

**Grade 9 Academic Math**  
**Unit 1 Test – Number Sense and Algebra (Part A)**

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Name: Mr. Solutions*Well done !!*

| KU    | APP   | TIPS | COM   |
|-------|-------|------|-------|
| 26/26 | 18/18 | 6/6  | 20/20 |

**Terminology (10 COM)**1. Match each term or equation in the left column with the **best** definition or description in the right column.

- |                                 |   |
|---------------------------------|---|
| <u>G</u> ✓ Degree of a Monomial | <u>A</u> ✓ An algebraic expression in which each term consists of constants and/or variables combined using only multiplication (including powers). |
| <u>F</u> ✓ Equation <i>✗✗</i>   | <u>B</u> ✓ Any mathematical calculation combining constants and/or variables using any valid mathematical operations.                               |
| <u>C</u> ✓ $c^2 = a^2 + b^2$    | <u>C</u> ✓ An equation expressing the relationship among the sides of a right triangle.   |
| <u>A</u> ✓ Polynomial           | <u>D</u> ✓ Multiply two powers with the same base, keep the base, add the exponents.  |
| <u>J</u> ✓ Equivalent           | <u>E</u> ✓ A symbol, usually a letter, which represents an unknown value.   |
| <u>B</u> ✓ Expression           | <u>F</u> ✓ A mathematical statement asserting that two expressions are equal. <i>~~~~~</i>  |
| <u>I</u> ✓ Like Terms           | <u>G</u> ✓ The sum of the exponents on the variables in a monomial.   |
| <u>E</u> ✓ Variable             | <u>H</u> ✓ A constant multiplying the variable part of a term.  |
| <u>D</u> ✓ $a^x(a^y) = a^{x+y}$ | <u>K</u> ✓ Terms that contain exactly the same variable part.   |
| <u>H</u> ✓ Coefficient          | <u>J</u> ✓ Two or more expressions that simplify to exactly the same expression.  |

**Modified True/False (4 KU)**State whether each statement is **true** or **false**. If false, **change** the **underlined part** to make the statement true.

2. T/F F ✓ The expression  $7 - n$  means a number reduced by 7. Change:  $n - 7$  ✓
3. T/F F ✓ The expression  $x^3$  means "triple a number." Change:  $3x$  ✓
4. T/F F ✓ The expression  $x^3 + x^3$  simplifies to  $x^6$ . *✓ = 1/2 mark* Change:  $2x^3$  ✓
5. T/F F ✓  $-2^6 = (-2)(-2)(-2)(-2)(-2)(-2)$  Change:  $-2(2)(2)(2)(2)(2)$  ✓

**Multiple Choice (3 KU)**

Identify the choice that best completes the statement or answers the question. Write the letter corresponding to your choice in the provided blank space.

6. d ✓ Which expression represents the **area** of the square shown at the right?  
 (a)  $3y^2$  (b)  $6y$  (c)  $12y$  (d)  $9y^2$
7. C ✓ Which expression represents the **perimeter** of the square shown at the right?  
 (a)  $3y^2$  (b)  $6y$  (c)  $12y$  (d)  $9y^2$
8. d ✓ In which pair are the expressions **equivalent**? *9m<sup>2</sup> 6m 6m*  
 (a)  $3m^2, (3m)^2$  (b)  $2(3m), (3m)^2$  (c)  $3m + 3m, 6m^2$  (d)  $9m^2, (3m)^2$

$$\begin{aligned}
 A &= 3y(3y) = 9y^2 \\
 P &= 3y + 3y + 3y + 3y = 12y
 \end{aligned}$$

| KU   | APP |
|------|-----|
| - 0  | - 0 |
| TIPS | COM |
| - 0  | - 0 |

Full Solutions (10 COM marks in addition to process marks)

9. Evaluate. (8 KU)

① ② ③ ④  
BEDMAS  
L→R L→R  
Always comes LAST!

(a)  $-5(4^2 - 12^2) - 5(4 - 12)^2$

$$= -5(16 - 144) - 5(-8)^2$$

$$= -5(-128) - 5(64)$$

$$= 640 - 320$$

$$= 320$$

(b)  $-4a^3 - 5a(a-b)^2$ , if  $a = \frac{1}{3}$  and  $b = -2$

$$= -4\left(\frac{1}{3}\right)^3 - 5\left(\frac{1}{3}\right)\left(\frac{1}{3} - (-2)\right)^2$$

$$= -\frac{4}{1}\left(\frac{1}{27}\right) - \frac{5}{1}\left(\frac{1}{3}\right)\left(\frac{1}{3} + \frac{2}{1}\right)^2$$

$$= -\frac{4}{27} - \frac{5}{3}\left(\frac{1}{3} + \frac{6}{3}\right)^2$$

$$= -\frac{4}{27} - \frac{5}{3}\left(\frac{7}{3}\right)^2$$

$$= -\frac{4}{27} - \frac{5}{3}\left(\frac{49}{9}\right)$$

$$= -\frac{4}{27} - \frac{245}{27} = -\frac{249}{27} = -\frac{83}{9}$$

Common Denominator Required!!

$\left(\frac{1}{3}\right)^3 = \left(\frac{1}{3}\right)\left(\frac{1}{3}\right)\left(\frac{1}{3}\right)$   
 $= \frac{1 \times 1 \times 1}{3 \times 3 \times 3} = \frac{1}{27}$

10. Simplify fully. (11 KU)

Addition/Subtraction

Multiplication!

(a)  $-5x^3 + 4y^4 - 3x^3 - 6y^4$

$$= -5x^3 - 3x^3 + 4y^4 - 6y^4$$

$$= -8x^3 - 2y^4$$

(b)  $-5x^3 + 4y^4 - (3x^3 - 6y^4)$

$$= -5x^3 + 4y^4 + (-3x^3 + 6y^4)$$

$$= -5x^3 + 4y^4 - 3x^3 + 6y^4$$

$$= -5x^3 - 3x^3 + 4y^4 + 6y^4$$

$$= -8x^3 + 10y^4$$

(c)  $(-5x^3)(+4y^4)(-3x^3)(-6y^4)$

$$= -5(4)(-3)(-6)x^3x^3y^4y^4$$

$$= -360x^{3+3}y^{4+4}$$

$$= -360x^6y^8$$

11. Simplify fully. (11 APP)

LAST!! BEDMAS

$-bd^4 = -1bd^4$

Power of a Product

(a)  $\frac{18s^{12}}{2s^2} - (3s^3)(8s^7)$

$$= \left(\frac{18}{2}\right)\left(\frac{s^{12}}{s^2}\right) - 3(8)s^3s^7$$

$$= 9s^{12-2} - 24s^{3+7}$$

$$= 9s^{10} - 24s^{10}$$

$$= -15s^{10}$$

LIKE TERMS!!

(b)  $\frac{-1bd^4(36b^9d^2)}{3^2(2b^3d)^2}$

$$= \frac{-1(36)b^9d^4d^2}{9[2^2(b^3)^2d^2]}$$

$$= \frac{-36b^{10}d^6}{9(4b^6d^2)}$$

$$= \frac{-36b^{10}d^6}{36b^6d^2}$$

$$= \left(\frac{-36}{36}\right)\left(\frac{b^{10}}{b^6}\right)\left(\frac{d^6}{d^2}\right)$$

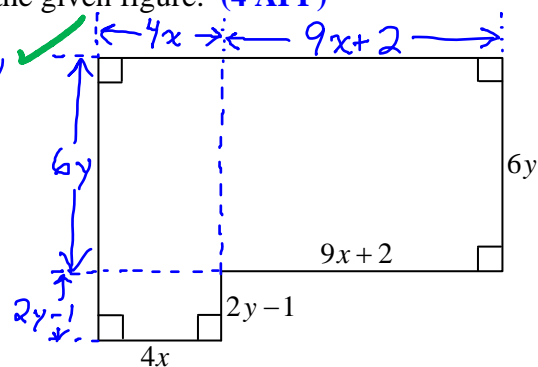
$$= -1b^4d^4 = -b^4d^4$$

Rearrange factors. Allowed because multiplication is insensitive to order.

| KU                                 | APP                                |
|------------------------------------|------------------------------------|
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| TIPS                               | COM                                |
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12. Write a **fully simplified** algebraic expression for the **perimeter** of the given figure. (4 APP)

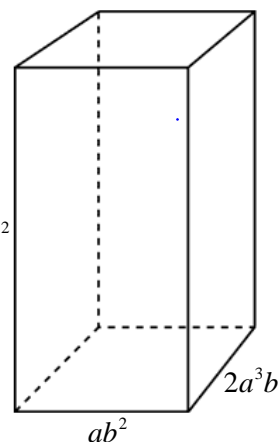
$$\begin{aligned}
 P &= 4x + 9x + 2 + 6y + 9x + 2 + 2y - 1 + 4x + 2y - 1 + 6y \\
 &= 4x + 9x + 9x + 4x + 6y + 2y + 2y + 6y + 2 + 2 - 1 - 1 \\
 &= 26x + 16y + 2
 \end{aligned}$$



13. Write a **fully simplified** algebraic expression for the **volume** of the rectangular prism shown at the right. **Hint:**  $V = lwh$  (3 APP)

$$\begin{aligned}
 V &= ab^2(2a^3b)(3ab^2) \\
 &= 2(3)a^1a^3a^1b^2b^1b^2 \\
 &= 6a^5b^5
 \end{aligned}$$

**Multiplication!**  
**Rearrange factors**  
(allowed because multiplication can be performed in any order)



14. The Aldric Loudspeaker Company is planning to produce a new ultra-loud speaker system. Each speaker costs \$80.00 to make and there is a \$3000 set-up charge for the machinery used to make them. (6 TIPS)

- (a) Write an algebraic expression that represents the **total cost** of **manufacturing**  $n$  speakers. (Note that  $n$  represents the number of speakers.)

$$80n + 3000$$

$80n \rightarrow$  cost of manufacturing  $n$  speakers  
 $3000 \rightarrow$  machinery set-up charge



- (b) Aldric Loudspeaker sells each speaker for \$160.00. Write an algebraic expression that represents the **total amount of money obtained** for **selling**  $n$  speakers. (Note again that  $n$  represents the number of speakers.)

$$160n$$

- (c) How many speakers does Aldric Loudspeaker need to sell to make a profit?

**Hint:** profit = (money made from selling  $n$  speakers) - (cost of manufacturing  $n$  speakers)

$$\begin{aligned}
 \text{profit} &= 160n - (80n + 3000) \\
 &= 160n + (-80n - 3000) \\
 &= 160n - 80n - 3000 \\
 &= 80n - 3000
 \end{aligned}$$

By trial and error,  
 $80n - 3000 > 0$  if  $n > 37$ .  
Therefore, at least 38 speakers must be sold to make a profit.

To make a profit,  
 $80n - 3000 > 0$

Check:  $80(37) - 3000 = -40$  ← loss of \$40  
 $80(38) - 3000 = 40$  ← profit of \$40

| KU   | APP |
|------|-----|
| - 0  | - 0 |
| TIPS | COM |
| - 0  | - 0 |