



UDAAN

A QUEST FOR SCIENCE ASPIRANTS

SCIENCE APTITUDE TEST

CLASS 8

ANSWER KEY WITH SOLUTIONS

DATE : 19.01.25

IIT Ashram
IIT JEE | NEET | GUJCET | FOUNDATION (6 to10)



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PART - I : MENTAL ABILITY

1.

Sol: (a)

Clearly, the numerators of the fractions in the given sequence form the series 1, 3, 5, 7, in which each term is obtained by adding 2 to the previous term. The denominators of the fractions form the series 2, 4, 8, 16,

i.e. 21, 22, 23, 24.

So, the numerator of the next fraction will be

$(7 + 12)$ i.e., 19 and the denominator will be 25 i.e. 32.

The next term is $\frac{19}{32}$

2.

Sol. (c)

The pattern is $+ 5, + 7, + 9, + 11, \dots$

Missing number = $33 + 13 = 46$

3.

Sol. (d)

The number are coded as shown :

9 4 3 1 2 8

B E D S W T

i.e., 4 as E, 9 as B, 2 as W, 3 as D and 1 as S, So, 492311 is coded as EBWDSS.

4

Sol. (c)

The answer is (C) i.e. 12 because

$(7 \times 4) - (5 \times 3) = 28 - 15 = 13$ (Ist Circle)

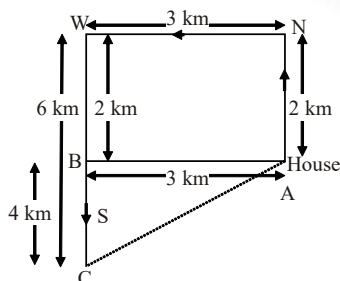
$(8 \times 4) - (9 \times 3) = 32 - 27 = 05$ (IIInd Circle)

So, $(9 \times 4) - (8 \times 3) = 36 - 24 = 12$ (IIIrd Circle)

5.

Sol: (b)

See the figure.



$$(AC)^2 = (AB)^2 + (BC)^2$$

$$= 9 + 16$$

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

Ans.

6.

Sol: (a)

From the figures (i), (ii) and (iv) we find that numbers 6, 1, 5 and 2 appear on the adjacent surfaces to the number 3.

Therefore, number 4 will be opposite to number 3.

Hence option (a) is the answer.

7.

Sol. (b)

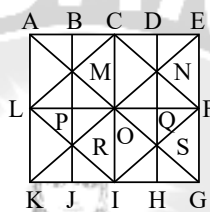
The series is cabbbb/cabbbb/cabbbb

Thus , the pattern cabbbb is repeated.

8.

Sol. (b)

The figure is labelled as shown.



Clearly, there are 3 horizontal lines namely AE, LF and KG.

There are 5 vertical lines : AK, BJ, CI, DH and E G.

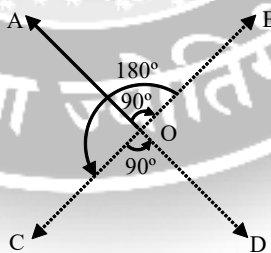
There are 6 slanting lines : LC, KE, IF, LI, AG and CF.

Thus, there are $3 + 5 + 6 = 14$ straight lines in the figure.

Hence, the answer is (b).

9.

Sol. (d)



As shown in figure the man initially faces in the direction OA. On moving 90° clockwise, he faces in the direction OB. On further moving 180° anticlockwise, he faces in the direction OC. Finally on moving 90° anti-clockwise, he faces in the direction OD, which is South-East.

10.

Sol. (c)

Using the proper signs, we get :

$$36 - 12 \div 4 + 6 \div 2 \times 3$$

$$= 36 - 3 + 3 \times 3$$

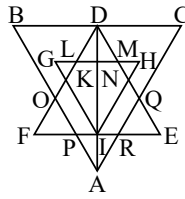
$$= 36 - 3 + 9 = 45 - 3 = 42$$

So, the correct answer is (C)

11.

Sol: (c)

The figure may be labelled as shown :



The simplest triangles are GKL, MHN, DLJ, DMJ, QRE, OPF, PIA and IRA i. e. 8 in number.

The triangles having two components each. are BDO, CDQ, DLM, PRA, KEL, NEI, HJI, GJI, DKI, and DNI i. e. 10.

The triangles having four components each, are DIE, DFI, DOA, DQA and DHI i.e 252.

The triangle having six components each, are DCA, and DBA i. e. 2.

DEF is the only triangle having eight components.

ABC is the only triangle having twelve components.

Thus, there are $8 + 10 + 5 + 2 + 1 + 1 = 27$ triangles in the figure.

12.

Sol: (d)

Granddaughter

A is the sister of B and B is the daughter of C.

So, A is the daughter of C. Also, D is the father of C.

So, A is the granddaughter of D.

13.

Sol: (c)

Number of students in class = $(8 + 1 + 37) = 46$

14

Sol: (b)

In the first column $25 = (17 - 12)^2$ therefore

$(19 - 16)^2$ is 9

15.

Sol: (b)

The numbers are coded as shown :

3 9 4 6 1 8 7

P O A L R S E

i.e., 9 as O, 4 as A, 6 as L, 7 as E and 8 as S. So, 94678 is coded as OALES.

PART - II : MATHEMATICS

1.

Sol: (c)

We have,

$$\begin{aligned} & (1.5p + 1.2q)^2 - (1.5p - 1.2q)^2 \\ &= [(1.5p + 1.2q) + (1.5p - 1.2q)][(1.5p + 1.2q) - (1.5p - 1.2q)] \\ & \text{[using the identity, } a^2 - b^2 = (a + b)(a - b) \text{]} \\ &= [(1.5p + 1.5p) + (1.2q - 1.2q)][(1.5p - 1.5p) + (1.2q + 1.2q)] = 3p * 2.4q = 7.2pq \end{aligned}$$

2.

Sol: (a)

$$\begin{aligned} & (a - b)(a^2 + b^2 + ab) - (a + b)(a^2 + b^2 - ab) \\ &= a(a^2 + b^2 + ab) - b(a^2 + b^2 + ab) - a(a^2 + b^2 - ab) - b(a^2 + b^2 - ab) \\ &= a^3 + ab^2 + a^2b - ba^2 - b^3 - ab^2 - a^3 - ab^2 + a^2b - ba^2 - b^3 + ab^2 \\ &= (a^3 - a^3) + (-b^3 - b^3) + (ab^2 - ab^2) + (a^2b - a^2b) + (ab^2 - ab^2) \\ &= 0 - 2b^3 + 0 + 0 + 0 = -2b^3 \end{aligned}$$

3.

Sol: (a)

$$\begin{aligned} 2\pi(y^2 - 7y + 12) &= 2\pi(y - 3)h \\ \Rightarrow h &= (y^2 - 7y + 12) / (y - 3) \\ \Rightarrow h &= (y - 3)(y - 4) / (y - 3) \\ \Rightarrow h &= y - 4 \end{aligned}$$

The height of the cylinder is $(y - 4)$ units.

4.

Sol: (a)

$$\begin{aligned} \text{Given, } m - n &= 16 \text{ and } m^2 + n^2 = 400 \\ \text{Since, } (m - n)^2 &= m^2 + n^2 - 2mn \\ \text{[Using the identity, } (a - b)^2 &= a^2 + b^2 - 2ab \text{]} \\ \therefore (16)^2 &= 400 - 2mn \\ \Rightarrow 2mn &= 400 - (16)^2 \\ \Rightarrow 2mn &= 400 - 256 \\ \Rightarrow 2mn &= 144 \\ \Rightarrow mn &= 144 / 2 \\ \Rightarrow mn &= 72 \end{aligned}$$

5.

Sol: (a)

We have,

$$\begin{aligned} pq^2a &= (4pq + 3q)^2 - (4pq - 3q)^2 \\ \Rightarrow [(4pq + 3q) + (4pq - 3q)][(4pq + 3q) - (4pq - 3q)] \\ \dots \text{[Using the identity, } a^2 - b^2 &= (a + b)(a - b) \text{]} \\ \Rightarrow (4pq + 3q + 4pq - 3q)(4pq + 3q - 4pq + 3q) \\ \Rightarrow 8pq \times 6q \\ \Rightarrow pq^2a &= 48pq^2 \\ \Rightarrow a &= \frac{48pq^2}{pq^2} \\ \Rightarrow a &= 48 \end{aligned}$$

6.

Sol: (a)

Here height of the pole and length of the shadow are in direct proportion.

Direct Proportion: Two quantities are said to be direct proportion if an increase in one leads to the increase in the other quantity and vice-versa.

We know that 1 m 100 cm so

$$5 \text{ m } 60\text{cm} = 5 \times 100 + 60 = 500 + 60 = 560\text{cm}$$

$$3 \text{ m } 20\text{cm} = 3 \times 100 + 20 = 300 + 20 = 320\text{cm} \quad 10 \text{ m } 50\text{cm} = 10 \times 100 + 50 = 1000 + 50 = 1050\text{cm}$$

Let the length of the shadow of another pole be x.

Since these two quantities are in direct proportion so

Height of the pole (in cm) 560 1050

Length of the pole (in cm) 320 x

$$\frac{560}{320} = \frac{1050}{x}, \frac{320}{560} = \frac{x}{1050}$$

$$x = \frac{320}{560} \times 1050 = 600\text{cm}$$

Hence length of the shadow of the another pole is 600 cm

7.

Sol: (b)

Number of crystals in 1 kg sugar = 4.5×10^6

Therefore, number of crystals in 1.2 kg of sugar = $1.2 \times 4.5 \times 10^6 = 5.4 \times 10^6$

8.

Sol: (c)

Let the total distance = x km .

Let the time taken by Ravi to reach the school at sharp time = t min.

We know that Speed = $\frac{\text{Distance}}{\text{time}}$

If the speed of the bicycle is 10 km/h then he reaches his school late by 8 min.

$$\therefore \frac{x}{10} = t + \frac{8}{60} \quad [\text{Late time} = \text{sharp time} + 8 \text{ min}]$$

$$\Rightarrow \frac{x}{10} = t + \frac{2}{15} \dots\dots(i)$$

If the speed of the bicycle is 16 km/h then he reach his school 10 min early.

$$\therefore \frac{x}{16} = t + \frac{10}{60} \quad [\text{Early time sharp time} - 10 \text{ min}]$$

$$\Rightarrow \frac{x}{16} = t - \frac{1}{6} \dots\dots(ii)$$

On subtracting Eq. (ii) from (i), we get

$$\frac{x}{10} - \frac{x}{16} = \frac{2}{15} + \frac{1}{6}$$

$$\Rightarrow \frac{8x - 5x}{80} = \frac{4 + 5}{30}$$

$$\Rightarrow \frac{3x}{80} = \frac{9}{30}$$

$$\Rightarrow x = \frac{9 \times 80}{30 \times 3} = 8 \text{ km}$$

Now put $x = 8$ in E.q. (i), we get

$$\frac{8}{10} = t + \frac{2}{15}$$

$$\Rightarrow t = \frac{8}{10} - \frac{2}{15} = \frac{24 - 4}{30}$$

$$\Rightarrow t = \frac{20}{30} = \frac{2}{3} \text{ hours}$$

So the time of school is 40 mins after 8:20 am 9:00 am

9.

Sol: (c)

Provision available for 120 men for 200 days.

total provision can be consumed by 1 man

$$= 120 \times 200 = 24000 \text{ days.}$$

Since, after 5 days 30 men died

Total provision consumed in 5 days

$$= 120 \times 5 = 600 \text{ men days}$$

total provision left = 24000 - 600 = 23400 men days

Persons left after 5 days = 120 - 30 = 90 men

No of days it can last for remaining people = 23400 / 90 = 260 days

Thus, the remaining provision will last for 260 days

10.

Sol: (a)

$$\text{we have } (2^{-1} + 4^{-1} + 6^{-1} + 8^{-1})x = 1$$

Using law of exponents $a^{-m} = \frac{1}{a^m}$

$$\text{Then } \left(\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8} \right)^x = 1$$

$$\Rightarrow \left(\frac{12 + 64 + 43}{24} \right)^x = 1$$

$$\Rightarrow \left(\frac{25}{24} \right)^x = 1$$

this can be possible only if $x = 0$ Since $a = 1$

11.

Sol: (d)

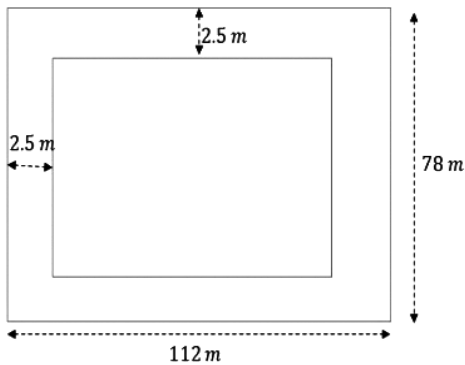
The radius of a proton is 1.3 fermi.

One fermi is equal to 10^{-15} m.

So, the radius of the proton is 1.3×10^{-15} m Hence, standard form of radius of the proton is 1.3×10^{-15} m .

12.

Sol: (d)



Length of rectangular grassy plot = 112 m long and Breadth = 78m

Therefore, the outside area of rectangular grassy plot

$$= L \times B = 112 \times 78 = 8736 \text{ m}^2$$

$$\text{Total Area of Plot} = 8736 \text{ m}^2$$

It has a gravel path 2.5 m wide all around it on the inside.

$$\text{Then, Grassy area} = (112 - 5)(78 - 5) = 7811 \text{ m}^2$$

$$\text{Area of Path} = \text{Area of total plot area of inside (grassy area)} = 8736 - 7811 = 925 \text{ m}^2$$

13.

Sol: (b)

Let the length of the other parallel side be b

Length of one parallel side (a) = 10 cm and height (h) = 4 cm

$$\text{Area of trapezium} = \frac{1}{2}(a + b) \times h$$

$$\Rightarrow 34 = \frac{1}{2}(10 + b) \times 4$$

$$\Rightarrow 34 = (10 + b) \times 2$$

$$\Rightarrow 34 = 20 + 2b$$

$$\Rightarrow 34 - 20 = 2b$$

$$\Rightarrow 14 = 2b$$

$$\Rightarrow b = 7$$

Hence an other required parallel sides is 7 cm

14.

Sol: (b)

The correct option is B

Volume of the cylinder will remain unchanged.

Explanation for the correct option:

Find the change in the area of the cylinder.

Let the height of the cylinder be h and the radius be r.

$$\text{The volume of the cylinder} = \pi r^2 h$$

If the height of the cylinder be $\frac{h}{4}$ and the radius be 2r.

Volume after changing dimension

$$= \pi(2r)^2 \left(\frac{h}{4}\right) = \pi(4r^2) \left(\frac{h}{4}\right) = \pi r^2 h$$

The volume of the cylinder remains unchanged after changing the dimensions.
Hence option (b) is the correct answer.

15.

Sol: (b)

Let the edge of cube be l

Since, Surface area of the cube $(A) = 6l^2$

When edge of cube is doubled, then

Surface area of the new cube

$$(A') = 6(2l)^2 = 6 \times 4l^2 = 4 \times 6l^2$$

$$A' = 4A$$

Hence, surface area will increase 4 times

16.

Sol: (a)

The correct option is (a) Rs 3916.80

Principal $(P) = 48000$

Rate $(R) = 8\%$ p. a.

Time $(n) = 1$ year

Interest is compounded half yearly, then Amount is given by

$$A = P \left(1 + \frac{R}{200}\right)^{2n}$$

$$= 48000 \left(1 + \frac{8}{200}\right)^2$$

$$= 48000 \times \frac{26}{25} \times \frac{26}{25}$$

$$= 76.8 \times 26 \times 26$$

$$= 51916.80$$

Therefore, compound interest $= A - P$

$$= \text{Rs } (51916.8 - 48000) = 3916.8$$

17.

Sol: (b)

The correct option is B

Given: Principal amount, $P = \text{Rs } 800$

Total amount after t years, $A = \text{Rs. } 882$

Rate of interest, $R = 5\%$ per annum

As we know that the compound interest

$$= P \left[1 + \left(\frac{5}{100}\right)^t\right] \Rightarrow 882 = 800 \left(1 + \frac{1}{20}\right)^t \Rightarrow \frac{882}{800} = \left(\frac{21}{20}\right)^t \Rightarrow \frac{441}{400} = \left(\frac{21}{20}\right)^t$$

$$\Rightarrow \left(\frac{21}{20}\right)^2 = \left(\frac{21}{20}\right)^t \Rightarrow t = 2 \text{ years.}$$

18.

Sol: (b)

The cost price of the article = Rs. 600

Gain % = 20% of CP

$$\therefore \text{Gain} = \frac{20 \times 600}{100} = \text{Rs. } 120$$

$$\therefore \text{SP} = \text{Gain} + \text{CP} = \text{Rs. } 600 + \text{Rs. } 120 = \text{Rs. } 720$$

Let marked price be Rs. x.

Since, he allow a discount of 10%.

According to the question,

$$x - 10\% \text{ of } x = \text{Rs. } 720$$

$$\Rightarrow x - \frac{10 \times x}{100} = 720 \Rightarrow \frac{100 - 10x}{100} = 720 \Rightarrow \frac{90x}{100} = 720$$

$$\Rightarrow x = \frac{720 \times 100}{90} \Rightarrow x = \text{Rs. } 800$$

Hence, required marked price is Rs. 800.

19.

Sol: (c)

The correct option is 5%

Let the cost price be Rs. 100.

Then, the marked price

$$= 100 + \frac{40}{100} \times 100 = \text{Rs. } 140$$

Discount = 25% of

$$140 = \frac{25}{100} \times 140 = \frac{140}{4} = \text{Rs. } 35$$

Selling price = marked price - discount = 140 - 35 = Rs. 105

Profit percentage

$$= \frac{\text{Profit}}{\text{C.P.}} \times 100 = \frac{105 - 100}{100} \times 100 = 5\%$$

20.

Sol: (b)

Time taken by A and B to complete a unit of work = 12 days

Therefore, work done by A and B in 1 day = $\frac{1}{12}$ units of work

Similarly,

Work done by B and C in 1 day = $\frac{1}{15}$ units of workWork done by A and C in 1 day = $\frac{1}{20}$ units of work Therefore, total work done by A, B and C

$$= \frac{1}{2} \times \left(\frac{1}{12} + \frac{1}{15} + \frac{1}{20} \right)$$

LCM of 12, 15 and 20 is 60

$$= \frac{1}{2} \times \left(\frac{1 \times 5 + 1 \times 4 + 1 \times 3}{60} \right) = \frac{1}{2} \times \left(\frac{12}{60} \right)$$

$$= \frac{1}{10} \text{ units of work}$$

Therefore, work done by A alone in 1 day = Total work done – Work done by B and C

$$= \frac{1}{10} - \frac{1}{15}$$

$$= \frac{1}{30} \text{ units of work}$$

Hence, time taken by A to complete a unit of work = 30 days

21.

Sol: (b)

Earning of 12 boys in 7 days = Rs. 840

So, 1 boy in 7 days will earn = Rs. $\frac{840}{12}$

= 70 rupees

1 boy will earn in 1 day = Rs. $\frac{70}{7}$

15 boys will earn in 1 day $15 \times 10 = 150$ Rs. So, 15 boys will earn in 6 days = $6 \times 150 = 900$ Rs. Hence, 15 boys will earn 900 Rs. in 6 days.

22.

Sol: (a)

$$\begin{aligned} & \{(24^2 + 72)^{1/2}\}^3 \\ &= \{(576 + 25)^{1/2}\}^3 \\ &= \{(625)^{1/2}\}^3 \\ &= (25)^3 = 15625 \end{aligned}$$

23.

Sol: (b)

Let's, first thing we should do is to find the cube of 3 and that is 27. Now, add 27 to 189 that is $27 + 189 = 216$ Finally, find the cube root of 216 and that is 6.

Therefore, the cube root of the larger number is 6.

24.

Sol: (c)

Step: Evaluate root $\sqrt[3]{0.1 \times 0.1 \times 0.1 \times 13 \times 13 \times 13}$

$$\sqrt[3]{0.1 \times 0.1 \times 0.1 \times 13 \times 13 \times 13}$$

$$= \sqrt[3]{(0.1 \times 0.1 \times 0.1) \times (13 \times 13 \times 13)} = 0.1 \times 13 = 1.3$$

Hence, the value of $\sqrt[3]{0.1 \times 0.1 \times 0.1 \times 13 \times 13 \times 13}$

is 1.3

25.

Sol: (c)

$$\begin{aligned}
 & (1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y \\
 &= 1.5x(1.5x + 4y + 3) - 4y(1.5x + 4y + 3) - 4.5x + 12y \\
 &= 2.25x^2 + 6xy + 4.5x - 6xy - 16y^2 - 12y - 4.5x + 12y \\
 &= 2.25x^2 + 6xy - 6xy + 4.5x - 4.5x - 16y^2 - 12y + 12y \\
 &= 2.25x^2 - 16y^2
 \end{aligned}$$

26.

Sol: (b)

The length of one side is the square root of the area of the field. Hence, we need to calculate the value

of $\sqrt{80\frac{244}{729}}$ We have

$$\sqrt{80\frac{244}{729}} = \sqrt{\frac{5856}{729}} = \sqrt{\frac{58564}{729}}$$

Now, to calculate the square root of the numerator and the denominator:

	242
2	58564
2	4
44	185
4	176
482	964
2	964
	0

We know that:

$$\sqrt{729} = 27$$

Therefore, length of one side of the field 242

27.

Sol: (a)

Step 1: Find the LCM

Given numbers are 4, 9 and 10

Prime factors of 4 are $4 = 2 \times 2$

Prime factors of 9 are $9 = 3 \times 3$

Prime factors of 10 are $10 = 5 \times 2$

LCM of 4, 9 and 10

$$\text{LCM}(4, 9, 10) = 2 \times 2 \times 3 \times 3 \times 5 = 180$$

Step 2: Find the least square number divisible by the given number

On grouping the factors of 180, we get $180 = (2 \times 2)(3 \times 3) \times 5$

That is 5 is not able to make their pair. So, to make it perfect square, 180 must be multiplied with 5

$$180 \times 5 = 900$$

Hence, 900 is the smallest square number divisible by each one of the numbers 4, 9 and 10

28.

Sol: (b)

On tossing two coins, following outcomes can be observed:

$\{(H,H),(T,T),(H,T),(T, H)\}$

Therefore, there are total of 4 possible outcomes.

Now, favourable outcomes are $\{(H, H), (H,T),(T, H)\}$

Therefore, no. of favourable outcomes are 3

Hence, $P(\text{Getting atleast one head}) = \frac{3}{4}$

29.

Sol: (c)

The correct option is C 9 m, 15 m

Let the two sides of parallelogram be $3x$ and $5x$

Perimeter = $2(\text{length} + \text{breadth})$

$$2(3x + 5x) = 16x$$

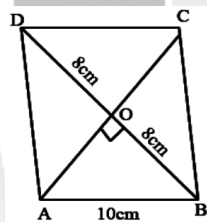
$$\Rightarrow 48 = 16x \quad \Rightarrow x = \frac{48}{16} = 3$$

Hence, the sides of the parallelogram are $3 \times 3 = 9\text{m}$ and $5 \times 3 = 15\text{m}$

30.

Sol: (b)

In rhombus ABCD.



$AB = 10\text{ cm}$, diagonal $BD = 16\text{ cm}$

Draw diagonal AC which bisects BD at O at right angle.

Now in $\triangle AOB$

$BO = OD = 8\text{ cm}$ and $AO = OC$

$$AB^2 = AO^2 + BO^2$$

$$(10)^2 = AO^2 + (8)^2$$

$$\Rightarrow 100 = AO^2 + 64$$

$$\Rightarrow AO^2 = 100 - 64 = 36 = (6)^2$$

$$AO = 6$$

$$AC = 2AO = 2 \times 6 = 12\text{ cm}$$

31.

Sol: (a)

Let us assume x be the no.

So another number will be $5x$

If we add 21 in both of them, these number become $(x + 21)$ and $(5x + 21)$

Now it is given that in new number one number is twice the other number

Thus, $5x + 21 = 2(x + 21)$

$$5x + 21 = 2x + 42$$

$$5x - 2x = 42 - 21$$

$$3x = 21$$

$$x = 7$$

Thus one number is 7 and other one is 35.

32.

Sol: (d)

Solve for the required number:

Let the number be zy and therefore can be written as $10x + y$

Given that,

• Sum of the two digits of a number is

$$9 \Rightarrow x + y = 9 \Rightarrow x = 9 - y$$

• On interchanging the digits the new number is 27 greater than the earlier number.

On interchanging the digits the new number is yz .

According to the question,

$$\Rightarrow (10y + x) - (10x + y) = 27$$

$$\Rightarrow 9y - 9x = 27$$

$$\Rightarrow y - x = \frac{27}{9}$$

$$\Rightarrow y - x = 3$$

$$\Rightarrow y - (9 - y) = 3 \quad [\because x + y = 9]$$

$$\Rightarrow y - 9 + y = 3$$

$$\Rightarrow 2y = 9 + 3$$

$$\Rightarrow y = \frac{12}{2}$$

$$\Rightarrow y = 6$$

$$\Rightarrow x = 9 - 6$$

$$\Rightarrow x = 3 \quad [\because x = 9 - y]$$

$$\therefore xy = 36$$

Hence, the number is 36

33.

Sol: (a)

The first recipe requires $\frac{1}{2}$ cup of sugar.

the 2nd recipe requires 2 tablespoon of sugar

According to question

$$1 \text{ tablespoon} = \frac{1}{16} \text{ cup}$$

$$\text{therefore, } 2 \text{ tablespoons} = 2 * (\frac{1}{16}) = \frac{1}{8} \text{ cup}$$

$$\text{hence, more amount of sugar the 1st cup requires } (\frac{1}{2}) - (\frac{1}{8}) \text{ cup} = \frac{3}{8} \text{ cup}$$

34.

Sol: (b)

$$\text{Total weight of rice and drum} = 40 \frac{1}{6} \text{ kg} = \frac{241}{6} \text{ kg}$$

$$\text{Weight of empty drum} = 13 \frac{3}{4} = \frac{55}{4} \text{ kg}$$

$$\therefore \text{Weight of rice} = \left(\frac{241}{6} - \frac{55}{4} \right) \text{ kg}$$

$$= \frac{485 - 165}{12} = \frac{317}{12} \text{ kg} = 26 \frac{5}{12} \text{ kg}$$

35.

Sol: (b)

Amit's income per month = Rs 32,000

Money spent on food = $\frac{1}{4}$ of

$$\text{Rs } 32,000 = \frac{1}{4} \times \text{Rs } 32,000 = \text{Rs } 8,000$$

Remaining amount

$$= \text{Rs } 32,000 - \text{Rs } 8,000 = \text{Rs } 24,000$$

Money spent on house rent

$$= \frac{3}{10} \times \text{Rs } 24,000 = \text{Rs } 7,200$$

Money left = Rs 24,000 - Rs 7,200 = Rs 16,800

Money spent on education of children

$$= \frac{5}{21} \times \text{Rs } 16,800 = \text{Rs } 4,000$$

Amount of money still left with him

$$= \text{Rs } 16,800 - \text{Rs } 4,000 = \text{Rs } 12,800$$

36.

Sol: (a)

Let the cost price be Rs.100.

So, the marked price will be Rs. 125.

After allowing a certain discount the profit reduces to $12\frac{1}{2}\%$

price would be Rs.112.5

$$\text{Discount percent offered} = \frac{12.5}{125} \times 100 = 10$$

So, the answer would be option b)10%.

37.

Sol: (c)

We know that the X-coordinate is the distance of the point from Y-axis and the Y-coordinate is the distance from the X-axis. Hence, the point (3,4) is at a distance of 4 from the X-axis and 3 from the Y-axis.

38.

Sol: (b)

Length of wall (l) = 8m = 800cm

height (h) = 5.4m = 540cm

Width (b) = 33cm

Volume of wall $l \times b \times h$

$$= 800 \times 540 \times 33 \text{ cm}^3$$

$$= 14256000 \text{ cm}^3$$

Volume of one brick

$$= 25 \times 13.5 \times 6 \text{ cm}^3 = 2025 \text{ cm}^3$$

$$\text{No. of bricks} = \frac{14256000}{2025} = 7040$$

39.

Sol: (d)

Principal (P) = 4000

Amount (A) = Rs. 4410

Period (n) = 2 years

Let r be the rate per cent per annum we know that,

$$A = P \left(1 + \frac{r}{100}\right)^n \Rightarrow \frac{A}{P} = \left(1 + \frac{r}{100}\right)^n$$

$$\Rightarrow \left(\frac{21}{20}\right)^2 = \left(1 + \frac{r}{100}\right)^2$$

$$\Rightarrow 1 + \frac{r}{100} = \frac{21}{20}$$

$$\Rightarrow \frac{r}{100} = \frac{21}{20} - 1 = \frac{1}{20}$$

$$\Rightarrow r = \frac{1}{20} \times 100 = 5$$

Rate = 5% p. a. Ans.

40.

Sol: (a)

Three years ago,

Population of a town = 50000

Annual increase in population in first year = 4%

in second year = 5%

and in third year = 3%

Present population

$$= 50000 \left(1 + \frac{4}{100}\right) \left(1 + \frac{5}{100}\right) \left(1 + \frac{3}{100}\right)$$

$$= 50000 \times \frac{26}{25} \times \frac{21}{20} \times \frac{103}{100} = 56238$$

PART - III : PHYSICS & CHEMISTRY

1.

Sol: (a)

At higher altitudes, there is decreased oxygen levels in the air, which leads to dizziness and difficulty breathing due to lower oxygen availability for the body.

2.

Sol: (d)

Exposure to loud noise can cause stress and anxiety, and can also lead to hearing loss due to prolonged exposure.

3.

Sol: (b)

The force that causes the rubber band to change shape when stretched is elastic force, as the rubber band returns to its original shape when the force is removed.

4.

Sol: (b)

The most effective way to protect a building from lightning strikes is to install a lightning conductor, which safely directs the lightning to the ground.

5.

Sol: (a)

In parallel, the total force is distributed evenly among both springs. If the total force is 5 N, each spring will show a reading of 2.5 N.

6.

Sol: (b)

When the side of the cube is doubled, the volume of the cube increases by a factor of 8 (since $\text{volume} \propto \text{side}^3$). As a result, the mass (which is proportional to volume) and the weight ($\text{mass} \times \text{gravitational acceleration}$) also increase by a factor of 8.

However, the pressure exerted by an object on a surface is calculated as:

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

The force in this case is the weight, which increases by a factor of 8 due to the increase in mass. The area on which the weight acts (the area of the cube's face) increases by a factor of 4 (since $\text{area} \propto \text{side}^2$). Thus, the pressure exerted by the second cube is:

$$\text{Pressure} = \frac{\text{Force (increased by 8 times)}}{\text{Area (increased by 4 times)}} =$$

$$= 2 \times \text{Original Pressure}$$

So, the pressure exerted by the second cube will be twice the original pressure.

7.

sol: (c)

Sound travels fastest in solids because the particles are closely packed, which allows sound waves to travel more quickly compared to liquids and gases.

8.

Sol: (a)

Since the speed of sound is constant in the same medium, wavelength is inversely proportional to frequency. Therefore, the ratio of wavelengths will be 3:4.

9.

Sol: (c)

Sound requires a medium to travel, and since space is a vacuum, sound cannot travel through it. Therefore, the sound will never reach Earth.

10.

Sol: (a)

Noise can change both amplitude and frequency suddenly because it is irregular and non-periodic. Musical sound is generally periodic, and pitch and vibrating strings are related to specific frequencies.

11.

Sol: (b)

The meteor burns up due to the intense friction caused when it enters the Earth's atmosphere at high speeds. This friction generates heat, causing the meteor to disintegrate.

12.

Sol: (c)

Gravitational force acts downward, pulling the car down the ramp. Friction between the wheels and the ramp opposes the motion. There is no magnetic force involved.

13.

Sol: (a)

* When a 100g weight is hung, the length becomes 5 cm.

* When a 200g weight is hung, the length becomes 9 cm.

The change in length due to the increase from 100g to 200g is:

$$9 \text{ cm} - 5 \text{ cm} = 4 \text{ cm}$$

This 4 cm increase corresponds to an additional 100g weight, which means for each 100g, the spring stretches by 4 cm.

Now, to find the natural length of the spring (the length when no weight is applied), we need to subtract the stretch caused by the 100g weight from the 5 cm (the length when 100g is applied).

The stretch due to 100g is 4 cm, so:

$$\text{Natural length} = 5$$

$$= 5 - 4 = 1 \text{ cm}$$

14.

Sol: (a)

The person pushes backward (southward) with their feet, and the friction between the foot and the ground resists this motion, acting northward.

This frictional force is what enables the person to move in the north direction.

15.

Sol: (a)

* Speed of sound = 340 m/s

* Total time taken for sound to travel to the wall and back = 2 seconds

Step 1: We need to find the one-way distance to the wall. The sound travels to the wall and then returns. Hence, the total time of 2 seconds is for the round trip.

Step 2: The time for one-way travel is:

$$\text{Time one way} = \frac{\text{Total time}}{2} = \frac{2 \text{ seconds}}{2}$$

$$= 1 \text{ second}$$

Step 3: Now, using the formula for distance Distance = Speed \times Time, we can calculate the one-way distance to the wall:

$$\text{Distance one way} = 340 \text{ m/s} \times 1 \text{ s} = 340 \text{ m}$$

Step 4: Thus, the one-way distance to the wall is 340 meters, and the total distance traveled by the

16.

Sol: (c)

Graphite is a good conductor of electricity, making it suitable for use as an electrode.

17.

Sol: (b)

In limited oxygen, incomplete combustion occurs, producing carbon monoxide (CO) and water (H₂O).

18.

Sol: (c)

All the statements are correct.

19.

Sol: (a)

Polycot is a blend of polyester and cotton.

20.

Sol: (b)

Bitumen is used for making roads and water-proofing.

21.

Sol: (d)

Biomass is a renewable resource as it can be replenished naturally.

22.

Sol: (c)

Hydrogen has the highest calorific value.

23.

Sol: (c)

Iron reacts with copper sulphate, displacing copper and forming ferrous sulphate (greenish solution).

24.

Sol: (b)

Paraffin wax is obtained from petroleum, not coal.

25.

Sol: (b)

Carbonization is the process by which dead vegetation converts into coal over millions of years.

26.

Sol: (c)

LPG (Liquefied Petroleum Gas) burns more cleanly and produces fewer pollutants compared to coal, diesel, or kerosene.

27.

Sol: (b)

Synthetic fibres have low moisture absorption, making them less comfortable in humid climates.

28.

Sol: (b)

Kerosene is used as a fuel in jet engines due to its high energy content and stability.

29.

Sol: (b)

Magnesium is the most reactive, followed by Zinc, Iron, and Copper.

30.

Sol: (c)

The substance is a base since it is slippery, forms an alkaline solution, and turns red litmus blue.

PART - IV : BIOLOGY

1.

Sol: (d) Adolescent boys

The Adam's apple, or laryngeal prominence, is a feature of the human neck, caused by the thyroid cartilage surrounding the larynx. It becomes more prominent during puberty in males due to the growth of the larynx, which deepens the voice. This change typically occurs in adolescent boys during puberty.

2

Sol: (a) Voice box

The larynx, located in the throat, is commonly referred to as the voice box. It houses the vocal cords and is involved in producing sound, regulating airflow, and protecting the trachea during swallowing. While "sound box" is a colloquial term, the accurate term is "voice box."

3.

Sol: (c) Fish

Internal fertilization refers to the process where fertilization occurs inside the female's body. While it happens in humans, dogs, and cows, most fish species perform external fertilization, where the eggs and sperm meet outside the female's body, in the water.

4.

Sol: (b) Zygote

Fertilization is the union of a male sperm and a female egg, resulting in the formation of a zygote. This single-celled organism will divide and develop into an embryo, eventually becoming a fully developed individual.

5.

Sol: (a) Endemic species

Endemic species are organisms that are found only in a specific geographic location. They are not naturally occurring in other parts of the world. For example, the giant panda is endemic to China.

6.

Sol: (c) Endangered species

Endangered species are those whose population has declined significantly, and they face the risk of extinction. Conservation efforts are often focused on protecting these species to prevent their extinction.

7.

Sol: (c) Vaccination

Vaccination involves introducing a weakened or inactivated form of a pathogen (microbe) into the body. This stimulates the immune system to produce antibodies, which help protect against future infections by the same pathogen.

8.

Sol: (b) Female Anopheles Mosquito

Malaria is caused by a protozoan parasite, Plasmodium, which is transmitted through the bite of a female Anopheles mosquito. Male mosquitoes do not transmit the parasite.

9.

Sol: (c) September/October

Kharif crops are typically sown at the start of the monsoon season, which is from June to July, and are harvested around September to October. These crops, like rice and maize, require the rainy season for growth.

10.

Sol: (a) Fungus

Penicillium is a genus of mold (fungus) known for producing the antibiotic penicillin. It plays a significant role in medicine, agriculture, and food production, such as in the production of cheeses.

11.

Sol: (a) Protozoa

Malaria is caused by a protozoan parasite of the genus Plasmodium, which is transmitted to humans through the bites of infected female Anopheles mosquitoes.

12.

Sol: (a) Biosphere

The biosphere is the part of the Earth that supports life, including the land, water, and air. It is where all ecosystems and biodiversity are found, encompassing all living organisms and their interactions with the environment.

13.

Sol: (a) Animals are protected

A sanctuary is a protected area where animals are safeguarded from hunting, poaching, or other human disturbances. It provides a safe habitat for wildlife to thrive and reproduce.

14.

Sol: (d) Metamorphosis

Metamorphosis is a biological process in which an organism undergoes significant physical changes from the larval stage to the adult form. Examples include butterflies (from caterpillar to adult) and frogs (from tadpole to adult).

15.

Sol: (b) Hydra and Yeast

Budding is an asexual form of reproduction in which a new organism develops as a growth or "bud" on the parent. It is found in organisms like Hydra (a freshwater organism) and Yeast (a type of fungus). The bud eventually detaches and becomes an independent individual.