

Solutions

Name: _____

Work in groups to answer as many problems as you can. Ask questions if you get stuck.

1. Determine what kind of number the following are. Circle all that apply.

(a) 0	Natural	Integer	Rational	Irrational
(b) 1	Natural	Integer	Rational	Irrational
(c) $\frac{1}{2}$	Natural	Integer	Rational	Irrational
(d) -4	Natural	Integer	Rational	Irrational
(e) $-\frac{2}{3}$	Natural	Integer	Rational	Irrational
(f) $\sqrt{5}$	Natural	Integer	Rational	Irrational
(g) $\sqrt{4}$	Natural	Integer	Rational	Irrational
(h) $\frac{7}{1}$	Natural	Integer	Rational	Irrational

2. For each of the given numbers, determine if a and b are factors or terms.

(a) 5, $a = 3, b = 2$

Answer: Terms

(b) 7, $a = 1, b = 7$

Answer: Factors

(c) 15, $a = 5, b = 3$

Answer: Factors

(d) 11, $a = 5, b = 6$

Answer: Terms

3. Evaluate the following arithmetic expressions

$$\begin{aligned}
 \text{(a) } 2 - \left[4 \cdot 7 - 5 \left(9 - \frac{8}{2} \right) \right] &= 2 - [28 - 5(9 - 4)] \\
 &= 2 - [28 - 5(5)] \\
 &= 2 - [28 - 25] = 2 - [3] = -1
 \end{aligned}$$

Answer: -1

$$\begin{aligned}
 \text{(b) } 3(4 \cdot 6 - 2 \cdot 10) + 7(15 - 8 \cdot 2) &= 3(24 - 20) + 7(15 - 16) \\
 &= 3(4) + 7(-1) \\
 &= 12 - 7 = 5
 \end{aligned}$$

Answer: 5

5. Expand the following expressions using the distributive property.

(a) $3(x + 7)$

Answer: $3x + 21$

(b) $8(a - 2)$

Answer: $8a - 16$

(c) $-3c(6ab - 5bd) = -3c(6ab) - 3c(-5bd)$

Answer: $-18abc + 15bcd$

(d) $4mn(2p + 3pq - 2q) = 4mn(2p) + 4mn(3pq) + 4mn(-2q)$

Answer: $8mnp + 12mnpq - 8mnq$

(e) $(3q - 2qr - 5r)(-2ps) = 3q(-2ps) - 2qr(-2ps) - 5r(-2ps)$

Answer: $-6pqs + 4pqrs + 10prs$

6. Factor the following expressions using the distributive property.

(a) $3x + 21$

Answer: $3(x + 7)$

(b) $-20x + 40y$

Answer: $-20(x - 2y)$

(c) $-5ab + 10bc$

Answer: $-5b(a - 2c)$

(d) $15xyz - 18wxy$

Answer: $3xy(5z - 6w)$

(e) $2qrs - 6qst + 12rst$

Answer: $2s(qr - 3qt + 6rt)$

7. For each of the given intervals, find a point on the real line that is in one, but not the other. State which interval your point is in.

(a) $A = [-2, 5)$, $B = (-2, 5)$

Answer: -2, A

(b) $A = [0, 17)$, $B = (-1, 15)$

Answer: $-\frac{1}{2}$, B

(c) $A = [4, 5)$, $B = [4, 4.9]$

Answer: 4.95, A

(d) $A = (-1, 1)$, $B = (-1, 1]$

Answer: 1, B

8. Find the indicated set if $A = \{1, 2, 3, 4, 5, 6, 7\}$, $B = \{2, 4, 6, 8\}$, $C = \{7, 8, 9, 10\}$.

(a) $A \cup B$

Answer: $\{1, 2, 3, 4, 5, 6, 7, 8\}$

(b) $A \cap B$

Answer: $\{2, 4, 6\}$

(c) $B \cup C$

Answer: $\{2, 4, 6, 7, 8, 9, 10\}$

(d) $B \cap C$

Answer: $\{8\}$

(e) $A \cup C$

Answer: $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

(f) $A \cap C$

Answer: $\{7\}$

(g) $A \cup B \cup C$

Answer: $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

(h) $A \cap B \cap C$

Answer: Empty

(i) $A \cap (0, 3)$

Answer: $\{1, 2\}$

(j) $B \cap (3, 9)$

Answer: $\{4, 6, 8\}$

9. Use exponential notation to rewrite the following products.

(a) $2 \cdot 5 \cdot 3 \cdot 2 \cdot 2 \cdot 5 \cdot 7 \cdot 3$

Answer: $2^3 \cdot 3^2 \cdot 5^2 \cdot 7$

(b) $3 \cdot 11 \cdot 11 \cdot 2 \cdot 5 \cdot 13 \cdot 17 \cdot 23 \cdot 17$

Answer: $2 \cdot 3 \cdot 5 \cdot 11^2 \cdot 13 \cdot 17^2 \cdot 23$

(c) $7 \cdot 5 \cdot 7 \cdot 5 \cdot 11 \cdot 13 \cdot 11 \cdot 19$

Answer: $5^2 \cdot 7^2 \cdot 11^2 \cdot 13 \cdot 19$

(d) $5 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5 \cdot 3$

Answer: $2^3 \cdot 3^2 \cdot 5^3$

10. Use the rules of exponents to write each expression in as simple a form as possible.

(a) $5 \cdot 5^2$

Answer: 5^3

(b) $(-3)^2$

Answer: 3^2

(c) $\frac{10^7}{10^4}$

Answer: 10^3

(d) $5^1 \cdot 5^{-2}$

Answer: 5^{-1}

(e) $\left(\frac{3}{4}\right)^2$

Answer: $3^2 \cdot 4^{-2}$

(f) $\frac{2^{-3} \cdot 2^2}{3^0}$

Answer: 2^{-1}

(g) $(2^3)^0$

Answer: 1

(h) $\frac{7^5 \cdot 7^{-3}}{7^2}$

Answer: 1

11. Convert each radical to rational exponential form, and each rational exponent to radical form.

$$(a) \frac{1}{\sqrt{5}} = \frac{1}{5^{1/2}}$$

Answer: $5^{-1/2}$

$$(b) \sqrt[3]{7^2} = (7^2)^{1/3}$$

Answer: $7^{2/3}$

$$(c) 4^{\frac{2}{3}} = (4^2)^{1/3}$$

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

$$(d) 11^{-\frac{3}{2}} = \frac{1}{11^{3/2}}$$

$$= \frac{1}{(11^3)^{1/2}}$$

Answer: $\frac{1}{\sqrt{11^3}}$

$$(e) \sqrt[5]{5^3} = (5^3)^{1/5}$$

Answer: $5^{3/5}$

$$(f) 2^{-\frac{1}{2}} = \frac{1}{2^{1/2}}$$

Answer: $\frac{1}{\sqrt{2}}$

$$(g) a^{\frac{2}{5}} = (a^2)^{1/5}$$

Answer: $\sqrt[5]{a^2}$

$$(h) \frac{1}{\sqrt{x^5}} = \frac{1}{(x^5)^{1/2}}$$

$$= (x^5)^{-1/2}$$

Answer: $x^{-5/2}$

12. Evaluate the following.

$$(a) \frac{2}{3} + \frac{5}{4} = \frac{2 \cdot 4 + 3 \cdot 5}{3 \cdot 4} = \frac{8 + 15}{12}$$

$$\frac{23}{12}$$

Answer: _____

$$(b) \frac{6}{7} + \frac{9}{2} = \frac{6 \cdot 2 + 7 \cdot 9}{7 \cdot 2} = \frac{12 + 63}{14}$$

$$\frac{75}{14}$$

Answer: _____

$$(c) \frac{3}{2} - \frac{5}{7} = \frac{3 \cdot 7 - 2 \cdot 5}{2 \cdot 7} = \frac{21 - 10}{14}$$

$$\frac{11}{14}$$

Answer: _____

$$(d) \frac{11}{15} - \frac{2}{3} = \frac{11 \cdot 3 - 15 \cdot 2}{15 \cdot 3} = \frac{33 - 30}{45}$$

$$\frac{3}{45}$$

Answer: _____

$$(e) \left(\frac{5}{4}\right) \left(\frac{7}{3}\right) = \frac{5 \cdot 7}{4 \cdot 3}$$

$$\frac{35}{12}$$

Answer: _____

$$(f) \left(\frac{11}{3}\right) \left(\frac{7}{11}\right) = \frac{11 \cdot 7}{3 \cdot 11}$$

$$\frac{77}{33}$$

Answer: _____

$$(g) \frac{6/11}{2/3} = \frac{6}{11} \cdot \frac{1}{(2/3)}$$

$$= \frac{6}{11} \cdot \frac{3}{2} = \frac{6 \cdot 3}{11 \cdot 2}$$

$$\frac{18}{22}$$

Answer: _____

$$\begin{aligned} \text{(h)} \quad \frac{9/13}{3/2} &= \frac{9}{13} \cdot \frac{1}{(3/2)} \\ &= \frac{9}{13} \cdot \frac{2}{3} = \frac{9 \cdot 2}{13 \cdot 3} \end{aligned}$$

$$\text{Answer: } \underline{\frac{18}{39}}$$

13. Evaluate the expression.

(a) $\sqrt{16}$

$$\text{Answer: } \underline{4}$$

(b) $\sqrt[3]{16}$

$$\text{Answer: } \underline{2}$$

(c) $\sqrt{\frac{4}{9}}$

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

(d) $49^{\frac{1}{2}}$

$$\text{Answer: } \underline{7}$$

(e) $(-27)^{-\frac{2}{3}} = (-3)^4$

$$\text{Answer: } \underline{81}$$

(f) $\left(\frac{1}{8}\right)^{-\frac{3}{2}} = 8^{\frac{2}{3}} = 2^2$

$$\text{Answer: } \underline{4}$$

$$(g) \frac{\sqrt{48}}{\sqrt{3}} = \sqrt{\frac{48}{3}} = \sqrt{16}$$

Answer: 4

$$(h) \sqrt{7}\sqrt{28} = \sqrt{7 \cdot 28} = \sqrt{196}$$

Answer: 14

14. Simplify the expressions, using exponent rules, leaving your answer in rational exponent form.

$$(a) \sqrt{x^3}\sqrt{x^5} = \sqrt{x^3 \cdot x^5} = \sqrt{x^8} = x^{8/2}$$

Answer: x^4

$$(b) \sqrt[3]{5y^4} = (5y^4)^{1/3}$$

Answer: $5^{1/3} \cdot y^{4/3}$

$$(c) \sqrt[4]{3s^3t^5}\sqrt[4]{27st^3} = \sqrt[4]{(3s^3t^5)(27st^3)} = \sqrt[4]{81s^4t^8} = 81^{1/4} \cdot s^{4/4} \cdot t^{8/4} = 3 \cdot s \cdot t^2$$

Answer: $3 \cdot s \cdot t^2$

$$(d) \sqrt[5]{y^5}\sqrt[3]{y^2} = y^{5/5} \cdot y^{2/3} = y^{5/5} \cdot y^{4/6} = y^{9/6} = y^{3/2}$$

Answer: $y^{3/2}$

$$(e) \sqrt[3]{b^3}\sqrt{b} = b^{3/3} \cdot b^{1/2} = b^{3/3} \cdot b^{2/4} = b^{5/4}$$

Answer: $b^{5/4}$

$$(f) (2\sqrt{a})(\sqrt[3]{a^2}) = 2a^{1/2} \cdot a^{2/3} = 2a^{3/6} \cdot a^{4/6} = 2a^{7/6}$$

Answer: $2a^{7/6}$