MATHS

NCERT - NCERT MATHEMATICS(HINGLISH)

NUMBER SYSTEMS

Solved Examples

1. Show that 3.142678 is a rational number. In other words, express 3.142678 in the form $\frac{p}{q}$,

where p and q arc integers and $q \neq 0$.

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2. Show that $0.3333\ldots = 0.\bar{3}$can be expressed in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

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

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4. Find the decimal expansions of $\frac{10}{3}$, $\frac{7}{8}$ and $\frac{1}{7}$.

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5. Find five rational numbers between 1 and 2.

We can approach this problem in at least two ways.

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6. Locate $\sqrt{2}$on the number line.

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7. Are the following statements true or false? Give reasons for your answers.(i) Every whole number is a natural number.(ii) Every integer is a rational number.(iii) Every rational number is an integer.

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8. Rationalise the denominator of $\frac{1}{7+3\sqrt{2}}$

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9. Simplify (i) $2^{\frac{2}{3}}.2^{\frac{1}{3}}$ (ii) $\left(3^{\frac{1}{5}}\right)^{4}$ (iii) $\frac{7^{\frac{1}{5}}}{7^{\frac{1}{3}}}$ (iv) $13^{\frac{1}{5}}.17^{\frac{1}{5}}$

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10. Show that $1.272727\ldots = 1.\overline{27}$can be expressed in the form $\frac{p}{q}$, where p and q are

integers and $q \neq 0$.

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11. Show that $0.2353535... = 0.2\overline{35}$ can be expressed in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

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12. Visualize the representation of $5.\overline{37}$ on the number line upto 5 decimal places, that is, up

to 5.37777.

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13. Find the irrational number between $\frac{1}{7}$ and $\frac{2}{7}$.

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

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15. Check whether $7\sqrt{5}, \frac{7}{\sqrt{5}}, \sqrt{2}+21, \pi-2$ are irrational numbers or not.

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16. Divide $8\sqrt{15}$ and $2\sqrt{3}$.

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17. Multiply $6\sqrt{5}$ by $2\sqrt{5}$.

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18. Rationalise the denominator of $\frac{1}{\sqrt{2}}$

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19. Simplify the following expressions. (i) $\left(5+\sqrt{7}\right)\left(2+\sqrt{5}\right)$ (ii) $\left(5+\sqrt{5}\right)\left(5-\sqrt{5}\right)$ (iii) $\left(\sqrt{3}+\sqrt{7}\right)^{2}$ (iv) $\left(\sqrt{11}-\sqrt{7}\right)\left(\sqrt{11}+\sqrt{7}\right)$

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20. Rationalise the denominator of $\frac{5}{\sqrt{3}-\sqrt{5}}$

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21. Rationalise the denominator of $\frac{1}{2+\sqrt{3}}$

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Exercise 1 3

1. Classify the following numbers as rational or irrational: (i) $\sqrt{23}$ (ii) $\sqrt{225}$ (iii) 0.3796 (iv) 7.478478... (v) 1.101001000100001...

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2. Find three different irrational numbers between the rational numbers $\frac{5}{7}$ and $\frac{9}{11}$.

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3. 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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4. Write three numbers whose decimal expansions are non-terminating non-recurring.

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5. Look at several examples of rational numbers in the form $\frac{p}{q}(q \neq 0)$, where p and q are integers with no common factors other than 1 and having terminating decimal representations (expansions). Can you guess what property q must satisfy?

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6. What can the maximum number of digits be in the repeating block of digits in the decimal

expansion of $\frac{1}{17}$? Perform the division to check your answer.

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7. 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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8. Express the following in the form $\frac{p}{q}$, , where p and q are integers and $q \neq 0$.(i) $0.\bar{6}$ (ii) $0.\overline{47}$ (iii) $0.\overline{001}$

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9. 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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Exercise 1 2

1. State whether the following statements are true or false. Justify your answers, (i) Every irrational number is a real number.(ii) Every point on the number line is of the form $\sqrt{m}$,

where m is a natural number.(iii) Every real number is an irrational number.

2. Are the square roots of all positive integers irrational? If not, give an example of the square root of a number that is a rational number.

3. Show how $\sqrt{5}$ can be represented on the number line.

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4. Classroom activity (Constructing the 'square root spiral') : Take a large sheet of paper and construct the 'square root spiral' in the following fashion. Start with a point O and draw a line segment OP_1 of unit length. Draw a line segment P_1P_2 perpendicular to OP_1 of

unit length . Now draw a line segment P_2P_3 perpendicular to OP_2. Then draw a line segment P3P 4 perpendicular to OP_3. Continuing in this manner, you can get the line segment $P_{n-1}P_n$ by drawing a line segment of unit length perpendicular to OP_{n-1}. In this manner, you will have created the points $P_2, P_3, \ldots., P_n, \ldots.$, and joined them to create a beautiful spiral depicting $\sqrt{2}, \sqrt{3}, \sqrt{4}$. .

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Exercise 1 5

1. Recall, π 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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2. Simplify each of the following expressions:

(i) $\left(3+\sqrt{3}\right)\left(2+\sqrt{2}\right)$ (ii) $\left(3+\sqrt{3}\right)\left(3-\sqrt{3}\right)$

(iii) $\left(\sqrt{5}+\sqrt{2}\right)^2$ (iv) $\left(\sqrt{5}-\sqrt{2}\right)\left(\sqrt{5}+\sqrt{2}\right)$

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3. Rationalize 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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4. Represent $\sqrt{7}$on the number line.

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5. Classify the following numbers as rational or irrational:(i) $2-\sqrt{5}$ (ii) $\left(3+\sqrt{23}\right)-\sqrt{23}$ (iii) $\frac{2\sqrt{7}}{7\sqrt{7}}$ (iv) $\frac{1}{\sqrt{2}}$ (v) 2π

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Exercise 1 6

1. Find: (i) $64^{\frac{1}{2}}$ (ii) $32^{\frac{1}{5}}$ (iii) $125^{\frac{1}{3}}$

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2. Find : (i) $9^{\frac{3}{2}}$ (ii) $32^{\frac{2}{5}}$ (iii) $16^{\frac{3}{4}}$ (iv) $125^{\frac{-1}{3}}$

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3. Simplify : (i) $2^{\frac{2}{3}} . 2^{\frac{1}{5}}$ (ii) $\left(\frac{1}{3^3}\right)^7$ (iii) $\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}}$ (iv) $7^{\frac{1}{2}} . 8^{\frac{1}{2}}$

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Exercise 1 1

1. State whether the following statements are true or false. Give reasons for your answers.(i) Every natural number is a whole number. (ii) Every integer is a whole number.(iii) Every rational number is a whole number.

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2. Is zero a rational number? Can you write it in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$?

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3. Find five rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$.

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4. Insert six rational numbers between 3 and 4.

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Exercise 1 4

1. Visualise $3.\overline{765}$on the number line, using successive magnification

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2. Visualise 3.765 on the number line, using successive magnification.

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