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Class: IX
Subject: Math's
Topic: Number system
No. of Questions: 25

Q.1 Find 5 rational numbers between 3/5 and 4/5.

Solution: 7/10, 13/20, 15/20, 25/40, 29/40

[Explanation: 5 rational numbers between 3/5 and 4/5 are:
I: 1/2(3/5+4/5)= 7/10
II: 1/2(3/5+7/10)= 13/20
III: 1/2(7/10+4/5)= 15/20
IV: 1/2(3/5+13/20)= 25/40
V: 1/2(7/10+15/20)= 29/40]

Q.2 Show that 3.142678 is a rational number.

Solution: It can be written in the form of p/q , q≠0

[Explanation: We have 3.142678= $\frac{3142678}{1000000}$, and hence a rational number.]

Q.3 Show that 0.3333….= $0.\bar{3}$ can be expressed in the form of p/q, where p and q are integers and q≠0.

Solution: x=1/3 = p/q, q≠0

[Explanation: Let x=0.3333…
Multiplying the above equation by 10
10x= 10 x 0.3333..
10x= 3.333….
10x= 3+ 0.333…
10x= 3 + x
10x-x= 3
9x=3
x=3/9=1/3]

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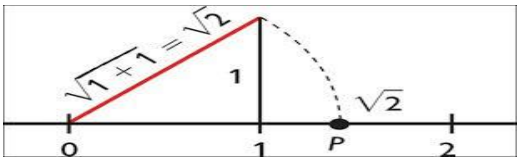
Q.4 Locate $\sqrt{2}$ on number line.

Solution:



[Explanation: Consider a unit square, with each side 1 unit in length. Then the diagonal is $\sqrt{1+1}$ $=\sqrt{2}$. Using a compass with centre 0 and radius $\sqrt{1+1}$, draw an arc intersecting the number line at the point P. Then P corresponds to $\sqrt{2}$ on number line.]

Q.5 Show that 1.272727....= $1.\overline{27}$ can be expressed in the form p/q, where p and q are integers and q≠0.

Solution: $1.\overline{27}$ =14/11

[Explanation: Let x= 1.272727....Since two digits are repeating, we multiply x by 100 to get
100x= 127.272727.....
100x=126+1.272727....
100x=126+x
100x-x=126
99x=126
x=126/99=14/11]

Q.6 Show that 0.2353535....=$0.2\overline{35}$ can be expressed in the form of p/q, where p and q are integers and q≠0.

Solution: $0.2\overline{35}$ =233/990

[Explanation: Let x= $0.2\overline{35}$. Since two digits are repeating, we multiply x by 100 to get
100x=23.53535....
100x=23.3 + 0.23535....
100x=23.3 + x
100x-x= 23.3
99x= 23.3
x= 23.3/99= 233/990]

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Q.7 Find an irrational number between 1/7 and 2/7

Solution: 0.15015001....

[Explanation: 1/7= $\overline{0.142857}$. Also 2/7= $\overline{0.285714}$. To find an irrational number between 1/7 and 2/7, we find a number which is non-terminating, non- recurring lying between them. There are infinitely many such numbers. An example of such a number is 0.15015001....]

Q.8 Check whether $\frac{7}{\sqrt{5}}$ is an irrational number or not.

Solution: $\frac{7}{\sqrt{5}}$ = 3.1304.....It is a non-terminating non-recurring decimal. Therefore, it is an irrational number.

[Explanation: $\frac{7}{\sqrt{5}} \text{ x } \frac{\sqrt{5}}{\sqrt{5}} = \frac{7\sqrt{5}}{5} = 3.1304\ldots$

It is a non-terminating non-recurring decimal. Therefore, it is an irrational number]

Q.9 Add $2\sqrt{2}+5\sqrt{3}$ and $\sqrt{2}-3\sqrt{3}$

Solution: $3\sqrt{2}+2\sqrt{3}$

[Explanation :($2\sqrt{2}+5\sqrt{3}$) + ($\sqrt{2}-3\sqrt{3}$)

= (2+1) $\sqrt{2}+(5-3)\sqrt{3}$

= $3\sqrt{2}+2\sqrt{3}$]

Q.10 Multiply $6\sqrt{5}$ by $2\sqrt{5}$

Solution: 60

[Explanation: $6\sqrt{5}$ x $2\sqrt{5}$

= 6 x 2 x ($\sqrt{5}x\sqrt{5}$)

= 12 x 5= 60]

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Q.11 Divide $8\sqrt{15}$ by $2\sqrt{3}$

Solution: $4\sqrt{5}$

[Explanation: $8\sqrt{15} \div 2\sqrt{3} = \frac{8\sqrt{15}}{2\sqrt{3}} = \frac{8\sqrt{5}x\sqrt{3}}{2\sqrt{3}} = 4\sqrt{5}$]

Q.12 Simplify $(\sqrt{3}+\sqrt{7})^2$

Solution: $10+2\sqrt{21}$

[Explanation: $(\sqrt{3}+\sqrt{7})^2$

Using identity, $(a+b)^2 = a^2 + 2ab + b^2$

$(\sqrt{3}+\sqrt{7})^2 = (\sqrt{3})^2 + 2 \text{ x } \sqrt{3}x\sqrt{7} + (\sqrt{7})^2$

$= 3 + 2\sqrt{21} + 7 = 10 + 2\sqrt{21}$]

Q.13 Find the value of $(\sqrt{11}-\sqrt{7})(\sqrt{11}+\sqrt{7})$

Solution: 4

[Explanation: $(\sqrt{11}-\sqrt{7})(\sqrt{11}+\sqrt{7})$

Using property, $(a-b)(a+b) = a^2 + b^2$

$(\sqrt{11}-\sqrt{7})(\sqrt{11}+\sqrt{7}) = (\sqrt{11})^2 - (\sqrt{7})^2$

$= 11-7 = 4$]

Q.14 Rationalize the denominator of $\frac{1}{2+\sqrt{3}}$

Solution: $2-\sqrt{3}$

[Explanation: $\frac{1}{2+\sqrt{3}} \text{ x } \frac{2-\sqrt{3}}{2+\sqrt{3}} = \frac{2-\sqrt{3}}{4-3} = 2-\sqrt{3}$]

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Q.15 Rationalize $\frac{5}{\sqrt{3}-\sqrt{5}}$

Solution: $(-\frac{5}{2})(\sqrt{3}+\sqrt{5})$

[Explanation: $\frac{5}{\sqrt{3}-\sqrt{5}} \text{ x } \frac{(\sqrt{3}+\sqrt{5})}{(\sqrt{3}+\sqrt{5})} = \frac{5(\sqrt{3}+\sqrt{5})}{3-5} = \frac{-5}{2}(\sqrt{3}+\sqrt{5})$]

Q.16 Rationalize $\frac{1}{7+3\sqrt{2}}$

Solution: $\frac{7-3\sqrt{2}}{31}$

[Explanation: $\frac{1}{7+3\sqrt{2}} \text{ x } \frac{(7-3\sqrt{2})}{(7-3\sqrt{2})} = \frac{7-3\sqrt{2}}{49-18} = \frac{7-3\sqrt{2}}{31}$]

Q.17 Simplify $13^{1/5}. 17^{1/5}$

Solution: $221^{1/5}$

[Explanation: $13^{1/5}. 17^{1/5}$
According to rule, $a^p . b^p = (axb)^p$
$(13 \text{ x } 17)^{1/5} = 221^{1/5}$]

Q.18 Is (π-2) an irrational number?

Solution: (π-2) is an irrational number.

[Explanation: π = 3.141.....
(π-2)= (3.141.....-2)= 1.41....
which is a non-terminating non-recurring decimal number. Therefore, (π-2) is an irrational number .]

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Q.19 State whether true or false:

a)Every natural number is a whole number.

b) Every integer is a whole number.

c) Every rational number is a whole number.

Solution: a) True b) False c) False

[Explanation: a) The collection of whole numbers contains all the natural numbers.
Natural numbers= 1 to ∞
Whole numbers= 0 + Natural numbers
b) eg: -2 is not a whole number but is an integer.
c) eg: 1/2 is a rational number but not a whole number]

Q.20 Find the decimal expansion of 10/3

Solution: $3.\bar{3}$. It is a non-terminating repeating decimal expansion.

[Explanation: 10/3
On dividing 10 by 3 we get 3.333…. as quotient.
Therefore, 10/3= $3.\bar{3}$]

Q.21 Express 0.9999…. in the form of p/q and q≠0

Solution: 1

[Explanation: Let x= 0.9999…
Multiplying x by 10
10x= 9.9999….
10x= 9+ 0.9999…..
10x= 9 + x
10x-x= 9
9x=9
x=1]

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Q.22 Classify 2-$\sqrt{5}$ as rational or irrational

Solution: Irrational

[Explanation: 2-$\sqrt{5}$

Since $\sqrt{5}$ = 2.236....

2-$\sqrt{5}$ = 2-2.236....

2-$\sqrt{5}$ = -0.236...

As the decimal expansion is non-terminating, non-recurring, 2-$\sqrt{5}$ is irrational]

Q.23 Find the value of $(125)^{-1/3}$

Solution: 1/5

[Explanation: $(125)^{-1/3} = (5^3)^{-1/3}$

Using law, $(a^p)^q = a^{pq}$

$(5^3)^{-1/3} = 5^{-1} = 1/5$]

Q.24 Solve $2^{2/3} . 2^{1/3}$

Solution: 2

[Explanation: $2^{2/3} . 2^{1/3} = 2^{(2/3+1/3)} = 2^{3/3} = 2^1 = 2$]

Q.25 Rationalize $\frac{1}{\sqrt{5}+\sqrt{2}}$

Solution: $\frac{\sqrt{5}-\sqrt{2}}{3}$

[Explanation: $\frac{1}{\sqrt{5}+\sqrt{2}} \times \frac{(\sqrt{5}-\sqrt{2})}{(\sqrt{5}-\sqrt{2})} = \frac{\sqrt{5}-\sqrt{2}}{5-2} = \frac{\sqrt{5}-\sqrt{2}}{3}$]