MPM 1D9   **Semester 2, 2016-2017**
Grade 9 Pre-AP Math: Unit 1 – Major Test
Version 1 (Period 2)

Mr. Nolfi
Victim: _Mr. Solutions_   *Yet another exquisite performance Mr. S.!!*

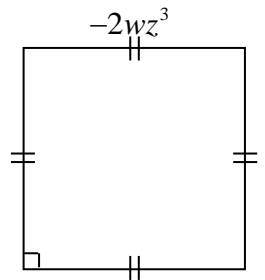| KU	APP	TIPS	COM
44/44	16/16	10/10	10/10

Modified True/False (5 KU)

State whether each statement is *true* or *false*. If false, *change* the *underlined part* to make the statement true.

(✓ = ½ mark)

1. T/F __F__ $(x+y)^2 = \underline{x^2 + y^2}$ $(x+y)(x+y) = x^2 + xy + xy + y^2$ Change: $x^2 + 2xy + y^2$ ✓

2. T/F __F__ $3p^2q^2 \underline{+} 6p^2q^2 = 18p^4q^4$ *operation is addition NOT multiplication*   Change: $9p^2q^2$ ✓

3. T/F __F__ $\dfrac{-6x^{-3}}{y^2}$ written *without* negative exponents is $\underline{\dfrac{y^2}{6x^3}}$ Change: $\dfrac{-6}{x^3 y^2}$ ✓

4. T/F __F__ Algebra is nothing more than arithmetic with <u>unknowability</u>.   Change: $unknowns$ ✓

5. T/F __F__ $3p^3q(-6p^3q) = \underline{-3p^3q}$ *operation is multiplication NOT addition*   Change: $-18p^6q^2$ ✓

Multiple Choice (5 KU)

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

6. __C__ ✓ Which expression represents the *area* of the square shown at the right?

     (a) $8wz^3$ **(b)** $-8wz^3$ **(c)** $4w^2z^6$ **(d)** $-4w^2z^6$

     (diagram of square labelled $-2wz^3$)

7. __b__ ✓ Which expression represents the *perimeter* of the square shown at the right?

     (a) $8wz^3$ **(b)** $-8wz^3$ **(c)** $4w^2z^6$ **(d)** $-4w^2z^6$

8. __b__ ✓ Which of the following expressions is equivalent to $2ab^2(+3ab)^2$?

     (a) $2ab^2 + (3ab)^2$ **(b)** $2(3)(3)aaabbbb$ **(c)** $2(3)aabbbb$ **(d)** $2+3+3+a+a+a+b+b+b+b$

9. __d__ ✓ Which of the following expressions is equivalent to $12 - 2(x-7)(x+3)$?

     ~~**(a)** $12(-2)(x-7)(x+3)$~~   ~~**(b)** $10(x-7)(x+3)$~~   ~~**(c)** $12 - 2x^2 - 8x - 42$~~   **(d)** $12 - (2x+6)(x-7)$

10. __a__ ✓ A movie theatre charges the following prices for admission: <u>Children: $6</u>   <u>Teens: $9</u>   <u>Adults: $12</u>
     Which expression models the total earnings from movie ticket sales?

     (a) $6c + 9t + 12a$ ~~**(b)** $(6c)(+9t)(+12a)$~~   ~~**(c)** $6+c+9+t+12+a$~~   ~~**(d)** $27abc$~~

K   A   T   C
-0 -0 -0 -0

Full Solutions (Up to 10 COM marks can be deducted for communication errors)

11. Evaluate. **(10 KU)** Use BEDMAS, not the distributive property!! ✓✓ → substituing   ✓✓✓✓ → evaluating

(a) $-2(5^2-11^2)-3(5-11)^2$ ④

$= -2(25-121)-3(-6)^2$ ✓

$= -2(-96)-3(36)$ ✓

$= 192-108$ ✓

$= 84$ ✓

(b) $-6ab^{-2}-3a(2a-b)^2$, if $a=\dfrac{-1}{3}$ and $b=5$

$= -6\left(-\frac{1}{3}\right)(5^{-2})-3\left(-\frac{1}{3}\right)\left[2\left(-\frac{1}{3}\right)-\frac{5}{1}\right]^2$

$= \frac{6}{3}\left(\frac{1}{5^2}\right)-\left(\frac{-3}{3}\right)\left(\frac{-2}{3}-\frac{15}{3}\right)^2$

$= \frac{2}{1}\left(\frac{1}{25}\right)-(-1)\left(\frac{-17}{3}\right)^2$ ⑥

$= \frac{2}{25}-(-1)\left(\frac{284}{9}\right)$

$= \frac{2}{25}-\left(\frac{-289}{9}\right)$

$= \frac{2}{25}\times\frac{\times 9}{\times 9}+\frac{289}{9}\times\frac{\times 25}{\times 25}$

$= \frac{18}{225}+\frac{7225}{225}$

$= \frac{7243}{225}$

12. Simplify *fully*. **(24 KU)**

(a) $6x^2y^3-xy^3+9x^2y^3-2xy^3$

$= 6x^2y^3+9x^2y^3-xy^3-2xy^3$ ✓

$= 15x^2y^3-3xy^3$ ✓ ③

(b) $(6x^2y^3)(-xy^3)(+9x^2y^3)(-2xy^3)$

$= 6(-1)(9)(-2)(x^2)(x)(x^2)(x)$

$\quad (y^3)(y^3)(y^3)(y^3)$ ✓✓✓

$= 108x^6y^{12}$ ③

(c) $6x^2y^3-xy^3(+9x^2y^3-2xy^3)$

$= 6x^2y^3-9x^3y^6+2x^2y^6$ ✓✓✓ ③

Equivalent Form (Descending Order of Degree)

$-9x^3y^6+2x^2y^6+6x^2y^3$

④

(d) $-(6p^2-5p)-(5p^2-7p)$

$= +(-6p^2+5p)+(-5p^2+7p)$ ✓

$= -6p^2+5p+(-5p^2)+7p$

$= -6p^2-5p^2+5p+7p$

$= -11p^2+12p$ ✓✓

Equivalent Form:

$12p-11p^2$

(e) $(5q-1)(2q-3)-4(q^2-3q-1)$

$= 10q^2-15q-2q+3-4q^2+12q+4$ ✓

$= 6q^2-5q+7$ ✓✓✓

Equivalent Form:

$-3q+12q^2$

④

(f) $\dfrac{256b^{13}d^2(-b^{-1}d^4)^3}{-2^3(2b^3d)^{-3}}$ ⑦

$= \dfrac{256b^{13}d^2(-1)^3(b^{-1})^3(d^4)^3}{-8\left[2^{-3}(b^3)^{-3}d^{-3}\right]}$ ✓

$= \dfrac{256(-1)b^{13}b^{-3}d^2d^{12}}{-8\left(\frac{1}{2^3}b^{-9}d^{-3}\right)}$ ✓

$= \dfrac{-256b^{10}d^{14}}{\left(\frac{-8}{1}\right)\left(\frac{1}{8}\right)b^{-9}d^{-3}}$ ✓

$= \left(\frac{-256}{-1}\right)\left(\frac{b^{10}}{b^{-9}}\right)\left(\frac{d^{14}}{d^{-3}}\right)$

$= 256b^{19}d^{17}$ ✓

KU	APP	TIPS	COM
– ⓪	– ⓪	– ⓪	– ⓪

13. Write *fully simplified* expressions for the *perimeter* and *area* of the shape shown at the right. **(10 APP)**

$4b-(2b+9)=4b-2b-9$
$=2b-9$

Perimeter ✓✓✓

$P = 2(9a+3) + 2(4b) + 2(2b+9)$

$= 18a + 6 + 8b + 4b + 18$ ✓

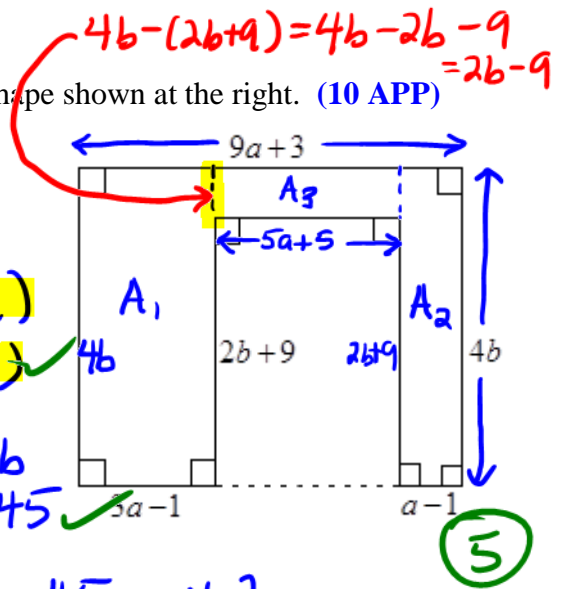$= 18a + 12b + 24 \text{ units}$ ✓

⑤

Area

$A = A_1 + A_2 + A_3$ ✓

$= 4b(3a-1) + 4b(a-1)$

$\quad + (5a+5)(2b-9)$ ✓

$= 12ab - 4b + 4ab - 4b$

$\quad + 10ab - 45a + 10b - 45$ ✓

$= 26ab - 45a + 2b - 45 \text{ units}^2$ ✓

⑤

Diagram labels: $9a+3$, A_3, $5a+5$, A_1, A_2, $4b$, $2b+9$, $2b+9$, $4b$, $3a-1$, $a-1$

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14. Write a *fully simplified* algebraic expression for the *volume* of the triangular prism shown at the right. **(6 APP)**

Hints: (i) You need to use the Pythagorean Theorem. (ii) $V = (A_{base})h$

⑥

By the Pythagorean Theorem,

$h^2 + (3x)^2 = (5x)^2$ ✓

$\therefore h^2 + 9x^2 = 25x^2$

$\therefore h^2 = 16x^2$

$\therefore h = 4x$ ✓

$\therefore V_{prism} = A_{Base} \, h_{prism}$

$= \left(\dfrac{b_\triangle h_\triangle}{2}\right)\left(\dfrac{h_{prism}}{1}\right)$ ✓

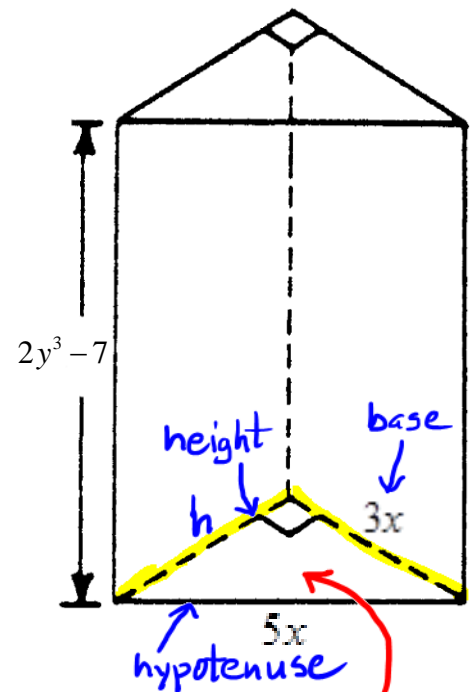$= \left(\dfrac{3x(4x)}{2}\right)\left(\dfrac{2y^3-7}{1}\right)$ ✓

$= \dfrac{12x^2(2y^3-7)}{2}$ ✓

$= \left(\dfrac{12}{2}\right)\left(\dfrac{x^2}{1}\right)\left(\dfrac{2y^3-7}{1}\right)$
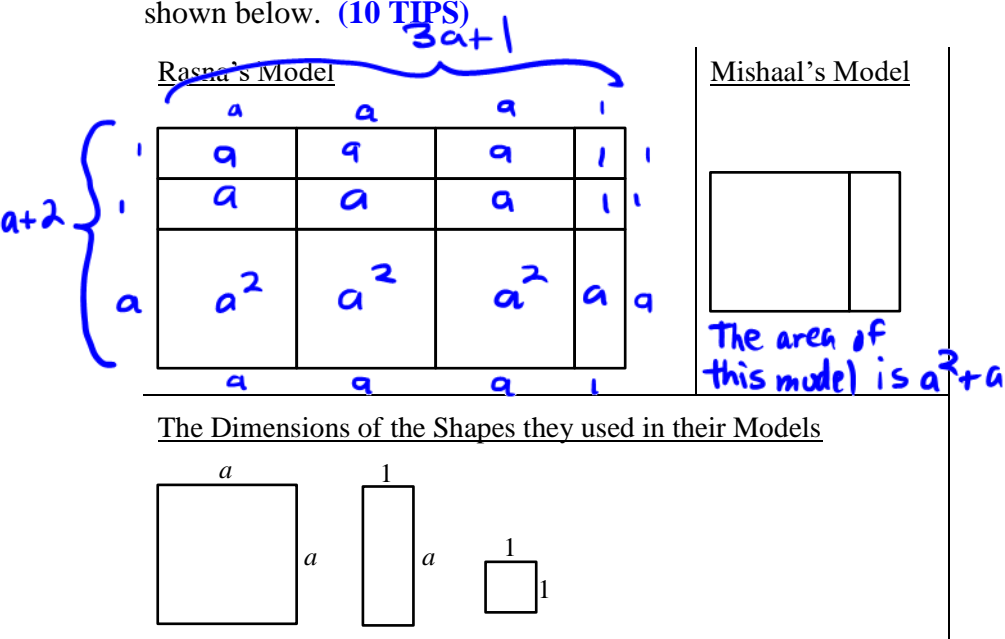
$= 6x^2(2y^3-7) \text{ units}^3$ ✓ (Expanding is **not** necessary)

$(12x^2y^3 - 42x^2)$ ←

Diagram labels: $2y^3-7$, height h, base $3x$, $5x$ hypotenuse

Think of the famous 3-4-5 right triangle

KU	APP	TIPS	COM
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15. Rasna and Mishaal are arguing over a math problem. Each creates a geometric model to attempt to demonstrate how to expand the product of binomials $(3a+1)(a+2)$. Their geometric models are shown below. **(10 TIPS)**

Forget it Mishaal! You know I'm always right!

Not this time Rasna! I shall prove once and for all that I am the mathematical master, not you!

Rasna's Model

$3a+1$

$a+2$

Mishaal's Model

The area of this model is a^2+a

The Dimensions of the Shapes they used in their Models

a

a

1

a

1

1

Which model correctly demonstrates how $(3a+1)(a+2)$ should be expanded? *Justify* your answer. (In other words, <u>explain in detail</u> *why* the model that you have chosen is correct.)

Rasna's model is correct. In her model,

$$A_{\text{large rectangle}} = \text{length(width)}$$
$$= (3a+1)(a+2)$$

But $A_{\text{large rectangle}}$ can also be found by summing the areas of the smaller squares and rectangles within the large rectangle.

$$\therefore A_{\text{large rectangle}} = 3a^2+7a+2$$

$$\therefore (3a+1)(a+2) = 3a^2+7a+2$$

$9,10 \rightarrow$ level 4
$7,8 \rightarrow$ level 3
$6 \rightarrow$ level 2
$5 \rightarrow$ level 1
$0\rightarrow4 \rightarrow$ level R

This argument uses the following logic:
If $a=b$ and $a=c$ then $b=c$.

Bonus Question: You are not required to attempt this question. Extra credit will be given for good responses.

Simplify the algebraic expression given below. In your answer, arrange the variables in alphabetical order.

kugavaratharajah

$a^6gh^2jkr^2tuv + 1B$

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