"Where working hard is a habit"

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JEE MAIN || JEE ADVANCED || MEDICAL || FOUNDATION

KHOJ-2019
ANSWER KEY WITH SOLUTION
CLASS - 10

PART - I		PART - II		PART - III			
Q. No.	Answer	Q. No.	Answer	Q. No.	Answers	Q. No.	Answers
1	C	1	C	1	A	31	A
2	C	2	B	2	B	32	B
3	C	3	D	3	A	33	A
4	A	4	A	4	D	34	A
5	A	5	D	5	A		
6	A	6	D	6	C		
7	A	7	D	7	C		
8	D	8	A	8	A		
9	B	9	C	9	C		PART - IV
10	B	10	D	10	C	1	C
11	B	11	D	11	C	2	C
12	A	12	C	12	D	3	D
13	D	13	B	13	D	4	A
14	D	14	C	14	C	5	B
15	B	15	C	15	A	6	D
16	B	16	D	16	B	7	D
17	A	17	C	17	C	8	B
18	B	18	C	18	B	9	A
19	A	19	C	19	A	10	C
20	B	20	D	20	D	11	B
		21	C	21	B	12	B
		22	B	22	A	13	C
		23	A	23	D	14	B
		24	A	24	C	15	C
		25	D	25	D	16	A
		26	D	26	D		
		27	D	27	C		
		28	A	28	B		
		29	B	29	C		
		30	A	30	D		

PART - I

1. (c)

A, B, C, D, E are five iron piece

$A = 2B \quad \Rightarrow B = 4\frac{1}{2}C = \frac{9}{2}C \quad \Rightarrow \quad C = \frac{D}{2} \quad \Rightarrow D = \frac{E}{2}$

$C < E < A$ So, $A > B,\ B > C,\ D > C,\ E > D$

from here we can conclude that C is lightest

2. (c)

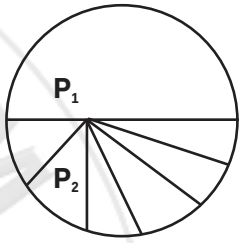
Since there are total seven pieces so P_2 has 6 parts which are equal.

Since small part is of 20 gms.

So, weight of $P_2 = 20 \times 6 = 120\text{gm}$

$P_1 = 120\text{gm}$

Original Cake = 120 + 120 = 240 gm



3. (c)

Suppose distance b/w XY = d km

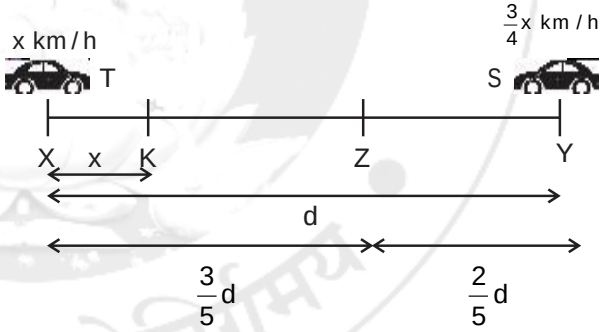
speed of T = x km/h

speed of S = $\frac{3}{4}$x km/h

Suppose at 4:00 pm T reach at K

distance b/w XK = x km.

at time t both train reaches at Z.



dis. travelled by T = $\frac{3}{5}$d - x

dis. travelled by S = $\frac{2}{5}$d

time for both is same

So, $\frac{\frac{3}{5}d - x}{x} = \frac{2/5\,d}{\frac{3x}{4}} \quad \Rightarrow \quad \frac{3d - 5x}{5x} = \frac{8d}{15x} \quad \Rightarrow$ 45d - 75x = 40d $\Rightarrow$ 5d = 75x

$\boxed{\frac{d}{x} = 15\,\text{hrs}}$

4. (a)

Suppose present age of Barun = x yrs.

Arun's = 0.4x yrs

after 't' yrs -

Barun's age = x + t yrs $\Rightarrow$ Arun's = 0.4x + t yrs $\Rightarrow$ Arun's = $\frac{1}{2}$ Barun's

$0.4x + t = \frac{x+t}{2} \Rightarrow 0.8x + 2t = x + t \Rightarrow t = .2x$

So % increment in Barun's age $= \frac{.2x}{x} \times 100 \Rightarrow 20\%$

5. (a)

Day 1 work $= \frac{1}{120}$

Day 2 work $= \frac{1}{120} + \frac{1}{120}$

Day 3 work $= \frac{1}{120} + \frac{1}{120} + \frac{1}{120}$

Suppose no. of days n

So Day 1 work + Day 2 work + --------- + Day n work = 1

$\frac{1}{120} + \frac{2}{120} + \text{---------} + \frac{n}{120} = 1 \Rightarrow \frac{1}{120}(1+2+\_\_\_\_\_+n) = 1 \Rightarrow \frac{n(n+1)}{2} = 120$

n (n+1) = 240 $\Rightarrow$ n (n+1) = 15 $\times$ 16

So, n = 15 days

6. (a)

Speed of A = x_1

B = x_2

C = x_3

time by A to travel 10 km $= \frac{10}{x_1} = \frac{9}{x_2}$

Similarly time taken by B $= \frac{10}{x_2} = \frac{9}{x_3}$

$\frac{10}{x_1} = \frac{9}{x_2} = K \Rightarrow x_1 = \frac{10}{K}, x_2 = \frac{9}{K} \Rightarrow \frac{10}{x_2} = \frac{9}{x_3} = m \Rightarrow x_2 = \frac{10}{m}, x_3 = \frac{9}{m}$

So, $\frac{9}{K} = \frac{10}{m} \Rightarrow K = \frac{9m}{10} \Rightarrow \frac{K}{m} = \frac{9}{10}$

Suppose A beat C by x km.

So, $\frac{10}{x_1} = \frac{10-x}{x_3} \Rightarrow \frac{x_3}{x_1} = \frac{10-x}{10} \Rightarrow \frac{\frac{9}{m}}{\frac{10}{K}} = \frac{10-x}{10}$

$\Rightarrow \frac{9K}{10m} = \frac{10-x}{10} \Rightarrow 9 \times \frac{9}{10} = 10 - x \Rightarrow \frac{81}{10} = 10 - x \Rightarrow x = 10 - 8.1 = 1.9 \text{ km}$

7. (a)

$7^1 = 7$

$7^2 = 49$

$7^3 = 343$

$7^4 = 2401$

So, when 7^4 divided by 100 remainder is 1.

$7^{700} = \left(7^{175}\right)^4$ So, $\frac{7^{700}}{100}$ = Remainder is 1.

8. (d)

no. of odd days upto April 1, 2002 =

Dec. 31, 2001 = 1 odd day

Jan. = 3

Feb. = 0

March = 3

April = 1

1 odd day

So, April 1st is Monday

2nd = Tuesday

So dates or, Tuesday = 2, 9, 16, 23, 30

9. (b)

no. of odd days from Feb. 29, 2016 to

Feb. 29, 2020 = 5

So, no. of odd days in 4 years = 5

To celebrate her birthday on Monday no. of odd days must be zero. By observing pattern,

So, after 28 years her birthday would fall on (i.e. on 29 Feb. 2044) Monday.

Since she will live till 2099.

So, no. of birthday on Monday.

2016 + 28 = 2044 $\Rightarrow$ 2044 + 28 = 2072

So in 2044 & 2072 her birthday will come on Monday, twice.

10. (b)

Watch gain 5 sec. in 3 min.

So in 1 min. $= \frac{5}{3}$sec. $\Rightarrow$ in 60 min. $= \frac{5}{3} \times 60$ $\Rightarrow$ 100 sec.

from 7 : 00 am to 4:00 pm

Total hours = 9 hrs.

In 9 hrs watch will gain = 9 $\times$ 100

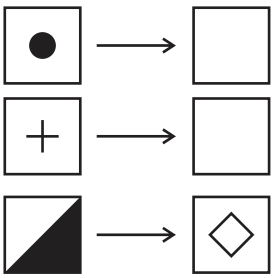
= 900 sec. = 15 min.

So, till 4:00 pm it will gain 15 min.

hence it will show 4:15 pm when actual time is 4:00 pm.

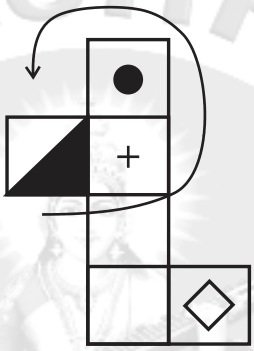
11. (b)

From the figure it is clear that the opposite faces are-



So when dice is closed either option (b) or (c) is correct (because opposite surface cannot come together).

But when we move in anti clock wise direction (as shown)



 should come in anticlock wise direction of 

So only option (b) is correct.

12. (a)

no. of cubes having no surface colored = $(n-2)^3$ + no. of cubes which are on surface of blank surface

= 8 + 10 = 18 cubes

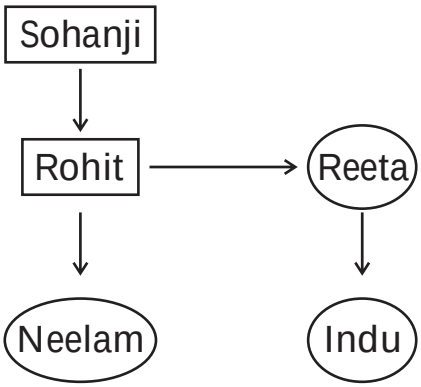
13. (d)

no. of cubes have atleast red color = 16 + 16 = 32

14. (d)

no. of cubes have atleast blue color = 16 + 16 = 32

15. (b)



So, Sohanji is Indu's Grandfather.

16. (b)

$2^2=4, 2^3=8, 2^2=16, 2^5=32, 2^6=64, 3^2=9, \quad 3^3=27, 5^2=25, 6^2=36, 7^2=49$

17. (a)

The effective growth rate (4% –2%) is 2%

So population after two years

$20000\ (1+0.02)^2 = 20808$

18. (b)

Look at cases, by observing pattern

$3^2 + 2 = 11$, $33^2 + 22 = 1111$,

$333^2 + 222 = 111111$

So sum of digit = 10

19. (a)

	Water	Milk
Vessel I	1 / 3	2 / 3
Vessel II	2 / 7	5 / 7

The ratio of water to milk in the mixture-

$$\left(\frac{1}{3}\cdot\frac{1}{5}+\frac{2}{7}\cdot\frac{4}{5}\right):\left(\frac{2}{3}\times\frac{1}{5}+\frac{5}{7}\times\frac{4}{5}\right) = 31 : 74$$

20. (b)

Work for 16 hrs $=\frac{16}{24}=\frac{2}{3}$ part

Remaining work $=1-\frac{2}{3}=\frac{1}{3}$ part

$\frac{1}{3}$ part will be completed in $=\frac{1}{3}\times 18=6$ hrs.

So total time = 16 + 6 = 22 hrs.

PART - II

1.(c) $x = \sqrt[3]{6+\sqrt[3]{6+\sqrt[3]{6+\ldots}}}$ so $x = \sqrt[3]{6+x}$. Cube both sides to get $x^3 = x + 6$ so $x^3 - x - 6 = 0$ and $(x-2)(x^2+2x+3) = 0$. So $x = \boxed{2}$. The other roots are complex.

2.(b) Let $a = 1991$, so we have

$$\frac{1}{a} + \frac{(a+1)(a-1)}{a} - (a+1) = \frac{1+(a^2-1)}{a} - (a+1)$$

$$= a - (a+1) = \boxed{-1}$$

3.(d) By repeated application of the Pythagorean theorem (see fig.), we have:

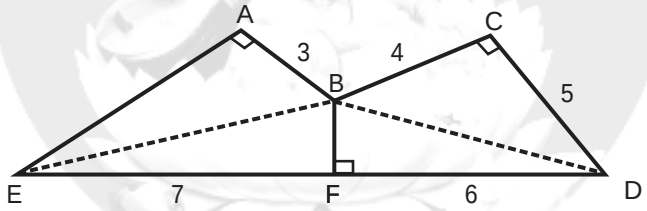
$$BD^2 = BC^2 + CD^2 = 41$$

$$BF^2 = BD^2 + DF^2 = 5$$

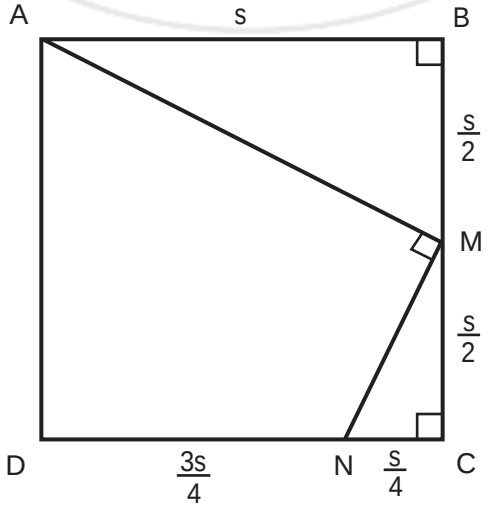
$$BE^2 = BF^2 + EF^2 = 54$$

$$AE^2 = BE^2 - AB^2 = 45.$$

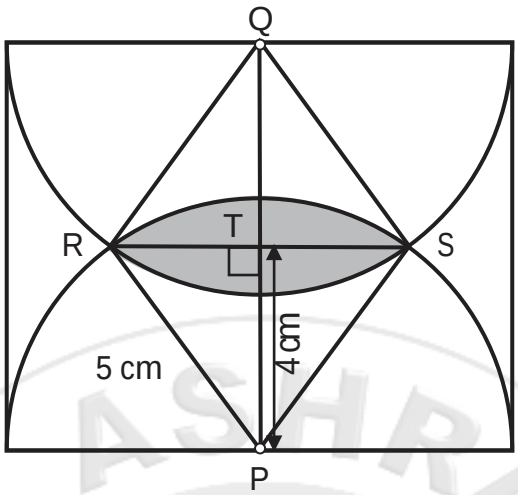
So $AE = \sqrt{45} = \boxed{3\sqrt{5}}$.



4.(a) Let s be the side length of the square (see fig.). We have $m\angle BAM + m\angle BMA = 90^0$ and $m\angle BMA + m\angle AMN + m\angle NMC = 180^0$, so $m\angle BAM = m\angle NMC$ and $\Delta BAM \sim \Delta CMN$, with ratio of similitude AB:MC = 2:1. Since $BM = \frac{s}{2}, CN = \frac{s}{4}$, so $ND = CD - CN = \frac{3s}{4}$, and $CN : ND = \boxed{1:3}$



5.(d) Let P, Q be the midpoints of the longer sides of the rectangle. Let R, S be the points where the semicircles meet. Let T be the point where PQ meets RS.



Each of the semicircles has radius 5 cm. Therefore PR, PS, QR and QS all have length 5 cm. Therefore PSQR is a rhombus. Hence the diagonals PQ and RS bisect each other at right angles. It follows that PT and QT each have length 4cm. Let the common length of RT and ST be x cm.

We now apply Pythagoras' Theorem to the right-angled triangle PTR. This gives $4^2+x^2=5^2$, and hence $x^2=5^2-4^2=25-16=9$. Therefore x = 3.

It follows that both RT and ST have length 3 cm. Hence the length of RS is 6 cm. Therefore the width of the overlap of the two semicircles is 6 cm.

6.(d) To avoid a lot of complicated arithmetic, we exploit the facts that $2.017=\frac{201.7}{100}$ and $10.16=\frac{1016}{100}$.

Then we take out the common factor $\frac{201.7}{100}$. This gives

$$2.017\times 2016-10.16\times 201.7=\frac{201.7}{100}\times 2016-\frac{1016}{100}\times 201.7$$

$$=\frac{201.7}{100}\times(2016-1016)$$

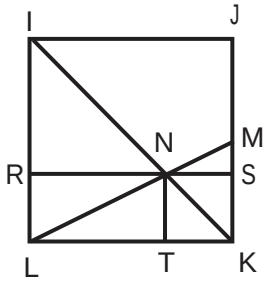
$$=\frac{201.7}{100}\times 1000$$

$$=201.7\times 10$$

$$=2017.$$

7. (d)

Sol. Let I, J, K and L be the vertices of the sqaure. Let M be the midpoint of JK, let N be the point where the diagonal IK meets LM. Let the line through N parallel to LK meet IL at R and JK at S. Let T be the foot of the perpendicular from N to LK. Let the square have side length s.



In the triangles INL and KNM, the opposite angles $\angle INL$ and $\angle KNM$ are equal. Also, as IL is parallel to JK, the alternate angles $\angle LIN$ and $\angle MKN$ are equal. Therefore the triangles INL and KNM are

similar. Hence $\frac{IN}{NK}=\frac{IL}{MK}=2.$ Similarly, the triangles INR and KNS are similar. Therefore $\frac{NR}{NS}=\frac{IN}{NK}=2.$

So $NR=\frac{2}{3}s$ and $NS=\frac{1}{3}s$.

Now, NTKS is square, because its angles are all right-angles, and $\angle NKT=45^0$. Therefore

$NT=NS=\frac{1}{3}s$.

It follows that the area of the triangles LNK, INL and MNK are $\frac{1}{2}(s\times\frac{1}{3}s)=\frac{1}{6}s^2$, $\frac{1}{2}(s\times\frac{2}{3}s)=\frac{1}{3}s^2$ and $\frac{1}{2}\left(\frac{1}{2}s\times\frac{1}{3}s\right)=\frac{1}{12}s^2$, respectively.

The area of the region P, is that of the triangle LNK, that is, $\frac{1}{6}s^2$. The area of the region Q is obtained by subtracting the areas of the triangles LNK, INL and MNK from the area of the square. So region Q has area $s^2-\frac{1}{6}s^2-\frac{1}{3}s^2-\frac{1}{12}s^2=\frac{5}{12}s^2$. So the ratio of these areas is $\frac{1}{6}s^2:\frac{5}{12}s^2=\frac{1}{6}:\frac{5}{12}=2:5$.

8.(a) f(x) – x = (x – 1) (x – 2) (x – 3) (x – 4) (x – 5) $\Rightarrow$ f (0) = d = (–1) (–2) (–3) (–4) (–5).

9.(c) The probaility of one getting the right answer and other two do not can be written as-

$=\frac{1}{4}\left(1-\frac{1}{3}\right)\left(1-\frac{1}{2}\right)+\frac{1}{3}\left(1-\frac{1}{4}\right)\left(1-\frac{1}{2}\right)+\frac{1}{2}\left(1-\frac{1}{4}\right)\left(1-\frac{1}{3}\right)=\frac{11}{24}$

10.(d) x = 3y + 3
2y = x – 9
$\Rightarrow$ x = 2y + 9
From equation (1) and (2), we get
3y + 3 = 2y + 9
$\therefore$ y = 6 and x = 21

11.(d) Let the speed of the boat be x km/hr, stream be y km/hr
$\therefore$ (x + y) 2 = 20
$\Rightarrow$ x + y = 10 ... (1)

$(x-y)\times\frac{5}{2}=20$

$\Rightarrow$ x – y = 8 ... (2)
From (1) and (2), we get
$\therefore$ y = 1

12.(c) Clearly, L.C.M. = (L.C.M. of p and p^3) (L.C.M. of q^2 and q) = p^3q^2

13.(b) $\sum\alpha_1=0, \sum\alpha_1\alpha_2=2-\sqrt{3}, \sum\alpha_1\alpha_2\alpha_3=0, \alpha_1\alpha_2\alpha_3\alpha_4=2+\sqrt{3}$

$(1-\alpha_1)(1-\alpha_2)(1-\alpha_3)(1-\alpha_4)$

$=1-\left(\sum\alpha_1\right)+\left(\sum\alpha_1\alpha_2\right)-\left(\sum\alpha_1\alpha_2\alpha_3\right)+\alpha_1\alpha_2\alpha_3\alpha_4$

$=1-0+2-\sqrt{3}-0+2\sqrt{3}=5$.

14. (c) $f(x)=x^2+4x+3$

$\alpha+\beta=-4 \qquad \alpha\ \beta=3$

$$\text{Soz} = 1+\frac{\beta}{\alpha}+1+\frac{\alpha}{\beta}=2+\frac{\alpha}{\beta}=2+\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=2+\frac{\left(\alpha^2+\beta^2\right)}{\alpha\beta}$$

$$\text{Soz} = 2+\frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}=2+\frac{(-4)^2-2\times3}{3}$$

Soz = 16/3

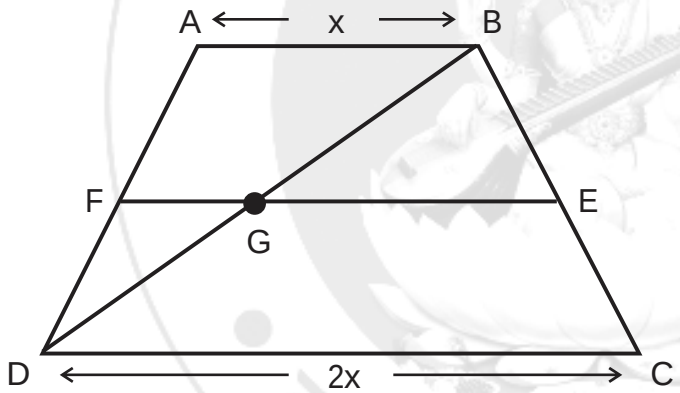
$$\text{Poz} = \left(1+\frac{\beta}{\alpha}\right)\left(1+\frac{\alpha}{\beta}\right)=1+\frac{\alpha}{\beta}+\frac{\beta}{\alpha}+1=\ 16/3$$

15. (c) For infinite many solutions, $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

$$\therefore \frac{(2m-1)}{3}=\frac{3}{(n-1)}=\frac{5}{2}$$

$m=\frac{17}{4}$, $n=\frac{11}{5}$.

16. (d)



In ΔBDC, $\because GE \| DC$

then $\frac{GE}{CD}=\frac{BE}{BC}$

i.e. $\frac{GE}{2x}=\frac{4}{7}$

$GE=\frac{8x}{7}$

Similarly, In ΔADB, $GF=\frac{3x}{7}$

$\therefore EF=GF+GE=\frac{3x}{7}+\frac{8x}{7}=\frac{11x}{7}$

$\therefore 7EF = K\ AB$

$7 \times \frac{11x}{7} = k\ x$

$\boxed{k=11}$

17. (c) If $15\tan^2\theta + 4\sec^2\theta = 23$

$15\tan^2\theta + 4\left(1+\tan^2\theta\right) = 23$

$\tan^2\theta = 1$

$\tan\theta = 1$

$\boxed{\theta = 45^0}$

$\therefore \quad \left(\sec 45^0 + \operatorname{cosec} 45^0\right)^2 - \sin^2 45^0$

$= \frac{15}{2}$

18.(c) $\because$ centroid, G is $\left[\frac{a+b+c}{3}, \frac{a+b+c}{3}\right] = [0, 0]$

i.e. $\frac{a+b+c}{3} = 0 \quad \Rightarrow a+b+c=0$

then $a^3 + b^3 + c^3 - 3abc = (a+b+c)\ (a^2+b^2+c^2-ab-ab-ca)$.

$a^3 + b^3 + c^3 - 3abc = 0$

$a^3 + b^3 + c^3 = 3abc$

$\frac{a^3}{abc} + \frac{b^3}{abc} + \frac{c^3}{abc} = 3$

$\frac{a^2}{bc} + \frac{b^2}{ac} + \frac{c^2}{ab} = 3$ Ans.

19. (c)

Sol. Let D be the midpoint of the side BC. By Apollonius theorem, $AB^2 + AC^2 = 2(BD^2 + AD^2)$.

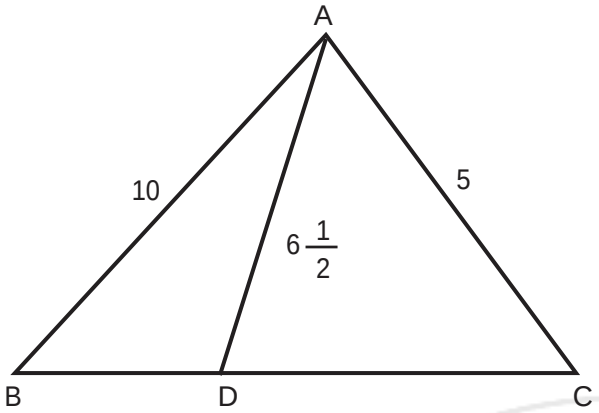
Hence $BD^2 = \frac{1}{2}(10^2 + 5^2) - \left(6\frac{1}{2}\right)^2 = \frac{81}{4}$

Thus $BD = \frac{9}{2}$ and BC = 9. The sides of the triangle are therefore, a = 9, b = 5, c = 10.

The semi-perimeter s = 12 and the area (ΔABC) is given by

$\sqrt{s(s-a)(s-b)(s-c)} = 6\sqrt{14}$

OR



By Appolloneous theorem, $AB^2 + AC^2 = 2AD^2 + 2CD^2$

we get $CD = \frac{9}{2}$, $BD = \frac{9}{2}$

By Herons formula, area of $\Delta ADC = 3\sqrt{14}$ cm^2

and area of $\Delta ABD = 3\sqrt{14}$ cm^2

$\therefore$ ar(ΔABC) = ar (ΔADC) + ar (ΔABD) $= 6\sqrt{14}$

$6\sqrt{x} = 6\sqrt{14}$

$\therefore x = 14$

20. (d)

Sol. From the given conditions we have

$$a^2 + b^2 - \frac{a^3 + b^3}{a+b} = 28 \Rightarrow ab = 28$$

The possibilities are

(a, b) = (1, 28), (2, 14), (4, 7), (7, 4), (14, 2), (28, 1)

21. (c)

Sol. $2m^5 - 5m^4 + 2m^3 - 8m^2 = m^2(2m^3 - 5m^2 + 2m - 8)$

$= (3m-1)(2m(3m-1) - 5(3m-1) + 2m - 8)$

$= (3m-1)(6m^2 - 2m - 15m + 5 + 2m - 8)$

$= (3m-1)(6m^2 - 15m - 3)$

$= (3m-1)(6(3m-1) - 15m - 3)$

$= (3m-1)(3m-9)$

$= 9m^2 - 30m + 9$

$= 9(3m-1) - 30m + 9 = -3m$

Hence

$$\frac{2m^5-5m^4+2m^3-8m^2}{m^2+1}=\frac{-3m}{3m}=-1$$

22. (b) $\text{Sin}^2(90-88)+\text{Sin}^2(90-86)+\text{Sin}^2(90-84)+\ldots\ldots\ldots\ldots 22 + \ldots\ldots\ldots\ldots \text{Sin}^2 90$

$\Rightarrow \cos^2 88^0 + \cos^2 86^0 + \cos^2 84^0 + \ldots\ldots\ldots\ldots\ldots\ldots + 1$

$\because$ it has total of 45 terms

$\therefore \Rightarrow$ 1 + 1 + 1 + 1 + ...22 times + 1

$\Rightarrow$ 23 Ans.

23. (a) P = L.C.M.(2,4,6,8,10) =120, Q = LCM (1,3,5,7,9)=315

Also, L.C.M. of (P, Q) = 2520

$\therefore$ option (a) satisfies the relation between P, Q and L.

24. (a) $2\sin\theta + 3\cos\theta = 2$

$(2\sin\theta + 3\cos\theta)^2 = (2)^2$

$4\sin^2\theta + 9\cos^2\theta + 12\sin\theta\cos\theta = 4$ (1)

Let

$3\sin\theta - 2\cos\theta = x$

squaring both sides

$9\sin^2\theta + 4\cos^2\theta - 12\sin\theta\cos\theta = x^2$ (2)

Adding (1) & (2)

$13\left(\sin^2\theta + \cos^2\theta\right) = 4 + x^2$

$\boxed{x = \pm 3}$

25. (d) $\because$ AB : BD : DC = 3 : 1 : 3

then AB = 3x, BD = x, CD = 3x

In ΔABC, by pythagoras theorem.

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

$(20)^2 = 9x^2 + 16x^2$

$400 = 25x^2$

$\boxed{x = 4}$

Again In ΔABD,

$AD^2 = AB^2 + BD^2$

$AD^2 = 12^2 + 4^2$

$AD = \sqrt{160} = \sqrt{160}$

$AD = 4\sqrt{10}$

26. (d) $mx^2 + nx + 1 = 0$

$$\sin\theta + \cos\theta = -\frac{n}{m} \qquad (1)$$

$$\sin\theta \times \cos\theta = \frac{1}{m}$$

Squaring both sides eq^n (1)

$$\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = \frac{n^2}{m^2}$$

$$1 + \frac{2}{m} = \frac{n^2}{m^2}$$

$$\boxed{m^2 = (n^2 - 2m)}$$

or $\boxed{n^2 - m^2 = 2m}$ Ans.

27. (d) Let Son's present age be 'x' years.
then Acc. to Ques.

Father's present age = $[30(x-20)-7]$ (1)

Also, Father's present age = (x + 31) (2)

$$30(x-20) - 7 = x + 31$$

$$30x - 600 - 7 = x + 31$$

$$29x = 638$$

$$x = \frac{638}{29}$$

$$x = 22$$

$\therefore$ Sum of their ages = 22 + 53 = 75 Ans.

28. (a) By div. algo.
{let remainder = ax + b}

$$x^{51} = (x^2 - 3x + 2)\, q(x) + ax + b$$

$$x^{51} = (x-2)(x-1)\, q(x) + ax + b$$

at $x = 2$

$$2^{51} = 2a + b \qquad \text{----- (1)}$$

at x = 1

$$1^{51} = a + b$$

$$1 = a + b \qquad \text{----- (2)}$$

from (1) and (2)

$$a = 2^{51} - 1$$

$$b = 2 - 2^{51}$$

So, remainder is $ax + b = (2^{51} - 1)\, x + (2 - 2^{51})$

29. (b) $\because a^3+b^3+c^3=3abc$ {when a + b + c = 0}.

then, a + b + c = $3(abc)^{1/3}$. Ans.

30. (a) By $S_n=\frac{n}{2}[a+l]$

and $l=a+(n-1)d$

888 = 222 + (n-1) 2

666 = (n-1) 2

$\boxed{334=n}$

$S_{334}=\frac{334}{2}[222+888]$

$=\frac{334}{2}\times 1110$

= 185370

PART - III

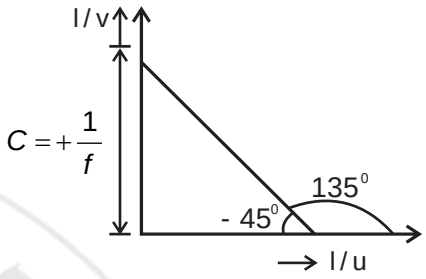
1.

Sol.(a)

Since $\frac{1}{f}=\frac{1}{v}+\frac{1}{u} \Rightarrow \frac{1}{v}=-\frac{1}{u}+\frac{1}{f}$

Putting the sign convention properly.

$\frac{1}{(-v)}=\frac{-1}{(-u)}+\frac{1}{(-f)} \Rightarrow \frac{1}{v}=-\frac{1}{u}+\frac{1}{f}$



Comparing this equation with y = mx + c

Slope $=m=\tan\theta=-1 \Rightarrow \theta=135^0$ or -45^0 and intercept $C=+\frac{1}{f}$

2.

Sol. (b)

Since a parallel beam will reflect parallel and seen to meet at infinity.

3.

Sol.(a)

All the conductors have equal lengths. Area of cross-section of A is $\left\{\left(\sqrt{3}a\right)^2-\left(\sqrt{2}a\right)^2\right\}=a^2$

Similarly area of cross-section of B = Area of cross-section of $C=a^2$

Hence according to formula $R=\rho\frac{l}{A}$; resistances of all the conductors are equal i.e., $R_A=R_a=R_C$

4.

Sol.(d)

$R\propto\frac{l^2}{m} \Rightarrow R_1:R_2:R_3=\frac{l_1^2}{m_1}:\frac{l_2^2}{m_2}:\frac{l_3^2}{m_3} \quad \Rightarrow R_1:R_2:R_3==\frac{9}{1}:\frac{4}{2}:\frac{1}{3}=27:6:1$

5.

Sol. (a)

Direction of induced current can be find out of fleming's right hand rule.

6.

Sol. (c)

$R=\frac{\rho l}{A} \quad \Rightarrow \quad \rho=\frac{RA}{l}\Rightarrow\frac{\Omega m^2}{m}\Rightarrow\Omega m$

7.

Sol.(c)

$i=\frac{ne}{t}=\frac{62.5\times10^{18}\times1.6\times10^{-19}}{1}=10 ampere$

8.

Sol.(a)

Total internal reflection occurs when i > c

9.

Sol.(c)

As r > i therefore $n_1 > n_2$

10.

Sol.(c)

In both the cases initial verticle velocity is zero, so time taken by them to reach the ground is same ratio 1 : 1

11.

Sol.(c)

For last second of motion

$v = 0\ m/s$

$t = 1s$

$a = -g\ m/s^2$

$v = u + at$

$O = u - g \quad \Rightarrow u = g$

$v^2 - u^2 = 2as$

$0 - g^2 = 2(-g)s$

$$s = \frac{g}{2}$$

12.

Sol.(d)

$F = ma$

$I = 100 \times a$

$$a = \frac{1}{100} = 0.01\ cm/s^2$$

13.

Sol.(d)

$$g = \frac{GM}{(R+h)^2}$$

So, when height increase, acceleration due to gravity will decreases

14.

Sol.(c)

$KE = \frac{P^2}{2m}$

P is increased 50%

So, $P' = \frac{3}{2}P$

Now, $KE' = \frac{P'^2}{2m} = \frac{9}{4}\frac{p^2}{2m} = \frac{9}{4}KE \quad \Rightarrow \quad KE' = \frac{9}{4}KE$

change in $KE = \frac{9}{4}\left(\frac{1}{2}mv_1^2\right) - \frac{1}{2}mv_1^2 \quad \Rightarrow \quad \frac{1}{2}mv_1^2\left[\frac{9}{4} - 1\right] \Rightarrow \quad \frac{5}{4}\left[\frac{1}{2}mv_1^2\right]$

15.

Sol.(a)

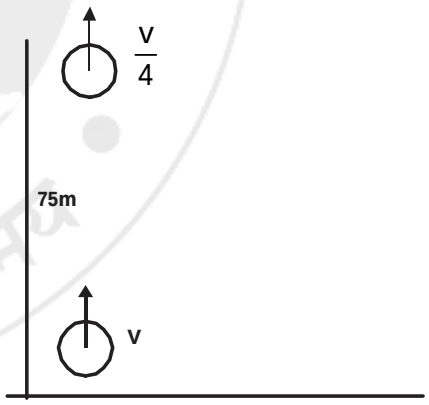
$m_1 = m_2$

$v_1 = v_2$

$F = \frac{mv^2}{r}$ So, $\frac{F_1}{F_2} = \frac{\frac{m_1v_1^2}{r_i}}{\frac{m_1v_2^2}{r_2}} = \frac{r_2}{r_1}$

16.

Sol.(b)



$v^2 - u^2 = 2as$

$\frac{v^2}{16} - v^2 = -2g \times 75 \quad \Rightarrow \quad \frac{-15v^2}{16} = -2g \times 75$

$v^2 = \frac{2 \times 75 \times 16 \times 9}{15} \quad \Rightarrow \quad v^2 = 10 \times 16g$

$v^2 = 1600 \quad \Rightarrow \quad v = 40 \text{ m/s}$

$v^2 - u^2 = 2as \quad \Rightarrow \quad -1600 = -2 \times 10 \times s \quad \Rightarrow \quad s = \frac{-1600}{-20} = 80\text{m}$

17.

Sol.(c)

$Q = i^2Rt$

18.

Sol.(b)

At – 36ºC bromine will be liquid

19.

Sol.(a)

Atoms & molecules are constituents of matter.

20.

Sol.(d)

Evaporation leads to cooling in perspiration in human body and earthen put. Plant keep themsevies cool by transpiration of leaves.

21

Sol.(b)

Sodium amalgam is mixture

22.

Sol.(a)

Milk is fat dispersed in water

23.

Sol.(d) Gun powder is heterogenuns mixture

24.

Sol.(c)

Mass of solution - 100 + 34.7 = 134.7g

$$\text{Volume of solution} = \frac{\text{mass of solution}}{\text{density}} = \frac{134.7}{1.3} = 103.61 m^3$$

$$(m/v)\ \% = \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100 = \frac{34.7}{103.61} \times 100 = 33.49\%$$

25.

Sol.(d)

four coloured dues were used to colour four sweets

26.

Sol.(d)

2nd & 3rd period consist of both S & P block elements where 1st period consist only S block.

27.

Sol. (c)

Ca consist of – 20

C consist of – 6

O consist of – 8

$CaC0_3$ consists of = 20 + 6 + 24 = 50 protons

100 gram consists of = $50 \times 6.022 \times 10^{23}$

10 gram consist of = $50 \times 6.022 \times 10^{22}$

= 3.011×10^{24} protons

28. (b)

Sol. X is HC*l* and B is Na_2CO_3

$$Na_2CO_3 + HCl \rightarrow 2NaCl + CO_2 + H_2O$$

29. (c)

Sol. The volume of sulphuric acid require to produce colour change for any indicator is same.

30. (d)

Sol. The conjugate base of $H_2PO_4^{1-}$ is HPO_4^{2-}

31.

Sol.(a)

Soda Ash is $Na_2CO_3 \cdot H_2O$

32.

Sol.(b)

Malchite is an ore of copper.

33. (a)

Sol. Zigzag line separetes metal from non-metal.

34. (a)

Sol. P, B, A*l* have valency 3.

P, Ar, A*l* have 3 shells.

PART - IV

1. (c)

   P in the given concept map is Chloroplast.

2. (c) the following characteristics are applicable to cockroach .

   (i) Bilaterally symmetrical and segmented body

   (iii) **Open circulatory system**

3. (d)

   The table given below shows a list of organisms and its method of reproduction.

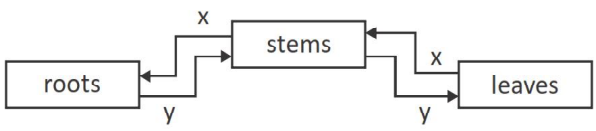
Organism	**Method of reproduction**
Amoeba	**P** Binary fission
Hydra	**Q** Budding
Mucor	**R** Sporulation

4. (a)

   Sperm is a haploid cell .

5. (b)

   The diagram below shows how both X and Y are transported in a plant.



   X starch **Y** water

6. (d)

   Retina is part of the human eye where images are formed.

7. (d)

   Most of the photosynthesis (80%) which takes place on this earth is carried out by algae present in ocean and fresh water sources.

8. (b)

   Bile juice has no digestive enzyme

9. (a)

   Dark reaction and light reaction of photosynthesis takes place in stroma and grana of chloroplast respectively

10. (c)

The most important function of villi in the small intestine is to provide increased surface area for absorption of digested food.

11. (b)

The final product of digestion of carbohydrates and proteins are glucose and amino acids respectively

12. (b)

In a closed circulatory system, blood is completely enclosed with in vessels

13. (c) (ii) and (iv)

Left ventricle pumps oxygenated blood to different body parts while right ventricle pumps deoxygenated blood to lungs and Right atrium receives deoxygenated blood from different parts of the body while left ventricle pumps oxygenated blood to different parts of the body

14. (b)

Wavelength of visible light is 400 - 700 nm

15. (c)

Nitrogen is used in the synthesis of proteins?

16. (a)

If the tip of a seeding is cut off, growth as well as bending ceases because it hampers perception of light stimulus