MATHS

BOOKS - NAGEEN PRAKASHAN ENGLISH

NUMBER SYSTEM

Solved Examples

1. Represents $\frac{4}{3}$ on the number line.

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2. Find a rational number between -3 and 8.

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3. Find three rational number between -1 and 7.

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4. Find 9 rational number between $\frac{1}{3}$ and $\frac{1}{2}$.

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5. Find 5 rational numbers between $-\frac{1}{6}$ and $\frac{5}{21}$.

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6. Find nine rational nember between 0 and 0.1.

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7. Without actual division, find which of the following rational numbers have terminating decimal representation :

$(i)\frac{5}{32}, \quad (ii)\frac{3}{320}, \quad (iii)\frac{7}{24}$

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8. Express each of the following recurring decimals into the rational number :

$(i)0.\bar{5} \quad (ii)2.\bar{4} \quad (iii)1.\overline{12} \quad (iv)2.7\overline{39} \quad (v)0.\overline{516} \quad (vi)3.$

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9. If $\frac{1}{7} = 0.142857$, write the decimal expression of $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7} and \frac{6}{7}$ without actually doing the long division.

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10. Evaluate $3.\overline{2} - 0.\overline{16}$

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11. Express 0.99999 .... in the form $\frac{p}{q}$. . Are you surprised by your answer? With your teacher and classmates discuss why the answer makes sense.

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12. Find the decimal representation of $\frac{22}{7}$

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13. Prove that $\sqrt{2}$ is an irrational number.

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14. Prove that $\sqrt{3}$ is an irrational or not .

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15. Prove that $3 + 2\sqrt{5}$ is irrational.

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16. Represent $\sqrt{9.3}$ on the number line.

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17. Represent $\sqrt{3.8}$ on the number line.

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18. Evaluate each of the following :

$(i) 2^3 \times 2^2$ $(ii) 3^5 \div 3^2$ $(iii) \left(5^2\right)^3$ $(iv) \left(\frac{3}{4}\right)^3$ $(v) \left(\frac{2}{3}\right)$

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19. If a=2 and b=5, then evaluate $a^b + b^a$.

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20. Evaluate each of the following :

$(i) (32)^{1/5}$ $(ii) (27)^{-1/3}$ $(iii) \left(\frac{16}{81}\right)^{-1/4}$

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21. Evaluate each of the following :

$(i) \left(\sqrt{9}\right)^{-3}$ $(ii) \left(3\sqrt{8}\right)^{-2}$

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22. Simplify each of the following :

$(i)\dfrac{(16)^{\frac{5}{4}}\times(8)^{\frac{4}{3}}}{(25)^{\frac{3}{2}}\times(243)^{\frac{3}{5}}}$ $(ii)\dfrac{2^n+2^{n-1}}{2^{n+1}-2^n}$

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23. Rewrite the following irrational numbers in ascending order of magnitude.

$(i)3\sqrt{18},\ 6\sqrt{144},\ \sqrt{7}$ $(ii)3\sqrt{12},\ \sqrt{20},\ 6\sqrt{25},\ \sqrt{6},\ 12\sqrt{112}$

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24. If $3^{3x}=\dfrac{9}{3^x}$, find the value of x.

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25. Find the value of x, if $5^{x-2}\times 3^{2x-3}=135$

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26. Rationalise the denominator of $\frac{1}{\sqrt{5}}$.

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27. Rationalise the denominator of $\frac{2 \cdot 3\sqrt{3}}{3\sqrt{25}}$.

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28. Rationalise the denominator of $\frac{11}{5+\sqrt{3}}$

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29. Rationalise the denominator of $\frac{1}{7+4\sqrt{3}}$.

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30. Rationalise the denominator of $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$.

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31. Find the rationalising factor of $5^{\frac{1}{3}}-2^{\frac{1}{3}}$.

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32. If $\sqrt{2}=1.414$, then find the value of $\frac{1}{2+\sqrt{2}}$

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33. Simplify each of the following by rationalising the denominator;

$\frac{1}{5+\sqrt{2}}$ (ii) $\frac{5+\sqrt{6}}{5-\sqrt{6}}$ $\frac{7+3\sqrt{5}}{7-3\sqrt{5}}$ (iv) $\frac{2\sqrt{3}-\sqrt{5}}{2\sqrt{2}+3\sqrt{3}}$

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34. Find the value of a and b if

$(i)\dfrac{\sqrt{3}+1}{\sqrt{3}-1}=a+b\sqrt{3}$ $(ii)\dfrac{5+2\sqrt{3}}{5-2\sqrt{3}}=a+b\sqrt{3}$

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35. Rationalise the denominator of the following : $\dfrac{1}{\sqrt{3}-\sqrt{2}-1}$'

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36. Find the value of:

$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\ldots\frac{1}{\sqrt{99}+\sqrt{100}}$$

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37. Compare the surds

(i) $A=\sqrt{10}-\sqrt{5}, B=\sqrt{19}-\sqrt{14}$

(ii) $P=\sqrt{10}+\sqrt{5}, Q=\sqrt{8}+\sqrt{7}$

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38. Evaluate : $(i)\sqrt{3-2\sqrt{2}}$ $(ii)\sqrt{9+6\sqrt{2}}$

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39. If 3 rational numbers $x^{1/x}, y^{1/y}$ and $z^{1/z}$ are equal and $x^{yz}+y^{zx}+z^{xy}=729$, then find the value of $x^{1/x}$

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40. If $x=\sqrt{2}+1$, then find the values of the following :

$(i)\frac{1}{x}$ $(ii)x+\frac{1}{x}$ $(iii)x-\frac{1}{x}$ $(iv)x^2+\frac{1}{x^2}$

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41. If $x=\frac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}}$, then prove that $b^2-ax+b=0$

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42. If $x = \frac{1}{2-\sqrt{3}}$, find the value of $x^3 - 2x^2 - 7x + 5$

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43. $a = 9 - 4\sqrt{5}$,$\sqrt{a} - \frac{1}{\sqrt{a}} = ?$

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Problems From Ncert Exemplar

1. Write the following in decimal form and say what kind of decimal expansion each has :(i) $\frac{36}{100}$ (ii) $\frac{1}{11}$ (iii) $4\frac{1}{11}$ (iv) $\frac{3}{13}$ (v) $\frac{2}{11}$ (iv) $\frac{329}{400}$

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2. You know that $\frac{1}{7} = 0.\overline{142857}$Can you predict what the decimal expansion of $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}, \frac{6}{7}$are, without actually doing the long division? If so, how? [Hint: Study the remainders while finding the value of $\frac{1}{7}$carefully.]

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3. Recall, is defined as the ratio of the circumference (say c) of a circle to its diameter (say d). That is, $\pi = \frac{c}{d}$. This seems to contradict the fact the $\pi$is irrational How will you resolve this contradiction?

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4. Rationalise the denominators of the following:(i) $\frac{1}{\sqrt{7}}$ (ii) $\frac{1}{\sqrt{7} - \sqrt{6}}$ (iii) $\frac{1}{\sqrt{5} + \sqrt{2}}$ (iv) $\frac{1}{\sqrt{7} - 2}$

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5. Find which of the variables x, y, z and u represent rational numbers and which irrational numbers:(i) $x^2 = 5$ (ii) $y^2 = 9$(iii)$z^2 = 0.04$(iv) $u^2 = \frac{17}{4}$

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6. Rationalise the denominator of the following :

$(a)\frac{2}{3\sqrt{3}}$ $(b)\frac{\sqrt{40}}{\sqrt{3}}(c)$ $\frac{3+\sqrt{2}}{4\sqrt{2}}$ $(d)\frac{16}{\sqrt{41}-5}$ (

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7. Find the values of a and b in each of the following :

$(a)\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a - 6\sqrt{3}$ $(b)\frac{3-\sqrt{5}}{3+2\sqrt{5}} = a\sqrt{5} - \frac{19}{11}$

$(c)\frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} = 2 - b\sqrt{6}$ $(d)\frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} = a + \frac{7}{11}\sqrt{5b}$

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Exercise 1 A

1. Are the following statements true or false? Give reasons for your answer? Every whole number is a natural number Every integer is a rational number. Every rational number is an integer. Every natural number is a whole number. Every integer is a whole number Every rational number is a whole number

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2. Find a rational number between :

$(i)\frac{3}{7}$ and $\frac{5}{14}(ii)\frac{2}{5}$ and $-\frac{1}{3}(iii)-\frac{1}{3}$ and $-\frac{1}{2}$

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3. Find two rational number between :

$(i)\frac{2}{3}$ and $\frac{8}{3}$

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4. Find three rational number between :

$(i)\frac{1}{2}$ and $\frac{7}{3}(ii) -\frac{3}{5}$ and $\frac{2}{7}(iii)\frac{2}{5}$ and $\frac{8}{5}$

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5. Find 9 rational numbers between $\frac{1}{2}$ and $\frac{3}{5}$.

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Exercise 1 B

1. without actual division, find which of the following rational numbers have terminating decimal representation :

$(i)\frac{3}{64}$ $(ii)\frac{7}{24}$ $(iii)\frac{17}{400}$ $(iv)\frac{1}{1250}$ $(vi)\frac{7}{80}$ $(iv)\frac{}{5}$

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2. Express each of the following recurring decimals into the rational number :

$(i) 0.\bar{7}$ $(ii) 0.\bar{6}$ $(iii) 1.\bar{3}$ $(iv) 3.\bar{8}$

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3. Express each of the following recurring decimals into the rational number :

$(i) 0.\overline{32}$ $(ii) 0.\overline{56}$ $(iii) 3.\overline{18}$ $(iv) 10.\overline{13}$

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4. Express each of the following recurring decimals into the rational number :

$(i) 6.\overline{315}$ $(ii) 7.\overline{1641}$

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5. Evaluate :

$2.\bar{5} - 0.\overline{35}$

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6. Evaluate :

$2.\bar{7} + 1.\bar{3}$

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7. Evaluate :

$1.\overline{45} + 0.\bar{3}$

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8. Find the decimal representation of $\frac{1}{11}$. Deduce from itâ€™s the decimal represtation of $\frac{2}{11}, \frac{3}{11}$ and $\frac{4}{11}$.

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Exercise 1 C

1. Fill in the blanks :

(i) Every real number is either . . . . . Number or . . . . . number.

(ii) The decimal representaion of rational number is either . . . . . .or . . . . . .

(iii) The decimal representation of an irrational number is . . . . . .

(iv) The sum of two rational numbers is always . . . . . .

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2. Examine whether the following numbers are rational or irrational :

$(i)\sqrt{5}$ $(ii)\sqrt{9}$ $(iii)1+\sqrt{2}$ $(iv)2+\sqrt{4}$

$(v)\sqrt{3}-\sqrt{5}$ $(vi)\left(2+\sqrt{2}\right)^2$ $(vii)\left(5+\sqrt{2}\right)\left(5-\sqrt{2}\right)$ $(viii)($

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3. Examine whether the following numbers are rational or irrational. Give the decimal representation of rational numbers :

$(i)\sqrt{2.56}$ $(ii)2\sqrt{3}$ $(iii)\frac{\sqrt{36}}{20}$ $(iv)\sqrt{8}$

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4. Give a rational number between 0.272772777 . . . And 0.3.

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5. Give a rational number between 0.103 and 0.112111211112 . . . .

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6. Give an irrational numbers between `0.505005000 . . . and 0.525225222 . . . .

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7. Find two irrational numbers between 0.6 and 0.66.

8. Find two irrational numbers between 0.2 and 0.23.

9. Find two rational numbers between 0.565665666 . . . and 0.585885888 . . . .

10. Find two rational numbers between 0.383383338 . . . and 0.404404440 . . . .

11. Prove that $5 + \sqrt{3}$ is irrational.

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12. Prove that $3 - \sqrt{2}$ is irrational.

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13. Prove that $8\sqrt{5}$ is irrational.

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14. Prove that $\frac{2}{\sqrt{3}}$ is irrational.

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15. Give an example of each, of two irrational numbers whose: (i) difference is a rational number. (ii) difference is an irrational number. (iii) sum is a rational number. (iv) sum is an irrational number. (v) product is a rational number. (vi) product is an irrational number. (vii) quotient is a rational number. (viii) quotient is an irrational number.

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16. Represent $\sqrt{6}, \sqrt{7}, \sqrt{8}$ on the number line.

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17. Represents $\sqrt{9.3}$ on the number line.

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18. Locate $\sqrt{3}$on the number line.

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19. Visualise 2.364 on the number line using successive magnification.

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20. Visualise $5.\overline{3}$ on the number line upto 4 decimal places.

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Exercise 1 D

1. Evaluate each of the following :

$(i)16^{1/2}$ $(ii)243^{1/5}$ $(iii)81^{1/4}$

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2. Evaluate each of the following :

$(i) 4^{3/2}$ $(ii) 625^{3/4}$ $(iii) 81^{3/4}$

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3. Simplify :

$(i) 3^{\left(\frac{1}{3}\right) \times \left(\frac{11}{5}\right)}$ $(ii) \left(\frac{1}{2}\right)^{\frac{1}{5}} \times 2^{\frac{3}{5}}$

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4. Evaluate each of the following :

$(i) \left\{(81)^{1/5}\right\}^{5/2}$ $(ii) \left(3\sqrt{64}\right)^{-2}$ $(iii) 9^{3/2} + 3 \times 4^{0} - \left(\frac{1}{81}\right)^{-}$

$(vi) \sqrt{\frac{1}{9}} + (0.01)^{-1/2} - (27)^{4/3}$ $(v) \left(\frac{125}{64}\right)^{2/3} + \left(\frac{256}{625}\right)^{-1/4}$

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5. Simiplify :

$$\frac{16 \times 2^{n+1} - 4 \times 2^{n}}{16 \times 2^{n+2} - 2 \times 2^{n+1}}$$

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6. Simplify :

$$\frac{5^{n+4} - 6 \times 5^{n+2}}{9 \times 5^{n+1} - 5^{n+1} \times 4}$$

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7. Find the value of x in each of the following cases :

$(i) 3^{2x+3} = 1$ $(ii) 2^{x-5} \times 5^{x-4} = 5$

$(iii) 2^{2x+1} = 2^{2x-1} + 12$ $(vi) 3^{2x-3} = 3\sqrt{3}$

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Exercise 1 E

1. Rationalise the denominator of each the following

$(i)\dfrac{2}{\sqrt{3}}$ $(ii)\dfrac{1}{3\sqrt{5}}$ $(iii)\dfrac{1}{\sqrt{8}}$ $(iv)\dfrac{\sqrt{2}+1}{\sqrt{3}}$

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2. Rationalise the denominator of each the of the following :

$(i)\dfrac{1}{3+\sqrt{5}}$ $(ii)\dfrac{1}{\sqrt{5}-\sqrt{3}}$ $(iii)\dfrac{16}{\sqrt{41}+5}$ $(iv)\dfrac{30}{5\sqrt{3}+3\sqrt{}$

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3. Simplify each of the following :

$(i)\dfrac{\sqrt{2}+1}{\sqrt{2}-1}+\dfrac{\sqrt{2}-1}{\sqrt{2}+1}$ $(ii)\dfrac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}+\dfrac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

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4. If $\sqrt{2}=1.414$, $\sqrt{3}=1.732$, find the value of the following :

$(i)\dfrac{\sqrt{2}+1}{\sqrt{2}-1}$ $(ii)\dfrac{\sqrt{3}-1}{\sqrt{3}+1}$ $(iii)\dfrac{2+\sqrt{6}}{\sqrt{2}}$

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5. Find the value of a and b in each of the following

$(i)\dfrac{3+\sqrt{2}}{3-\sqrt{2}}=a+b\sqrt{2}$ $(ii)\dfrac{\sqrt{2}+1}{\sqrt{2}-1}=a-b\sqrt{2}$ $(iii)\dfrac{5+4\sqrt{}}{5-4\sqrt{}}$

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6. If $x=2+\sqrt{3}$, then find :

$(i)\dfrac{1}{x}$ $(ii)x+\dfrac{1}{x}$ $(iii)x-\dfrac{1}{x}$ $(iv)x^2+\dfrac{1}{x^2}$

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7. If $x=3+2\sqrt{2}$, then find :

$(i)\dfrac{1}{x}$ $(ii)x+\dfrac{1}{x}$ $(iii)x-\dfrac{1}{x}$ $(iv)x^2-\dfrac{1}{x^2}$

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8. If $x = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ and $y = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ find $x^2 + y^2$

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9. If $a = 1 - \sqrt{2}$, then find the value of $\left(a - \frac{1}{a}\right)^3$

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10. Evaluate $\frac{15}{\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}}$ is being given that $\sqrt{5} = 2.236$ and $\sqrt{10} = 3.162$

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11. Write the following surds in descending order of their magnitudes :

$(i)(2)^{\frac{1}{3}}, (3)^{\frac{1}{6}}, (4)^{\frac{1}{9}}$ $(ii)(3)^{\frac{1}{3}}, (5)^{\frac{1}{4}}, \sqrt{2}, (10)^{\frac{1}{6}}$

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12. If $25^{x-1} = 5^{2x-1} - 100$, then find the value of x.

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13. Which is greater $\sqrt{11} - \sqrt{6}$ or $\sqrt{17} - \sqrt{12}$?

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14. If $x = 7 - 4\sqrt{3}$ then find the value of $\sqrt{x} + \frac{1}{\sqrt{x}}$

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15. If $x = 2 + \sqrt{3}$, then find the value of $x^4 - 4x^3 + x^2 + x + 1$.

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16. Simplify $\sqrt{5 + 2\sqrt{6}} + \sqrt{8 - 2\sqrt{15}}$

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17. If $\frac{9^n \, x \, 3^2 \, x \, 3^n - 27^n}{3^{3m} \, x \, 2^3} = \frac{1}{27}$, prove that $m - n = 1$

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18. Rationalise the denominator of : $\frac{2}{\sqrt{5} + \sqrt{3} + 2}$

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Revision Exercise Very Shortanswer Questions

1. Find a rational number between $\frac{1}{10}$ and $\frac{1}{30}$.

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2. Find a rational number between $-\frac{1}{2}$ and $\frac{1}{6}$.

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3. Express $\frac{3}{4}$ in the decimal form.

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4. Find the decimal representation of $\frac{4}{3}$.

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5. Express $0.\bar{5}$ in the form of $\frac{p}{q}$.

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6. What is the rationalisation factor of $\frac{3}{\sqrt{5}}$?

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7. What is the rationalisation factor of $\frac{1}{3+\sqrt{5}}$?

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8. Evaluate : $\left[(3\sqrt{8})-\frac{1}{2}\right]^4$.

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9. Simplify $\frac{1}{(625)^{-1/4}}$.

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10. If $x=\frac{1}{\sqrt{3}+\sqrt{2}}$. Then find $\frac{1}{x}$.

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Revision Exercise Short Answer Questions

1. Find two rational numbers between $-\frac{1}{4}$ and $\frac{2}{5}$.

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2. Find three rational numbers between $\frac{1}{10}$ and $\frac{2}{15}$.

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3. Express $\frac{13}{7}$ in the decimal form.

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4. Express $0.\overline{17}$ in the form of $\frac{p}{q}$.

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5. Express $4.\overline{163}$ in the form of $\frac{p}{q}$.

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6. Rationalise the denominator : $\frac{5}{\sqrt{11}+4}$.

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7. Simplify : $\frac{1}{\sqrt{3}+\sqrt{2}} - \frac{1}{\sqrt{3}-\sqrt{2}} + \frac{2}{\sqrt{2}+1}$

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8. Represent $\sqrt{2}, \sqrt{3}$ and $\sqrt{5}$ on the real line

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9. Represents $\sqrt{9.3}$ on the number line.

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10. If $a + b\sqrt{5} = \frac{4 - 3\sqrt{5}}{4 + 3\sqrt{5}}$, then find the values of a and b.

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