

1. Exponent Laws

$a^m \cdot a^n = \underline{\hspace{2cm}}$ $a^m \div a^n = \underline{\hspace{2cm}}$ $(a^m)^n = \underline{\hspace{2cm}}$	Simplify. a) $a^4 \cdot a^6$ b) $a^8 \div a^{-2}$ c) $(a^5)^2$
When you have a power of a power, the outside exponent applies to each power in the brackets AND the coefficient. $(x^m y^n)^a = \underline{\hspace{2cm}}$ $(2x^m)^a = \underline{\hspace{2cm}}$	Simplify. d) $(3a^2)^2$ e) $(-4xy^2z^3)^4$

2. Adding and Subtracting Polynomials

You can add or subtract like terms which are terms with the same _____ and _____.

To add a polynomial in brackets, remove the brackets by _____ each term in brackets.

To subtract a polynomial in brackets, remove the brackets by _____ each term in brackets.

Simplify.

- a) $3x - 4y + 7x - 5y$
- b) $5x + 5y + (6x - 7y)$
- c) $(4x - 3y) - (-x + y)$

3. Distributive Law: $a(b + c) = ab + ac$

Simplify.

- a) $4(x - 2y)$
- b) $-4(x - 2y)$
- c) $3x(x^2 + 2x - 5)$

4. Putting it all together! Remember **BEDMAS** whenever simplifying an expression.

Simplify.

- a) $6x^2(3x - 1) - 5x(4x^2 + x)$
- b) $\frac{(-2ab^2)^2(3a^2b^5)}{18a^3b^9}$
- c) $5x - 3x[x - 4x(6x + 2)]$
- d) $(-2a^2b^3)^3 - 3a(5a^5b^9 - 4ab^4)$

Answers...

- 1.a) a^{10} b) a^{10} c) a^{10} d) $9a^4$ e) $256x^4y^8z^{12}$ 2.a) $10x - 9y$ b) $11x - 2y$ c) $5x - 4y$
- 3.a) $4x - 8y$ b) $-4x + 8y$ c) $3x^3 + 6x^2 - 15x$
- 4.a) $-2x^3 - 11x^2$ b) $\frac{2a}{3}$ c) $5x + 72x^3 + 21x^2$ d) $-23a^6b^9 + 12a^2b^4$

MPM1D Unit 1 Review

1. Evaluate.

- a) 4^3 b) 16^1 c) 12^2 d) 1^{32} e) 0^{35}

2. Find the missing value of x.

- a) $(4^3)(4^x) = 4^{15}$ b) $7^{12} \cdot 7^x = 7^{14}$ c) $\frac{10^{12}}{10^x} = 10^{12}$ d) $\frac{5^x}{5^{10}} = 5^6$

3. Express as a single power. Do not evaluate.

- a) $5^3 \times 5^4$ b) $4^2 \times 4^2$ c) $7^7 \times 7^8$ d) $15^{34} \times 15^2$ e) $1^3 \times 1^2$
f) $3^4 \div 3^2$ g) $2^{12} \div 2^5$ h) $13^5 \div 13$ i) $7^{10} \div 7^2$ j) $9^{14} \div 9^{-2}$

4. Express as a single power.

- a) $(4^2)(4^3)(4^4)$ b) $3^5 \cdot 3 \cdot 3^3 \cdot 3^2$ c) $144^3 \cdot 144^8 \cdot 144^4$ d) $(6)(6)(6)(6)$ e) $8^{-2} \cdot 8^4 \cdot 8^2 \cdot 8^5$
f) $6^{13} \div 6^3 \div 6^4$ g) $8^{20} \div 8^{10} \div 8^9$ h) $5^{50} \div 5^{12} \div 5^4 \div 5^2$ i) $90^{90} \div 90^{30} \div 90^{60}$ j) $7^{10} \div 7 \div 7^7$

5. Simplify. Do not evaluate your answer.

- a) $3^2 \times 3^4 \times 5^2 \times 5^4$ b) $(10^2)(10^2)(2^5)(2^3)(2)$ c) $7^2 \times 7^0 \times 1^5 \times 1^3$ d) $8^{12} \div 8^4 \div 6^{10} \div 6^3$

6. Simplify and evaluate.

- a) $2^3 \times 2^4$ b) $5^{10} \div 5^5$ c) $6^{15} \div 6^3 \div 6^7$ d) $11^{34} \times 11^{-32}$ e) $1^{35} \times 1^{21}$
f) $9^5 \div 9^3$ g) $10^4 \times 10^2$ h) $9^{13} \div 9^6 \div 9^6$ i) $2^3 \times 2^2 \times 2^2$ j) $4^5 \div 4^0$

7. Simplify and evaluate.

- a) $(2p^3)^4$ b) $(-3)^3$ c) $(-6)^5$ d) $5(n^2)^7$
e) $(-1)^3$ f) $(-1)^4$ g) $(9f^3)^2$ h) $(h^3j^2)^5$

8. Simplify.

- a) $\left(\frac{3}{4}\right)^3$ b) $\left(\frac{2}{5}\right)^2$ c) $\left(\frac{5}{7}\right)^2$ d) $\left(\frac{4m^2}{5m}\right)^5$ e) $\frac{(8x^5)^2}{(4x^2)^3}$ f) $\frac{(5m^5n^3)^3}{(3m^3n^2)^3}$ g) $\frac{4(a^3b^4c)^2}{(2ab)^6}$

Answers...

1. a) 64 b) 16 c) 144 d) 1 e) 0 2. a) $x=12$ b) $x=2$ c) $x=0$ d) $x=16$
3. a) 5^7 b) 4^4 c) 7^{15} d) 15^{36} e) 1^5 f) 3^2 g) 2^7 h) 13^4 i) 7^8 j) 9^{16}
4. a) 4^9 b) 3^{11} c) 144^{15} d) 6^4 e) 8^9 f) 6^6 g) 8 h) 5^{32} i) 90^0 j) 7^2
5. a) $3^6 \times 5^6$ b) $10^4 \times 2^9$ c) $7^2 \times 1^8$ d) $8^8 \div 6^7$
6. a) 128 b) 3125 c) 7776 d) 121 e) 1 f) 81 g) 1 000 000 h) 9 i) 128 j) 1024
7. a) $16p^{12}$ b) -27 c) -7776 d) $5n^{14}$ e) -1 f) 1 g) $81f^6$ h) $h^{15}j^{10}$
8. a) $\frac{27}{64}$ b) $\frac{4}{25}$ c) $\frac{25}{49}$ d) $\frac{1024m^5}{3125}$ e) x^4 f) $\frac{125m^6n^3}{27}$ g) $\frac{b^2c^2}{16}$

9. Clearly identify the sets of like terms.

$$2y^2, 3x^2y, -4xy^3, -6, -2xy^2, \frac{-1}{2}xy^3, 3y^2, 2$$

10. Expand and simplify.

- a) $2(x-2)$ b) $-(3y+2x)$ c) $-xy(2x-y)$ d) $-3x(x^3+2)+3x^2(-2x^2-1)+3x^2-3x$
 e) $m^2n(-3m+4n)$ f) $-9c(ab-3c^8)$ g) $3a^2b(2ab-ab^2)$ h) $-f(-6f^3-4f)$

11. Expand and simplify.

- a) $-2(2x+1)+3(x-2)$ b) $5(a+b)-2(a+3b)$ c) $3(x+2)-4(x-1)$
 d) $6(h^4+h)-(h^4-3h)$ e) $(-3mn)(6m^2n^4)$ f) $x(xy-4y)-7xy(4x+2)$
 g) $-2(4x+1)-3(x+2)$ h) $-(5a+2b)-(-5a+2b)$ i) $10abc(a-3b)-(a^2bc+9b^2)$

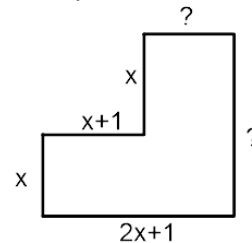
12. Jane and Joe serve food at different restaurants. The chart below shows their weekly earnings from tips and how much they owe weekly for rent.

	Jane	Joe
Average weekly tips	\$220/table	\$160/table
Rent	\$160/week	\$125/week

- a) Write a polynomial expression to represent Jane's weekly earnings after she pays rent.
 b) Write a polynomial expression to represent Joe's weekly earnings after he pays rent.
 c) Write a single polynomial expression that represents Jane and Joe's weekly earnings if they serve the same number of tables.
 d) Use the expression from c) to determine how much they make together if they each serve 5 tables.

13. Use the diagram to:

- a) Determine an expression for the length of the unknown sides (?).
 b) Determine an expression for the perimeter of the shape.
 c) Determine an expression for the area of the shape.



14. A rectangular room measures $4x^2-7$ metres in length and x^2 metres in width. There is a rectangular island in the middle of the room with dimensions $2x$ metres by $(x-3)$ metres. The owners want to install carpet on the part of the floor not covered by the island.

- a) Draw a labelled diagram of the room.
 b) Determine a polynomial expression that represents the area of the room that will be carpeted.
 c) If $x = 4m$, calculate the amount of carpet required.

Answers...

9. $2y^2$ & $3y^2$; $-4xy^3$ & $\frac{-1}{2}xy^3$; -6 & 2
 10. a) $2x-4$ b) $-3y-2x$ c) $-2x^2y+xy^2$ d) $-9x^4-9x$ e) $-3m^3n+4m^2n^2$ f) $-9abc+27a^9$ g) $6a^3b^2-3a^3b^3$ h) $6f^4+4f^2$
 11. a) $-x-8$ b) $3a-b$ c) $-x-10$ d) $5h^4+9h$ e) $-18m^3n^5$ f) $-27x^2y-4xy-14xy^2$ g) $-11x-8$ h) $-4b$ i) $9a^2bc-30ab^2c-9b^2$
 12. a) Jane = $220t-160$ b) Joe = $160t-125$ c) Total = $380t-285$ d) \$1615
 13. a) top = x , side = $2x$ b) $P=8x+2$ c) $A=3x^2+x$
 14. b) $4x^4-9x^2+6x$ c) $904m^2$

15. Complete the table.

Expression	#terms/name	Coefficient(s)	Constant	Degree of Polynomial
$-7x$				
$8x^2y - 5$				
$-x^5y + 5xy + 7$				

16. Simplify.

a) $6x^2 + (-5x) + 3x^3 - (+x^2) + x - 4x - (-3x^3)$ b) $4x - 5y + 8 - 2x^2y + 3y^2x - x + 7yx^2 + 10y - 3$

c) $3(-2n) + 4n(-3n) - (-3n) - n(5n) + 2(-3n) + (-n^2)$ d) $\frac{1}{2}x - \left(+\frac{1}{4}y\right) - \left(-\frac{1}{3}x\right) - (-3) + \frac{3}{4}y + \left(\frac{-2}{3}\right)$

17. Simplify.

a) $(-3x^2 - 5x^3 + x - 6) + (-4x - 7x^2 + 5x^3 - 3)$ b) $(-5x^2 + 6x - 2) - (-3x + 8x^2 - 4)$

c) $(-3x^2 - 7x + 4) - (-x^2 + x - 1) + (7x^2 - x + 5)$ d) $\left(4n - \frac{1}{2}\right) - \left(3n + \frac{1}{4}\right) + (5n - 1) - \left(2n - \frac{3}{2}\right)$

18. Simplify.

a) $2(4x^2 - 5x + 6) + 3(-4x + 2 - 5x^2)$ b) $-6(3x + x^2 - 1) - 4(3x^2 - x + 3)$

c) $3x(2x - 1) - 4(5 - x + x^2) + 3(4x^2 - 7x + 3)$ d) $\frac{-1}{2}(4x^2 - 3) + \frac{2}{3}(1 - 9x)$

19. Simplify.

a) $3x^2(2x^2 - 5x + 1) - 3x(3x^3 - 7x)$ b) $8x - 2x(2x - 4) - 3[x - 2(5 - x)] - 7x^2$

c) $-2x(3x^2 + 4x - 2) + 5 - 4[3 - x(x + 1)]$ d) $\frac{3}{4}(5x^2 - 7x + 1) - \frac{1}{3}(2 - 3x - x^2)$

Answers...

15. a) 1 monomial, -7, none, deg 1 b) 2 binomial, 8, -5, deg3 c) 3 trinomial, 3, -1&5, 7 deg6

16. a) $6x^3 + 5x^2 - 8x$ b) $5x^2y + 3xy^2 + 3x + 5y + 5$ c) $-18n^2 - 9n$ d) $\frac{5}{6}x + \frac{1}{2}y + \frac{7}{3}$

17. a) $-10x^2 - 3x - 9$ b) $-13x^2 + 9x + 2$ c) $5x^2 - 9x + 10$ d) $4n - \frac{1}{4}$

18. a) $-7x^2 - 22x + 18$ b) $-18x^2 - 14x - 6$ c) $14x^2 - 20x - 11$ d) $-2x^2 - 6x + \frac{13}{6}$

19. a) $-3x^4 - 15x^3 + 24x^2$ b) $-11x^2 + 7x + 30$ c) $-6x^3 - 4x^2 + 7$ d) $\frac{49}{12}x^2 - \frac{17}{4}x + \frac{1}{12}$