

1. Which of the following numbers are rational?

$$\sqrt{2}, \frac{3}{5}, \sqrt{4}, 8, \pi, \sqrt{26}, 0.30\ 300\ 3000\dots, 0.934\ 34\ 34\dots, \frac{22}{7}, 0.45, -\sqrt{10}, \sqrt{9i}, \sqrt{-16}$$

2. Give an example of a number satisfying each of the following conditions, or state that no such number exists.

- (a) a whole number that is not a natural number
 (b) an integer that is not a whole number
 (c) an integer that is not a natural number
 (d) a rational number that is not an integer
 (e) an integer that is not a rational number
 (f) a real number that is not a rational number
 (g) a real number that is not an irrational number
 (h) a real number that is neither rational nor irrational
 (i) a complex number which is a real number

3. Simplify. Express your answers without negative exponents.

(a) $\frac{(5m k^7)^4}{(5m^3 k^2)^2}$ (b) $(2a^2 k^3)^5 (3a^3 k)^4$ (c) $\frac{ab^{-2}}{a^{-2}b}$ (d) $\frac{-2x^{-2}}{(-3x)^{-4}}$ (e) $(-2x^2 y^{-1})^{-2} (4x^{-1} y^3)^3$

4. Evaluate. Leave answers in simplified fraction form.

(a) $(3^{-1} + 3^0)^{-1}$ (b) $\frac{1}{5^{-1} + 2^{-1}}$ (c) $\frac{3^{-1} + 2^{-1}}{3^{-2} - (-2)^{-2}}$ (d) $-8^{\frac{2}{3}} + \sqrt[3]{32^2} - (-27)^{\frac{1}{3}} + (-1)^{-25}$

5. Simplify.

(a) $\frac{2^{2n} \times 4^{n-1} \times 16^{n-2}}{(4^3)^{n+1} \times 4^n}$ (b) $\frac{(3x^{2v})(2x^{u+2})^4}{(6x^u)^2}$ (c) $\left(\frac{27a^6}{b^{-9}}\right)^{\frac{2}{3}}$ (d) $\frac{6^{2x-y} \times 36^{3y-x}}{216^{x+y}}$

6. Simplify.

(a) $(27x^4)^{\frac{1}{3}} (16x^{-2})^{\frac{1}{4}}$ (b) $\frac{\sqrt{50x^2 y^4}}{\sqrt{5x^4 y^7}}$ (c) $8x^{\frac{1}{3}} y^{\frac{-5}{3}} \left(-2x^{\frac{2}{3}} y^{\frac{1}{3}}\right)^{-4}$ (d) $\sqrt[3]{\sqrt{x^{10}} \times \sqrt[3]{x^{15}}}$

7. Solve for x.

(a) $25^{x+4} = \left(\frac{1}{125}\right)^3$ (b) $4^{x-2} = 8^{x+1}$ (c) $11 \times 3^x = 297 \times 9^{x+1}$ (d) $2^x + 2^{x-1} = 192$

8. (a) Express $\sqrt[3]{81^4}$ as a power of 3. (b) Express $64^{\frac{3}{4}}$ as a power of 2.

9. Evaluate to 3 decimal places. (a) $125(105)^{34}$ (b) $\sqrt[3]{(-23.5)^{-1}}$

UNIT 1: 1. $\frac{3}{5}, \sqrt{4}, 8, 0.9\overline{34}, \frac{22}{7}, 0.45$ 3(a) $\frac{25k^{24}}{m^2}$ (b) $2592a^{22}k^{19}$ (c) $\frac{a^3}{b^3}$ (d) $-162x^2$

(e) $\frac{16y^{11}}{x^7}$ 4(a) $\frac{3}{4}$ (b) $\frac{10}{7}$ (c) -6 (d) $-\frac{2}{3}$ 5(a) 2^{-16} (b) $\frac{4x^{4u+8}}{3}$ (c) $9a^4b^6$ (d) 6^{2y-3x}

6(a) $6x^{\frac{5}{6}}$ (b) $\sqrt{10x^{-1}y^{-\frac{3}{2}}}$ (c) $\frac{x^3}{2y^3}$ (d) x^2 7(a) $-\frac{17}{2}$ (b) -7 (c) -5 (d) 7 8(a) $3^{\frac{16}{5}}$ (b) $2^{\frac{9}{2}}$

9(a) 656.668 (b) -0.349