MATHS

BOOKS - KUMAR PRAKASHAN

REAL NUMBERS

Textual Examples

1. Use Euclid's algorithm to find the HCF of 4052 and 12576.

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2. Show that every positive even integer is of the form 2q, and that every positive odd integer is of the form 2q + 1, where q is some integer.

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3. Show that any positive odd integer is of the form 4q + 1 or 4q + 3, where q is some integer.

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4. A sweetseller has 420 kaju barjis and 130 badam barjis. She wants to stack them in such a way that each stack has the same number of barjis, and they take up the least area of the tray. What is the number of barj is that can be placed in each stack for this purpose ?

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5. Consider the numbers 4^n , where n is a natural number. Check whether there is any value of n for which 4^n ends with the digit zero.

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6. Find the LCM and HCF of 6 and 20 by the prime factorisation method.

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7. Find the HCF of 96 and 404 by the prime factorisation method. Hence, find their LCM

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8. Find the HCF and LCM of 6, 72 and 120, using the prime factorisation m ethod.

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9. Prove that $\sqrt{3}$ is irrational.

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10. Show that $5 - \sqrt{3}$ is irrational.

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11. Show that $3\sqrt{2}$ is irrational.

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Other Important Examples

1. The measurements of a room are 7 m 50 cm, 6 m and 3 m 75 cm. Find the length of the longest rod that can measure all the three dimensions of the room exactly.

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2. Prove that the sum of any positive integer and its square is an even number.

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3. Show that the square of any positive integer is of the form 5 m or 5 m $\pm$ 1.

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4. Prove that $\sqrt{7}$ is irrational.

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

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6. Without actually performing the long division, write the decimal expansion of the following rational numbers

$(1)\frac{113}{200}(2)\frac{613}{2500}(3)\frac{4213}{3125}(4)\frac{63}{32}$

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7. Express the non-terminating repeating decimal number $1.\overline{325}$ in the $\frac{p}{q}$ form.

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8. Find the HCF of 660 and 252 by using Euclid's division algorithm and verify it by using prime factorisation m ethod.

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9. Find the HCF of 315 and 1275 by prime factorisation method. Then, find their LCM

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10. Three bells toll at intervals of 8, 12 and 15 minutes respectively. If they start tolling together, after what time will they toll together again

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Exercise 1 1

1. Use Euclid's division algorithm to find the $>$ HCF of (1) 135 and 225 (2) 196 and 382 2 0 (3) 867 and 255.

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2. Show that any positive odd integer is of the form 6q + 1 or 6q + 3 or 6q + 5, where q is some integer.

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3. An army contingent of 616 members is to march behind an army band of 32 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march ?

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4. Use Euclid's division lemma to show that the square of any positive integer is either of the form 3m or 3m.+ 1 for some integer m.

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5. Use Euclid's division lemma to show that the cube of any positive integer is of the form 9m, 9m + 1 or 9m + 8.

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Exercise 1 2

1. Express each number as a product of its prime factors : (1) 140 (2) 156 (3) 3825 (4) 5005 (5) 7429

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2. Find the LCM and HCF of the following pairs of integers and verify that LCM X HCF = product of the two numbers : (1) 26 and 91 (2) 510 and 92 (3)336 and 54

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3. Find the LCM and HCF of the following integers by applying the prime factorization method :

(1) 12 , 15 and 21

(2) 17 , 23 and 29

(3) 8 , 9 and 25.

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4. Given that HCF (306, 657) = 9, find LCM (306, 657).

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5. Check whether 6^n can end with the digit 0 for any natural number n

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6. Explain why 7 x 11 x 13 + 13 and 7 x 6 x 5 x 4 x 3 x 2 x 1 + 5 are composite numbers.

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7. There is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field, while Ravi takes 12 minutes for the same. Suppose they both start at the same point and at the same time, and go in the same direction. After how many minutes will they meet again at the starting point ?

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Exercise 1 3

1. Prove that $\sqrt{5}$ is irrational

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

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3. Prove that the following are irrationals

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

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Exercise 1 4

1. Without actually performing the long division, state whether the following rational numbers will have a terminating decimal expansion or a non-terminating repeating decimal al expansion :

$(1)\frac{13}{3125}(2)\frac{17}{8}(3)\frac{64}{455}(4)\frac{15}{1600}(5)\frac{29}{343}(6)\frac{23}{2^3 5^2}(7)\frac{129}{2^2 5^7 7^5}(8)\frac{6}{15}(9)\frac{35}{50}(10)$

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2. Write down the decimal expansions of those rational numbers m Question 1 above which have terminating decimal expansions.

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3. The following real numbers have decimal expansions as given below. In each case, decide whether they are rational or not. If they are rational, and of the form $\frac{p}{q}$ what can you say about the prime factors of q ?

(1) 43.123456789

(2) 0.120120012000120000

(3) $43.\overline{123456789}$

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Practice Thoroughly

1. Can the number 6^n , n being a positive integer end with digit 0 ? Give reasons.

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2. Can two positive integers have 18 as their HCF and 380 as their LCM ? Give reasons,

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3. Show that the square of an odd positive integer is of the form 8m + 1, for some whole ? number m.

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4. Prove that if x and y are both odd positive Integers, then $x^2 + y^2$ is even but not divisible by 4.

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5. Show that the square of an odd positive c integer is of the form 6q + 1 or 6q + 3 for some integer q.

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6. For any positive integer a, show that one and only one out of a, a + 2 and a+4 is divisible by 3.

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

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8. Show that 12^n cannot end with digit 0 or 5 for any natural number n.

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9. Find the HCF of 195, 416 and 637 by using Euclid's division algorithm.

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10. Find the greatest number which divides 450, 570 and 880 leaving remainders 2, 3 and 5 respectively.

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11. Find the greatest number of 7 digits which is exactly divisible by 12, 15 and 21.

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Objective Questions

1. The decimal expansion of $\frac{13211}{1250}$ terminates after ..... decimal places.

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2. If two positive integers a and b are expressible as $a = x^3y$ and $b = x^2y^3$ x and y being prime numbers, then HCF (a, b) is .....

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3. The product of two consecutive positive integers is always divisible by .....

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4. HCF (156 , 455) = ...

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5. LCM (220, 60) = ...

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6. If the square of any positive integer a is divided by 6, the remainder cannot be

A. 1

B. 3

C. 4

D. 5

Answer: 5

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7. According to Euclid's division lemma, for positive integer a and 5, if a = 5q + r is unique, then r = ... is not possible.

A. 0

B. 2

C. 6

D. 4

Answer: 6

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8. The greatest four digit number that is divisible by 95 is .....

A. 9995

B. 9975

C. 9985

D. 9950

Answer: 9975

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9. Any positive odd integer a is of the form ..... for some integer m.

A. 4m+1 or 4m+2

B. 4m+2 or 4m+3

C. 4m+1 or 4m+3

D. 4m or 4m+1

Answer: 4m +1 or 4m+3

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10. The LCM of the smallest prime number and the smallest composite number is

A. 4

B. 3

C. 2

D. 1

Answer: 4

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11. For two positive integers a and b, if HCF (a, b) = 7 and LCM (a, b) = 385, then their product is .....

A. 385

B. 2695

C. 2595

D. 2675

Answer: 2695

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12. The prime factorisation of 98 is .....

A. $2^2 \times 7^2$

B. 2×7^2

C. $2^2 \times 7$

D. 2×7

Answer: 2×7^2

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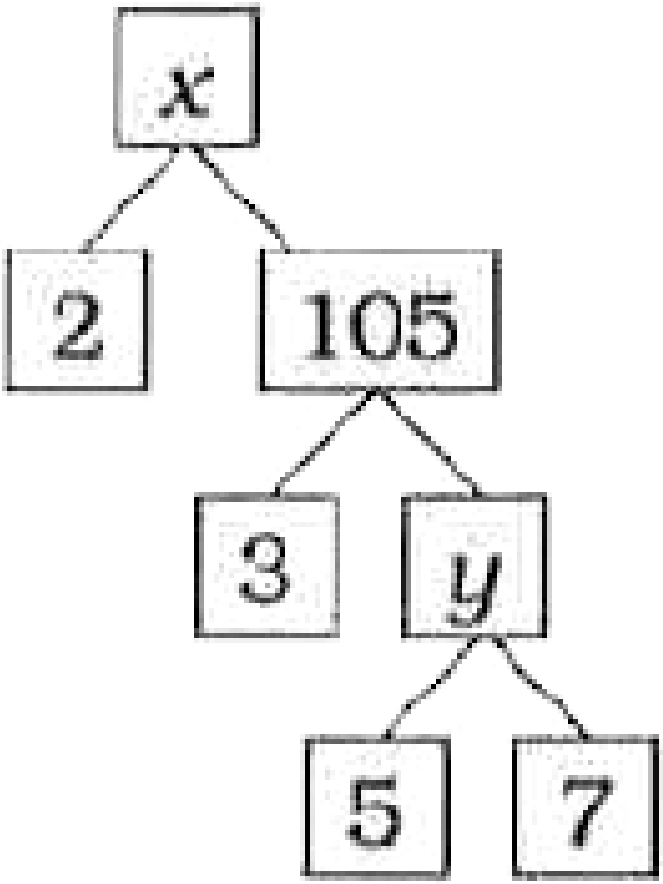
13. From the given factor tree, the values of x and y are ..... respectively.



A. 35 and 210

B. 210 and 35

C. 200 and 40

D. 40 and 200

Answer: 210 and 35

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14. ..... is not an irrational number. √6 √5 √4 √3

A. $\sqrt{6}$

B. $\sqrt{5}$

C. $\sqrt{4}$

D. $\sqrt{3}$

Answer: $\sqrt{4}$

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15. ..... is a rational number between $\sqrt{2}$ and $\sqrt{3}$ a. 4/5 b. 3/2 c. 3/4 d. 6/5

A. $\frac{4}{5}$

B. $\frac{3}{2}$

C. $\frac{3}{4}$

D. $\frac{6}{5}$

Answer: $\frac{3}{2}$

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16. If the HCF of 65 and 117. is expressible in the form 65m - 117, then the value of m is .....

A. 4

B. 2

C. 1

D. 3

Answer: 2

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17. The largest number which divides 70 and 125 leaving remainders 5 and 8 respectively is .....

A. 13

B. 65

C. 875

D. 1750

Answer: 13

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18. The decimal expansion of $\frac{27}{2^{113} \times 5^{110}}$ no terminates after ..... places of decimal

A. 113

B. 110

C. 3

D. 223

Answer: 113

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19. Given positive integers a and b, there exists unique integers q and r satisfying a = bq + r. In this statement r should be smaller than which integer ?

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20. What is the HCF of 65 and 117?

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21. What is the LCM of 36 and 100 ?

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22. After how many places of decimal does 751 the decimal expansion of $\frac{751}{2^4 5^2}$ terminate?

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23. State the smallest positive integer which is divisible by 28 and 63 both.

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24. The decimal expansion of $\frac{256}{125}$ is nonterminating repeating.

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25. The HCF of 25 and 52 is 1

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26. The decimal expansion of $\frac{87}{2^5 5^2}$ terminates after ..... decimal places.

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27. π is a rational number.

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28. For two positive integers a and b, HCF (a, b) x LCM (a, b) = a x b.

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Test Your Skills

1. Show that the square of any positive integer is of the form 4m or 4m + 1 for some integer m.

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2. Show that the square of any positive integer cannot be of the form 6m + 2 or 6m + 5 for ? some integer m.

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3. Show that the cube of any positive integer j is of the form 4m or 4m + 1 or 4m + 3 for some integer m.

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4. if n is an odd integer, then show that n^2 - 1 is divisible by 8.

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5. Using Euclid's division algorithm, find the HCF of 441, 567 and 693.

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6. Using Euclid's division algorithm, find the largest number that divides 1251, 9377 and 15628 leaving remainders 1, 2 and 3 respectively.

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7. Using Euclid's division algorithm, find the HCF of 5404 and 4800

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8. Using Euclid's division algorithm, find the HCF of 1620, 1725 and 255.

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9. For any positive integer n, prove that $n^3 - n$ is divisible by 6.

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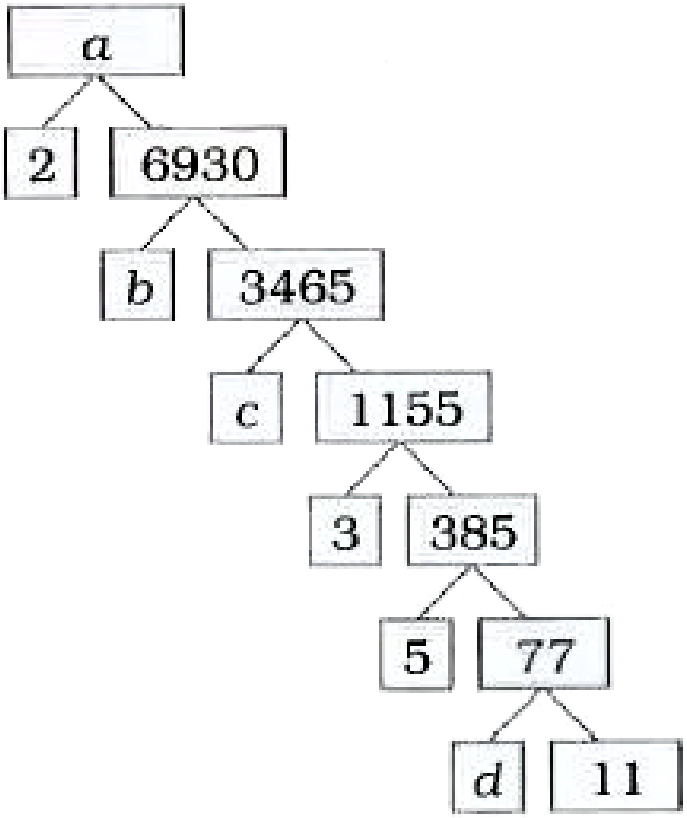
10. Find the missing numbers a, b, c and d in the following factor tree



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11. Find the HCF of 525 and 1120 by the prime factorisation method. Then, find their LCM using the relation formula.

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12. The HCF of 128 and 68 is expressible in ? the form 128 m - 1 5 x 6 8 . Find the value of m. Also find the LCM of 128 and 68 using prim e factorisation m ethod.

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13. Explain why 5 x 7 x 13 + 13 is a composite number

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14. The HCF of two numbers is 145 and their LCM is 2175. If one of the numbers is 725, find the other number.

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15. Find the HCF and LCM of 510 and 92 and also verify that HCF x LCM = the product of two given numbers.

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16. Find the HCF and LCM of 60, 120 and 288.

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

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

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19. Prove that $\sqrt{11}$ is irrational.

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20. Prove that $5\sqrt{7}$ is irrational.

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

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22. Prove that $\sqrt{p}+\sqrt{q}$ is irrational, where p and q are primes.

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23. Prove that there is no rational number whose square is 6.

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24. Without actually performing the long division, , state whether the following rational numbers will have a terminating decimal expansion or a non-terminating repeating decimal expansion

$(1)\frac{317}{500}(2)\frac{19}{24}(3)\frac{513}{160}(4)\frac{62}{375}(5)\frac{894}{2000}(6)\frac{348}{700}(7)\frac{1537}{4000}(8)\frac{106}{42}$

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25. Express $0.\overline{43}$ in the $\frac{p}{q}$ form

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26. Write down the decimal expansions of the following rational numbers without performing the long division :

$(1)\frac{7}{16}(2)\frac{133}{250}(3)\frac{517}{625}(4)\frac{891}{1250}$

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