

MATHS

BOOKS - CENGAGE

NUMBER SYSTEM

Worked Examples

1. Find the product of $4\sqrt{3}$ and $5\sqrt{3}$.



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2. Find the product of $5\sqrt{2}$ and $6\sqrt{3}$.



- **3.** Divide $\sqrt{108}by\sqrt{147}$.
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4. Rationalise the denominator of $\frac{1}{\sqrt{5}}$ without changing its value.



- **5.** Rtionalise the denominator of $\dfrac{1}{\sqrt{3}-\sqrt{2}}$ without changing its value.
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- **6.** Rationalise the denominator of $\frac{\sqrt{5}-1}{\sqrt{5}+1}$.
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7. What kind of decimal expansions do the following numbers have?

$$\frac{5}{8}, \frac{22}{3}, \frac{1}{7}$$



8. Express the recurring decimal 0.123123123... as a fraction.



9. Simplify $5\sqrt{300} + 2\sqrt{75} - 4\sqrt{108}$.



10. Rationalise the denominator and siplify $\frac{3-\sqrt{8}}{3+\sqrt{8}}$



11. If the number 2x348 is divisible by 9, what is the value of x ?



12. Find all possible two-digit numbers such that the number plus the number formed by reversing its digits, is a perfect square.

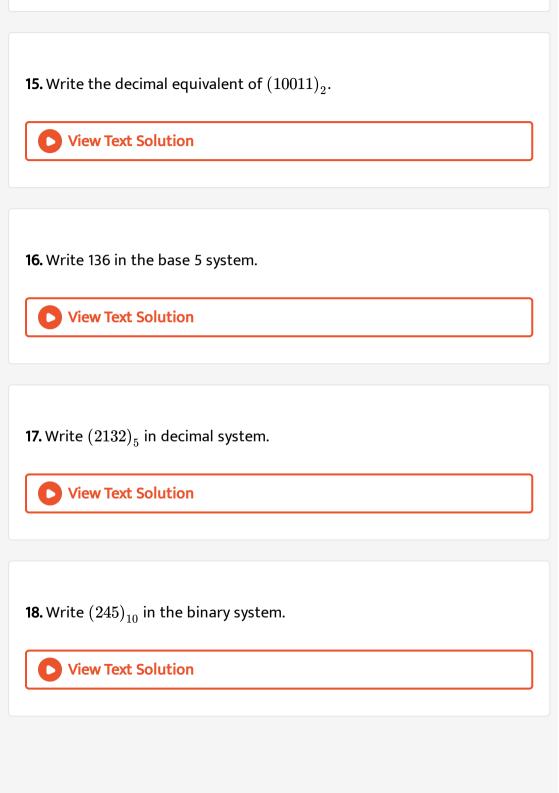


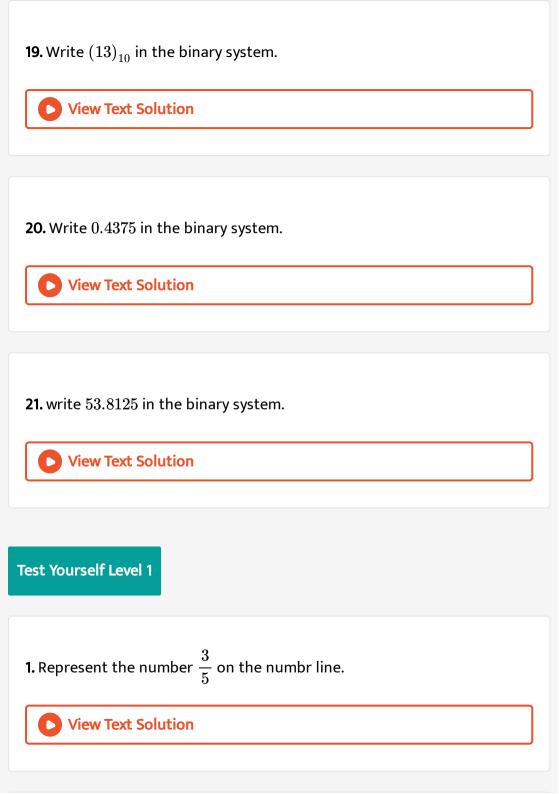
13. What is the square root of $3+2\sqrt{2}$, given that it is a square number



14. What is the square root of $8-2\sqrt{15},\,\,$ given that it is a square number ?







- **2.** Fina a fraction between $\frac{3}{8}$ and $\frac{2}{5}$.
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- 3. Which of the following fractions yield/s a recurring decimal? $\frac{5}{3}$, $\frac{7}{16}$, $\frac{9}{14}$, $\frac{5}{7}$, $\frac{12}{5}$, $\frac{6}{11}$
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- **4.** Find an irrational number between $\frac{1}{5}$ and $\frac{5}{16}$,
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- **5.** Which of the following numbers are not rational? (1.256, 0.45454545..., , 0.0500500500005...,), (5.51551555151..., , 2. 0123401
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- **6.** Represent 1.129129129... as a fraction.
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7. What is the simplest form of $\sqrt{200} - \sqrt{50}$?

8. Rationalise the denominator of $\frac{5}{\sqrt{10} + \sqrt{5}}$.

9. If $x = \sqrt{2} - 1$, then what is the value of $x - \frac{1}{x}$?

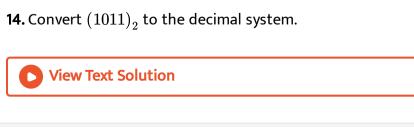
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10. Simplify $\left(\sqrt{5}+1\right)^2+\left(\sqrt{5}-1\right)^2$.

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11. Find the immediate predecessor to $(110)_2$.
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12. Find the immediate predecessor to $\left(4320\right)_{5}$.
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13. Convert $(321)_5$ to the danary ststem.
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15. Convert $(29)_{10}$ to the quinary system.
View Text Solution
16. Convert $\left(487\right)_{10}$ to the quinary system.
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17. Find the sum of $(232)_5$ and $(443)_5$.
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18. Subtract $(321)_5$ from $(432)_5$.
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19. Find the product of $(201)_5 imes (130)_5$.



Test Yourself Level 2

1. Represent $\sqrt{6}$ on the number line.

2. Find two irrational numbers between $\sqrt{5}$ and $\sqrt{6}$.

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3. Find the square root of $10 + 2\sqrt{21}$.

4. Find the square root of $12 - 4\sqrt{5}$.



5. Find the square root of
$$(2x-3)-2\sqrt{x^2-3x+2}$$
.



6. Which is greater,
$$\sqrt{15} - \sqrt{14}$$
 or $\sqrt{23} - \sqrt{22}$?



7. If
$$\sqrt{8-x\sqrt{2}}=\sqrt{12}-\sqrt{6}$$
, then what is the value of x?



8. Which is smaller , $\sqrt{13} + \sqrt{10}$ or $\sqrt{12} + \sqrt{11}$?



9. If $x=\dfrac{\sqrt{5}-2}{\sqrt{5}+2}, \,$ then the value of $x+\dfrac{1}{x}.$



10. If x>0, then what is the expression $\sqrt{x\sqrt{x}\sqrt{x...to\infty}}$ equal to ?



11. Convart $(526)_{10}$ to the ternary system.

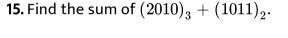


12. Convert $(340)_5$ to the ternary system.



13. Convert $(2153)_{10}$ to the octal system.

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14. Convert $\left(489\right)_{10}$ to the octal system.
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16. Find the sum of $(2012)_3 + (1011)_2$.

17. Find the product of $\left(22\right)_3+\left(1011\right)_3.$







18. Find the product of $(11)_2 \times (32)_5$.



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19. Find the product of $(111)_2 \times (212)_3$.



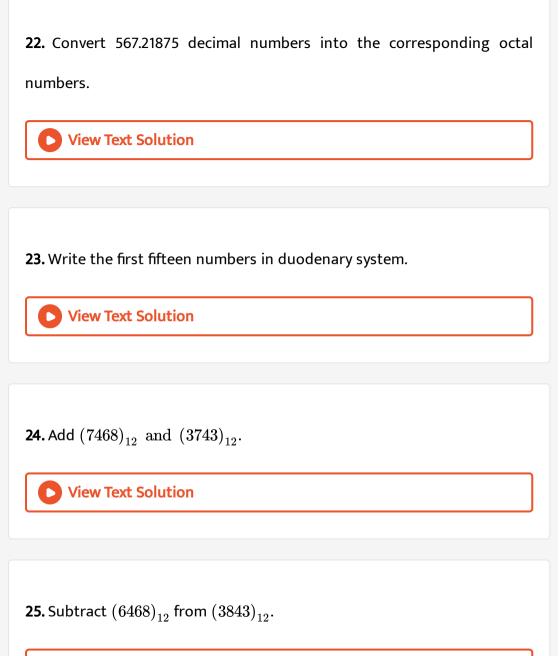
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20. In the base - x system, the equality $\left(434\right)_x+\left(344\right)_x=\left(1000\right)_x$ holds true. Find x.



21. Convert 73.625 decimal numbers into the corresponding octal numbers.





1. What is the value of following expression

$$2-rac{1}{20rac{2}{2+rac{2}{-2}}}$$
 ?

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2. Arrange the surds $(\sqrt{10}-\sqrt{5}), (\sqrt{19},\sqrt{14}), (\sqrt{22}-\sqrt{17})$ in ascending order of magnitude.



- **3.** If $x=a+\sqrt{a^2-1}$, then express a in terms of x.
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4. Simplift

$$rac{x}{x+rac{1}{x-rac{x}{1+x}}}$$

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5. How many times does the digit 7 appear when integers from 1 to 1000 are written?



6. A three-digit number consists of 5, 9 and an unknown digit. When the digits are written in the reverse order and subtracted from the original number, the resulting number contains the same digits in a different order. What is the unknown digit?



7. A natural number when divided by d leaves 24 as remainder. When twice the original number is divided by d, then the remainder is 11.



Calculate the value of d.

8. How many keystrokes are needed to type all the integers from 1 to 1000?



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9. If a natural number is multiplied by 18 and another by 21 and the products are added. Which one of the following numbers could be the sum of the products?

A. 2002

B. 2003

C. 2004

D. 2005

Answer: C



10. If x=0. $\bar{8}$ then 2x is

A. 1.
$$\bar{6}$$

 $\mathsf{B.}\ 1.\ \bar{5}$

C. $1.~ar{7}$

D. 1. $\bar{8}$

Answer: C



11. If $a=2+\sqrt{5}$ and $b=2-\sqrt{5}$ then the value of $\dfrac{1}{a}+\dfrac{1}{b}$ is

A. 2

B. $2\sqrt{5}$

C. 4

D.-4

Answer: D



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12. If $a=rac{\sqrt{5}+2}{\sqrt{5}-2}$ and $b=rac{\sqrt{5}-2}{\sqrt{5}+2}$ then the value of a + b is

A. $4\sqrt{5}$

B. 18

 $\mathrm{C.}-4\sqrt{5}$

D. - 18

Answer: B



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13. If $x=\dfrac{1}{7-4\sqrt{3}}$ and $y=\dfrac{1}{7+4\sqrt{3}}$ then the value of x^2+y^2 is

A. 193

B. 194

C. 195

D. 196

Answer: B



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14. The ratioal form of a. $\overline{72}$ is

A. $\frac{8}{11}$

B. $\frac{19}{11}$

C. $\frac{3}{11}$

D. $\frac{14}{99}$

Answer: B



15. Which of the following is a multiplicative inverse of 3 ?
A. 1
B. $\frac{1}{3}$
C.-3
D. 0
Answer: B



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16. If the number 2x348 is divisible by 3 then the value of x CANNOT be

A. 1

B. 4

C. 6

D. 7

Answer: C View Text Solution 17. If the number 34x576 is divisible by 4 then the value of x CANNOT be A. 1 B. 2 C. 0 D. none of these **Answer: D View Text Solution** 18. The multiplicative inverse of 0 is A. 1

B. any real number

C. 0

D. not defined

Answer: D



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19. If $x=\sqrt{2}+1$ then value of $x^3-\dfrac{1}{x^3}$ is

A. 14

B. $14\sqrt{2}$

C. 7

D. $7\sqrt{2}$

Answer: A



20. Square root of $\frac{5}{2} - \sqrt{6}$ is

$$\mathsf{A.}\,1-\frac{\sqrt{3}}{2}$$

$$\text{B.}\ \sqrt{\frac{3}{2}}-1$$

$$\mathsf{C.}\,1-\sqrt{\frac{2}{3}}$$

D.
$$\frac{\sqrt{5}}{3} - 1$$

Answer: B



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21. For $x>0,\,\,$ then value of $x\sqrt{x\sqrt{x\sqrt{x}...}}$ is

A. x

 $B. x^2$

 $\mathsf{C.}\,x^3$

D. $x^{3/2}$

Answer: B



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- **22.** If $x+\sqrt{3}=\sqrt{7+4\sqrt{3}}$ then the value of x is
 - A.-2
 - B. 2
 - $\mathsf{C.}-4$
 - D. 4

Answer: B



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23. If $a=\sqrt{13}+\sqrt{12}$ and $b=\sqrt{14}+\sqrt{11}$ then which of the following true ?

A.
$$a>b$$

B. a < b

C. a = b

D. none of these

Answer: A



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24. $\sqrt{10+\sqrt{91}}+\sqrt{10-\sqrt{91}}$ is equal to

A. $\sqrt{26}$

B. $2\sqrt{26}$

D. $2\sqrt{13}$

C. $\sqrt{13}$

Answer: A



25. The value of
$$3+\frac{1}{3+\frac{1}{2-\frac{1}{4}}}$$
 is

A. 3

 $\text{B. } \frac{82}{25}$

c. $\frac{25}{82}$

D. none of these

Answer: B



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26. The value of $2-\frac{1}{20\frac{1}{2-\frac{1}{2}}}$ is

A. 1/2

B.3/2

C. 1

D. none of these

Answer: C



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- **27.** The value of $\dfrac{\sqrt{14}}{\sqrt{6+\sqrt{35}}+\sqrt{6-\sqrt{35}}}$ is
 - A. 1
 - B.1/2
 - C. 2
 - D.3/2

Answer: A



B. $\sqrt{10}$ $C.\sqrt{40}$

A. $\sqrt{20}$

D. $\sqrt{5}$

Answer: A



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- **29.** Then the value of $\sqrt{2+\sqrt{2+\sqrt{2+...}}}$ is
 - **A.** -1
 - B. 2

C. 4

D. none of these



Answer: B

30. Square root of $(x-2)-\sqrt{x^2-4x+3}$ is

A.
$$(\sqrt{x-3}-\sqrt{x-1})$$

B.
$$\frac{\left(\sqrt{x-3}-\sqrt{x-1}\right)}{2}$$

C.
$$\frac{\left(\sqrt{x-3}-\sqrt{x-1}\right)}{\sqrt{2}}$$

D. none of these

Answer: C



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31. The square root of $x^2+x+4+2\sqrt{x^3+4x}$ is

A.
$$\sqrt{x}$$

B.
$$\sqrt{x^2+4}$$

C.
$$\sqrt{x}-\sqrt{x^2+4}$$

D.
$$\sqrt{x}+\sqrt{x^2+4}$$

Answer: D



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- **32.** If $x=7+4\sqrt{3}$ then value of $\sqrt{x}+\frac{1}{x}$ is
 - A. 4
 - B. \sqrt{x}
 - C. $\sqrt{3}$
 - D. 2

Answer: A



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B. x < y $\mathsf{C}.\,x=y$

110

B. $\frac{100}{99}$

c. $\frac{90}{99}$

D. $\frac{42}{99}$

Answer: A

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- **34.** If $x=\sqrt{13}-\sqrt{11}$ and $y=\sqrt{35}-\sqrt{33}$ then which of the followig is

correct?

A. x > y

- D. none of these
- Answer: A

35. The value of
$$\dfrac{1}{3+\sqrt{2}}-\dfrac{1}{3-\sqrt{2}}isig(\sqrt{2}=1.~414ig)$$

- A. 0.404
- B. 0.404
- C.0.202
- D. 0.202

Answer: B



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Test Yourself Level 3 Olympiad And Ntse Level Exercises

- 1. If the number 258a4 is divisible by 6, then what is the value of a?
 - A. 1

B. 2

C. 3

D. 4

Answer: B

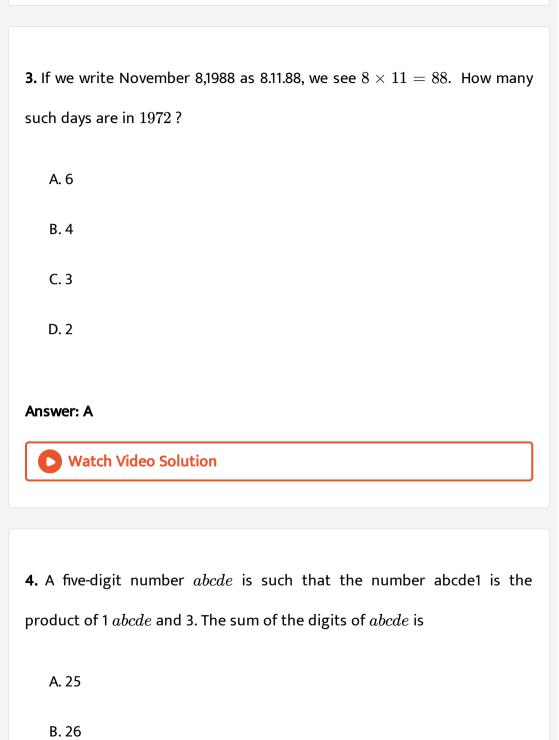


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- 2. The LCM of tow numbers is (a + b) and their HCF is k (a-b). If one number is k, then the other number is
 - A. $\frac{ka}{b}$
 - B. kab
 - C. $a^2 b^2$
 - D. $rac{ka+b}{ka-b}$

Answer: C





C. 27

D. 28

Answer: B



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5. If $\displaystyle \frac{\sqrt{x}}{11} = 0.1$ then x =

A. 12.1

 $\mathrm{B.}\,\sqrt{1.1}$

C. 1.21

D. $\sqrt{11}$

Answer: C



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6. The sum of the digits of the number 10^n-1 is 3375. The value of ${\mathsf n}$ is
A. 337
B. 375
C. 335
D. 3375
Answer: B
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7. Fill in the blanks.
(i) Sum of rational and irrational is P
(ii) Square root of an odd number isQ
(iii) Number ending withR number of zeroes is never a perfect
square.
A. $rac{P}{ ext{Irrational}} rac{Q}{ ext{Odd}} rac{R}{ ext{Even}}$

- PRIrrational Odd Odd PRC. Rational Even Odd PQRD. Rational Odd Odd
- **Answer: B**



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- 8. Read the following statements.

Statement 1: Square root of an irrational numbr is rational.

- Statement 2: All those real numbers which are not rational are irrational.
- A. Both Statement 1 and Statement 2 are true.
 - B. Statement 1 is true and Statement 2 is false.
 - C. Statement 1 is false and Statement 2 is true.
 - D. Both Statement 1 and Statement 2 are false.

Answer: C

9. Match the following.

15.86	Column I Column I		mn II
(P)	If $\frac{5}{12-x} = \frac{7}{12+x}$, then $x =$	(i)	4
(Q)	If $\frac{3^{3x-7} \times 9^{x-1}}{27^{x-1}} = 81$, then $x =$	(ii)	-2
(R)	If $3^x - 3^{x-1} = 54$, then $x =$	(iii)	5
(S)	If $5^{x+6} = 625$, then $x =$	(iv)	2

$$\label{eq:alpha} \text{A.} \begin{array}{cccc} P & Q & R & S \\ (iv) & (ii) & (i) & (ii) \end{array}$$

$$\text{B.} \begin{array}{ccccc} P & Q & R & S \\ (iv) & (i) & (iii) & (ii) \end{array}$$

C.
$$egin{array}{cccccc} P & Q & R & S \\ (iii) & (i) & (ii) & (iv) \end{array}$$

D.
$$egin{array}{cccc} P & Q & R & S \\ (ii) & (iii) & (i) & (iv) \end{array}$$

Answer: A



10. The value of

$$\frac{1}{1+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{7}}+\frac{1}{\sqrt{7}+\sqrt{9}}+...\frac{1}{\sqrt{23}+\sqrt{25}}\text{ is }$$

- $\mathsf{A.}-1$
- В. О
- **C**. 1
- D. 2

Answer: D

