In that case tell about the present age of mother.

- A - 40 years
- B - 41 years
- C - 42 years
- D - 43 years

**Answer - A**

### **Explanation**

Let daughter present age be  $x$  year .

in that case mother present age would be  $= 30x$  years

$$30x + 18 = 3(x + 18) \Rightarrow 27x = 36 \Rightarrow x = 4/3$$

$\therefore$  so the present age of mother  $= (30 * 4/3) = 40$  years.

**Q 7 -** The ratio of present ages of three persons ajay , vijay and sanjay are in the proportion of 4: 7: 9. Before 8 year total sum of their age is 56. What should be the present ages?

- A - 28 and 36 years
- B - 28 and 38 years
- C - 30 and 36 years
- D - 36 and 28 years

**Answer - A**

### **Explanation**

If the present age of ajay , vijay and sanjay is  $4x$  ,  $7x$  and  $9x$  years.

Total sum of ages of ajay, vijay and sanjay before 8 years ago

$$= (4x-8)+(7x-8)+(9x-8)$$

$$=(20x-24) \text{ years.}$$

$$\therefore 20x-24 = 56 \Rightarrow 20x = 80 \Rightarrow x= 4$$

Hence, it proves that age of ajay is  $4*4 = 16$  years,  
vijay ( $7*4$ ) = 28 years and sanjay ( $9* 4$ ) = 36 years.

**Q 8 -** Daughter's present age is  $\frac{2}{5}$  in the comparison of her mother .8 year later , age of her daughter will be  $\frac{1}{2}$  in the comparison of her mother. Find out mother present age?

A - 39 years.

B - 40 years

C - 41 years

D - 42 years

**Answer - B**

**Explanation**

If the present age of mother is equal to  $x$  year.

In that situation the daughter present age would be  $= \frac{2x}{5}$  years.

$$2x/5 + 8 = 1/2 (x+8) \Rightarrow 4x + 80 = 5x + 40 \Rightarrow x = 40.$$

The mother age at the present time is  $= 40$  years.

**Q 9 -** Ajay age was double in the comparison of bhuvan before 3 years. Seven years hence, the sum of both ages would be 83 years. What should be the age at the present time of both?

A - 43 years

B - 44 years

C - 45 years

D - 46 years

**Answer - C**

**Explanation**

Before 3 year let bhuvan age be  $x$  years.

3 years before , ajay age will be  $2x$  years.

Now Bhuwan's age  $=(x+3)$  years and ajay age  $=(2x+3)$  years.

$$(x+3)+7+(2x+3)+7 = 83 \Rightarrow 3x+20 = 83 \Rightarrow 3x = 63 \Rightarrow x = 21$$

Now the bhuwan present age  $=(21+3) = 24$  years

Now the ajay present age =  $(2 * 21 + 3)$  years = 45 years

Q 10 - Ajay is as much younger to vijay as he is older to vinay. If 48 years is the sum of the ages of vijay and buwan . Then find out the present age of Mr. ajay ?

A - 21 years

B - 22 years

C - 23 years

D - 24 years

**Answer - D**

**Explanation**

$$V-A = A-B \Rightarrow V+B = 2A = 48 \Rightarrow 24$$

Now, We can say that the present age of Mr. Ajay is 24 years.

Q 11 - If 100 year is equal to the sum of the ages of father and son. 2:1 was the ratio of father and son before the period of 5 years. Find out the ratio of ages which would be after the period 10 year.

A - 3:4

B - 3:5

C - 4:3

D - 5:3

**Answer - D**

**Explanation**

If the age of father at the present time =  $x$  years

His son age at the present time =  $(100-x)$  years.

$$\frac{x-5}{(100-x-5)} = \frac{2}{1} \Rightarrow$$

$$(x-5) = 2(95-x)$$

$$\Rightarrow 3x = 195$$

$$\Rightarrow x = 65$$

Ratio of the ages of man and son after 10 years =  $(65+10)/(35+10) = 75/45 = 5/3 = 5:3$

**12.** Father is four times the age of his daughter. If after 5 years, he would be three times of daughter's age, then further after 5 years, how many times he would be of his daughter's age?

A. 1.5 times

B. 2 times

C. 2.5 times

D. 3 times

Answer & Explanation

**Sol : Option C**

Let the daughter's age be  $x$  and father's age be  $4x$ .

So as per question,  $4x + 5 = 3(x + 5)$ . So  $x = 10$ .

Hence present age of daughter is 10 years and present age of father is 40 years.

So after  $5 + 5 = 10$  years, daughter age would be 20 years and father's age would be 50 years.

Hence father would be  $50/20 = 2.5$  times of daughter's age.

A pipe is connected to a tank or cistern. It is used to fill or empty the tank; accordingly, it is called an inlet or an outlet.

**Inlet:** A pipe which is connected to fill a tank is known as an inlet.

**Outlet:** A pipe which is connected to empty a tank is known as an outlet.

Problems on pipes and cisterns are similar to problems on time and work. In pipes and cistern problems, the amount of work done is the part of the tank of filled or emptied. And, the time taken to do a piece of work is the time take to fill or empty a tank completely or to a desired level.

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Points to remember:

1) If an inlet connected to a tank fills it in X hours, part of the tank filled in one hour is =  $1/X$

2) If an outlet connected to a tank empties it in Y hours, part of the tank emptied in one hour is =  $1/Y$

3) An inlet can fill a tank in X hours and an outlet can empty the same tank in Y hours. If both the pipes are opened at the same time and  $Y > X$ , the net part of the tank filled in one hour is given by;

$$= \left( \frac{1}{X} - \frac{1}{Y} \right)$$

If X is greater than Y, more water is flowing out of the tank than flowing into the tank. And, the net part of the tank emptied in one hour is given by;

$$= \left( \frac{1}{Y} - \frac{1}{X} \right)$$

4) An inlet can fill a tank in X hours and another inlet can fill the same tank in Y hours. If both the inlets are opened at the same time, the net part of the tank filled in one hour is given by;

$$= \left( \frac{1}{X} + \frac{1}{Y} \right)$$

Therefore, the time taken to fill the whole tank is given by;

$$= \left( \frac{XY}{Y+X} \right) \text{ hours}$$

In a similar way, If an outlet can empty a tank in X hours and another outlet can empty the same tank in Y hours, the part of the tank emptied in one hour when both the pipes start working together is given by;

$$= \left( \frac{1}{X} + \frac{1}{Y} \right)$$

Therefore, the time taken to empty the full tank is given by;

$$= \left( \frac{XY}{Y+X} \right) \text{ hours}$$

5) Three inlets A, B, and C can fill a tank in X, Y and Z hours respectively. If all the inlets are opened together, the time taken to fill the tank is given by;

$$= \left( \frac{X+Y+Z}{XY+YZ+ZX} \right) \text{ hours}$$

6) Two pipes can fill a tank in X and Y hours respectively and an outlet can empty the same tank in Z hours. If all the pipes are opened together, part of the tank filled in one hour is given by;

$$= \frac{1}{X} + \frac{1}{Y} - \frac{1}{Z}$$

∴ Time taken to fill the tank completely when all the pipes are working is given by;

$$= \frac{XYZ}{YZ+XZ-XY}$$

7) A pipe can fill a tank in X hours but due to a leak in the bottom, it can be filled in Y hours. The time taken by the leak to empty the tank is given by;

$$= \frac{XY}{Y-X}$$

## Type 2

**Inlet:** A pipe connected with a tank or cistern or a reservoir, that fills it, is known as an inlet.

**Outlet:** A pipe connected with a tank or cistern or reservoir, emptying it is known as an outlet.

### Important Concepts

1. If a pipe can fill a tank in  $x$  hours, part filled in 1 hour =  $1/x$ .
2. If a pipe can fill a tank in  $x$  hours and another pipe in  $y$  hours, part of tank filled in 1 hour when both the pipes are opened simultaneously =  $(1/x + 1/y) = (x+y)/xy$   
∴ Time taken to fill the tank by both the pipes when opened simultaneously =  $xy/(x+y)$
3. If a pipe can empty a tank in "y" hours, then tank emptied in 1 hour =  $1/y$
4. If a pipe can empty a tank in  $y$  hours and another pipe in  $x$  hours, part of tank emptied in 1 hour when both the pipes are opened simultaneously =  $(1/x + 1/y) = (x+y)/xy$   
∴ Time taken to empty the tank by both the pipes when opened simultaneously =  $xy/(x+y)$
5. If a pipe can fill a tank in  $x$  hours and another pipe can empty the full tank in  $y$  hours (where  $y > x$ ), then on opening both the pipes, the net part filled in 1 hour =  $1/x - 1/y = (y - x)/xy$   
∴ When both the pipes are opened simultaneously, time taken to fill the tank fully =  $xy/(y - x)$  hours.
6. If a pipe can fill a tank in  $x$  hours and another pipe can empty the full tank in  $y$  hours (where  $x > y$ ), then on opening both the pipes, the net part emptied in 1 hour =  $1/y - 1/x = (x - y)/xy$   
∴ When both the pipes are open simultaneously, time taken to empty the tank fully =  $xy/(x - y)$  hours.

**Q 1 -** Two pipes A and B can fill a tank in 24 hours and 30 hours separately. In the event that both the channel are opened all the while in the void tank, the amount of the truth will surface eventually taken by them to fill it?

- A - 12 hrs 10 min
- B - 13 hrs 20 min
- C - 12 hrs 20 min
- D - 11 hrs 20 min

**Answer - B**

**Explanation**

Part filled by A in 1 hour =  $1/24$ , part filled by B in 1 hour =  $1/30$

Part filled by (A+B) in 1 hour =  $(1/24 + 1/30) = 9/120 = 3/40$

Time taken by both to fill the tank =  $40/3$  hrs = 13 hrs 20 min.

2) A pipe can fill a tank in 6 hours and another pipe can empty the tank in 12 hours. If both the pipes are opened at the same time, the tank can be filled in

- A. 10 hours
- B. 12 hours
- C. 14 hours
- D. 16 hours

Correct answer; option (B)

**Answer with explanation:**

Part of the tank filled in one hour =  $\frac{1}{6}$

Part of the tank emptied in one hour =  $\frac{1}{12}$

Net part of the tank filled in one hour;

$$\begin{aligned} &= \frac{1}{6} - \frac{1}{12} \\ &= \frac{2-1}{12} = \frac{1}{12} \end{aligned}$$

$\frac{1}{12}$  Part of the tank can be filled in one hour.

$\therefore$  The tank will be filled completely in 12 hours.

## Solution 2:

$$\text{Apply formula;} = \frac{XY}{Y-X}$$

X = 6 hours and Y = 12 hours

$$\therefore \frac{6 * 12}{12 - 6} = 12 \text{ hours}$$

3) Three pipes A, B and C can fill a cistern in 8 minutes, 12 minutes and 16 minutes respectively. What is the time taken by three pipes to fill the cistern when they are opened together?

- A. 3.7 minutes
- B. 4 minutes
- C. 4.5 minutes
- D. 5 minutes

Correct answer; option (A)

## Answer with explanation:

$$\text{Part of the tank filled by A in one minute} = \frac{1}{8}$$

$$\text{Part of the tank filled by B in one minute} = \frac{1}{12}$$

$$\text{Part of the tank filled by C in one minute} = \frac{1}{16}$$

Net part of the tank filled by A+B+C in one minute;

$$= \frac{1}{8} + \frac{1}{12} + \frac{1}{16}$$

$$= \frac{6+4+3}{48} = \frac{13}{48}$$

$\frac{13}{48}$  Part of the cistern is filled in one minute.

$\therefore$  The whole tank will be filled in  $\frac{48}{13} = 3.7$  minutes

---

4) Two pipes can fill a tank in 6 hours and 8 hours respectively. A third pipe can empty the same tank in 12 hours. If all the pipes start working together, how long it will take to fill the tank?

- A. 4 hours
- B. 4.5 hours
- C. 4.8 hours
- D. 5.2 hours

**Correct Option (C)**

**Answer with explanation:**

$$\text{Part of the tank filled by two pipes in one hour} = \frac{1}{6} + \frac{1}{8}$$

$$\text{Part of the tank emptied by the third pipe in one hour} = \frac{1}{12}$$

$$\therefore \text{Net part of the tank filled in one hour} = \frac{1}{6} + \frac{1}{8} - \frac{1}{12}$$

$$= \frac{4+3-2}{24} = \frac{5}{24}$$

$\frac{5}{24}$  Part of tank can be filled in one hour

$$\therefore \text{The whole tank will be filled in } \frac{24}{5} = 4.8 \text{ hours}$$

---

5) A tank can be filled in 10 hours. After a leak in its bottom, it takes 12 hours to fill the tank. Find the time taken by the leak to empty the full tank?

- A. 45 hours
- B. 60 hours
- C. 50 hours
- D. 55 hours

Correct Option (B)

**Answer with explanation:**

Part of the tank filled in one hour before the leak =  $\frac{1}{10}$

Part of the tank filled in one hour after the leak =  $\frac{1}{12}$

Part of the tank emptied in one hour by the leak =  $\frac{1}{10} - \frac{1}{12}$   
 $= \frac{12 - 10}{120} = \frac{1}{60}$

$\frac{1}{60}$  part of tank will be emptied in one hour by the leak  
 $\therefore$  The full tank will be emptied by the leak in 60 hours.

**Solution 2:**

Apply formula;  $= \frac{XY}{Y - X}$

X = 10 hours

Y = 12 hours

$$\therefore \frac{10 \times 12}{12 - 10} = \frac{120}{2} = 60 \text{ hours}$$

6) Two pipes can fill a tank in 10 and 14 minutes respectively. A third pipe can empty the tank at the rate of 10 liters/minute. If all the pipes working together can fill the empty tank in 8 minutes, what is the capacity of the tank?

- A. 210 liters
- B. 215.4 liters
- C. 220 liters
- D. 225.4 liters

Correct answer; option (B)

**Answer with explanation:**

Let the capacity of the tank is X liters.

Part of the tank filled by two pipes in one minute =  $\frac{1}{10} + \frac{1}{14}$

10 liters is emptied in 1 minute

X liters will be emptied in  $\frac{X}{10}$  minutes

In  $\frac{X}{10}$  minutes the whole tank will be emptied.

In one minute  $\frac{10}{X}$  part of the tank will be emptied.

As per question;

$$\frac{1}{10} + \frac{1}{14} - \frac{10}{X} = \frac{1}{8}$$

$$\frac{1}{10} + \frac{1}{14} - \frac{1}{8} = \frac{10}{X}$$

$$\frac{112 + 80 - 140}{1120} = \frac{10}{X}$$

$$\frac{52}{1120} = \frac{10}{X}$$

$$52X = 11200$$

$$X = \frac{11200}{52} = 215.4 \text{ liters}$$

7) Two pipes can fill a tank in 20 minutes and 30 minutes respectively. If both the pipes are opened simultaneously, then the tank will be filled in

- A 10 minutes
- B 12 minutes
- C 15 minutes
- D 25 minutes

**Answer**

Correct option is

**B**

12 minutes

Part of tank filled by 1st pipe in 1 minute =  $\frac{1}{20}$

Part of tank filled by 2nd pipe in 1 minute =  $\frac{1}{30}$

$\therefore$  Part of tank filled by both the pipes in 1 minute =  $(\frac{1}{20} + \frac{1}{30}) = \frac{5}{60} = \frac{1}{12}$

Time taken to fill the tank = 12 minutes.

8) A cistern can be filled by an inlet in 6 hours and can be emptied by an outlet in 8 hours. If the inlet and outlet are opened together, in what time the cistern can be filled?

- A. 24 hours
- B. 26 hours
- C. 20 hours
- D. 18 hours

Correct Option (A)

**Answer with explanation:**

Part of the tank filled by the inlet in one hour =  $\frac{1}{6}$

Part of the tank emptied by the outlet in one hour =  $\frac{1}{8}$

Net part of the tank filled in one hour =  $\frac{1}{6} - \frac{1}{8}$

$$= \frac{8-6}{48} = \frac{1}{24}$$

$\frac{1}{24}$  part of the tank is filled in one hour  
∴ The whole tank will be filled in 24 hours.

**Solution 2:**

**Apply formula;**  $= \left( \frac{XY}{Y-X} \right)$

X = 6 hours

Y = 8 hours

$$\therefore \text{Required time} = \frac{6 * 8}{8 - 6} = \frac{48}{2} = 24 \text{ hours}$$

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9) 20 buckets can fill a tank when the capacity of each bucket is 12 liters. If the capacity of each bucket is 10 liters, find the number of buckets required to fill the tank.

- A. 30 buckets
- B. 34 buckets
- C. 24 buckets
- D. 27 buckets

Correct answer; option (C)

**Answer with explanation:**

Capacity of each bucket = 12 liters

20 buckets can fill the tank. So, capacity of tank =  $20 * 12 = 240$  liters

New capacity of bucket = 10 liters

So, 10 liters can be poured into the tank by one bucket

240 liters will be poured by  $\frac{1}{10} * 240 = 24$  buckets

## Important Terms

### 1. Speed in km/hr

$$a \text{ km/hr} = (a * 5 / 18) \text{ m/s.}$$

### 2. Speed in m/s

$$a \text{ m/s} = (a * 18/5) \text{ km/hr.}$$

3. Time taken by a train of length L metres to pass a pole or a standing man or a signal post is equal to the time taken by the train to cover

L Metres.

4. Time taken by a train of length L metres to pass a stationary object of length b metres is the time taken by the train to cover

(L + b) metres.

5. Suppose two train or two bodies are moving in the same direction at u m/s and v m/s , where  $u > v$ , then their

relative speed =  $(u - v)$  m/s.

6. Suppose two trains or two bodies are moving in opposite directions at u m/s and v m/s , then their

relative speed =  $(u + v)$  m/s.

7. If two trains of length a metres and b metres are moving in opposite directions at u m/s and v m/s, then time taken by the trains to cross each other =

$(a+b) / (u+v)$  sec.

8. If two train s of length a metres and b metres are moving in the same direction at u m/s and v m/s , then the time taken by the faster train to cross the slower train =

$(a+b) / (u-v)$  sec.

9. If two train ( or bodies) start at the same time from points A and B towards each other and after crossing they take a and b sec in reaching B and A respectively, then

$$(\text{A speed}) : (\text{B speed}) = (\sqrt{b} : \sqrt{a}).$$

**Q 1 -** What is 90 kmph as metres per second?

A - 15 m /sec

B - 20 m /sec

C - 25 m /sec

D - 30 m /sec

**Answer - C**

**Explanation**

$90 \text{ kmph} = (90 * 5/18) \text{ m/sec} = 25 \text{ m/sec.}$

**Q 2 -** What is 35 m/sec as km/hr?

A - 123 km/hr

B - 124 km/hr

C - 125 km/hr

D - 126 km/hr

**Answer - D**

**Explanation**

$35 \text{ m/sec} = (35 * 18 / 5) \text{ km/hr} = 126 \text{ km/hr.}$

**Q 3 -** A 75m long train is running at 54 km/hr. In how much time will it cross an electric pole?

A - 25 sec

B - 20 sec

C - 15 sec

D - 5 sec

**Answer - D**

### **Explanation**

Speed of the train =  $( 54 * 5 / 18 )$  m/sec = 15 m / sec.

Time taken to cross an electric pole = Time taken to cover 75m

$$= ( 75 / 15 ) \text{ sec}$$

$$= 5 \text{ sec.}$$

**Q 4 - A 415 m long train is running at 63 km/hr. In how much time will it cross a tunnel 285 m long?**

A - 40 sec

B - 50 sec

C - 60 sec

D - 70 sec

### **Answer - A**

### **Explanation**

Speed of the train =  $( 63 * 5 / 18 )$  m/sec

$$= 35/2 \text{ m/sec.}$$

Time taken to cross the tunnel = Time taken to cover  $( 415 + 285 )$  m

$$= ( 700 * 2/35 ) \text{ sec} = 40 \text{ sec.}$$

**Q 5 -** A train 125m long is running at 50 km/ hr. In what time will it pass a man , running at 5 km/hr in the **same direction** in which the train is going?

- A - 22 sec
- B - 20 sec
- C - 15 sec
- D - 10 sec

**Answer - D**

### **Explanation**

$$\begin{aligned}\text{Speed of the train relative to man} &= ( 50 - 5 ) \text{ km/hr (same direction So)} \\ &= ( 45 * 5 / 18) \text{ m/sec} \\ &= 25/2 \text{ m/ sec.}\end{aligned}$$

$$\text{Distance covered in passing the man} = 125\text{m.}$$

$$\begin{aligned}\therefore \text{Time taken} &= \text{Distance/time} \\ &= 125 / ( 25/2 ) \text{ sec} \\ &= ( 125 * 2 / 25 ) \text{ sec} \\ &= 10 \text{ sec.}\end{aligned}$$

**Q 6 -** A train 110 m long is running at 60 km / hr. In what time will it pass a man, **running in the direction opposite** to that of the train at 6 km/hr?

- A - 9 sec
- B - 8 sec
- C - 7 sec
- D - 6 sec

**Answer - D**

**Explanation**

Speed of the train relative to man = ( 60 + 6) km/hr = 66 km/hr  
= ( 66 \* 15 / 18 ) m/sec = 55/3 m/sec.

Distance covered in passing the man = 110m.

Time taken =distance /time  
=  $110/( 55/3)$  sec  
= (  $110 * 3 / 55$  ) sec  
= 6 sec.

**Q 7 -** A train 100m long takes 9 seconds to cross a man walking at 5 km/hr in the **direction opposite** to that of the train. Find the speed of the train.

- A - 55 km/hr
- B - 45 km/hr
- C - 25 km/hr
- D - 35 km/hr

**Answer - D**

### **Explanation**

Let the speed of the train be  $x$  km/hr.

$$\begin{aligned}\text{Relative speed} &= (x + 5) \text{ km/hr} \\ &= 5(x+5)/18 \text{ m/sec.}\end{aligned}$$

Distance covered in passing the man = 100m.

$$\therefore 100/5(x+5)/18 = 9$$

$$\Rightarrow 45(x+5) = 1800$$

$$\Rightarrow x+5 = 40$$

$$\Rightarrow x = 35.$$

Speed of the train = 35 km/hr.

**Q 8 -** Two train 128 m and 132m long are running **towards** each other on parallel lines at 42 km/hr and 30 km / hr respectively . In what time will they be clear of each other from the moment they meet?

- A - 13 sec
- B - 14 sec
- C - 15 sec
- D - 16 sec

**Answer - A**

### **Explanation**

$$\begin{aligned}\text{Relative speed} &= ( 42 + 30 ) \text{ km/hr} = 72 \text{ km/hr} \\ &= ( 72 * 5 / 18 ) \text{ m/sec} = 20 \text{ m / sec.}\end{aligned}$$

$$\begin{aligned}\text{Distance covered in passing each other} &= ( 128 + 132) \text{ m} = 260\text{m.} \\ \therefore \text{Required time} &= 260 / 20 \text{ sec} = 13 \text{ sec.}\end{aligned}$$

## Train Aptitude

Keep same units for all values mentioned in the problem i.e. as per the units of the given answers convert kilometer per hour (km/hr) to meters per second (m/s) and vice versa. In a similar way, convert meter (m) into centimeter (cm) and vice versa. See the examples given below:

### Formula to convert Km/hr into m/s:

- 1km is equal to 1000 meters
- 1 hours is equal to 3600 seconds
- 1Km/hr is equal to  $\frac{1000 \text{ meters}}{3600 \text{ Sec}}$  OR  $\frac{5}{18}$  meter/sec or m/s

So, to convert a value in Km/hr to m/s, we need to multiply it with  $\frac{5}{18}$ . See the example given below:

$$60 \text{ km/hr} * \frac{5}{18} = \frac{300}{18} = 16.7 \text{ m/s}$$

### Formula to convert m/s to Km/hr

- 1 meter is equal to 1/1000 km
- 1 sec is equal to 1/3600 hours
- 1 m/s is equal to  $\frac{1/1000}{1/3600}$  km/hr OR  $\frac{3600}{1000} = \frac{18}{5}$  km/hr

So, to convert a value in m/s to Km/hr, we will multiply it with 18/5. See the example given below:

$$20 \text{ m/s} * \frac{18}{5} = \frac{360}{5} = 72 \text{ km/hr}$$

Important Formula:

$$\text{Distance} = \text{Speed} \times \text{Time}$$

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

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

Important facts about moving trains:

1. The distance traveled by a train to cross a pole or person is equal to the length of the train.
2. The distance traveled by train when it crosses a platform is equal to the sum of the length of the train and length of the platform.
3. When two trains are travelling in opposite directions at speeds  $V_1$  m/s and  $V_2$  m/s then their relative speed is the sum of their individual speeds ( $V_1+V_2$ ) m/s.
4. Two trains are travelling in the same direction at  $V_1$  m/s and  $V_2$  m/s where  $V_1 > V_2$  then their relative speed will be equal to the difference between their individual speeds ( $V_1-V_2$ ) m/s.
5. When two trains of length X meters and Y meters are moving in opposite direction at  $V_1$  m/s and  $V_2$  m/s then the time taken by the trains to cross each other is  $= \frac{X+Y}{V_1+V_2}$
6. When two trains of length X meters and Y meters are moving in same direction at  $V_1$  and  $V_2$  where  $V_1 > V_2$  then the time taken by the faster train to cross the slower train  $= \frac{X+Y}{V_1-V_2}$
7. When two trains X and Y start moving towards each other at the same time from points A and B and after crossing each other the train X reaches point B in a seconds and train Y reaches points A in b seconds, then

$$\text{Train X speed: Train Y speed} = b^{1/2} : a^{1/2}$$

1) A train moving at speed of 90 km/hr crosses a pole in 7 seconds. Find the length of the train.

- A. 150 m
- B. 165 m
- C. 175 m
- D. 170 m

The correct option is (C).

**Answer with explanation:**

Length of the train is equal to the distance covered by train to cross the pole. So, we will find the distance travelled by the train in 7 seconds by applying the following formula:

$$\text{Distance} = \text{Speed} \times \text{Time}$$

Speed is given in Km/hr so we will convert it into m/s as answers are given in meters.

$$\text{Speed} = 90 * \frac{\frac{5}{18}}{} = 25 \text{ m/s}$$

$$\text{Time} = 7 \text{ seconds}$$

$$\text{Distance} = 25 * 7 = 175 \text{ meters}$$

2) A train of length 200 meters crosses a man running at 10 km/hr in the same direction in 10 seconds. What is the speed of the train?

- A. 72 km/hr
- B. 95 km/hr
- C. 85 km/hr
- D. 82 km/hr

The correct option is (D).

**Answer with explanation:**

When the train and man are moving in same direction then relative speed will be the difference between their individual speeds. In this problem the other way to find the relative speed is to divide the distance covered (length of train) by the time taken by the train to cross the man.

$$\text{Relative Speed} = \frac{200}{10}$$

We will convert it into Km/hr

$$\frac{200}{10} * \frac{18}{5} = 72 \text{ km/hr}$$

Now, let the speed of the train is X km/hr. So, the relative speed, 72 km/hr = X km/hr - 10 km/hr

$$X - 10 = 72$$

$$X = 72 + 10$$

$$X = 82 \text{ km/hr}$$

3) A train moving at 50 km/hr crosses a bridge in 45 seconds. The length of train is 150 meters. Find the length of the bridge.

- A. 525 m
- B. 545 m
- C. 575 m
- D. 500 m

The correct option is (C).

**Answer with explanation:**

The distance covered by train when it crosses the bridge is equal to the sum of length of the train and length of the bridge.

$$\text{Speed of train in m/s} = 50 * \frac{5}{18} = \frac{250}{18} = \frac{125}{9} \text{ m/s}$$

Time = 40 seconds

Let the length of the bridge is X.

$$\frac{\text{length of bridge} + \text{length of train}}{\text{time taken to cross the bridge}} = \text{speed of train}$$

$$\frac{X+150}{45} = \frac{125}{9} = \text{speed of train}$$

$$9(X+150) = 45 \times 125$$

$$9X + 450 = 5625$$

$$9X = 5625 - 450$$

$$9X = 5175$$

$$X = \frac{5175}{9} = (\text{speed of train})$$

4) A train is moving at 120 km/hr. The length of the train is 150 meters. How long it will take to cross a platform of length 100 meters?

- A. 10 seconds
- B. 7.5 seconds
- C. 20 Seconds
- D. 25 seconds

The correct option is (B).

**Answer with explanation:**

$$\text{Speed of train in m/s} = 120 \times \frac{5}{18} = \frac{300}{18} = \frac{50}{3} \text{ m/s}$$

Distance covered to cross the platform is equal to the sum of length of the train and length of the platform.

So, distance =  $150 + 100 = 250$  meters

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

$$= 250 * \frac{3}{100}$$

$$= \frac{750}{100} = 7.5 \text{ seconds}$$

5) A train of length 100 meters is moving at a speed of 70 km/hr. In what time it will cross a man who is walking at 10 km/hr in the same direction?

1. 5 seconds
2. 6 seconds
3. 8 seconds
4. 7 seconds

The correct option is (B).

**Answer with explanation:**

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

In this problem, both the train and man are moving so we will find the relative speed of the train. They are moving in the same direction, so the relative speed = (speed of train - speed of man)

$$\text{Relative Speed} = (70-10) = 60 \text{ km/hr}$$

$$\text{Relative Speed in m/s} = 60 * \frac{5}{18} = \frac{300}{18} = \frac{50}{3} \text{ m/s}$$

Distance covered to cross the man = length of the train (100 meters)

$$\text{Time} = \frac{\text{Distance covered}}{\text{Speed}}$$

$$\text{Time} = \frac{100}{\frac{50}{3}}$$

$$= 100 * \frac{3}{50}$$

$$= \frac{300}{50} = 6 \text{ seconds}$$

6) A train of length 200 meters is moving at a speed of 80 km/hr. In what time it will cross a man who is running at 10 km/hr in opposite direction of the train?

- A. 11 seconds
- B. 9 seconds
- C. 7 seconds
- D. 8 seconds

The correct option is (D).

**Answer with explanation:**

$$\text{Time} = \frac{\text{Distance covered}}{\text{Speed}}$$

In this problem, both the train and man are in motion so we will find the relative speed of the train. They are moving in the opposite direction, so the relative speed = (speed of train + speed of man)

Relative Speed:  $(80+10) = 90 \text{ km/hr}$

$$\text{Relative Speed in m/s} = 90 * \frac{5}{18} = \frac{450}{18} = \frac{225}{9} \text{ m/s}$$

Distance covered to cross the man = length of the train (200 meters)

$$\text{Time} = \frac{200}{\frac{225}{9}}$$

$$= 200 * \frac{9}{225}$$

$$= \frac{1800}{225} = 8 \text{ seconds}$$

7) Two trains of length 140 meters and 166 meters are moving towards each other on parallel tracks at a speed of 50 km/hr and 60 km/hr respectively. In what time the trains will cross each other from the moment they meet?

- A. 10 seconds
- B. 12 seconds
- C. 9 seconds
- D. 11 seconds

The correct option is (A).

**Answer with explanation:**

$$\text{Time} = \frac{\text{Distance covered}}{\text{Speed}}$$

In this problem, both the trains are moving so we will find the relative speed of the train. They are moving in the opposite direction, so the relative speed will be sum of their individual speeds.

Relative speed:  $(50+60) = 110 \text{ km/hr}$

$$\text{Relative speed in m/s} = 110 * \frac{5}{18} = \frac{550}{18} = \frac{275}{9}$$

Distance covered is equal to the sum of the length of trains:  $140 + 166 = 306 \text{ meters}$

$$\text{Time} = \frac{306}{\frac{275}{9}}$$

$$= 306 * \frac{9}{275} = 10 \text{ seconds}$$

8) Two trains of length 120 meters and 140 meters are moving in the same direction on parallel tracks at speed of 82 km/hr and 64 km/hr. In what time the first train will cross the second train?

- A. 42 seconds
- B. 48 seconds
- C. 52 seconds
- D. 60 seconds

The correct option is (C).

**Answer with explanation:**

$$\text{Time} = \frac{\text{Distance covered}}{\text{Speed}}$$

In this problem, both the trains are in motion so we will find the relative speed of the train. They are moving in the same direction, so the relative speed is equal to the difference of their individual speeds.

Relative Speed:  $(82-64) = 18 \text{ km/hr}$

Relative Speed in m/s:  $18 * \frac{5}{18} = 5 \text{ m/s}$

Distance covered is equal to the sum of the length of trains:  $120+140 = 260 \text{ meters}$

$$\text{Time} = \frac{260}{5} = 52 \text{ seconds}$$

9) Two trains running in opposite direction cross a man standing on the platform in 36 seconds and 26 seconds respectively. The trains cross each other in 30 seconds. What is the ratio of their speeds?

- A. 2/4
- B. 4/6
- C. 3/9
- D. 4/8

The correct option is (B).

**Answer with explanation:**

Let the trains are moving at X m/s and Y m/s respectively.

So, length of the first train: (speed) \* (time taken to cross the standing man) =  $X * 36$  seconds =  $36X$

In a similar way, length of second train: (speed) \* (time taken to cross the standing man) =  $Y * 26$  seconds =  $26Y$

The trains take 30 seconds to cross each other =  $\frac{\text{Total distance covered}}{\text{Relative Speed}}$

Total Distance = sum of the length of trains ( $36X + 26Y$ )

Relative Speed =  $X + Y$ , as the trains are moving in opposite direction.

$$\text{Time} = \frac{\text{Total distance covered}}{\text{Relative Speed}}$$

$$30 = \frac{(36X + 26Y)}{(X+Y)}$$

$$30X + 30Y = 36X + 26Y$$

$$30X - 36X = 26Y - 30Y$$

$$-6X = -4Y$$

$$\frac{x}{y} = \frac{-4}{-6} = \frac{4}{6}$$

10) A train moving at 108 km/hr crosses a platform in 18 seconds and a man standing on the platform in 10 seconds. Find the length of the platform.

- A. 210 meters
- B. 220 meters
- C. 240 meters
- D. 260 meters

The correct option is (C).

**Answer with explanation:**

$$\text{Speed of train in m/s} = 108 * \frac{5}{18} = 30 \text{ m/s}$$

$$\begin{aligned}\text{Length of the train} &= \text{Speed} * \text{Time (time taken to cross the man)} \\ &= 30 \times 10 = 300 \text{ meters}\end{aligned}$$

$$\text{Now, the time taken to cross the platform is} = \frac{\text{Total distance covered}}{\text{Speed of train}}$$

$$\text{Total distance covered} = \text{length of train} + \text{length of platform}$$

$$\text{Let the length of platform is } X \text{ then the total distance} = 300 + X$$

$$\text{Speed of train} = 30 \text{ m/s}$$

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

$$18 = \frac{300 + X}{30}$$

$$540 = 300 + X$$

$$240 = X \text{ or } X = 240 \text{ meters}$$

11) A train moving at 108 km/hr crosses a platform in 18 seconds and a man standing on the platform in 10 seconds. Find the length of the platform.

- A. 210 meters
- B. 220 meters
- C. 240 meters
- D. 260 meters

The correct option is (C).

**Answer with explanation:**

$$\text{Speed of train in m/s} = 108 * \frac{5}{18} = 30 \text{ m/s}$$

Length of the train = Speed \* Time (time taken to cross the man)

$$= 30 \times 10 = 300 \text{ meters}$$

Now, the time taken to cross the platform is =  $\frac{\text{Total distance covered}}{\text{Speed of train}}$

Total distance covered = length of train + length of platform

Let the length of platform is X then the total distance =  $300 + X$

Speed of train = 30 m/s

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

$$18 = \frac{300 + X}{30}$$

$$540 = 300 + X$$

$$240 = X \text{ or } X = 240 \text{ meters}$$

12) A train moving at 108 km/hr crosses a platform in 18 seconds and a man standing on the platform in 10 seconds. Find the length of the platform.

- A. 210 meters
- B. 220 meters
- C. 240 meters
- D. 260 meters

The correct option is (C).

**Answer with explanation:**

$$\text{Speed of train in m/s} = 108 * \frac{5}{18} = 30 \text{ m/s}$$

Length of the train = Speed \* Time (time taken to cross the man)

$$= 30 \times 10 = 300 \text{ meters}$$

Now, the time taken to cross the platform is =  $\frac{\text{Total distance covered}}{\text{Speed of train}}$

Total distance covered = length of train + length of platform

Let the length of platform is X then the total distance =  $300 + X$

Speed of train = 30 m/s

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

$$18 = \frac{300 + X}{30}$$

$$540 = 300 + X$$

$$240 = X \text{ or } X = 240 \text{ meters}$$

13) A train of length 240 meters crosses a pole in 12 seconds. In what time it will cross a platform of length 400 meters?

- A. 33 seconds
- B. 35 seconds
- C. 37 seconds
- D. 39 seconds

The correct option is (A)

**Answer with explanation:**

$$\text{Time taken to cross the platform} = \frac{\text{Total distance covered}}{\text{Speed of train}}$$

$$\text{Distance covered} = \text{length of train} + \text{length of platform}$$

$$= 240 + 400 = 660 \text{ meters}$$

Speed of train = Distance (length of train) / time taken to cross the pole

$$= \frac{240}{12} = 20 \text{ m/sec}$$

$$\text{So, time taken to cross the platform} = \frac{660}{20} = 33 \text{ seconds}$$

14) Two trains of equal length are moving in same direction on parallel tracks at speed of 92 km/hr and 72 km/hr respectively. The faster train crosses the slower train in 18 seconds. Find the length of each train.

- A. 65 meters
- B. 60 meters
- C. 55 meters
- D. 50 meters

The correct option is (D)

**Answer with explanation:**

Let the length of each train is X.

Distance covered =  $2X$  (sum of the length of trains)

Relative Speed of faster train =  $92 - 72 = 20$  km/hr

Relative Speed in m/s =  $20 \times \frac{5}{18} = \frac{100}{18} = \frac{50}{9}$  m/s

Relative speed of faster train =  $\frac{\text{total distance covered}}{\text{time taken to cross the slower train}}$

$$= \frac{2X}{18}$$

Therefore,  $\frac{2X}{18} = \frac{50}{9}$

$$18X = 900$$

$$X = \frac{900}{18} = 50 \text{ meters}$$

15) Two trains of equal length 200 meters are moving in opposite direction on parallel tracks. The trains cross each other in 10 seconds. If one train is moving twice as fast as the other train, find the speed of faster train.

- A. 48 Km/hr
- B. 52 km/hr
- C. 60 Km/hr
- D. 65 km/hr

[Hide Answer Workspace](#)

The correct option is (A)

**Answer with explanation:**

Let the speed of the slower train =  $X$  m/sec

Then, the speed of the faster train will be =  $2X$  m/sec

Relative Speed =  $X + 2X = 3X$  m/sec

$$\frac{\text{Sum of the length of trains}}{\text{Time taken to cross each other}}$$

Relative Speed is also =

$$= \frac{200+200}{10} = \frac{400}{10} = 40$$

So,  $3X = 40$

$$X = \frac{40}{3} \text{ m/s}$$

$$X \text{ (speed) in Km/hr} = \frac{40}{3} \times \frac{18}{5}$$

$$= \frac{720}{15} = 48 \text{ Km/hr}$$



## **Revision Average**

### **A. Average**

$$\text{Average} = \left( \frac{\text{Sum of Observations}}{\text{Number of Observations}} \right)$$

### **B. Average Speed**

Suppose a man covers a certain distance at  $m$  kmph and an equal distance at  $y$  kmph.

Then:

Average speed (during the whole journey)

$$= \left( \frac{2xy}{x+y} \right) \text{kmph.}$$

**Q 1 - The average of 20 numbers is zero. Of them, at the most, how many may be greater than zero?**

A - 19

B - 10

C - 0

D - 1

**Answer - A**

**Explanation**

Average of 20 numbers = 0.

Therefore Sum of 20 numbers =  $(0 \times 20) = 0$

It is quite possible that 19 of these numbers may be positive and if their sum is a, then 20th number is (-a).

**Q 2 - Find the average of all the numbers between 6 and 34 which are divisible by 5?**

A - 30

B - 24

C - 20

D - 18

**Answer - C**

**Explanation**

Average =  $\frac{(10 + 15 + 20 + 25 + 30)}{5} = \frac{100}{5} = 20$ .

**Q 3 - The average of first five multiples of 3 is?**

A - 15

B - 12

C - 3

D - 9

**Answer - D**

**Explanation**

$$\text{Average} = \frac{3(1 + 2 + 3 + 4 + 5)}{5} = \frac{45}{5} = 9$$

**Q 4 - The average of first nine prime numbers is?**

A - 10

B -  $11\frac{1}{9}$

C - 9

D -  $11\frac{2}{9}$

**Answer - B**

**Explanation**

$$\text{Average} = \frac{(2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 + 23)}{9} = \frac{100}{9} = 11\frac{1}{9}$$

**Q 5 - A student was asked to find the arithmetic mean of the numbers 3, 11, 7, 9, 15, 13, 8, 19, 17, 21, 14, and z?**

A - 3

B - 7

C - 17

D - 31

**Answer - B**

**Explanation**

Clearly, we have  $(3 + 11 + 7 + 9 + 15 + 13 + 8 + 19 + 17 + 21 + 14 + z)/12 = 12$   
or  $137 + z = 144$   
or  $z = 144 - 137 = 7.$

**Q 6 - If the mean of 5 observation z, z + 2, z + 4, z + 6 and z + 8 is 11, then the mean of the last three observation is?**

A - 11

B - 13

C - 15

D - 17

**Answer - B**

**Explanation**

we have :  $(z + (z + 2) + (z + 4) + (z + 6) + (z + 8))/5 = 11$  or  
 $5z + 20 = 55$  or  
 $z = 7.$

So the numbers are 7, 9, 11, 13, 15.  
therefore required mean =  $(11 + 13 + 15)/3$

$$= \frac{39}{3} = 13.$$

**Q 7 - The average of the two-digit numbers, which remain the same when the digits interchange their positions, is?**

A - 55

B - 33

C - 44

D - 66

**Answer - A**

**Explanation**

$$\begin{aligned}\text{Average} &= \left( \frac{11 + 22 + 33 + 44 + 55 + 66 + 77 + 88 + 99}{9} \right) \\ &= \left( \frac{(11 + 99) + (22 + 88) + (33 + 77) + (44 + 66) + 55}{9} \right) \\ &= \left( \frac{4 \times 110 + 55}{9} \right) \\ &= \left( \frac{495}{9} \right) = 55\end{aligned}$$

**Q 8 - The average of a non-zero number and its square is 5 times the number. The number is?**

- A - 9
- B - 17
- C - 29
- D - 295

**Answer - A**

**Explanation**

Let the number be  $z$ . then,

$$\begin{aligned} \frac{z + z^2}{2} &= 5z \\ z^2 - 9z &= 0 \\ z(z - 9) &= 0 \\ z = 0 \text{ or } z &= 9 \end{aligned}$$

so the number is 9.

**Q 9 - The average of 7 consecutive number is 20. The largest of these numbers is?**

- A - 20
- B - 22
- C - 23
- D - 24

**Answer - C**

**Explanation**

Let the number be  $z, z + 1, z + 2, z + 3, z + 4, z + 5, z + 6$ . then,  
$$\frac{(z + (z + 1) + (z + 2) + (z + 3) + (z + 4) + (z + 5) + (z + 6))}{7} = 20$$

$$7z + 21 = 140 \text{ or } 7z = 119 \text{ or } z = 17$$

$$\text{Largest number} = z + 6 = 17 + 6 = 23$$

**Q 10 - The average of five consecutive odd numbers is 61. What is the difference between the highest and lowest numbers?**

A - 9

B - 8

C - 10

D - 11

**Answer - B**

**Explanation**

Let the number be  $z, z + 2, z + 4, z + 6$  and  $z + 8$ .

then,  $\frac{(z + (z + 2) + (z + 4) + (z + 6) + (z + 8))}{5} = 61$

$$5z + 20 = 305 \text{ or}$$

$$z = 57$$

$$\text{so the required number is } = (57 + 8) - 57 = 8$$

**Q 11 - The sum of three consecutive odd numbers is 38 more than the average of these numbers. What is the first of these numbers?**

A - 17

B - 13

C - 19

D - none

**Answer - A**

**Explanation**

Let the number be  $z$ ,  $z + 2$ , and  $z + 4$ . then,  $(z + z + 2 + z + 4) - \frac{(z + z + 2 + z + 4)}{3} = 38$

$$2(3z + 6) = 114 \text{ or } 6z = 102 \text{ or } z = 17.$$

**Q 12 - The average age of the boys in a class is 16 years and that of the girls is 15 years. The average age for the whole class is**

A - 15 years

B - 15.5 years

C - 16 years

D - Cannot be computed with the given information

**Answer - D**

**Explanation**

Clearly to find the average we ought to know the number of boys, girls or students in the class neither of which is given. So, data is inadequate.

**Q 13 - A family consists of grandparents, parents and three grandchildren. The average age of the grandparents is 67 years, that of the parent is 35 years and that of the grandchildren is 6 years. What is the average age of the family?**

A -  $28\frac{4}{7}$

B -  $31\frac{5}{7}$

C -  $32\frac{1}{7}$

D - none

**Answer - B**

### **Explanation**

$$\text{Required average} = \left( \frac{67 \times 2 + 35 \times 2 + 6 \times 3}{2 + 2 + 3} \right) = \left( \frac{134 + 70 + 18}{7} \right)$$
$$= \frac{222}{7} = 31\frac{5}{7}$$

**Q 14 - A library has an average of 510 visitors on Sundays and 240 on other days. The average number of visitors per day in a month of 30 days begining with a Sunday is?**

A - 276

B - 280

C - 285

D - 250

**Answer - C**

### **Explanation**

Since the month begins with a sunday, so there will be five sundays in the month

$$\begin{aligned}\text{Therefore Required average} &= \left( \frac{510 \times 5 + 240 \times 25}{30} \right) \\ &= \frac{8550}{30} = 285\end{aligned}$$

**Q 15 - If the average marks of three batches of 55, 60 and 45 students respectively is 50, 55 and 60, then the average marks of all the students is?**

A - 53.33

B - 54.68

C - 55

D - none

**Answer - B**

**Explanation**

$$\begin{aligned}\text{Required average} &= \left( \frac{55 \times 50 + 60 \times 55 + 45 \times 60}{55 + 60 + 45} \right) \\ &= \left( \frac{2750 + 3300 + 2700}{160} \right) = \left( \frac{8750}{160} \right) = 54.68\end{aligned}$$

**Q 16 - The average weight of 16 boys in a class is 50.25 kgs and that of the remaining 8 boys is 45.15 kgs. Find the average weight of all the boys in the class?**

A - 48.55

B - 49.25

C - 45

D - 47

**Answer - A**

**Explanation**

$$\text{Required average} = \left( \frac{50.25 \times 16 + 45.15 \times 8}{16 + 8} \right) \\ \left( \frac{804 + 361.20}{24} \right) = \left( \frac{1165.20}{24} \right) = 48.55$$

**Q 17 - A car owner buys petrol at Rs. 7.50, Rs. 8 and Rs. 8.50 per litre for three successive years. What approximately is the average cost per litre of petrol if he spends Rs. 4000 each year?**

A - 7.98

B - 8

C - 8.50

D - 9

**Answer - A**

**Explanation**

Total quantity of petrol consumed in 3 years.  
=  $\left( \frac{4000}{7.50} + \frac{4000}{8} + \frac{4000}{8.50} \right)$  litres  
=  $4000 \left( \frac{2}{15} + \frac{1}{8} + \frac{2}{17} \right) = \frac{76700}{51}$  litres

$$\begin{aligned}\text{Total amount spent} &= \text{Rs. } (3 \times 4000) \\ &= \text{Rs } 12000\end{aligned}$$

$$\begin{aligned}\text{Therefore Average cost} &= \text{Rs. } \left( \frac{12000 \times 51}{76700} \right) \\ &= \text{Rs. } \frac{6120}{767} \\ &= \text{Rs. } 7.98.\end{aligned}$$

**Q 18 - The average of six numbers is z and the average of three of these is y. If the average of the remaining three is w, then?**

A -  $2z = 2y + 2w$

B -  $z = 2y + 2w$

C -  $z = y + w$

D -  $2z = y + w$

**Answer - D**

### **Explanation**

Clearly, we have:  $z = \frac{3y + 3w}{6}$   
or  $2z = y + w$ .

**Q 19 - Out of 9 persons, 8 persons spent Rs. 30 each for their meals. The ninth one spent Rs. 20 more than the average expenditure of all the nine. The total money spent by all of them was?**

A - 290

B - 260

C - 292.50

D - 400.50

**Answer - C**

### **Explanation**

Let the average expenditure be Rs  $z$  then,

$$9z = 8 \times 30 + (z + 20)$$

$$9z = z + 260 \text{ or}$$

$$8z = 260 \text{ or}$$

$$z = 32.50.$$

Therefore total money spent =  $9z = \text{Rs. } (9 \times 32.50) = \text{Rs. } 292.50$ .

**Average:**

$$\text{Average} = \left( \frac{\text{Sum of observations}}{\text{Number of observations}} \right)$$

1. Average of all prime numbers between 30 to 50

- A.** 37
- B.** 37.8
- C.** 39
- D.** 39.8

**Answer:** Option D

**Explanation:**

Prime numbers between 30 and 50 are:

31, 37, 41, 43, 47

Average of prime numbers between 30 to 50 will be

$$((31+37+41+43+47)/5)$$

$$=199/55$$

$$=39.8$$

2. Reeya obtained 65, 67, 76, 82 and 85 out of 100 in different subjects, What will be the average.

- A.** 70
- B.** 75
- C.** 80
- D.** 85

**Answer:** Option B

**Explanation:**

$$((65+67+76+82+85)/5)=75$$

3. Find the sum of first 30 natural numbers

- A. 470
- B. 468
- C. 465
- D. 463

**Answer:** Option C

**Explanation:** Sum of n natural numbers

$$= (n(n+1))/2$$

$$= (30(30+1))/2 = 30(31)/2 = 465$$

4. Find the average of first 10 multiples of 7

- A. 35.5
- B. 37.5
- C. 38.5
- D. 40.5

**Answer And Explanation**

**Answer:** Option C

**Explanation:**

$$= (7(1+2+3+\dots+10))/10$$

$$= (7(55))/10$$

$$= 38.5$$

5. The average of four consecutive odd numbers is 24. Find the largest number.

- A. 25
- B. 27
- C. 29
- D. 31

**Answer And Explanation**

**Answer:** Option B

**Explanation:**

Let the numbers are  $x, x+2, x+4, x+6$ , then

$$\Rightarrow x + (x+2) + (x+4) + (x+6) = 24$$

$$\Rightarrow (4x+12) = 24$$

$$\Rightarrow x+3=24$$

$$\Rightarrow x=21$$

So largest number is  $21 + 6 = 27$

6. Average of 10 numbers is zero. At most how many numbers may be greater than zero

- A. 0
- B. 1
- C. 5
- D. 9

**Answer:** Option D

**Explanation:**

(Average 0 asel tar total kiti value aahet tyachya adhichi value gheychi)  
so Answer 9 D

7. Find the average of all numbers between 6 and 34 which are divisible by 5

- A. 15
- B. 20
- C. 25
- D. 30

**Answer And Explanation**

**Answer:** Option B

**Explanation:**

$$\text{Average} = ((10+15+20+25+30)/5) = 100/5 = 20$$

8. Average of first five multiples of 3 is

- A. 9
- B. 11
- C. 13
- D. 15

**Answer:** Option A

**Explanation:**

$$\text{Average} = (3(1+2+3+4+5))/5 = 45/5 = 9$$

9. Average age of boys in a class is 16 years and average age of girls is 15 years, what is the average age of all

- A. 15.5
- B. 15
- C. 16
- D. Cant be computed

**Answer:** Option D

**Explanation:**

As number of girls and boys is not given so result cant be computed

10. A library has an average of 510 visitors on Sundays and 240 on other days. The average number of visitors in a month of 30 days starting with Sunday is

- A. 280
- B. 285
- C. 290
- D. 295

**Answer:** Option B

**Explanation:**

As the month begins with Sunday, so there will be five Sundays in the month. So result will be:

$$=((510 \times 5 + 240 \times 25) / 30)$$

$$=(8550 / 30)=285$$

11. A batsman makes a score of 87 runs in the 17th match and thus increases his average by 3. Find his average after 17th match

- A. 36
- B. 37
- C. 38
- D. 39

**Answer:** Option D

**Explanation:**

Let the average after 17th match is  $x$   
then the average before 17th match is  $x-3$   
so  $16(x-3) + 87 = 17x$   
 $\Rightarrow x = 87 - 48 = 39$

12. Average weight of 10 people increased by 1.5 kg when one person of 45 kg is replaced by a new man. Then weight of the new man is

- A. 50
- B. 55
- C. 60
- D. 65

**Answer:** Option C

**Explanation:**

Total weight increased is  $1.5 * 10 = 15$ .

So weight of new person is  $45+15 = 60$

13. Average of five numbers is 27. If one number is excluded the average becomes 25. The excluded number is

- A. 35
- B. 45
- C. 55
- D. 65

**Answer:** Option A

**Explanation:**

Number is  $(5*27) - (4*25) = 135-100 = 35$

14. The average score of a cricketer for ten matches is 38.9 runs. If the average for first six matches is 42, then average for last four matches is

- A. 33.25
- B. 32.25
- C. 34.25
- D. 34.50

**Answer And Explanation**

**Answer:** Option C

**Explanation:**

$$=((38.9 \times 10) - (42 \times 6)) / 4$$

$$=(1216 - 750) / 4 = 34.25$$

15. Average of 10 matches is 32, How many runs one should score to increase his average by 4 runs.

- A. 70
- B. 76
- C. 78
- D. 80

**Answer:** Option B

**Explanation:**

Average after 11 innings should be 36

$$\begin{aligned}\text{So, Required score} &= (11 * 36) - (10 * 32) \\ &= 396 - 320 = 76\end{aligned}$$

16. If the average marks of three batches of 55, 60 and 45 students respectively is 50, 55, 60, then the average marks of all the students is

- A. 54.48
- B. 54.68
- C. 54.60
- D. 54.58

**Answer:** Option B

**Explanation:**

$$\begin{aligned}&((55 \times 50) + (60 \times 55) + (45 \times 60)) / 55 + 60 + 45 \\ &= 8750 / 160 \\ &= 54.68\end{aligned}$$

1. The average of 20 numbers is zero. Of them, at the most, how many may be greater than zero?

A - 19

B - 10

C - 0

D - 1

2. Find the average of all the numbers between 6 and 34 which are divisible by 5?

A - 30

B - 24

C - 20

D - 18

3. The average of first five multiples of 3 is?

A - 15

B - 12

C - 3

D - 9

4. If the mean of 5 observation  $z, z + 2, z + 4, z + 6$  and  $z + 8$  is 11, then the mean of the last three observation is?

A - 11

B - 13

C - 15

D - 17

5. The average of the two-digit numbers, which remain the same when the digits interchange their positions, is?

A - 55

B - 33

C - 44

D - 66

6. The average age of the boys in a class is 16 years and that of the girls is 15 years. The average age for the whole class is?

- A - 15 years
- B - 15.5 years
- C - 16 years
- D - Cannot be computed with the given information

7. The average weight of 16 boys in a class is 50.25 kgs and that of the remaining 8 boys is 45.15 kgs. Find the average weight of all the boys in the class?

- A - 48.55
- B - 49.25
- C - 45
- D - 47

8. Average of five numbers is 27. If one number is excluded the average becomes 25. The excluded number is

- A. 35
- B. 45
- C. 55
- D. 65

9. The average age of 30 boys in a class is 15 years. If we include the age of two teachers the average age increases by 1. Find the sum of ages of the two teachers.

- A. 55 years
- B. 58 years
- C. 62 years
- D. 64 years

10. If the sum is 240 and average is 40, find the number of quantities.

- A. 5
- B. 8
- C. 5
- D. 6

11. Mohan gets a salary of Rs. 6435, Rs. 6927, Rs. 6855, Rs. 7230 and Rs. 6562 for 5 months. How much salary he must have in the sixth month so that he gets an average of Rs. 6500?

- A. 4091
- B. 4991
- C. 3499
- D. 3344

12. The average weight of 8 women increases by 2.5 kg when a new woman replaces one of them weighing 65 kg. Find the weight of the new woman.

- A. 20
- B. 85
- C. 67
- D. 80

13. The average of 15 numbers is 15. If the average of first five numbers is 14 and that of other 9 numbers is 16, then find the middle number.

- a. 12
- b. 11
- c. 10
- d. 9

14. The average of 11 numbers is 30. If the average of first six numbers is 17.5 and that of last six is 42.5, then what is the sixth number?
- a. 30
  - b. 36
  - c. 45
  - d. 47
15. The average of four consecutive even numbers is 27. Find the largest of these numbers.
- a. 28
  - b. 30
  - c. 32
  - d. 34
16. There are two batches A and B of a class. Batch A consists of 36 students and batch B consists of 44 students. Find the average weight of whole class, if average weight of batch A is 40 kg and that of batch B is 35 kg.
- a. 29.23 kg
  - b. 32.56 kg
  - c. 35.66 kg
  - d. 37.25 kg
17. In a school, average marks of three batches of 40, 50 and 60 students respectively is 45, 55 and 70. Find the average marks of all the students.
- a. 54.78
  - b. 55.23
  - c. 50.36
  - d. 58.33

18. The average of 9 observations was 9, that of the 1st of 5 being 10 and that of the last 5 being 8. What was the 5th observation?

- A. 6
- B. 7
- C. 8
- D. 9

19. The average of 10 numbers is 23. If each number is increased by 4, what will the new average be?

- A. 23
- B. 25
- C. 27
- D. 29

20. In the first 10 overs of a cricket game, the run rate was only 3.2. What should be the run rate in the remaining 40 overs to reach the target of 282 runs?

- A. 5.75
- B. 6.25
- C. 6.75
- D. 7.25

21. The average weight of 8 sailors in a boat is increased by 1 kg if one of them weighing 56 kg is replaced by a new sailor. The weight of the new sailor is?

- A. 50
- B. 64
- c. 89

D. 110

22. The average age of P, Q, R, S five years ago was 45 years.  
By including T, the present average age of all the five is 49 years.  
The present age of T is?

- A. 45
- B. 50
- C. 70
- D. 80

# Aptitude KALNIRNAY

Points to remember:

1. Problems on calendar mainly deal with finding the day of the week on a given date using the number of odd days.
2. **Odd days:** Odd days are different from odd numbers. They are the number of days more than the complete number of weeks in a given period.
3. To find the number of odd days divide the given number of by seven. The remainder left represents the number of odd days.

**For example:** if the given number of days is 80, after dividing 80 by 7, the remainder left is 3. Hence, there are three odd days.

Similarly, if the given number of days is 77, after dividing 77 by 7, the remainder left is 0. Hence, there are 0 odd days.

4. **Ordinary year:** A year which is not a leap year is called an ordinary year. It has 365 days.

5. **Leap year:** A year which is divisible by 4 is called a leap year, e.g. 1992, 1996, 2000, etc., are leap years. A leap year has 366 days. If the year is a century, it will be a leap year if it is divisible by 400, i.e. every 4th century is a leap year, e.g. 400, 800, 1200, etc., but 200, 500, 1900, etc., are not leap years.

Counting odd:

**Odd days in an ordinary year:** An ordinary year contains 365 days. On dividing 365 by 7, we get 1 as a remainder ( $52 \times 7 + 1$ ) or (52 weeks + 1 day). It means an ordinary year has one odd day.

**Odd days in a leap year:** A leap year contains 366. On dividing 366 by 7, we get 2 as remainder ( $52 \times 7 + 2$ ) or (52 weeks + 2). It means a leap year has two odd days.

**Odd days in a century:** A century has 76 ordinary years and 24 leap years.

$$\therefore 100 \text{ years} = 76 \text{ ordinary years} + 24 \text{ leap years}$$

$$= [(76 \times 52) \text{ weeks} + 76 \text{ odd days}] + [(24 \times 52) \text{ weeks} + 48 \text{ odd days}]$$

$$= [(100 \times 52) \text{ weeks} + 124 \text{ odd days}]$$

$$= (5200 \text{ weeks} + 17 \text{ weeks} + 5 \text{ odd days})$$

$$= (5217 \text{ weeks} + 5 \text{ odd days})$$

$\therefore$  A century or 100 years have 5 odd days.

Similarly, in 200 years, there will be 10 (5+5) days, 7 days (1 week) + 3 odd days. So, 200 years have 3 odd days.

In 300 years, there will be 15 days, 14 days (2 weeks) + 1 odd day. So, 300 years have 1 odd day.

In 400 years, there will be  $20 + 1$  (as 400 is a leap year) = 21 days, 21 days (3 weeks). So, 400 years have 0 odd days. A century divisible by 400 also has 0 odd days.

Tables of odd :

a.) Table showing the relation between the year and the number of odd ;

<b>Years</b>	<b>No. of odd</b>
Ordinary year	1
Leap year	2
100 years	5
200 years	3
300 years	1
400 years	0

b.) Table showing the relation between the day of the week and the number of odd ;

<b>Day of week</b>	<b>No. of odd</b>
Sunday	0
Monday	1
Tuesday	2
Wednesday	3
Thursday	4
Friday	5
Saturday	6

Notes:

- The years which are divisible by 400 have 0 odd days, e.g. 400, 800, 1200, 1600, 2000, etc.
- Last day of a century cannot be Tuesday, Thursday or Saturday.
- April & July for all years and January and October for non-leap years have the same calendar.
- The calendars of two different years are same if they satisfy the following conditions;
  - a) The years must be of the same type, i.e. both must be either ordinary years or leap years.
  - b) January 21 of both the years, must be the same day of the week.

## **Q 1 - What was the day of the week on 15th June, 1776?**

- A - Sunday
- B - Saturday
- C - Thursday
- D - None of these

### **Answer - B**

#### **Explanation**

15<sup>th</sup> June 1776 = (1775 years + Period from 01.01.1776 to 15.06.1776)

Counting of odd days:

No of odd days in 1600 years = 0

No of odd days in 100 years = 5

75 years = 18 leap years + 57 ordinary years

$$= 18*2 + 57*1$$

$$= 36 + 57$$

$$= 93 \text{ odd days}$$

$$= 13 \text{ weeks} + 2 \text{ odd days} = 2 \text{ odd days}$$

$\therefore$  1775 years have  $(0+5+2) = 7$  odd days = 0 odd days.

Jan to May =  $(31+29+31+30+31)$

$$= 152 \text{ days}$$

Add 15 days of June.

$$= 152 + 15$$

$$= 167 \text{ days}$$

$$= 23 \text{ weeks} + 6 \text{ days}$$

$$= 6 \text{ odd days.}$$

$\therefore$  Total number of odd days =  $0 + 6 = 6$  odd days.

Hence 15.06.1776 was Saturday.

**Q 2 - January 15, 1997 was a Wednesday. What day of the week was on Jan 5, 2000?**

A - Wednesday

B - Thursday

C - Friday

D - Saturday

**Answer - A**

**Explanation**

1997, 1998 and 1999 are not leap years.

1998 and 1999 has 2 odd days.

No of days remaining in 1997 =  $365 - 15 = 350$   
= 50 weeks of 0 odd days.

05.01.2000 = 5 odd days.

Total no of odd days =  $2 + 0 + 5 = 7$

7 days from Wednesday is Wednesday.

∴ Jan 5, 2000 was also Wednesday.

**Q 3 - The calendar for the year 2007 will be the same for the year:**

A - 2018

B - 2017

C - 2016

D - 2014

**Answer - A**

**Explanation**

We will count the no of odd days from the year 2007 onwards to get the sum equal to 0 odd days.

<b>Year</b>	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Odd day</b>	1	2	1	1	1	2	1	1	1	2	1

Sum = 14 odd days = 0 odd days

Calendar for the year 2018 will be the same for the year 2007.

#### **Q 4 - Will date-book for the year 2003 serve for the year 2014?**

A - no

B - yes

**Answer - B**

#### **Explanation**

We must have same day on 1.1.2003 and 1.1.2014.

Along these lines, number of odd days somewhere around 31.12.2002 and

31.12.2013 must be 0. This period has 3 jump years and 8 common years.

Number of odd days =  $(3*2+8*1) = 14 = 0$  odd days.

∴ Calendar for the year 2003 will serve for the year 2014.

**Q 5 - What was the week's day on fifteenth august, 1947?**

- A - Rs 1720
- B - Rs 1820
- C - Rs 1920
- D - Rs 1220

**Answer - C**

### **Explanation**

fifteenth Aug.1947 = (1946 years + period from 1.1.1947 to 15.8.1947)

Odd days in 1600 years = 0

Odd days in 300 years =  $(5 \times 3) = 15$  = 1946 years = (11 leap years + 35  
ordinary years)

=  $(11 \times 2 + 35 \times 1)$  odd days = 57 days

= (8 weeks + 1 day) = 1 odd day

$\therefore$  odd days in 1946 years =  $(0+1+1) = 2$

Jan + Feb. + March + April + May + June + July + Aug

$(31 + 28 + 31 + 30 + 31 + 30 + 31 + 15) = 227$  days

227 days = (32 weeks + 3 days) = 3 odd days.

Aggregate no. of odd days =  $(2+3) = 5$

Consequently the required day is Friday.

6. It was Sunday on Jan 1, 2006. What was the day of the week Jan 1, 2010?

- A.** Sunday
- B.** Saturday
- C.** Friday
- D.** Wednesday

**Answer:** Option C

**Explanation:**

On 31<sup>st</sup> December, 2005 it was Saturday.

Number of odd days from the year 2006 to the year 2009 =  $(1 + 1 + 2 + 1) = 5$  days.

∴ On 31<sup>st</sup> December 2009, it was Thursday.

Thus, on 1<sup>st</sup> Jan, 2010 it is Friday.

**Q 7.** It was Tuesday on Feb 8, 2005. What was the day of the week on Feb 8, 2004?

- A. Monday
- B. Thursday
- C. Friday
- D. Sunday

**Sol : Option D**

The year 2004 was a leap year. So, it had 2 odd days.

The day on Feb 8, 2004 must be 2 days before the day on Feb 8, 2005.  
Hence, this day was Sunday

## Revision Clock

The face or dial of a watch is a circle whose outline is partitioned into 60 equivalent amounts of, called moment spaces.

A timekeeper has two hands, the littler one is known as the hour hand or short hand while the bigger one is known as the moment hand or long hand.

1. In an hour, the moment hand pick up 55 minutes on the hour hand.
2. In consistently, both the hands concur once each hour.
3. The hands are in the same straight line when they are incidental or inverse to one another.
4. Edge followed by hour hand in 12 hrs =  $360^\circ$
5. Angel followed by moment hand in 60 min. =  $360^\circ$
6. The hour spaces are  $30^\circ$  spaces apart. ( $360^\circ/12 = 30^\circ$ )
7. In 12 hours, they are at right angles 22 times.
8. The hands of a clock coincide 11 times in every 12 hours
9. In 12 hours, the hands coincide or are in opposite direction 22 times.
10. The minute spaces are  $6^\circ$  spaces apart. ( $360^\circ/60 = 6^\circ$ )
11. When the two hands are at rights angles  $90^\circ$ , they are  $90/6 = 15$  minutes apart. This occurs twice in every hour.
12. When the two hands are in opposite directions, they are  $180/6 = 30$  minutes apart. This occurs once in each hour.
13. When the hands coincide, they are 00 and zero minutes apart.

Too quick

On the off chance that a watch or a clock shows 8.15, when the right time is 8, it is said to be 15 minutes too quick.

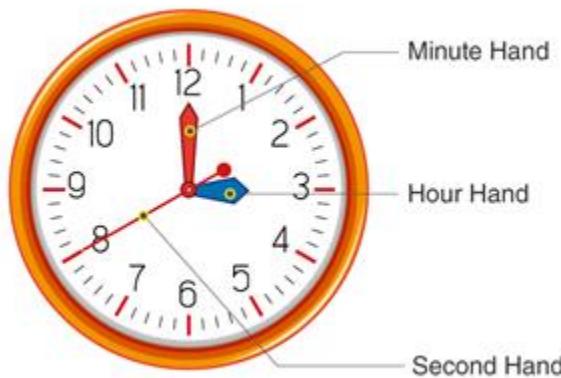
Too moderate

In the event that it showed 7.45, when the right time is 8,it is said to be 15 minutes too moderate.

## Revision Clock

### Introduction

A Clock is a circular device provided with three hands viz. an hour hand, minute and second hand. The study of the clock is known as “**horology**”.



A basic structure of a clock with three hands

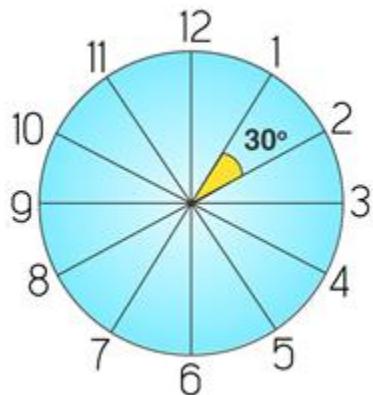
### Structure of a Clock

A clock is composed of **360** degrees and divided into **12** equal divisions. The angle between the consecutive divisions is obtained by dividing the total angle of clock  **$360^\circ$**  by the number of divisions i.e. **12**.



Twelve equal divisions of a clock

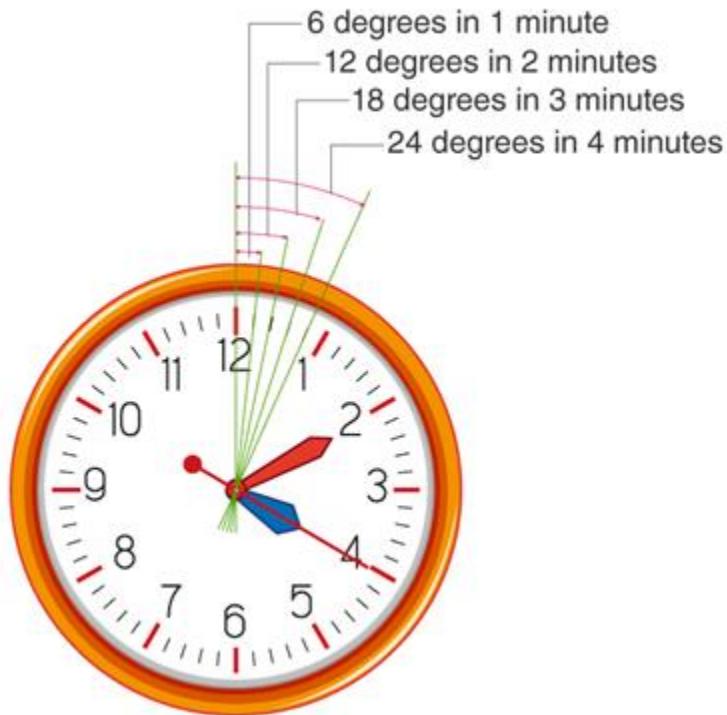
**The angle between any two consecutive divisions =  $(360^\circ)/12 = 30^\circ$**



### Angle divisions of a clock

A close observation of a clock reveals that an angular space between any two consecutive divisions has further five more divisions. The area between the two divisions corresponds to a value of 5 minutes. Hence, dividing the  $30^\circ$  by five will result in the angular value of a minute.

**Angular value of a minute =  $(30^\circ)/5 = 6^\circ$**



## Angular values of minutes

The table given below demonstrates the angular values of the first ten minutes:

Minute(s)	Angular values
1	$6^\circ$
2	$12^\circ$
3	$18^\circ$
4	$24^\circ$
5	$30^\circ$
6	$36^\circ$
7	$42^\circ$
8	$48^\circ$
9	$54^\circ$
10	$60^\circ$

1. An accurate clock shows 7 a.m. Through how many degrees will the hour hand rotate when the clock shows 1 p.m.?

A.  $154^\circ$  B.  $180^\circ$

C.  $170^\circ$  D.  $160^\circ$

**Solution:**

We know that angle traced by hour hand in 12 hrs. =  $360^\circ$

From 7 to 1, there are 6 hours.

Angle traced by the hour hand in 6 hours =  $6 \times (360/12) = 180^\circ$

Option B is the correct answer.

2. By 20 minutes past 4, the hour hand has turned through how many degrees? If then the clock is 12 p.m.

A.  $100^\circ$  B.  $110^\circ$

C.  $120^\circ$  D.  $130^\circ$

**Solution:**

At 4 o'clock the hour hand is at 4 and has an angle of  $30^\circ \times 4 = 120^\circ$

An Hour hand travels  $1/2^\circ$  per minute In 20 minutes it will travel  $20 \times (1/2^\circ) = 10^\circ$ . Adding both we get  $120^\circ + 10^\circ = 130^\circ$

Option D is the correct answer.

3. At what time between 5.30 and 6 will the hands of a clock be at right angles?

A. 44 minutes past 5 B.  $44 \left( \frac{7}{11} \right)$  minutes past 5

C.  $43 \left( \frac{7}{11} \right)$  minutes past 5 D. 43 minutes past 5

**Solution:**

Given:  $H = 5$  and  $A = 90$ , since 5 and 6 lies in the first half, a positive sign is considered.

$$T = \frac{2}{11} [H^*30 \pm A]$$

$$T = \frac{2}{11} [5^*30 + 90]$$

$$T = \frac{2}{11} [240] = 480/11 = 43 \left( \frac{7}{11} \right)$$

Option C is the correct answer.

4. What is the angle between the minute hand and the hour hand of a clock at 5.30?

A.  $05^\circ$  B.  $15^\circ$

C.  $25^\circ$  D.  $35^\circ$

**Solution:**

At 5 'o'clock the hour hand is at 5 and hence has made  $30^\circ$  angle.

From 5 to 5.30 its will travel for 30 minutes with a speed of  $\frac{1}{2}^\circ$

Therefore the total distance travelled will be  $30 \text{ minutes} * \frac{1}{2} = 15^\circ$

The full angle made by the hour hand will be  $150^\circ + 15^\circ = 165^\circ$ .

The minute hand at 5 o'clock is at 12, and hence the angle made is zero. In 30 minutes, it will travel a distance of 30 minutes with a speed of  $6^\circ$  per minute. Therefore the total distance travelled will be  $30 \text{ minutes} * 6^\circ = 180^\circ$ .

The angle between the minute and hour hand is  $180 - 165 = 15^\circ$

Option B is the correct answer.

5. How many times in a day, the hands of a clock are straight?

A. 22 B. 24

C. 44 D. 48

**Solution:**

The hands of clocks make a straight line of  $180^\circ$  about 22 times in 24 hours. Also, the hands coincide 22 times in 24 hours, the coincidence of the hands also forms a straight line. Hence, the total straight lines are  $22+22 = 44$ .

Option C is the correct answer.

# Revision Decimal Fraction

## Decimal Fractions

Fractions having denominators in power of 10 are called decimal fractions.

$$\frac{1}{10} = 0.1, \frac{2}{10} = 0.2, \dots$$

$$\frac{1}{100} = 0.01, \frac{2}{100} = 0.02, \dots$$

$$\frac{1}{1000} = 0.001, \frac{2}{1000} = 0.002, \dots$$

## Converting a decimal number into a fraction

In the denominator part, place 1 under decimal point and suffix with as many zeroes as is the total number of digits after decimal point. Remove the decimal point and reduce the fraction to its lowest term.

$$0.56 = \frac{56}{100} = \frac{14}{25}$$

$$0.0024 = \frac{24}{10000} = \frac{3}{1250}$$

Suffixing zeroes to the right of a decimal fraction does not change its value. Thus  $0.6 = 0.60 = 0.600$  etc.

If numerator and denominator contains same number of decimal places, we can remove decimal signs from each number.

$$2.71/3.41 = 271/341$$

$$14.4/15.6 = 144/156 = 12/13$$

## Adding decimals

Place each number under each other in such a way that decimal points lies in same column. Numbers so arranged can be added in usual way.

$$21.3 + .213 + 3.21 + .021 + 2.0031 = ?$$

$$\begin{array}{r}
 21.300 \\
 + 00.213 \\
 + 3.210 \\
 + 0 .021 \\
 + 2.0031 \\
 \hline
 26.7471
 \end{array}$$

### **Subtracting decimals**

Place each number under each other in such a way that decimal points lies in same column. Numbers so arranged can be subtracted in usual way.

$$\begin{array}{r}
 23.0040 \\
 -16.5628 \\
 \hline
 6.4412
 \end{array}$$

### **Multiplying decimals**

Multiply given numbers without considering decimal point. In product, mark the decimal point as many places of decimals as is the sum of number of decimal places in the given numbers.

$$\begin{aligned}
 2.3 \times 0.12 &= ? \\
 23 \times 12 &= 276 \\
 \text{Sum of decimal places} &= 1 + 2 = 3 \\
 \therefore 2.3 \times 0.12 &= 0.276
 \end{aligned}$$

## **Dividing decimals by number**

Divide given decimal number without considering decimal point. In quotient, mark the decimal point as many places of decimals as is the sum of number of decimal places in the given dividend.

$$0.63 / 9 = ?$$

$$63 / 9 = 7$$

Decimal places in dividend = 2

$$\therefore 0.63 / 9 = 0.07$$

## **Dividing decimals by decimals**

Multiply both dividend and divisor by such multiple of 10 so that divisor becomes a whole number. Divide dividend without considering decimal point. In quotient, mark the decimal point as many places of decimals as is the sum of number of decimal places in the given dividend.

$$0.00042 / 0.06 = ?$$

$$\begin{aligned} 0.00042 / 0.06 &= (0.00042 \times 100) / (0.06 \times 100) \\ &= 0.042 / 6 \end{aligned}$$

$$\text{Now } 42/6 = 7$$

Decimal places in dividend = 3

$$\therefore 0.00042 / 0.06 = 0.007$$

## **Decimal Fractions**

Fractions having denominators in power of 10 are called decimal fractions.

$$1/10 = .1, \quad 2/10 = 0.2, \dots$$

$$1/100 = .01, \quad 2/100 = 0.02, \dots$$

$$1/1000 = .001, \quad 2/1000 = 0.002, \dots$$

## **Converting a decimal number into a fraction**

In the denominator part, place 1 under decimal point and suffix with as many zeroes as is the total number of digits after decimal point. Remove the decimal point and reduce the fraction to its lowest term.

$$0.56 = 56/100 = 14/25$$

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Suffixing zeroes to the right of a decimal fraction does not change its value.

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If numerator and denominator contains same number of decimal places, we can remove decimal signs from each number.

$$2.71/3.41 = 271/341$$

$$14.4/15.6 = 144/156 = 12/13$$

## **Recurring Decimals**

### **A.Pure recurring decimals**

A decimal fraction in which all figures after decimal point are repeated is called a pure recurring decimals.

For example, 0.5555, 0.323232

Converting pure recurring decimal to fraction

Put the repeating figure only once in the numerator and put as many nines in the denominator as in number of repeating figures.

Express 0.33333 in fraction.

$$0.3333 = 3/9 = 1/3$$

Express 0.2727 in fraction.

$$0.2727 = 27/99 = 3/11$$

## B. Mixed recurring decimals

A decimal fraction in which some figures are not repeating whereas some of them are repeating, is called as mixed recurring decimals. For example, 0.534242, 0.078888.

Converting mixed recurring decimal to fraction

Put the difference of numbers formed by digits after decimal point taking repeated digits once and that formed by non-repeating number, in the numerator and put as many nines in the denominator as in number of repeating figures and annex them with as many zeroes as in the non-repeating digits.

Express 0.266666 in fraction.

$$0.266666 = (26-2)/90 = 24/90 = 4/15$$

Express 0.326868 in fraction.

$$0.326868 = (3268 - 32)/9900 = 3236/9900 = 809/2475$$

## Basic Formulae

These are the basic formulae:

- i.  $(a + b)^2 = a^2 + b^2 + 2ab$
- ii.  $(a + b)^2 - (a - b)^2 = 4ab$
- iii.  $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$
- iv.  $(a^2 - b^2) = (a + b)(a - b)$
- v.  $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
- vi.  $(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$
- vii.  $(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$
- viii.  $(a^3 + b^3 + c^3 - 3abc) = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

**Q 1 - Which is the following is fraction for 0.36?**

- A - 9/25
- B - 51/25
- C - 3/400
- D - 2081/250

**Answer - A**

**Explanation**

$$0.36 = 36/100 = 9/25$$

**Q 2 - Which is the following is fraction for 2.04?**

- A - 9/25
- B - 51/25
- C - 3/400
- D - 2081/250

**Answer - B**

**Explanation**

$$2.04 = 204/100 = 51/25$$

**Q 3 - Which is the following is fraction for 0.0075?**

- A - 9/25
- B - 51/25
- C - 3/400
- D - 2081/250

**Answer - C**

**Explanation**

$$0.0075 = 75/10000 = 3/400$$

**Q 4 - Which is the following is fraction for 8.324?**

- A - 9/25
- B - 51/25
- C - 3/400
- D - 2081/250

**Answer - D**

**Explanation**

$$8.324 = 8324/1000 = 2081/250.$$

**Q 5 - Which of the following is the correct ascending order for  $\frac{3}{8}, \frac{7}{12}, \frac{2}{3}, \frac{16}{25}, \frac{14}{15}$ ?**

- A -  $\frac{3}{8} < \frac{7}{12} < \frac{2}{3} < \frac{16}{25} < \frac{14}{15}$
- B -  $\frac{3}{8} < \frac{7}{12} < \frac{16}{25} < \frac{2}{3} < \frac{14}{15}$
- C -  $\frac{7}{12} < \frac{3}{8} < \frac{2}{3} < \frac{16}{25} < \frac{14}{15}$
- D -  $\frac{2}{3} < \frac{7}{12} < \frac{3}{8} < \frac{16}{25} < \frac{14}{15}$

**Answer - B**

**Explanation**

$\frac{3}{8} = 0.375,$   
 $\frac{7}{12} = 0.583,$   
 $\frac{2}{3} = 0.666,$   
 $\frac{16}{25} = 0.64$  and  
 $\frac{14}{15} = 0.933$   
As  $0.375 < 0.583 < 0.64 < 0.666 < 0.933$   
 $\therefore \frac{3}{8} < \frac{7}{12} < \frac{2}{3} < \frac{16}{25} < \frac{14}{15}$

**Q 6 - Which of the following is the correct descending order for  $3/5$ ,  $4/7$ ,  $8/9$ ,  $9/11$ ,  $13/15$ ?**

- A -  $3/5 > 4/7 > 8/9 > 9/11 > 13/15$
- B -  $8/9 > 13/15 > 9/11 > 3/5 > 4/7$
- C -  $13/15 > 8/9 > 9/11 > 3/5 > 4/7$
- D -  $13/15 > 8/9 > 3/5 > 9/11 > 4/7$

**Answer - B**

**Explanation**

$$3/5 = 0.6, 4/7 = 0.571, 8/9 = 0.888, 9/11 = 0.818, 13/15 = 0.866$$

$$\text{As } 0.888 > 0.866 > 0.818 > 0.6 > 0.571$$

$$\therefore 8/9 > 13/15 > 9/11 > 3/5 > 4/7$$

**Q 7 - Which of the following is the H.C.F. of 1.5, 3 and 0.6?**

- A - 0.3
- B - 0.1
- C - 0.2
- D - 0.6

**Answer - A**

**Explanation**

Make same numbers of decimal places in the given numbers.

Numbers become 1.5, 3.0 and 0.6

Without decimal places, these numbers are 15, 30 and 6.

H.C.F. of 15, 30 and 6 = 3

$\therefore$  H.C.F. of given numbers = 0.3

**Q 8 - Which of the following is the L.C.M. of 1.5, 3 and 0.6?**

A - 3

B - 2

C - 1

D - 6

**Answer - A**

**Explanation**

Make same numbers of decimal places in the given numbers.

Numbers become 1.5, 3.0 and 0.6

Without decimal places, these numbers are 15, 30 and 6.

L.C.M. of 15, 30 and 6 = 30

$\therefore$  L.C.M. of given numbers = 3

**Q 9 -  $34.64 + 2.9 + 107.035 + .0086 = ?$**

A - 141.5436

B - 144.5836

C - 134.5678

D - 132.8765

**Answer - B**

**Explanation**

We have

34.64

2.9

107.035

.0086

-----  
144.5836  
-----

$$\therefore 34.64 + 2.9 + 107.035 + .0086 = 144.5836$$

**Q 10 -  $3.004 - 1.2996 = ?$**

A - 1.7044

B - 0.7262

C - 1.6723

D - 0.3456

**Answer - A**

**Explanation**

We have

3.004

-1.2996

-----

1.7044

-----

$$\therefore 3.004 - 1.2996 = 1.7044$$

**Q 11 - Which of the following is the result when  $6.2958$  is subtracted from  $10$ ?**

A - 3.7042

B - 3.8675

C - 2.8762

D - 3.8762

**Answer - A**

**Explanation**

We have

10.0000

- 6.2958

-----  
3.7042

-----  
 $\therefore 10 - 6.2958 = 3.7042$

**Q 12 -  $1.71 \times 1.3 = ?$**

A - 3.213

B - 2.223

C - 1.223

D - 3.213

**Answer - B**

**Explanation**

$$171 \times 13 = 2223$$

Here sum of decimal places = 2 + 1 = 3

$$\therefore 1.71 \times 1.3 = 2.223$$

**Q 13 -  $3.746 \times 11.4 = ?$**

A - 42.7044

B - 40.7654

C - 34.8762

D - 42.7862

**Answer - A**

### **Explanation**

$$\begin{array}{r} 3746 \\ \times 114 \\ \hline 14984 \\ 3746x \\ 3746xx \\ \hline 427044 \end{array}$$

Here sum of decimal places =  $3 + 3 = 6$   
 $\therefore 3.746 \times 11.4 = 42.7044$

**Q 14 - .5 x 0.5 x .005 x 50 = ?**

A - .00625

B - .0625

C - .625

D - 6.25

**Answer - A**

### **Explanation**

We have  $5 \times 5 \times 5 \times 50 = 6250$   
Sum of decimal places =  $1 + 2 + 3 = 6$   
 $\therefore .5 \times 0.5 \times .005 \times 50 = 0.00625.$

**Q 15 - If  $172 \times 38 = 6536$ , what is  $1.72 \times 0.38$ ?**

- A - 65.36
- B - 0.06536
- C - 0.6536
- D - 6.536

**Answer - B**

**Explanation**

Sum of decimal places =  $2 + 3 = 5$

$$\therefore 1.72 \times 0.38 = 0.06536.$$

**Q 16 -  $0.0182 / 14 = ?$**

- A - 13
- B - 0.013
- C - 0.0013
- D - 1.3

**Answer - C**

**Explanation**

$$182 / 14 = 13$$

Dividend contains 4 places of decimals.

$$\therefore 0.0182 / 14 = 0.0013$$

**Q 17 -  $40.40 / 0.0008 = ?$ .**

- A - 50.5
- B - 505
- C - 5050
- D - 50500

**Answer - D**

**Explanation**

$$40.40 / 0.0008 = (40.40 \times 10000) / (8 \times 10000) = 404000 / 8 = 50500$$

**Q 18 -  $0.001 / ? = 0.1$**

- A - 0.1
- B - 0.01
- C - 0.001
- D - 1.0

**Answer - B**

**Explanation**

$$\begin{aligned} \text{Let } 0.001/x &= 0.1 \\ \Rightarrow x &= (0.001/0.1)x \quad (10/10) = .01/1 = .01 \end{aligned}$$

**Q 19 - What is fraction for 0.313131?**

- A - 3/7
- B - 4/9
- C - 3/9
- D - 31/99

**Answer - B**

**Explanation**

$$=0.313131 = 31/99$$

**Q 20 - What is fraction for 0.5366666?**

- A - 61/300
- B - 69/550
- C - 161/300
- D - 8/45

**Answer - C**

**Explanation**

$$0.5366666 = (536 - 53)/900 = 483/900 = 161/300.$$

1. Evaluate :  $\frac{(2.39)^2 - (1.61)^2}{2.39 - 1.61}$

A. 2

B. 4

C. 6

D. 8

2. The value of  $\frac{0.1 \times 0.1 \times 0.1 + 0.02 \times 0.02 \times 0.02}{0.2 \times 0.2 \times 0.2 + 0.04 \times 0.04 \times 0.04}$  is:

A. 0.0125

B. 0.125

C. 0.25

D. 0.5

3. If  $2994 \div 14.5 = 172$ , then  $29.94 \div 1.45 = ?$

A. 0.172

B. 1.72

C. 17.2

D. 172

4. When  $0.232323\dots$  is converted into a fraction, then the result is:

A.  $\frac{1}{5}$

B.  $\frac{2}{9}$

C.  $\frac{23}{99}$

D.  $\frac{23}{100}$

$$\frac{0.009}{?} = .01$$

A. .0009

B. .09

C. 9

D. 9

6.  $3889 + 12.952 - ? = 3854.002$

A. 47.095

B. 47.752

C. 47.932

D. 47.95

7.  $0.04 \times 0.0162$  is equal to:

A.  $6.48 \times 10^{-3}$

B.  $6.48 \times 10^{-4}$

C.  $6.48 \times 10^{-5}$

D.  $6.48 \times 10^{-6}$

8. Which of the following are in descending order of their value ?

A.  $\frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}$

B.  $\frac{1}{3}, \frac{2}{5}, \frac{3}{5}, \frac{4}{7}, \frac{5}{6}, \frac{6}{7}$

C.  $\frac{1}{3}, \frac{2}{5}, \frac{3}{5}, \frac{4}{6}, \frac{5}{7}, \frac{6}{7}$

D.  $\frac{6}{7}, \frac{5}{6}, \frac{4}{5}, \frac{3}{7}, \frac{2}{5}, \frac{1}{3}$

**9. The rational number for recurring decimal 0.125125.... is:**

**A.**  $\frac{63}{487}$

**B.**  $\frac{119}{993}$

**C.**  $\frac{125}{999}$

**D.** None of these

**10.  $617 + 6.017 + 0.617 + 6.0017 = ?$**

**A.** 6.2963

**B.** 62.965

**C.** 629.6357

**D.** None of these

**11.  $0.002 \times 0.5 = ?$**

**A.** 0.0001

**B.** 0.001

**C.** 0.01

**D.** 0.1

**12.  $34.95 + 240.016 + 23.98 = ?$**

**A.** 298.0946

**B.** 298.111

**C.** 298.946

**D.** 299.09

**13. Which of the following is equal to  $3.14 \times 10^6$  ?**

- A. 314
- B. 3140
- C. 3140000
- D. None of these

**14. The least among the following is:**

- A. 0.2
- B.  $1 \div 0.2$
- C. 0.2
- D.  $(0.2)^2$

**15. How many digits will be there to the right of the decimal point in the product of 95.75 and .02554 ?**

- A. 5
- B. 6
- C. 7
- D. None of these

**16. The correct expression of 6.46 in the fractional form is:**

- A.  $\frac{646}{99}$
- B.  $\frac{64640}{1000}$
- C.  $\frac{640}{100}$
- D.  $\frac{640}{99}$

**17. 4.036 divided by 0.04 gives :**

- A. 1.009
- B. 10.09
- C. 100.9
- D. None of these

**18. Which of the following has fractions in ascending order?**

a.  $\frac{2}{5}, \frac{3}{5}, \frac{1}{3}, \frac{4}{7}, \frac{5}{6}$

b.  $\frac{1}{3}, \frac{2}{5}, \frac{3}{5}, \frac{5}{6}, \frac{4}{7}$

c.  $\frac{1}{3}, \frac{2}{5}, \frac{5}{6}, \frac{4}{7}, \frac{3}{5}$

d.  $\frac{1}{3}, \frac{2}{5}, \frac{4}{7}, \frac{3}{5}, \frac{5}{6}$

**19. Which of the following has fractions in descending order?**

a.  $\frac{5}{6}, \frac{4}{7}, \frac{2}{5}, \frac{3}{5}, \frac{1}{3}$

b.  $\frac{5}{6}, \frac{3}{5}, \frac{4}{7}, \frac{2}{5}, \frac{1}{3}$

c.  $\frac{4}{7}, \frac{1}{3}, \frac{2}{5}, \frac{5}{6}, \frac{3}{5}$

d.  $\frac{1}{3}, \frac{2}{5}, \frac{4}{7}, \frac{3}{5}, \frac{5}{6}$

**20. Convert 0.737373... into vulgar fraction?**

a.  $\frac{73}{99}$

b.  $\frac{73}{100}$

c.  $\frac{73}{90}$

d.  $\frac{73}{900}$

**21. Convert 0.67 into vulgar fraction.**

a.  $\frac{67}{99}$

b.  $\frac{67}{90}$

c.  $\frac{61}{90}$

d.  $\frac{61}{100}$

**22. Find the correct expression for 5.46 in the fractional form.**

a.  $\frac{541}{100}$

b.  $\frac{541}{99}$

c.  $\frac{546}{99}$

d.  $\frac{541}{900}$

**23. Which of the following fractions is the smallest?**

- (A)  $\frac{14}{16}$   
(B)  $\frac{15}{19}$   
(C)  $\frac{16}{21}$   
(D)  $\frac{17}{23}$

**24.  $337.62 + 8.591 + 34.4 = ?$**

- (A) 371.722  
(B) 391.622  
(C) 380.611  
(D) 463.94

**25.  $34.95 + 240.016 + 23.98 = ?$**

- (A) 298.1057  
(B) 298.222  
(C) 298.946  
(D) 299.09

**26.  $48.95 - 32.006 = ?$**

- (A) 16.091  
(B) 16.34  
(C) 16.97  
(D) 16.944

**27.  $12.1212 + 17.0005 - 9.1102 = ?$**

- (A) 20.0017  
(B) 20.0216  
(C) 20.0115  
(D) 20.1115

**28.  $.3889 + 12.952 - ? = 3854.002$**

- (A) 47.015  
(B) 47.641  
(C) 47.943  
(D) 47.95



# Revision HCF and LCM

## Factors and Multiples

If a number P divides another number Q exactly, we say that P is a factor of Q i.e. Q is a multiple of P.

## H.C.F

The H.C.F of two or more than two numbers is the greatest number that divides each of them exactly.

We will discuss here about the method of h.c.f. (highest common factor). Let us consider two numbers 16 and 24.

Factor of 16 are → 1, 2, 4, 8, 16       $1 \times 16, 2 \times 8, 4 \times 4$

Factor of 24 are → 1, 2, 3, 4, 6, 8, 12, 16       $1 \times 24, 2 \times 12, 3 \times 8,$   
 $4 \times 6$

We see that the highest common factor of 16 and 24 is 8. In short, the Highest Common Factor is expressed as H.C.F.

## Finding H.C.F.

There are three methods of finding H.C.F. of two or more numbers.

### 1. Factorization Method

### 2. Prime Factorization Method

#### 1. H.C.F. by factorization method

Let us consider an example.

Find the H.C.F. of 36 and 45.

Factor of 36 are →

1, 2, 3, 4, 6, 9, 12, 18, 36       $1 \times 36, 2 \times 18, 3 \times 12, 4 \times 9, 6 \times$   
6

Factor of 45 are → 1, 3, 5, 9, 15,  
45       $1 \times 45, 3 \times 15, 5 \times 9$

## **2. H.C.F. by prime factorization method**

Let us consider an example.

Find the H.C.F. of 24, 36 and 48.

First we find the prime factors of 24, 36 and 48.

$$24 = 2 \times 2 \times 2 \times 3$$

$$36 = 2 \times 2 \times 3 \times 3$$

$$48 = 2 \times 2 \times 2 \times 2 \times 3$$

The common prime factors = 2, 2, 3

$$\text{H.C.F.} = 2 \times 2 \times 3 = 12$$

## **L.C.M**

The least number which is exactly divisible by each one of the given numbers is called their L.C.M

We will discuss here about the method of l.c.m. (least common multiple).

Let us consider the numbers 8, 12 and 16.

1. Multiples of 8 are  $\rightarrow 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96,$

.....

2. Multiples of 12 are  $\rightarrow 12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132,$

.....

3. Multiples of 16 are  $\rightarrow 16, 32, 48, 64, 80, 96, 112, 128, 144, 160,$   
176, .....

The common multiple of 8, 12, 16 are 78, 96, .....

The least common multiple of 8, 12 and 16 is 48. (Smallest common multiple)

In short, the lowest common factor is expressed as L.C.M.

## Finding L.C.M.

To find the L.C.M. we find prime factors of the given numbers.

Remember, we consider common prime factors only.

Example: Find the L.C.M. of 12, 16 and 24.

First we find the prime factors of the given numbers.

$$12 = 2 \times 2 \times 3$$

$$16 = 2 \times 2 \times 2 \times 2$$

$$24 = 2 \times 2 \times 2 \times 2 \times 3$$

(2 comes maximum 4 times and 3 comes maximum once only.)

$$\text{L.C.M.} = 2 \times 2 \times 2 \times 2 \times 3$$

= 48 which is the product of their prime factors.

Product of two numbers

Product of their H.C.F and L.C.M

## Co-primes

**Two numbers are co-primes if their H.C.F is 1.**

H.C.F and L.C.M of fractions

$$\text{H.C.F} = \frac{\text{H.C.F of Numerators}}{\text{L.C.M of Denominators}}$$

$$\text{L.C.M} = \frac{\text{L.C.M of Numerators}}{\text{H.C.F of Denominators}}$$

**Q 1 - Compute H.C.F of  $(2^2 * 2^3 * 5 * 7^4)$ ,  $(2^3 * 3^2 * 5^2 * 7^3)$  and  $(2^2 * 5^3 * 7^5)$ .**

A - 6760

B - 6860

C - 6960

D - 7060

**Answer - B**

**Explanation**

Prime numbers which are common to all the given numbers are 2,5 ,7.

$$\therefore \text{H.C.F} = (2^2 * 5 * 7^3) = (4 * 5 * 343) = 6860$$

**Q 2 - Find the H.C.F of 108, 360 and 600.**

A - 12

B - 13

C - 14

D - 15

**Answer - A**

**Explanation**

$$108 = (2^2 * 3^3), 360 = (2^3 * 3^2 * 5) \text{ and } 600 = (2^3 * 5^2 * 3)$$

$$\therefore \text{H.C.F} = (2^2 * 3) = (4 * 3) = 12$$

**Q 3 - Find the H.C.F of 148 and 185.**

A - 37

B - 38

C - 39

D - 40

**Answer - A**

**Explanation**

Remainder of  $185/148 = 37$

Remainder of  $148/37 = 0$

$\therefore$  H.C.F. = 37

**Q 4 - Find the H.C.F of 204, 1190 and 1445.**

A - 16

B - 17

C - 18

D - 19

**Answer - B**

**Explanation**

Remainder of  $1190/204 = 170$

Remainder of  $204/170 = 34$

Remainder of  $170/34 = 0$

$\therefore$  H.C.F. of 204, 1190 = 34

Remainder of  $1445/34 = 17$

Remainder of  $34/17 = 0$

$\therefore$  H.C.F. of 204, 1190 and 1445 = 17

**Q 5 - Reduce 391/667 to lowest terms.**

A - 7/29

B - 27/29

C - 17/29

D - 37/29

**Answer - C**

**Explanation**

First we find the H.C.F of 391 and 667.

Remainder of  $667/391 = 276$

Remainder of  $391/276 = 115$

Remainder of  $276/115 = 46$

Remainder of  $115/46 = 23$

Remainder of  $46/23= 0$

$\therefore$  H.C.F. of 391, 667 = 23

$\therefore 391/667 = (391/23)/ (667/23) = 17/29$

**Q 6 - Find the L.C.M of  $(2^2 \cdot 3^2 \cdot 5 \cdot 7)$ ,  $(2^3 \cdot 3 \cdot 5^2 \cdot 7^2)$  and  $(2 \cdot 3 \cdot 7 \cdot 11)$ .**

A - 970200

B - 97020

C - 9702

D - 970

**Answer - A**

**Explanation**

We have L.C.M = product of terms containing highest powers of  
 $(2, 3, 5, 7, 11)$

$$= (2^3 \cdot 3^2 \cdot 5^2 \cdot 7^2 \cdot 11) = (8 \cdot 9 \cdot 25 \cdot 49) = 970200$$

**Q 7 - Find the L.C.M of 15, 18, 24, 27, 56.**

A - 7260

B - 7360

C - 7460

D - 7560

**Answer - D**

**Explanation**

$$15 = 3 \cdot 5$$

$$18 = 2 \cdot 3 \cdot 3 = 2 \cdot 3^2$$

$$24 = 2 \cdot 2 \cdot 2 \cdot 3 = 2^3 \cdot 3$$

$$27 = 3 \cdot 3 \cdot 3 = 3^3$$

$$56 = 2 \cdot 2 \cdot 2 \cdot 7 = 2^3 \cdot 7$$

L.C.M = product of terms containing highest powers of  $(2, 3, 5, 7)$   
 $= 2^3 \cdot 3^3 \cdot 5 \cdot 7 = 7560$

**Q 8 - Find the H.C.F and L.C.M of  $\frac{2}{3}$ ,  $\frac{8}{9}$ ,  $\frac{10}{27}$  and  $\frac{16}{81}$ .**

- A - 45
- B - 55
- C - 65
- D - 75

**Answer - D**

**Explanation**

$$\text{H.C.F of } 2,8,10,16 = 2$$

$$\text{L.C.M of } 3,9,27,81 = 81$$

$$\text{H.C.F} = \text{H.C.F of } 2,8,10,16 / \text{L.C.M of } 3,9,27,81 = 2/81$$

$$\text{L.C.M} = \text{L.C.M of } 2,8,10,16 / \text{H.C.F of } 3,9,27,81 = 80/3$$

**Q 9 - Two numbers are in the ratio 8:11 . Considering their H.C.F as 6, find the numbers.**

- A - 58.79
- B - 48.66
- C - 38.56
- D - 28.33

**Answer - B**

**Explanation**

Let the numbers be  $8x$  and  $11x$ . then, their H.C.F =  $x$

So, the numbers are  $(8*6)$ ,  $(11*6)$  i.e 48 and 66.

**Q 10 - Given the H.C. F of two numbers as 7 and their L.C.M as 210. If one of the numbers is 35, find the other.**

- A - 32
- B - 42
- C - 52
- D - 62

**Answer - B**

**Explanation**

Let the Other number be X. then,

Product of numbers = product of their H.C .F and L.C.M

$$35 \times x = 7 \times 210 \Rightarrow x = 7 \times 210 / 35 = 42$$

Hence, the other number is 42.

**Q 11 - Three big drums contain 36 liters, 45 liters and 72 liters of oil. What is the biggest measure which can measure all the different quantities exactly?**

- A - 9 liters
- B - 10 liters
- C - 11 liters
- D - 12 liters

**Answer - A**

**Explanation**

Required measure = H.C.F of 36 L, 45 L, and 72 L

$$= (3^2) \text{ liters} = 9 \text{ liters}$$

$$[\text{As } 36 = 2^2 \times 3^2, 45 = 3^2 \times 5 \text{ and } 72 = 2^4 \times 3^4]$$

**Q 12 - Four electronic devices make a beep after duration of 30 minutes, 1 hour, 3/2 hours and 1 hour 45 min. respectively. If all the devices beeped together at 12 noon at what time will they beep together again?**

- A - 9 am
- B - 10 am
- C - 11 am
- D - 11:30 am

**Answer - A**

**Explanation**

Intervals of beeping 30 min, 60 min, 90 min, 105 min.  
Interval of beeping together= L.C.M of 30 min. 60 min. 90 min. 105 min  
 $= (3^2 * 5 * 2 * 2 * 3 * 7)$  min. = 1260 min = 21 hrs.  
So, they will beep together again next morning at 9 am.

**Q 13 - Find the largest number which can exactly divide 513, 783 and 1107.**

- A - 22
- B - 23
- C - 24
- D - 25

**Answer - B**

**Explanation**

Remainder of  $783/513 = 270$   
Remainder of  $513/270 = 243$   
Remainder of  $270/243 = 27$   
Remainder of  $243/27 = 0$

Remainder of  $46/23 = 0$

$\therefore$  H.C.F. of 513, 783 = 23

Remainder of 1107/23 = 0

$\therefore$  H.C.F. of 513, 783 and 1107= 23

**Q 14 - Find the smallest number which is exactly divisible by each one of the numbers 12, 15, 20 and 27.**

A - 540

B -530

C - 520

D - 510

**Answer - A**

**Explanation**

Required no. = L.C.M of 12,15, 20 and 27

$$= (3*2*2*5*9) = 540$$

**Q 15 - Find the least number which if divided by 6, 7, 8, 9, 12 leaves the same remainder 2 in each case.**

- A - 506
- B - 504
- C - 502
- D - 500

**Answer - A**

**Explanation**

Required number = (L.C.M of 6,7,8,9,12)+2 =  $(2*3*2*7*2*3)+2 = (504+2) = 506$ .

**Q 16 - Find the largest natural number which can divide the product of any 4 consecutive natural numbers.**

- A - 23
- B - 24
- C - 25
- D - 26

**Answer - B**

**Explanation**

$(1*2*3*4) = 24$   
 $\therefore$  Required number = 24

**Q 17 - Find the least number which if divided by 35, 45 and 55 leaves the remainder 18, 28 and 38 respectively.**

A - 3448

B - 3458

C - 3468

D - 3478

**Answer - A**

**Explanation**

Here  $(35-18) = 17$ ,  $(45-28) = 17$  and  $(55-38) = 17$

Required number = (L.C.M of 35,45, 55)- 17 =  $(3465 - 17) = 3448$

**Q 18 - The H.C.F of  $1/2$  ,  $2/3$  ,  $3/4$  ,  $4/5$  is**

A -  $1/120$

B -  $12/5$

C -  $100/3$

D -  $10/3$

**Answer - A**

**Explanation**

H.C.F = H.C.F of 1,2,3,4/ L.C.M of 2,3,4,5 =  $1/120$

**Q 19- What is the H.C.F. of  $\frac{4}{9}$ ,  $\frac{10}{21}$  and  $\frac{20}{63}$ ?**

- A.  $\frac{4}{189}$
- B.  $\frac{6}{63}$
- C.  $\frac{2}{63}$
- D.  $\frac{20}{21}$
- E. None of these

**Sol : Option 3**

H.C.F of  $\frac{4}{9}$ ,  $\frac{10}{21}$  and  $\frac{20}{63}$  = H.C.F of 4,10 and 20 / L.C.M of 9,21 and 63  
= H.C.F of 4, 10 and 20 = 2 & L.C.M. of 9, 21 and 63 = 63. Required  
H.C.F. =  $\frac{2}{63}$

**Q 20 - Which of the following is a pair of Co-primes?**

- A - (14, 35)
- B - (18, 25)
- C - (31, 93)
- D - (32,62)

**Answer - B**

**Explanation**

H.C.F of 18 and 25 is 1.

$\therefore$  18 and 25 are co-primes.

**Q 21-** The LCM of  $\frac{1}{3}, \frac{5}{6}, \frac{2}{9}$ , and  $\frac{4}{27}$  is:

- A.  $\frac{1}{54}$
- B.  $\frac{10}{27}$
- C.  $\frac{20}{3}$
- D. None of these.

**Answer: C**

**Explanation:**

**Formula:** LCM of a fraction number =  $\frac{\text{LCM of Numerator}}{\text{HCF of denominator}}$

**LCM:**

2	1 , 5 , 2 , 4
2	1 , 5 , 1 , 2
5	1 , 1 , 1 , 1
	1 , 1 , 1 , 1

$$\text{LCM} = 2 \times 2 \times 5 = 20$$

**HCF:**

$$3=3 \times 1$$

$$6=3 \times 2 \times 1$$

$$9=3 \times 3 \times 1$$

$$27=3 \times 3 \times 3 \times 1$$

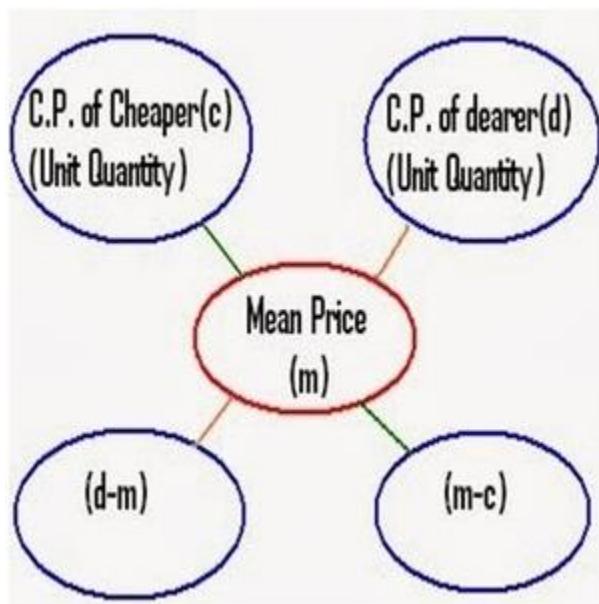
$$\text{HCF}=3$$

**Formula:**  $\text{LCM} = \frac{\text{LCM of Numerator}}{\text{HCF of denominator}} = \frac{20}{3}$

## Revision Mixture and alligation

1. **Alligation:** It refers to a rule that helps to find the ratio in which two or more ingredients at a given price are mixed to produce a mixture of specified price.
2. **Mean Price:** It is the cost price of a unit quantity of a mixture which is prepared by mixing two or more ingredients.
3. **Alligation rule:** It says that if two ingredients at a given price are mixed to produce a mixture at the given price, the ratio of quantity of cheaper ingredient and quantity of dearer ingredient is given by;

$$\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}} = \frac{\text{Cost price of dearer} - \text{Mean price}}{\text{Mean price} - \text{Cost price of cheaper}}$$



Cheaper quantity: Dearer quantity:  $(d-m) : (m-c)$

1. Suppose a container contains  $x$  units of liquid from which  $y$  units are taken out and replaced by water.

After  $n$  operations, the quantity of pure liquid =  $\left[ x \left( 1 - \frac{y}{x} \right)^n \right]$  units.

1) A container contains  $x$  units of a liquid from which  $y$  units are taken out and replaced by water. Again from this mixture  $y$  units are taken out and replaced by water. If this process is repeated  $n$  times;

$$\frac{\text{liquid left in the container after } n \text{ operation}}{\text{Original quantity of the liquid in the vessel}} = \frac{x - y}{x}$$

Or,

$$\text{Quantity of pure liquid after } n \text{ operation} = x * (1 - \frac{y}{x})^n$$

2) If  $n$  containers of equal capacity are filled with the mixture of liquids  $X$  and  $Y$  in the ratio  $x_1: y_1, x_2: y_2, \dots, x_n: y_n$ , respectively and the content of all the containers is mixed in a single container;

$$\frac{\text{Quantity of liquid A}}{\text{Quantity of liquid B}} = \frac{\frac{x_1}{x_1 + y_1} + \frac{x_2}{x_2 + y_2} + \dots + \frac{x_n}{x_n + y_n}}{\frac{y_1}{x_1 + y_1} + \frac{y_2}{x_2 + y_2} + \dots + \frac{y_n}{x_n + y_n}}$$

3) If  $n$  containers of different sizes ( $z_1, z_2, \dots, z_n$ ) are filled with a mixture of liquids  $X$  and  $Y$  in the ratio  $x_1: y_1, x_2: y_2, \dots, x_n: y_n$ , respectively and the content of all the containers is mixed in a single container;

$$\frac{\text{Quantity of liquid A}}{\text{Quantity of liquid B}} = \frac{\frac{x_1 z_1}{x_1 + y_1} + \frac{x_2 z_2}{x_2 + y_2} + \dots + \frac{x_n z_n}{x_n + y_n}}{\frac{y_1 z_1}{x_1 + y_1} + \frac{y_2 z_2}{x_2 + y_2} + \dots + \frac{y_n z_n}{x_n + y_n}}$$

**1) A 60 liter mixture of milk and water contains 10% water. How much water must be added to make water 20% in the mixture?**

- A. 8 liters
- B. 7.5 liters
- C. 7 liters
- D. 6.5 liters

The Correct answer is (B)

**Answer with explanation:**

The mixture has 10% water, so the milk would be 90% of 60 liters.

$$\text{Milk} = \frac{90}{100} * 60 = 54 \text{ liters}$$

$$\therefore \text{Water} = 60 - 54 = 6 \text{ liters}$$

Let water to be added = x liters

$$\text{Now, } \frac{6+x}{60+x} * 100 = 20$$

$$\frac{6+x}{60+x} = \frac{1}{5}$$

$$30 + 5x = 60 + x$$

$$30 - 60 = x - 5x$$

$$-30 = -4x$$

$$x = \frac{30}{4} = 7.5 \text{ liters}$$

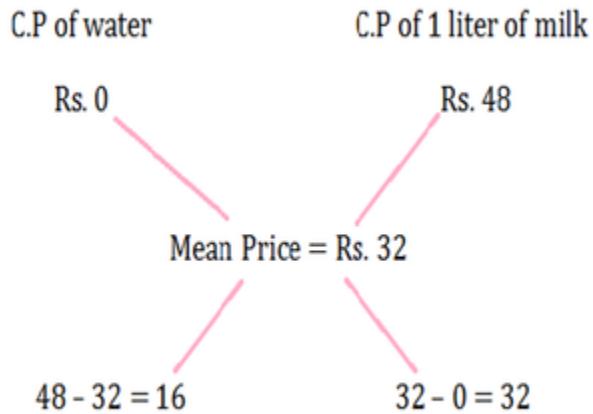
**2) In what ratio water must be mixed with milk costing Rs. 48 per liter to get a mixture worth Rs. 32 per liter ?**

- A. 2:3
- B. 3:2
- C. 3:4
- D. 1:2

The Correct answer is (D)

**Answer with explanation:**

**Apply alligation rule:**



$$\therefore \frac{\text{Water}}{\text{Milk}} = \frac{16}{32} = \frac{1}{2}$$

**3) 700 ml of a mixture contains water and milk in the ratio 2:8. How much water must be added to the mixture so that the ratio of water and milk becomes 3:8?**

- A. 75 ml
- B. 65 ml
- C. 70 ml
- D. 60 ml

The Correct answer is (C)

**Answer with explanation:**

$$\text{Milk in the 700 ml of mixture} = 700 * \frac{8}{10} = 560 \text{ ml}$$

$$\text{So, water in the mixture would be} = 700 - 560 = 140 \text{ ml}$$

$$\text{Let water to be added} = x \text{ ml}$$

$$\text{Now, } \frac{140+x}{560} = \frac{3}{8}$$

$$1120 + 8x = 1680$$

$$8x = 1680 - 1120$$

$$8x = 560$$

$$X = \frac{560}{8} = 70 \text{ ml}$$

How many kilogram of sugar costing Rs. 9 per kg must be mixed with 27 kg of sugar costing Rs. 7 per kg so that there may be a gain of 10% by selling the mixture at Rs. 9.24 per kg?

- A. 36 kg
- B. 42 kg
- C. 54 kg
- D. 63 kg

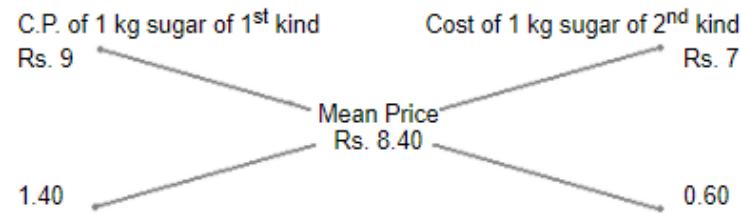
**Answer:** Option D

**Explanation:**

S.P. of 1 kg of mixture = Rs. 9.24, Gain 10%.

$$\therefore \text{C.P. of 1 kg of mixture} = \text{Rs. } \left( \frac{100}{110} \times 9.24 \right) = \text{Rs. } 8.40$$

By the rule of alligation, we have:



$$\therefore \text{Ratio of quantities of 1<sup>st</sup> and 2<sup>nd</sup> kind} = 14 : 6 = 7 : 3.$$

Let  $x$  kg of sugar of 1<sup>st</sup> be mixed with 27 kg of 2<sup>nd</sup> kind.

Then,  $7 : 3 = x : 27$

$$\Rightarrow x = \left( \frac{7 \times 27}{3} \right) = 63 \text{ kg.}$$

A jar full of whisky contains 40% alcohol. A part of this whisky is replaced by another containing 19% alcohol and now the percentage of alcohol was found to be 26%. The quantity of whisky replaced is:

- A.  $\frac{1}{3}$
- B.  $\frac{2}{3}$
- C.  $\frac{2}{5}$
- D.  $\frac{3}{5}$

**Answer:** Option B

**Explanation:**

By the rule of alligation, we have:



So, ratio of 1<sup>st</sup> and 2<sup>nd</sup> quantities = 7 : 14 = 1 : 2

∴ Required quantity replaced =  $\frac{2}{3}$

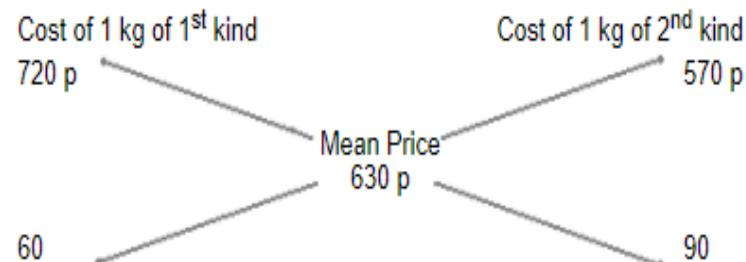
Find the ratio in which rice at Rs. 7.20 a kg be mixed with rice at Rs. 5.70 a kg to produce a mixture worth Rs. 6.30 a kg.

- A. 1 : 3
- B. 2 : 3
- C. 3 : 4
- D. 4 : 5

**Answer:** Option B

**Explanation:**

By the rule of alligation:



$\therefore$  Required ratio = 60 : 90 = 2 : 3.

In what ratio must a grocer mix two varieties of tea worth Rs. 60 a kg and Rs. 65 a kg so that by selling the mixture at Rs. 68.20 a kg he may gain 10%?

- A. 3 : 2
- B. 3 : 4
- C. 3 : 5
- D. 4 : 5

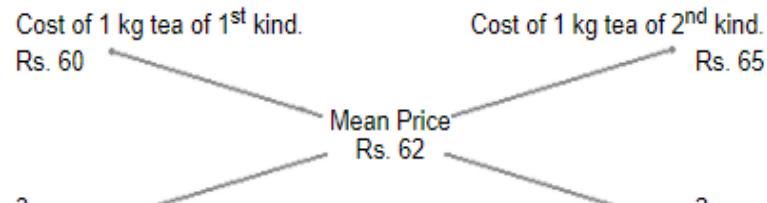
**Answer:** Option A

**Explanation:**

S.P. of 1 kg of the mixture = Rs. 68.20, Gain = 10%.

$$\text{C.P. of 1 kg of the mixture} = \text{Rs. } \left( \frac{100}{110} \times 68.20 \right) = \text{Rs. } 62.$$

By the rule of alligation, we have:



∴ Required ratio = 3 : 2.

A dishonest milkman professes to sell his milk at cost price but he mixes it with water and thereby gains 25%. The percentage of water in the mixture is:

- A. 4%
- B.  $6\frac{1}{4}\%$
- C. 20%
- D. 25%

**Answer:** Option C

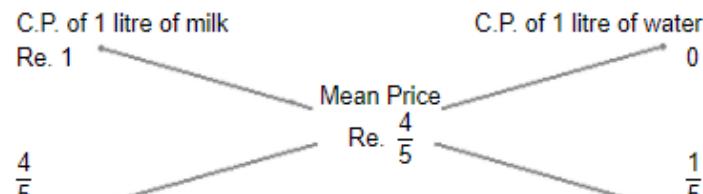
**Explanation:**

Let C.P. of 1 litre milk be Re. 1

Then, S.P. of 1 litre of mixture = Re. 1, Gain = 25%.

$$\text{C.P. of 1 litre mixture} = \text{Re. } \left( \frac{100}{125} \times 1 \right) = \frac{4}{5}$$

By the rule of alligation, we have:



$$\therefore \text{Ratio of milk to water} = \frac{4}{5} : \frac{1}{5} = 4 : 1.$$

$$\text{Hence, percentage of water in the mixture} = \left( \frac{1}{5} \times 100 \right)\% = 20\%.$$

# Revision Number Series

## Numbers:

In Decimal number system, there are ten symbols namely 0,1,2,3,4,5,6,7,8 and 9 called digits. A number is denoted by group of these digits called as numerals.

## Face Value

Face value of a digit in a numeral is value of the digit itself. For example in 321, face value of 1 is 1, face value of 2 is 2 and face value of 3 is 3.

## Place Value

Place value of a digit in a numeral is value of the digit multiplied by  $10^n$  where n starts from 0.

For example in 321:

$$\text{Place value of } 1 = 1 \times 10^0 = 1 \times 1 = 1$$

$$\text{Place value of } 2 = 2 \times 10^1 = 2 \times 10 = 20$$

$$\text{Place value of } 3 = 3 \times 10^2 = 3 \times 100 = 300$$

0<sup>th</sup> position digit is called unit digit and is the most commonly used topic in aptitude tests.

## Types of Numbers

**Natural Numbers** -  $n > 0$  where n is counting number; [1,2,3...]

**Whole Numbers** -  $n \geq 0$  where n is counting number; [0,1,2,3...].

0 is the only whole number which is not a natural number.

Every natural number is a whole number.

**Integers** -  $n \geq 0$  or  $n \leq 0$  where n is counting number; ..., -3, -2, -1, 0, 1, 2, 3... are integers.

**Positive Integers** -  $n > 0$ ; [1,2,3...]

**Negative Integers** -  $n < 0$ ; [-1, -2, -3...]

**Non-Positive Integers** -  $n \leq 0$ ;  $[0, -1, -2, -3, \dots]$

**Non-Negative Integers** -  $n \geq 0$ ;  $[0, 1, 2, 3, \dots]$

0 is neither positive nor negative integer.

**Even Numbers** -  $n / 2 = 0$  where n is counting number;  $[0, 2, 4, \dots]$

**Odd Numbers** -  $n / 2 \neq 0$  where n is counting number;  $[1, 3, 5, \dots]$

**Prime Numbers** - Numbers which is divisible by themselves only apart from 1.

1 is not a prime number.

To test a number p to be prime, find a whole number k such that  $k > \sqrt{p}$ . Get all prime numbers less than or equal to k and divide p with each of these prime numbers. If no number divides p exactly then p is a prime number otherwise it is not a prime number.

**Example: 191 is prime number or not?**

**Solution:**

Step 1 -  $14 > \sqrt{191}$

Step 2 - Prime numbers less than 14 are 2, 3, 5, 7, 11 and 13.

Step 3 - 191 is not divisible by any above prime number.

Result - 191 is a prime number.

Example: 187 is prime number or not?

**Solution:**

Step 1 -  $14 > \sqrt{187}$

Step 2 - Prime numbers less than 14 are 2, 3, 5, 7, 11 and 13.

Step 3 - 187 is divisible by 11.

Result - 187 is not a prime number.

**Composite Numbers** - Non-prime numbers  $> 1$ . For example, 4,6,8,9 etc.

1 is neither a prime number nor a composite number.

2 is the only even prime number.

**Co-Primes Numbers** - Two natural numbers are co-primes if their H.C.F. is 1. For example, (2,3), (4,5) are co-primes.

## **Divisibility**

Following are tips to check divisibility of numbers.

**A. Divisibility by 2** - A number is divisible by 2 if its unit digit is 0,2,4,6 or 8.

Example: 64578 is divisible by 2 or not?

Solution:

Step 1 - Unit digit is 8.

Result - 64578 is divisible by 2.

Example: 64575 is divisible by 2 or not?

Solution:

Step 1 - Unit digit is 5.

Result - 64575 is not divisible by 2.

**B. Divisibility by 3** - A number is divisible by 3 if sum of its digits is completely divisible by 3.

Example: 64578 is divisible by 3 or not?

Solution:

Step 1 - Sum of its digits is  $6 + 4 + 5 + 7 + 8 = 30$

which is divisible by 3.

Result - 64578 is divisible by 3.

Example: 64576 is divisible by 3 or not?

Solution:

Step 1 - Sum of its digits is  $6 + 4 + 5 + 7 + 6 = 28$

which is not divisible by 3.

Result - 64576 is not divisible by 3.

**C. Divisibility by 4** - A number is divisible by 4 if number formed using its last two digits is completely divisible by 4.

Example: 64578 is divisible by 4 or not?

Solution:

Step 1 - number formed using its last two digits is 78 which is not divisible by 4.

Result - 64578 is not divisible by 4.

Example: 64580 is divisible by 4 or not?

Solution:

Step 1 - number formed using its last two digits is 80 which is divisible by 4.

Result - 64580 is divisible by 4.

**D. Divisibility by 5** - A number is divisible by 5 if its unit digit is 0 or 5.

Example: 64578 is divisible by 5 or not?

Solution:

Step 1 - Unit digit is 8.

Result - 64578 is not divisible by 5.

Example: 64575 is divisible by 5 or not?

Solution:

Step 1 - Unit digit is 5.

Result - 64575 is divisible by 5.

**E. Divisibility by 6** - A number is divisible by 6 if the number is divisible by both 2 and 3.

Example: 64578 is divisible by 6 or not?

Solution:

Step 1 - Unit digit is 8. Number is divisible by 2.

Step 2 - Sum of its digits is  $6 + 4 + 5 + 7 + 8 = 30$  which is divisible by 3.

Result - 64578 is divisible by 6.

Example: 64576 is divisible by 6 or not?

Solution:

Step 1 - Unit digit is 8. Number is divisible by 2.

Step 2 - Sum of its digits is  $6 + 4 + 5 + 7 + 6 = 28$

which is not divisible by 3.

Result - 64576 is not divisible by 6.

**F. Divisibility by 8** - A number is divisible by 8 if number formed using its last three digits is completely divisible by 8.

Example: 64578 is divisible by 8 or not?

Solution:

Step 1 - number formed using its last three digits is 578

which is not divisible by 8.

Result - 64578 is not divisible by 8.

Example: 64576 is divisible by 8 or not?

Solution:

Step 1 - number formed using its last three digits is 576

which is divisible by 8.

Result - 64576 is divisible by 8.

**G. Divisibility by 9** - A number is divisible by 9 if sum of its digits is completely divisible by 9.

Example: 64579 is divisible by 9 or not?

Solution:

Step 1 - Sum of its digits is  $6 + 4 + 5 + 7 + 9 = 31$

which is not divisible by 9.

Result - 64579 is not divisible by 9.

Example: 64575 is divisible by 9 or not?

Solution:

Step 1 - Sum of its digits is  $6 + 4 + 5 + 7 + 5 = 27$

which is divisible by 9.

Result - 64575 is divisible by 9.

**H. Divisibility by 10** - A number is divisible by 10 if its unit digit is 0.

Example: 64575 is divisible by 10 or not?

Solution:

Step 1 - Unit digit is 5.

Result - 64578 is not divisible by 10.

Example: 64570 is divisible by 10 or not?

Solution:

Step 1 - Unit digit is 0.

Result - 64570 is divisible by 10.

**I. Divisibility by 11** - A number is divisible by 11 if difference between sum of digits at odd places and sum of digits at even places is either 0 or is divisible by 11.

Example: 64575 is divisible by 11 or not?

Solution:

Step 1 - difference between sum of digits at odd places and sum of digits at even places =  $(6+5+5) - (4+7) = 5$   
which is not divisible by 11.

Result - 64575 is not divisible by 11.

Example: 64075 is divisible by 11 or not?

Solution:

Step 1 - difference between sum of digits at odd places and sum of digits at even places =  $(6+0+5) - (4+7) = 0$ .

Result - 64075 is divisible by 11.

### Tips on Division

If a number n is divisible by two co-primes numbers a, b then n is divisible by ab.

$(a-b)$  always divides  $(a^n - b^n)$  if n is a natural number.

$(a+b)$  always divides  $(a^n + b^n)$  if n is an odd number.

$(a+b)$  always divides  $(a^n - b^n)$  if n is an even number.

## **Division Algorithm**

When a number is divided by another number then

$$\text{Dividend} = (\text{Divisor} \times \text{Quotient}) + \text{Reminder}$$

Series

Following are formulae for basic number series:

$$(1+2+3+\dots+n) = (1/2)n(n+1)$$

$$(1^2+2^2+3^2+\dots+n^2) = (1/6)n(n+1)(2n+1)$$

$$(1^3+2^3+3^3+\dots+n^3) = (1/4)n^2(n+1)^2$$

## **Basic Formulae**

These are the basic formulae:

$$\text{i. } (a + b)^2 = a^2 + b^2 + 2ab$$

$$\text{ii. } (a - b)^2 = a^2 + b^2 - 2ab$$

$$\text{iii. } (a + b)^2 - (a - b)^2 = 4ab$$

$$\text{iv. } (a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$$

$$\text{v. } (a^2 - b^2) = (a + b)(a - b)$$

$$\text{vi. } (a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$$

$$\text{vii. } (a^3 + b^3) = (a + b)(a^2 - ab + b^2)$$

$$\text{viii. } (a^3 - b^3) = (a - b)(a^2 + ab + b^2)$$

$$\text{ix. } (a^3 + b^3 + c^3 - 3abc) = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

**Q 1 -** Which of the following is a prime number?

A - 187

B - 811

C - 341

D - 437

**Answer - B**

**Explanation**

Step 1. Find a whole number k such that  $k^2 > n$  for each number.

$$14^2 > 187.$$

$$30^2 > 811.$$

$$19^2 > 341.$$

$$21^2 > 437.$$

Step 2. Get all prime numbers which are  $< k$

14 - 2 , 3, 5, 7, 11, 13

30 - 2 , 3, 5, 7, 11, 13, 17, 19, 23, 29

19 - 2 , 3, 5, 7, 11, 13, 17

21 - 2 , 3, 5, 7, 11, 13, 17, 19

Step 3. Check divisiblity of each number

with prime numbers which are  $< k$ .

187 is divisible by 11.

811 is not divisible by any prime number.

341 is divisible by 11.

437 is divisible by 19.

Result: 811 is the prime number.

**Q 2 - Which of the following is the output of  $6894 \times 99$  ?**

- A - 685506
- B - 682506
- C - 683506
- D - 684506

**Answer - B**

**Explanation**

$$\begin{aligned}6894 \times 99 &= 6894 \times (100 - 1) \\&= 6894 \times 100 - 6894 \times 1 \\&= 689400 - 6894 \\&= 682506\end{aligned}$$

**Q 3 - Which of the following is the output of  $685798 \times 125$  ?**

- A - 8224750
- B - 8225750
- C - 8225950
- D - 8224760

**Answer - A**

**Explanation**

$$\begin{aligned}685798 \times 125 &= 685798 \times 5^3 \\&= 685798 \times (10/2)^3 \\&= (685798 \times 10^3) / 2^3 \\&= 685798000 / 8 \\&= 85724750\end{aligned}$$

**Q 4 - Which of the following is the output of  $43986 \times 625$  ?**

- A - 27491450
- B - 27491350
- C - 27491250
- D - 27491750

**Answer - C**

**Explanation**

$$\begin{aligned}43986 \times 625 \\&= 43986 \times 5^4 \\&= 43986 \times (10/2)^4 \\&= (43986 \times 10^4) / 2^4 \\&= 439860000 / 16 \\&= 27491250\end{aligned}$$

**Q 5 - Which of the following is the output of  $869 \times 738 + 869 \times 262$  ?**

- A - 262000
- B - 738000
- C - 969000
- D - 869000

**Answer - D**

**Explanation**

$$\begin{aligned}869 \times 738 + 869 \times 262 \\&= 869 \times (738 + 262) \\&= 869 \times 1000 \\&= 869000\end{aligned}$$

**Q 6 - Which of the following is the output of  $936 \times 587 - 936 \times 487$  ?**

- A - 93600
- B - 58700
- C - 48700
- D - 100

**Answer - A**

**Explanation**

$$\begin{aligned}936 \times 587 - 936 \times 487 \\= 936 \times (587 - 487) \\= 936 \times 100 \\= 93600\end{aligned}$$

**Q 7 - Which of the following is the output of  $1496 \times 1496$  ?**

- A - 3338016
- B - 2238016
- C - 2248016
- D - 2258016

**Answer - B**

**Explanation**

$$\begin{aligned}1496 \times 1496 \\= 1496^2 \\= (1500-4)^2 \\= 1500^2 + 4^2 - 2 \times 1500 \times 4 \\= 2250000 + 16 - 12000 \\= 2238016\end{aligned}$$

We've used following formula here:

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

**Q 8 - Which of the following is the output of  $1607 \times 1607$  ?**

A - 2581449

B - 2583449

C - 2582449

D - 2584449

**Answer - C**

**Explanation**

$$\begin{aligned}1607 \times 1607 &= 1607^2 \\&= (1600+7)^2 \\&= 1600^2 + 7^2 + 2 \times 1600 \times 7 \\&= 2560000 + 49 + 22400 \\&= 2582449\end{aligned}$$

We've used following formula here:

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

**Q 9 - If the number 467X4 is divisible by 9, find the value of the digit marked as X.**

A. 4

B. 5

C. 6

D. 7

**Answer (C)**

**Answer with explanation:**

The number is divisible by 9 so the sum of its digits would be divisible by 9.

$\therefore 4 + 6 + 7 + X + 4 = 21 + X$ , must be divisible by 9.

$X = 6$ , fulfills our requirement so the required digit is 6.

**Q 10 - Which of the following is the output of  $57 \times 57 + 43 \times 43 + 2 \times 57 \times 43$  ?**

A - 10000

B - 5700

C - 4300

D - 1000

**Answer - A**

**Explanation**

$$\begin{aligned} & 57 \times 57 + 43 \times 43 + 2 \times 57 \times 43 \\ &= (57 + 43)^2 \\ &= (100)^2 \\ &= 10000 \end{aligned}$$

We've used following formula here:

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

**Q 11- What smallest number should be subtracted from 9805 so that it is divisible by 8?**

- A. 3
- B. 4
- C. 5
- D. 7

The Correct answer is (C)

**Answer with explanation:**

On dividing 9805 by 8, the remainder is 5. So, 5 is the smallest number which should be subtracted from 9805 to make it divisible by 8.

**Q 12 - Which of the following is the output of**

**(578 x 578 x 578 + 432 x 432 x 432) / (578 x 578 - 578 x 432 + 432 x 432) ?**

- A - 2000
- B - 4000
- C - 3000
- D - 1000

**Answer - D**

**Explanation**

$(578 \times 578 \times 578 + 432 \times 432 \times 432) / (578 \times 578 - 578 \times 432 + 432 \times 432)$

Let's have  $a = 578$ ,  $b = 432$

Now expression is  $(a^3 + b^3) / (a^2 - ab + b^2)$   
 $= a + b$

$$\begin{aligned} &= 578 + 432 \\ &= 1000 \end{aligned}$$

We've used following formula here:

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2).$$

**Q 13 - Which of the following is the output of  $(141 \times 141 \times 141 - 58 \times 58 \times 58) / (141 \times 141 + 141 \times 58 + 58 \times 58)$  ?**

- A - 83
- B - 100
- C - 90
- D - 73

**Answer - A**

**Explanation**

$$(141 \times 141 \times 141 - 58 \times 58 \times 58) / (141 \times 141 + 141 \times 58 + 58 \times 58)$$

Let's have  $a = 141$ ,  $b = 58$

Now expression is  $(a^3 - b^3) / (a^2 + ab + b^2)$

$$\begin{aligned} &= a - b \\ &= 141 - 58 \\ &= 83 \end{aligned}$$

We've used following formula here:

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2).$$

**Q 14 - Which of the following is the output of  $213 \times 213 + 187 \times 187$  ?**

- A - 50338
- B - 80338
- C - 90338
- D - 70338

**Answer - B**

**Explanation**

$$213 \times 213 + 187 \times 187$$

Let's have  $a = 213$ ,  $b = 187$

Now expression is  $a^2 + b^2$

Using following formula,  $(a + b)^2 + (a - b)^2 = 2 \times (a^2 + b^2)$

$$2 \times (213 \times 213 + 187 \times 187) = (213 + 187)^2 + (213 - 187)^2$$

$$2 \times (213 \times 213 + 187 \times 187) = 400^2 + 26^2$$

$$2 \times (213 \times 213 + 187 \times 187) = 160000 + 676$$

$$213 \times 213 + 187 \times 187 = 160676 / 2$$

$$= 80338$$

**Q 15 - Which of the following is the output of  
 $((637 + 478)^2 - (637 - 478)^2) / (637 \times 478)$  ?**

A - 4

B - 6

C - 8

D - 24

**Answer - C**

**Explanation**

$$((637 + 478)^2 - (637 - 478)^2) / (637 \times 478)$$

Let's have  $a = 637$ ,  $b = 478$

$$\begin{aligned} \text{Now expression is } & ((a + b)^2 - (a - b)^2) / ab \\ &= (a^2 + b^2 + 2ab - (a^2 + b^2 - 2ab)) / ab \\ &= (a^2 + b^2 + 2ab - a^2 - b^2 + 2ab) / ab \\ &= 4ab / ab \\ &= 4 \end{aligned}$$

We've used following formulae here:

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

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

**Q 16 - Which of the following is the output of  
 $((964 + 578)^2 + (964 - 578)^2) / (964 \times 964 + 578 \times 578)$  ?**

A - 4

B - 6

C - 8

D - 2

**Answer - D**

**Explanation**

$$((964 + 578)^2 + (964 - 578)^2) / (964 \times 964 + 578 \times 578)$$

Let's have  $a = 964$ ,  $b = 578$

$$\begin{aligned} \text{Now expression is } & ((a + b)^2 + (a - b)^2) / (a^2 + b^2) \\ = & (a^2 + b^2 + 2ab + (a^2 + b^2 - 2ab)) / (a^2 + b^2) \\ = & (a^2 + b^2 + 2ab + a^2 + b^2 - 2ab) / (a^2 + b^2) \\ = & 2(a^2 + b^2) / (a^2 + b^2) \\ = & 2 \end{aligned}$$

We've used following formulae here:

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

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

**Q 17 - On dividing a number by 342, 47 is the remainder. What will be remainder if same number is divided by 18?**

A - 11

B - 6

C - 8

D - 2

**Answer - A**

**Explanation**

Let's quotient is a and given number be b.

$$b = 342a + 47$$

$$= (18 \times 19)a + 36 + 11$$

$$= (18 \times 19)a + (18 \times 2) + 11$$

$$= 18 \times (19a + 2) + 11$$

Thus, if same number is divided by 18, remainder will be 11.

We've used following formulae here:

**Dividend = (Divisor x Quotient) + Reminder**

**Q 18 -What should be added to 1459 so that it is exactly divisible by 12?**

A. 4

B. 3

C. 5

D. 6

The Correct answer is (C)

**Answer with explanation:**

On dividing 1459 by 12, the remainder is 7.

$\therefore$ The number to be added would be  $= 12 - 7 = 5$

**Q 19 - What will be unit digit in  $658 \times 539 \times 436 \times 312$ ?**

- A - 8
- B - 9
- C - 4
- D - 6

**Answer - C**

**Explanation**

Multiply unit digits of each number.

Unit digit in  $658 \times 539 \times 436 \times 312$

$=$  Unit digit in  $8 \times 9 \times 6 \times 2$ .

$=$  Unit digit in 864.

$= 4$ .

**Q 20 - What will be unit digit in  $3^{57} \times 6^{41} \times 7^{63}$ ?**

- A - 8
- B - 9
- C - 4
- D - 6

**Answer - C**

**Explanation**

$$3^{57} = (3^4)^{14} \times 3$$

So Unit digit in  $3^{57}$   
= Unit digit in  $1 \times 3$   
= 3

$6^{41} = (6^4)^{10} \times 6$   
So Unit digit in  $6^{41}$   
= Unit digit in  $6 \times 6$   
= 6

$7^{63} = (7^4)^{15} \times 7^3$   
So Unit digit in  $7^{61}$   
= Unit digit in  $1 \times 343$   
= 3

So Unit digit in  $3^{57} \times 6^{41} \times 7^{63}$   
= Unit digit in  $3 \times 6 \times 3$   
= 4

We've used following formulae here:

Unit digit in  $3^4 = 1$   
Unit digit in  $6^4 = 6$   
Unit digit in  $7^4 = 1$

So Unit digit  
- in  $((3^4)^n)$  will be 1.  
- in  $((6^4)^n)$  will be 6.  
- in  $((7^4)^n)$  will be 1.

# **Revision Percentage**

## **Percentage**

Percent means many hundredths. Example:  $z\%$  is  $z$  percent which means  $z$  hundredths. It will be written as:

$$z\% = \frac{z}{100}$$

$$\frac{p}{q} \text{ as percent: } (\frac{p}{q} \times 100)\%$$

## **Commodity**

If the price of a commodity increases by  $R\%$ , then the reduction in consumption so as not to increase the expenditure is:

$$[\frac{R}{(100 + R)} \times 100]\%$$

If the price of a commodity decreases by  $R\%$ , then the increase in consumption so as not to decrease the expenditure is:

$$[\frac{R}{(100 - R)} \times 100]\%$$

## **Population**

The population of a city is  $P$  and let it increases at the rate of  $R\%$  per annum:

$$\text{Population after } t \text{ years: } P(1 + \frac{R}{100})^t$$

$$\text{Population } t \text{ years ago: } P(1 + \frac{R}{100})^{-t}$$

## **Depreciation**

Let  $V$  be the present value of machine. Suppose it depreciates at the rate of  $R\%$  per annum:

$$\text{Machine's value after } t \text{ years: } P(1 - \frac{R}{100})^t$$

**Machine's value t years ago:**  $\frac{P}{(1 + \frac{R}{100})^t}$

If P is R% more than Q, then Q is less than P by how many percent?

$[\frac{R}{(100 + R)} \times 100]\%$

If P is R% more than Q, then Q is more than P by how many percent?

$[\frac{R}{(100 - R)} \times 100]\%$

**Q 1 -** What is fraction equivalent of 32%.

A - 6/30

B - 8/25

C - 7/50

D - 11:10

**Answer - B**

**Explanation**

$$32\% = 32/100 = 8/25.$$

**Q 2 -** What is fraction equivalent of 160%.

A - 8/5

B - 9/5

C - 6/7

D - 6/23

**Answer - A**

**Explanation**

$$160\% = 160/100 = 8/5$$

**Q 3 -** What is decimal equivalent of 0.8%.

A - 0.008

B - 0.08

C - 0.8

D - 0.0008

**Answer - A**

**Explanation**

$0.8\% = 0.8/100 = 0.008$ .

**Q 4 - What is decimal equivalent of 18%.**

A - 0.0018

B - 0.18

C - 18

D - 0.018

**Answer - B**

**Explanation**

$18\% = 18/100 = 0.18$

**Q 5 - What is decimal equivalent of 5%.**

A - 0.0005

B - 0.005

C - 0.05

D - 0.5

**Answer - C**

**Explanation**

$5\% = 5/100 = 0.05$

**Q 6 -** What is decimal equivalent of 126%.

A - 1.26

B - 126

C - 12.6

D - 1260

**Answer - A**

**Explanation**

$$126\% = 126/100 = 1.26$$

**Q 7 -** What is decimal equivalent of 0.06%.

A - 0.6

B - 0.06

C - 0.006

D - 0.0006

**Answer - D**

**Explanation**

$$0.06\% = 0.06/100 = 0.0006.$$

**Q 8 - What is 3/4 as per cent?**

A - 45

B - 55

C - 65

D - 75

**Answer - D**

**Explanation**

$$\frac{3}{4} = (\frac{3}{4} * 100)\% = 75\%$$

**Q 9 - 45% of 280 + 28% of 450 = ?.**

A - 352

B - 252

C - 452

D - 552

**Answer - B**

**Explanation**

$$\begin{aligned} & 45\% \text{ of } 280 + 28\% \text{ of } 450 \\ &= (450/100 * 280)(28/100 * 450) \\ &= (126+126) = 252 \end{aligned}$$

**Q 10 - Which is largest in 50/3%, 2/15, 0.18, 3/7 ?**

A - 0.18

B - 3/7

C - 2/15

D - 50/3%

**Answer - B**

**Explanation**

$162/3\% = 50/(3*100) = 1/6 = 0.166$ ,  $2/15 = 0.133$ , 3rd number = 0.18,  
 $3/7 = 0.42$ .

Clearly, 3/7 is largest.

**Q 11 - 65% of a number is 21 less than  $4/5$  th of that number. Find the number.**

A - 140

B - 130

C - 120

D - 110

**Answer - A**

**Explanation**

Let the number be x. Then,

$$(4/5 x) - (65\% \text{ of } x) = 21 \Rightarrow 4x/5 - 65x/100 = 21 \Rightarrow 4x/5 - 13x/20 = 21 \\ \Rightarrow 16x - 13x = 420 \Rightarrow 3x = 420 \Rightarrow x = 140.$$

Required number = 140.

**Q 12 - What per cent is 120 of 90?**

A - 400/3%

B - 400/6%

C - 200/3%

D - 200/6%

**Answer - A**

**Explanation**

$$\text{Required \%} = (120/90 * 100)\% = 400/3\%$$

**Q 13 - What percent is 5gm of 1kg?**

A - 0.15%

B - 0.05%

C - 0.25%

D - 0.35%

**Answer - B**

**Explanation**

$$\text{Required \%} = (5/1000 * 100)\% = 1/2\% = 0.05\%$$

**Q 14 - What per cent is 120 ml of 3.5 liters?**

A - 30/7%

B - 20/7%

C - 10/7%

D - 1/7%

**Answer - A**

**Explanation**

Required % =  $(150/3500 * 100)\% = 30/7\%$

Q 15 - If A's pay is 20% more than that of B, then what number of per penny is B's compensation not as much as that of A?

A -  $50/3\%$

B -  $60/3\%$

C -  $70/3\%$

D -  $80/3\%$

**Answer - A**

**Explanation**

B's salary is less than that of A by is less than that of a by

$$\{R/((100+R) * 100)\%\}$$

$$= \{20/((120) * 100)\% = 50/3\%$$

Q 16 - If A's salary is 25% not as much as that of B, then what number of per penny is B's compensation more than that of A?

A -  $10/3\%$

B -  $100/3\%$

C -  $20/3\%$

D -  $200/3\%$

**Answer - B**

**Explanation**

B's salary is more than that of A by  $\{R/((100-R) * 100)\%\}$

$$= \{25/((100-25) * 100)\% = (25/75 * 100) = 100/3\%$$

**Q 17 -** If the cost of tea is expanded by 20%, by what amount of percent must the utilization of tea be lessened so as not to build the consumption?

- A -  $50/3\%$
- B -  $100/3\%$
- C -  $20/3\%$
- D -  $200/3\%$

**Answer - A**

**Explanation**

$$\begin{aligned}\text{Reduction \% in consumption} &= \{R/((100+R) )*100\}\% (20/120*100)\% \\ &= 50/3\%\end{aligned}$$

**Q 18 -** If the cost of sugar falls by 10%, by how much per penny should a householder expand its utilization, so as not to diminish its use on sugar?

- A -  $100/9$
- B -  $10/9$
- C -  $100/3$
- D -  $10/3$

**Answer - A**

**Explanation**

$$\begin{aligned}\text{Increase \% in consumption} &= \{R/((100-R) )*100\}\% \\ &= \{10/((100-10) )*100\} = 100/9\%\end{aligned}$$

**Q 19 -** The tax on a commodity is diminished by 20% and its consumption increases by 15%. Find the effect on revenue.

- A - 8% increase
- B - 8% decrease
- C - 10% decrease
- D - 10% increase

**Answer - B**

**Explanation**

Let originally revenue obtained by Rs. x.

New revenue = (Consumption \* Tax)

$$= (115\% \text{ of } 80\% \text{ of } \text{Rs. } x) = \text{Rs}(115/100 * 80/100 * x) = \text{Rs. } 92x/100$$

= 92% of the original.

Hence, the revenue is decreased by 8%.

**Q 20 -** The population of a town is 176400. It increases annually at the rate of 5% p.a. What will be its population after 2 years?

- A - 194481
- B - 294481
- C - 394481
- D - 494481

**Answer - A**

**Explanation**

$$\text{Population after 2 years} = \{176400 * (1+5/100)^2\}$$

$$176400 * 21/20 * 21/20 = 194481.$$

1. What percentage of numbers from 1 to 70 have 1 or 9 in the unit's digit?
  - A. 1
  - B. 14
  - C. 20
  - D. 21
2.  $40\% \text{ of } 280 = ?$ 
  - A. 112
  - B. 116
  - C. 115
  - D. 120
3. Whose 35% is 280?
  - A. 700
  - B. 750
  - C. 800
  - D. 850
4.  $45 * ? = 35\% \text{ of } 900$ 
  - A. 6
  - B. 7
  - C. 9
  - D. 4
5. If 40% of an amount is 250, what will be 60% of that amount?
  - A. 300
  - B. 320
  - C. 375
  - D. 400
6. If  $30\% \text{ of } 1520 + 40\% \text{ of } 800 = x\% \text{ of } 5000$ , find the value of x.
  - A. 14.42%
  - B. 15.52%
  - C. 12.22%
  - D. 18.82%

7. What is 3% of 5%?

- A. 60 %
- B. 70 %
- C. 65 %
- D. 75 %

8. Find the value of 25% of 10% of Rs. 800.

- A. 25
- B. 20
- C. 30
- D. 35

9. The population of a town is increased from 54500 to 58500 in one year. What is the percentage increase in the population?

- A. 6.34%
- B. 5.34%
- C. 7.34%
- D. 4.34%

10. The population of a town is decreasing at a rate of 10% per annum. If the population two years ago was 20,000, what is the present population?

- A. 15000
- B. 15200
- C. 16000
- D. 16200

11. A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had:

- A. 588 apples
- B. 600 apples
- C. 672 apples
- D. 700 apples

**Answer:** Option D

**Explanation:**

Suppose originally he had  $x$  apples.

Then,  $(100 - 40)\%$  of  $x = 420$ .

$$\Rightarrow \frac{60}{100} \times x = 420$$
$$\Rightarrow x = \left( \frac{420 \times 100}{60} \right) = 700.$$

12. Three candidates contested an election and received 1136, 7636 and 11628 votes respectively. What percentage of the total votes did the winning candidate get?

- A.** 57%
- B.** 60%
- C.** 65%
- D.** 90%

13. A fruit seller had some oranges. He sells 30% oranges and still has 140 mangoes. Originally, he had:

- A. 288 oranges
- B. 300 oranges
- C. 672 oranges
- D. 200 oranges

14. A Stationery seller had some Pens, Sharpeners, Erasers & Pencils. He sells 65% of the total units and still has 175 units. Originally, he had:

- A. 588 units
- B. 400 units
- C. 272 units
- D. 500 units

A pipe is connected to a tank or cistern. It is used to fill or empty the tank; accordingly, it is called an inlet or an outlet.

**Inlet:** A pipe which is connected to fill a tank is known as an inlet.

**Outlet:** A pipe which is connected to empty a tank is known as an outlet.

Problems on pipes and cisterns are similar to problems on time and work. In pipes and cistern problems, the amount of work done is the part of the tank of filled or emptied. And, the time taken to do a piece of work is the time take to fill or empty a tank completely or to a desired level.

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Points to remember:

1) If an inlet connected to a tank fills it in X hours, part of the tank filled in one hour is =  $1/X$

2) If an outlet connected to a tank empties it in Y hours, part of the tank emptied in one hour is =  $1/Y$

3) An inlet can fill a tank in X hours and an outlet can empty the same tank in Y hours. If both the pipes are opened at the same time and  $Y > X$ , the net part of the tank filled in one hour is given by;

$$= \left( \frac{1}{X} - \frac{1}{Y} \right)$$

If X is greater than Y, more water is flowing out of the tank than flowing into the tank. And, the net part of the tank emptied in one hour is given by;

$$= \left( \frac{1}{Y} - \frac{1}{X} \right)$$

4) An inlet can fill a tank in X hours and another inlet can fill the same tank in Y hours. If both the inlets are opened at the same time, the net part of the tank filled in one hour is given by;

$$= \left( \frac{1}{X} + \frac{1}{Y} \right)$$

Therefore, the time taken to fill the whole tank is given by;

$$= \left( \frac{XY}{Y+X} \right) \text{ hours}$$

In a similar way, If an outlet can empty a tank in X hours and another outlet can empty the same tank in Y hours, the part of the tank emptied in one hour when both the pipes start working together is given by;

$$= \left( \frac{1}{X} + \frac{1}{Y} \right)$$

Therefore, the time taken to empty the full tank is given by;

$$= \left( \frac{XY}{Y+X} \right) \text{ hours}$$

5) Three inlets A, B, and C can fill a tank in X, Y and Z hours respectively. If all the inlets are opened together, the time taken to fill the tank is given by;

$$= \left( \frac{X+Y+Z}{XY+YZ+ZX} \right) \text{ hours}$$

6) Two pipes can fill a tank in X and Y hours respectively and an outlet can empty the same tank in Z hours. If all the pipes are opened together, part of the tank filled in one hour is given by;

$$= \frac{1}{X} + \frac{1}{Y} - \frac{1}{Z}$$

∴ Time taken to fill the tank completely when all the pipes are working is given by;

$$= \frac{XYZ}{YZ+XZ-XY}$$

7) A pipe can fill a tank in X hours but due to a leak in the bottom, it can be filled in Y hours. The time taken by the leak to empty the tank is given by;

$$= \frac{XY}{Y-X}$$

## Type 2

**Inlet:** A pipe connected with a tank or cistern or a reservoir, that fills it, is known as an inlet.

**Outlet:** A pipe connected with a tank or cistern or reservoir, emptying it is known as an outlet.

### Important Concepts

If a pipe can fill a tank in  $x$  hours, part filled in 1 hour =  $1/x$ .

If a pipe can fill a tank in  $x$  hours and another pipe in  $y$  hours, part of tank filled in 1 hour when both the pipes are opened simultaneously =  $(1/x + 1/y) = (x+y)/xy$

∴ Time taken to fill the tank by both the pipes when opened simultaneously =  $xy/(x+y)$

If a pipe can empty a tank in " $y$ " hours, then tank emptied in 1 hour =  $1/y$

If a pipe can empty a tank in  $y$  hours and another pipe in  $x$  hours, part of tank emptied in 1 hour when both the pipes are opened simultaneously =  $(1/x + 1/y) = (x+y)/xy$

∴ Time taken to empty the tank by both the pipes when opened simultaneously =  $xy/(x+y)$

If a pipe can fill a tank in  $x$  hours and another pipe can empty the full tank in  $y$  hours (where  $y > x$ ), then on opening both the pipes, the net part filled in 1 hour =  $1/x - 1/y = (y - x)/xy$

∴ When both the pipes are opened simultaneously, time taken to fill the tank fully =  $xy/(y - x)$  hours.

If a pipe can fill a tank in  $x$  hours and another pipe can empty the full tank in  $y$  hours (where  $x > y$ ), then on opening both the pipes, the net part emptied in 1 hour =  $1/y - 1/x = (x - y)/xy$

∴ When both the pipes are open simultaneously, time taken to empty the tank fully =  $xy/(x - y)$  hours.

**Q 1 -** Two pipes A and B can fill a tank in 24 hours and 30 hours separately. In the event that both the channel are opened all the while in the void tank, the amount of the truth will surface eventually taken by them to fill it?

- A - 12 hrs 10 min
- B - 13 hrs 20 min
- C - 12 hrs 20 min
- D - 11 hrs 20 min

**Answer - B**

**Explanation**

Part filled by A in 1 hour =  $1/24$ , part filled by B in 1 hour =  $1/30$

Part filled by (A+B) in 1 hour =  $(1/24 + 1/30) = 9/120 = 3/40$

Time taken by both to fill the tank =  $40/3$  hrs = 13 hrs 20 min.

2) A pipe can fill a tank in 6 hours and another pipe can empty the tank in 12 hours. If both the pipes are opened at the same time, the tank can be filled in

- A. 10 hours
- B. 12 hours
- C. 14 hours
- D. 16 hours

Correct answer; option (B)

**Answer with explanation:**

Part of the tank filled in one hour =  $\frac{1}{6}$

Part of the tank emptied in one hour =  $\frac{1}{12}$

Net part of the tank filled in one hour;

$$\begin{aligned} &= \frac{1}{6} - \frac{1}{12} \\ &= \frac{2-1}{12} = \frac{1}{12} \end{aligned}$$

$\frac{1}{12}$  Part of the tank can be filled in one hour.  
 $\therefore$  The tank will be filled completely in 12 hours.

**Solution 2:**

Apply formula;  $= \frac{XY}{Y-X}$

X = 6 hours and Y = 12 hours

$$\therefore \frac{6 * 12}{12 - 6} = 12 \text{ hours}$$

2) Three pipes A, B and C can fill a cistern in 8 minutes, 12 minutes and 16 minutes respectively. What is the time taken by three pipes to fill the cistern when they are opened together?

- A. 3.7 minutes
- B. 4 minutes
- C. 4.5 minutes
- D. 5 minutes

Correct answer; option (A)

**Answer with explanation:**

Part of the tank filled by A in one minute =  $\frac{1}{8}$

Part of the tank filled by B in one minute =  $\frac{1}{12}$

Part of the tank filled by C in one minute =  $\frac{1}{16}$

Net part of the tank filled by A+B+C in one minute;

$$= \frac{1}{8} + \frac{1}{12} + \frac{1}{16}$$

$$= \frac{6+4+3}{48} = \frac{13}{48}$$

$\frac{13}{48}$

Part of the cistern is filled in one minute.

$\therefore$  The whole tank will be filled in  $\frac{48}{13} = 3.7$  minutes

---

3) Two pipes can fill a tank in 6 hours and 8 hours respectively. A third pipe can empty the same tank in 12 hours. If all the pipes start working together, how long it will take to fill the tank?

- A. 4 hours
- B. 4.5 hours
- C. 4.8 hours
- D. 5.2 hours

**Correct Option (C)**

**Answer with explanation:**

$$\text{Part of the tank filled by two pipes in one hour} = \frac{1}{6} + \frac{1}{8}$$

$$\text{Part of the tank emptied by the third pipe in one hour} = \frac{1}{12}$$

$$\therefore \text{Net part of the tank filled in one hour} = \frac{1}{6} + \frac{1}{8} - \frac{1}{12}$$

$$= \frac{4+3-2}{24} = \frac{5}{24}$$

$\frac{5}{24}$  Part of tank can be filled in one hour

$$\therefore \text{The whole tank will be filled in } \frac{24}{5} = 4.8 \text{ hours}$$

---

4) A tank can be filled in 10 hours. After a leak in its bottom, it takes 12 hours to fill the tank. Find the time taken by the leak to empty the full tank?

- A. 45 hours
- B. 60 hours
- C. 50 hours
- D. 55 hours

Correct Option (B)

**Answer with explanation:**

Part of the tank filled in one hour before the leak =  $\frac{1}{10}$

Part of the tank filled in one hour after the leak =  $\frac{1}{12}$

Part of the tank emptied in one hour by the leak =  $\frac{1}{10} - \frac{1}{12}$   
 $= \frac{12 - 10}{120} = \frac{1}{60}$

$\frac{1}{60}$  part of tank will be emptied in one hour by the leak  
 $\therefore$  The full tank will be emptied by the leak in 60 hours.

**Solution 2:**

Apply formula;  $= \frac{XY}{Y - X}$

X = 10 hours

Y = 12 hours

$$\therefore \frac{10 \times 12}{12 - 10} = \frac{120}{2} = 60 \text{ hours}$$

5) Two pipes can fill a tank in 10 and 14 minutes respectively. A third pipe can empty the tank at the rate of 10 liters/minute. If all the pipes working together can fill the empty tank in 8 minutes, what is the capacity of the tank?

- A. 210 liters
- B. 215.4 liters
- C. 220 liters
- D. 225.4 liters

Correct answer; option (B)

**Answer with explanation:**

Let the capacity of the tank is X liters.

Part of the tank filled by two pipes in one minute =  $\frac{1}{10} + \frac{1}{14}$

10 liters is emptied in 1 minute

X liters will be emptied in  $\frac{X}{10}$  minutes

In  $\frac{X}{10}$  minutes the whole tank will be emptied.

In one minute  $\frac{10}{X}$  part of the tank will be emptied.

As per question;

$$\frac{1}{10} + \frac{1}{14} - \frac{10}{X} = \frac{1}{8}$$

$$\frac{1}{10} + \frac{1}{14} - \frac{1}{8} = \frac{10}{X}$$

$$\frac{112 + 80 - 140}{1120} = \frac{10}{X}$$

$$\frac{52}{1120} = \frac{10}{X}$$

$$52X = 11200$$

$$X = \frac{11200}{52} = 215.4 \text{ liters}$$

- Two pipes can fill a tank in 20 minutes and 30 minutes respectively. If both the pipes are opened simultaneously, then the tank will be filled in
- A 10 minutes
  - B 12 minutes
  - C 15 minutes
  - D 25 minutes

**Answer**

Correct option is

- B  
12 minutes

Part of tank filled by 1st pipe in 1 minute =  $1/20$

Part of tank filled by 2nd pipe in 1 minute =  $1/30$

$\therefore$  Part of tank filled by both the pipes in 1 minute =  $(1/20 + 1/30) = 5/60 = 1/12$

Time taken to fill the tank = 12 minutes.

- 6) A cistern can be filled by an inlet in 6 hours and can be emptied by an outlet in 8 hours. If the inlet and outlet are opened together, in what time the cistern can be filled?

- A. 24 hours
- B. 26 hours
- C. 20 hours
- D. 18 hours

Correct Option (A)

**Answer with explanation:**

Part of the tank filled by the inlet in one hour =  $\frac{1}{6}$

Part of the tank emptied by the outlet in one hour =  $\frac{1}{8}$

Net part of the tank filled in one hour =  $\frac{1}{6} - \frac{1}{8}$

$$= \frac{8-6}{48} = \frac{1}{24}$$

$\frac{1}{24}$  part of the tank is filled in one hour  
∴ The whole tank will be filled in 24 hours.

**Solution 2:**

**Apply formula;**  $= \left( \frac{XY}{Y-X} \right)$

X = 6 hours

Y = 8 hours

$$\therefore \text{Required time} = \frac{6 * 8}{8 - 6} = \frac{48}{2} = 24 \text{ hours}$$

---

7) 20 buckets can fill a tank when the capacity of each bucket is 12 liters. If the capacity of each bucket is 10 liters, find the number of buckets required to fill the tank.

- A. 30 buckets
- B. 34 buckets
- C. 24 buckets
- D. 27 buckets

Correct answer; option (C)

**Answer with explanation:**

Capacity of each bucket = 12 liters

20 buckets can fill the tank. So, capacity of tank =  $20 * 12 = 240$  liters

New capacity of bucket = 10 liters

So, 10 liters can be poured into the tank by one bucket

240 liters will be poured by  $\frac{1}{10} * 240 = 24$  buckets

# Probability

Experiment:

An operation which can produce some well-defined outcomes is called an experiment.

Random Experiment:

An experiment in which all possible outcomes are known and the exact output cannot be predicted in advance, is called a random experiment.

Examples:

- Rolling an unbiased dice.
- Tossing a fair coin.
- Drawing a card from a pack of well-shuffled cards.
- Picking up a ball of certain colour from a bag containing balls of different colours.

Details:

When we throw a coin, then either a Head (H) or a Tail (T) appears.

A dice is a solid cube, having 6 faces, marked 1, 2, 3, 4, 5, 6 respectively. When we throw a die, the outcome is the number that appears on its upper face.

A pack of cards has 52 cards.

It has 13 cards of each suit, name Spades, Clubs, Hearts and Diamonds.

Cards of spades and clubs are black cards.

Cards of hearts and diamonds are red cards.

There are 4 honours of each unit.

There are Kings, Queens and Jacks. These are all called face cards.

### Sample Space:

When we perform an experiment, then the set  $S$  of all possible outcomes is called the sample space.

### Examples:

- In tossing a coin,  $S = \{H, T\}$
- If two coins are tossed, the  $S = \{HH, HT, TH, TT\}$ .
- In rolling a dice, we have,  $S = \{1, 2, 3, 4, 5, 6\}$ .

### Event:

Any subset of a sample space is called an event.

### Probability of Occurrence of an Event:

Let  $S$  be the sample and let  $E$  be an event.

Then,  $E \subseteq S$ .

$$\therefore P(E) = \frac{n(E)}{n(S)}.$$

### Results on Probability:

- $P(S) = 1$
- $0 \leq P(E) \leq 1$
- $P(\emptyset) = 0$
- For any events  $A$  and  $B$  we have :  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- If  $A$  denotes (not- $A$ ), then  $P(A) = 1 - P(A)$ .

1. The probability that a number selected at random from the first 50 natural numbers is a composite number is -.

A.  $\frac{21}{25}$

B.  $\frac{17}{25}$

C.  $\frac{4}{25}$

D.  $\frac{8}{25}$

E.  $\frac{9}{25}$

### **Answer & Explanation**

Answer: Option B

Explanation:

The number of exhaustive events =  ${}^{50}C_1 = 50$ .

We have 15 primes from 1 to 50.

Number of favourable cases are 34.

Required probability =  $34/50 = 17/25$ .

2. If a number is chosen at random from the set {1, 2, 3, ...., 100}, then the probability that the chosen number is a perfect cube is -.

A.  $\frac{1}{25}$

B.  $\frac{1}{2}$

C.  $\frac{4}{13}$

D.  $\frac{1}{10}$

E.  $\frac{9}{13}$

### **Answer & Explanation**

Answer: Option A

Explanation:

We have 1, 8, 27 and 64 as perfect cubes from 1 to 100.

Thus, the probability of picking a perfect cube is

$4/100 = 1/25$ .

Out of first 20 natural numbers, one number is selected at random. The probability that it is either an even number or a prime number is -.

- A.  $1/2$
- B.  $16/19$
- C.  $4/5$
- D.  $17/20$
- E.  $3/5$

### **Answer & Explanation**

Answer: Option D

Explanation:

$$n(S) = 20$$

$$n(\text{Even no}) = 10 = n(E)$$

$$n(\text{Prime no}) = 8 = n(P)$$

$$P(E \cup P) = 10/20 + 8/20 - 1/20 = 17/20$$

If four coins are tossed, the probability of getting two heads and two tails is -.

- A.  $3/8$
- B.  $6/11$
- C.  $2/5$
- D.  $4/5$
- E.  $5/11$

### **Answer & Explanation**

Answer: Option A

Explanation:

Since four coins are tossed, sample space  $= 2^4 = 16$

Getting two heads and two tails can happen in six ways.

$$n(E) = \text{six ways}$$

$$p(E) = 6/16 = 3/8$$

In a cycle race there are 5 persons named as J,K,L,M,N participated for 5 positions. How many number of ways can M finishes always before N?

- A. 20
- B. 36
- C. 55
- D. 60

**Answer:** D. 60

**Explanation:** Total number of ways in which 5 persons can finish is  $5! = 120$  (there are no ties)

Now, in half of these ways M can finish before N

A box contains 3 blue marbles, 4 red, 6 green marbles and 2 yellow marbles. If three marbles are picked at random, what is the probability that they are all blue?

- A.  $1/455$
- B.  $2/455$
- C.  $4/455$
- D.  $1/91$

**Answer:** A.  $1/455$

**Explanation:** Given that there are three blue marbles, four red marbles, six green marbles and two yellow marbles.

Probability that all the three marbles picked at random are blue =  $3C_3 / 15C_3 = (3 * 2 * 1) / (15 * 14 * 13) = 1/455$

If a card is drawn from a well shuffled pack of cards, the probability of drawing a spade or a king is:

- A.  $19/52$
- B.  $17/52$
- C.  $4/13$
- D.  $5/13$

**Answer:** C.  $4/13$

**Explanation:**  $P(SuK) = P(S) + P(K) - P(SnK)$ , where S denotes spade and K denotes king.

$$P(SuK) = 13/52 + 4/52 - 1/52 = 4/13$$

Three 6 faced dice are thrown together. The probability that all the three show the same number on them is:

- A. 1/64
- B. 1/36
- C. 5/9
- D. 5/12

**Answer:** B. 1/36

**Explanation:** If all 3 numbers have to be same; basically we want triplets. 111, 222, 333, 444, 555 and 666. Those are six in number. Further the three dice can fall in  $6 * 6 * 6 = 216$  ways

Hence the probability is  $6/216 = 1/36$

A box contains 3 blue marbles, 4 red, 6 green marbles and 2 yellow marbles. If four marbles are picked at random, what is the probability that none is blue?

- A. 17/91
- B. 33/91
- C. 51/91
- D. 65/91

**Answer:** B. 33/91

**Explanation:** Given that there are 3 blue marbles, 4 red marbles, 6 green marbles and 2 yellow marbles.

When 4 marbles are picked at random, then the probability that none is blue is  $= 12C_4/15C_4$

$$=>(12 * 11 * 10 * 9)/(15 * 14 * 13 * 12) = 33/91$$

Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

- A.  $\frac{1}{2}$
- B.  $\frac{2}{5}$
- C.  $\frac{8}{15}$
- D.  $\frac{9}{20}$

**Answer:** D.  $\frac{9}{20}$

**Explanation:** Here,  $S = \{1, 2, 3, 4, \dots, 19, 20\}$

Let  $E$  = event of getting a multiple of 3 or 5 =  $\{3, 6, 9, 12, 15, 18, 5, 10, 20\}$

$$P(E) = n(E)/n(S) = 9/20$$

**You have a well shuffled deck of 52 playing cards. Find the possibility of drawing a Queen or hearts?**

- a.  $\frac{1}{26}$
- b.  $\frac{1}{13}$
- c.  $\frac{4}{13}$
- d.  $\frac{17}{52}$

Answer

**Answer:** c.  $\frac{4}{13}$

**Explanation:**

**Probability** = 
$$\frac{\text{What we want}}{\text{Total}}$$

OR = add      AND = multiply

We want queen **OR** hearts

There are 4 queens and 13 hearts cards

Total 52 cards

Also 1 queen is queen of hearts.

So             $\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{4}{13}$   
probability      $=$

**There are 2 yellow, 6 black, 4 grey and 8 red pebbles in a glass bowl.  
I pick one pebble randomly. What is the probability of me picking up a black or red pebble?**

a.  $\frac{1}{10}$

b.  $\frac{7}{10}$

c.  $\frac{3}{4}$

d.  $\frac{4}{3}$

Answer

**Answer:** b.  $\frac{7}{10}$

**Explanation:**

**Probability** = 
$$\frac{\text{What we want}}{\text{Total}}$$

**OR** = add      **AND** = multiply

We want black **OR** red pebble

There are 6 black and 8 red pebbles

Total pebbles =  $2 + 6 + 4 + 8 = 20$

**So probability** =  $\frac{6}{20} + \frac{8}{20} = \frac{7}{10}$

# **Profit and Loss**

**Cost Price, (c.p.)** = The price, at which an article is purchased, is called its cost price.

**Selling price (s.p)** = The price, at which an article is sold, is called its selling price.

**Profit or Gain** =  $(S.P) - (C.P)$

**Loss** =  $(C.P) - (S.P)$

Gain or Loss is always reckoned on C.P.

Formulae

- $\text{Gain\%} = (\text{Gain} * 100) / \text{C.P}$
- $\text{Loss\%} = (\text{Loss} * 100) / \text{C.P}$
- $\text{S.P} = (100 + \text{Gain \%}) / 100 * (\text{C.P})$
- $\text{S.P} = (100 - \text{Loss \%}) / 100 * (\text{C.P})$
- $\text{C.P} = 100 / (100 + \text{Gain \%}) * (\text{S.P})$
- $\text{C.P} = 100 / (100 - \text{Loss \%}) * (\text{S.P})$

Important cases

If an article is sold at a profit of say, 20%, then  $SP = 120\%$  of CP.

If an article is sold at a loss of say, 20%, then  $SP = 80\%$  of CP.

When a person sells two similar items, one at a gain of say  $x\%$  and the other at a loss of say  $x\%$ . then the seller always incurs a loss given by:  
 $\text{Loss\%} = (x/10)^2$

If a seller sells his goods at cost price but uses false weights, then

$\text{Gain\%} = [\text{Error}/(\text{True value} - \text{Error}) * 100]\%$

**Q 1 -** A vendor bought 6 oranges for Re 10 and sold them at 4 for Re 6. Find his loss or gain percent.

- A - 8% gain
- B - 10% gain
- C - 8% loss
- D - 10% loss

**Answer - D**

**Explanation**

Suppose, number of oranges bought = LCM of 6 and 4 = 12

$\therefore \text{CP} = \text{Re } (10/6 * 12) = \text{Re } 20$  and  $\text{SP} = \text{Re } (6/4 * 12) = \text{Re } 18$

$\therefore \text{Loss\%} = (2/20 * 100)\% = 10\%$

**Q 2 -** By selling 33 meters of cloth, one gains the selling price of 11 meters. Find the gain percent.

- A - 50%
- B - 45%
- C - 40%
- D - 60%

**Answer - A**

**Explanation**

$(\text{SP of } 33\text{m}) - (\text{CP of } 33\text{m}) = \text{Gain} = \text{SP of } 11\text{m}$

$\therefore \text{SP of } 22\text{m} = \text{CP of } 33\text{m}$

Let CP of each meter be Re 1. Then, CP of 22m = Re 22.

Hence SP of 22m = Re 33.

$\therefore \% \text{Gain} = 11/22 * 100$   
 $= 50\%$

**Q 3 -** Pure ghee costs Re 100 per kg. A shopkeeper mixes vegetable oil costing Re 50 per kg and sells the mixture at Re 96 per kg, making a profit of 20%. In what ratio does he mix the pure ghee with the vegetable oil.

- A - 3:2
- B - 2:3
- C - 4:3
- D - 3:1

**Answer - A**

**Explanation**

Mean Cost price = Re  $(100/120) * 96 = \text{Re } 80$  per kg

Apply rule of allegation,

there4; Required ratio = 30:20 = 3:2

**Q 4 -** The CP of 25 articles is equal to SP of 20 articles. Find the loss or gain percent.

- A - 35%
- B - 30%
- C - 25%
- D - None of these

**Answer - C**

**Explanation**

Let the CP of each article = Re 1.

Then CP of 20 articles = Re 20.

SP of 20 articles = CP of 25 articles = Re 25.

$\therefore$  Gain% =  $(5/20) * 100\% = 25\%$

**Q 5 -** A shopkeeper bought 80 kg of sugar at Re 13.50/kg and mixed it with 120 kg sugar at Re 16/kg. If he is to make a profit of 16% what rate should he sell the sugar to his customers?

- A - Re 12/kg
- B - Re 15.25/kg
- C - Re 17/kg
- D - Re 17.40/kg

**Answer - D**

**Explanation**

$$CP \text{ of } 200 \text{ kg of mixture} = \text{Re } (80 * 13.50) + (120 * 16) = \text{Re } 3000$$

$$SP = 116\% \text{ of Re } 3000 = \text{Re } (116/100)*3000 = \text{Re } 3480$$

$$\therefore \text{Rate of SP} = \text{Re } 3480/200 = \text{Re } 17.40/\text{kg}$$

**Q 6 -** A man bought cookies at 3 for a rupee. How many for a rupee should he sell to make a profit a 50%.

- A - 1
- B - 2
- C - 1.5
- D - None of these

**Answer - B**

**Explanation**

$$CP \text{ of 3 cookies} = \text{Re } 1$$

$$SP \text{ of 3 cookies} = 150\% \text{ of Re } 1 = 3/2$$

For Re  $3/2$ , the man sells 3 cookies.

Hence for Re 1, number of cookies sold =  $3*2/3 = 2$

**Q 7 -** Anil buys a calculator for Re 600 and sells it to Vikash at 10% profit. Vikash sells it to Chandan for 5 % profit. Chandan after using it for certain time, sells it to Dinesh at a loss of 20%. For how much Chandan sell the calculator to Dinesh.

- A - Re 550.50
- B - Re 564.40
- C - Re 554.40
- D - None of these

**Answer - C**

**Explanation**

$$\begin{aligned} \text{SP for Chandan} &= 600 * (110/100) * (105/100) * (80/100) \\ &= 600 * 924/1000 \\ &= \text{Re } 554.40 \end{aligned}$$

**Q 8 -** An article is sold by X to Y at a loss of 20%, Y to Z at a gain of 15%, Z to W at a loss of 5% and W to V at a profit of 10%. If v had to pay Re 500, how much X paid for it?

- A - Re 520.07
- B - Re 490.07
- C - Re 510.07
- D - Re 530.07

**Answer - A**

**Explanation**

$$\begin{aligned} \text{CP for X} &= 500 * (100/80) * (100/115) * (100/95) * (100/110) \\ &= 500 * 10000/9614 \\ &= \text{Re } 520.07 \end{aligned}$$

**Q 9.** A shopkeeper sells an article for Rs. 200 with a loss of Rs. 20 %. Find the cost price of the article.

- a. 220
- b. 250
- c. 280
- d. 260

Correct Option: (b)

**Hint:**

$$\text{Cost Price} = \frac{100}{(100 - \text{Loss}\%)} \times \text{S.P.}$$

We are given that,

S.P. = Rs. 200 and loss = 20

$$\text{Cost Price} = \frac{100}{(100 - 20)} \times 200$$

$$\text{Cost Price} = \frac{100}{80} \times 200$$

**Cost Price = Rs. 250**

**Q 10.** A trader expects a gain of 15 % on his cost price. If in a week his sale is of Rs. 580, then what is his profit?

- a. 75.65
- b. 73.26
- c. 72.50
- d. 70.78

Correct Option: (a)

**Hint:**

$$\text{Cost Price} = \frac{100}{(100 + \text{Gain}\%)} \times \text{S.P.}$$

$$\text{Cost Price} = \frac{100}{(100 + 15)} \times 580$$

$$\text{Cost Price} = \frac{100}{(115)} \times 580 = \text{Rs. } 504.35$$

Therefore,

$$\text{Profit} = \text{C.P.} - \text{S.P.}$$

$$\text{C.P.} = \text{Rs. } 504.35 \text{ and S.P.} = \text{Rs. } 580$$

$$\text{Profit} = 580 - 504.35 = \text{Rs. } 75.65$$

**The trader gets a profit of Rs. 75.65**

**Q 11.** If a boy sells a book for Rs. 450 he gets a loss of 10 %, then find cost price. To gain 10 %, what should be the selling price?

- a. 400, 500
- b. 550, 600
- c. 500, 550
- d. 475, 525

Correct Option: (c)

### **1) Find cost price**

Let C.P. of book = x and S.P. = Rs. 450

**S.P. of book = C.P. – (10% of C.P.)**

$$\text{S.P.} = x - (0.10x)$$

$$450 = 0.9 \times$$

**x i.e cost price = Rs. 500**

**2) Find Selling Price to gain 10 %.**

**Now, we are asked to find selling price to gain 10% profit.**

**Hint:**

$$\text{Selling Price} = \frac{(100 + \text{Gain}\%)}{100} \times \text{C.P.}$$

$$\text{Selling Price} = \frac{(100 + 10)}{100} \times 500$$

$$\text{Selling Price} = \frac{(110)}{100} \times 500$$

**Therefore, selling Price = Rs. 550**

**Q 12.** A merchant sells 30 metres of cloth and gains selling price of 10 metres. Find the gain percent.

- a. 15 %
- b. 25 %
- c. 50 %
- d. 75%

Correct Option: (c)

**Here, selling price of 10 m cloth is obtained as profit.**

**Profit of 10 m cloth = (S.P. of 30 m cloth) – (C.P. of 30 m cloth)**

**Selling price of 20 m cloth = Selling Price of 30 m of cloth**

Let cost of each metre be Rs. 100.

Therefore, cost price of 20 m cloth = Rs. 2000 and S.P. of 20 m cloth = Rs. Rs. 3000

$$\text{Profit\%} = \frac{10}{20} \times 100 = 50\%$$

**Profit of 50 % was made by the merchant.**

**Q 13.** S.P. of 10 candles is same as C.P. of 12 candles. Find the gain percent.

- a. 11 %
- b. 15 %
- c. 20 %
- d. 25 %

**View solution**

Correct Option : (c)

**(Number of Y articles > Number of X articles)**

**Hint:**

$$\text{Profit\%} = \frac{\text{No. of X articles} - \text{No. of Y articles}}{\text{No. of Y articles}} \times 100$$

No. of X articles = 10

No. of Y articles = 12

Therefore,

$$\text{Profit\%} = \frac{12 - 10}{10} \times 100 = \frac{200}{10}$$

Profit % = 20 %

**Q 14.** The selling price of 40 apples is equal to cost price of 35 apples. Find the profit or loss obtained.

- a. Gain of 5.5 %
- b. Gain of 12.5 %
- c. Loss of 5.5 %
- d. Loss of 12.5 %

[View solution](#)

Correct Option: (d)

**Let C.P. of each apple be Re 1/-.**

Therefore,

$$\text{C.P. of 40 apples} = \text{Rs. } 40$$

$$\text{S.P. of 40 apples} = \text{Rs. } 35$$

**C.P. of 40 apples > S.P. of 40 apples**

**Loss = 40 – 35 = Rs. 5**

$$\text{Loss\%} = \frac{\text{Loss}}{\text{C.P.}} \times 100$$

$$\text{Loss\%} = \frac{5}{40} \times 100 = 12.5\%$$