TRUE FALSE

For any real numbers a and b,

$$(a^2b^3)^4 = a^8b^{12}$$

For any real numbers a and b, $(a^2b^3)^4 = a^8b^{12}$

True. When raising a product to a power, we apply the power to each factor: $(a^2b^3)^4 = (a^2)^4 \times (b^3)^4 = a^8 \times b^{12} = a^8b^{12}$

TRUE FALSE

The expression $2^3 \times 2^4 = 4^7$

The expression $2^3 \times 2^4 = 4^7$

False. $2^3 \times 2^4 = 2^{3+4} = 2^7$, not 4^7. The bases must be the same to use the multiplication law of indices.

TRUE FALSE

For any non-zero number x, $x^{-3} = 1/x^3$

For any non-zero number x, $x^{-3} = 1/x^3$

True. A negative exponent indicates the reciprocal of the base raised to the positive exponent: $x^{-3} = 1/x^3$

TRUE FALSE

$(3^2)^3 = 3^5$

$(3^2)^3 = 3^5$

False. When raising a power to another power, we multiply the exponents: $(3^2)^3 = 3^{2\times 3} = 3^6$, not 3^5

TRUE FALSE

For any real numbers a and b where $a \neq 0$, $(a/b)^{-2} = b^2/a^2$

For any real numbers a and b where $a \neq 0$, $(a/b)^{-2} = b^2/a^2$

True. A negative exponent applied to a fraction means we take the reciprocal and apply the positive exponent: $(a/b)^{-2} = (b/a)^2 = b^2/a^2$

TRUE FALSE

$5^0 = 0$ for any base 5

$5^0 = 0$ for any base 5

False. Any non-zero number raised to the power of 0 equals 1: $5^0 = 1$, not 0

TRUE FALSE

The expression $\sqrt{(x^6)} = x^3$ for all real numbers x

The expression $\sqrt{(x^6)} = x^3$ for all real numbers x

False. This is only true when $x \geq 0$. For negative x, $\sqrt{(x^6)} = |x|^3$, not x^3, since square roots yield non-negative results

TRUE FALSE

$$2^4 \div 2^2 = 2^2$$

$2^4 \div 2^2 = 2^2$

True. When dividing powers with the same base, we subtract the exponents: $2^4 \div 2^2 = 2^{4-2} = 2^2$

TRUE FALSE

For any real number a, $(a^3)^2 = a^9$

For any real number a, $(a^3)^2 = a^9$

False. When raising a power to another power, we multiply the exponents: $(a^3)^2 = a^{3x2} = a^6$, not a^9

TRUE FALSE

The expression $4^{1/2} \times 4^{1/2} = 4$

The expression $4^{1/2} \times 4^{1/2} = 4$

True. $4^{1/2} = \sqrt{4} = 2$, so $2 \times 2 = 4$. Alternatively, using the multiplication law: $4^{1/2} \times 4^{1/2} = 4^{1/2+1/2} = 4^1 = 4$

TRUE FALSE

$x^2 \times y^2 = (xy)^2$ for all real numbers x and y

$x^2 \times y^2 = (xy)^2$ for all real numbers x and y

True. This follows from the commutative and associative properties: $x^2 \times y^2 = (x \times x) \times (y \times y) = (x \times y) \times (x \times y) = (xy)^2$

TRUE FALSE

$8^{2/3} = 4$

$8^{2/3} = 4$

True. $8^{2/3} = (8^{1/3})^2 = (\sqrt[3]{8})^2 = 2^2 = 4$, or $8^{2/3} = (8^2)^{1/3}$
$= 64^{1/3} = \sqrt[3]{64} = 4$

TRUE FALSE

For any real numbers a and b, $a^2 + b^2 = (a + b)^2$

For any real numbers a and b, $a^2 + b^2 = (a + b)^2$

False. $(a + b)^2 = a^2 + 2ab + b^2$, which is not equal to $a^2 + b^2$ unless $ab = 0$

TRUE FALSE

The expression $(2x^3)^2 = 4x^5$

The expression $(2x^3)^2 = 4x^5$

False. $(2x^3)^2 = 2^2 \times (x^3)^2 = 4 \times x^6 = 4x^6$, not $4x^5$

TRUE FALSE

For any non-zero number x, $x^4 \div x^7 = x^3$

For any non-zero number x, $x^4 \div x^7 = x^3$

False. When dividing powers with the same base, we subtract exponents: $x^4 \div x^7 = x^{4-7} = x^{-3} = 1/x^3$, not x^3

TRUE FALSE

$$27^{2/3} = 9$$

$27^{2/3} = 9$

True. $27^{2/3} = (27^{1/3})^2 = (\sqrt[3]{27})^2 = 3^2 = 9$, or $27^{2/3} = (27^2)^{1/3} = 729^{1/3} = \sqrt[3]{729} = 9$

TRUE FALSE

The expression $(a^2b)^3 \div (ab^2)^2 = a^4b^{-1}$

The expression $(a^2b)^3 \div (ab^2)^2 = a^4b^{-1}$

True. $(a^2b)^3 = a^6b^3$ and $(ab^2)^2 = a^2b^4$, so $a^6b^3 \div a^2b^4$

$= a^{6-2}b^{3-4} = a^4b^{-1}$

TRUE / FALSE

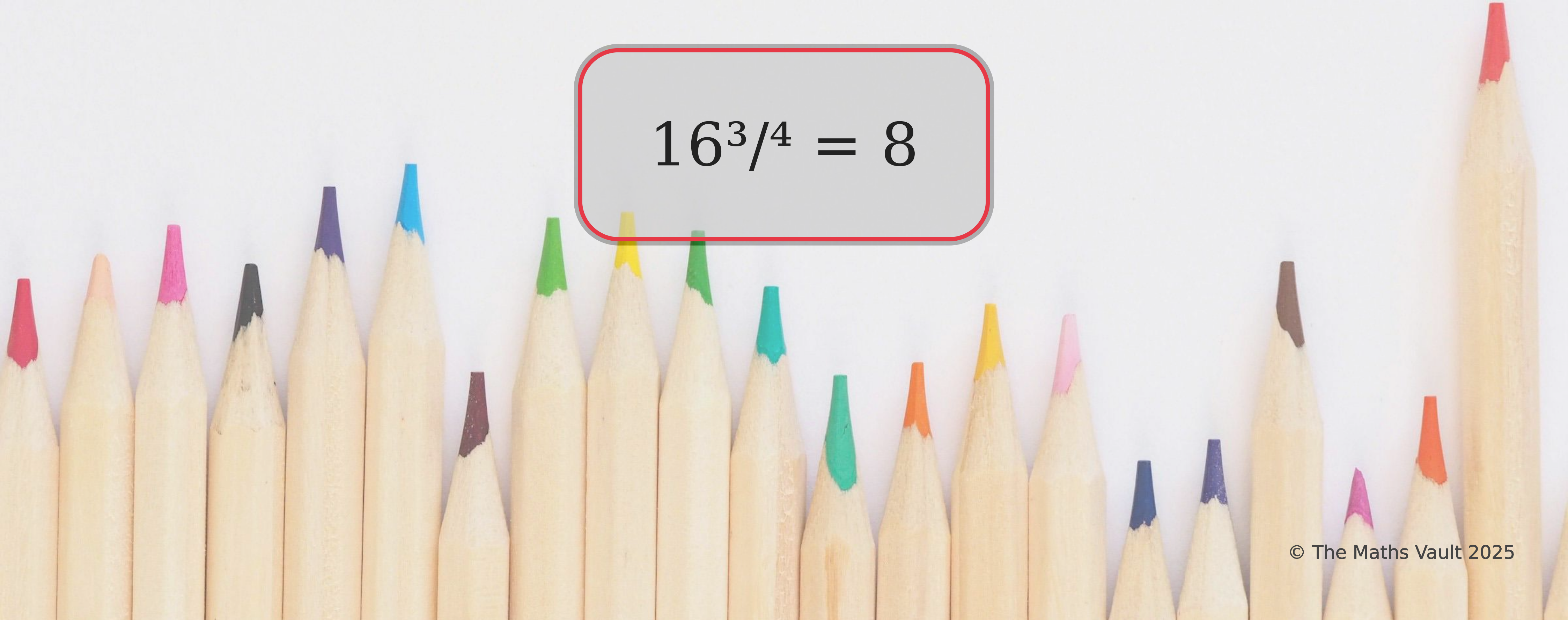
For any real number x, $(x^2)^{1/2} = x$

For any real number x, $(x^2)^{1/2} = x$

False. $(x^2)^{1/2} = |x|$, not x. This only equals x when $x \geq 0$

TRUE FALSE

$16^{3/4} = 8$



$16^{3/4} = 8$

True. $16^{3/4} = (16^{1/4})^3 = (\sqrt[4]{16})^3 = 2^3 = 8$, or $16^{3/4} = (16^3)^{1/4} = 4096^{1/4} = \sqrt[4]{4096} = 8$

TRUE FALSE

The expression $3^2 \times 4^2 = 12^2$

The expression $3^2 \times 4^2 = 12^2$

False. $3^2 \times 4^2 = 9 \times 16 = 144$, while $12^2 = 144$. Wait, this is actually true! Both expressions equal 144. Correction: This statement is TRUE because

$$3^2 \times 4^2 = (3 \times 4)^2 = 12^2$$