Algebra Questions for RRB NTPC Set-4 PDF

Instructions
For the following questions answer them individually

Question 1

The smallest positive integer n with 24 divisors considering 1 and n as divisors is

A 420

B 240

C 360

D 480

Answer: C

Explanation:
For any given number, that can be represented as $A^x \times B^y$, etc

The number of factors is denoted by (x+1) x (y+1), etc

360 = $2^3 \times 3^2 \times 5^1$

So the number of factors = (3 +1) x (2+ 1) (1+ 1) = 4x3x2 = 24

For 240, it is $2^4 \times 3^1 \times 5^1$

Number of factors = 5 x 2 x 2 = 20 only

Question 2

If 3 (a^{2} + b^{2} + c^{2}) = (a + b + c)^{2} , then the relation between a, b and c is

A a = b = c

B a = b ≠ c

C a < b < c

D a > b > c

Answer: A

Explanation:
Given , 3 (a^{2} + b^{2} + c^{2}) = (a + b + c)^{2}
3 (a^{2} + b^{2} + c^{2})=3 (a^{2} + b^{2} + c^{2}) +2[ab+bc+ca]
2 (a^{2} + b^{2} + c^{2})= +2[ab+bc+ca]
(a^{2} + b^{2} + c^{2})= [ab+bc+ca]
(a^{2} -ab) + (b^{2} -bc) + (c^{2} -ca) = 0
a(a-b) + b(b-c) + c(c-a) = 0
This is only possible when a=b=c .

Question 3

If $(x-3)^2+(y-5)^2+(z-4)^2=0$, then the value of $\frac{x^2}{9}+\frac{y^2}{25}+\frac{z^2}{16}$ is

A 12

B 9

C 3

D 1

Answer: C

Explanation:
$(x-3)^2 + (y-5)^2 + (z-4)^2 = 0$
Since square values are always positive or equal to zero, x must be 3, y must be 5 and 4 must be 4.
Substituting these values in $\frac{x^2}{9} + \frac{y^2}{25} + \frac{z^2}{16}$, we get the value as 1+1+1 = 3.
Option C is the right answer.

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Question 4

If $(x + \frac{1}{x}) = 4$ then the value of $x^4 + \frac{1}{x^4}$ is

A 64

B 194

C 81

D 124

Answer: B

Explanation:
$(x + \frac{1}{x}) = 4$
squaring both sides
$x^2 + \frac{1}{x^2} + 2 * x * \frac{1}{x}$ = 16
$x^2 + \frac{1}{x^2}$ = 16-2 = 14
again squaring both sides
$x^4 + \frac{1}{x^4} + 2 * x^2 * \frac{1}{x^2}$ = 196
$x^4 + \frac{1}{x^4}$ = 196 - 2 = 194

Question 5

If $\frac{5x}{2x^2+5x+1} = \frac{1}{3}$ then the value of $(x + \frac{1}{2x})$ is

A 15

B 10

C 20

D 5

Answer: D

Explanation:
Expression : $\frac{5x}{2x^2+5x+1} = \frac{1}{3}$
=> $2x^2 + 5x + 1 = 15x$
=> $2x^2 + 1 = 10x$
To find : $(x + \frac{1}{2x})$

= $\frac{2x^2+1}{2x}$

= $\frac{10x}{2x}$

= 5

Question 6

If $2\sqrt{x} = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} + \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

A 6

B 30

C √15

D 16

Answer: D

Explanation:
it is given that

$2\sqrt{x} = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} - \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

here , $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ = $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ x $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ = $\frac{(\sqrt{5}+\sqrt{3})^2}{2}$

similarly , $\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ = $\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ x $\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ = $\frac{(\sqrt{5}-\sqrt{3})^2}{2}$

$\frac{(\sqrt{5}+\sqrt{3})^2}{2}$ + $\frac{(\sqrt{5}-\sqrt{3})^2}{2}$ = 2$\sqrt{(x)}$

8 = 2$\sqrt{(x)}$

x = 16

Question 7

Two numbers are less than the third number by 30% and 37% respectively. By what percent is the second number less than the first number?

A 15%

B 10%

C 25%

D 20%

Answer: B

Explanation:
Let the third number be x. So, the first number is .7x

The second number is .63x

So, the second number is less than the first number by .7 ie 10% of the first number.

Question 8

If a is positive and $a^2 + \frac{1}{a^2} = 7$, then $a^3 + \frac{1}{a^3} = ?$

A 21

B $3\sqrt{7}$

C 18

D $7\sqrt{7}$

Answer: C

Explanation:
$a^2 + \frac{1}{a^2} = 7$

Addition 2 in both sides of equation.

$a^2 + \frac{1}{a^2} + 2 = 7 + 2$

$a^2 + \frac{1}{a^2} + 2 = 9$ Eq.(1)

Eq.(1) is making the formula of $(a + \frac{1}{a})^2$.

After removing the square got $(a + \frac{1}{a}) = \pm 3$

In question, it is mentioned that value of **a** is positive.

So $(a + \frac{1}{a}) = 3$ Eq.(2)

In Eq.(2) apply formula $(a + \frac{1}{a})^3$.

So $(a + \frac{1}{a})^3 = a^3 + (\frac{1}{a})^3 + 3 \times a \times (\frac{1}{a})[a + \frac{1}{a}]$

$(a + \frac{1}{a})^3 = a^3 + (\frac{1}{a})^3 + 3[a + \frac{1}{a}]$ Eq.(3)

Put Eq.(2) in Eq.(3).

$(3)^3 = a^3 + (\frac{1}{a})^3 + 3 \times 3$

$27 = a^3 + (\frac{1}{a})^3 + 9$

$27 - 9 = a^3 + (\frac{1}{a})^3$

$18 = a^3 + (\frac{1}{a})^3$

$a^3 + (\frac{1}{a})^3 = 18$

Question 9

Find the value of $\frac{1}{1\times2} + \frac{1}{2\times3} + \frac{1}{3\times4} + \frac{1}{4\times5} + \frac{1}{5\times6} + ... + \frac{1}{9\times10}$

A $\frac{1}{10}$

B $\frac{9}{10}$

C $\frac{5}{11}$

D $\frac{2}{5}$

Answer: B

Question 10

simplify $\sqrt{10 + \sqrt{25} + \sqrt{108} + \sqrt{154} + \sqrt{225}}$**?**

A 3

B 8

C 4

D 6

Answer: C