

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.



- **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 :

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



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

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



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.



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



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11. Express 0.99999 in the form $\frac{p}{a}$. Are you surprised by your answer?

With your teacher and classmates discuss why the answer makes sense.



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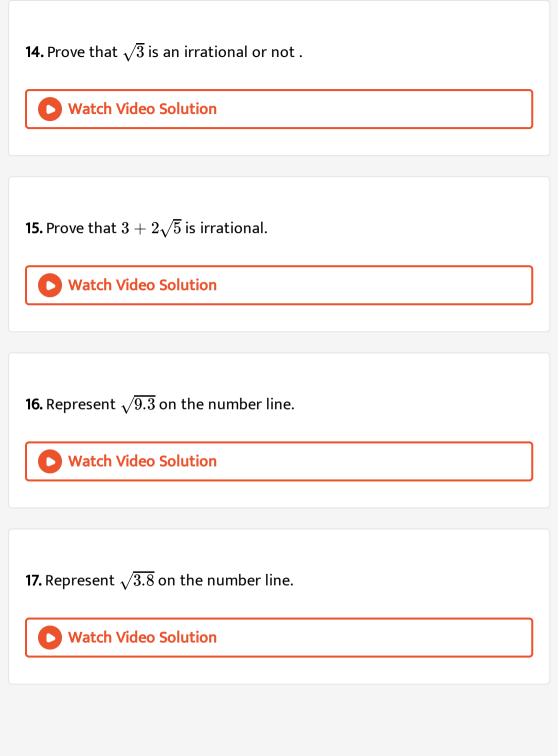
12. Find the decimal representation of $\frac{22}{7}$



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





18. Evaluate each of the following:

 $(i)2^3 imes 2^2 \hspace{1cm} (ii)3^5 \div 3^2 \hspace{1cm} (iii) ig(5^2ig)^3$

 $(iv)\left(\frac{3}{4}\right)^3$

 $(iii) igg(rac{16}{81}igg)^{-1/4}$

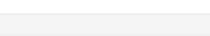
 $(v)\left(\frac{2}{3}\right)$

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

$$(i)(32)^{1/5}$$
 $(ii)(27)^{-1/3}$

20. Evaluate each of the following:





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

21. Evaluate each of the following:

 $(ii) (3\sqrt{8})^{-2}$

22. Simplify each of the following:

$$(i)rac{(16)^{rac{5}{4}} imes(8)^{rac{4}{3}}}{(25)^{rac{3}{2}} imes(243)^{rac{3}{5}}} \hspace{3.5cm} (ii)rac{2^n+2^{n-1}}{2^{n+1}-2^n}$$



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

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



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





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

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

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

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









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;

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



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34. Find the value of a and b if

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

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

the

value

of:

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

Find

36.



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

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

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

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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 :
- $(i)rac{1}{x}$ $(ii)x+rac{1}{x}$ $(iii)x-rac{1}{x}$ $(iv)x^2+rac{1}{x^2}$
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41. If $x=rac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}}$, then prove that $b^2-ax+b=0$

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



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



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 π 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) $\frac{1}{\sqrt{7}-2}$



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) $u^2=rac{17}{4}$

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

 $(d)rac{7+\sqrt{5}}{7-\sqrt{5}}-rac{7-\sqrt{5}}{7+\sqrt{5}}=a+rac{7}{11}\sqrt{5b}$



6.

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

$$(c)rac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}}=2-b\sqrt{6}$$

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 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 $\frac{8}{3}$



- 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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1. without actual division, find which of the following rational numbers

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

- have terminating decimal representation:
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2. Express each of the following recurring decimals into the rational number:

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



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

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



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:

 $2, \bar{5} - 0, \bar{35}$

6. Evaluate:

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

7. Evaluate:

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

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decimal represtation of $\frac{2}{11}$, $\frac{3}{11}$ and $\frac{4}{11}$.

8. Find the decimal representation of $\frac{1}{11}$. Deduce from itâ \in ^{Ms} the

Exercise 1 C

1.	Fill	in	the	blanks

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



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

- $(i)\sqrt{5}$ $(ii)\sqrt{9}$ $(iii)1+\sqrt{2}$ $(iv)2+\sqrt{4}$
- $(v)\sqrt{3}-\sqrt{5}$ $(vi)\left(2+\sqrt{2}\right)^2$ $(vii)\left(5+\sqrt{2}\right)\left(5-\sqrt{2}\right)$ $(viii)\left(5+\sqrt{2}\right)$
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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.



5. Give a rational number between 0.103 and 0.112111211112



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

7. Find two irrational numbers between 0.6 and 0.66.
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8. Find two irrational numbers between 0.2 and 0.23.
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9. Find two rational numbers between 0.565665666 and 0.585885888
••
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10 Find two vational numbers between 0.20220220 and 0.404404440
10. Find two rational numbers between 0.383383338 and 0.404404440
••••
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11. Pr	ove th	at $5+$	- $\sqrt{3}$ is	s irratior	ıal.
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12. Prove that $3-\sqrt{2}$ is irrational.



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



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



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.



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



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



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



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



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



Exercise 1 D

1. Evaluate each of the following:

$$(i)16^{1/2} \hspace{1.5cm} (ii)243^{1/5} \hspace{1.5cm} (iii)81^{1/4}$$



2. Evaluate each of the following:

 $(i)4^{3/2}$

$$(ii)625^{3\,/\,4}$$

 $(iii)81^{3/4}$

 $(iii)9^{3/2} + 3 imes 4^0 - \left(rac{1}{81}
ight)^{-1}$

 $(v)igg(rac{125}{64}igg)^{2/3}+igg(rac{256}{625}igg)^{-1/4}$



3. Simplify:

$$(i)3^{\left(rac{1}{3}
ight) imes \left(rac{11}{5}
ight)} \qquad \qquad (ii)igg(rac{1}{2}igg)^{rac{1}{5}} imes 2^{rac{3}{5}}$$



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4. Evaluate each of the following:

 $(vi)\sqrt{rac{1}{9}}+(0.01)^{-1/2}-(27)^{4/3}$

$$(i) \Big\{ (81)^{1/5} \Big\}^{5/2} \hspace{1cm} (ii) \Big(3\sqrt{64} \Big)^{-2}$$

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:

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

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



1. Rationalise the denominator of each the following

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

- $(i)\frac{2}{\sqrt{3}} \qquad (ii)\frac{1}{3\sqrt{5}} \qquad (iii)\frac{1}{\sqrt{8}}$
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$$(i)\frac{1}{3+\sqrt{5}}$$
 $(ii)\frac{1}{\sqrt{5}-\sqrt{3}}$ $(iii)\frac{16}{\sqrt{41}+5}$ $(iv)\frac{30}{5\sqrt{3}+3\sqrt{5}}$

 $(ii)\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}+\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

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

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3. Simplify each of the following:

$$(i)\frac{\sqrt{2}+1}{\sqrt{2}+1}+\frac{\sqrt{2}-1}{\sqrt{2}+1}$$

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- **4.** If $\sqrt{2}=1.414, \sqrt{3}=1.732$, find the value of the following : $(i)\frac{\sqrt{2}+1}{\sqrt{2}-1}$ $(ii)\frac{\sqrt{3}-1}{\sqrt{2}+1}$ $(iii)\frac{2+\sqrt{6}}{\sqrt{2}}$



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

 $(iii)\frac{5+4\sqrt{5}}{5}$



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

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

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

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

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



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



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

$$\sqrt{5}=2.236$$
 and $\sqrt{10}=3.162$



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

$$(i)(2)^{rac{1}{3}},(3)^{rac{1}{6}},(4)^{rac{1}{9}} \hspace{1.5cm} (ii)(3)^{rac{1}{3}},(5)^{rac{1}{4}},\sqrt{2},(10)^{rac{1}{6}}$$



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



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



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



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





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

 $\frac{2}{\sqrt{5}+\sqrt{3}+2}$



18. Rationalise the denominator of:



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 $\frac{1}{6}$.



- **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 $\frac{p}{a}$.

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

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



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

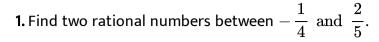


9. Simplify $\frac{1}{(625)^{-1/4}}$.

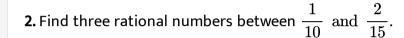


10. If
$$x=\dfrac{1}{\sqrt{3}+\sqrt{2}}.$$
 Then find $\dfrac{1}{x}.$











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



- **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 $\frac{p}{q}$.



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



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

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

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

