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CSAT PRELIMS 2023

Sample Handout

Quant and Reasoning

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FORMULA

Number Systems

- $1 + 2 + 3 + 4 + 5 + \ldots + n = n(n + 1)/2$
- $(1^2 + 2^2 + 3^2 + \ldots.. + n^2) = n (n + 1) (2n + 1) / 6$
- $(1^3 + 2^3 + 3^3 + \ldots.. + n^3) = \left[n\frac{(n+1)}{2} \right]^2$
- Sum of first n odd numbers = n^2
- Sum of first n even numbers = n (n + 1)

Mathematical Formulas

- $(a - b)^2 = (a^2 + b^2 - 2ab)$
- $(a + b)^2 = (a^2 + b^2 + 2ab)$
- $(a + b)(a - b) = (a^2 - b^2)$
- $(a + b)^2 = (a^2 + b^2 + 2ab)$
- $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
- $(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$
- $(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$
- $(a^3 + b^3 + c^3 - 3abc) = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac)$
- When $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$
- $(a+b)^2 = a^2 + n_{c_1} a^{n-1}b + n_{c_2} a^{n-2}b^2 + n_{c_3} a^{n-3}b^3 / n_{c_{n-1}} a^1 b^{n-1} + n_{c_c} a^{\circ} b^n$

Profit, Loss and Discount

- Profit/Gain = (S.P.) – (C.P.)
- Profit % = [Profit/(C P)]×100 → Profit
- Selling Price = [(100+gain 0%)/100] × CP
- Cost Price = [100/(100+gain %)]×SP
- Loss = (C.P.) – (S.P.)
- Loss % = [Loss/(C.P.)]×100
- Selling Price = [(100-loss %)/100]×CP
- Cost Price = [100/(100-loss %)]×SP

LCM and HCF

LCM × HCF = Product of the Numbers

LCM of Co-prime Numbers = Product Of The Numbers

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Speed, Time and Distance

Distance = Speed x Time

Time = Distance/Speed

Speed= Distance/Time

Percentages

To find what percentage of x is y: y/x × 100

Increase N by S % = N(1+ S/100)

Decrease N by S % = N (1 – S/100)

Time and Work

If A can do a piece of work in n days, then A's 1 day's work = 1/n

If A's 1 day's work =1/n, then A can finish the work in n days.

Averages

Average = (Sum of observations/Number of observations)

Simple and Compound Interest

When interest is compound Annually:

$$\text{Amount} = \text{P}\left(\text{a} + \frac{R}{100}\right)^{n}$$

When interest is compounded Half-yearly:

$$\text{Amount} = \text{P}\left[1 + \frac{(R/2)}{100}\right]^{4n}$$

When interest is compounded Quarterly:

$$\text{Amount} = \text{P}\left[1 + \frac{(R/4)}{100}\right]^{4n}$$

When interest is compounded Annually but time is in fraction, say $3\frac{2}{5}$ years.

$$\text{Amount} = \text{P}\left(1 + \frac{R}{100}\right)^{3} \times \left(1 + \frac{\frac{2}{5}R}{100}\right)$$

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When Rates are different for different years, say R_1%, R_2%, R_3% for 1st, 2nd and 3rd year respectively

Then, Amount = $P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)$

Present worth of Rs. *X* due *n* years hence is given by:

Present Worth = $\frac{X}{\left(1+\frac{R}{100}\right)^n}$

Log Formulas

$\log_a (xy) = \log_a x + \log_a y$

$\log_a (x^n) = n(\log_a x)$

$\log_a \left(\frac{x}{y}\right) = \log_a x - \log_a y$

$\log_a x = \frac{a}{\log_x a}$

$\log_x x = 1$

$\log_a x = \frac{\log_b x}{\log_b a} = \frac{\log x}{\log a}$

$\log_a 1 = 0$

Probability

Sample Space: When we perform an experiment, then the set S of all possible outcomes is called the sample space.

Event: Any subset of a sample space is called an event.

The probability of Occurrence of an Event:

Let S be the sample and let E be an event.

Therefore, **P(E) =n(E) / n(S)**

Surds and Indices

Laws of Indices:

i. $a^m \times a^n = a^{m+n}$

ii. $\frac{a^m}{a^n} = a^{m-n}$

iii. $(a^m)^n = a^{mn}$

(iv) $(ab)^n = a^n b^n$

(v) $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

(vi) $a^0 = 1$

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Surds:

Let *a* be rational number and *n* be a positive integer such that $a^{(1/n)} = \sqrt[n]{a}$

Then, $\sqrt[n]{a}$ is called a surd of order *n*.

Law of Surds:

i. $\sqrt[n]{a} = a^{(1/n)}$

ii. $\sqrt[n]{ab} = \sqrt[n]{a} \times \sqrt[n]{b}$

iii. $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

iv. $\left(\sqrt[n]{a}\right)^n = a$

v. $\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$

vi. $\left(\sqrt[n]{a}\right)^m = \sqrt[n]{a^m}$

Permutation & Combination

Permutation & Formula: A permutation is the choice of *r* things from a set of *n* things without replacement. Order matters in permutation.

$$n_{P_r} = \frac{n!}{(n-r)!}$$

Combination Formula: A combination is the choice of *r* things from a set of *n* things without replacement. Order does not matter in combination.

$$n_{C_r} = \frac{n!}{(n-r)!r!} = \frac{n_{Pr}}{r!}$$

Mixtures and Allegations

Allegation: It is the rule that enables us to find the ratio in which two or more ingredients at the given price must be mixed to produce a mixture of desired price.

Mean Price: The cost of a unit quantity of the mixture is called the mean price.

Rule of Allegation:

If two ingredients are mixed, then

(Quantity of cheaper / Quantity of dearer) = (C.P. of dearer – Mean Price / Mean price – C.P. of cheaper)

Trigonometric Identities

- Sine=Opposite/Hypotenuse
- Secant=Hypotenuse/Adjacent
- Cosine=Adjacent/Hypotenuse
- Tangent=Opposite/Adjacent
- Co−Secant=Hypotenuse/Opposite
- Co−Tangent=Adjacent/Opposite

The reciprocal identities are given as

- Cosecθ =1/sinθ
- sinθ =1/Cosecθ
- secθ =1/cosθ
- cosθ =1/secθ
- cotθ =1/tanθ
- tanθ =1/cotθ

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Coordinate Geometry

The Distance Between two Points A and B:

$AB^e = \sqrt{(Bx - Ax)^2 + (By - Ay)^2}$

The Midpoint of a Line Joining Two Points

The midpoint of the line joining the points (x_1, y_1) and (x_2, y_2) is:

$$\frac{1}{2}(x_1 + x_2), \frac{1}{2}(y_1 + y_2)$$

The Equation of a Line Using One Point and the Gradient

The equation of a line which has gradient m and which passes through the point (x_1, y_1) is:

$y - y_1 = m(x - x_1)$

Mensuration

Rectangle

- Area = l × b
- Perimeter = 2(l+b)

Triangle

- Area =b×h/2 or $\sqrt{s(s-a)(s-b)(s-c)}$

…….where s=a+b+c/2

Square

- Area = a×a
- Perimeter = 4a

Circle

- Area = πr^2 or $\pi d^2/4$
- Circumference = $2\pi r$ or πd
- Area of sector of a circle = $(\theta \pi r^2)/360$

Cube

- Volume: V $\Rightarrow l^3$
- Lateral surface area = $4a^2$
- Surface Area: S = $6s^2$
- Diagonal (d) = $\sqrt{3}l$

Cuboid

- Volume of cuboid: $l \times b \times h$
- Total surface area = 2 (lb + bh + hl) or $6l^2$
- Length of diagonal = $\sqrt{l^2 + b^2 + h^2}$

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8th August

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- Coverage of all relevant NCERTs (old and new)
- Crisp Summary Notes
- 7 - NCERT based tests for practice.

AI Based Assessment (TACKLE Test Series)

- Integrated Prelims & Mains Tests
- Detailed strengths & weakness analysis
- Guided Mentorship

CURRENT AFFAIRS

- News Analysis from 7 National Dailies & Government Reports
- 24 months coverage
- Weekly & Monthly - MCQs & Editorials

On-Target Handouts

- Concise & Compiled Handouts
- Topic Oriented Simplified Mindamaps, Mnemonics etc.

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QUANT PRACTICE QUESTIONS

1. $1^2 - 2^2 + 3^3 - 4^2 + \ldots - 198^2 + 199^2$:

(a) 19900 (b) 12321

(c) 19998 (d) none of these

2. A number *'p'* is such that it is divisible by 7 but not by 2.

Another number *'q'* is divisible by 6 but not by 5, then the following expression which necessarily be an integer is :

(a) $\frac{7p+6q}{42}$ (b) $\frac{5p+6q}{71}$

(c) $\frac{6p+7q}{42}$ (d) none of these

3. There are 10 compartments in passenger train which carries on an average 20 passengers per compartment. If atleast 12 passengers were sitting in each compartment and no any compartment has equal number of passengers then maximum how many passengers can be accommodated in any compartment:

(a) 64 (b) 45

(c) 56 (d) none of these

4. From a container, 6 litres milk was drawn out and was replaced by water. Again 6 litres of mixture was drawn out & was replaced by the water. Thus the quantity of milk and water in the container after these two operations is 9 : 16. The quantity of mixture is

(a) 15 (b) 16

(c) 25 (d) 31

5. The ratio of copper and nickel by weight in the two allows X and Y are 2 : 7 and 5 : 4. How many kilogram of the alloy X and Y are required to make 42 kg of new allow Z in which the ratio of copper and nickel is same?

(a) 6 kg and 36 kg (b) 10 kg and 32 kg

(c) 7 kg and 35 kg (d) none of these

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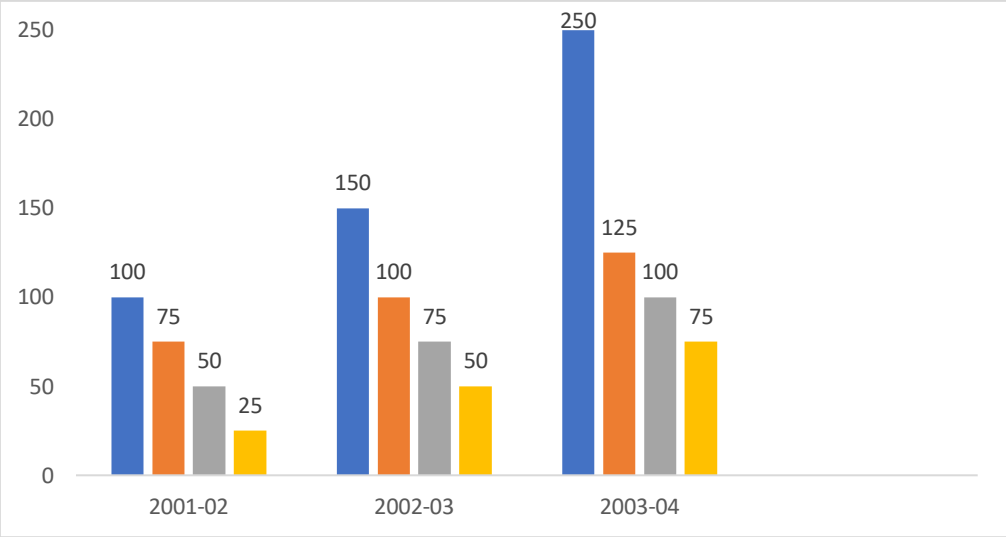
6. Direction for question number 1, 2 and 3: The bar graph shown below reveals the data about the no. of students in different disciplines of MBA at a prominent Business School in India.



6(i). The growth rate of Finance compared to that of marketing is:

(a) less (b) equal

(c) greater (d) none of these

6(ii). Total no. of MBA students in the session of 2004-05 if the no. of students in 2004-2005 is increasing by 9.09% over the previous year:

(a) 555 (b) 600

(c) 777 (d) none of these

6(iii). In the session of 2002-03 what percentage of MBA students are studying International Business?

(a) 13.33% (b) 25%

(c) 6.66% (d) 24%

7. A, B and C invest in the ratio of 3 : 4 : 5. The percentage of return on their investments are in the ratio of 6 : 5 : 4. Find the total earnings. If B earns Rs. 250 more than A:

(a) Rs. 6000 (b) Rs. 7250

(c) Rs. 5000 (d) none of these

8. Cost price of 12 oranges is equal to the selling price of 9 oranges and the discount on 10 oranges is equal to the profit on 5 oranges. What is the percentage point difference between the profit percentage and discount percentages?

(a) 20 (b) 22.22

(c) 16.66 (d) 15

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9. Akram Ali left an amount of Rs. 340000 to be divided between his two sons aged 10 years and 12 years such that both of them would get an equal amount when each attain 18 years age. What is the share of elder brother if the whole amount was invested at 10% simple interest:

(a) 12000 (b) 16000

(c) 160000 (d) 180000

10. A property dealer bought a rectangular plot (of land) in Noida 5 years ago at the rate of Rs. 1000 per m^2. The cost of plot is increases by 5% in every 6 years and the worth of a rupee falls down at a rate of 2% in every 5 years. What is the approximate value of the land per $meter^2$ 25 years hence?

(a) Rs. 995 (b) Rs. 1134

(c) Rs. 1500 (d) Rs. 1495

11. There are three boats B_1, B_2 and B_3 working together they carry 60 people in each trip. One day an early morning B_1 carried 50 people in few trips alone. When it stopped carrying the passengers B_2 and B_3 started carrying the people together. It took a total of 10 trips to carry 300 people by B_1, B_2 and B_3. It is known that each day on an average 300 people cross the river using only one of the 3 boats B_1, B_2 and B_3. How many trips it would take to B_1 to carry 150 passengers alone?

(a) 15 (b) 30

(c) 25 (d) 10

12. Two boats start at the same instant to cross a river W metre wide. The faster boat reaches the other bank and returns back immediately. What are the distances travelled by them when they meet, where the speeds of these boats are b_1 & b_2?

(a) $\frac{2W}{(b_1+b_2)}, \frac{2W}{(b_1-b_2)}$ (b) $\frac{2W}{(b_1+b_2)}b_1$ and $\frac{2W}{(b_1+b_2)}b_2$

(c) $\frac{W}{(b_1+b_2)}b_1, \frac{W}{(b_1+b_2)}$ (d) data insufficient

13. At what time after 3 : 10 am, the acute angle made by the minute and hour-hand is double to that of at 3 : 10 am, for the first time?

(a) 4 h 43 min (b) 3 h 48 min

(c) $3h\frac{320}{11}min$ (d) none of these

14. The four triangles formed by joining the pairs of mid-points of the sides of a given triangle are congruent if the given triangle is:

(a) an isosceles triangle (b) an equilateral triangle

(c) a right angled triangle (d) of any shape

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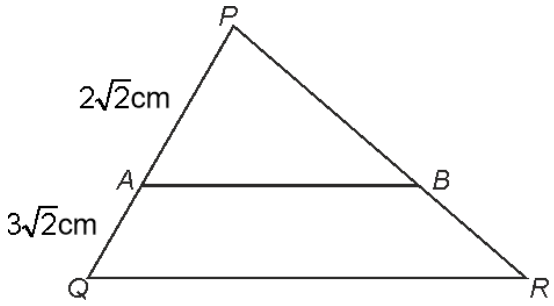
15. In ΔPQR, AP = $2\sqrt{2}$ cm, AQ = $3\sqrt{2}$ cm. AB || QR. Find the length of BR :



(a) $6\sqrt{2}$ cm (b) 6 cm

(c) $5\sqrt{2}$ cm (d) none of these

16. If *a, b, c* are not equal, then the value of $\frac{(a+b+c)(ab+bc+ca)}{abc}$ is:

(a) less than 9 (b) greater than 9

(c) less than or equal to 9 (d) can't be determined

17. If *p* and *q* are the roots of $x^2 + px + q = 0$, then:

(a) $p = 1$ (b) $p = 1$ or 0

(c) $p = -2$ (d) $p = -2$ or 0

18. In a city 45% of the people read English and Hindi newspapers. 15% read only Urdu newspaper and 75% reads all the three newspapers and everybody read atleast one newspaper out of English, Hindi and Urdu newspapers, how many read Urdu newspaper?

(a) Max 45% (b) Max. 555

(c) a right angled triangle (d) Min 30%

19. Find the sum of $1+\frac{2}{3}+\frac{4}{9}+\frac{6}{27}+\frac{8}{81}+\frac{10}{243}+....\infty$:

(a) $\frac{2}{3}$ (b) $\frac{5}{2}$

(c) $\frac{19}{45}$ (d) $\frac{81}{17}$

20. The total number of natural numbers of 6 digits that can be formed with digits 1, 2, 3, 4, if all the digits are to appear in the same number atleast once, is:

(a) 740 (b) 1830

(c) 1560 (d) none of these

21. In a certain test there are *n* questions. In this test 2^{n-k} students gave wrong answers to atleast *k* questions, where $k = 1, 2, 3\ldots, n$. If the total number of wrong answers given is 2047, then *n* is equal to:

(a) 10 (b) 11

(c) 12 (d) 13

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22. A consignment of 15 wristwatches contains 4 defectives. The wristwatches are selected at random, one by one and examined. The ones examined are not put back. What is the probability that ninth one examined is the last defective?

(a) $\frac{11}{195}$ (b) $\frac{17}{195}$

(c) $\frac{8}{195}$ (d) $\frac{16}{195}$

23. Two numbers a and b are chosen at random from the set of first 30 natural numbers. The probability that $a^2 - b^2$ is divisible by 3 is:

(a) $\frac{37}{87}$ (b) $\frac{47}{87}$

(c) $\frac{17}{29}$ (d) none of these

24. The smallest integer x for which the inequality $\frac{x-7}{x^2+5x-36} > 0$ is given by

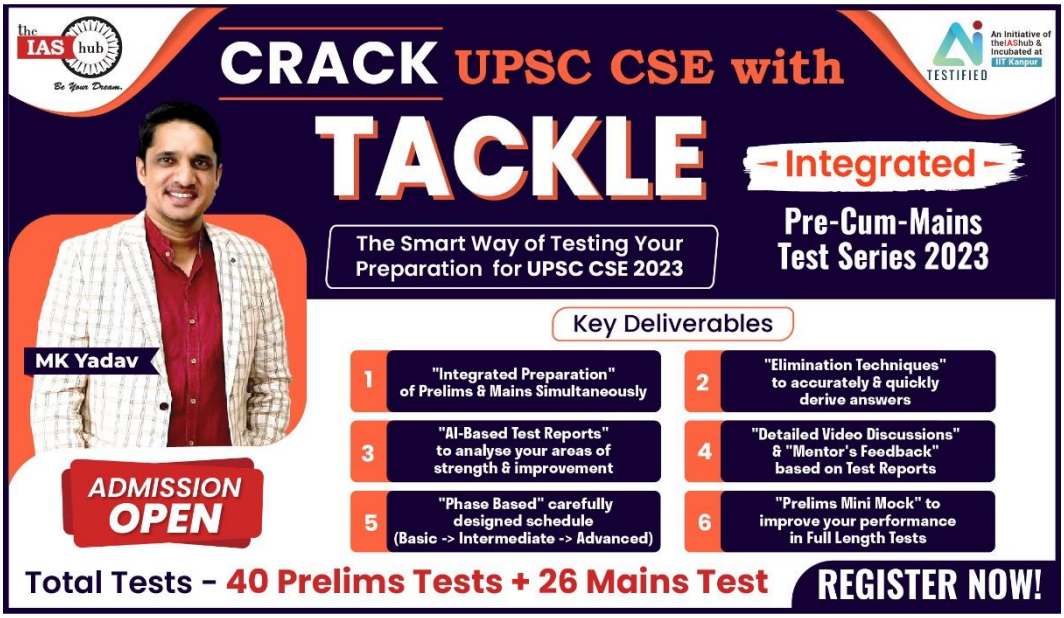
(a) – 12 (b) 9

(c) –9 (d) – 8

25. Akthat plans to cover a rectangular floor of dimensions 9.5 meters and 11.5 meters using tiles. Two types of square shaped tiles are available in the market. A tile with side 1 meter costs ₹ 100 and a tile with side 0.5 meters cost ₹ 30. The tiles can be cut if required. What will be the minimum cost of covering the entire floor with tiles?

(a) 10930 (b) 10900

(c) 11000 (d) 10950



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ANSWER KEYS

1-(a)	2-(c)	3-(c)	4-(a)	5-(c)
6(i)-(a)	6(ii)-(b)	6(iii)-(a)	7-(b)	8-(b)
9-(b)	10-(d)	11-(a)	12-(b)	13-(c)
14-(d)	15-(b)	16-(b)	17-(b)	18-(b)
19-(b)	20-(b)	21-(c)	22-(c)	23-(b)
23-(b)	24-(d)	25-(a)		

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REASONING PRACTICE QUESTIONS

Directions (Q No. 1(a), 1(b), 1(c) Select one alternative out of given four alternatives, which is analogous to the first two.

1.(i) TZW : 25 : : QYS : ?

(a) 35 (b) 160

(c) 38 (d) 158

1.(ii) TGVL : 720515 : : GPAE : ?

(a) 27122226 (b) 415827

(c) 41330 (d) 20112622

1.(iii) Which of the following depicts the relationship between the following?

Dda: aDD : : Rrb :?

(a) DDA (b) RRR

(c) bRR (d) BBr

2. In the series AABABCABCDABCDE .. which letter occupies the 100th position? UPSC (Civil Services) 2008

(a) H (b) 1

(c) J (d) K

3. In a certain language, 'tea' is called 'coffee', 'coffee' is called 'salty', 'salty' is called 'sweet' and 'sweet' is called 'tasty', then the 'sweet coffee' will be coded as

(a) tasty tea (b) salty tasty

(c) tea tasty (d) tasty salty

4. If 'pink' means 'blue', 'blue' means 'white', 'white' means black', 'black' means 'red', 'red' means 'green', then what is the colour of 'blood'?

(a) red (b) green

(c) blue (d) black

5. If it is possible to make a meaningful word with the 2nd, 6th, 9th and 12th letters of the word contribution which of the following will be the last letter of that word? If more than one such word can be formed, give 'M' as the answer and if no such word can be formed, give 'X' as the answer.

(a) T (b) O

(c) M (d) X

6. Who is the North-East of the person, which is to the left to Kunal?

(a) Dinesh (b) Nitin

(c) Atul (d) None of these

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7. Six children B, D, C, M, J and K are split into two groups of three each and are made to stand in two rows in such a way that a child in one row is exactly facing a child in the other row. M is not at the ends of any row and is to the right of J, who is facing C.K is to the left of D, who is facing M. Which of the following groups of children are in the same row?

(a) M J K (b) B M D

(c) B D C (d) None of these

8. Pointing to a photograph Yuvraj says, 'He is the only brother of the only daughter of my sister's maternal grandmother.' Pointing to another photograph Sourav says, 'He is the only brother of the only daughter of my sister's maternal grandmother.' If among the two photographs, one was either of Sourav of Yuvraj and the photograph, towards which Yuvraj was pointing was not of Sourav, then how is Yuvraj related to Sourav?

(a) Paternal uncle (b) Maternal uncle

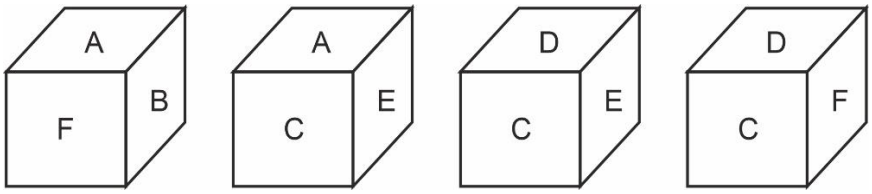
(c) Grandfather (d) None of the above

9. There are 50 students admitted to a nursery class. Some students can speak only English and some can speak only Hindi. Ten students can speak both English and Hindi. If the number of students who can speak English is 21, then how many students can speak Hindi, how many can speak only Hindi and how many can speak only English respectively?

(a) 39, 29 and 11 (b) 37. 27 and 13

(c) 28, 18 and 22 (d) 21, 11 and 29

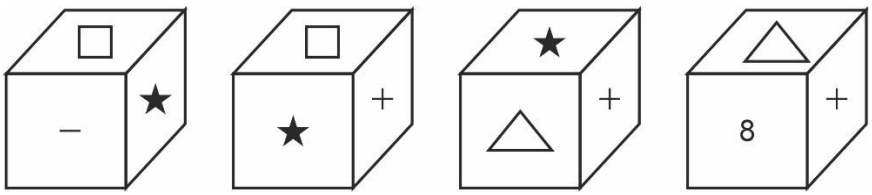
10. Four position of a cube are shown below. Which letter will be on the face opposite to the face with 'A'?



(a) D (b) B

(c) C (d) F

11. Which symbol will be on the face opposite to the face with symbol ★?



(a) D (b) B

(c) C (d) F

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Direction (Q. Nos. 12 (i) (ii) (iii) (iv) These questions are based on the following information. Study it carefully to answer the questions that follow.

Seven officers L, M, N, P, Q, R and S work in three different shifts I, II and III with atleast two persons work in each shift. Each one of them has a different weekly off from Monday to Sunday not necessary in the same order.

M work in second shift only with R, whose weekly off is on Friday, Q's weekly off is on the next day of L's weekly off and both of them work in different shifts.

P works in third shift and his weekly off is on Saturday, S has a weekly off on Monday and he works in first shift. N has a weekly off on Sunday and he works in first shift. L and P do not work in the same shift. L's weekly off is on Tuesday.

12.(i) Whose weekly off is on Sunday?

(a) L (b) M

(c) N (d) Q

12.(ii) Which of the following groups of officers works in shift I?

(a) L, N and S (b) L and S

(c) N and S (d) Q

12.(iii) On which day is Q's weekly off?

(a) Tuesday (b) Wednesday

(c) Sunday (d) Cannot be determined

12.(iv) Which of the following combinations of shift, person and weekly off is definitely correct?

(a) II, M, Sunday (b) III, N, Sunday

(c) II, P, Sunday (d) I, L, Tuesday

13. The train for Patna leaves at after every two and a half hours from new Delhi railway station. An announcement was made at the station that the train for Patna had left 40 min ago and the next train will leave at 18:00 h. At what time was the announcement made?

(a) 15:30 h (b) 17:10 h

(c) 16:10 h (d) 15:00 h

14. Keshav knows that Sudha's marks are more than 3 but less than 8 in a unit test. Sonia knows that these are more than 6 but less than 10. If both of them are correct, then which of the following statements about Sudha's marks is definitely true?

(a) It has only one value (b) It has any of three values

(c) It has either of the two values (d) It has any of the four values

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Directions (Q. Nos. 15 (a) (b) (c) (d) Each of the questions given below is followed by two statements numbered I and II. Decide whether the data provided in the statements are sufficient to answer the questions.

Give answer

(a) If the statement I alone is sufficient to provide the answer

(b) If the Statement II alone is sufficient to provide the answer

(c) If both the statements are required to provide the answer

(d) If neither Statement I nor II is sufficient to provide the answer

15.(i) Amongst five students A, B, C, D an E who got the maximum marks?

I. D got more than A and C.

II. B got less than E but more than D.

(a) It has only one value (b) It has any of three values

(c) It has either of the two values (d) It has any of the four values

15.(ii) A toy was initially listed at a price to give the shopkeeper 20% profit of the wholesale cost. What is the wholesale cost?

I. After reducing the listed price by 10%, the toy sold a profit of ₹ 10.

II. The tow sold for ₹ 50

15.(iii) Is $a < b$?

I. $a^2 - 4a + 4 = 0$

II. $b^2 - 9 - 6b$

15.(iv) What is the value of a two-digit number?

I. The sum of the two digits is 6.

II. The difference of the two digits is 2.

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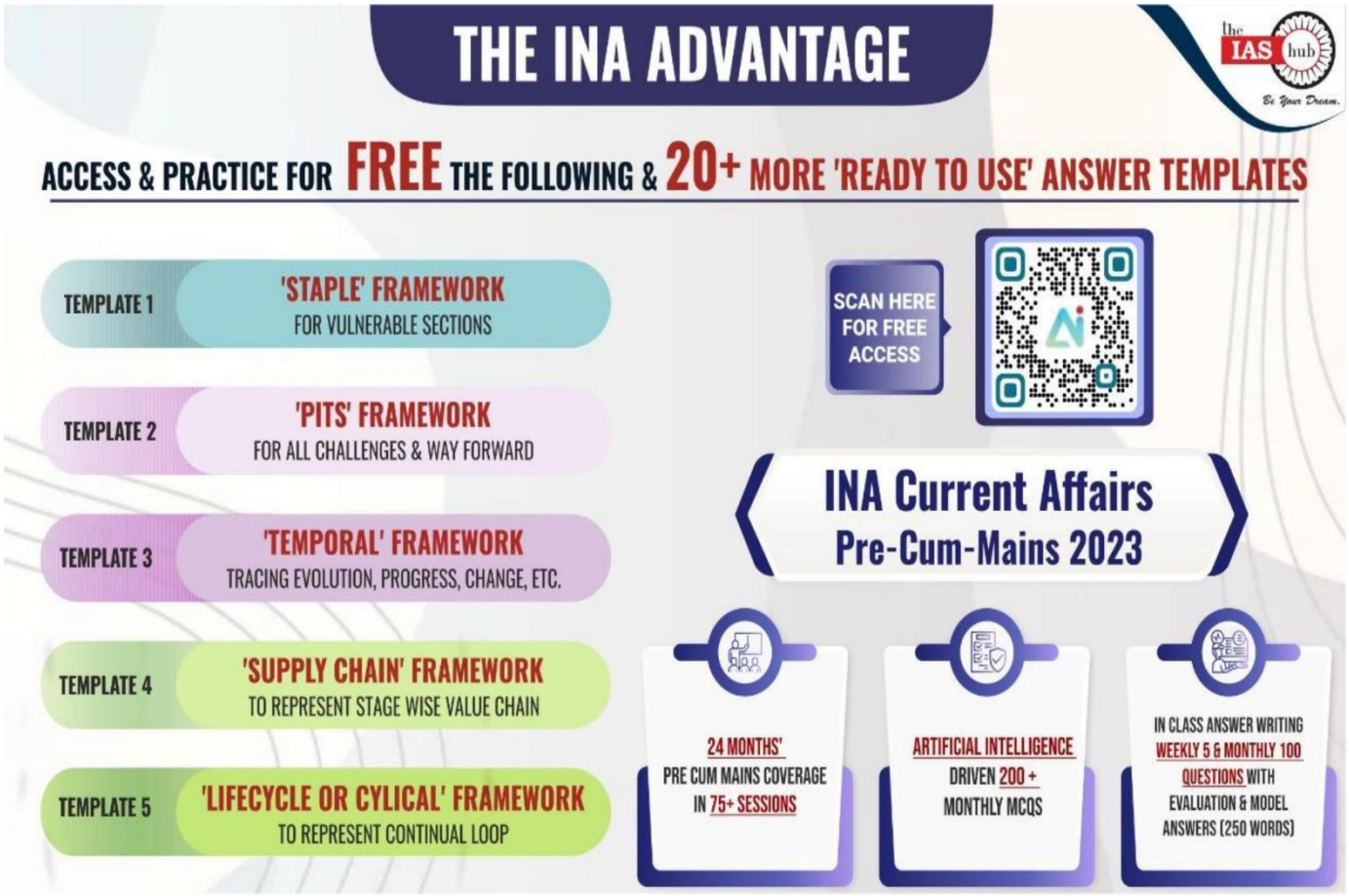
ANSWER KEYS

1(i)-(b)	1(ii)-(d)	1(iii)-(c)	2-(b)	3-(d)
4-(b)	5-(b)	6-(d)	7-(d)	8-(b)
9-(a)	10-(a)	11-(c)	12(i)-(c)	12(ii)-(a)
12(iii)-(b)	12(iv)-(d)	13-(c)	14-(a)	15(i)-(c)
15(ii)-(a)	15(iii)-(d)	15(iv)-(d)		



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