

Grade 9 Pre-AP Math: Unit 1 – Major Test
Version 1 (Period 1)

Mr. Nolfi

Victim: Mr. Solution*Very adept algebraic acrobatics*
Mr. S.!!

KU	APP	TIPS	COM
<u>44</u> / 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.

1. T/F F $(x+y)^2 = x^2 + y^2$ $(x+y)^2 = (x+y)(x+y)$ Change: $x^2 + 2xy + y^2$

2. T/F F $3p^2q^2 + 6p^2q^2 = 18p^4q^4$ $3 \text{ groups of } p^2q^2 + 6 \text{ groups of } p^2q^2$ Change: $9p^2q^2$

3. T/F F $\frac{-6x^{-3}}{y^2}$ written **without** negative exponents is $\frac{y^2}{6x^3}$ Change: $\frac{-6}{x^3y^2}$ $\frac{-6}{1}(\frac{1}{x^3})$
 $\frac{-6}{y^2}$

4. T/F F Algebra is nothing more than arithmetic with unknowability. $x = \frac{1}{2} \text{ marth}$ Change: unknowns $= \frac{-6}{y^2} \times \frac{1}{x^3}$

5. T/F F $3p^3q(-6p^3q) = -3p^3q$ $3(-6)p^3p^3qq$ 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.

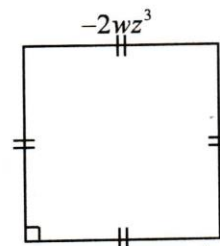
6. c Which expression represents the **area** of the square shown at the right?

~~(a)~~ $8wz^3$

~~(b)~~ $-8wz^3$

(c) $4w^2z^6$

~~(d)~~ $-4w^2z^6$

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: Children: \$6 Teens: \$9 Adults: \$12
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)~~ $27abc$

-OK

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

11. Evaluate (10 KU)

BEDMAS

(a) $-2(5^2 - 11^2) - 3(5 - 11)^2$

$= -2(25 - 121) - 3(-6)^2$

$= -2(-96) - 3(36)$

$= 192 - 108$

$= 84$

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

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

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

$= \frac{2}{1}\left(\frac{1}{25}\right) - (-1)\left(-\frac{2}{3} - \frac{5}{1}\right)^2$

$= \frac{2}{25} - (-1)\left(-\frac{2}{3} - \frac{15}{3}\right)^2$

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

$= \frac{2}{25} - (-1)\left(\frac{289}{9}\right) = \frac{2}{25} + \frac{289}{9} = \frac{18}{225} + \frac{7225}{225} = \frac{7243}{225}$

12. Simplify fully. (24 KU)

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

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

$= 15x^2y^3 - 3xy^3$

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

$= 6(-1)(9)(-2)(x^2)(x)(x^2)(x)(y^3)(y^3)(y^3)(y^3)$

$= 108x^6y^{12}$

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

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

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

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

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

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

$= -11p^2 + 12p$

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

$= 10q^2 - 15q - 2q + 3 - 4q^2 + 12q + 4$

$= 10q^2 - 4q^2 - 15q - 2q + 12q + 3 + 4$

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

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

$= \frac{256b^{13}d^2(-1)^3(b^{-1})^3(d^4)^3}{-8(2^3)(b^3)^3d^{-3}}$

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

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

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

$= 256b^{19}d^{17}$

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

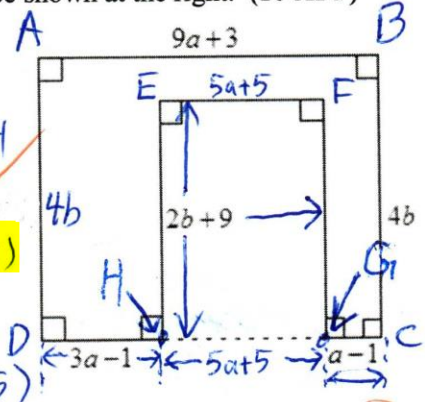
Perimeter

$$\begin{aligned}
 P &= 9a+3 + 4b + a-1 + 2b+9 \\
 &\quad + 5a+5 + 2b+9 + 3a-1 \\
 &\quad + 4b \\
 &= 9a+a+5a+3a \\
 &\quad + 4b+2b+2b+4b \\
 &\quad + 3-1+9+5+9-1 \\
 &= 18a+12b+24 \text{ units}
 \end{aligned}$$

Area

A = area rectangle ABCD -
area rectangle EFGH

$$\begin{aligned}
 &= 4b(9a+3) - (5a+5)(2b+9) \\
 &= 36ab+12b \\
 &\quad - (10ab+45a+10b+45) \\
 &= 36ab+12b + (-10ab-45a-10b-45) \\
 &= 36ab+12b-10ab-45a-10b-45 \\
 &= 36ab-10ab-45a+12b-10b-45 \\
 &= 26ab-45a+2b-45
 \end{aligned}$$



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) $V = (A_{\text{base}})h$

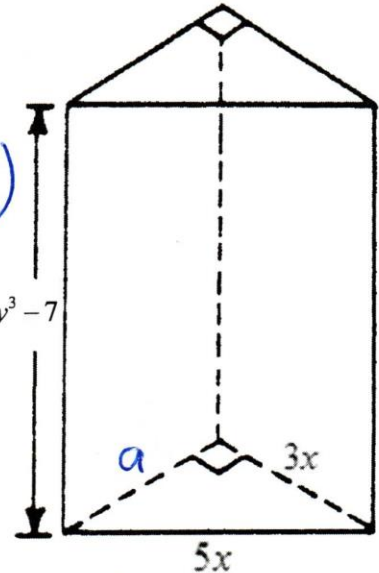
$$\begin{aligned}
 &\text{By the Pythagorean Theorem,} \\
 &a^2 + (3x)^2 = (5x)^2 \\
 \therefore a^2 + 9x^2 &= 25x^2 \\
 \therefore a^2 &= 25x^2 - 9x^2 \\
 \therefore a^2 &= 16x^2 \\
 \therefore a &= \sqrt{16x^2} = 4x
 \end{aligned}$$

$$\begin{aligned}
 V &= (A_{\text{base}})(h) \\
 &= \frac{3x(4x)}{2}(2y^3-7) \\
 &= \frac{12x^2}{2}(2y^3-7)
 \end{aligned}$$

$$\begin{aligned}
 &= 6x^2(2y^3-7) \\
 &= 12x^2y^3 - 42x^2
 \end{aligned}$$

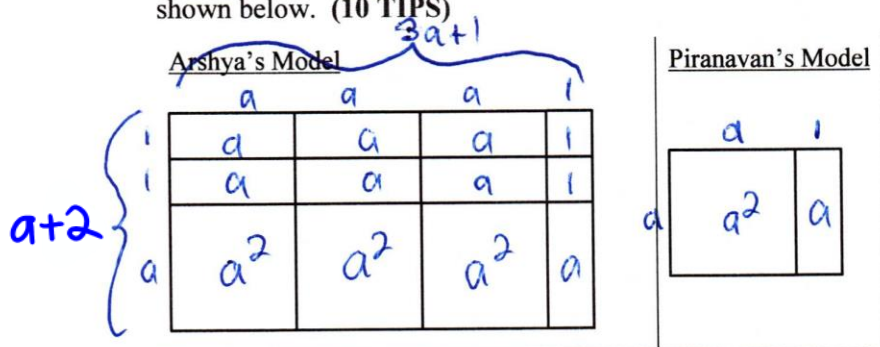
The volume of the triangular prism is

$$12x^2y^3 - 42x^2 \text{ units}^3$$

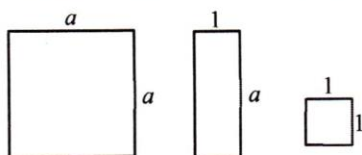


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15. Arshya and Piranavan are arguing over a math problem. Each creates a geometric model to attempt to demonstrate how to expand the product of binomials $(3a+1)(a+2)$. Their geometric models are shown below. (10 TIPS)



The Dimensions of the Shapes they used in their Models



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

Arshya's model is correct!

$$A_{\text{Arshya's Model}} = lw = (3a+1)(a+2) \checkmark$$

But,

$$A_{\text{Arshya's Model}} = a^2 + a^2 + a^2 + a + a + a + a + a + a + 1 + 1 \checkmark$$

$$= 3a^2 + 7a + 2 \checkmark$$

Applying the distributive property gives the same result:

$$(3a+1)(a+2) = 3a^2 + 6a + a + 2 \checkmark$$

$$= 3a^2 + 7a + 2 \checkmark$$

$$A_{\text{Piranavan's Model}} = lw = a(a+1) \checkmark$$

$$= a^2 + a \checkmark$$

This is obviously incorrect.

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

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.

sooriyakumaran = $a^3ikmno^2r^2suy$ = $a^3ikmno^2r^2suy$

+2 if in alphabetical order
+1 if not

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



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



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