Extra Practice: Prime Factors, Applications, Rational/Irrational, Number Systems & Radicals

Math 10 · Mr. Merrick

Prime Factors

1. State *all* positive divisors of the following.
   a) 84
   b) 75
   c) 96
   d) 105
2. In each case, determine the *number* of factors of the given whole number.
   a) 96
   b) 131
   c) 225
   d) 256
   e) 374
3. From the list in Question 2, state which numbers are prime and which are composite.
4. Classify each whole number as prime or composite.
   (a) 47 (b) 91 (c) 101 (d) 143 (e) 221 (f) 257
5. Twin primes are consecutive odd primes (e.g. $5, 7$). List seven other twin-prime pairs < 120.
6. a) State the factors of 48.
   b) State the *prime* factors of 48.
   c) Express 72 as a product of prime factors.
7. State the *prime factors* of:
   a) 18
   b) 40
   c) 63
   d) 90
8. Explain why the numbers 0 and 1 have no prime factors.
9. Use a *division table* to determine the prime factorization of:
   a) 252
   b) 378
   c) 2025
   d) 2926
10. Use a *factor tree* to determine the prime factorization of:
    a) 784
    b) 960
    c) 4725
    d) 8400
11. In each case, write the number as a product of prime factors.
    a) 3315
    b) 8085
    c) 9990
    d) 7980
12. Which of the following numbers is *not* a prime factor of 2079?
    A. 3 **B.** 7 **C.** 11 **D.** 13
13. How many numbers in the list $2, 3, 9, 13$ are *not* prime factors of 2592?
14. The sum of all *distinct* prime factors of 462 462 is ________.
15. There is only one set of *prime triplets* (three consecutive odd primes). If the triplets are a, b, c, find abc.
16. The number 375 can be expressed as $p \times q^r$ in primes. Find $p + q + r$.

Applications of Prime Factors

1. State the greatest common factor (GCF) of:
   a) 18 and 27
   b) 32 and 56
   c) $36, 48, 90$
2. Use prime factorization to determine the GCF of:
   a) 180 and 420
   b) 294 and 385
   c) 252 and 756
3. Use prime factorization to determine the GCF of each pair.
   a) 528 and 780
   b) 616 and 840
   c) 1870 and 2210
   d) 714 and 1050
   e) 128 and 320
   f) 735 and 980
4. Determine the GCF of:
   a) 84, 420, 1008
   b) 128, 984, 1496, 3080
5. State the lowest common multiple (LCM) of:
   a) 8 and 12
   b) 7 and 9
   c) 12 and 20
   d) 15 and 18
6. Use prime factorization to determine the LCM of:
   a) 18 and 24
   b) 45 and 84
   c) 96 and 144
   d) 55 and 143
   e) 72 and 252
7. Determine the LCM of:
   a) $8, 12, 18$
   b) $6, 14, 35$
   c) $9, 10, 25$
   d) $12, 30, 105$
8. In each case, decide whether the number is a perfect square (give the root if so).
   a) 9801
   b) 7776
   c) 4900
   d) 1089
9. Consider 103 823.
   a) Evaluate $\sqrt[3]{103\,823}$.
   b) Explain why 103 823 is a perfect cube.
10. Use prime factorization to test for perfect cubes (give the cube root if so).
    a) 2744
    b) 110 592
    c) 35 937
    d) 421 875
11. Explain how to tell if a number is *both* a perfect square and cube.
12. The greatest common factor of 425 and 595 is
    A. 5 **B.** 7 **C.** 17 **D.** 85
13. Two whole numbers x, y have $\gcd(x, y) = 14$. Which statement must be false?
    A. x, y both even **B.** xy divisible by 98 **C.** x, y both multiples of 7 **D.** Neither x nor y can be prime
14. The LCM of $36, 231, 275$ is __________.
15. An encyclopedia has 840 pages. Page 12 and every 12th page is green; page 21 and every 21st is orange. How many pages are both?

Rational and Irrational Numbers

1. For each, state repeating/non-repeating and terminating/non-terminating.
   a) $\dfrac{7}{20}$
   b) $0.742742742\ldots$
   c) $\dfrac{19}{22}$
   d) $\sqrt{\dfrac{196}{400}}$
   e) $-\sqrt{31}$
   f) $\sqrt{0.36}$
   g) $-4\dfrac{5}{11}$
   h) π
2. True/False.
   a) Every terminating decimal is rational.
   b) A repeating decimal cannot be written as a fraction.
   c) Only terminating decimals are rational.
   d) Every rational decimal is either terminating or repeating.
   e) A decimal cannot be both repeating and non-repeating.
   f) π is irrational.
3. Rational or irrational? Briefly justify.
   a) $-\dfrac{17}{8}$
   b) 0.605
   c) $\sqrt{196}$
   d) $0.305305305\ldots$
4. Order on a number line:
   $\sqrt{14},\ \sqrt{\pi},\ \sqrt{0.2},\ \sqrt{98},\ 2\sqrt{11},\ 3\sqrt{5}$.
5. Identify as rational or irrational; if rational, simplest fraction.
   a) 0.92
   b) $\sqrt{\frac{9}{121}}$
   c) $\sqrt{0.0121}$
   d) $-\sqrt{97}$
   e) $-0.\overline{8}$
   f) $-\sqrt{\frac{49}{81}}$
   g) $4.612612\ldots$
   h) $\sqrt{\frac{361}{529}}$
   i) $5.\overline{0}$
6. Convert to improper fraction (simplest form).
   a) $0.\overline{7}$
   b) $0.1\overline{6}$
   c) $1.2\overline{3}$
   d) $0.\overline{204}$
   e) $-2.4\overline{545}$
7. Convert the repeating decimal to a fraction (algebraic method).
   a) $0.\overline{3}$
   b) $0.7\overline{2}$
   c) $0.009\overline{81}$
8. Convert each terminating decimal to an improper fraction (lowest terms).
   a) 3.007
   b) -2.125
   c) 4.0625
9. The decimal for $\dfrac{7}{12}$ is
   A. terminating & repeating
   B. terminating & non-repeating
   C. non-terminating & repeating
   D. non-terminating & non-repeating
10. Which is irrational?
    A. $\sqrt{256}$ **B.** $\sqrt{0.09}$ **C.** $\frac{25}{6}$ **D.** $\sqrt{50}$
11. $9.\overline{9}$ is equal to
    A. $\frac{99}{10}$ **B.** $\frac{999}{100}$ **C.** 10 **D.** 9
12. Write $0.\overline{27} = \dfrac{a}{b}$ in lowest terms and compute $b - a$.

Number Systems

1. Place each into the appropriate nested sets ($N \subset W \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R}$ and $\mathbb{R} \setminus \mathbb{Q}$): $-3,\ \sqrt{81},\ \dfrac{29}{11},\ \sqrt{2},\ 0,\ \pi$.
2. List all sets (largest $\rightarrow$ smallest) each belongs to.
   a) -8
   b) $\sqrt{64}$
   c) $3.2727\ldots$
   d) $-\dfrac{12}{7}$
   e) 0
   f) $\sqrt{11}$
   g) non-repeating $-2.1345218\ldots$
   h) π
3. Why does -7 belong to more sets than $-\dfrac{7}{2}$?
4. Indicate membership in $\mathbb{N}, \mathbb{W}, \mathbb{Z}, \mathbb{Q}, \overline{\mathbb{Q}}$ (irrationals), and $\mathbb{R}$ for each.
   a) $\frac{1}{5}$
   b) $123\,987$
   c) -4
   d) 7.534
   e) 9.5
   f) $\sqrt{75}$
   g) $-\pi$
   h) $-\frac{355}{113}$
   i) $-\sqrt{49}$
   j) 0.000005
   k) non-repeating $2.232425\ldots$
5. Find a number that satisfies each condition.
   a) Integer but not whole.
   b) Rational but not integer.
   c) Real but not rational.
   d) Whole but not natural.
6. Fill with *always/sometimes/never*.
   a) A whole number is ______ a natural number.
   b) The quotient of two integers is ______ an integer.
   c) A whole number is ______ a rational number.
   d) The difference between two integers is ______ an integer.
   e) The square root of a number is ______ irrational.
   f) A negative number is ______ in W.
   g) A number in N is ______ in $\mathbb{R}$.
7. True/False.
   a) All natural numbers are integers.
   b) Real numbers consist of rationals and irrationals.
   c) Integers are nested within rationals.
   d) All integers are rational.
   e) All irrationals are real.
   f) $\mathbb{R}$ is contained in N.
   g) $\mathbb{Q}$ is contained in W.
   h) Exactly one element of W is not in N.
8. More about roots (True/False).
   a) Every positive number has two square roots but one cube root.
   b) Every negative number has one real cube root but no real square roots.
9. Short explanations (estimation).
   a) $\sqrt{8} + \sqrt{17} \neq \sqrt{25}$
   b) $\sqrt{2} + \sqrt{3} + \sqrt{4} \neq \sqrt{9}$
10. Determine true or false.
    a) $\sqrt{9} + \sqrt{4} = \sqrt{9+4}$.
    b) $\sqrt{9} - \sqrt{4} = \sqrt{9-4}$.
    c) $\sqrt{9} \cdot \sqrt{4} = \sqrt{36}$.
    d) $\sqrt{9} + \sqrt{4} = \sqrt{9} + 4$.

11. For each, (i) estimate mentally; (ii) use a calculator (nearest tenth) and judge the estimate.
    a) $\sqrt{21}$
    b) $\sqrt{27.4}$
    c) $4\sqrt{48} - 3\sqrt{63}$
    d) $\dfrac{3}{4}\sqrt{14.2} + \dfrac{1}{2}\sqrt{5}$
    e) $\sqrt{123}$
    f) $\sqrt{\sqrt{90}}$
    g) $\sqrt{10} + \sqrt{24.5}$
    h) $\sqrt{\sqrt{2601}}$
12. Estimate to one significant digit.
    a) $\sqrt{507.1}$
    b) $\sqrt{7991}$
    c) $\sqrt{10\,389}$
    d) $\sqrt{823\,775}$
    e) $\sqrt{0.501}$
    f) $\sqrt{0.0501}$
    g) $\sqrt{0.0876}$
    h) $\sqrt{0.000\,397\,2}$
13. (i) estimate; (ii) calculator (nearest tenth).
    a) $\sqrt[3]{25}$
    b) $\sqrt[3]{2}$
    c) $\sqrt[3]{202}$
    d) $\sqrt[3]{999.9}$
    e) $2\sqrt[3]{58.7} - 3\sqrt[3]{7.62}$
    f) $\dfrac{2}{3}\sqrt{40} - \dfrac{1}{2}\sqrt{60}$
    g) $\sqrt[3]{3\sqrt{10}}$
14. Order on the number line:
    $\sqrt{50},\ \sqrt[3]{50},\ 5\sqrt{10},\ \sqrt[3]{10^3},\ 10\sqrt{5},\ 10\sqrt[3]{5}.$
15. Which nesting statement is *false*?
    A. Integers $\subset$ rationals
    B. Wholes $\subset$ naturals
    C. Irrationals $\subset$ reals
    D. Reals $\subset$ naturals
16. How many of $-\sqrt{6},\ \sqrt[3]{-6},\ -\sqrt[3]{6},\ \sqrt{-6}$ are not real?
17. How many of $\sqrt{49},\ \sqrt{49/100},\ \sqrt{0.49},\ \sqrt{\frac{4}{9}}$ can be written as $\frac{a}{b}$ with $a, b \in \mathbb{N}$?
18. To the nearest hundredth, evaluate $5\sqrt[3]{7}$.
19. Evaluate the absolute values.
    a) $|-4|$
    b) $|13|$
    c) $|3-9|$
    d) $\big||3| - |9|\big|$
    e) $\left|-\sqrt[3]{27}\right|$
    f) $\left|\sqrt[3]{-27}\right|$
20. Decide whether the statement is true or false.
    a) $|x| = x$ if $x > 0$.
    b) $|x| = -x$ if $x < 0$.
21. Sketch solution sets on a number line.
    a) $|x| < 5$
    b) $|a| \geq 3$

Radicals

1. Mentally evaluate where possible (real numbers).
   a) $\sqrt{81}$
   b) $\sqrt[4]{81}$
   c) $5\sqrt[3]{27}$
   d) $\sqrt[5]{100\,000}$
   e) $\sqrt{\dfrac{16}{25}}$
   f) $\sqrt[4]{\dfrac{1}{16}}$
   g) $4\sqrt[4]{\dfrac{1}{16}}$
   h) $-\sqrt{1}$
   i) $\sqrt{-1}$
   j) $\sqrt[5]{-1}$
   k) $7\sqrt[3]{-125}$
   l) $-\sqrt[4]{\dfrac{1}{16}}$
   m) $3\sqrt{144}$
   n) $\dfrac{5}{2}\sqrt[5]{32}$
   o) $-\sqrt[11]{-1}$
   p) $\sqrt[3]{\dfrac{8}{27}}$
2. True/False.
   a) The square roots of 25 are ± 5.
   b) $\sqrt{25} = \pm 5$.
   c) If $x^2 = 25$ and $x \in \mathbb{R}$, then $x = \pm 5$.
3. Use a calculator to evaluate (state sign first, then value as needed).
   a) $\sqrt[4]{4096}$
   b) $\sqrt[5]{-243}$
   c) $-\sqrt[4]{2401}$
   d) $-\sqrt[3]{729}$
   e) $\sqrt[3]{-729}$
   f) $-8\sqrt[4]{\dfrac{1}{256}}$
   g) $\sqrt[6]{0.015625}$
   h) $\sqrt[4]{-6561}$
   i) $\dfrac{3}{2}\sqrt[4]{\dfrac{16}{81}}$
4. Evaluate to the nearest hundredth.
   a) $\sqrt[4]{10}$
   b) $\sqrt[8]{29}$
   c) $\dfrac{3}{2}\sqrt[3]{-527}$
5. Evaluate to the nearest tenth.
   a) $\sqrt[5]{-25}$
   b) $-5\sqrt[4]{169}$
   c) $\dfrac{1}{2}\sqrt[3]{-81}$
6. Identify the *index* and the *radicand* in each radical.
   a) $\sqrt[3]{42}$
      index: ______
      radicand: ________
   b) $\sqrt[4]{36}$
      index: ______
      radicand: ________
   c) $5\sqrt{17}$
      index: ______
      radicand: ________
7. Explain the meaning of the index 4 in the radical $\sqrt[4]{36}$.
8. Determine whether each statement is **true** or **false**.
   a) $\sqrt{30} = \sqrt{5}\sqrt{6}$
   b) $\sqrt{6-4} = \sqrt{6} - \sqrt{4}$
   c) $\sqrt{3} = \dfrac{\sqrt{45}}{\sqrt{15}}$
   d) $\dfrac{\sqrt{20}}{\sqrt{10}} = \sqrt{10}$
   e) $\sqrt{2} + \sqrt{2} = \sqrt{4}$
   f) $\sqrt{2} \times \sqrt{2} = \sqrt{4}$
   g) $\sqrt{\dfrac{1}{2} \cdot 30} = \sqrt{15}$
   h) $\dfrac{1}{2}\sqrt{30} = \sqrt{15}$

9. Write as a *single* radical in the form $\sqrt{x}$ (simplify x).
   a) $\sqrt{5}\sqrt{7}$
   b) $\sqrt{14}\sqrt{2}$
   c) $\sqrt{3}\cdot\sqrt{8}$
   d) $\sqrt{6}\cdot\sqrt{11}$
   e) $\dfrac{\sqrt{20}}{\sqrt{10}}$
   f) $\dfrac{\sqrt{25}}{\sqrt{5}}$
   g) $\dfrac{\sqrt{10}\sqrt{6}}{\sqrt{2}}$
   h) $\dfrac{\sqrt{81}}{\sqrt{9}}$
10. Express each as a product of radicals (split into two square roots).
   a) $\sqrt{35}$
   b) $\sqrt{33}$
   c) $\sqrt{65}$
   d) $\sqrt{49}$
11. Consider the statements:
   I. The cube root of -27 (over the reals) is ± 3.
   II. The fourth roots of 81 (over the reals) are ± 3.
   III. $-\sqrt[3]{1000} = \sqrt[3]{-1000}$.
   IV. $-\sqrt[4]{16} = \sqrt[4]{-16}$.
   Which are true?
   A. II and III only
   B. I, II, and III only
   C. I, II, III, and IV
   D. Some other combination
12. In the radical $\sqrt[4]{18}$, the index and radicand are
   A. index 2, radicand $\sqrt{18}$
   B. index 1, radicand 1
   C. index 18, radicand 1
   D. index 4, radicand 18
13. To the nearest hundredth, evaluate $\sqrt{\frac{7}{8}} + 2\sqrt[4]{\frac{7}{8}}$.
   ____

Entire Radicals and Mixed Radicals — Part One

1. Without a calculator, arrange in order from *greatest to least*:
   $3\sqrt{5},\ 5\sqrt{3},\ \sqrt{15},\ 2\sqrt{8},\ 8\sqrt{2}.$

2. Two students find the hypotenuse PQ of a right triangle with legs $\sqrt{34}$ and $\sqrt{38}$. Louis rounds each leg; Asia simplifies radicals first.
   a) Compute each to the nearest hundredth.
   b) Which is more accurate?
   c) Exact mixed radical.

3. Convert each to a *mixed radical* (simplest form).
   a) $\sqrt{96}$
   b) $\sqrt{242}$
   c) $\frac{2}{3}\sqrt{180}$
   d) $\frac{1}{8}\sqrt{320}$
   e) $\sqrt{245}$
   f) $4\sqrt{338}$
   g) $\sqrt{1250}$
   h) $\sqrt{66}$
   i) $-\frac{5}{6}\sqrt{304}$
   j) $\sqrt{980}$
   k) $4\sqrt{272}$
   l) $-3\sqrt{288}$
   m) $2\sqrt{369}$
   n) $\sqrt{364}$
   o) $\frac{2}{5}\sqrt{450}$
   p) $\frac{7}{11}\sqrt{341}$

4. Convert to a *mixed radical* where the radicand is a whole number.
   a) $\sqrt{\frac{2}{9}}$
   b) $\sqrt{\frac{5}{4}}$
   c) $\sqrt{\frac{18}{25}}$
   d) $7\sqrt{\frac{20}{49}}$

5. Convert to *entire radical* form.
   a) $2\sqrt{6}$
   b) $3\sqrt{7}$
   c) $5\sqrt{15}$
   d) $12\sqrt{2}$
   e) $3\sqrt{25}$
   f) $-8\sqrt{3}$
   g) $9\sqrt{10}$
   h) $-4\sqrt{5}$

6. Convert the following to *entire radical* form.
   a) $\frac{1}{3}\sqrt{27}$
   b) 15
   c) $\frac{3}{2}\sqrt{8}$
   d) $3^2\sqrt{21}$

7. Given $\sqrt{6} \approx 2.45$ and $\sqrt{60} \approx 7.75$, approximate:
   a) $\sqrt{600}$
   b) $\sqrt{6000}$
   c) $\sqrt{600\,000}$
   d) $\sqrt{0.06}$
   e) $\sqrt{0.6}$
   f) $\sqrt{24}$
   g) $\sqrt{540}$
   h) $\sqrt{\frac{6}{25}}$

8. Arrange from *greatest to least*:
   $3\sqrt{7},\ 5\sqrt{3},\ \sqrt{60},\ 2\sqrt{11},\ \frac{1}{2}\sqrt{200}.$

9. In right $\triangle XYZ$ with legs 19 cm and 5 cm, find hypotenuse XY:
   a) entire radical
   b) mixed radical
   c) decimal (nearest hundredth)

10. Find the missing side in simplest mixed radical form.
    a) legs $4, 8$; hypotenuse x
    b) legs $5, 6$; hypotenuse x
    c) hypotenuse 8, leg 6; other leg x

11. The length of $\overline{KL}$ for legs $\sqrt{6}$ and $\sqrt{24}$ is
    A. $\sqrt{540}$ **B.** $3\sqrt{2}$ **C.** $\sqrt{30}$ **D.** $9\sqrt{2}$

12. Without a calculator, which radical is *not* equal to the others?
    A. $12\sqrt{2}$ **B.** $\sqrt{288}$ **C.** $6\sqrt{8}$ **D.** $4\sqrt{72}$

13. On a clear day, $d = \sqrt{13h}$ (km), where h metres is eye level above ground. From a 698.2 m building with eye level 1.8 m above the roof, write $d = a\sqrt{b}$ and find $a + b$.
14. Using Heron's formula, a triangle with sides $14, 15, 25$ has area $A = p\sqrt{26}$. Find p.
15. A square of side 8 cm is inscribed in a larger square by joining midpoints. If larger side is $p\sqrt{q}$, find pq.

Entire Radicals and Mixed Radicals — Part Two

1. Convert the following radicals to mixed radicals in simplest form.
   a) $\sqrt[3]{48}$
   b) $\sqrt[3]{128}$
   c) $\sqrt[3]{2000}$
   d) $5\sqrt[3]{-81}$
   e) $\frac{5}{6}\sqrt[3]{108}$
   f) $5\sqrt[4]{162}$
   g) $5\sqrt{192}$
   h) $-2\sqrt[3]{625}$
2. Convert the following mixed radicals to entire radicals.
   a) $2\sqrt[5]{2}$
   b) $3\sqrt[3]{4}$
   c) $-3\sqrt[4]{3}$
   d) $-10\sqrt[3]{5}$
   e) $2\sqrt[5]{6}$
   f) $\frac{1}{2}\sqrt[3]{16}$
   g) $\frac{3}{10}\sqrt[4]{100000}$
   h) $-5\sqrt[3]{9}$
3. Arrange, least to greatest (no calculator): $7\sqrt[6]{1}$, $-3\sqrt[3]{-27}$, $\frac{5}{2}\sqrt[4]{16}$, $3\sqrt[3]{64}$.
4. Consider $2\sqrt[3]{11}$, $3\sqrt[3]{3}$, $4\sqrt[3]{2}$, $2\sqrt[3]{6}$.
   a) Explain how to compare without a calculator.
   b) Order least to greatest.
5. $\sqrt[3]{240}$ is equivalent to
   A. $2\sqrt[3]{40}$ **B.** $4\sqrt[3]{15}$ **C.** $2\sqrt[3]{30}$ **D.** $8\sqrt[3]{30}$
6. Consider the statements:
   1) $-3\sqrt[4]{8} = 3\sqrt[4]{-8}$,
   2) $-2\sqrt[3]{7} = 2\sqrt[3]{-7}$.
   A. Both true **B.** Both false **C.** 1 true, 2 false **D.** 1 false, 2 true
7. The mixed radical $\frac{1}{12}\sqrt[3]{128}$ equals $a\sqrt[3]{b}$ in simplest form. Find $a + b$ (nearest tenth).
8. $\sqrt{3x} \cdot \sqrt{2x}$ is equivalent to
   A. $\sqrt{6x}$ **B.** $\sqrt{36x^2}$ **C.** $6\sqrt{x}$ **D.** $x\sqrt{6}$
9. Express as an *entire* radical.
   a) $6\sqrt{y}$
   b) $8\sqrt{c^2}$
   c) $10\sqrt{2yz^3}$
   d) $-3\sqrt[3]{x^2}$
   e) $c\sqrt{c}$
   f) $x\sqrt{3y^3}$
   g) $11c^2\sqrt{c^2d}$
   h) $5a^3b\sqrt{3a^2b}$
10. Express as a mixed radical in simplest form.
    a) $\sqrt{a^5}$
    b) $\sqrt{t^3}$
    c) $\sqrt{x^{11}}$
    d) $\sqrt[3]{x^4}$
    e) $\sqrt[3]{b^8}$
    f) $\sqrt[4]{x^6}$
11. Express as a mixed radical.
    a) $\sqrt{8y^2}$
    b) $\sqrt{16p^3}$
    c) $\sqrt{75y^3z^4}$
    d) $\sqrt{300a^9w^7}$
    e) $5\sqrt{28c^4d^3}$
    f) $-6\sqrt{29a^4b^8}$

Quick Check

1. Which is not a prime factor of 14 014?
   A. 7 **B.** 11 **C.** 13 **D.** 17
2. How many numbers in the list $7, 11, 17, 21$ are prime factors of 3234?
   A. 1 **B.** 2 **C.** 3 **D.** 4
3. The sum of prime factors of 160797 is _____.
4. The GCF of 6699 and 8265 is _____.
5. LCM of 14 and 105 equals GCF of P, Q. Which must be false?
   A. P multiple of 7
   B. Q multiple of 21
   C. $P < 200$
   D. $Q > 2000$
6. If x is a perfect square, minimum value of d (in the given factor tree) is
   A. 2 **B.** 3 **C.** 6 **D.** 9
7. If x is a perfect cube, the minimum value of x is _____.
8. $\otimes$ is irrational. Its decimal representation is
   A. terminating & repeating
   B. terminating & non-repeating
   C. non-terminating & repeating
   D. non-terminating & non-repeating
9. Which are rational? (I) $1.0100100001\ldots$ (non-repeating), (II) $\sqrt[3]{\frac{8}{27}}$, (III) 0.04, (IV) 0.29
   A. III, IV
   B. II, III, IV
   C. I, II, III, IV
   D. Other
10. The rational number $1.\overline{54}$ as $\frac{c}{d}$; the value of c is
    A. 17 **B.** 11 **C.** 6 **D.** 4
11. M, N irrationals with $30 < M < 40, 3 < N < 4$. The value of $\sqrt{M} + \sqrt{N}$ is best represented by
    A. P **B.** Q **C.** R **D.** S
12. Largest among $\sqrt[3]{67}$, $\sqrt[4]{98}$, $\sqrt{19}$, $\sqrt[5]{201}$ is
    A. $\sqrt{19}$ **B.** $\sqrt[4]{98}$ **C.** $\sqrt[3]{67}$ **D.** $\sqrt[5]{201}$
13. The length $12\sqrt[4]{4000}$ m has index and radicand
    A. 4 and 4000
    B. 12 and 4000
    C. 4 and 12
    D. 4000 and 4
14. When $7\sqrt[3]{6}$ is written as an entire radical, the radicand is _____.
15. Which statements are true? 1) $35 = 7\sqrt{5}$ 2) $\sqrt{28} = 2\sqrt{7}$ 3) $4\sqrt{3} = 48$
    A. 1 only
    B. 2 only
    C. 1 and 2 only
    D. 2 and 3 only
16. Three students rewrote $\sqrt{4050}$. Who is correct?
    A. I only
    B. II and III
    C. All three
    D. Other
17. Circle area: if area 120π cm^2, radius is
    A. 60 **B.** $12\sqrt{10}$ **C.** $2\sqrt{30}$ **D.** $2\sqrt{15}$
18. A cube with volume 720 mm^3 has edge length $a\sqrt[3]{b}$ mm. Find $a + b$.
19. Consider $4\sqrt[3]{3}$, $5\sqrt{x}$, $16\sqrt{y}$. Which is correct?
    A. $x < y < z$
    B. $z < x < y$
    C. $y < z < x$
    D. $z < y < x$