

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

- 1) Convert the repeating decimal  $0.454\ 545\ \dots$  into a reduced fraction.

Answer:  $\frac{5}{11}$

- 2) Convert the repeating decimal  $2.626\ 262\ \dots$  into a reduced fraction.

Answer:  $\frac{260}{99}$

- 3) Indicate True (T) or False (F), and for each false statement find real number replacements for a, b, and c that will a counterexample.

(A)  $a - b = b - a$

(B)  $(a - b) - c = a - (b - c)$

(C)  $a + b = b + a$

(D)  $(a \cdot b) \cdot c = a \cdot (b \cdot c)$

Answer: (A) F,  $a = 1$  and  $b = 2$  provides a counterexample

(B) F,  $a = 3$ ,  $b = 2$ , and  $c = 1$  provides a counterexample

(C) T

(D) T

- 4) Indicate True (T) or False (F) by each statement.

(A) Every real number is a natural number.

(B) An irrational number is not a real number.

(C) Every natural number is an integer.

(D) An integer is a rational number.

Answer: (A) F; (B) F; (C) T; (D) T

- 5) Given the sets N, Z, Q, and R, indicate to which set(s) each of the following numbers belong.

(A)  $\frac{5}{6}$

(B) e

(C) -2

(D) 8

Answer: (A) Q, R; (B) R; (C) Z, Q, R; (D) N, Z, Q, R

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 6) Which of the following sets: N, Z, Q and I, together compose the set of real numbers?

A) N and Z together

B) I and Z together

C) I and Q together

D) Z and Q together

Answer: C

Find the product.

7)  $(4x - 5y)(5x - 10y)$

A)  $20x^2 - 25xy + 50y^2$

B)  $20x^2 - 65xy + 50y^2$

C)  $20x^2 - 65xy - 65y^2$

D)  $20x^2 - 40xy + 50y^2$

Answer: B

8)  $(10y + 11)(3y^2 - 2y - 9)$

A)  $30y^3 + 13y^2 - 112y - 99$

C)  $30y^3 - 20y^2 - 90y + 11$

B)  $63y^2 - 42y - 189$

D)  $30y^3 + 53y^2 + 112y + 99$

Answer: A

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Simplify the expression by combining like terms, if possible.

9) Perform the indicated operation and simplify:  $3t - [5 - 3(t - t(6 + t))]$ .

Answer:  $-5 - 12t + 3t^2$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

10)  $-7(3r + 8) + 7(2r + 5)$

A)  $-7r + 8$

B)  $-77r$

C)  $-7r - 21$

D)  $-4r + 1$

Answer: C

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Provide an appropriate response.

- 11) Each ounce of food A contains 4 units of calcium, and each ounce of food B contains 7 units of calcium. A 150 ounce diet mix is formed using foods A and B. If  $x$  is the number of ounces of food A used, write an algebraic expression that represents the total number of units of calcium in the diet mix. Simplify the expression.

Answer:  $1050 - 3x$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Factor the GCF from the polynomial.

12)  $6x^7y^6z - 10x^6y^5$

A)  $2x^6y^5z(3xy - 5)$

C)  $2x^6y^5(3xyz - 5)$

B)  $x^6y^5(6xyz - 10)$

D)  $2xy(3x^6y^6z - 5x^5y^4)$

Answer: C

Factor completely using grouping.

13)  $4y^2 + 18y - 10$

A)  $2(2y + 1)(y - 5)$

B)  $2(2y - 1)(y + 5)$

C)  $(4y - 2)(y + 5)$

D) prime

Answer: B

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14) Factor by grouping:  $12x^3 - 8x^2 + 3x - 2$

Answer:  $(3x - 2)(4x^2 + 1)$

15) Factor the expression using integer coefficients:  $24a^2x^3 - 3a^2y^3$ .

Answer:  $3a^2(2x - y)(4x^2 + 2xy + y^2)$

16) Which polynomial can be factored using integer coefficients? Find its factored form.

I)  $20x^2 - 3x - 35$

II)  $16m^2 + 25n^2$

III)  $x^2 + 7x - 5$

Answer: I;  $(4x + 5)(5x - 7)$

17) Factor using integer coefficients:  $4x^3y^2 - 20x^3y + 25x^3$

Answer:  $x^3(2y - 5)^2$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Simplify the expression.

18)  $\frac{3x + 4}{15x^2 + 26x + 8}$

A)  $\frac{3x + 5}{5x + 26}$

B)  $\frac{3x + 4}{15x^2 + 26x + 8}$

C)  $\frac{1}{5x + 2}$

D)  $\frac{3x}{5x + 2}$

Answer: C

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19) Perform the indicated operation and reduce to lowest terms:  $\frac{20x^3y}{4xy + 8y} \cdot \frac{x^2 - 4}{16x^2 - 32x}$

Answer:  $\frac{5x^2}{16}$

20) Perform the indicated operation and reduce to lowest terms:  $\frac{3x + 3y}{x^2 - 5xy - 14y^2} \div \frac{6x + 6y}{x^2 + 9xy + 14y^2}$

Answer:  $\frac{x + 7y}{2(x - 7y)}$

21) Combine into a single fraction and simplify:  $\frac{1}{49x^4} - \frac{7x + 1}{5x^3} + \frac{5}{245x}$

Answer:  $\frac{5 - 49x - 343x^2 + 5x^3}{245x^4}$

22) Combine into a single fraction and simplify:  $\frac{y - 5}{y^2 - 4} - \frac{y + 5}{y^2 - 4y + 4} - \frac{3}{2 - y}$

Answer:  $\frac{3y^2 - 14y - 12}{(y + 2)(y - 2)^2}$

23) Express as a simple fraction reduced to lowest terms:  $\frac{\frac{a}{b} - 1 - \frac{2b}{a}}{\frac{a}{b} - 3 + \frac{2b}{a}}$

Answer:  $\frac{a+b}{a-b}$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Simplify. The exponents in the answer should be positive integers.

24)  $\frac{-8ym^5n}{-3ym^8n}$

A)  $\frac{1}{5m^3}$

B)  $\frac{5y^2n^2}{m^3}$

C)  $\frac{5}{m^3}$

D)  $\frac{8}{3m^3}$

Answer: D

25)  $(6x^{-3}y^5)(6^{-1}x^5y^{-8})$

A)  $-\frac{x^2}{6y^3}$

B)  $\frac{x^2}{y^3}$

C)  $\frac{1}{x^{15}y^{40}}$

D)  $\frac{x^8}{y^{13}}$

Answer: B

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26) Simplify and express using positive exponents:  $\left(\frac{5m^{-3}}{n^4}\right)^{-2}$

Answer:  $\frac{m^6n^8}{25}$

27) Simplify and express the answer using positive exponents:  $\frac{5m^{-4}}{m^{-8}}$

Answer:  $5m^4$

28) Write  $\frac{3x^5 - 4x^3 + 9x}{3x^2}$  in the form  $ax^p + bx^q + cx^r$ , where a, b, and c are real numbers and p, q and r are integers.

Answer:  $x^3 - \frac{4}{3}x + 3x^{-1}$

29) Write  $\frac{3x^3(x-2)^3 - 2x^2(x-2)^4}{(x-2)^2}$  with positive exponents only, and as a single fraction reduced to lowest terms.

Answer:  $x^2(x-2)(x+4)$

30) Write  $7.214 \times 10^7$  in standard notation.

Answer: 72,140,000

31) According to the 2000 U.S. census, the population of the United States on April 1, 2000 was approximately 281,422,000 (Source: www.census.gov). The population of the U.S. in 1900 was approximately 76,212,000. Write both population numbers in scientific notation and use these expressions to calculate the ratio of the population in 2000 to that in 1900. Express the ratio in standard decimal form to four decimal places.

Answer:  $2.81422 \times 10^8$ ,  $7.6212 \times 10^7$ ; 3.6926

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Rewrite the expression with a positive rational exponent. Simplify, if possible.

32)  $\left( \frac{4a^2b^{-4}}{a^{-2}b^4} \right)^{1/2}$

A)  $2a^2b^4$

B)  $\frac{2a^2}{b^4}$

C)  $\frac{4a}{b^2}$

D)  $\frac{4b^4}{a}$

Answer: B

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33) Simplify and express using positive exponents:  $\left( \frac{4x^{2/3}}{10x^{-1/4}} \right)^{-1}$

Answer:  $\frac{5}{2x^{11/12}}$

34) Change to simplest radical form:  $(2xy^6z^{35})^{3/7}$

Answer:  $y^2z^{15}\sqrt[7]{8x^3y^4}$

35) Simplify and express the answer using positive exponents only:  $(2x^{-5/8}y^{3/4})^8$

Answer:  $\frac{256y^6}{x^5}$

36) Change to simplest radical form:  $\frac{49x^4y}{\sqrt{7x}}$

Answer:  $7x^3y\sqrt{7x}$

37) Write in simplest radical form:  $\sqrt[5]{243x^{13}y^{22}}$

Answer:  $3x^2y^4\sqrt[5]{x^3y^2}$

38) Change to simplest radical form:  $\sqrt{12m^8n^6}\sqrt{3m^8n^2}$

Answer:  $6m^8n^4$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Rationalize the denominator and simplify. Assume that all variables represent positive real numbers.

39)  $\frac{4}{\sqrt{10} + \sqrt{14}}$

A)  $\sqrt{10} - \sqrt{14}$

B)  $\sqrt{4}$

C)  $\sqrt{14} + \sqrt{10}$

D)  $\sqrt{14} - \sqrt{10}$

Answer: D

Use the square root property to solve the equation.

40)  $(x + 6)^2 = 40$

A)  $\{-2\sqrt{10}, 2\sqrt{10}\}$

B)  $\{2\sqrt{10} - 6, 2\sqrt{10} + 6\}$

C)  $\{-6 - 2\sqrt{10}, -6 + 2\sqrt{10}\}$

D)  $\{-6 - 2\sqrt{20}, -6 + 2\sqrt{20}\}$

Answer: C

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41) Solve by factoring:  $4y^2 = 10y$

Answer:  $y = 0$  or  $\frac{5}{2}$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the quadratic formula to solve the equation.

42)  $x^2 + 12x + 19 = 0$

A)  $\{6 + \sqrt{17}\}$

B)  $\{-6 - \sqrt{17}, -6 + \sqrt{17}\}$

C)  $\{6 - \sqrt{19}, 6 + \sqrt{19}\}$

D)  $\{-12 + \sqrt{19}\}$

Answer: B

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43) Factor, if possible, as the product of two first-degree polynomials with integer coefficients:  $4x^2 - 131x + 435$

Answer:  $(4x - 15)(x - 29)$

44) The supply and demand equations for a certain product are  $s = 2,500p - 14,500$  and  $d = \frac{3,000}{p}$ , where  $p$  is the price in dollars. Find the price where supply equals demand.

Answer: \$6