Year 10 index laws worksheet

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Name: _____ Date: _____

Question 1

Simplify $3a^4 \times 5a^3$.

Answer: _____

Question 2

Evaluate 4^{-2}, giving your answer as a fraction or a decimal.

Answer: _____

Question 3

Simplify $((3x^2y)^3)/(9x^4y^2)$, giving your answer with positive indices only.

Answer: _____

Question 4

Evaluate $(\frac{1}{5})^{-2} + 2^{-1}$.

Answer: _____

Question 5

A square solar panel has a side length of $2x^3$ metres. Four of these panels are laid flat in a single row end to end, and the combined area is divided equally among $8x^2$ households. Write an expression for each household's share of the total panel area in square metres, giving your answer with positive indices only.

Answer: _____

Question 6

Evaluate, writing fractions or decimals where needed.

(a) 2^{-1}

(b) 5^0

(c) 10^{-2}

(d) 3^{-2}

Answer: _____

Question 7

Simplify $((2x^3)^4)/(x^5)$, giving your answer as a coefficient times a power of x.

What is the exponent of x in the simplified expression?

Answer: _____

Question 8

Write each expression with positive indices only.

(a) x^{-3}

(b) $4y^{-2}$

(c) $(1)/(m^{-5})$

Answer: _____

Question 9

Simplify $((2m^3n)^4)/(4m^6n^2)$, giving your answer with positive indices only.

Answer: _____

Question 10

Simplify, writing each answer with positive indices.

(a) $x^5 \times x^{-8}$

(b) $6a^{-2} \times 2a^{-3}$

(c) $(2m^{-3})^2$

(d) $10k^3 \div 5k^7$

Answer: _____

Year 10 index laws: answers and worked solutions

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Question 1

Key idea: When multiplying terms with the same base, add the exponents: $a^m \times a^n = a^{m+n}$.

1. Multiply the coefficients: 3 × 5 = 15. 2. Apply the product law to the powers of a: $a^4 \times a^3 = a^{4+3} = a^7$. 3. Write the result: $15a^7$.

Answer: $15a^7$

Question 2

Key idea: $a^{-n} = (1)/(a^n)$.

1. $4^{-2} = (1)/(4^2)$. 2. = 1/16 = 0.0625.

Answer: 1/16

Question 3

Key idea: Expand any brackets using the power law first, then apply the quotient law to simplify.

1. Expand the numerator using the power law: $(3x^2y)^3 = 3^3 \cdot x\text{^}(2 \times 3) \cdot y^3 = 27x^6y^3$. 2. W rite the full expression: $(27x^6y^3)/(9x^4y^2)$. 3. Divide the coefficients: 27/9 = 3. 4. Apply the quotient law to each base: $x^{6-4} = x^2$ and $y^{3-2} = y^1 = y$. 5. Write the result: $3x^2y$.

Answer: $3x^2y$

Question 4

Key idea: A negative index means take the reciprocal.

1. $(⅕)^{-2} = 5^2 = 25$. 2. $2^{-1} = ½ = 0.5$. 3. Total = 25.5.

Answer: 25.5 (or 25½)

Question 5

Key idea: Find the total area of the four panels, then divide by the number of households using the quotient law.

1. Find the area of one panel: $(2x^3)^2 = 4x^6$ square metres. 2. Find the total area of four p anels: $4 \times 4x^6 = 16x^6$ square metres. 3. Divide by the number of households: $(16x^6)/(8x^2)$. 4. D ivide the coefficients: 16/8 = 2. 5. Apply the quotient law: $x^{6-2} = x^4$.

Answer: $2x^4$ square metres per household

Question 6

Answer: (a) ½ (or 0.5) (b) 1 (c) 1/100 (or 0.01) (d) 1/9

Question 7

Key idea: Apply the power law $(a^m)^n = a^{mn}$ first, then the quotient law $a^m \div a^n = a^{m-n}$.

1. Apply the power law to the numerator:\ $(2x^3)^4 = 2^4 \times x^{(3 \times 4)} = 16x^{12}$ 2. Rewrite the expression:\ $(16x^{12})/(x^5)$ 3. Apply the quotient law to the x terms:\ $x^{12} \div x^5 = x^{12-5} = x^7$ 4. Combine with the coefficient:\ $16x^7$

Answer: $16x^7$, so the exponent of x is 7.

Question 8

Answer: (a) $(1)/(x^3)$ (b) $(4)/(y^2)$ (c) m^5

Question 9

Key idea: Expand the numerator using the power law, then apply the quotient law to each base.

1. Expand the numerator: $(2m^3n)^4 = 2^4 \cdot m^{(3 \times 4)} \cdot n^4 = 16m^{12}n^4$. 2. Write the full expression: $(16m^{12}n^4)/(4m^6n^2)$. 3. Divide the coefficients: 16/4 = 4. 4. Apply the quotient law: $m^{12-6} = m^6$ and $n^{4-2} = n^2$. 5. Write the result: $4m^6n^2$.

Question 10

Answer: (a) $(1)/(x^3)$ (b) $(12)/(a^5)$ (c) $(4)/(m^6)$ (d) $(2)/(k^4)$