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20 TOUGHEST PYQ

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Q-1 Which of the following Articles of the Indian Constitution directs the state "to organise agriculture and animal husbandry on modern and scientific lines"?

[OSSC Excise SI 2021 By TCS]

- (A) Article 49
- (B) Article 48
- (C) Article 47
- (D) Article 46

ANS- (B) Article 48

Explanation: Article 48 of the Constitution says the State shall try to organise **agriculture and animal husbandry** on modern and scientific lines. It also asks the State to improve cattle breeds and to stop the slaughter of cows, calves and other milch and draught cattle. It is a **Directive Principle of State Policy** in **Part IV** (Articles 36 to 51), which the courts cannot enforce but which guide the government in making laws.

Article	Direction
46	Education and economic interests of SC, ST and weaker sections
47	Nutrition, standard of living and public health
48	Agriculture and animal husbandry
48A	Protection of environment, forests and wildlife
49	Protection of monuments of national importance

Key Points:

- ✦ **Article 48A:** added by the 42nd Amendment, 1976
- ✦ **Source of idea:** the Constitution of Ireland
- ✦ **Court view:** Supreme Court upheld a State ban on slaughter of cow progeny (Mirzapur Moti Kureshi case, 2005)

Other Options:

(A) Article 49 — It asks the State to protect monuments, places and objects of national importance, such as the Konark Sun Temple.

(C) Article 47 — It makes it a duty of the State to raise nutrition and public health and to prevent the use of harmful drinks and drugs.

(D) Article 46 — It asks the State to promote the education and economic interests of Scheduled Castes, Scheduled Tribes and other weaker sections.

Q-2 Find the next number in the series.



1, 6, 28, 143, 711, ?

[OSSC Excise SI 2021 By TCS]

- (A) 3660
- (B) 3560
- (C) 3860
- (D) 3760

ANS- (B) 3560

STEP 1 Test $\times 5$ on each term

Each term $\times 5$, then add a changing number: $+1, -2, +3, -4, +5$.

1	$\times 5 + 1$	$\rightarrow$	6
6	$\times 5 - 2$	$\rightarrow$	28
28	$\times 5 + 3$	$\rightarrow$	143
143	$\times 5 - 4$	$\rightarrow$	711
711	$\times 5 + 5$	$\rightarrow$	3560

STEP 2 Next term

$711 \times 5 + 5 = 3555 + 5 = 3560$

HINT: Multiply by 5; the added number goes $+1, -2, +3, -4, +5$.

FINAL ANSWER: 3560

Q-3 A can finish a work in 273 days and B can do the same work in 546 days. Working together, they will complete the same work in how many days?



[OSSC Excise SI 2021 By TCS]

- (A) 168
- (B) 184
- (C) 180
- (D) 182

ANS- (D) 182

Given:

- A alone takes 273 days, B alone takes 546 days
- Required: days taken together

Concept:

- Take total work = LCM(273, 546) = 546 units
- Efficiency = $\frac{\text{Total work}}{\text{Days}}$, and together efficiency = sum of efficiencies
- Days = $\frac{\text{Total work}}{\text{Together efficiency}}$

Solution:

- A's efficiency = $\frac{546}{273} = 2$ units/day
- B's efficiency = $\frac{546}{546} = 1$ unit/day
- Together = 2 + 1 = 3 units/day
- Days = $\frac{546}{3} = 182$

∴ Ans: (D) 182

Hint:

- Alternative: $\frac{1}{273} + \frac{1}{546} = \frac{2 + 1}{546} = \frac{3}{546} = \frac{1}{182}$ per day, so 182 days

Q-4 In a certain code language, if HUSBAND is coded as EOBCTVI, then how is MONSTER coded in that language?

[OSSC Excise SI 2021 By TCS]

- (A) SFUTOPN
- (B) NPOUWHU
- (C) NNORUDS
- (D) NPORUFS

ANS- (A) SFUTOPN



STEP 1 Read the example

HUSBAND is **reversed** to DNABSUH, then every letter moves **+1**: D → E, N → O, A → B, B → C, S → T, U → V, H → I.

H U S B A N D

▼ reverse

D N A B S U H

▼ each letter +1

E O B C T V I

STEP 2 Apply to MONSTER

Reverse it, then move each letter **+1**.

M O N S T E R

▼ reverse

R E T S N O M

▼ each letter +1

S F U T O P N

HINT: Two steps: **reverse** the word, then **+1** to every letter.

FINAL ANSWER: SFUTOPN

Q-5 A woman walked 7km in the West direction, took a left turn and walked 10km and walked 28km after taking another left. She then walked 10km in the North direction and finally took a left turn and covered the distance of 13km. How far is the starting point from the ending point?



[OSSC Excise SI 2021 By TCS]

- (A) 6km
- (B) 8km
- (C) 12km
- (D) 10km

ANS- (B) 8km

STEP 1 Follow the walk



The woman turns **left** each time. Note each new direction.

Step	Turn	Move	Easy hint
1	Start: walk	West 7 km	Facing West
2	Left turn	South 10 km	Left of West is South
3	Left turn	East 28 km	Left of South is East
4	Walks	North 10 km	Heading North
5	Left turn	West 13 km	Left of North is West

STEP 2 Cancel opposite moves

East – West: $28 - (7 + 13) = 8 \text{ km East}$

North – South: $10 - 10 = 0$



HINT: Opposite moves cancel. Only the leftover East-West and North-South gaps decide the distance.

FINAL ANSWER: 8 km



Q-6 Which dynasty shifted its capital from Kalinganagar to Varanasi Katak on the bank of the Mahanadi?

[OSSC Excise SI 2021 By TCS]

- (A) Imperial Ganga
- (B) Somavamsi
- (C) Sailodbhava
- (D) Bhaumakara

ANS- (A) Imperial Ganga

Explanation: The **Imperial (Eastern) Ganga** dynasty ruled from **Kalinganagara** (modern Mukhalingam in Srikakulam, Andhra Pradesh). King **Anangabhima Deva** (reigned **1211-1238**) moved the capital to **Abhinava Varanasi Kataka**, today's **Cuttack**, on the bank of the Mahanadi. The move took place in about **1230**. He named the city after Varanasi, and Cuttack stayed the capital of Odisha until 1948.

King	Reign	Known for
Anantavarman Chodaganga	c. 1078-1150	Began the Puri Jagannath temple
Anangabhima Deva	1211-1238	Moved capital to Cuttack
Narasimhadeva I	1238-1264	Built the Konark Sun Temple

Key Points:

- ✦ **Title:** Anangabhima called himself the **Rauta (deputy)** of Lord Jagannath
- ✦ **End of rule:** Kapilendra Deva founded the **Suryavamsi Gajapati** dynasty in **1434-35**
- ✦ **Other Ganga branch:** the **Khemundi Gangas** ruled from **Paralakhemundi**

Other Options:

(B) Somavamsi — This dynasty ruled Kosala and Utkala till about 1110; the Lingaraj temple of Bhubaneswar (11th century) belongs to their time, and tradition credits Yayati Keshari with beginning it and Lalatendu Keshari with completing it.

(C) Sailodbhava — This dynasty ruled Kongoda around the Chilika area between the 6th and 8th centuries, and the Parasurameswara temple of Bhubaneswar belongs to their time.

(D) Bhaumakara — This dynasty ruled Toshali from about the 8th century with Guhadevapataka as capital, and it built Buddhist centres at Ratnagiri, Udayagiri and Lalitagiri.

Q-7 If both the roots of the quadratic equation $(2p + 1)x^2 + (3p + 2)x + (p+1) = 0$ and $(6p + 1)x^2 + 9px + 3p - 1 = 0$ are common, then what is the value of $p^2 + 3p - 1$?

[OSSC Excise SI Mains 2024 By TCS]

- (A) $-\frac{69}{7}$



(B) $-\frac{17}{9}$

(C) $\frac{58}{9}$

(D) $\frac{83}{7}$

ANS- (B) $-\frac{17}{9}$

Given:

$\rightarrow (2p + 1)x^2 + (3p + 2)x + (p + 1) = 0$

$\rightarrow (6p + 1)x^2 + 9px + (3p - 1) = 0$

$\rightarrow$ Both roots of the two equations are common

Concept:

$\rightarrow$ If both roots are common, the coefficients are proportional: $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Solution:

$\rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2}$ gives $\frac{2p + 1}{6p + 1} = \frac{3p + 2}{9p}$

$\Rightarrow 9p(2p + 1) = (3p + 2)(6p + 1)$

$\Rightarrow 18p^2 + 9p = 18p^2 + 15p + 2$ (the p^2 terms cancel)

$\Rightarrow p = -\frac{1}{3}$

$\rightarrow p^2 + 3p - 1 = \frac{1}{9} - 1 - 1 = -\frac{17}{9}$

$\therefore$ Ans: (B) $-\frac{17}{9}$

Hint:

$\rightarrow$ Alternative: $\frac{a_1}{a_2} = \frac{c_1}{c_2}$ gives $(2p + 1)(3p - 1) = (p + 1)(6p + 1)$, that is $6p^2 + p -$

$1 = 6p^2 + 7p + 1$, so again $p = -\frac{1}{3}$

Q-8 The list price of a air conditioner is ₹75000. It is sold to a retailer after two successive discounts of 2% and 30%. The retailer wants to earn a profit of 42% on his cost after allowing a 29% discount (on its new list price) to the customer. At what price should he list the air conditioner?

[OSSC Excise SI Mains 2024 By TCS]

(A) ₹102740

(B) ₹102731

(C) ₹102905

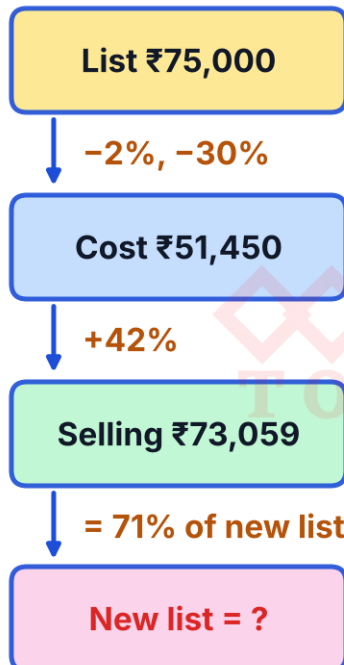
(D) ₹102900



ANS- (D) ₹102900

Given:

- List price = ₹75,000, retailer buys after discounts of 2% and 30%
- Retailer's profit = 42%, customer gets 29% off the new list price
- Required: the new list price L



Concept:

- Successive discounts multiply: price = list $\times \frac{100 - d_1}{100} \times \frac{100 - d_2}{100}$
- Selling price = cost $\times \frac{100 + \text{profit \%}}{100}$, and selling price = L $\times \frac{100 - 29}{100}$

Solution:

$$\rightarrow \text{Retailer's cost} = 75000 \times \frac{98}{100} \times \frac{70}{100} = ₹51,450$$

$$\rightarrow \text{Selling price} = 51450 \times \frac{142}{100} = ₹73,059$$

$$\rightarrow L \times \frac{71}{100} = 73059$$

$$\Rightarrow L = \frac{73059 \times 100}{71} = ₹102900$$

∴ Ans: (D) ₹102900

Hint:

$$\rightarrow \text{Alternative: } L = \text{cost} \times \frac{142}{100} \times \frac{100}{71} = \text{cost} \times \frac{142}{71} = 2 \times 51450 = ₹102900 \text{ (since } 142 = 2 \times 71)$$

Q-9 Match the following temples built between 900 to 1200 A.D. with their respective locations.



a. Kandariya Temple	i. Bhubaneswar
b. Jagannath Temple	ii. Konark
c. Lingaraj Temple	iii. Khajuraho
d. Surya Temple	iv. Puri

[OSSC Excise SI Mains 2024 By TCS]

- (A) a-iv, b-iii, c-ii, d-i
(B) a-iii, b-i, c-ii, d-iv
(C) a-ii, b-i, c-iv, d-iii
(D) a-iii, b-iv, c-i, d-ii

ANS- (D) a-iii, b-iv, c-i, d-ii

Explanation: Each temple belongs to one famous place. The **Kandariya Mahadeva** temple stands at **Khajuraho** (Madhya Pradesh), the **Jagannath** temple at **Puri**, the **Lingaraj** temple at **Bhubaneswar** and the **Surya (Sun)** temple at **Konark**. So the pairs are a-iii, b-iv, c-i and d-ii. Konark was finished a little after 1200 (about 1250), but the pairing is the same.

Temple	Place	Builders and time
Kandariya Mahadeva	Khajuraho	Chandelas, about 1030
Jagannath	Puri	Eastern Gangas, 12th century
Lingaraj	Bhubaneswar	Somavamsis, 11th century
Surya (Sun)	Konark	Eastern Gangas, 13th century

Key Points:

- ✦ **Khajuraho:** UNESCO World Heritage Site since 1986
- ✦ **Konark:** UNESCO World Heritage Site since 1984, shaped like a stone chariot
- ✦ **Puri:** one of the four Char Dham pilgrimage places of India
- 💡 **Memory Hook:** K-K: Kandariya = Khajuraho.

Other Options:

- (A) **a-iv, b-iii, c-ii, d-i** — This swaps the places: the Kandariya temple stands at Khajuraho, the Jagannath temple at Puri, the Lingaraj temple at Bhubaneswar and the Sun temple at Konark.
- (B) **a-iii, b-i, c-ii, d-iv** — Only the first pair holds (Kandariya at Khajuraho); the Jagannath temple is at Puri, the Lingaraj temple at Bhubaneswar and the Sun temple at Konark.
- (C) **a-ii, b-i, c-iv, d-iii** — This places Kandariya at Konark and the Sun temple at Khajuraho; in fact Kandariya is at Khajuraho and the Sun temple is at Konark.





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Q-10 P, Q, R, X, Y and Z live on six different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it, number 2 and so on till the topmost floor is numbered 6. R lives immediately above Y. Only two people live between P and Y. P lives on an odd numbered floor. X lives immediately below Q. How many people live between Z and Q?

[OSSC Excise SI Mains 2024 By TCS]

- (A) Four
- (B) Three
- (C) One
- (D) Two

ANS- (D) Two

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STEP 1 Try each odd floor for P

Y is **3 floors** from P (two people between). R is just above Y.

P = 1	Y 4, R 5. Then X 2, Q 3, Z 6.	YES
P = 3	Y 6 leaves no floor above for R.	NO
P = 5	Y 2, R 3. Left 1, 4, 6: X, Q not adjacent.	NO

STEP 2 Build the building

Floors from top: Z, R, Y, Q, X, P.

floor 6	Z	
floor 5	R	between
floor 4	Y	between
floor 3	Q	
floor 2	X	
floor 1	P	

STEP 3 Count between Z and Q

Z is on floor **6**, Q is on floor **3**.
Floors 5 and 4 hold **R** and **Y**.

People between Z and Q = **2**

HINT: Test the **odd** floors for P one by one.

FINAL ANSWER: Two

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Q-11 Two trains having lengths of 280 m and 470 m are running at speeds of 60 km/h and 110 km/h, respectively, in the same direction. The time taken (in minutes) by the faster train, coming from behind, to completely cross the other train is:

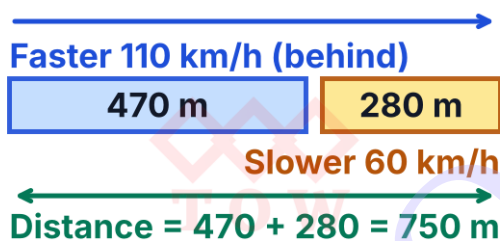
[OSSC Excise SI Mains 2024 By TCS]

- (A) 1
- (B) 2
- (C) 0.9
- (D) 0.3

ANS- (C) 0.9

Given:

- Slower train: 280 m long, speed 60 km/h
- Faster train: 470 m long, speed 110 km/h, coming from behind in the same direction
- Required: time in minutes for the faster train to cross the other completely



Relative speed = 110 - 60 = 50 km/h

Time = ?

Concept:

- Same direction: relative speed = difference of the speeds
- To cross completely: distance = sum of the two lengths
- km/h to m/s: multiply by $\frac{5}{18}$

→ Time = $\frac{\text{Distance}}{\text{Relative speed}}$

Solution:

→ Relative speed = 110 - 60 = 50 km/h

⇒ $50 \times \frac{5}{18} = \frac{125}{9}$ m/s

→ Distance = 280 + 470 = 750 m

→ Time = $\frac{750}{\frac{125}{9}} = 54$ seconds

⇒ 54 seconds = $\frac{54}{60}$ minute = 0.9 minute

∴ Ans: (C) 0.9

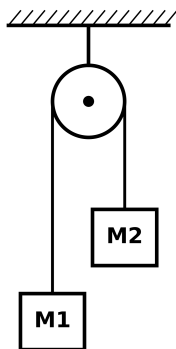
Hint:



→ Alternative (in km and hours): time = $\frac{0.75}{50}$ h = $\frac{0.75}{50} \times 60$ minutes = 0.9 minutes

Q-12 Two loads of mass M_1 and M_2 ($M_1 > M_2$) are hung at the ends of a rope passing over a smooth pulley shown in the figure. Assume that both loads are moving with equal acceleration of 'a'. What will be the tension (T) in the string?

[OSSC Excise SI Mains 2024 By TCS]

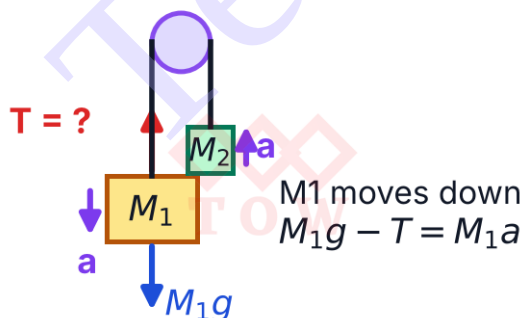


- (A) $T = M_1 g + M_1 a$
- (B) $T = 0$
- (C) $T = M_1 g - M_1 a$
- (D) $T = M_2 a - M_2 g$

ANS- (C) $T = M_1 g - M_1 a$

Given:

- Two loads $M_1 > M_2$ on a rope over a smooth pulley
- Both move with the same acceleration a
- Required: tension T in the rope



Concept:

- Weight = mass $\times$ g
- Newton's second law: net force = mass $\times$ acceleration

Solution:

- M_1 is heavier, so M_1 moves down with acceleration a





→ Forces on M_1 : weight M_1g downwards, tension T upwards

⇒ Net force downwards = $M_1g - T$

→ Second law for M_1 : $M_1g - T = M_1a$

⇒ $T = M_1g - M_1a$

∴ Ans: (C) $T = M_1g - M_1a$

Hint:

→ Trap: $M_1g + M_1a$ is the tension only when M_1 is accelerating upwards, and here it moves down

Q-13 In a certain code language,

A + B means ‘A is the brother of B’,

A – B means ‘A is the father of B’,

A x B means ‘A is the mother of B’ and

A ÷ B means ‘A is the wife of B’.

Based on the above, how is P related to T if ‘P x Q ÷ R – S + T’?

[OSSC Excise SI Mains 2024 By TCS]

(A) Mother’s mother

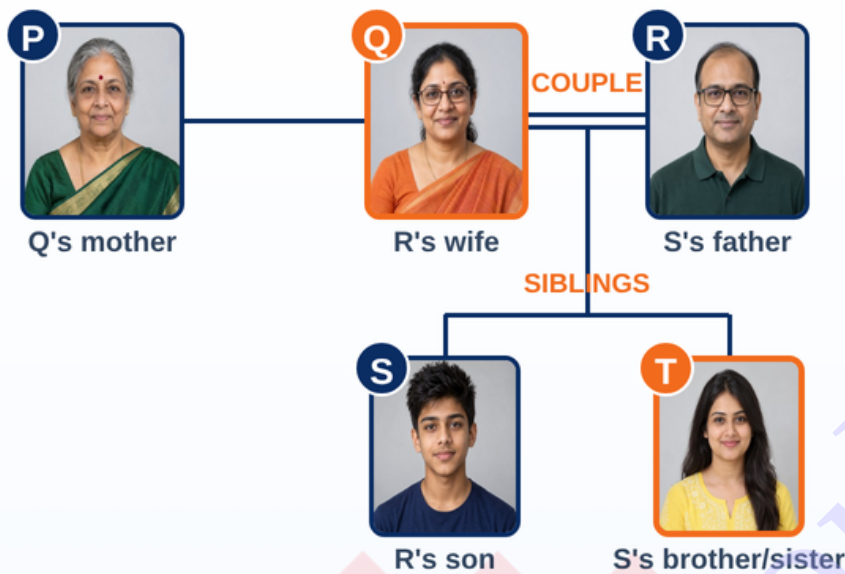
(B) Father’s sister

(C) Husband’s sister

(D) Husband’s mother

ANS- (A) Mother’s mother





STEP 1 Symbols

$P \times Q$: P is Q's mother. $Q \div R$: Q is R's wife.

STEP 2 Children

$R - S$: R is S's father, so Q is the mother of S and T (S + T: S is T's brother).

STEP 3 Relation

P is Q's mother and Q is T's mother, so P is T's mother's mother.

HINT: From T: T's mother Q → Q's mother P.

FINAL ANSWER: MOTHER'S MOTHER

Q-14 Each of P, Q, R, S, T, U, and V has an exam on a different day of a week, starting from Monday and ending on Sunday of the same week. V has an exam on Friday. Exactly 3 people have an exam between R and T, neither of whom has an exam on Sunday. P has an exam immediately after S. Q has an exam immediately before T. Who has an exam on Wednesday?





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- (A) Q
- (B) S
- (C) R
- (D) U

ANS- (B) S

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STEP 1 Fix V, then R and T

V is on **Friday**. 3 people between R and T means they are **4 days apart**: Mon–Fri, Tue–Sat or Wed–Sun. Fri is V and neither is on Sun, so R, T = **Tue & Sat**.

Mon	Tue	Wed	Thu	Fri	Sat	Sun
?	R/T	?	?		R/T	?
				V		

STEP 2 Use Q before T

Q is just before T. If T = Sat, Q = Fri (that is V). So T = Tue, Q = Mon, R = Sat.

Mon	Tue	Wed	Thu	Fri	Sat	Sun
		?	?			?
Q	T			V	R	

STEP 3 Place S, P and U

P is just after S. Free days: Wed, Thu, Sun. So S = Wed, P = Thu, U = Sun.

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						
Q	T	S	P	V	R	U

HINT: 3 days between two people = 4 days apart.

FINAL ANSWER: S

Q-15 Which of the following statements regarding online fund transfers in Internet Banking are correct?



1. NEFT processes transactions in real-time without any batch settlement.
 2. RTGS is used for high-value transactions and is settled individually in real-time.
 3. IMPS allows instant money transfers 24×7, including on holidays.
- [OSSC Excise SI & Traffic SI 2025 By TCS]**
- (A) 1 and 3 only
(B) 1 and 2 only
(C) 1, 2, and 3
(D) 2 and 3 only

ANS- (D) 2 and 3 only

Explanation: RTGS (Real Time Gross Settlement) settles each high-value transfer one by one in real time, with a minimum of ₹2 lakh. IMPS (Immediate Payment Service) moves money instantly 24x7, including holidays. NEFT settles in half-hourly batches, not in real time, so statement 1 is false. So only statements 2 and 3 are true.

Mode	Settlement	Limits
NEFT	Half-hourly batches, 24x7	Min ₹1, no maximum
RTGS	Real time, one by one, 24x7	Min ₹2 lakh, no maximum
IMPS	Instant, 24x7	Up to ₹5 lakh

Key Points:

- ✦ 24x7 start: NEFT Dec 2019, RTGS Dec 2020
- ✦ IMPS: started by NPCI in 2010
- ✦ Regulator of these systems: RBI

Statements:

1. ✗ False — NEFT works in half-hourly batches (deferred net settlement) and not one by one in real time.
2. ✓ True — RTGS is meant for large amounts and settles every payment on its own, at once.
3. ✓ True — IMPS works through the day and night, on all days including bank holidays.

Q-16 D is a point on side QR of an equilateral ΔPQR of side 4 cm such that the area of ΔPDQ is twice the area of ΔPDR . Find the length (in cm) of PD.

[OSSC Excise SI & Traffic SI 2025 By TCS]

- (A) $\frac{\sqrt{109}}{3}$



(B) $\frac{4\sqrt{7}}{3}$

(C) $\frac{3\sqrt{7}}{9}$

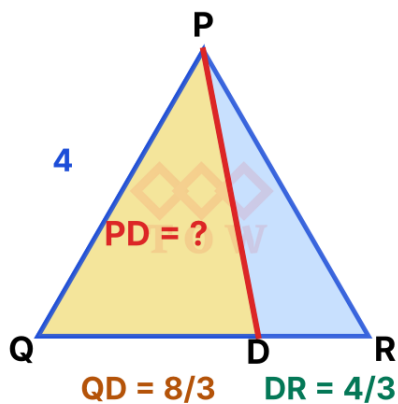
(D) $\frac{3\sqrt{3}}{4}$

ANS- (B) $\frac{4\sqrt{7}}{3}$

Given:

→ Equilateral ΔPQR , side $PQ = QR = 4$ cm

→ D lies on QR, with area $\Delta PDQ = 2 \times$ area ΔPDR



Concept:

→ ΔPDQ and ΔPDR have the same height from P , so area $\propto$ base, giving $QD : DR = 2 : 1$

→ Cosine rule: $PD^2 = PQ^2 + QD^2 - 2 \cdot PQ \cdot QD \cdot \cos 60^\circ$

Solution:

→ $QD = \frac{2}{3} \times 4 = \frac{8}{3}$ cm

→ $PD^2 = 4^2 + \left(\frac{8}{3}\right)^2 - 2 \times 4 \times \frac{8}{3} \times \frac{1}{2}$

$\Rightarrow PD^2 = 16 + \frac{64}{9} - \frac{32}{3} = \frac{112}{9}$

→ $PD = \sqrt{\frac{112}{9}} = \frac{4\sqrt{7}}{3}$ cm

$\therefore$ Ans: (B) $\frac{4\sqrt{7}}{3}$

Hint:

→ Alternative: drop the altitude PM to QR , so $QM = 2$, $PM = 2\sqrt{3}$ and $MD = QD - QM = \frac{2}{3}$; then $PD^2 = (2\sqrt{3})^2 + \left(\frac{2}{3}\right)^2 = \frac{112}{9}$

Q-17 At high pressures, the decomposition of gaseous ammonia on a hot platinum surface is an example of a ____.



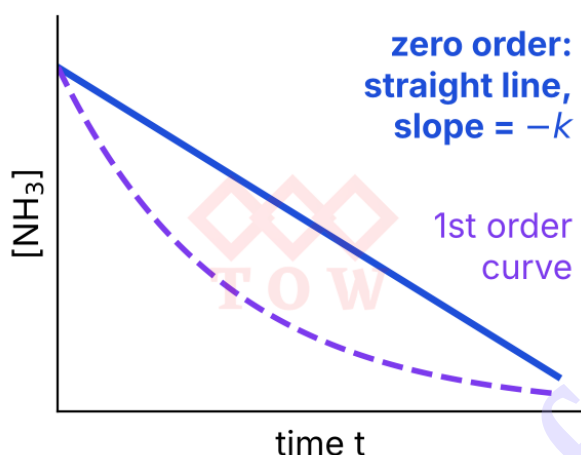
[OSSC Excise SI & Traffic SI 2025 By TCS]

- (A) Zero order reaction
- (B) 2nd order reaction
- (C) 1st order reaction
- (D) 3rd order reaction

ANS- (A) Zero order reaction

Given:

→ High pressure of NH_3 on hot platinum: $2\text{NH}_3(g) \xrightarrow{\text{Pt}, \Delta} \text{N}_2(g) + 3\text{H}_2(g)$



Concept:

→ At high pressure the Pt surface is fully covered by NH_3 molecules, so more NH_3 in the gas does not raise the rate.

→ The rate then does not depend on the concentration: $\text{rate} = k[\text{NH}_3]^0 = k$, which is a zero order reaction.

Solution:

➤ $\text{rate} = \frac{-d[\text{NH}_3]}{dt} = k$

⇒ $[\text{NH}_3] = [\text{NH}_3]_0 - kt$ (straight line, slope = $-k$)

➤ **Ans: (A) Zero order reaction**

Why not others:

→ **(B) 2nd order reaction** — the rate would grow with the square of $[\text{NH}_3]$; here the rate stays constant.

→ **(C) 1st order reaction** — the rate = $k[\text{NH}_3]$ holds at low pressure, when the surface is not yet saturated.

→ **(D) 3rd order reaction** — the rate would depend on $[\text{NH}_3]^3$; here it does not depend on $[\text{NH}_3]$.

Hint:

→ Surface-saturated catalysis (NH_3 on Pt or W at high pressure, HI on gold) is zero order.

Q-18 The radius of a sphere is 6 cm more than the radius of a smaller sphere. The surface area of the larger sphere is 2640 cm^2



more than the surface area of the smaller sphere. What is the diameter (in cm) of the larger sphere? (Use $\pi = \frac{22}{7}$)

[OSSC Excise SI & Traffic SI 2025 By TCS]

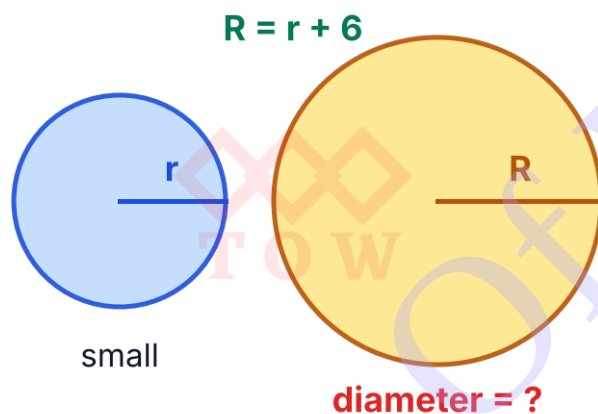
- (A) 41
- (B) 43
- (C) 37
- (D) 39

ANS- (A) 41

Given:

→ Radius of larger sphere $R = r + 6$ (r = radius of smaller sphere)

→ Difference of surface areas = 2640 cm^2 , $\pi = \frac{22}{7}$



Concept:

→ Surface area of a sphere = $4\pi r^2$

→ $a^2 - b^2 = (a - b)(a + b)$

Solution:

→ $4\pi(R^2 - r^2) = 2640$

→ $4 \times \frac{22}{7} \times (R - r)(R + r) = 2640$

→ $R - r = 6$, so $\frac{88}{7} \times 6 \times (R + r) = 2640$

⇒ $R + r = 35$

→ Diameter of larger sphere = $2R = (R + r) + (R - r) = 35 + 6 = 41 \text{ cm}$

∴ Ans: (A) 41

Hint:

→ Check: $R = 20.5$, $r = 14.5$, so $4 \times \frac{22}{7} \times (420.25 - 210.25) = 2640$

Q-19 A certain sum amounts to ₹14,523 at the rate of 39% per annum in 2 years, interest compounded 8-monthly. What will be the amount payable (in ₹, rounded off to the nearest number) on the



same sum at the same rate and in the same time, if the interest is compounded yearly?

[OSSC Excise SI & Traffic SI 2025 By TCS]

- (A) 13,677
- (B) 14,027
- (C) 14,629
- (D) 14,541

ANS- (B) 14,027

Given:

→ Amount = ₹14,523, rate = 39% per annum, time = 2 years

→ Compounded 8-monthly in the first case, yearly in the second

Same sum P, rate 39%, 2 years

8-monthly

×1.26

×1.26

×1.26

Yearly

×1.39

×1.39

$$P \times 1.26^3 = 14523$$

$$P \times 1.39^2 = ?$$

Concept:

→ Compound amount $A = P \times \left(1 + \frac{R}{100}\right)^n$, where R is the rate for one period and n is the number of periods

→ 8 months = $\frac{8}{12}$ year, so the rate for 8 months = $39 \times \frac{8}{12} = 26\%$

Solution:

→ Number of 8-month periods in 2 years = $\frac{24}{8} = 3$

$$\rightarrow 14523 = P \times \left(\frac{126}{100}\right)^3 = P \times 2.000376$$

$$\Rightarrow P = \frac{14523}{2.000376} \approx 7260$$

$$\rightarrow \text{Yearly compounding: } A = 7260 \times \left(\frac{139}{100}\right)^2$$

$$\Rightarrow A = 7260 \times 1.9321 = 14027.05 \approx 14027$$

∴ Ans: (B) 14,027

Hint:

→ Check: $7260 \times 2.000376 = 14522.7 \approx 14523$, so the principal is right



Q-20 Which of the following statements is INCORRECT about mitochondria?

[OSSC Excise SI & Traffic SI 2025 By TCS]

- (A) Considerable degree of variability is observed in its shape and size
- (B) It is not easily visible under the microscope
- (C) It is not the site of aerobic respiration
- (D) The number of mitochondria per cell is variable depending on the physiological activity of the cells

ANS- (C) It is not the site of aerobic respiration

Explanation:

Statement (C) is the INCORRECT one: mitochondria **are** the site of aerobic respiration. The **Krebs cycle** runs in the matrix, and the electron transport chain with **ATP synthase** sits on the inner membrane, which is why mitochondria are called the powerhouses of the cell.

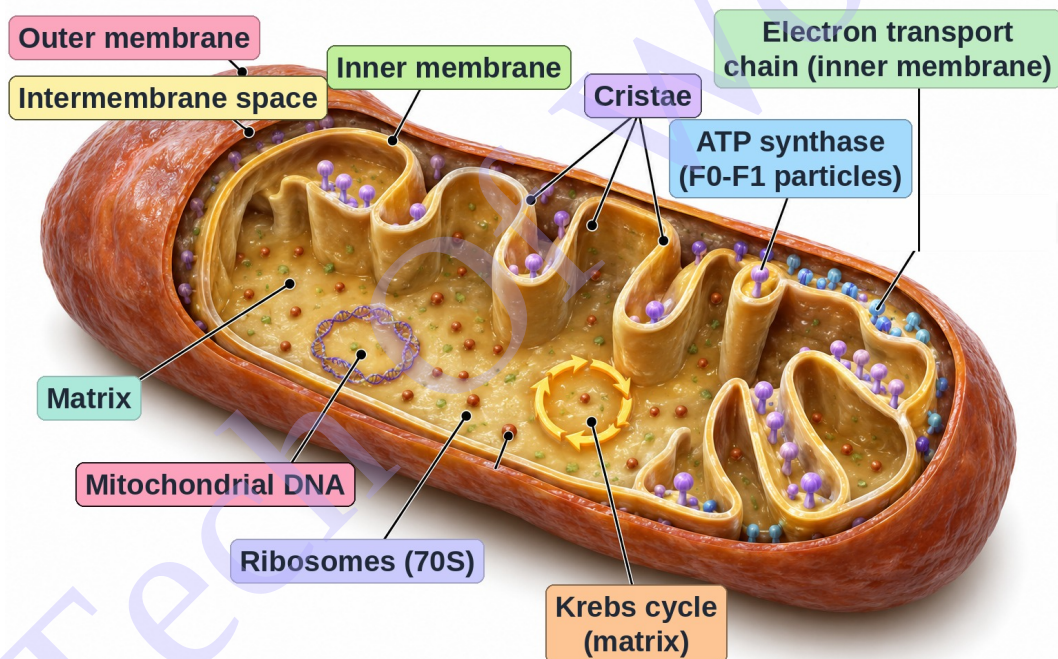


Fig. Mitochondrion (asked part: site of aerobic respiration, the matrix with the Krebs cycle and the inner membrane with ATP synthase).

Key Points:

- ✦ **Membranes:** A double membrane, with the inner one folded into cristae to enlarge the surface for ATP synthesis.
- ✦ **Genome:** Circular mitochondrial DNA and 70S ribosomes make it a semi-autonomous organelle.
- ✦ **Division:** Mitochondria multiply by binary fission, like bacteria.
- ✦ **Inheritance:** In humans mitochondrial DNA passes from the mother through the egg.

Other Options:





(A) Shape and size — sausage-like, rod-like or round forms, usually $0.2-1.0\ \mu\text{m}$ wide (average $0.5\ \mu\text{m}$) and $1.0-4.1\ \mu\text{m}$ long, as NCERT describes.

(B) Visibility under the microscope — true as NCERT puts it: mitochondria are hard to see unless specially stained; Janus green B stains them in living cells, where they appear as threads and granules.

(D) Number per cell — varies with energy demand, so active cells such as liver and muscle hold hundreds to thousands while less active cells hold a few.

Memory Hook:

Mitochondria = mighty powerhouse: the matrix runs Krebs, the cristae carry ATP synthase.

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