

SSC CPO Previous Year Question Paper 2018

Quantitative Aptitude (Questions & Solutions)

Q. (1) PA and PB are tangents to a circle with centre O, from a point P outside the circle, and A and B are points on the circle. If $\angle APB = 40^\circ$, then $\angle AOB$ is equal to:

1. 40°
2. 20°
3. 50°
4. 25°

Answer: 2

Solution: Since OA is perpendicular to PA and also, OB is perpendicular to PB

Therefore,

$$\angle APB + \angle AOB = 180^\circ$$

$$\Rightarrow 40^\circ + \angle AOB = 180^\circ$$

$$\Rightarrow \angle AOB = 180^\circ - 40^\circ = 140^\circ$$

In $\triangle AOB$,

OA = OB = radii of same circle

Hence, $\angle OAB = \angle OBA = x$

Again, $\angle OAB + \angle OBA + \angle AOB = 180^\circ$

$$\Rightarrow x + x + 140^\circ = 180^\circ$$

$$\Rightarrow 2x = 180^\circ - 140^\circ = 40^\circ$$

$$\Rightarrow x = 20^\circ$$

Hence, $\angle OAB = 20^\circ$

Q. (2) 3 men, 4 women and 6 boys together can complete a work in 6 days. A woman does triple the work a man does and a boy does half the work a man does. How many women alone will be able to complete this work in 7 days?

1. 7
2. 8
3. 6
4. 9

Answer: 3

Solution:

Given, 3 men = 1 woman

$\Rightarrow 1 \text{ man} = \frac{1}{3} \text{ women}$

Again, 2 boys = 1 man

$\Rightarrow 2 \text{ boys} = \frac{1}{3} \text{ women}$

$\Rightarrow 1 \text{ boy} = \frac{1}{6} \text{ women}$

Therefore, 6 boys = 1 woman

Now, 3 men, 4 women and 6 boys = $1 + 4 + 1 = 6$ women

Thus, 7 women alone will be able to complete this work in 7 days.

Q. (3) What is the difference between a single discount of 30% and a single discount equivalent to two successive discounts of 25% and 5%, being given on shopping of ₹2,000?

1. ₹20
2. ₹25
3. No difference
4. ₹15

Answer: 2

Solution: Single equivalent discount percent to 25% and 5%

$$= [r_1 + r_2 - (r_1 r_2 / 100)]$$

$$= 25 + 5 - [(25 \times 5) / 100]$$

$$= 30 - 1.25 = 28.75$$

$$\text{Hence, required difference} = [(30 - 28.75) \times 2000] / 100$$

$$= (1.25 \times 2000) / 100$$

$$= \text{Rs. } 25$$

Q. (4) A sphere of radius 6 cm is melted and recast into spheres of radius 2 cm each. How many such spheres can be made?

1. 25
2. 27
3. 36
4. 24

Answer: 2

Solution: Radius of the sphere, $r = 6\text{cm}$

Volume, $v = \frac{4}{3}\pi r^3$

Let the number of spheres that can be recast from the given sphere = n

Radius of the new spheres, $R = 2\text{cm}$

Volume of n spheres, $V = n\frac{4}{3}\pi R^3$

The volume of the sphere that can be formed must be equal to the given sphere

Hence, $n\frac{4}{3}\pi R^3 = \frac{4}{3}\pi r^3$

$$\Rightarrow nR^3 = r^3$$

$$\Rightarrow n(2)^3 = (6)^3$$

$$\Rightarrow 8n = 216$$

$$\Rightarrow n = 216/8$$

$$\Rightarrow n = 27$$

Q. (5) What is the simplified value of $[(\tan^2 \theta - \sin^2 \theta)/\tan^2 \theta \sin^2 \theta]$?

1. -1
2. 0
3. 1
4. 2

Answer: 3

Solution: $[(\tan^2 \theta - \sin^2 \theta)/\tan^2 \theta \sin^2 \theta]$

Let us take the numerator here and solve it.

$$\tan^2 \theta - \sin^2 \theta$$

$$\begin{aligned} &= \sin^2 \theta / \cos^2 \theta - \sin^2 \theta \\ &= (\sin^2 \theta / \cos^2 \theta) - (\sin^2 \theta \cos^2 \theta / \cos^2 \theta) \\ &= [\sin^2 \theta (1 - \cos^2 \theta)] / \cos^2 \theta \\ &= \tan^2 \theta (1 - \cos^2 \theta) \text{ [Since, } \sin^2 \theta / \cos^2 \theta = \tan^2 \theta \text{]} \\ &= \tan^2 \theta \sin^2 \theta \end{aligned}$$

Now putting this value in the given expression, we get,

$$\begin{aligned} &\tan^2 \theta \sin^2 \theta / \tan^2 \theta \sin^2 \theta \\ &= 1 \end{aligned}$$

Q. (6) What is the simplified value of $(1 - \sin A \cos A)(\sin A + \cos A)$?

1. $\sin^2 A - \cos^2 A$
2. $\sin^3 A + \cos^3 A$
3. 0
4. $\cos^2 A - \sin^2 A$

Answer: 2

Solution:

By trigonometric identities, we know,

$$\Rightarrow \sin^2 A + \cos^2 A = 1$$

Therefore, $(1 - \sin A \cos A)(\sin A + \cos A)$

$$= (\sin^2 A + \cos^2 A - \sin A \cos A)(\sin A + \cos A)$$

By Algebraic identities, we know,

$$\Rightarrow x^3 + y^3 = (x + y)(x^2 + y^2 - xy)$$

Hence, we get,

$$(1 - \sin A \cos A)(\sin A + \cos A) = \sin^3 A + \cos^3 A$$

Q. (7) If $\tan^2 \theta + \cot^2 \theta = 2$, then what is the value of $2 \sec \theta \operatorname{cosec} \theta$?

1. 0
2. 1
3. 2
4. 4

Answer: 4

Solution:

$$\text{Given, } \tan^2 \theta + \cot^2 \theta = 2$$

$$\Rightarrow \tan^2 \theta + \cot^2 \theta - 2 = 0$$

$$\Rightarrow \tan^2 \theta + \cot^2 \theta - 2 (\tan \theta \cot \theta) = 0 \text{ [since, } \tan \theta \cot \theta = 1 \text{]}$$

$$\Rightarrow (\tan \theta - \cot \theta)^2 = 0$$

$$\Rightarrow \tan \theta - \cot \theta = 0$$

$$\Rightarrow \tan \theta = \cot \theta$$

$$\Rightarrow \tan \theta = \tan(90 - \theta)$$

$$\Rightarrow \theta = 90 - \theta$$

$$\Rightarrow 2\theta = 90$$

$$\Rightarrow \theta = 45$$

Putting the value of θ we get,

$$2 \sec 45 \operatorname{cosec} 45 = 2 \times \sqrt{2} \times \sqrt{2}$$

$$= 2 \times 2$$

$$= 4$$

Q. (8) What is the value of $\sin(-\pi/3) + \cos(-\pi/6)$?

1. 0
2. 1
3. 2
4. 3

Answer: 1

Solution:

$$\text{Given, } \sin(-\pi/3) + \cos(-\pi/6)$$

We know,

$$\sin(-A) = -\sin A \text{ and } \cos(-A) = \cos A$$

Therefore,

$$\sin(-\pi/3) + \cos(-\pi/6) = -\sin \pi/3 + \cos \pi/6$$

$$= -\sqrt{3}/2 + \sqrt{3}/2$$

$$= 0$$

Q. (9) When an integer n is divided by 8, the remainder is 3. What will be the remainder if $(6n - 1)$ is divided by 8?

1. 2
2. 0
3. 4
4. 1

Answer: 4

Solution: According to the question,

$$n = 8q + 3 \text{ [as the remainder is 3]}$$

Now, multiplying 6 on both sides,

$$6n = 48q + 18$$

$$\Rightarrow 6n = 48q + 16 + 2$$

$$\Rightarrow 6n = 8(6q + 2) + 2$$

$$\Rightarrow 6n = 8y + 2 \text{ (where } y = 6q + 2\text{)}$$

Subtracting both sides with -1 ,

$$6n - 1 = 8y + 2 - 1$$

$$\Rightarrow 6n - 1 = 8y - 1$$

Hence, the remainder is 1.

Q. (10) If $a^3 - b^3 = 208$ and $a - b = 4$, then $(a + b)^2 - ab$ is equal to:

1. 52
2. 42
3. 32
4. 38

Answer: 1

Solution: $a^3 - b^3 = 208$

$$\Rightarrow (a - b)(a^2 + ab + b^2) = 208$$

$$\Rightarrow (a - b)[(a + b)^2 - 2ab + ab] = 208$$

$$\Rightarrow (a + b)^2 - ab = 208 / (a - b)$$

$$\Rightarrow (a + b)^2 - ab = 208 / 4 = 52$$

Q. (11) If $x + 1/x = 5$, then $x^3 + 1/x^3$ is equal to:

1. 130
2. 110
3. 145
4. 125

Answer: 2

Solution: $x^3 + 1/x^3 = (x + 1/x) (x^2 + 1/x^2 - x \cdot 1/x)$
 $= (x + 1/x) [(x + 1/x)^2 - 2 \cdot x \cdot 1/x - 1]$
 $= 5 \times [(5)^2 - 3]$
 $= 5 \times 22$
 $= 110$

Q. (12) If $(x - 5)^3 + (x - 6)^3 + (x - 7)^3 = 3(x - 5)(x - 6)(x - 7)$ then what is the value of x ?

1. 5
2. 6
3. 18
4. 7

Answer: 2

Solution: We know,

$$a^3 + b^3 + c^3 - 3abc = (a + b + c) [a^2 + b^2 + c^2 - ab - bc - ca]$$

Therefore,

$$\begin{aligned} & (x - 5)^3 + (x - 6)^3 + (x - 7)^3 - 3(x - 5)(x - 6)(x - 7) \\ &= [x - 5 + x - 6 + x - 7] [(x - 5)^2 + (x - 6)^2 + (x - 7)^2 - (x - 5)(x - 6) - (x - 6)(x - 7) - (x - 7)(x - 5)] \\ &= [3x - 18] [(x^2 - 10x + 25 + x^2 - 12x + 36 + x^2 - 14x + 49) - (x - 5)(x - 6) - (x - 6)(x - 7) - (x - 7)(x - 5)] \\ &= [3x - 18] [(3x^2 - 36x + 110) - (x^2 - 11x + 30) - (x^2 - 13x + 42) - (x^2 - 12x + 35)] \\ &= [3x - 18] [3x^2 - 36x + 110 - 3x^2 + 36x - 107] \\ &= (3x - 18) \times 3 \\ &= 9x - 54 \end{aligned}$$

Given, $(x - 5)^3 + (x - 6)^3 + (x - 7)^3 = 3(x - 5)(x - 6)(x - 7)$

Therefore,

$$(x - 5)^3 + (x - 6)^3 + (x - 7)^3 - 3(x - 5)(x - 6)(x - 7) = 9x - 54$$

$$\Rightarrow 3(x - 5)(x - 6)(x - 7) - 3(x - 5)(x - 6)(x - 7) = 9x - 54$$

$$\Rightarrow 9x = 54$$

Hence, $x = 6$

Q. (13) If the selling price of 40 articles is equal to the cost price of 50 articles, then the percentage loss or gain is:

1. 20% loss
2. 25% loss
3. 20% gain
4. 25% gain

Answer: 4

Solution: Let the price of each article be x rupees

Thus, price for 40 articles = $40x$ rupees

Cost price of 40 articles = $40x$ rupees

The selling price of 40 articles = $50x$ rupees

Now, Profit = selling price - cost price

$$= 50x - 40x$$

$$= 10x$$

Therefore, profit [gain]% = $(\text{profit}/\text{cost price}) \times 100$

$$= (10x/40x) \times 100$$

$$= 1/4 \times 100$$

$$= 25\%$$

Q. (14) In $\triangle ABC$, $A = 50^\circ$. Its sides AB and AC are produced to the point D and E . If the bisectors of $\angle CBD$ and $\angle BCE$ meet at the point O , then $\angle BOC$ will be equal to:

1. 40°
2. 65°
3. 75°
4. 55°

Answer: 2

Solution:

$$\angle CBE = 180^\circ - \angle ABC$$

$$\angle CBO = 1/2 \angle CBE \text{ (BO is the bisector of } \angle CBE)$$

$$\Rightarrow \angle CBO = 1/2 (180^\circ - \angle ABC)$$

$$= 90^\circ - 1/2 \angle ABC$$

Also, $\angle BCD = 180^\circ - \angle ACD$

$$\angle BCO = 1/2 \angle BCD \text{ (CO is the bisector of } \angle BCD)$$

$$= 1/2 (180^\circ - \angle ACD)$$

$$= 90^\circ - 1/2 \angle ACD$$

Therefore, $\angle BOC = 180^\circ - (\angle CBO + \angle BCO)$

$$\angle BOC = 180^\circ - (90^\circ - 1/2 \angle ABC + 90^\circ - 1/2 \angle ACD)$$

$$= 180^\circ - 180^\circ + 1/2 \angle ABC + 1/2 \angle ACD$$

$$= 1/2 (\angle ABC + \angle ACD)$$

$$= 1/2 (180^\circ - \angle BAC)$$

Now, $180^\circ - \angle BAC = \angle ABC + \angle ACD$

$$\angle BOC = 90^\circ - 1/2 \angle BAC$$

$$= 90^\circ - 25^\circ$$

$$= 65^\circ$$

Q. (15) A starts walking at 4 kmph and after 4 hours, B starts cycling from the same point as that of A, in the same direction at 10 kmph. After how much distance from the starting point will B catch up with A (Correct to two decimal places)?

1. 25.67 km
2. 26.67 km
3. 24.67 km
4. 23.67 km

Answer: 2

Solution: A's position after 4 hrs is 16km from start.

Assuming A and B meet after x km.

Now, Time = Distance/Speed

Therefore, $x/4 = x/10 + 4$

$$\Rightarrow 10x = 4x + 160$$

$$\Rightarrow 6x = 160$$

$$\Rightarrow x = 26.67$$

Q. (16) If $\tan\theta + \cot\theta = 5$, then the value of $\tan^2\theta + \cot^2\theta$ is

1. 22
2. 25
3. 23
4. 27

Answer: 3

Solution:

Given,

$$\tan\theta + \cot\theta = 5$$

Square both sides

$$(\tan\theta + \cot\theta)^2 = 5^2$$

$$\Rightarrow \tan^2\theta + \cot^2\theta + 2\tan\theta\cot\theta = 25$$

We know, $\tan\theta = 1/\cot\theta$

$$\text{So, } \tan^2\theta + \cot^2\theta + 2 = 25$$

$$\Rightarrow \tan^2\theta + \cot^2\theta = 23$$

Q. (17) What is the value of $\tan 45^\circ + 4/\sqrt{3} \sec 60^\circ$?

1. $(\sqrt{3} + 8)/\sqrt{3}$
2. $(\sqrt{3} + 8)/3$
3. $(\sqrt{3} - 8)/\sqrt{3}$
4. $(\sqrt{3} - 8)/3$

Answer: 1

Solution:

The given equation is $\tan 45^\circ + 4/\sqrt{3} \sec 60^\circ$

Now, express $\sec 60^\circ$ in terms of \cos

So, the equation becomes,

$$\tan 45^\circ + 4/\sqrt{3} \times (1/\cos 60^\circ)$$

We know, $\tan 45^\circ = 1$ and $\cos 60^\circ = \frac{1}{2}$

$$\text{So, } \tan 45^\circ + 4/\sqrt{3} \sec 60^\circ$$

$$= 1 + 4/\sqrt{3} \times 2$$

$$= 1 + 8/\sqrt{3}$$

$$= (\sqrt{3} + 8)/\sqrt{3}$$

Q. (18) If 85% of a number is added to 75, then the result is the number itself. The number is:

1. 500
2. 200
3. 100
4. 300

Answer: 1

Solution: Let the number be x .

Therefore, 85% of $x + 75 = x$

$$\Rightarrow x - 85x/100 = 75$$

$$\Rightarrow 15x = 7500$$

$$\Rightarrow x = 500$$

Q. (19) ABCD is a cyclic quadrilateral such that AB is the diameter of the circle circumscribing it and $\angle ADC = 129^\circ$. Then, $\angle BAC$ is equal to:

1. 61°
2. 49°
3. 39°
4. 51°

Answer: 3

Solution: Given, ABCD is a cyclic quadrilateral such that AB is the diameter of the circle.

Therefore, $\angle ADC + \angle ABC = 180^\circ$ (The sum of the opposite angles in a cyclic quadrilateral is 180°)

$$\Rightarrow 129^\circ + \angle ABC = 180^\circ$$

$$\Rightarrow \angle ABC = 51^\circ$$

Since, $\angle ACB$ is a semi-circle angle, therefore $\angle ACB = 90^\circ$

Now, in $\triangle ABC$,

$$\angle BAC + \angle ABC + \angle ACB = 180^\circ$$

$$\Rightarrow \angle BAC + 51^\circ + 90^\circ = 180^\circ$$

$$\Rightarrow \angle BAC = 39^\circ$$

Q. (20) The average of 27 numbers is zero. Out of them, how many maybe greater than zero, at the most?

1. 0
2. 26
3. 20
4. 15

Answer: 2

Solution: Given, Average of 27 number is zero

Therefore, average = sum of observations/total number of observations

$$\Rightarrow 0 = \text{sum of observations}/27$$

$$\Rightarrow \text{Sum of observations} = 0 \times 27 = 0$$

Hence, the sum of all 27 numbers must be zero.

Thus, the maximum number of positive numbers = $27 - 1 = 26$

Q. (21) If the radius of the circumcircle of an equilateral triangle is 8 cm, then the measure of radius of its incircle is:

1. 16 cm
2. 4 cm
3. 12 cm
4. 8 cm

Answer: 2

Solution:

We know that, the radius of the circumcircle of an equilateral triangle (R) = 2 x (radius of its incircle)

Given, $R = 8$ cm

Therefore, $R = 2r$

$$\Rightarrow r = R/2$$

$$\Rightarrow r = 8/2 = 4 \text{ cm}$$

Q. (22) Table shows the sales of books (in thousands) from six branches of a publishing company during 2000 and 2001.

Year	Branch 1	Branch 2	Branch 3	Branch 4	Branch 5	Branch 6
2000	80	75	95	85	75	70
2001	105	65	110	95	95	80

What is the total sales of books from branches B1, B3 and B6 together for both the years (in thousands)?

1. 240
2. 310
3. 650
4. 540

Answer: 4

Solution:

The total sales of books from branch B1 for both the years = $80 + 105 = 185$

The total sales of books from branch B3 for both the years = $95 + 110 = 205$

The total sales of books from branch B6 for both the years = $70 + 80 = 150$

Hence, the total sales of books from branches B1, B3 and B6 together for both the years (in thousands) = $185 + 205 + 150 = 540$

Q. (23) Table shows the percentage distribution of the expenditure incurred on different items for publishing a book.

Items of expenditure	Percentage of expenditure
Paper	25
Printing	20
Binding	20
Royalty	15
Promotion	10
Transportation	10

Expenditure on Royalty is less than that on Printing by:

1. 10%
2. 20%
3. 25%
4. 15%

Answer: 3

Solution: Percentage of expenditure on Royalty = 15

Percentage of expenditure on Printing = 20

Therefore, required difference = $(20 - 15)/20 \times 100\%$

= $(100/4)\%$

= 25%

Q. (24) If a train runs at 60 km/h, it reaches its destination 15 minutes late. But, if it runs at 80 km/h. it is late by 7 minutes only. The right time for the train to cover its journey is:

1. 17 minutes
2. 18 minutes
3. 20 minutes

4. 21 minutes

Answer: 1

Solution: Let the right time for the train be t hour.

Therefore, according to the question,

$$60(t + 15/60) = 80(t + 7/60)$$

$$\Rightarrow 60(t + \frac{1}{4}) = 80t + \frac{28}{3}$$

$$\Rightarrow 60t + 15 = 80t + \frac{28}{3}$$

$$\Rightarrow 20t = \frac{28}{3} - 15$$

$$\Rightarrow t = \frac{17}{3} \times \frac{1}{20}$$

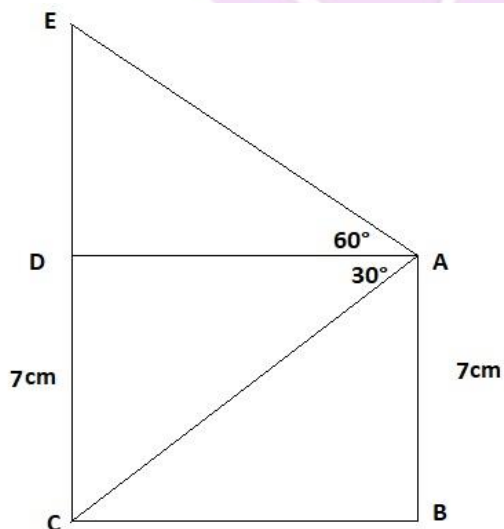
$$\Rightarrow t = \frac{17}{60} \text{ hours} = \frac{17}{60} \times 60 = 17 \text{ minutes}$$

Q. (25) From the top of a 7m high building, the angle of elevation of the top of a tower is 60° and the angle of depression of the foot of the tower is 30° . What is the height of the tower to nearest metres?

1. 35 m
2. 28 m
3. 34 m
4. 33 m

Answer: 2

Solution:



$$\tan 30^\circ = DC/AD$$

$$\Rightarrow 1/\sqrt{3} = 7/AD$$

$$\Rightarrow AD = 7\sqrt{3}$$

$$\tan 60^\circ = ED/AD$$

$$\Rightarrow 1/3 = ED/7\sqrt{3}$$

$$\Rightarrow ED = 21$$

$$EC = ED + DC$$

$$= 21 + 7$$

$$= 28 \text{ m}$$

Q. (26) The value of $(\sec^2 45^\circ - \cot^2 45^\circ) - (\sin^2 30^\circ + \sin^2 60^\circ)$ is:

- 1
- $2\sqrt{3}$
- 0
- $1/\sqrt{2}$

Answer: 3

Solution:

Use the following values:

$$\sec 45^\circ = \sqrt{2} \text{ i.e. } \sec^2 45^\circ = 2$$

$$\cot 45^\circ = 1 \text{ i.e. } \cot^2 45^\circ = 1$$

$$\sin 30^\circ = \frac{1}{2} \text{ i.e. } \sin^2 30^\circ = \frac{1}{4}$$

$$\sin 60^\circ = \frac{\sqrt{3}}{2} \text{ i.e. } \sin^2 60^\circ = \frac{3}{4}$$

$$\text{So, } (\sec^2 45^\circ - \cot^2 45^\circ) - (\sin^2 30^\circ + \sin^2 60^\circ)$$

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

$$= 0$$

Q. (27) If $(1/\cos \theta) - (1/\cot \theta) = 1/P$, then what is the value of $\cos \theta$?

- $(P + 1)/(P - 1)$
- $(P^2 + 1)/2P$

3. $2(P^2 + 1)/P$

4. $2P/(P^2 + 1)$

Answer: 4

Solution:

Given, $(1/\cos \theta) - (1/\cot \theta) = 1/P$

$\Rightarrow (1/\cos \theta) - (\sin \theta/\cos \theta) = 1/P$

$\Rightarrow [1 - \sqrt{(1 - \cos^2 \theta)}]/\cos \theta = 1/P$

Let $\cos \theta = x$

$\Rightarrow 1 - \sqrt{(1 - x^2)} = x/P$

$\Rightarrow 1 - x/P = \sqrt{(1 - x^2)}$

Squaring both the sides, we get;

$\Rightarrow (1 - x/P)^2 = (\sqrt{(1 - x^2)})^2$

$\Rightarrow 1 + x^2/P^2 - 2x/P = 1 - x^2$

$\Rightarrow x^2/P^2 - 2x/P + x^2 = 0$

$\Rightarrow (x^2 - 2xP + x^2P^2)/P^2 = 0$

$\Rightarrow x^2 - 2xP + x^2P^2 = 0$

$\Rightarrow x(1 + P^2) = 2P$

$\Rightarrow x = 2P/(1 + P^2)$

$\Rightarrow \cos \theta = 2P/(1 + P^2)$

Q. (28) What is the simplified value of $\sec^6 A - \tan^6 A - 3 \sec^2 A \tan^2 A$?

1. -1

2. 0

3. 1

4. $\sec A \tan A$

Answer: 3

Solution:

Given, $\sec^6 A - \tan^6 A - 3 \sec^2 A \tan^2 A$

$$= [(\sec^2 A)^3 - (\tan^2 A)^3] - 3\sec^2 A \cdot \tan^2 A$$

By algebraic identities, $x^3 - y^3 = (x - y)(x^2 + y^2 + xy)$, we get;

$$[(\sec^2 A - \tan^2 A)(\sec^4 A + \tan^4 A + \sec^2 A \tan^2 A)] - 3 \sec^2 A \tan^2 A$$

$$\text{Also, } (\sec^2 A - \tan^2 A = 1)$$

$$\Rightarrow \sec^4 A + \tan^4 A - 2\sec^2 A \tan^2 A = 1$$

$$\Rightarrow (\sec^2 A - \tan^2 A)^2 = 1$$

$$\Rightarrow (\sec^2 A - \tan^2 A) = \sqrt{1} = 1$$

Q. (29) A sum of ₹ 20,000 is invested for 15 months at the interest of 10% per annum compounded half yearly. What is the percentage gain, correct to one decimal place, at the end of 15 months?

1. 13.6%
2. 13.4%
3. 13.0%
4. 12.5%

Answer: 4

Solution: Principal Amount , P = Rs. 20,000

Rate, R = 10%

Time, T = 15 months = 1 yr 5 month

So, number of time compounded half yearly = 2

Now, Rate = 5%

According to the question,

$$A = P[1 + R/100]^2$$

$$= 20,000[1 + 5/100]^2$$

$$= 20,000 \times 105/100 \times 105/100$$

$$= 22050$$

Now for the remaining 5 months,

$$\text{S.I.} = \text{PRT}/100$$

$$= (22050 \times 5 \times 5/12) / 100$$

$$= 459.3$$

Amount after 15 months = $22050 + 459.3 = 22509.3$

Hence, percentage increase = $[(22509.3 - 20,000) / 20,000] \times 100$
 $= 12.5\%$

Q. (30) The side of a rhombus is 5 cm and one of its diagonal is 8 cm. What is the area of the rhombus?

1. 40 cm^2
2. 20 cm^2
3. 30 cm^2
4. 24 cm^2

Answer: 4

Solution: Let the length of the other side be x cm

Therefore, by applying Pythagoras Theorem,

$$x^2 + 4^2 = 5^2$$

$$\Rightarrow x^2 = 25 - 16 = 9$$

$$\Rightarrow x = 3 \text{ cm}$$

Hence, the length of the other diagonal = $2 \times 3 \text{ cm} = 6 \text{ cm}$

Now, the area of a rhombus = $\frac{1}{2} \times$ area of the large rectangle around it

$$= \frac{1}{2} \times (6 \times 8) \text{ cm}^2$$

$$= 24 \text{ cm}^2$$

Q. (31) In an examination 34% of the students failed in Mathematics and 42% failed in English. If 20% of the students failed in both the subjects, then the percentage of students who passed in both the subjects was:

1. 32%
2. 56%
3. 44%
4. 48%

Answer: 3

Solution:

Students failed in only maths = $34 - 20 = 14\%$

Students failed in only english = $42 - 20 = 22\%$

Total students failed = $14 + 22 + 20 = 56\%$

Total passed = $100 - 56 = 44\%$

Q. (32) Two numbers are in the ratio 4 : 5. If their HCF is 16, then the sum of these two numbers is:

1. 150
2. 160
3. 124
4. 144

Answer: 4

Solution: Let the number be $4x$ and $5x$

LCM \times HCF = product of two numbers

$$\Rightarrow 16 \times \text{LCM} = 20x^2$$

$$\Rightarrow \text{LCM} = 20x^2/16$$

$$\Rightarrow \text{LCM} = 5/4 x^2$$

LCM of $4x$ and $5x = 20x$

$$\Rightarrow 20x = 5/4 x^2$$

$$\Rightarrow x = 16$$

Hence, the sum of these two numbers = $(4 \times 16) + (5 \times 16) = 144$

Q. (33) What is the sum of digits of the least number. which when divided by 15, 18 and 24 leaves the remainder 8 in each case and is also divisible by 13?

1. 18
2. 16
3. 15

4. 17

Answer: 4

Solution: $15 = 3 \times 5$

$18 = 2 \times 3 \times 3$

$24 = 2 \times 2 \times 2 \times 3$

$LCM = 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 360$

Now, the required number = $360 + 8 = 368$

$368/13 = 28.31$ (not divisible by 13)

Hence, $(360 \times 2) + 8 = 720 + 8 = 728$

$728 \div 13 = 56$

Thus, the correct number = 728

Therefore, the sum of these digits = 17

Q. (34) In a class of 50 students. 40% are girls. The average weight of the boys is 62 kg and that of the girls is 58 kg. What is the average weight (in kg) of the whole class?

1. 59.2
2. 60.2
3. 60.8
4. 60.6

Answer: 1

Solution: If 40% are girls,

40% of 60 = 24

Therefore, number of girls = 24

Number of boys = $60 - 24 = 36$

Average weight of boys = total weight of boys \div number of boys

$$\Rightarrow 62 = \text{total weight}/36$$

Therefore, total weight = $62 \times 36 = 2232$

Average weight of girls = total weight of girls \div number of girls

$$\Rightarrow 55 = \text{total weight} /24$$

Total weight = $55 \times 24 = 1320$

Thus, for whole class, total weight = $1320 + 2232 = 3552$

Average weight of whole class = $3552 \div 60 = 59.2$

Q. (35) A shopkeeper sold two fans for rs 990 each. On one he gains 10% and on the other he loses 10%. Calculate his gain or loss per cent in the whole transaction.

1. 1% loss
2. 1% gain
3. 5.29% gain
4. 5.29% loss

Answer: 1

Solution: C.P of first fan = $(990 \times 100) \div 110 = \text{Rs. } 900$

C.P of second fan = $(990 \times 100) \div 90 = \text{Rs. } 1100$

Total C.P. = $1100 + 900 = 2000$

Total S.P = 990×2

=1980

Loss = $2000 - 1980 = \text{Rs. } 20$

Loss% = $(20 \times 100) \div 2000 = 1\%$

Q. (36) The radius of a cylinder is increased by 150 cm and its height is decreased by 20 cm. What is the percentage increase in its volume?

1. 80%
2. 400%
3. 500%
4. 600%

Answer: 2

Solution: Let the radius of cylinder be 100 cm and height also 100 cm

We know that,

$$\text{Volume} = \pi r^2 h$$

$$V = \pi(100)^2 \times 100$$

$$V = 1000000 \pi \text{cm}^3$$

$$\text{Now, given radius} = (100 + 150) = 250 \text{ cm}$$

$$\text{Height} = (100 - 20) = 80 \text{ cm}$$

$$\text{Therefore, volume} = \pi (250)^2 \times 80 = 50,00,000\pi$$

$$\begin{aligned} \text{Now, increase in volume} &= (50,00,000 - 10,00,000)\pi \\ &= 40,00,000 \pi \text{cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Increase in percentage} &= (40,00,000 / 10,00,000) \times 100\% \\ &= 4 \times 100\% \\ &= 400\% \end{aligned}$$

Q. (37) What is the simplified value of $[2/(\cot A - \tan A)]$?

1. $\sin A \cos A$
2. $\tan 2A$
3. $\tan^2 A$
4. $\sin^2 A \cos^2 A$

Answer: 2

Solution: Given, $[2/(\cot A - \tan A)]$

$$= [2/(1/\tan A - \tan A)]$$

$$= 2 \tan A / 1 - \tan^2 A$$

By trigonometric identities, we can write the above expression as $\tan 2A$

Q. (38) What is the simplified value of $(\sec^4 A - \tan^2 A) - (\tan^4 A + \sec^2 A)$?

1. -1
2. -1/2
3. 0
4. 1

Answer: 0

Solution:

$$\text{Given, } (\sec^4 A - \tan^2 A) - (\tan^4 A + \sec^2 A)$$

$$= \sec^4 A - \tan^2 A - \tan^4 A - \sec^2 A$$

$$= \sec^2 A (\sec^2 A - 1) - \tan^2 A (1 + \tan^2 A)$$

By using trigonometric identity, $(1 + \tan^2 A) = \sec^2 A$, we get;

$$(1 + \tan^2 A) \tan^2 A - \tan^2 A (1 + \tan^2 A)$$

$$= 0$$

Q. (39) What is the simplified value of $(\operatorname{cosec} A - \sin A)(\sec A - \cos A)(\tan A + \cot A)$?

1. -1
2. 0
3. 1
4. 2

Answer: 3

Solution:

Represent the given equation in terms of only sin and cos.

We know,

$$\operatorname{Cosec} A = 1 / \sin A,$$

$$\operatorname{Sec} A = 1 / \cos A,$$

$$\operatorname{Tan} A = \sin A / \cos A, \text{ and}$$

$$\operatorname{Cot} A = \cos A / \sin A$$

$$= (1/\sin A - \sin A)(1/\cos A - \cos A)(\sin A/\cos A + \cos A/\sin A)$$

Now, take the LCM,

$$\begin{aligned} &= \left[\frac{\sin^2 A + \cos^2 A}{\cos A \sin A} \right] \cdot \left[\frac{1 - \sin^2 A}{\sin A} \right] \cdot \left[\frac{1 - \cos^2 A}{\cos A} \right] \\ &= \left(\frac{1}{\cos A \sin A} \right) \cdot \left(\frac{\cos^2 A}{\sin A} \right) \cdot \left(\frac{\sin^2 A}{\cos A} \right) \\ &= \frac{1 \times \cos^2 A \times \sin^2 A}{\cos^2 A \times \sin^2 A} \\ &= 1 \end{aligned}$$

Thus, $(\operatorname{cosec} A - \sin A) (\sec A - \cos A) (\tan A + \cot A) = 1$

Q. (40) What is the simplified value of $(\cos^4 A - \sin^4 A)$?

1. 0
2. $2 \cos^2 A$
3. $\cos 2A$
4. 1

Answer: 3

Solution:

$$\cos^4 A - \sin^4 A = (\cos^2 A - \sin^2 A) (\cos^2 A + \sin^2 A)$$

Now, using the trigonometric identity of $\cos 2x$.

We know,

$$\cos 2x = \cos^2 x - \sin^2 x$$

So, the value of $\cos^2 A - \sin^2 A = \cos 2A$

$$\text{Also, } \cos^2 A + \sin^2 A = 1$$

$$\begin{aligned} \text{Thus, } (\cos^2 A - \sin^2 A) (\cos^2 A + \sin^2 A) &= (\cos 2A)(1) \\ &= \cos 2A \end{aligned}$$

Q. (41) A ladder leaning against a wall makes an angle of 60° with the horizontal. If the foot of the ladder is 2.5 m away from the wall, find the length of the ladder.

1. 4m
2. 5m
3. 6.2m
4. 4.5m

Answer: 2

Solution: Distance between the wall and the foot of the ladder = 2.5 m

The angle of elevation is 60°

Let the length of the ladder is L. The angle of elevation is 60°

By using cosine formulae,

$$\cos 60^\circ = 2.5/L$$

Therefore, the length of the ladder will be,

$$L = 2.5/\cos 60^\circ$$

$$= 2.5/(\frac{1}{2}) = 5 \text{ m}$$

Therefore, the length of the ladder is 5 m.

Q. (42) Two pipes can fill a tank with water in 15 and 12 hours respectively, and a third pipe can empty it in 4 hours. If the pipes be opened in order, at 8 , 9 am and 11 am respectively, the tank will be emptied at:

1. 11:40 am
2. 12:40 am
3. 1: 40 pm
4. 2: 40 pm

Answer: 4

Solution:

Suppose capacity of the tank is 60 litres.

Amount of water filled by first pipe in 1 hr = $60/15 = 4$ litres.

Amount of water filled by second pipe in 1 hr = $60/12 = 5$ litres.

Amount of water emptied by third pipe in 1 hr = $60/4 = 15$ litres.

From 8 am to 9 am, amount of water filled by first pipe = 4 litre.

From 9 am to 11 am, amount of water filled by first and second pipe together = $(4 + 5) \times 2$
= 18 litres.

At 11 am, quantity of water in the tank = $4 + 18 = 22$ litres.

All the pipes are open from 11 am and amount of water emptied in 1 hr = $15 - (4 + 5) = 6$ litres.

Therefore, the time required to empty the tank = $22/6 = 3 \frac{2}{3}$ hr = 3 hour 40 min

i.e., the tank will be emptied (3 hour 40 min) after 11 am, i.e., at 2:40 pm

Q. (43) A, B and C started a business by investing Rs. 24,000, Rs. 32000 and Rs.18000 respectively. A and B are active partners and get 15% and 12% of total profit and remaining profit is to be distributed among them in the ratio of their investment. If C got total Rs.65700 as a profit, what was the total amount of profit?

1. Rs. 4,70,000
2. Rs. 3,70,000
3. Rs. 3,45,000
4. Rs. 1,57,000

Answer: 2

Solution: Ratio of their capital = 24000 : 32000 : 18000

= 12 : 16 : 9

Let the total profit = 100x

Extra share of A = $(100x) \times (15/100) = 15x$

Extra share of B = $(100x) \times (12/100) = 12x$

Remaining profit = $[100x - (15x + 12x)] = 73x$

Therefore, share of C = $[73x / (12 + 16 + 9)] \times 9 = 657x/37$

$\Rightarrow 65700 = 657x/37$

$\Rightarrow x = \text{Rs. } 3700$

\therefore Hence required profit = $100x = 100 \times 3700 = \text{Rs. } 3,70,000$

Q. (44) 24 men working at 8 hours per day can do a piece of work in 15 days how many days can 20 men working at 9 hours per day the same work.

1. 16 days
2. 18 days
3. 12 days
4. 17 days

Answer: 1

Solution: Given, 24 men working at 8 hours per day can do the work in 15 days

Therefore, the amount of work done = $24 \times 8 \times 15 = 2880$ man-hour

Now, the number of days needed for 20 men working 9 hours a day
= (the amount of work done by 24 men working at 8 hours per day) / (man-hour for 20 men working 9 hours a day)
= $2880 / (20 \times 9) = 2880 / 180$
= 16 days

Q. (45) The sides of a triangle are 10 cm, 24 cm and 26 cm at each of its vertices circle of radius are drawn, what is the area of the triangle excluding the portion covered by the sectors of the circles:

1. 80.7 cm^2
2. 96.8 cm^2
3. 84.6 cm^2
4. 88 cm^2

Answer: 1

Solution: The sides of a triangle are 10 cm, 24 cm and 26 cm.

$$s = (10 + 24 + 26)/2 = 30$$

Area of triangle using heron rule,

$$\text{Area} = \sqrt{30(30 - 10)(30 - 24)(30 - 6)}$$

$$= \sqrt{30 \times 20 \times 6 \times 4}$$

$$= 120 \text{ cm}^2$$

Radius = 5 cm

Area covered by the sectors of the circles = $(180/360) \pi (\text{radius})^2$

$$= (1/2) \times 3.14 \times 5^2$$

$$= 39.3 \text{ cm}^2$$

The area of the triangle excluding the portion covered by the sectors of the circles = $120 - 39.3 = 80.7 \text{ cm}^2$

Q. (46) If $a^3 - b^3 = 208$ and $a - b = 4$, then $(a + b)^2 - ab$ is equal to:

1. 42
2. 52
3. 32

4. 38

Answer: 2

Solution: We know,

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$\Rightarrow 208 = 4 \times [(a + b)^2 - ab]$$

$$\Rightarrow (a + b)^2 - ab = 52$$

Q. (47) If $x + 1/x = 5$, then $x^3 + 1/x^3$ is equal to:

1. 125
2. 130
3. 145
4. 110

Answer: 4

Solution: We know, $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

$$\text{Therefore, } x^3 + 1/x^3 = (x + 1/x) [(x + 1/x)^2 - 3 \cdot x \cdot 1/x]$$

$$= 5 \times [5^2 - 3]$$

$$= 5 \times 22$$

$$= 110$$

Q. (48) The square root of which of the following is a rational number?

1. 6250.49
2. 1250.49
3. 5768.28
4. 1354.24

Answer: 4

Q. (49) What is the sum of the mean proportional between 10.8 and 4.8 and the third proportional of 2 and 4?

1. 10.2
2. 11.2
3. 8.2

4. 15.2

Answer: 3

Solution: Mean proportion of 10.8 and 4.8

$$= 10.8 \cdot 4.8$$

$$= 7.2$$

Third proportion of 2 and 4 = $2^2/4 = 1$

$$\text{Required sum} = 7.2 + 1 = 8.2$$

Q. (50) The successive discounts of 20%, 10 % and 15 % is equivalent to a single discount of:

1. 42.2 %
2. 43.5 %
3. 38.8 %
4. 44.5%

Answer: 3

Solution: Let a number = 100

Therefore, 20% of 100 = 20

Number after discount = 80

Again, 10% of 80 = 8

Number after discount = 72

Again, 15% of 72 = 10.8

Number after discount = 61.2

Now, $100 - 61.2 = 38.8$

Hence, single equivalent discount percent is 38.8%

