21.09.2020 FN SESSION

1. *Fishing is a serious environmental issue. It has been determined by the scientists that if the net of a trawler has mesh size x cm by x cm (square mesh) then the percentage of fish entering the net that are caught in the net is (100-0.02x2-0.05x). For example, if the mesh size is zero 100% of the fish that enter the net will be caught. The trawler with net with a square mesh that was suspected of using an illegal size net dropped its net to the ocean floor near the damans and coast guard officials arrested the crew. The scientists later looked at the size of the fish caught and estimated that with the net used by the trawler at least 97.93% of the fish entering the net would be caught. What is the maximum value of x for the net by the trawler?*

**a. 8.5 b. 9 c. 11 d. None of a, b, c**

**Solution:**

***When x = 0***

*100-0.02x2-0.05x.*

% of fish caught is 100 - .02(0)2 - .05(0) = 100 % 🡪 (1) x=0

What is the value of x when % of fish caught is 97.93 %?

% of fish caught is 100 - .02(x)2 - .05(x) = 97.93 % 🡪**(2)**

Multiply equation **(2)** by 100

10 000 - 2(x)2 - 5(x) = 9 793

10 000 – 9 793 = 2x2 + 5x

207 = 2x2 + 5x

2x2 + 5x – 207 = 0

414 - product & sum - + 5

Solving for x, we get the value of x = 9.

*Maximum value of x for the net by the trawler is* **9 cm.**

2. *In this problem abs(x) is the mathematical value of x without regard to its sign. For example abs (3) is 3 and abs (-3) is also 3. If the equation abs(x+12) + abs(x-5) = r is satisfied by infinitely many values of x the value of r is*

**a. 12 b. No such r exists c. 17 d. 5**

**Solution:**

***When x = 0***

abs(x+12) + abs(x-5) = r.

abs (0+12) + abs (0-5) = r.

12 + 5 = r.

17 = r.

***When x = 1***

abs(x+12) + abs(x-5) = r.

abs (1+12) + abs (1-5) = r.

13 + 4 = r.

17 = r.

***When x = 2***

abs(x+12) + abs(x-5) = r.

abs (2+12) + abs (2-5) = r.

14 + 3 = r.

17 = r.

***When x = 3***

abs(x+12) + abs(x-5) = r.

abs (3+12) + abs (3-5) = r.

15 + 2 = r.

17 = r.

***When x = 4***

abs(x+12) + abs(x-5) = r.

abs (4+12) + abs (4-5) = r.

16 + 1 = r.

17 = r.

***When x = 5***

abs(x+12) + abs(x-5) = r.

abs (5+12) + abs (5-5) = r.

17 + 0 = r.

17 = r.

***When x = 6***

abs(x+12) + abs(x-5) = r.

abs (6+12) + abs (6-5) = r.

18 + 1 = r.

**19 = r**.

***When x = 7***

abs(x+12) + abs(x-5) = r.

abs (7+12) + abs (7-5) = r.

19 + 2 = r.

**21 = r**.

***When x = 8***

abs(x+12) + abs(x-5) = r.

abs (7+12) + abs (7-5) = r.

20 + 3 = r.

**23 = r**.

***When x = 9*  🡪** r = 25

***When x = 10*  🡪** r = 27

***When x = 11*  🡪** r = 29

***When x = 12*  🡪** r = 31

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*Value of r is?* **No Specific r exists for all possible distinct values of x.**

3. *One laser blast will break asteroids larger than 20 kg into three pieces, each one third of mass of the original. Asteroids less than 20 kg are shattered into dust by the laser. How many laser blasts would be required to reduce a 2000kg asteroid to dust?*

**a. 365 b. 364 c. 244 d. 243**

**Solution:**

**1** laser blast on 2 000kg asteroid gives **3** asteroids of **(2 000/3)** kg 666.66kg

**3** laser blasts on 3 asteroids of (2 000/3)kggives **9** asteroids of **(2 000/9)** kg 222.22kg

**9** laser blasts on 9 asteroids of (2 000/9)kggives **27** asteroids of **(2 000/27)** kg 70 kg

**27** laser blasts on 27 asteroids of (2 000/27)kggives **81** asteroids of **(2 000/81)** kg 22 kg

**81** laser blasts on 81 asteroids of (2 000/81)kggives **243** asteroids of **(2 000/243)** kg 7kg

**2 000/243 is less than 20 kgs**

**243** laser blasts will shatter **243** asteroids of **(2 000/243)** kg into **dust**

*How many laser blasts would be required to reduce a 2000kg asteroid to dust?* **1 + 3 + 9 + 27 + 81 + 243 = 364.**

4. *All the digits 2, 4, 7, 8 and 9 are placed in the grid, one in each cell, to form two three digits numbers that are perfect squares. Which digit is placed in the centre of the grid?*

**2 4 7 8 9**

**100 121 144 169 196 225 256 289 324 361 400 441 484 529 576 625 676 729 784 841 900 961 1024**

**Solution:**

2

7 8 4

9

5. *The length, breadth and height of a room are in the ratio 3:2:1. If the breadth and height are halved, while the length is doubled, then the total area of the four walls of the room will*

**a. Decreased by 15% b. Decrease by 18.7% c. Decrease by 13.6% d. Decrease by 30%**

**Solution:**

**b**

**h l \* h b\*h**

**l 2 l\*h+2 b\* h**

Ratios of length, breadth and height of a room is 3: 2: 1.

Therefore length = 3x, breadth = 2x, height = x.

Total area of 4 walls of the room = 2 l\*h + 2 b\*h. = 2h (l + b) Sq. Units

Area of 4 walls before change in breadth & length =2x (3x + 2x) = 2x (5x) = **10x2 Sq. Units**

**Breadth & height halved; length is doubled.**

Therefore length = 2(3x), breadth = (2x)/2, height = x/2.

Area of 4 walls after change in breadth & length = 2(x/2) (2(3x) + (2x)/2) = x(6x + x) = **7x2 Sq. Units**

% decrease in area of the 4 walls after change is ((10x2 – 7x2) / 10x2) \* 100 = (3x2 / 10x2) \* 100 = **30%.**

6. *A and B stand at distinct points of a circular race track of length 135m. They cycle at speeds of a m/s and b m/s respectively. They meet for the first time 5 secs after the start of race and for the second time 14 sec from the time they start the race. Now, if B had started in the opposite direction to the one he had originally started, they would have met for the first time after 60 sec. If B is quicker than A, Find Speed of B?*

**Solution:**

7. *If 12 divides ab313ab (in decimal notation, where a, b are digits>0, the smallest value of a + b is*

**a. 2 b. 4 c. 7 d. 6**

**Solution:**

For ab313ab to be divisible by 12 it must be div by 3 & 4.

12 16 20 24 28 32 36 40 44 48 52 56 60 64

ab313ab = a+ b + 3 + 1 + 3 + a + b = mul of 3 =2(a+b)+ 7 = mul of 3

ab = 12 = 2(1+2)+7 = 13

ab = 16 = 2 (1+6)+7= 21

sb = 52 = 2 (5+2)+7 = 21

ab takes value 12 then ab313ab which becomes 1231312 is div by 4 but not 3.

ab takes value then ab313ab which becomes 1631316 is div by 4 & 3.

*the smallest value of a + b is?* **1 + 6 = 7.**

8. *George’s salary is 20% more than Mark’s, Harry’s salary is 30% greater than George’s, Tony’s salary is 40% more than Albert’s, Albert’s salary is 20% lesser than George’s. What is Albert’s salary as a percentage of Tony’s salary (to the nearest percentage point)?*

**a. 60% b. 76% c. 82% d. 69%**

**Solution:**

G = (120 / 100) \* M

H = (130/100) \* G

T = (140/100) \* A

A = (80/100) \* G

Find (A / T) \* 100 = (4/5 \* 6/5 M) / (7 / 5 (4/5 \* 6/5 M)) \* 100 = (5 / 7) \* 100 =14.28 \* 5 = 71.40 %

SECOND METHOD:

T = (140/100) \* A 🡪 A = 5 / 7T

Find (A / T) \* 100 = ((5/7) T / T) \*100 = 5 / 7 \* 100 = 71.40

9. *Of a set of 30 numbers, the average of the first 10 numbers is equal to the average of the last 20 numbers. The sum of the last 20 numbers is*

**a. 2 \* sum of last ten numbers b. Cannot be determined with the given data**

**c. Sum of first ten numbers d. 2 \* sum of first ten numbers**

**Solution:**

Avg of first 10 numbers = Sum of first 10 numbers / 10

Avg of last 20 numbers = Sum of Last 20 numbers / 20

Sum of first 10 numbers / 10 = Sum of Last 20 numbers / 20

2 \* Sum of first 10 numbers = Sum of Last 20 numbers

10. In a certain city, 60 percent of the registered voters are Party A supporters and the rest are Party B supporters. In an assembly election, if 75 percent of the registered Party A supporters and 20 percent of the registered Party B supporters are expected to vote for Candidate A, what percent of the registered voters are expected to vote for Candidate A?

Assume total population is 100.

Party A = 60 Party B = 40

75 % of 60 =45

20 % of 40 = 8

Totally 53 out of 100 are the registered voters expected vote for Candidate A

11. Find the length of the longest pole that can be placed in an indoor stadium 24m long, 18m wide and 16m high.

18m

C 16 m

A

D B

24 m

AC is the Longest Pole

ABC is a right triangle with Angle B as 90 deg.

BC = 16m AB= ?

ADB AB2 = DB2 + AD2

= 576 + 324 = = 30m

ABC 🡪 AC2 = AB2 + BC2 = 900 + 256 = 1156 🡪 AC = = 34m

12. M is 30% of Q, Q is 20% of P, and N is 50% of P, then M/N=

M = 3/10 \* Q

Q = 1/5 \* P

N = 1/2 \* P

M / N = 3/10 \* Q / 1/2 \* P = 3/10 \* 1/5 \* P / 1/2 \* P =(3P / 50) / (P/2) = 3 / 25

13. In the question, A^B means A raised to the power B. If f(x) = ax^4-bx^2 + x + 5 and f (-3) = 2, then f (3) =

f (x) = ax4-bx2 + x + 5

f (-3) = a(-3)4 - b(-3)2 + (-3) + 5 = 81a -9b -3 + 5 = 81 a -9b +2 = 2 🡪 81a – 9b = 0

f (3) = a(3)4-b(3)2 + 3 + 5 = 81a – 9b + 8 = 0 + 8 = 8

14. 1/4 of the tank contains fuel. When 11 litres of the fuel is poured into the tank, the indicator rests at the 1/2 mark. Find the capacity of the tank litres.

Assume total Capacity of tank is x litres.

x/4 litres + 11litres = x/2 litres

11 = x/2 – x/4

X = 44 litres.

15. You have been given a physical balance and 7 weights of 47,46,43,48,49,42 and 77 kgs. Keeping weight on one pan and object on the other, what is maximum you can weigh less than 178 kgs?

48 + 49 + 77 = 174 kgs

16. In the village, every weekend three by eighth of men and one third of the women participate in the social activity. If the total participant is 54, out of them 18 men then the total number of men and women in the village is?

3/8 of Men and 1/3 of women Participate in activity

3/8 Men = 18

1/3 Women = 36(54 – 18 )

Men = 48 , Women = 108

Total = 48 + 108 = 156 .