SOLUTION

Que:1 **Ans:C**

In order to find the unit digit of, $1^4 + 2^4 + 3^4 + ... + 130^4$ we will first find the unit digit of $1^4 + 2^4 + 3^4 + ... + 10^4$ as there will be cycle after every 10 numbers. Unit digit for 1^4=1, 2^4 = 6, 3^4 = 1, 5^4 =5,…, 10^4 =0, adding them 1+6+1+6+5+6+1+6+1+0=33, giving unit digit as 3.

There will be 13 cycles of 10 numbers → 13*3=39. Hence the unit digit will be 9.

Coming to second part, (1! + 2! + 3! + … + 120!), the unit digit will be sum of just first four natural numbers. 1! =1, 2! =4, 3! =6, 4! =24. Because after 4!, the factorial of any natural number end in 0. Hence the unit digit will be 1+2+6+4=3.

Subtracting 3 from 9 will give the final unit digit as 6.

Que:2 **Ans: D**

Statement 1 alone does not give any information about selling or cost price.

Statement 2 alone is not sufficient.

Let the Cost Price of Laptop be CP and Selling Price be SP. Then using the statement 2 only gives 1.25(0.9CP) = SP – 21. Two variables and one equation will not give a unique answer.

Combining both, SP=1.15 CP and 1.25(0.9CP) = SP – 21. It will give unique solution as $840.

Que:3 **Ans: D**

Probability that each son will have two sons each is $\left(\frac{1}{2} * \frac{1}{2} * \frac{1}{2}\right) * \left(\frac{1}{2} * \frac{1}{2} * \frac{1}{2}\right) = \frac{1}{64}$.

Probability that each daughter will have three daughters each is $\left(\frac{1}{2}\right) * \left(\frac{1}{2}\right) * \left(\frac{1}{2}\right) = \frac{1}{8}$.

Probability that both events happen is $\frac{1}{64} * \frac{1}{8} = \frac{1}{512}$.

Que:4 **Ans: E**

Each value in the series in n^2+n^3 where n is natural number. Sum of the series will be $(1^2+2^2+3^2+\ldots+50^2) + (1^3+2^3+3^3+4^3+\ldots+50^3)$.

Using 1. Sum of squares of first n natural numbers = $\frac{n(n+1)(2n+1)}{6}$ & sum of cubes of first n natural numbers = $n(n+1)^{\frac{2}{4}}$. Placing values of n = 50 in both equation, we get Option E as answer

Que:5

Let the first term be "a". Then using the given statement $(a + ar + ar^2 + ar^3 + ar^4) = 363$.

<table>
<tr><td colspan="2">Using First statement 1 alone, nothing can be said about the first term of the series.
Using Second statement alone, different value can be obtained which are pefect cube say 27, 216 .Even combining both the statement, we cannot derive the unique value of the first term</td></tr>
<tr><td>Que:6</td><td>Ans:A</td></tr>
<tr><td colspan="2">Total Score is 214, it means the average score is 71.33.
Using Statement 1 alone. A score 68 marks, B scored the least, it means B scored less than 68 and C’s score will be definitely more than 68. Hence, A didn’t score the highest and we get a unique answer for the question. So Statement 1 alone is sufficient.
Statement 2 doesn’t give enough information for the individual score of A and C, so we can’t say whether A scored highest or not.</td></tr>
<tr><td>Que:7</td><td>Ans: B</td></tr>
<tr><td colspan="2">Absolute value of X must be maximum and absolute value of Y must be minimum/ Solving for X in $|2X-5| \leq 9$, gives 2X=14, X=7 and $|Y| = 0$ satifies$|4Y-7| \leq 21$. Hence maximum value of $|X| - |Y|$ is 7- 0 =7.</td></tr>
<tr><td>Que:8</td><td>Ans: B</td></tr>
<tr><td colspan="2">Using Statement 1 alone we get multiple values (2,3) (2,5), (2,11), (2,17). Hence its not sufficient.
Using Statement 2 is sufficient. We get (2,11) as 4+ 121=125 which is a perfect cube</td></tr>
<tr><td>Que:9</td><td>Ans: B</td></tr>
<tr><td colspan="2">From numbers 1 to 15, if the natural number written on the board is a multiple of 3 as well as 5, it has to be a multiple of 15. Same is true for 7*2 = 14, 3* 4 = 12 and 2*5 = 10 as well. And if it is a multiple of all the numbers from l0 to 15, then it becomes a multiple of all the numbers from 1 to 7. So 8 and 9 are the only 2 numbers for which the condition can not be confirmed.</td></tr>
<tr><td>Que:10</td><td>Ans: C</td></tr>
<tr><td colspan="2">Starting with the first natural number 1, (1,1) is the solution for the given equation, but it’s not the multiple of 6. Proceeding for next natural numbers, it can be noted that the value of x will increase or decrease in multiples of 4, while the value of y will increase or decrease in multiples of 3, hence no value is going to be multiple of 6.</td></tr>
<tr><td>Que:11</td><td>Ans: B</td></tr>
</table>

$a^3 + \frac{1}{a^3} + 7 = \frac{a^6 + 7a^3 + 1}{a^3}$

Hence, $\log\left(a^3 + \frac{1}{a^3} + 7\right) + log\left(\frac{a^3}{a^6 + 7a^3 + 1}\right)$

$= \log\left(\frac{a^6 + 7a^3 + 1}{a^3}\right) + log\left(\frac{a^3}{a^6 + 7a^3 + 1}\right) = log 1 = 0$

The simplified expression is $a^3 + \frac{1}{a^3} + 7$.

Que:12 Ans: A

Time taken by Adam to complete the race = 600 seconds (30 KM→ 3600 seconds, 5 KM→ 600 seconds).

Time taken by Thomas to complete the race = 600+ 30= 630 seconds.

Time taken by Robert to complete the race = 630+ 70= 700 seconds.

In 630 seconds, Robert travelled = 630/700 * 5000m = 4500m.

Hence, Thomas beat Robert by 500 m.

Que:13 Ans: C

Looking at the options, let's try $2Y^2 \approx 1700$ or $Y \approx 29$ or 30. If Y=29, then $2Y^2=1682$, 1862-29=1653(year of birth) and 1653+17=1670, i.e., the year when he ascended to the throne.

Que:14 Ans: E

The series will give three 5'S and when multiplied by three 2'S, they will give three 0's. So, the last three digits of expression will be 0, 0, 0.

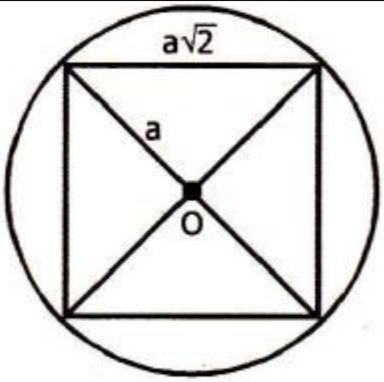
Que:15 Ans: A

If f(x) is odd and g(x) is even then g (f(x)) will also be even as the function g for all values of x is even.

Que:16 Ans: D

We get $(x! + 5)(x! - 6) \geq 0 \Rightarrow x! \geq 6$ or $x! \leq -5$, As x has to be positive, $x \geq 3$.

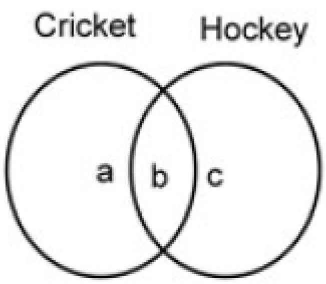
Que:17 Ans: B



$P_1 = \frac{2a^2}{\pi a^2} = \frac{2}{\pi}$ and $P_2 = 1 - \frac{2}{\pi} = \frac{\pi - 2}{\pi}$

Since $\pi - 2 < 2$, $P_2 < P_1$ (i.e.) $P_1 > P_2$

Que:18	Ans: C



Let a be the number of students who play only cricket, b be the number of students who play both the games and c be the number of students who play only Hockey.

b + c = 2b => c = b.

a + b = 2 (b + c)

a + b = 4b

a = 3b

Thus the number of students who play at least one game

= 3b + b + b = 5b.

The number of players who play only cricket is maximized when 5b is maximized => 5b = 70 => b = 14

Number of players who play only cricket = 3b = 42.

Que:19	Ans: C

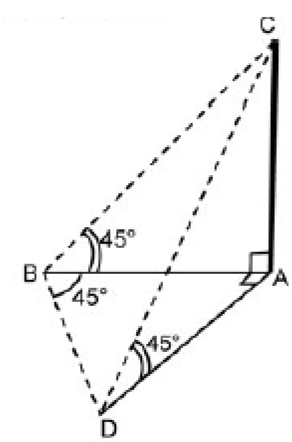
$\left(\sqrt{a} + \sqrt{b}\right)^2 = a + b + 2\sqrt{ab}$

By observation, 3+10 = 5+8+6+7 = 4+9 =13

The value will be the maximum possible, when the numbers are as close as possible. (i.e. when the product a * b is maximum) i.e. the difference between the numbers is the minimum. Thus $\sqrt{6} + \sqrt{7}$ is the maximum.

Que:20	Ans: B

Let the top of the pole be C.



As the angle of elevation from both B and D is the same, both must be equidistant from the foot of the pole.

Thus AB = AD.

In $\Delta\, ABD$, AB = AD and $\angle B$ = 45° => $\angle D$ = 45°.

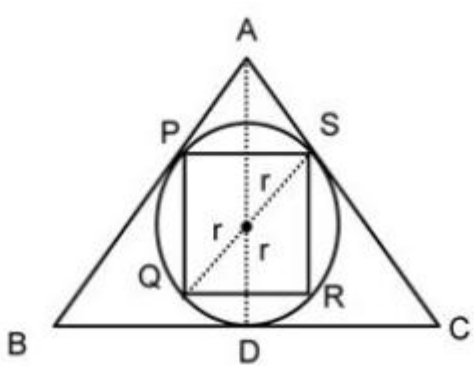
$AB^2 + AD^2 = 25^2$

⇨ $2AB^2 = 625$ i.e., AB = $\frac{25}{\sqrt{2}}\, m$

As the angle of elevation is 45°, tan 45° = $\frac{AC}{AB}$

⇨ AC = AB => $\frac{25}{\sqrt{2}}\, m$

Que:21 Ans: C



Let ABC be the triangle and PQRS be the square.

Let the side of the triangle be a.

The area of the triangle = $\frac{\sqrt{3}}{4}$ a^2.

The in radius of the equilateral triangle is

The in radius of the equilateral triangle is

$\frac{1}{3} * \frac{\sqrt{3}}{4} a = \frac{2}{2\sqrt{3}}$

The diameter of the circle is the diagonal of the square.

Thus the side of the square is

$$\frac{2\left(\frac{a}{2\sqrt{3}}\right)}{\sqrt{2}} = \frac{2}{\sqrt{3 * \sqrt{2}}} = \frac{a}{\sqrt{6}}$$

Area of the square = $\frac{a^6}{6}$

Required ratio = $\left(\frac{\sqrt{3}}{4}\, a^2\right) : \left(\frac{a^2}{6}\right) = 3\sqrt{3} : 2$

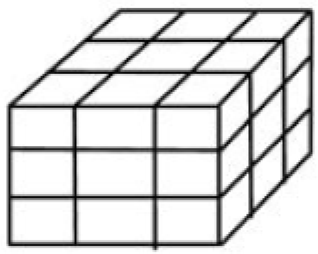
Que:22 Ans E

Using Statement 1 alone, PQRS can be any cyclic quadrilateral and hence area cannot be found.

Using Statement 2 alone, if any two sides of a quadrilateral are equidistant from the centre of the circle, then the two sides will be of equal length, but we cannot find the area of the quadrilateral.

Even by combining both statements, we can't determine the area of the quadrilateral.

Que:23	Ans: C



The yield the maximum number of cubes, 2 cuts should be made in each direction, as shown in figure.

∴ The number of smaller cubes = 3 * 3 * 3 = 27.

Surface area of the large cube = $6a^2$.

Surface area of each small cube = $6(a/3)^2$

∴ For 27 cubes = $27 * 6 * (a/3)^2 = 18a^2$

Ration of surface areas = $6a^2 : 18a^2 = 1 : 3$

Additional amount of paint required = 2*3.5 = 7 litres.

Alternative Solution:

The cuts being parallel to the original faces, every cut results in the exposure of 2 unpainted faces of the original cube. Therefore 6 cuts will result in 12 unpainted faces being exposed which will require 7

Que:24	Ans: B

Let V (in km/hr) be the speed by which the top speed reduces when n wagons are attached to the engine.

Given that, $V \propto \sqrt{n}$

⇨ $V = k\sqrt{n}$

Also given that when n = 25, V=80-55 = 25 km/hr

⇨ $25 = k\sqrt{25}$

⇨ K=5

∴ When V = 80 – 20 i.e., 60 km/hr

$60 = 5\sqrt{n}$

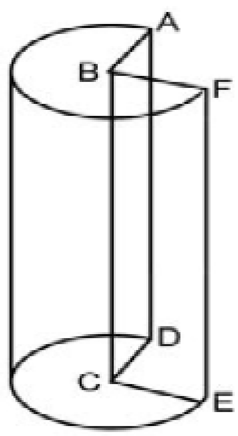
⇨ $N = 12^2 = 144$.

Since the speed must be more than 20 km/hr only 143 wagons should be attached.

Que:25	Ans D

Suppose the number of bacteria initially be 100. If the number of bacteria that perished in the first two hours is the same as the number of all the bacteria that perished after the first two hours, then at the end of two hours, bacteria left will be 50. Trying 30% as the rate, at the end of first hour, bacterial left will be 70, and at the end of second hour it will be 70*70%= 49 which is close to 50. Hence at the end of third hour the bacteria left will be 50*70%= 35. Nearest option is 35.36%

Que:26	Ans: D



The sum of the surface areas of BFEC and BCDA (which are rectangles)

= 2*BF*BC = 2*14*20 = 560 cm^2.

Total area of the flat surfaces = $2\left(\frac{3}{4}\pi * (14)^2\right)$

$= 2 * \frac{3}{4} * \frac{22}{7} * 14 * 14 = 924$ cm^2

Area of the curved surface = $\frac{3}{4} * 2\,\pi * 14 * 20$.

$= \frac{3}{4} * 2 * \frac{22}{7} * 14 * 20 = 1340$ cm^2

So total surface area of the new block

= (560+924+1320) = 2804 cm^2

Que:27	Ans: A

Replacing x with $\frac{1}{x}$ in $ax^2 + bx + c = 0$ gives $a\left(\frac{1}{x}\right)^2 + b\left(\frac{1}{x}\right) + c = 0$ => $cx^2+bx+a=0$ are reciprocals of the roots of $ax^2 + bx + c = 0$

Therefore, one can conclude that the roots of the first and the second quadratic equations are (2,-3) and $\left(\frac{1}{2}, \frac{-1}{3}\right)$ respectively.

∴ Sum of roots is 2 – 3 = -1

Que:28	Ans: B

Ratio of laptops to desktops in India – 5 :95, i.e., 1:19

Given, no of laptop = 28,000

⇨ No. Of desktops = 28000*19.

∴ Total value = value of laptops + value of desktops

$= (28000 * 45000) + (28000 * 19 * 25000)$

$= 28 * 10^6 * 5(9 + 95) = 10^6 * 140 * 104$ $= Rs. 1456\ crore$	
Que:29	Ans:C
Ratio of total pc sales in china and Australia = 3:1 ∴ ratio of desktop sales in china and Australia = 3*84 **:** 1*72 = 252 **:** 72 = 63 **:** 18 ∴ ratio of value of desktop market = 63 * 2 **:** 18 * 3 = 126 **:** 54 = 7 **:** 3	
Que:30	Ans: B
Let 100 be the initial cost price and P be the initial profit percentage. Hence, selling price = 100 + P The decreased cost price will be 80. Final profit percentage = $\frac{(P+20)}{80} * 100 = P + 30$ ⇨ P =20. If cost is decreased by a further 25%, CP = 60 ⇨ => Final profit percentage = $\frac{(120-60)}{60} = 100\%$	