Aptitude & Mental Ability

Tnpsc Previous Questions With Explanation - Part 2

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1. The greatest common divisor of $2x^2-x-1$, $4x^2+8x+3$ is

A) 2x+1 B)x−1 C)2x+3 D)2x−1

Factorizing $2x^2-x-1=0$;	Factorizing $4x^2+8x+3=0$;
$2x^2-2x-x-1=0$;	$4x^2+6x+2x+3=0$;
$2x(x-1)+1(x+1)=0$;	$2x(2x+3)+1(2x+3)=0$;
The factors are $(2x+1)$, $(x-1)$	The factors are $(2x+1)$,$(2x+3)$

The common factor is (2x+1)

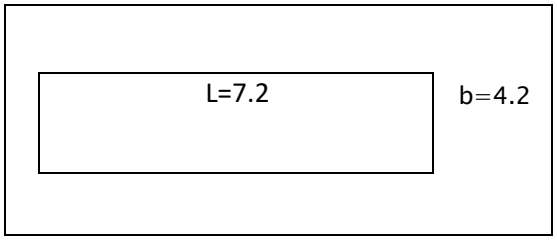
2. Length and breadth of a room are 8m and 5m respectively. A red colour border of uniform width of 0.4m has been painted all around on its inside. Then Area of the border is

A)9.76m B)12m C)10.66m D)5.04m

Length=8 , Breadth=5;

New length=8−0.8m = 7.2 m

New breadth =5−0.8m = 4.2 m



Old measurement =l * b;

= 8*5 = 40m^2

New Measurement = l * b;

= 4.2 * 7.2 = 30.24 m^2

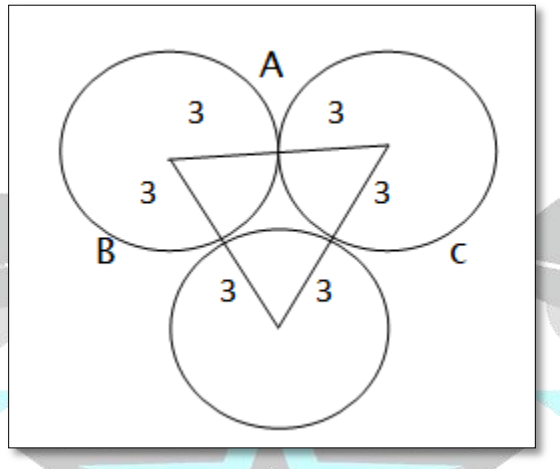
Area of the border = Old – New

= 40 – 30.24

= 9.76 m^2

3. Three equal circles of radius 3 cm touch one another in outside. Find the area enclosed by them,

A)10.88 B)6.11 C)27.93 D)1.45



All the radius are same , so it is an equilateral triangle, the degree for equilateral triangle is 60

Area of the equilateral triangle=$A = \frac{\sqrt{3}a^2}{4}$

$A = \frac{\sqrt{3}*6*6}{4} = 15.58$

Sector ABC $= A = \frac{1}{2}r^2\theta$;

A=$\frac{1}{2} * 6 * 6 * \frac{\pi}{3}$ =14.14

Area between triangle =(Area of equilateral triangle–Area of sector ABC)

=15.58–14.14

= 1.45cm^2

4. The sum of the deviation taken from the _____ is zero .

A)Mean B)Mode C) Median D) Variance

The sum of the deviations below the mean will be always equal the sum of the deviations above the mean.

So the Sum of deviation taken from the mean is always zero.

5. Mr. X borrowed Rs. 5000 on 7th june 2006 and returned it on 19th August 2006. Find the amount he paid , if the interest is calculated at 7% per annum

A)5140 B)5070 C)5210 D)5280

Interest is calculated after 7th of june to 18th of august, so june+july+august

(30−6)+31+18=73 days

Simple Interst $= \frac{p*n*r}{100}$;

P=principle, n=no of days, r= rate of interest;

Simple interest=$\frac{5000*73*7}{100*365}$

=70

Amount = S.I + Interest

= 5000+70 =5070

6.Simplify : $\log_5 4 + \log_5 \frac{1}{100}$

A) 1 B) -1 C) -2 D) 2

By formula, $\log(x^a)=a\log(x)$;

We can convert the (1/100) in the expression to a power of 10:

$\Rightarrow \log(\frac{1}{100})=\log(100^{-1})$

$\Rightarrow \log((10^2)^{-1})=\log(10^{-2})$

$\log(10^{-2}) = -2\log(10)$

$= -2$

7. Simplify: $\frac{x^3+8}{x^4+4x^2+16}$:

A) $\frac{x+2}{x^2+2x+4}$ B) $\frac{x+2}{x^4+4x^2+16}$ C) $\frac{x+8}{x^4+4x^2+8}$ D) $\frac{x-2}{x^4+4x^2+16}$

$(a^3+b^3)=(a+b)\ (a^2-ab+b^2)$

$=8$ is 2^3.

X^3+8 is in the form of (a^3+b^3),

$(x^3+2^3)=(x+2)(x^2-2x+4)$;

Factorizing $X^4+4x^2+16 = ((x^2+4)^2-2^2)$

$=(x^2+2x+4)(x^2-2x+4)$

Now, $\frac{x^3+8}{x^4+4x^2+16} = \frac{(x+2)(x2-2x+4)}{(x2+2x+4)(x2-2x+4)}$

$= \frac{(x+2)}{(x2+2x+4)}$

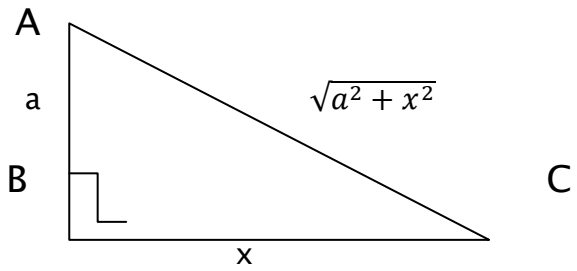
8. If $\tan\theta = \frac{a}{x}$, then the value of $\frac{x}{\sqrt{a^2+x^2}}$ is equal to

A)cos θ **B) sin θ** **C) cosec θ** **D) sec θ**

By pythagorean's theorem,

$\tan\theta = \frac{opposite}{adjacent}$

By the Pythagorean triangle, $\frac{x}{\sqrt{a^2+x^2}}$ is adjacent to hypotenuse



Adjacent / Hypotenuse = cos θ

9. For m, n € N, and m>n, which of the following is a Pythagorean triplet?

A) m^2+n^2, $m+n$, $2mn$ B) m^2+n^2, m^2-n^2, $2mn$

C) m^2+n^2, $m-n$, $2mn$ D) $m+n$, m^2-n^2, $2mn$

To satisfy the Pythagorean triplet the sum of square of two sides is equal to the square of the larger side(hypotenuse)

$A^2+B^2=C^2$

From the options , consider $A=m^2-n^2$; $B= 2mn$; $C=m^2+n^2$

$A^2 + B^2 = (m^2 - n^2)^2+(2mn)^2$

$= m^4-2n^2m^2+n^4+4n^2m^2$

$=m^4+2n^2m^2+n^4$ ⟶ 1

$C^2 = (m^2+n^2)^2$

$= m^4+2n^2m^2+n^4$. ⟶ 2

From 1 and 2 $A^2+B^2=C^2$, So it satisfies Pythagorean theorem

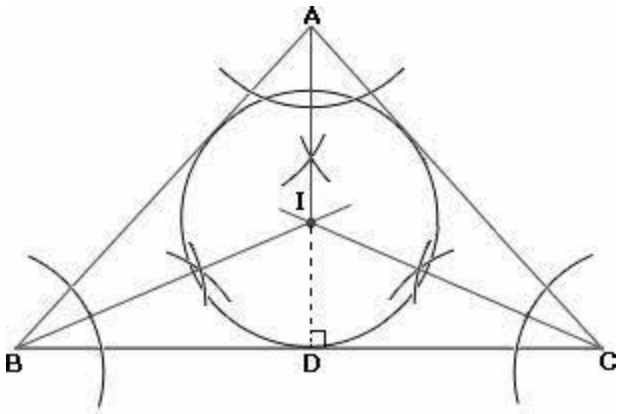
It is a triplet.

10. If a,b,c are in A.P then $\frac{a^2-b^2}{b^2-c^2}$ is equal to

A)$\frac{a-b}{b+c}$ **B) $\frac{a-b}{b+c}$** **C) $\frac{a-b}{b+c}$** **D) 1**

11. In a triangle point of concurrence of three angle bisectors is called as

A)Centroid **B)Orthocentre** **C)Circumcentre** **D) Incentre**



The point where the three angle bisectors of a triangle meet is known as the **incentre** of a triangle.

12. The ration of the ages of the father and the son at present is 149:5. After 4 years the ratio will become 3:1. What is the sum of the present ages of the father and the son?

A)40 B)42 C)48 D)52

Let the unknown present age be 'x'

The present age of father and son is 19x and 5x, after 4 years will be

$\frac{19x+4}{5x+4}=\frac{3}{1}$

(19x+4)*1 = 3*(5x+4)

19x−15x = 12−4

4x = 8

=>x=2

So the sum of present age 19*2 + 5*2

=38+10

=48

13. If 1+2+3+4+5+....+k=14400, Find the sum of 1+2+3+...+k?

A)144 B)169 C)120 D)441

The sum of first n cubes $1^3+2^3+3^3+....+n^3=\left(\frac{n(n+1)}{2}\right)^2$

$=(n^2(n+1)^2)/4$

So $(n^2(n+1)^2)/4 = 14400$

$\frac{n(n+1)}{2}=120$; n(n+1) =240

$N^2+n=240$; $n^2+n-240=0$;

Factorizing $n^2+n-240 =0$;

$N^2+16n-15n-240=0$;

$N(N+16)-15(N+16)=0$;

$(N+16)(n-15)$

'N' cannot be negative so 'n' is 15

The sum of first 'n' natural number is $\frac{n(n+1)}{2}$

$$=\frac{15*16}{2} \quad =120$$

14. What is the total area of eight squares whose sides are respectively 5cm, 6cm, 7cm .....,12cm?

A)650 B)620 C)600 D)675

The sum of square of 'n' natural number is $\frac{n(n+1)(2n+1)}{6}$

The numbers are 5,6,7,8,9,10,11,12. It is not in an order so we take the numbers from 1 to 12 and subtract 1 to 4 from it

for $n = 12$, $\frac{n(n+1)(2n+1)}{6}=\frac{12*13*25}{6}=650$

for $n=4$, $\frac{n(n+1)(2n+1)}{6}=\frac{4*5*9}{6}=30$

$650-30 = 620$ cm²

(or)

25+36+49+64+81+100+121+144 = 620cm2

15. Find the LCM of the following:

A)15xyz B)15xyC)15yx D)450xyz

L.C.M is Least Common Multiple

L.C.M of 90,150,225 is 450

L.C.M of x^2yz^3, xy^3z^2, x^3y^3z is $x^3y^3z^3$

The answer is 450 $x^3y^3z^3$

16. In a school of 720 students the ration of boys and girls is 7:5. How many more girls are to be admitted to make the raio 1:1?

A)100 B)110 C)120 D)105

Total students =720 , the number of boys and girls be 7x and 5x

So total students is 7x+5x=720;

12x=720; x=60

The number of boys and girls are 420 and 300 respectively

Total number of girls less than boys are 120 so to make 1:1 ratio , 120 girls to be admitted in the school (300+120) =420 girls

420 boys : 420 girls

1:1

17. A number is increased by $22\frac{1}{2}$ and gives 98. The number is?

A)45 B)18 C)80 D)81

Let the unknown number be x;

X+$22\frac{1}{2}\%$ x=98

X+$\frac{45}{200}$x=98 ;

$\frac{245x}{200}$=98 ; x=$\frac{98*200}{245}$

X=80

18. A sum of money triple itself at 10% interest per annum, over a certain time. Find the number of years

A) 10 years B) 15 years C)20 years D) 25 years

Money triples itself then, the total Amount is 3 times the principle,

If the principle is 100 then the Amount is 300 and the Interest is 200

Simple Interest $=\frac{p*n*r}{100}$ where p=principle, n=no of years, r= rate of interest

Let the principle be 100 then the interest is 200

$200 =\frac{100*10*n}{100}$;

by solving we get n=20

so it takes 20 years to triple itself in 10% interest rate.

19. Find simple interest on Rs. 10950 for 42 days at 10% p.a

A)116 B)74 C)126 D)108

Simple Interest $=\frac{p*n*r}{100}$;

where p=principle, n=no of years, r= rate of interest

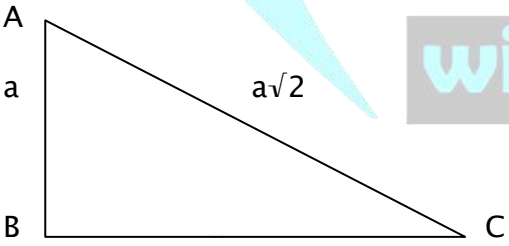
Simple Interest$=\frac{10950*10*42}{100*365}$; (n is in days so n/365 should be used)√

$= 126$

20. In a right angle triangle ABC, B=90 , A=C= 45 and AB=BC=a, then AC is equal to

A)2a B)4a C)3a D) a√2

ABC is a right angled triangle , we can apply Pythagorean theorem,



By Pythagorean theorem, $AB^2 = AC^2+BC^2$

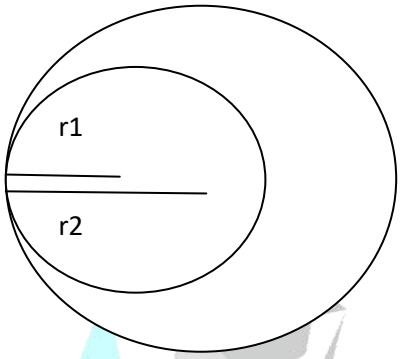
$AB^2 = a^2 + a^2$; (AB=BC=a)

$AB =\sqrt{a^2 + a^2}$

$=a\sqrt{2}$

21. Let r1,r2 are the radius of two circles. If two circles touches internally, then distance between their centre;s is equal to

A)r1+r2 **B)r1−r2** **C)r1r2** **D)r1/r2**



r1 is the radius of smaller circle and

r2 be the radius of larger circle ,

if they touch internally the r2 =x + r1,

x= r1−r2

22. The circumcentre of the triangle with vertices at (0,0) , (0,4) and (4,0) is?

A) (4,.4) **B) (4/3 ,4/3)** **C) (2,2)** **D) (3/4,3/4)**

Given points are,

A = (0,0) ; B = (0,4) ; C = (4,0)

To find out the circumcenter we have to solve any two bisector equations and find out the intersection points.

So, midpoint of AB = $(\frac{0+0}{2}, \frac{0+4}{2})$ = (0,2)

Slope of AB = $(\frac{4-0}{0-0})$ = 0

Slope of the bisector is the negative reciprocal of the given slope.

So, the slope of the perpendicular bisector = 0

Equation of AB with slope 0 and the coordinates (0,2) is,

$(y - 2) = 0(x - 0)$

$y=2$.....(1)

Similarly, for AC

Mid point of AC $= (\frac{0+4}{2}, \frac{4+0}{2}) = (2,2)$

Slope of AC $= (\frac{4-0}{4-0}) = 1$

Slope of the bisector is the negative reciprocal of the given slope.

So, the slope of the perpendicular bisector $= -1$

Equation of AC with slope -1 and the coordinates (2,2) is,

$(y - 2) = -1(x - 2)$

$y - 2 = -x + 2$

$x + y = 4$.....(2)

By solving equation (1) and (2),

Substitute the value of y in to (2)

$x + y = 4$; $x = 4 - 2 = 2$

So the circumcenter is (2,2)

23. If the equation kx+2y=5; 3x+y=1 having no solutions then K is

A) K=4 **B) K=6** **C) K=5** **D) K=2**

Let, $Kx + 2y = 5$ ⟶ 1

$3x + y = 1$ ⟶ 2

multiply equation 2 by 2 , we get $6x + 2y = 2$

solving, $6x + 2y = 2$

$kx + 2y = 5$

$x(6-k) = -3$

for k=6 , x = 0 so there will be no solution

24. Whole number W={0,1,2,3,4.....} are also called as

A)Intergers **B)Positive Intergers**

C)Non negative Intergers **D)Counting Numbers**

Whole numbers are also called as positive intergers , but if '0' is included it considered to be **Non negative Intergers**

25. Which of the following is /are tru

1) All divisors of a number are also factors for that number

2) All factors of a number are also divisors for that number

3) All divisors of a number need not be factors for that number

4) All factors of a number need not be divisors for that number

A) 2,3 **B)1,2** **C) 1,2,3** **D)All the above**

All the divisors of a number need not be a factor of that number whereas all the factor of a number is divisor of that number , so **2,3** are correct