Surds & Indices Questions for RRB NTPC PDF

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

Question 4

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

A 3/2

B 5/2

C 3

D 7/2

Answer: B

Explanation:
$\frac{1}{3-2\sqrt{2}} - \frac{1}{3+2\sqrt{2}} = \frac{3+2\sqrt{2}-3+2\sqrt{2}}{3^2-(2\sqrt{2})^2} = 4\sqrt{2}/1 = 2^{5/2}$. 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:
$\frac{30-\sqrt{884}}{\sqrt{17}+\sqrt{13}} = \frac{(\sqrt{17}-\sqrt{13})^2}{\sqrt{17}+\sqrt{13}} = \frac{(\sqrt{17}-\sqrt{13})^3}{(\sqrt{17}+\sqrt{13})(\sqrt{17}-\sqrt{13})} = \frac{x^3}{17-13} = \frac{x^3}{4}$.

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.

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.