



Surds & Indices Questions for RRB NTPC PDF

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Instructions

For the following questions answer them individually

Question 1

The two numbers 4^{30} and 25^{30} are written next to each other. What is the total number of digits written down?

- A 30
- B 59
- C 60
- D None of these

Answer: D

Explanation:

Let $\log_{10} 2$ be x .

So, the number of digits in 4^{30} is $[60x] + 1$.

So, $\log_{10} 5$ is $1-x$ and the number of digits of 25^{30} is $[60-60x]+1$.

Total number of digits is $2+[60x]+[60-60x]$ which is $62 + [60x]+[-60x]$.

As $60x$ is not an integer, the value of $[60x]+[-60x] = -1$. So, value is 61

Question 2

If $x = 9 + 4\sqrt{5}$, what is $x + \frac{1}{x}$

- A 17.83
- B 18.45
- C 18.00
- D None of these

Answer: C

Explanation:

$x = 9 + 4\sqrt{5}$. So, $\frac{1}{x} = 9 - 4\sqrt{5}$. So, $x + \frac{1}{x} = 18$

Question 3

What is the value of x for which $x^{2/3} + 3x^{1/3} - 4 < 0$?

- A $-64 < x < 1$
- B $-1 < x < 64$
- C $-64 < x < 64$
- D $1 < x < 64$

Answer: A

Explanation:

$-4 < x^{1/3} < 1$ or $-64 < x < 1$

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Question 4

$3^{-\frac{1}{2\sqrt{2}}} - 3^{\frac{1}{2\sqrt{2}}} = 2^x$. Find x ?

- A $3/2$
- B $5/2$
- C 3
- D $7/2$

Answer: B

Explanation:

$$3^{-\frac{1}{2\sqrt{2}}} - 3^{\frac{1}{2\sqrt{2}}} = \frac{3+2\sqrt{2}-3+2\sqrt{2}}{3^2-(2\sqrt{2})^2} = 4\sqrt{2}/1 = 2^{5/2}. \text{ Hence } x=5/2.$$

Question 5

Which of the following surds is the greatest?

- A $4 - \sqrt{7}$
- B $5 - \sqrt{10}$
- C $8 - \sqrt{15}$
- D Cannot be determined

Answer: C

Explanation:

The value of $\sqrt{7}$ is between 2 and 3. Hence, $4 - \sqrt{7}$ is between 1 and 2. Similarly, the value of b is between 1 and 2 and c is between 4 and 5. Hence, c is the greatest.

Question 6

If $x = \sqrt{17} - \sqrt{13}$, what is $\frac{30-\sqrt{884}}{\sqrt{17}+\sqrt{13}}$?

- A $\frac{x^2}{x-1}$
- B $\frac{x^3}{x-1}$
- C x^3
- D $\frac{x^3}{4}$

Answer: D

Explanation:

$$\frac{30-\sqrt{884}}{\sqrt{17}+\sqrt{13}} = \frac{(\sqrt{17}-\sqrt{13})^2}{\sqrt{17}+\sqrt{13}} = \frac{(\sqrt{17}-\sqrt{13})^3}{(\sqrt{17}+\sqrt{13})(\sqrt{17}-\sqrt{13})} = \frac{x^3}{17-13} = \frac{x^3}{4}.$$

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Question 7

If $\sqrt{28+5\sqrt{12}} = a + \sqrt{b}$, where a and b are positive rational numbers. Find $a+b$?

- A 2
- B 8
- C $13/2$
- D Cannot be determined

Answer: B

Explanation:

$$\sqrt{28 + 5\sqrt{12}} = a + \sqrt{b} \rightarrow 28 + 5\sqrt{12} = a^2 + b + 2a\sqrt{b}.$$

Hence $a^2 + b = 28$ and $4a^2b = 300$.

Hence $a^2 = 25$ and $b=3$. As a is positive, $a=5$.

Hence $a+b=8$.

Question 8

Which of the following surds is the greatest?

- A $\sqrt{1} + \sqrt{21}$
- B $\sqrt{2} + \sqrt{20}$
- C $\sqrt{4} + \sqrt{18}$
- D All of them are equal

Answer: C

Explanation:

$(\sqrt{a} + \sqrt{b})^2 = a + b + 2\sqrt{ab}$. As $a+b$ is equal for all three of them we need to compare which has the highest value for \sqrt{ab} . So the term with highest value of ab will be the greatest. ab values for the three options are 21, 40 and 72. Hence c) is the greatest.

Question 9

Simplify: $\sqrt{19 + 4\sqrt{21}}$

- A $2 + \sqrt{26}$
- B $3 - \sqrt{15}$
- C $\sqrt{5} + \sqrt{26}$
- D $\sqrt{12} + \sqrt{7}$

Answer: D

Explanation:

Let $\sqrt{19 + 4\sqrt{21}} = \sqrt{a} + \sqrt{b} \rightarrow a + b + 2\sqrt{ab} = 19 + 4\sqrt{21}$. Hence, $a+b=19$ and $ab=84$. Hence $a=12$, $b=7$.

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Question 10

Which of the following surds is the greatest?

- A** $\sqrt{2} + \sqrt{14}$
B $\sqrt{3} + \sqrt{13}$
C $\sqrt{5} + \sqrt{11}$
D $\sqrt{7} + \sqrt{8}$

Answer: C

Explanation:

On squaring the four options we get $16 + 2\sqrt{28}$, $16 + 2\sqrt{39}$, $16 + 2\sqrt{55}$, $15 + 2\sqrt{56}$.

Out of a-c options, c is clearly the greatest.

Similarly b is also rejected.

Now between c and d, let $d > c$

$$15 + 2\sqrt{56} > 16 + 2\sqrt{55}$$

$$2[\sqrt{56} - \sqrt{55}] > 1$$

Multiply both sides of the equation by $[\sqrt{56} + \sqrt{55}]$

$$2[\sqrt{56} - \sqrt{55}][\sqrt{56} + \sqrt{55}] > [\sqrt{56} + \sqrt{55}]$$

$$2 > [\sqrt{56} + \sqrt{55}]$$

which is false as the value of each term of RHS lies between 7 and 8.

This contradicts our assumption that $d > c$

Hence $c > d$.

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