SSC CGL

MATHEMATICS

TCS PYQ Solved Papers

Combined Graduate Level Exam (TIER–1)

100 SETs

2021-2024

- **Previous years' solved question papers with detailed conceptual explanations**
- **Promotes clear understanding of the answers without any external help**

CHRONICLE
Nurturing Talent Since 1990

SSC-CGL

Combined Graduate Level

Mathematics

100 SETS

TCS-PYQ Solved Papers 2021-2024

- ☑ **The questions in this book have been explained in such a way that you can understand the answers along with the concepts in detail without any external help.**
- ☑ **In the past few years, SSC conducted all its examinations in the CBT (Computer Based Test) format. TCS conducts exams 3 – 4 shift per day. We have selected certain sets based on the novelty of the questions. Specifically, we have provided answers with explanations for those sets in which the questions were of the latest type or particularly difficult.**
- ☑ **In these examinations, questions are not repeated, but the nature and pattern of the questions remain more or less the same. Therefore, these question sets will be highly beneficial for all examinations conducted by the SSC, as they cover the latest question patterns and difficulty levels.**

Solved by

Chandan Singh
Selected in Airforce

Kundan Kumar
Selected in CISF

Sanyog Kumar, Amarendra Kumar
Chronicle Editorial Team

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SSC-CGL

Combined Graduate Level PYQ Solved Paper

Held On 26/09/2024, Shift-3

1. Find the value of the unknowns:

x + 1.5y + 2x = 5.5

x + 5y + 7z = 15

3x + 11y + 13x = 25

(a) $x = -3y, y = 2, z = 4$

(b) $x = 4, y = -3, z = 2$

(c) $x = 2, y = 4, z = -3$

(d) $x = 2, y = -3, z = 4$

2. Simplify 626 × 2912 ÷ 8138

(a) 285 (b) 364

(c) 310 (d) 224

3. The greatest value of $\sin^4\theta + \cos^4\theta$ is:

(a) 1 (b) 3

(c) 4 (d) 2

4. An article costs ₹1,000 for a salesman. He fixes its marked price as ₹1,500. He sells it to a customer at a discount of 20%. He gives a further discount of 10% for each cash payment. Find the percentage of loss or gain that the salesman makes on sale.

(a) loss 10% (b) gain 10%

(c) loss 8% (d) gain 8%

5. A secant PAB is drawn from an external point P to the circle with the centre at O, intersecting it at A and B. If OP = 17 cm, PA = 12 cm and PB = 22.5 cm, then the radius of the circle is:

(a) $\sqrt{19}$ cm (b) $\sqrt{17}$ cm

(c) $\sqrt{21}$ cm (d) $\sqrt{23}$ cm

6. If $\frac{x}{x^2-2x+1}=\frac{1}{3}$, then the value of $x^3+\frac{1}{x^2}$ is:

(a) 160 (b) 180

(c) 130 (d) 110

7. In a circular race of 1600 m in length, Bhaskar and Vinay start with speeds of 27 km/h and 45 km/h starting at the same time from the same point. When will they meet for the first time on the track when running in the opposite directions and the same direction, respectively?

(a) 2 minutes 20 seconds and 4 minutes 20 seconds

(b) 1 minute 20 seconds and 5 minutes 20 seconds

(c) 1 minute 40 seconds and 5 minutes 20 seconds

(d) 2 minutes 40 seconds and 5 minutes 40 seconds

8. In how much time will ₹5,000 at 4% per annum simple interest produce the same interest as ₹8,000 in $2\frac{1}{2}$ years at 8% per annum simple interest?

(a) 2 years (b) 5 years

(c) 4 years (d) 8 years

9. Simplify $\frac{4x^2-49y^2}{2x+7y}+7y-2x$

(a) $4x - 14y$ (b) 0

(c) $7y$ (d) $4x$

10. If the altitude from two vertices of a triangle to the opposite sides are equal, then the triangle will be:

(a) equilateral triangle

(b) obtuse angle triangle

(c) isosceles triangle

(d) scalene triangle

11. The monthly incomes of A, B and C are in the ratio 2 : 9 : 3 and their expenses are in the ratio 3 : 9 : 5. If A's saving is half of his total income, then savings of A, B and C are, respectively, in the ratio of:

(a) 3 : 9 : 2 (b) 2 : 5 : 2

(c) 1 : 2 : 1 (d) 3 : 18 : 4

12. Find the volume of a cone having base radius 3.5 cm and height 18 cm.

(a) 201 cm^3 (b) 231 cm^1

(c) 241 cm^3 (d) 221 cm^3

13. A shopkeeper has a fault of 100 g in a 3 kg weight. He sold 3 kg of potatoes to Charu using the same faulty weight for ₹46. The cost price of the potatoes for the seller was ₹12 per kg. How much profit (in ₹) did he earn on the potatoes?

(a) 11.6 (b) 11.2

(c) 10.2 (d) 10

14. A tank is filled in 45 minutes by two pipes, A and B. Pipe B fills the tank twice as fast as A. How much time (in minutes) will pipe A alone take to fill the tank?

(a) 115 (b) 135

(c) 125 (d) 140

15. The number of applicants appeared and qualified in a 4-wheeler driving licence test during the last four months of 2022 from a city are listed in the following table. Study the table carefully and answer the question that follows.

Month	Appeared applicants	Qualified applicants
September	2500	1200
October	2000	1100
November	2100	900
December	3000	1500

What is the percentage of disqualified applicants for the driving licence test in September?

(a) 48% (b) 54%

(c) 52% (d) 50%

16. The given table shows the expenditure of a company (in lakh rupees) per annum over the years.

Year	Salary	Fuel and transport	Bonus	Interest on loan	Taxes
2005	212	78	4.00	24.6	88
2006	225	98	4.25	29.7	110
2007	236	105	4.75	36.8	125
2008	247	125	5.55	42.3	103
2009	295	145	6.25	49.6	118
2010	325	155	6.85	58.4	135

The total expenditure on all these categories in 2006 is what percentage (rounded off to two places of decimals) of the total expenditure in 2009?

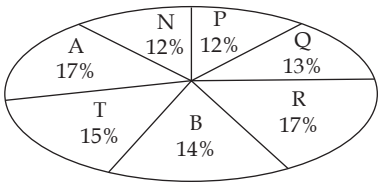
(a) 66.07% (b) 76.07%

(c) 76.09% (d) 66.09%

17. **$7^{15} + 7^{16} + 7^{17}$ is divisible by which of the following given numbers?**
(a) 4 (b) 2
(c) 3 (d) 5

18. **If $\cot\theta = \sqrt{11}$, then the value of $\frac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2\theta + \sec^2\theta}$ is:**
(a) $\frac{3}{5}$ (b) $\frac{4}{5}$
(c) $\frac{6}{7}$ (d) $\frac{5}{6}$

19. **The following pie-chart shows the distribution of students at graduate level in different institutes in a town. Study the given chart and answer the question that follows.**
Distribution of students at graduate level institutes
If the total number of students at the graduate level is 2,46,000, then how many students of institutes A and B are studying at graduate level?



(a) 86,190 (b) 76,260
(c) 74,580 (d) 78,370

20. **The following table shows the production (in units) and sales, of different items of a steel company. Study the table and answer the question that follows.**

Item	Production (Units)	Sales (Units)
Plate	252	190
Bowl	356	307
Spoon	185	133
Pipe	220	155
Holder	458	419

In which item is there the least number of unsold items?
(a) Plate (b) Spoon
(c) Pipe (d) Holder

21. **Ram's income is 2.5% more than Shyam's income. By what percentage is Shyam's income less than Ram's income?**
(a) 4.43% (b) 1.43%
(c) 3.43% (d) 2.43%

22. **How much rice of ₹4 per kg should be mixed to 15 kg of rice of ₹10 per kg, so as to make a mixture worth ₹6.50 per kg?**
(a) 15 kg (b) 40 kg
(c) 30 kg (d) 21 kg

23. **In triangle XYZ, A is a point on YZ such that XA = YA. If ∠XYA = 50° and <AYZ = 19°, what is the degree measure of ∠XZA ?**
(a) 53° (b) 41°
(c) 61° (d) 49°

24. **If $x = a\sec\theta\cos\phi$, $y = b\sec\theta\sin\phi$ and $z = c\tan\theta$, then the value of $\left(\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2}\right)$ is equal to:**
(a) 3 (b) 0
(c) 2 (d) 1

25. **In a triangle PQR, ∠P + ∠Q = 84. Find the value of ∠R.**
(a) 96° (b) 60°
(c) 102° (d) 74°

EXPLANATION

1. **(d),** $x + 1.5y + 2z = 5.5$ .....(i)
$x + 5y + 7z = 15$ .....(ii)
$3x + 11y + 13z = 25$ .....(iii)
According to question,
From equation (i) and (ii)
$x + 1.5y + 2z = 5.5$
$x + 5y + 7z = 15$
– – – –
$-3.5y - 5z = -9.5$
$-3.5y + 5z = 9.5$ .....(iv)
Now,
From equation (i) and (iii)
$x + 1.5y + 2z = 15.5$
$3x + 11y + 13z = 25$
Multiply by 3 in equation ...(ii)
$3x + 4.5y + 6z = 16.5$
$3x + 11y + 13z = 25$
– – – –
$-6.5y - 7z = -8.5$
$-6.5y + 7z = 8.5$ .....(v)
Again,
from equation (iv) and (v)
$3.5y + 5z = 9.5$.....×7
$6.5y + 7z = 8.5$.....×5
$24.5y + 35z = 66.5$
$32.5y + 35z = 42.5$
– – – –
$-8y = 2y$
$\therefore y = \frac{24}{-8} - 3$
Subtitute the value of y in equation (iv)
$3.5y + 5z = 9.5$
$\Rightarrow 3.5x - 3 + 5z = 9.5$
$\Rightarrow 10.5 + 52 = 9.5$
$\Rightarrow 5z = 9.5 + 10.5$
$\Rightarrow 5z = 20$
$\therefore z = \frac{20}{5} = 4$
Now, subtitue the value of y and z in equation (i)
$\Rightarrow x + 1.5y + 2z = 5.5$
$\Rightarrow x + 1.5x - 3 + 2 \times 4 = 5.5$
$\Rightarrow x + (-4.5) + 8 = 5.5$
$\Rightarrow x - 4.5 + 8 = 5.5$
$\Rightarrow x + 3.5 = 5.5$
$\therefore x = 5.5 - 3.5 = 2$
So, value of x = 2 ; y = –3 and z = 4

2. **(d),** Simplify $626 \times 2912 \div 8138$
According to question,
$\Rightarrow \frac{626 \times 2912}{8138}$
$\Rightarrow \frac{626 \times 2912}{8138} = 224$
So, required value is 224.

3. (a),

4. (d), Cost of an article = ₹1,000
He fixes its marked price as ₹1,500.
He sells it to a customer at a discount of 20%.
He gives a further discount of 10% for each cash payment.
According to question,
Selling price
$= \text{Marked price} \times \frac{100 - \text{discount}}{100}$
$= 1500 \times \frac{80}{100} \times \frac{90}{100} = ₹1,080$
Gain = Selling price – Cost price
= ₹1,080 - ₹1,000 = ₹80
$\text{Gain \%} = \frac{\text{gain} \times 100}{\text{cost price}}$

SSC-CGL

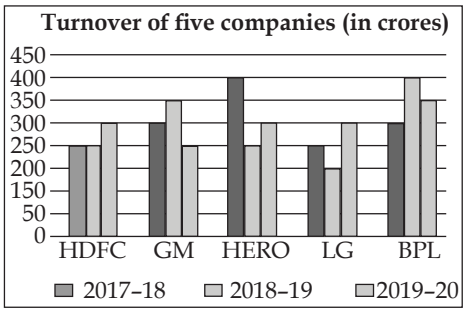
Combined Graduate Level PYQ Solved Paper

Held On 26/09/2024, Shift-2

1. The central angle of a sector is 80° and whose length is 90π. What is the radius of the circle?

(a) 204 units (b) 116 units
(c) 196 units (d) 216 units

2. The given bar graph shows the turnover of five companies (in crores).



What is the difference between the average sales turnover of all the companies put together between the years 2018-2019 and 2019-2020?

(a) ₹2 crore (b) ₹6.5 crore
(c) ₹3.5 crore (d) ₹5 crore

3. If $x=\sqrt{6}+2$ and $y=\sqrt{6}-2$, then what is the value of $\left(\frac{x}{y}+\frac{y}{x}\right)^2-3$?

(a) 35 (b) 42
(c) 22 (d) 97

4. In a ΔABC, right angled at B if $\tan C=\sqrt{3}$, then find $\frac{\sin^2 C+\cos^2 C}{1+\cot^2 C}$

(a) $\frac{16}{3}$ (b) $\frac{4}{15}$
(c) $\frac{3}{16}$ (d) $\frac{3}{4}$

5. If 8 cot θ = 7, then the value of $\frac{1+\sin\theta}{\cos\theta}$ is:

(a) $\frac{8+\sqrt{113}}{7}$ (b) $\frac{7+\sqrt{113}}{8}$
(c) $\frac{1+\sqrt{113}}{7}$ (d) $\frac{1+\sqrt{113}}{8}$

6. The marked price of an electronic watch in a store is ₹15,620 and it is available at a discount of 27%. What is the price (in ₹, to the nearest tens) that a customer pays if he buys from the store?

(a) 10,800 (b) 11,400
(c) 12,500 (d) 9,880

7. In a circle with center O, an arc ABC subtends an angle of 138° at the centre of the circle. The chord AB is produced to a point P. Then, the measure of ∠CBP is:

(a) 42° (b) 111°
(c) 108° (d) 69°

8. Suresh's expenditure and savings are in the ratio of 3 : 1. His income increases by 25%. If his savings increase by 20%, then by how much percentage does his expenditure increase?

(a) $28\frac{2}{3}\%$ (b) $26\frac{2}{3}\%$
(c) $25\frac{2}{3}\%$ (d) $27\frac{2}{3}\%$

9. A thief takes off on his bike at a certain speed, after seeing a police car at a distance of 250m. The police car starts chasing the thief and catches him. If the thief runs 1.5 km before being caught and the speed of the police car is 70 km/h, then what is the speed of thief's bike (in km/h)?

(a) 55 (b) 65
(c) 50 (d) 60

10. Study the below data and answer the question that follows.

Partners	Percentage of shares
Jeevan	10%
Kiran	15%
Lokesh	8%
Rasool	22%
Meera	45%

The company has issued 10 lakh shares between its five partners. If Jeevan offers to sell 20,000 of his shares to Meera, how many shares will Meera have?

(a) 4,60,000 (b) 4,80,000
(c) 4,70,000 (d) 5,10,000

11. In ΔABC, DE | | BC and 5AE = 3EC. If AB = 6.4 units, then the value of DB (in units) is:

(a) 3.2 (b) 2.4
(c) 5 (d) 4

12. Simplify the following expression.

(60 + 64 ÷ 4 of 4) {1000 ÷ (10 of (3 + 2) x 2 of 5)} – 28 + (100 x 3 of 3).

(a) 100 (b) 1000
(c) 600 (d) 500

13. The side BC of ΔABC is produced to a point D. If AC = BC and ∠BAC = 70°, then find the value of 2.5 ∠ACD – 1.5 ∠ABC.

(a) 230° (b) 225°
(c) 235° (d) 245°

14. The table given below shows the distribution of employees in four different companies in 2022.

Company	Number of zones	Average number of employees per zone	Male: Female
A	30	300	3 : 5
B	35	400	5 : 3
C	27	500	4 : 5
D	25	450	5 : 4

Find the total number of male employees working in company D in 2022.

(a) 6750 (b) 6500
(c) 6250 (d) 6000

15. If, $p=\frac{\sin A}{1+\cos A}$ then $\frac{\sin A}{1-\cos A}$ is equal to

(a) $\frac{1}{p}$ (b) $\frac{1}{1-p}$
(c) $\frac{1}{p+1}$ (d) $\frac{1}{p-1}$

16. **If $2a - b = 3$ and $8a^3 - b^3 = 999$, then find the value of $4a^2 - b^2$.**

(a) 65 (b) 67
(c) 63 (d) 61

17. **Raman fixes the sale price of his goods at 16% above the cost price. He sells his goods at 12% less than the fixed price. Find the profit percentage correct to two places of decimal.**

(a) 2.08% (b) 1.07%
(c) 0.08% (d) 3.01%

18. **Varun and Raju, working together, can complete a job in 40 hours whereas Varun alone can complete the same job in 50 hours. The number of hours required by Raju to complete the job alone is:**

(a) 190 (b) 200
(c) 170 (d) 150

19. **The five-digit number $45yz0$ is divisible by 40. What is the maximum possible value of $(y + z)$?**

(a) 18 (b) 16
(c) 15 (d) 17

20. **If $a : b = c : d = e : f = 5 : 7$, then what is the ratio $(3a + 5c + 11e) : (3b + 5d + 11f)$?**

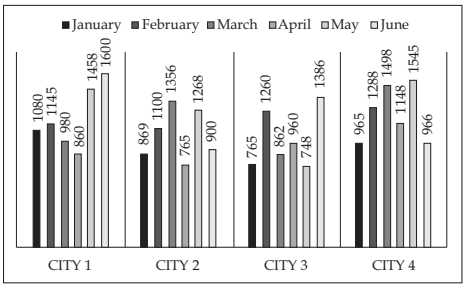
(a) 5 : 7 (b) 7 : 11
(c) 3 : 7 (d) 11 : 7

21. **Half litre of a solution contains 15% of alcohol. To change the alcohol concentration to 50%, find the quantity of alcohol to be mixed.**

(a) 175 ml (b) 400 ml
(c) 250 ml (d) 350 ml

22. **Study the given bar graph and answer the question that follows.**

The following bar graph shows the number of deaths that happened in cities 1, 2, 3 and 4 in the months mentioned.



The average number of deaths that occurred during April across all the cities (rounded off to the next integer) is:

(a) 953 (b) 928
(c) 965 (d) 934

23. **The sum of two consecutive even numbers is 174. Find the smaller number.**

(a) 86 (b) 88
(c) 84 (d) 90

24. **What principal would amount to ₹21,420 in 2 years at the rate of 9.5% p.a. simple interest?**

(a) ₹18,000 (b) ₹16,000
(c) ₹12,000 (d) ₹11,273

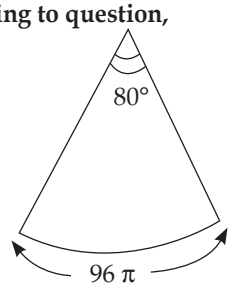
25. **If the radius and height of a right circular cylinder are 21 cm and 5 cm, respectively, then the total surface area of the cylinder is (use $\pi = \frac{22}{7}$):**

(a) 3816 cm^2 (b) 4312 cm^2
(c) 5212 cm^2 (d) 3432 cm^2

EXPLANATION

1. **(d),** The central angle of a sector is 80° and whose length is 96π.

According to question,



The arc length of a sector

$$= \frac{\theta}{360^\circ} \times 2\pi r$$

$$\Rightarrow 96\pi = \frac{80}{360^\circ} \times 2\pi r$$

$$\Rightarrow 96\pi = \frac{8}{36} \times 2\pi r$$

$$\Rightarrow 96\pi \times 36 = 8 \times 2\pi r$$

$$\therefore \quad r = \frac{96\pi \times 36}{8 \times 2\pi} = 216 \text{ units}$$

So, radius of a arc is 216 units.

2. **(d), According to question,**

Total sales of all the companies in 2018-19

$= 250 + 350 + 275 + 200 + 400 = 1475$

$$\therefore \text{ Average} = \frac{\text{Total sales}}{\text{Total number}}$$

$$= \frac{1475}{5} = 295$$

Now,

Total sales of all the companies in 2019-20

$= 300 + 250 + 300 + 300 + 350 = 1500$

$$\therefore \text{ Average} = \frac{\text{Total Sales}}{\text{Total number}}$$

$$= \frac{1500}{5} = 300$$

$\therefore$ Required difference

$= 300 - 295 = 5$ crores.

So, required answer is 5 crores.

3. **(d), According to question,**

$$\frac{x}{y} + \frac{y}{x} = \frac{x^2}{xy} + \frac{y^2}{xy} = \frac{x^2 + y^2}{xy}$$

Substitute x and y:

$$\Rightarrow x^2 = \left(\sqrt{6} + 2\right)^2 = 6 + 4\sqrt{6} + 4 = 10 + 4\sqrt{6}$$

$$\Rightarrow y^2 = \left(\sqrt{6} - 2\right)^2 = 6 - 4\sqrt{6} + 4 = 10 - 4\sqrt{6}$$

$$\Rightarrow xy = \left(\sqrt{6} + 2\right)\left(\sqrt{6} - 2\right) = \left(\sqrt{6}\right)^2 - 2^2$$

$$= 6 - 4 = 2$$

Calculate $\frac{x^2 + y^2}{xy}$

$$\Rightarrow \frac{x^2 + y^2}{xy} = \frac{\left(10 + 4\sqrt{6}\right) + \left(10 - 4\sqrt{6}\right)}{2}$$

$$= \frac{20}{2} = 10$$

Now,

$$\Rightarrow \left(\frac{x}{y} + \frac{y}{x}\right)^2 - 3$$

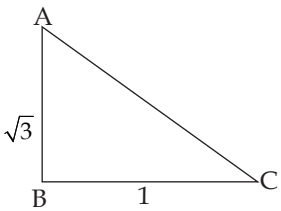
$$\Rightarrow \left(\frac{x}{y} + \frac{y}{x}\right)^2 - 3 = \left(\frac{x^2 + y^2}{xy}\right)^2 - 3$$

$(10)^2 - 3 = 100 - 3 = 97$

So, required value is 97.

4. **(d),** In a triangle ABC right angled at B, if $\tan c = \sqrt{3}$

According to question,



$\tan c = \sqrt{3}$

SSC-CGL

Combined Graduate Level PYQ Solved Paper

Held On 26/09/2024, Shift-1

1. A person first increases the price of a commodity by 8% and then he announces a discount of 18%. The actual discount (in%) on the original price is:

(a) 14.44 (b) 9.44
(c) 8.44 (d) 11.44

2. One pipe can fill a tank four times as fast as another pipe. If together the two pipes can fill the tank in 48 minutes, the slower pipe alone will be able to fill the tank in:

(a) 288 minutes (b) 240 minutes
(c) 144 minutes (d) 192 minutes

3. Two athletes are participating in a race on a circular track of 220m. Ravi runs at the speed of 22 m/s, while Kapil runs at the speed of 11 m/s. They start from the same point, at the same time and in the same direction. After how many seconds will they meet for the first time.

(a) 16 seconds (b) 15 seconds
(c) 20 seconds (d) 24 seconds

4. Annual income of five schools (in lakhs)
In case of how many schools, the income by semester fee, is less than three times of donation?

Source of Income	Schools				
	X	Y	Z	U	V
Tuition Fee	13	26	15	17	16
Semester Fee	43	56	39	89	59
Donation	14	17	14	50	19
Miscellaneous	25	18	29	13	23
Total	95	117	97	169	117

(a) 4 (b) 2
(c) 5 (d) 3

5. If ₹1,875 becomes ₹2,625 in 4 years, what will ₹24,000 become at the end of 9 years at the same rate of interest, under simple interest?

(a) ₹34,800 (b) ₹45,600
(c) ₹43,200 (d) ₹21,600

6. If the angles of a triangle are in the ratio 7 : 8 : 3, then the value of the largest angle is:

(a) 80° (b) 120°
(c) 100° (d) 60°

7. From a point A , which is at a distance of 17 cm from the centre C of a circle with radius 8 cm , the pair of tangents AB and AD to the circle are drawn. The area of the quadrilateral ABCD is _____ cm^2.

(a) 360 (b) 192
(c) 120 (d) 60

8. For triangles, which of the following statement(s) are true?
1. Sum of interior angles is 180°.
2. All interior angles can't be equal.
3. Can have at the most one obtuse angle.
4. Sun of two sides mary or may not be equal to the third side.

(a) 1 and 2 (b) 1 and 3
(c) 2, 3 and 4 (d) 1, 2 and 4.

9. Two successive percentage decrease of 25% each is by what percentage less than two successive percentage increase of 25% each? (Round to two decimal places.)

(a) 22.22% (b) 43.75%
(c) 50% (d) 56.25

10. Three people, A,B and C , invest in a business in the ratio 2 : 3 : 5. It was decided that 9% of the profits will go to charity. If the total profit was ₹2,50,000, then find the share of C in the profit (in ₹).

(a) 1,11,650 (b) 1,13,750
(c) 1,21,850 (d) 1,26,950

11. If $(48° + k)$ is an acute angle and $\sin(48° + k) = \cos 13°$, what is the value of k(in°)?

(a) 17 (b) 37
(c) 29 (d) 23

12. In a room, there are some chairs and some people. If on each chair, only one person is seated, then there is no chair for exactly one person. If on each chair, two persons sit, then there is one vacant chair. What is the number of chairs in the room?

(a) 6 (b) 3
(c) 7 (d) 4

13. What is the total surface area of a cone whose curved surfice area is 550 cm^2 and radius is 7 cm?

(Take $\pi = \frac{22}{7}$)

(a) 682.60 cm^2
(b) 764.71 cm^2
(c) 704.00 cm^2
(d) 714.05 cm^2

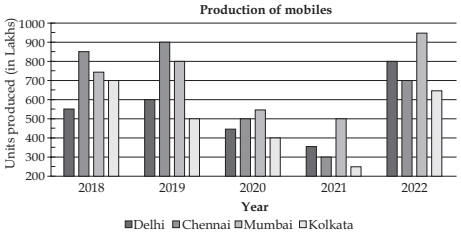
14. If $\frac{3(16^3 - 6^3)}{(16^2 + 6^2 + Q)} = 30$, then find the value of Q.

(a) 96 (b) 108
(c) 112 (d) 98

15. If A is an acute angle and tan A + cot A = 2, find the value of $7\tan^2 A - 6\cot^2 A + 8\sec^2 A$.

(a) 6 (b) 7
(c) 16 (d) 17

16. The following figure shows the production of mobiles in lakh units of four cities in different years. Study the figure and answer the question that follows.



What is the ratio between the average production in Delhi and Kolkata during the period of 2019 to 2022 ?

(a) 13 : 7 (b) 13 : 9
(c) 11 : 7 (d) 11 : 9

17. Given a linear equation in two variables: $5x + 7y - 8 = 0$, which of the following linear equations, along with the given equation, forms a system of linear equations having no solution?

(a) $7x + 5y - 8 = 0$
(b) $10x + 14y - 16 = 0$
(c) $5x + 7y - 16 = 0$
(d) $5x - 7y - 8 = 0$

18. Evaluate the given expression.

$$\frac{5}{(1+\cot^2\theta)}+\frac{3}{(1+\tan^2\theta)}+2\cos^2\theta$$

(a) 2 (b) 0
(c) 5 (d) 3

19. A number whose fifth part increased by 5 is equal to its third part decreased by 7. Find half of the number.

(a) 150 (b) 80
(c) 45 (d) 60

20. Study the given table and answer the question that follows.

The following table shows the percentage distribution of students in four different schools during the years 2021-22.

If there was a total number of 16,000 and 18,000 students during the years 2021 and 2022 respectively, then the difference in number of students in school 4 in 2022 with respect to 2021 is:

Year	Schools			
	School 1	School 2	School 3	School 4
2021	28	25	24	23
2022	27	28	23	22

(a) 240 (b) 180
(c) 380 (d) 280

21. Study the below table and answer the question that follows.

	2017	2018	2019	2020	2021
Company P	2000	4000	2000	3000	4000
Company Q	1500	3000	1500	3000	3000
Company R	1400	2000	2000	3000	3000

For which of the following pairs of years are the total exports from the three companies together, equal?

(a) 2018 and 2020
(b) 2020 and 2021
(c) 2018 and 2019
(d) 2017 and 2018

22. If books bought at prices ranging from ₹200 to ₹260 are sold at prices ranging from ₹250 to 300, what is the greatest possible profit that might be made in selling 25 books?

(a) ₹2,700 (b) ₹1,800
(c) ₹2,500 (d) ₹2,300

23. In a class of 150 students (boys and girls only), the girls are 60. The average weight of boys is 52 kg and that of girls is 48 kg. What is the average weight (in kg) of the whole class?

(a) 49.6 (b) 51.2
(c) 50.4 (d) 48 .8

24. ΔABC is a right-angled triangle with $\Delta ABC = 90°$. If m(AB) = 28 cm, and m(BC) 96 cm , find the area (in cm^2) of the circumcircle of ΔABC. (Use $\pi = 3.14$.)

(a) 7,850 (b) 8,164
(c) 7,693 (d) 7,536

25. Find the remainder when $9^{20} + 2$ is divided by 4 .

(a) 2 (b) 0
(c) 1 (d) 3

EXPLANATION

1. (d), A person first increases the price of a commodity by 8% and then he announces a discount of 18%.

According to question,

Actual discount = $x - y - \frac{x \times y}{100}$

$= 8 - 18 - \frac{8 \times 18}{100}$

$= -10 - \frac{144}{100}$

$= -10 - 1.44 = -11.44\%$

So, the actual discount (in%) on the original price is 11.44%.

2. (b), One pipe can fill a tank four times as fast as another pipe.

If together the two pipes can fill the tank in 48 minutes.

To Find : The slower pipe alone will be able to fill the tank in:

According to question,

Let the slower pipe can fill the tank in x minutes

One's minute work = $\frac{1}{x}$

Faster pipe can fill the tank four times faster

One's minute work = $\frac{4}{x}$

Now,

$\Rightarrow \frac{1}{x}+\frac{4}{x}=\frac{1}{48}$

$\Rightarrow \frac{1+4}{x}=\frac{1}{48}$

$\Rightarrow \frac{5}{x}=\frac{1}{48}$

$\Rightarrow$ x = 240 minutes

So, slower pipe can fill the tank in 240 minutes.

3. (c), Two athletes are participating in a race on a circular track of 220 m.

Ravi runs at the speed of 22 m/s, while Kapil runs at the speed of 11 m/s.

According to question,

Ravi's speed = 22 m/s

Kapil's speed = 11 m/s

$\therefore$ Relative speed = 22 m/s − 11 m/s

= 11 m/s

Now,

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

$= \frac{220}{11}$ = 20 seconds

So, required value is 20 seconds.

4. (b), According to question,

Semester fee of school X = 43

Donation of School X = 14

$\therefore 14 \times 3 = 43$

$= 42 < 43$

Semester fee is greater than three times of donation.

Again,

Semester fee of school Y = 56

Donation of School Y = 17

$\therefore 17 \times 3 = 56$

$= 51 < 56$

Semester fee is grater then three times of donation

Again,

Semester fee of school Z = 39

Donation of School Z = 14

$\therefore 14 \times 3 = 39$

$= 42 > 39$

Semester fee is less than three times of donation.

Again,

Semester fee of school U = 89

Donation of School U = 50

$\therefore 50 \times 3 = 89$

$= 150 > 89$

SSC-CGL

Combined Graduate Level PYQ Solved Paper

Held On 25/09/2024, Shift-3

1. A tap can fill a cistern in 10 minutes and another tap can empty it in 12 minutes. If both the taps are open, the time (in hours) taken to fill the tank will be:

(a) 2 hours (b) 1 hour
(c) 1.5 hours (d) 2.5 hours

2. 'x' varies directly with the cube of 'y', and inversely with the square of 'z'. If $x = \frac{1}{36}$ when $y = 2$ and $z = 3$, then what is the value of $800x$ when $y = 3$ and $z = 5$?

(a) $\frac{800}{9}$ (b) $\frac{9}{800}$
(c) 9 (d) 27

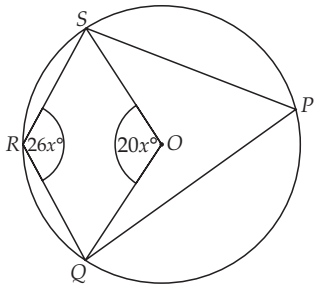
3. In $\Delta PQRS$, and T are the midpoints of the sides PQ and PR, respectively. The length of the side QR is 12 cm. If ST is parallel to QR, then find the length (in cm) of ST.

(a) 4 (b) 10
(c) 6 (d) 8

4. The value of N in the equation $9 \times N$ of $4 \div 4 - 15 \times 4 = 12$ is:

(a) 8 (b) 12
(c) 9 (d) 0

5. In the figure shown above, quadrilateral PQRS has its vertices on the circumference of the circle with centre O. If $m\angle QOS = 20x°$ and $m\angle QRS = 26x°$, then what is the value of 'x'?



(a) 6 (b) 5
(c) 3 (d) 4

6. What is the value of $\left(\frac{5}{\sqrt{3}} - \text{cosec}\,60°\right)$?

(a) $3\sqrt{3}$ (b) $\sqrt{3}$
(c) $\frac{1}{\sqrt{3}}$ (d) $\frac{2}{\sqrt{3}}$

7. Find the gain percentage, given that Aditi sold her scooter for ₹40620 gaining $\frac{1}{5}^{th}$ of the selfing price.

(a) 25% (b) 35%
(c) 20% (d) 10%

8. A class of 30 students appeared in a test. The average score of 12 students is 60, and that of the rest is 80. What is the average score of the class?

(a) 70 (b) 73
(c) 71 (d) 72

9. The single discount equivalent to the discount series of 15% 20% and 5% is:

(a) 32% (b) 32.5%
(c) 35.4% (d) 20%

10. The number of pages printed by two printers P1 and P2 over three days are given in the following table. Study the table carefully and answer the question given below.

Days/Printer	P1	P2
Monday	200	250
Tuesday	150	300
Wednesday	225	210

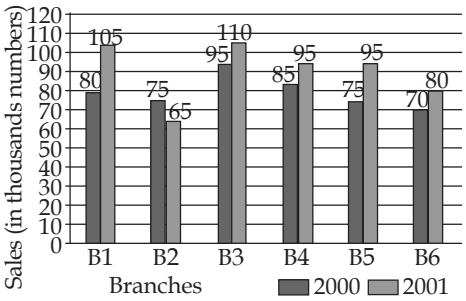
What is the difference between the total number of pages printed by the two printers during these three days?

(a) 175 (b) 170
(c) 185 (d) 180

11. Seema walks around a circular field at the rate of 3 rounds per hour, while Priya runs around it at the rate of 8 rounds per hour. They start in the same direction from the same point at 11:54 p.m. They shall first cross each other at:

(a) 12:06 a.m. (b) 12:06 p.m.
(c) 12:00 a.m. (d) 11:59 p.m.

12. Study the given bar-graph and answer the question that follows.
The bar-graph shows the sales of books (in thousands) from six branches (B1, B2, B3, B4, B5 and B6) of a publishing company during two consecutive years 2000 and 2001.
What percentage of the average sales of branches B1, B2 and B3 in 2001 is the average sales of branches B1, B3 and B6 in 2000?



(a) 78.5% (b) 80.25%
(c) 65.25% (d) 87.5%

13. The monthly income of Ramesh in year 2021 was ₹18,600 and his monthly expenditure was ₹12,400. In year 2022 his income increased by 15% and his expenditure increased by 8%. Find the percentage increase in his savings.

(a) 32% (b) 27%
(c) 25% (d) 29%

14. Cindy bought 15 apples and 12 oranges and paid a sum of ₹447 for the purchase. Which of the statements given below is inconsistent with the information given in the previous statement, leading to no possible prices of the two fruits?

(a) Purchased 25 apples and 20 oranges and paid a sum of ₹745
(b) Purchased 12 apples and 8 oranges and paid a sum of ₹340
(c) Purchased 10 apples and 13 oranges and paid a sum of ₹353
(d) Purchased 35 apples and 28 oranges and paid a sum of ₹1,029

15. The ratio of circumference and diameter of a circle is 3 : 5. If the circumference is 6 cm , then the radius of the circle is:

(a) 10 cm (b) 5 cm
(c) 1.8 cm (d) 15 cm

16. If $\sec\theta + \tan\theta = x$, then find $\sin\theta$.

(a) $\frac{x^2+1}{1-x^2}$ (b) $\frac{x^2-1}{1+2x^2}$
(c) $\frac{1-x^2}{1+x^2}$ (d) $\frac{x^2-1}{1+x^2}$

17. Which of the following numbers is divisible by 6 ?

(a) 438750 (b) 128530
(c) 12581 (d) 62233

18. Find the value of $3\sin 15° - 4\sin^3 15°$.

(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{2}$
(c) 2 (d) $\sqrt{2}$

19. If $x^2 + 1 = x$, then the value of ($x^{14} + x^8 = 1$) is:

(a) 3 (b) 1
(c) 0 (d) 2

20. From a point T, a tangent TP at point P, is drawn to a circle with centre O. A secant TQR (point Q is near to point T) is drawn from the point T. ΔPQR is inscribed into the circle by joining the points P, Q and R. Draw lines OQ and OR. If ∠PTQ is 27° and ∠TPQ = 55°, what is the degree measure of ∠ROQ?

(a) 94 (b) 86
(c) 98 (d) 82

21. If $a^2 + b^2 = 148$ and $ab = 54$, then find the value of $\frac{a+b}{a-b}$.

(a) $\frac{2}{\sqrt{10}}$ (b) $\frac{8}{\sqrt{10}}$
(c) $8\sqrt{7}$ (d) $5\sqrt{3}$

22. Pranav borrows a sum of ₹335180 at the rate of 13% per annum simple interest. At the end of the first year, he repays ₹23060 towards return of principal amount borrowed. If Pranav clears all pending dues at the end of the second year, including interest payment that accrued during the first year, how much does he pay (in ₹) at the end of the second year?

(a) 396269 (b) 398876
(c) 393949 (d) 388076

23. A well with 14 cm radius is dug 23 cm deep. Find the volume of the earth taken out of it.

(a) 14,168 cm^3 (b) 14,108 cm^3
(c) 15,168 cm^3 (d) 14,178 cm^3

24. The sales of two kinds of bicycles B1 and B2 (in lakhs) manufactured by a company over a period of three years are shown in the table below.

Year	B1	B2
2004	195	284
2005	230	300
2006	250	416

From 2004 to 2006, what is the ratio of the total sales of bicycles B1 to the total sales of bicycles B2?

(a) 27 : 40 (b) 40 : 27
(c) 10 : 9 (d) 9 : 10

25. The below table shows the number of 1 litre bottles of soft drink produced by three companies during 2016-2020. Study the given information carefully and answer the question that follows.
What is the difference in average production of A and C during 2016-2018 (in lakhs)?

Year	A (in lakhs)	B (in lakhs)	C (in lakhs)
2016	38,000	43,000	51,000
2017	41,000	52,000	57,000
2018	53,000	65,000	63,000
2019	30,000	35,000	32,000
2020	20,000	25,000	28,000

(a) 7800 (b) 9500
(c) 14,000 (d) 13,000

EXPLANATION

1. (b), A tap can fill a cistern in 10 minutes. Another tap can empty it in 12 minutes.

According to question,

Part of cistern filled in one minute by tap A $= \frac{1}{10}$

Part of cistern empted in one minute by another tap $= \frac{1}{12}$

Now,

Both pipes are opened together

$\Rightarrow \frac{1}{10} - \frac{1}{12}$

$\Rightarrow \frac{6-5}{60} = \frac{1}{60}$

$\therefore$ Required time = 60 minutes = 1 hour

So, time (in hours) taken to fill the tank is 1 hour.

2. (d), x varies directly with the cube of y and inversely with the square of z.

$x = \frac{1}{36}$ when y = 2 and z = 3

According to question,

$x \propto y^3$ and $x = \frac{1}{z^2}$

$\therefore x = \frac{ky^3}{z^2}$. Where k = proportional constant.

If y = 2 and z = 3, $x = \frac{1}{36}$

$\therefore \frac{1}{36} = \frac{k \times 2^3}{3^2}$

$\Rightarrow \frac{1}{36} = \frac{8k}{9}$

$\Rightarrow k = \frac{9}{36 \times 8} = \frac{1}{32}$

$\therefore x = \frac{1}{32} \times \frac{y^3}{z^2}$

When y = 3 and z = 5

$\Rightarrow x = \frac{1}{32} \times \frac{3^3}{5^2}$

$x = \frac{27}{32 \times 25}$

$\therefore 800x = 800 \times \frac{27}{32 \times 25} = 27$

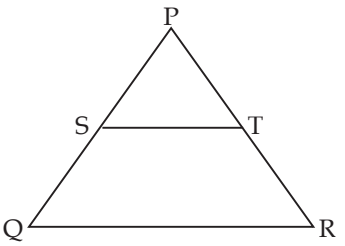
So, required value is 27.

3. (c), In ΔPQR, S and T are the midpoints of the sides PQ and PR, respectively.

The length of the side QR is 12 cm. If ST is parallel to QR,

To Find : The length (in cm) of ST.

According to question,



By midpoint Theorem:

S is the midpoint of PQ and T is the midpoint of PR

ST || QR

$ST = \frac{1}{2}$ QR

$\because$ QR = 12 cm

$\therefore ST = \frac{1}{2} \times 12 = 6$ cm

So, the length of ST is 6 cm.

SSC-CGL

Combined Graduate Level PYQ Solved Paper

Held On 25/09/2024, Shift-2

1. If $x = s\ p \sec A \cos B$, $y = q \sec A \sin B$ and $z = r \tan A$, what is the value of the following expression?

$$\frac{x^2}{p^2}+\frac{y^2}{q^2}-\frac{z^2}{r^2}$$

(a) $p^2 - q^2 + r^2$ (b) 0
(c) 1 (d) $p^2 + q^2 - r^2$

2. The two circles intersect at two points P and Q. PR and PS are diameters of the two circles. What is $\angle PQR$?

(a) 0° (b) 90°
(c) 60° (d) 45°

3. Consider the following table for total exports of goods of 5 companies over 5 years (in lakhs). If the ratio of exports to the imports of companies S and U in the year 2015 is 3 : 2 and 1 : 2, respectively, then, the total imports (in ₹ lakhs) of companies S and U together in the year 2015 is:

Companies / Year	R	S	T	U	V
2012	60	40	15	45	25
2013	30	60	70	15	90
2014	51	25	55	100	110
2015	45	51	20	70	65
2016	24	35	60	55	125

(a) 187 (b) 174
(c) 121 (d) 157

4. During a new-year sale, a shopkeeper offers a discount scheme to his customers, 'Buy 5 Sweaters, Get 2 Sweaters Free'. Find the effective percentage discount given by the shopkeeper.

(a) 30% (b) 25%
(c) $22\frac{2}{9}\%$ (d) $28\frac{4}{7}\%$

5. The ratio of expenditure to savings of a woman is 4 : 1. If her income and expenditure are increased by 20% and 10%, respectively, then find the percentage change in her savings.

(a) 50% (b) 30%
(c) 60% (d) 40%s

6. The relation between K_1 and K_2 for which the system of linear equations $K_1x + 3y = 8$ and $4x + K_2y = 16$ represents coincident lines, is:

(a) $K_1 + K_2 = 0$ (b) $K_2 = 3K_1$
(c) $K_2 + 3K_1 = 0$ (d) $K_2 = K_1$

7. A man loses 28% by selling an article for ₹144. If he sells it for ₹288, what will be his gain/loss percentage?

(a) Gain, 41% (b) Loss, 46%
(c) Loss, 43% (d) Gain, 44%

8. Find the value of 'k' for which the system of equations $4x + 6y = 7$ and $6x + (k + 4)y - 21 = 0$ has a unique solution.

(a) $k = 7$ (b) $k \neq 5$
(c) $k \neq 7$ (d) $k = 5$

9. Naman borrows a sum of ₹3,48,020 at the rate of 8% per annum simple interest. At the end of the first year, he repays ₹150,9s0 towards return of principal amount borrowed. If Naman clears all pending dues at the end of the second year, including interest payment that accrued during the first year, how much does he pay (in ₹) at the end of the second year?

(a) 3,79,386 (b) 3,92,733
(c) 3,87,406 (d) 3,88,931

10. Find the diameter (in cm) of a circle whose circumference is equal to the sum of the circumferences of two circles of radii 12 cm and 16 cm .

(a) 56 (b) 32
(c) 64 (d) 28

11. Simplify:

[25 – 48 ÷ 6 + 12 × 2] + 78 – [5 + 3 of (25 – 2 × 10)]

(a) 89 (b) 90
(c) 98 (d) 99

12. Two pipes X and Y can fill a tank in 14 hours and 21 hours, respectively. Both pipes are opened simultaneously to fill the tank. In how many hours will the empty tank be filled?

(a) $7\frac{2}{5}$ hours (b) $6\frac{2}{5}$ hours
(c) $8\frac{2}{5}$ hours (d) $5\frac{2}{5}$ hours

13. Study the given table and answer the question that follows.

The given table shows the number of students enrolled in different academic faculties of an institution during 2016-2019.

Year	Science	Commerce	Humanities
2016	550	457	699
2017	584	554	574
2018	625	332	743
2019	676	444	1223

From 2016 to 2019, what is the difference between the total number of students enrolled in science and that of students enrolled in humanities?

(a) 804 (b) 912
(c) 930 (d) 870

14. A cylindrical tank of radius 14 cm is full of water. If 616 litres of water are drawn out, then the water level in the tank is dropped by m. (Take $\pi = \frac{22}{7}$)

(a) 1 (b) 10
(c) 1000 (d) 100

15. The value of $(x + y)^2 + (x - y)^2$ is equal to:

(a) $2(x^2 + y^2)$ (b) $4xy$
(c) $(2x + 2y)^2$ (d) $2(x + y)^2$

16. If $\cot^2\theta - 2\cos^2\theta = 0$, $(0° < \theta < 90°)$ then the value of θ is:

(a) 30° (b) 45°
(c) 90° (d) 60°

17. Study the given table answer the question that follows.s

The following table shows the income of a person (in thousand rupees) per annum over the given

years. What is the average income from school as a salary per year earned by the person over the gisven years?

Year	School Salary	Coaching	Home tution
2018	132	42	12
2019	148	55	18
2020	166	68	24
2021	178	74	28
2022	196	88	35

(a) ₹1,74,000 (b) ₹1,58,000
(c) ₹1,48,000 (d) ₹1,64,000

18. A policeman noticed a thief at some distance. The policeman started running to catch the thief and the thief also started running at the same time. The speed of both policeman and the thief was 12 km per hour and 10 km per hour, respectively. It took 30 minutes for the policeman to catch the thief. Find the initial distance (in metres) between them.

(a) 100 (b) 500s
(c) 1000 (d) 600

19. A circular arc whose radius is 14 cm , makes an angle of 45° at the centre. Find the perimeter (in cm) of the sector. (Use $\pi = \frac{22}{7}$)

(a) 28 (b) 39
(c) 38 (d) 34

20. In a quadrilateral ABCD, AB = BC, AD = DC. ∠ABD = 68°, ∠ADB = (2Y – 7)°, ∠BDC = 33°, ∠DBC = (3X + 2)°. Then the value of 2X + 3Y is:

(a) 108 (b) 144
(c) 118 (d) 104

21. Find the value of 72° – tan 27° – tan 72° tan 27°.

(a) 1 (b) –1
(c) –2 (d) 0

22. If A : B = 6 : 8 and B : C = 5 : 11, then A : B : C is:

(a) 15 : 20 : 44 (b) 11 : 23 : 14
(c) 15 : 32 : 44 (d) 14 : 31 : 25

23. The given table shows the number of clerical and officer cadre employees recruited by four different banks A, B, C and D from 2011 to 2014.

Year	A		B		C		D	
	Officer	Clerk	Officer	Clerk	Officer	Clerk	Officer	Clerk
2011	260	458	255	460	205	428	265	470
2012	310	569	286	584	230	539	246	554
2013	350	730	321	725	340	740	361	725
2014	400	890	452	845	380	850	482	860

Compute the ratio of the number of officer cadre employees of bank A to the number of officer cadre employees of bank C.

(a) 5 : 6 (b) 7 : 8
(c) 8 : 7 (d) 6 : 5

24. If m is even, then $(8^m - 1)$ is divisible by:

(a) 42 (b) 63
(c) 8 (d) 65

25. In the 8th class, consisting of 30 students, a Mathematics test was taken. 10 students had an average score of 90. The other students had an average score of 75. What is the average score of the whole class?

(a) 80 (b) 74
(c) 76 (d) 78

EXPLANATION

1. (c), x = p sec A cos B, y = q secA sinB
z = tan A

According to question,

x = p sec A cos B

y = q sec A sin B

z = r tan A

Now,

$$\frac{x^2}{p^2}+\frac{y^2}{q^2}-\frac{z^2}{r^2}$$

$$= \frac{p^2\sec^2 A\cos^2 B}{p^2}+\frac{q^2\sec^2 A\sin^2 B}{q^2} - \frac{r^2\tan^2 A}{r^2}$$

$\Rightarrow \sec^2A\cos^2B + \sec^2A - \sin^2B - \tan^2A$

$\Rightarrow \sec^2A(\cos^2B + \sin^2B) - \tan^2A$

[$\because (\cos^2B + \sin^2B) = 1$ and $\sec^2A - \tan^2A = 1$]

$\Rightarrow \sec^2 A \times 1 - \tan^2A$

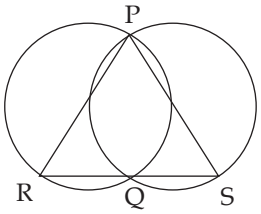
$\therefore \sec^2A - \tan^2 = 1$

So, required value is 1.

2. (b), Two circles interseet at two points P and Q.

PR and PS are diameters of the two circles.

According to question,



∠PQS = angle in the semi-circle = 90°

So, required value is 90°

3. (b), According to question,

Exports by company S = ₹51 lakhs

Ratio of export and import of 3 = 3 : 2

Now,

Let the ratio be = 3x and 2x

3x = 51

$\therefore x = \frac{51}{3} = 17$

$\therefore$ Import of company S = 2x
= 2 × 17 = 34 lakhs

So, import of company S is 34 lakhs

Now,

Export by company U = 70

Ratio of export and import = 1 : 2

Now,

Let the ratio be x and 2x

$\therefore$ x = 70

Import = 2 × 70 = 140

Total import = 140 + 34 = 174 Lakhs

So, required value is 174 lakhs

4. (d), In A discount offers scheme Buy 5 sweaters Get 2 free sweaters

According to question,

Total Discount = 2

Total cost = 7

Discount% $\frac{2\times100}{7} = \frac{200}{7} = 28\frac{4}{7}\%$

So, required value is $28\frac{4}{7}\%$

5. (c), The ratio of expenditure to saving of a women is 4 : 1

Her income and expenditure increase by 20% and 10%

According to question,

Let the total income of women = 50

$\therefore$ Expenditure = $50 \times \frac{4}{5}$ = ₹40

$\therefore$ Saving = 50 – 40 = ₹10

SSC-CGL

Combined Graduate Level PYQ Solved Paper

Held On 25/09/2024, Shift-1

1. The average of the squares of the first 48 natural numbers is

(a) 794.17 (b) 791.17
(c) 793.17 (d) 792.17

2. Find the values of 'a'and 'b' for which the system of equations $3x + y = 3$ and$(a - b)x + (a + b)y = 3a + b - 3$ has infinite solutions.

(a) $a = 3, b = -\frac{3}{2}$
(b) $a = -\frac{3}{2}, b = 2$
(c) $a = 3, b = -\frac{2}{3}$
(d) $a = 2, b = -\frac{3}{2}$

3. Find the value of $(\text{cosec}\,\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$.

(a) 1 (b) –1
(c) $\frac{1}{2}$ (d) 0

4. Ramesh purchased 130 books at the rate of ₹200 each and sold half of them at the rate of ₹300 each, one-fifth of them at the rate of ₹350 each and the rest at the cost price. Find his profit percentage.

(a) 35% (b) 40%
(c) 38% (d) 44%

5. The following table shows the number of pages printed by 3 printers (P , Q and R) for 3 days.

What is the ratio of the total number of pages printed by printer P over the course of three days to the total number of pages printed by printer Q during the same three days?

Day	P	Q	R
Monday	100	130	200
Tuesday	120	145	160
Wednesday	180	85	120

(a) 9 : 10 (b) 10 : 9
(c) 10 : 11 (d) 11 : 10

6. The circumference of the base of the cylindrical vessel is 154 cm and its height is 49 mm . How many litres of water can it hold? (correct to three places of decimals, use $\pi = \frac{22}{7}$)

(a) 4.329 (b) 9.244
(c) 3.924 (d) 2.439

7. The side BC of ΔABC is produced to a point D. If AC = BC and $\angle BAC = 70°$, then find the value of $\angle ACD - \angle ABC$.

(a) 75° (b) 45°
(c) 60° (d) 70°

8. The salaries of P and Q together amount to ₹9,60,000. P and Q save 64 % and 44%, respectively of their individual salaries. If P's expenditure is 1.5 times Q's expenditure, then what is the ratio of P's salary to Q's salary?

(a) 3 : 2 (b) 3 : 7
(c) 2 : 3 (d) 7 : 3

9. Nihira is 25 years old and Punith is 30 years old. How many years ago was the ratio of their ages 3 : 4?

(a) 5 years (b) 15 years
(c) 20 years (d) 10 years

10. Which of the following fractions is the largest? $\frac{3}{7}, \frac{7}{53}, \frac{41}{80}, \frac{29}{79}$

(a) $\frac{3}{7}$ (b) $\frac{29}{79}$
(c) $\frac{7}{53}$ (d) $\frac{41}{80}$

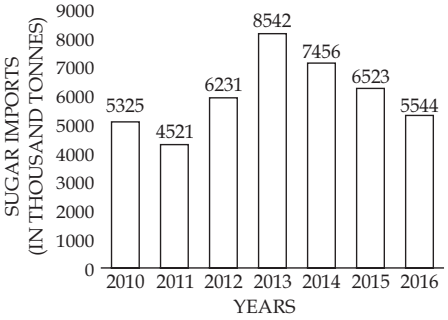
11. It is always possible to draw a circle passing through _____ non - collinear points in a plane.

(a) 4 (b) 3
(c) 6 (d) 5

12. The centres of two circles are 36 cm apart. If the radii of these two circles are 15 cm and 9 cm, respectively, then what is the sum of the lengths (in cm) of a direct common tangent and a transverse common tangent of these two circles?

(a) $6\sqrt{7}(\sqrt{7}+2)$
(b) $6\sqrt{5}(\sqrt{7}+2)$
(c) $6\sqrt{7}(\sqrt{5}+2)$
(d) $6\sqrt{5}(\sqrt{5}+2)$

13. The given bar graph shows sugar imports of a country (in thousand tonnes) over the years. Study the graph and answer the question that follows.



The average imports (in thousand tonnes) of all the years is:

(a) 6469 (b) 6306
(c) 6433 (d) 6603

14. The simple interest on a sum for 6 years is three-fifth of the sum. The rate of interest per annum is:

(a) 10% (b) 5%
(c) 3% (d) 7%

15. If $a^3 + \frac{1}{a^3} - 2\,(a > 0)$, then the value of $a + \frac{1}{a}$ is:

(a) 4 (b) 3
(c) 2 (d) 1

16. Evaluate $2\frac{\tan 54°}{\cot 36°} - \frac{\cot 41°}{\tan 49°}$

(a) 0 (b) 1
(c) 2 (d) –1

17. If $m + 5 = \sec^2 A\,\text{cosec}^2 A\,(1 - \cos^2 A)(1 - \sin^2 A) + 5$, then find the value of m:

(a) 1 (b) 10
(c) 5 (d) 0

18. $9 \div \left[1+\left\{4\times\left(\frac{5}{6}-\overline{\frac{1}{3}+\frac{1}{2}}\right)\right\}\right]$ **is equal to:**

(a) 0 (b) $\frac{9}{5}$

(c) 1 (d) 9

19. Study the given table and answer the question.

The table displays the number of cars produced (in lakhs) by six different brands between 2018 and 2023. Find the difference in the average production of B and D during 2018-2023.

Type	2018	2019	2000	2021	2022	2023
A	36	40	42	45	47	42
B	23	37	28	32	34	26
C	45	47	51	54	56	48
D	35	37	42	32	36	28
E	57	56	52	38	48	42
F	43	45	56	41	52	40

(a) 4 lakhs (b) 5 lakhs

(c) 5.5 lakhs (d) 6 lakhs

20. Study the given table and answer the question that follows.

The given table shows the production of three types of cars (A, B and C) manufactured (in thousands) by an automobile company over the years.

Year	A	B	C
2015	840	680	890
2016	900	750	960
2017	760	620	1000
2018	800	540	1200

The total number of A-type cars produced by the company from 2015 to 2017 is what percentage (rounded off to the nearest integer) is more or less than the total number of C-type cars produced by the company from 2016 to 2018?

(a) Less, 21% (b) Less, 24%

(c) More, 24% (d) More, 21%

21. An inlet pipe can fill a water storage tank in 11 hours and an outlet pipe can empty the completely filled tank in 15 hours. If both pipes opened simultaneously. The time taken to fill the empty tank (in hrs) is :

(a) $41\frac{1}{4}$ (b) $45\frac{1}{2}$

(c) $49\frac{3}{4}$ (d) 40

22. If the lengths of two sides of an isosceles triangle are 6 cm and 12 cm , then find the length of the third side.

(a) 8 cm (b) 14 cm

(c) 12 cm (d) 6 cm

23. Suppose A starts walking at a speed of 8 km/h. After 8 hours B started travelling on a bicycle at a speed of 24 km/h. The distance from the starting B can catch A is:

(a) 72 km (b) 88 km

(c) 96 km (d) 64 km

24. Rohini buys a Bluetooth headphone set for ₹1,700 from a wholesale shop and marks it at ₹2,000. Later on, she allows a discount of 40% on its sale. What is her loss or gain percentage (correct up to two decimal places)?

(a) 29.41% gain

(b) 25.19% gain

(c) 25.19 loss

(d) 29.41 loss

25. If $x^2 + 7x + 8 = 0$, then find the value of $\frac{4x}{x^2-5x+8}$.

(a) $\frac{-1}{4}$ (b) $\frac{1}{6}$

(c) $\frac{-1}{3}$ (d) $\frac{1}{2}$

EXPLANATION

1. (d), The average of the squares of the first 48 natural number.

According to question,

Natural number = 1, 2, 3, 4. ..... n

Squars of natural number

$= 1^2 + 2^2 + 3^2$ ..... n^2

$\therefore$ Avarage = $\frac{(n+1)(2n+1)}{6}$

Here n = 48

$\Rightarrow \frac{(48+1)(2\times48+1)}{6}$

$\Rightarrow \frac{49\times97}{6} = 792.166$

So, required average is 792.166 (792.17).

2. (a), The System of equation

$3x + y = 3$

$(a - b)x + (a + b)y = 39 + b - 3$

To find : The value of a and b

According to question,

System equation

$a_1x + b_1y + c_1 = 0$ and

$a_2x + b_2y + c_2 = 0$

Infinite solutions.

$\frac{a_1}{b_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$3x + y = 3$

$= 3x + y - 3 = 0$

And

$(a - b)x + (a + b)y - (3a + b - 3) = 0$

$\frac{3}{a-b} = \frac{1}{a+b} = \frac{-3}{-(3a+b-3)}$

$\Rightarrow \frac{3}{a-b} = \frac{1}{a+b} = \frac{3}{3a+b-3}$

$\therefore \frac{3}{a-b} = \frac{1}{a+b}s$

$\Rightarrow 3a + 3b = a - b$

$\Rightarrow 3a - a = -b - 3b$

$\Rightarrow 2a = -4b$

$\therefore a = -2b$ ..... (i)

Now,

$\frac{3}{a-b} = \frac{3}{3a+b-3}$

$\Rightarrow 3a - 3b = 9a + 3b - 9$

$\Rightarrow 3a - 9a = 3b + 3b - 9$

$\Rightarrow -6a = 6b - 9$

$\Rightarrow -2a = 2b - 3$

$\Rightarrow -2a - 2b = -3$

Now substitute the value of a.

$-2(-2b) - 2b = -3$

$\Rightarrow 4b - 2b = -3$

$\Rightarrow 2b = -3$

$\therefore b = \frac{-3}{2}$

SSC-CGL

Combined Graduate Level PYQ Solved Paper

Held On 23/09/2024, Shift-1

1. Simplify:

$6 \times [28 \div 84 \times \{36 \times 49 \div (6 \times 7)\}]$

(a) 94 (b) 64
(c) 84 (d) 74

2. A tank can be filled by pipe A in 4 hours and pipe B in 6 hours. At 8:00 a.m., pipe A was opened. At what time will the tank be filled if pipe B is opened at 9:00 a.m.?

(a) 10:18 a.m. (b) 10:48 a.m.
(c) 10:22 a.m. (d) 10:16 a.m.

3. For two circles of radius 7 units and $\frac{7}{2}$ units, whose centres are 15 units apart, what is the length of the direct common tangent in units? (Correct to 3 decimal places)

(a) 18.654 (b) 15.486
(c) 16.584 (d) 14.586

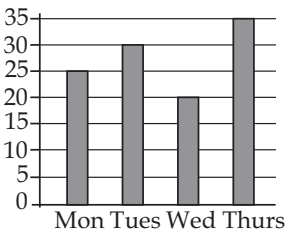
4. In the following sets, which set represents the sides of a right angled triangle?

(a) {3, 4, 6} (b) {5, 12, 13}
(c) {8, 15, 16} (d) {5, 10, 12}

5. Aman has certain number of notes of denomination ₹20 and ₹10 which amount to ₹390. If the numbers of notes of each kind are interchanged, then the new amount is ₹90 less than before. Find the number of notes of ₹20 denomination.

(a) 12 (b) 16
(c) 15 (d) 14

6. The bar graph shows the number of students present in a class on four days. The average number of students present on Monday, Tuesday and Wednesday is:



(a) 25 (b) 24
(c) 20 (d) 30

7. Simplify:

$$\frac{(232)^3 + (140)^3 + (353)^3 - 3 \times 232 \times 140 \times 353}{(232)^2 + (140)^2 + (353)^2 - 232 \times 140 - 140 \times 353 - 353 \times 232}$$

(a) 445 (b) 725
(c) 596 (d) 261

8. The difference between the simple interests on the principal of ₹500 at an interest rate of 5% per annum for 3 years and 4% per annum for 4 years is:

(a) ₹10 (b) ₹15
(c) ₹7.5 (d) ₹5

9. Amit and Bilal buy goods for ₹1,500 and ₹2,000, respectively. Amit marks his goods up by y%, while Bilal marks his goods up by $2y$% and offers a discount of y%. If both make the same profit, then find the value of y.

(a) 12 (b) 10.5
(c) 11.5 (d) 12.5

10. There is a 32 l mixture of milk and water. The ratio of milk and water in this mixture is 5 : 3. How many litres of water should be added to this mixture so that the resultant mixture has 50% water in it?

(a) 8 (b) 6
(c) 4 (d) 5

11. Let $x = r \cos(t)$, $y = r \sin(t) \cos(u)$, $z = r \sin(t) \sin(u)$. Then the value of $x^2 + y^2 + z^2$ is _____.

(a) $r^2 \sin(t)$ (b) r^2
(c) $2r$ (d) $r^2 \cos(u)$

12. The value of θ, when $\sqrt{3} \cos\theta + \sin\theta = 1$ $(1 \le \theta \le 90°)$

(a) 30° (b) 20°
(c) 90° (d) 60°

13. Find the length of the longest stick that can be fitted in a cubical vessel of edge 70 cm.

(a) $35\sqrt{3}$ cm (b) $70\sqrt{2}$ cm
(c) $10\sqrt{3}$ cm (d) $70\sqrt{3}$ cm

14. A trader offers the following discount schemes on the purchase of a refrigerator.

(i) a discount of 10% followed by a discount of 8%
(ii) successive discounts of 12% and 10%
(iii) two successive discounts of 12%
(iv) a discount of 20%

In which scheme is the selling price the lowest?

(a) (ii) (b) (iii)
(c) (iv) (d) (i)

15. 10 years ago, the age of Sunita was thrice the age of her daughter Tanya. 10 years hence, the age of Sunita will be twice the age of Tanya. What is the ratio of their present ages?

(a) 2 : 7 (b) 7 : 2
(c) 3 : 7 (d) 7 : 3

16. 30 is the mean proportional of 18 and A. Find the value of A.

(a) 45 (b) 50
(c) 60 (d) 40

17. R targets to score 85% marks in exams. He scores 450 marks and misses the target by 35%. How much increment in percentage should be there in his scored marks to meet the target?

(a) 35 (b) 70
(c) 45 (d) 53

18. If $\tan\theta - 3 = 0$, the value of $\frac{1 - \cos 2\theta}{1 + \cos 2\theta}$ is:

(a) $\frac{7}{15}$ (b) $\frac{4}{3}$
(c) $\frac{9}{16}$ (d) 1

19. Study the given table and answer the question that follows.

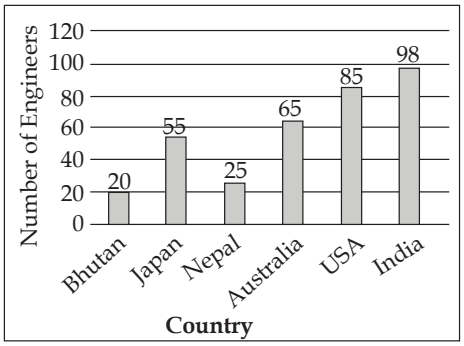
The following table shows the production of printers by four plants of a company over the five years.

Year	Production (in thousands)			
	Plant 1	Plant 2	Plant 3	Plant 4
2018	35	25	40	45
2019	43	44	44	40
2020	48	39	36	30
2021	32	40	35	48
2022	42	44	30	42

What is the difference between the average production of plant 1 and plant 2 during five years?

(a) 3840 (b) 1400
(c) 3000 (d) 1600

20. Study the given bar-graph and answer the question that follows.



What is the ratio of the number of engineers of countries with an above average to the number of engineers of countries with a below average?

(a) $\frac{62}{25}$ (b) $\frac{39}{71}$

(c) $\frac{1}{1}$ (d) $\frac{2}{1}$

21. Which of the following are the angles scalene triangle?

(a) 110°, 35° and 35°

(b) 60°, 60° and 60°

(c) 90°, 45° and 45°

(d) 60°, 30° and 90°

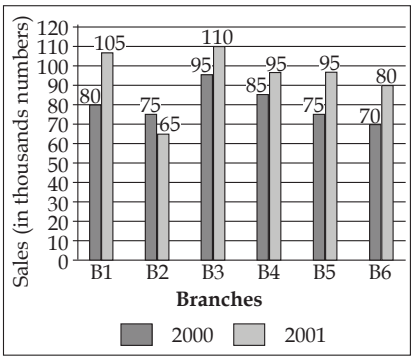
22. A triangle ABC is made on a circle, where AB is diameter of the circle. If BC is equal to the radius of the circle and ∠ABC = x∠BAC, then x is :

(a) 1.5 (b) 1

(c) 2.5 (d) 2

23. Study the given bar-graph and answer the question that follows.

The bar-graph shows the sales of books (in thousands) from six branches (B1, B2, B3, B4, B5 and B6) of a publishing company during two consecutive years 2000 and 2001.



What is the ratio of the total sales of branch B2 for both years to the total sales of branch B4 for both years?

(a) 6 : 7 (b) 2 : 3

(c) 7 : 9 (d) 3 : 5

24. A thief is noticed by a policeman from a distance of 92 m. The thief starts running and the policeman chases him. The thief and the policeman run at the speed of 90 km/h and 104.4 km/h, respectively. In how much time will the policeman catch the thief?

(a) 22 seconds (b) 21 seconds

(c) 26 seconds (d) 23 seconds

25. For what least value of n, $2^{2n} + 2n$ is completely divided by 6, where n is an integer?

(a) 2 (b) 1

(c) 3 (d) 0

EXPLANATION

1. (c), According to question,

$6 \times [28 \div 84 \times \{36 \times 44 \div (6 \times 7)]$

$\Rightarrow 6\,[28 \div 84 \times \{36 \times 49 \div 42\}]$

$\Rightarrow 6 \times \left[28 \div 84 \times \left\{36 \times \frac{49}{42}\right\}\right]$

$\Rightarrow 6 \times [28 \div 84 \times 42]$

$\Rightarrow 6 \times \left[\frac{28}{84} \times 42\right] \Rightarrow 6 \times 14 = 84$

So, required value is 84.

2. (b), Pipe A can fill the tank in 4 hours.

Pipe B can filled the tank in 6 hours.

According to question,

Let the tank can be filled in = x hours.

$\therefore \frac{x}{4} + \frac{x-1}{6} = 1$

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

$\Rightarrow 5x - 2 = 12$

$\Rightarrow 5x = 12 + 2$

$\Rightarrow 5x = 14$

$\therefore x = \frac{14}{5} = 2\frac{4}{5} \times 60$

= 2 hours 48 minutes

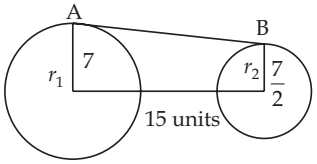
Required time = 8 A.M. + 2 hours 48 minutes = 10:48 A.M.

So, tank can be filled by 10:48 A.M.

3. (d), Radius of two circle = 7 units and $\frac{7}{2}$ units

Distance of centres = 15 units.

According to question,



Length of direct common tangent

$= \sqrt{d^2 - (r_1 - r_2)^2}$

$= \sqrt{15^2 - \left(7 - \frac{7}{2}\right)^2}$

$= \sqrt{225 - \left(\frac{14-7}{2}\right)^2}$

$= \sqrt{225 - \left(\frac{7}{2}\right)^2}$

$= \sqrt{225 - \frac{49}{4}}$

$= \sqrt{225 - 12.25}$

$= \sqrt{212.75} = 14.586$ units

So, required value is 14.586 units.

4. (b), To determine if a set of three numbers can be the sides of a right-angled triangle, we use the Pythagoras theorem:

If $a^2 + b^2 = c^2$ (where c is the largest number), then those sides can form a right-angled triangle.

According to option,

Option (a)

set (3, 4, 6):

Largest side is 6.

$\Rightarrow 3^2 + 4^2 = 6^2$

$\Rightarrow 9 + 16 = 36$

$25 \neq 36$ (Not a right triangle)

Option (b)

set (5, 12, 13):

Largest side is 13.

$\Rightarrow 5^2 + 12^2 = 13^2$

$\Rightarrow 25 + 144 = 169$

169 = 169 (This is a right-angled triangle)

Option (c)

set (8, 15, 16):

Largest side is 16.

SSC-CGL

Combined Graduate Level PYQ Solved Paper

Held On 17/8/2021, Shift 2

1. The marked price of an article is ₹2710. If a shopkeeper sold the article at 15% loss after giving 25% discount, then the cost price (in ₹) of the article is:
(a) 2,400 (b) 1,200
(c) 2,000 (d) 1,800

2. ABCD is a cyclic quadrilateral such that AB is the diameter of the circle and ∠ADC = 145°, then what is the measure of ∠BAC?
(a) 45° (b) 65°
(c) 35° (d) 55°

3. If $(x + y)^3 + 27(x - y)^3 = (Ax - 2y)(Bx^2 + Cxy + 13y^2)$, then the value of A – B – C is:
(a) 15 (b) 13
(c) 20 (d) 27

4. If $x^2 - \sqrt{11}x + 1 = 0$, then $(x^3 + x^{-3}) =$
(a) $10\sqrt{11}$ (b) $4\sqrt{11}$
(c) $8\sqrt{11}$ (d) $7\sqrt{11}$

5. A shopkeeper bought 20 kg of sugar at ₹45 per kg, 25 kg of sugar at ₹50 per kg and 35 kg of sugar at ₹40 per kg. He spent a sum of ₹450 on transportation and other expenses. He mixed all the three types of sugar and sold all the stock at ₹52.50 per kg. His profit percent in the entire transaction is:
(a) 4.25% (b) 6.5%
(c) 7.25% (d) 5%

6. In the table, production and sale (in 1000 tonnes) of a certain product of a company over 5 years is given. Study the table and answer the question:

Years	Production (in 1000 tonnes)	Sale (in 1000 tonnes)
2015	1250	1000
2016	1400	1290
2017	1450	1100
2018	1500	1450
2019	1600	1390

In which year(s) the sale increases by more than 25% of the previous year?
(a) 2018 (b) 2017 and 2019
(c) 2016 and 2018 (d) 2017

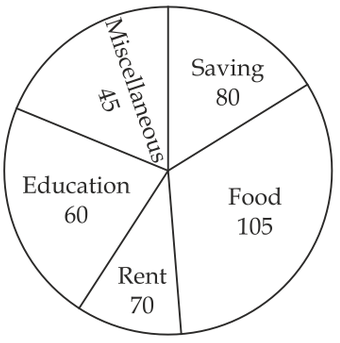
7. If $x^8 - 433x^4 + 16 = 0$, $x > 0$, then what is the value of $\left(x + \frac{2}{x}\right)$?
(a) 4 (b) 5
(c) 7 (d) 9

8. Points P, Q, R, S and T lie in this order on a circle with centre O. If chord TS is parallel to diameter PR and ∠RQT = 58°, then find the measure (in degrees) of ∠RTS.
(a) 45 (b) 29
(c) 32 (d) 58

9. In a class the ratio of rural to urban students is 4 : 7. In an examination the average percentage marks of the rural and the urban students are respectively 65 and 63. What is the overall average percentage marks of the class (correct to two decimal places)?
(a) 65.87% (b) 73.63%
(c) 63.73% (d) 64.37%

10. What is the difference in the mean proportional between 1.8 and 3.2 and the third proportional to 5 and 3?
(a) 0.6 (b) 0.7
(c) 0.4 (d) 0.5

11. The given Pie-Chart shows the degree wise breakup of expenditure of a family in a month. Total income of a family is ₹43,200.
Degree of Amount incurred in different expenditure (Total ₹43,000)



The amount spent on food is what percent of the savings and miscellaneous expenses?
(a) 60% (b) 90%
(c) 75% (d) 84%

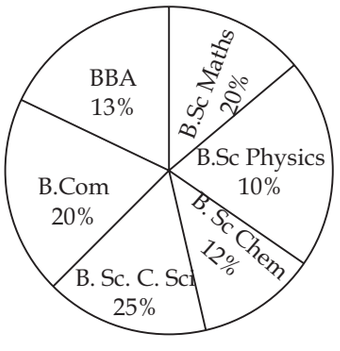
12. Find the smallest value of a, so that 42a48b (a > b) is divisible by 11.
(a) 9 (b) 5
(c) 0 (d) 4

13. In ΔABC, AD ⊥ BC at D and AE is the bisector of ∠A If ∠B = 62° and ∠C= 36°, then what is the measure of ∠DAE ?
(a) 54° (b) 13°
(c) 23° (d) 27°

14. There are two water taps in a tank which can fill the empty tank in 12 hours and 18 hours respectively. It is seen that there is a leakage point at the bottom of the tank which can empty the completely filled tank in 36 hours. If both the water taps are opened at the same time to fill the empty tank and the leakage point was repaired after 1 hour, then in how much time the empty tank will be completely filled?
(a) 7 hours 12 minutes
(b) 7 hours 24 minutes
(c) 8 hours 24 minutes
(d) 7 hours

15. A borrowed a sum of ₹1,60,000 from B at 10% per annum simple interest. At the same time he lent the same sum to C at the same rate on compound interest, compounded semi-annually for 2 years. Find the amount (in₹) earned by A in the whole transaction.
(a) 4,281 (b) 4,280
(c) 2,481 (d) 2,840

16. Pie-chart shows the distribution of percentage of students in various courses. Total number of students is 1400



Percentage-wise distribution of number of boys:

Course	Number of boys
B.Sc. Maths	40%
B.Sc. Physics	68%
B.Sc. Chem	58%
B.Sc. C.Sci	80%
B.Com.	75%
BBA	65%

What is the ratio of number of girls in B.Sc Maths to number of boys in B.Sc., C. Sci.?

(a) 7 : 2 (b) 3 : 5
(c) 2 : 7 (d) 5 : 3

17. Rajan spent 10% of his salary on rent. He spent 20% of the remaining part of the salary on transport. After which he spent 40% of the balance of the salary on food. Further, he spent 80% of the balance on various bills. He deposits ₹5,000 in the bank and kept the remaining ₹1,480 for his own petty expenditure. Find his monthly salary (in ₹).

(a) 64,800 (b) 82,500
(c) 80,000 (d) 75,000

18. A train running at 72 km/h crosses a pole in 12 seconds. How much time (in seconds) will it take to cross a bridge 360 m long?

(a) 30 (b) 40
(c) 60 (d) 75

19. If $\cos\theta - \sin\theta = \sqrt{3}\cos(90° - \theta)$, $0° < \theta < 90°$ then find the value of $\tan\theta - \cot\theta$.

(a) $-\frac{3+2\sqrt{3}}{(1+\sqrt{3})}$ (b) $\frac{3-2\sqrt{3}}{(1+\sqrt{3})}$

(c) $\frac{3+2\sqrt{3}}{(1+\sqrt{3})}$ (d) $-\frac{3+2\sqrt{3}}{(1-\sqrt{3})}$

20. $5\frac{1}{5} \div \left[3\frac{1}{2} - \left\{\frac{5}{6} - \left(\frac{3}{5} + \frac{1}{10} - \frac{4}{15}\right)\right\}\right]$ **is equal to:**

(a) $\frac{72}{31}$ (b) $\frac{52}{31}$

(c) $\frac{12}{31}$ (d) $\frac{22}{31}$

21. If $\sin A = \frac{1}{2}$, A is an acute angle, then find the value of $\frac{\tan A - \cot A}{\sqrt{3}(1+\text{cosec}A)}$

(a) $\frac{4\sqrt{3}}{9}$ (b) $-\frac{4\sqrt{3}}{9}$

(c) $-\frac{2}{9}$ (d) $\frac{2}{9}$

22. Table shows District-wise data of the number of primary school teachers posted in schools of a city. Study the table and answer the question:

District	Male teachers	Female teachers
East	1650	2375
North	1075	2651
West	1280	1520
South	1170	1085
Central	690	859

What is the average number of female teachers in the five districts?

(a) 1698 (b) 1173
(c) 1690 (d) 2871

23. For $0° < \theta < 90°$, $\frac{1}{\cos\theta} + \frac{1}{\tan\theta - \sec\theta}$ is equal to:

(a) $\tan\theta$ (b) $-\sec\theta$
(c) $-\tan\theta$ (d) $\sec\theta$

24. What is the volume (in cm^3) of a spherical shell whose inner and outer radii are respectively 2 cm and 3 cm?

(a) $\frac{76\pi}{3}$ (b) $\frac{56\pi}{3}$
(c) $\frac{106\pi}{3}$ (d) $\frac{86\pi}{3}$

25. In $\angle ABC$, AD is the bisector of $\angle A$ meeting BC at D. If AC= 21 cm, BC= 11 cm and the length of BD is 3 cm less than DC, then the length (in cm) of side AB is:

(a) 15 (b) 10
(c) 18 (d) 12

EXPLANATION

1. (a), To Given: The marked price of an article = ₹2720.

Loss = 15%; Discount = 25%

To Find: The cost price of the article.

According to the question

$$SP = \frac{M.P \times (100 - \text{discount}\%)}{100}$$

$$\Rightarrow SP = 2720 \times \frac{(100-25)}{100}$$

$$\Rightarrow SP = \frac{2720 \times 75}{100}$$

$\therefore$ SP = ₹2,040

Now,

$$CP = \frac{SP \times 100}{(100 - \text{loss}\%)}$$

$$\Rightarrow CP = 2040 \times \frac{100}{100-15}$$

$$\Rightarrow CP = 2040 \times \frac{100}{85}$$

$\therefore$ CP = 100 × 24 = ₹2,400

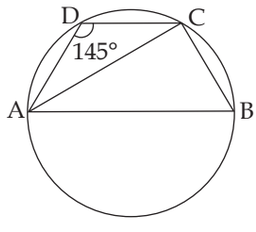
$\therefore$ The cost price of the article is ₹2,400.

2. (d), To Given: ABCD is a cyclic quadrilateral with AB is the diameter of the circle

$\angle ADC = 145°$

To Find: The value of $\angle BAC$.

According to question



$\angle ADC + \angle ABC = 180°$ ...(Since the sum of the opposite angles of a quadrilateral is 180°)

$\Rightarrow \angle ABC = 180° - 145°$

$\therefore \angle ABC = 35°$

Also, $\angle ACB = 90°$..... (Since the angle subtended by diameter at the circumference of the circle, is 90°)

In ΔABC, we have

$\angle ACB = 90°$ and $\angle ABC = 35°$

So, $\angle BAC = 180° - (\angle ACB + \angle ABC)$

$\Rightarrow \angle BAC = 180° - (90° + 35°)$

$\therefore \angle BAC = 180° - 125° = 55°$

$\therefore$ The measure of $\angle BAC$ is 55°.

3. (b), To Given: $(x + y)^3 + 27(x - y)^3 = (Ax - 2y)(Bx^2 + Cxy + 13y^2)$.

To Find: The value of A – B – C.

SSC-CGL

Combined Graduate Level PYQ Solved Paper

Held On 13/8/2021, Shift 1

1. If $x + y = 4$ and $\frac{1}{x} + \frac{1}{y} = \frac{16}{15}$, then what is the value of $(x^3 + y^3)$?

(a) 18 (b) 19
(c) 21 (d) 16

2. If the 5-digit number 676xy is divisible by 3, 7 and 11, then what is the value of (3x – 5y)?

(a) 9 (b) 11
(c) 10 (d) 7

3. $\Delta ABC \sim \Delta PQR$. The area of ΔABC and ΔPQR are 64 cm^2 and 81 cm^2, respectively and AD and PT are the medians of ΔABC and ΔPQR, respectively. If PT = 10.8 cm, then AD = ?

(a) 9 cm (b) 12 cm
(c) 8.4 cm (d) 9.6 cm

4. Some fruits are bought at 15 for ₹ 140 and equal number of fruits at 10 for ₹120. If all the fruits are sold at ₹132 per dozen, then what is the profit percent in the entire transaction?

(a) $4\frac{1}{2}$ (b) $2\frac{1}{4}$
(c) $3\frac{1}{8}$ (d) 3

5. Study the following table and answer the question:

Number of cars sold by dealers A, B, C, D and E during first six months of 2018.

Dealer	Month					
	January	February	March	April	May	June
A	620	640	628	635	430	625
B	600	642	635	580	450	620
C	640	635	640	540	625	740
D	520	645	722	740	600	780
E	548	638	720	740	650	800

The ratio of the total number of cars sold by dealer B in January, April and June to the total number of cars sold by dealers A and D in March is

(a) 8 : 9 (b) 7 : 5
(c) 10 : 9 (d) 4 : 3

6. If $x + \frac{1}{x} = 4$, then the value of $x^5 + \frac{1}{x^5}$ is:

(a) 776 (b) 736
(c) 724 (d) 684

7. The average of 28 numbers is 77. The average of first 14 numbers is 74 and the average of last 15 numbers is 84. If the 14^{th} number is excluded, then what is the average of remaining numbers? (correct to one decimal places)

(a) 74.7 (b) 77
(c) 73.1 (d) 76.9

8. The value of $20 \div 5$ of $8 \times [9 \div 6 \times (6 - 3)] - (10 \div 2$ of $20)$ is:

(a) 6 (b) 2
(c) 1 (d) 0

9. To do a certain work. A and B work on alternate days with B beginning the work on the first day. A alone can complete the same work in 24 days. If the work gets completed in $11\frac{1}{3}$ days, then B alone can complete $\frac{7}{9}$th part of the original work in:

(a) 4 days (b) 6 days
(c) $5\frac{1}{2}$ days (d) $4\frac{1}{2}$ days

10. If $8(x + y)^3 - 27(x - y)^3 = (5y - x)(Ax^2 + By^2 + Cxy)$, then what is the value of (A – B – C)?

(a) 16 (b) – 26
(c) 34 (d) – 16

11. Length of each side of a rhombus is 13 cm and one of the diagonal is 24 cm. What is the area (in cm^2) of the rhombus?

(a) 60 (b) 120
(c) 300 (d) 240

12. If $\frac{\cos^2\theta}{\cot^2\theta + \sin^2\theta - 1} = 3$, $0° < \theta < 90°$, then the value of $(\tan\theta + \text{cosec}\,\theta)$ is:

(a) $2\sqrt{3}$ (b) $\frac{4\sqrt{3}}{3}$
(c) $3\sqrt{3}$ (d) $\frac{5\sqrt{3}}{3}$

13. Let $\Delta ABC \sim \Delta PQR$ and $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{144}{49}$. If AB = 12 cm. BC = 7 cm and AC = 9 cm, then PR (in cm) is equal to:

(a) 12 (b) $\frac{49}{12}$
(c) $\frac{108}{7}$ (d) $\frac{21}{4}$

14. Study the following table and answer the question:

Number of cars sold by dealers A, B, C, D & E during first six months of 2018.

Dealer	Month					
	January	February	March	April	May	June
A	620	640	628	635	430	625
B	600	642	635	580	450	620
C	640	635	640	540	625	740
D	520	645	722	740	600	780
E	548	638	720	740	650	800

In July 2018, if the sales of cars by the dealer D increases by the same percentage as in June 2018 over its previous month, then what is the number of cars sold by D in July 2018?

(a) 1020 (b) 975
(c) 959 (d) 1014

15. A shopkeeper earns a profit of 21% after selling a book at 21% discount on the printed price. The ratio of the cost price and selling price of the book is

(a) 100 : 79 (b) 79 : 100
(c) 100 : 121 (d) 121 : 100

16. Study the table and answer the question.

In the table, production and sale (in 1000 tonnes) of a certain product of a company over 5 years is given.

Year	Production (in 1000 tonnes)	Sale (in 1000 tonnes)
2015	1250	1000
2016	1400	1290
2017	1450	1100
2018	1500	1450
2019	1600	1390

In which year(s) sale is more than 90% of the production?

(a) 2015, 2017, 2019
(b) 2016, 2018
(c) 2016, 2017
(d) 2017, 2018

17. When x is subtracted from each of 19, 28, 55 and 91, the numbers so obtained in this order are in proportion. What is the value of x?

(a) 5 (b) 8
(c) 7 (d) 9

18. A chord 21 cm long is drawn in a circle of diameter 25 cm. The perpendicular distance of the chord from the centre is:

(a) $\sqrt{41}$ (b) $\sqrt{23}$
(c) $\sqrt{56}$ (d) $\sqrt{46}$

19. Study the table and answer the question.
Table shows District-wise data of the number of primary school teachers posted in schools of a city.

District	Male Teacher	Female Teacher
East	1650	2375
North	1075	2651
West	1280	1520
South	1170	1085
Central	690	859

What is the ratio of the number of male teachers to the number of female teachers in the city'?

(a) 195 : 283 (b) 586 : 849
(c) 391 : 566 (d) 78 : 113

20. What is the compound interest (in ₹) on a sum of ₹8192 for $1\frac{1}{4}$ years at 15% per annum, if interest is compounded 5-monthly?

(a) 1,740 (b) 1,735
(c) 1,634 (d) 1,640

21. X, Y are two points in a river. Points P and Q divide the straight line XY into three equal parts. The river flows along XY and the time taken by a boat to row from X to Q and from Y to Q are in the ratio 4 : 5. The ratio of the speed of the boat downstream to that of the river current is equal to:

(a) 4 : 3 (b) 10 : 3
(c) 3 : 10 (d) 3 : 4

22. $\frac{\text{cosec}\,\theta}{\text{cosec}\,\theta - 1} + \frac{\text{cosec}\,\theta}{\text{cosec}\,\theta + 1} - \tan^2\theta$
$0^\circ < \theta < 90^\circ$ is equal to ?

(a) $1 - \tan^2\theta$ (b) $\sec^2\theta$
(c) $2\sec^2\theta$ (d) $\sec^2\theta + 1$

23. Find the value of cot 25° cot 35° cot 45° cot 55° cot 65°.

(a) 1 (b) $\frac{\sqrt{3}}{2}$
(c) $\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$

24. The income of A is 45% more than the income of B and the income of C is 60% less than the sum of the incomes of A and B. The income of D is 20% more than that of C. If the difference between the incomes of B and D is ₹ 13,200, then the income (in ₹) of C is:

(a) 72,000 (b) 75,000
(c) 73,500 (d) 72,500

25. Sides AB and DC of a cyclic quadrilateral ABCD are produced to meet at E and sides AD and BC are produced to meet at F. If ∠ADC = 78° and ∠BEC = 52°, then the measure of ∠AFB is:

(a) 30° (b) 28°
(c) 26° (d) 32°

EXPLANATION

1. (b), According to question

$\Rightarrow \frac{1}{x} + \frac{1}{y} = \frac{16}{15}$

$\Rightarrow \frac{y+x}{xy} = \frac{16}{15}$

$\Rightarrow \frac{4}{xy} = \frac{16}{15}$

$\therefore xy = \frac{4 \times 15}{16} = \frac{15}{4}$

Now,

By taking cube both side

$\Rightarrow (x + y)^3 = 4^3$

$\Rightarrow x^3 + y^3 + 3xy(x + y) = 4^3$

$\Rightarrow x^3 + y^3 = 64 - 3 \times \frac{15}{4} \times 4$

$\Rightarrow x^3 + y^3 = 64 - 45 = 19$

$\therefore x^3 + y^3 = 19$

2. (a), According to question

Let the 5-digit largest number is 67699

LCM of (3, 7 and 11) = 231.

Now,

Divided 67699 by 231 = remainder 16

To make complete divisible

$\Rightarrow$ 67699 – 16 = 67683

$\therefore$ 67683 is completely divisible by 231

Then

$\Rightarrow$ 67683 = 676xy

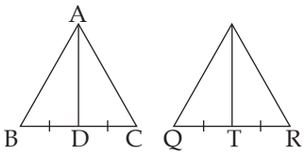
x = 8 and y = 3

Now,

$\therefore$ (3x – 5y) = 3 × 8 – 5 × 3 = 24 – 15 = 9

So, required value is 9.

3. (d), According to question



$\Rightarrow \frac{\text{Area of ABC}}{\text{Area of PQR}} = \frac{AD^2}{PT^2}$

$\Rightarrow \frac{64}{81} = \frac{AD^2}{PT^2}$

$\Rightarrow \frac{AD}{PT} = \frac{8}{9}$

$\Rightarrow AD = \frac{8}{9} \times 10.8 = 9.6$ cm

$\therefore$ AD = 9.6 cm

4. (c), To Find: The profit%.
According to question

Let the number of fruits is 30

CP of 30 fruits at 15 for ₹ 140

$= \frac{140}{15} \times 30 =$ ₹ 280

CP of 30 fruits at 10 for ₹ 120

$= \frac{120}{10} \times 30 =$ ₹ 360

Total CP of 60 fruits

= 360 + 280 = ₹ 640

Now,

$\because$ SP of 12 fruits = ₹ 132

$\therefore$ SP of 60 fruits $= \frac{132}{12} \times 60 =$ ₹ 660

$\therefore$ Profit% $= \frac{(660 - 640) \times 100}{640}$

$= \frac{2000}{640} = 3\frac{1}{8}\%$

So, required profit is $3\frac{1}{8}\%$.

5. (d), According to question

Total number of cars sold by B in Jan, April and June = 600 + 580 + 620

= 1800