

Mr. Nolfi

Victim:

Mr. Solutions

Very adept algebraic acrobatics 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.

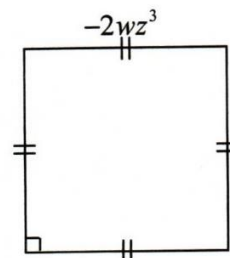
1. T/F F $(a+b)^2 = a^2 + b^2$ $(a+b)(a+b)$ Change: $a^2 + 2ab + b^2$
2. T/F F $-6p^2q^2 - 1p^2q^2 = 6p^4q^4$ lose 6 groups of p^2q^2 , then lose one more group Change: $-7p^2q^2$
3. T/F F $\frac{-5u^3}{v^{-2}}$ written without negative exponents is $\frac{-1}{5u^3v^2}$ Change: $-5u^3v^2$
 $\frac{-5u^3}{1} \div \frac{1}{v^2} = \frac{-5u^3}{1} \times \frac{v^2}{1}$
4. T/F F Algebra is nothing more than arithmetic with unknowability. Change: unknowns
5. T/F F $-3p^3q(-6p^3q) = -9p^3q$ $-3(-6)p^3p^3qq$ 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. b Which expression represents the perimeter of the square shown at the right?

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



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

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

8. c Which of the following expressions is equivalent to $1ab^2(+4ab)^2$?

~~(a)~~ $1ab^2 + (4ab)^2$ ~~(b)~~ $1(4)aabbbb$ (c) $1(4)(4)aaabbbb$ ~~(d)~~ $1+4+4+a+a+a+b+b+b+b$

9. c Which of the following expressions is equivalent to $11 - 3(x-7)(x+3)$?

~~(a)~~ $11(-3)(x-7)(x+3)$ ~~(b)~~ $8(x-7)(x+3)$ (c) $11 - (3x+9)(x-7)$ ~~(d)~~ $11 - 3x^2 - 12x - 63$

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

OK

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

11. Evaluate. (10 KU)

$$\begin{aligned} \text{(a)} \quad & -3(4^2 - 13^2) - 2(4 - 13)^2 \\ &= -3(16 - 169) - 2(-9)^2 \\ &= -3(-153) - 2(81) \\ &= 459 - 162 \\ &= 297 \end{aligned}$$

(4)

$$\begin{aligned} \text{(b)} \quad & -6ab^{-2} - 3a(2a - b)^2, \text{ if } a = \frac{-1}{4} \text{ and } b = 3 \\ &= -6\left(\frac{-1}{4}\right)(3)^{-2} - 3\left(\frac{-1}{4}\right)\left[2\left(\frac{-1}{4}\right) - 3\right]^2 \\ &= \frac{3}{2}\left(\frac{1}{3^2}\right) - \left(\frac{-3}{4}\right)\left(-\frac{1}{2} - \frac{3}{1}\right)^2 \\ &= \frac{3}{2}\left(\frac{1}{9}\right) - \left(\frac{-3}{4}\right)\left(-\frac{1}{2} - \frac{6}{2}\right)^2 \\ &= \frac{1}{6} - \left(\frac{-3}{4}\right)\left(-\frac{7}{2}\right)^2 \\ &= \frac{1}{6} - \left(\frac{-3}{4}\right)\left(\frac{49}{4}\right) = \frac{1}{6} - \left(-\frac{147}{16}\right) \\ &= \frac{1}{6} + \frac{147}{16} = \frac{8}{48} + \frac{441}{48} \\ &= \frac{449}{48} \end{aligned}$$

(6)

12. Simplify fully. (24 KU)

$$\begin{aligned} \text{(a)} \quad & -4x^2y^3 - 9xy^3 + x^2y^3 - 5xy^3 \\ &= -4x^2y^3 + x^2y^3 - 9xy^3 - 5xy^3 \\ &= -3x^2y^3 - 14xy^3 \end{aligned}$$

(2)

$$\begin{aligned} \text{(b)} \quad & (-4x^2y^3)(-9xy^3)(+x^2y^3)(-5xy^3) \\ &= (-4)(-9)(1)(-5)x^2x^2xy^3y^3y^3y^3 \\ &= -180x^6y^{12} \end{aligned}$$

(3)

$$\begin{aligned} \text{(c)} \quad & -4x^2y^3 - 9xy^3(+x^2y^3 - 5xy^3) \\ &= -4x^2y^3 - 9x^3y^6 + 45x^2y^6 \end{aligned}$$

(3)

$$\begin{aligned} \text{(d)} \quad & -(5p - 6p^2) - (7p - 5p^2) \\ &= +(-5p + 6p^2) + (-7p + 5p^2) \\ &= -5p + 6p^2 - 7p + 5p^2 \\ &= 6p^2 + 5p^2 - 5p - 7p \\ &= 11p^2 - 12p \end{aligned}$$

(4)

$$\begin{aligned} \text{(e)} \quad & (4q - 3)(3q - 1) - 3(-q^2 - 3q + 1) \\ &= 12q^2 - 4q - 9q + 3 \\ &\quad + 3q^2 + 9q - 3 \\ &= 12q^2 + 3q^2 - 4q - 9q + 9q \\ &\quad + 3 - 3 \\ &= 15q^2 - 4q \end{aligned}$$

(4)

$$\begin{aligned} \text{(f)} \quad & \frac{343b^{16}d^4(-b^{-1}d^4)^3}{-3^4(3b^2d)^{-3}} \\ &= \frac{343b^{16}d^4(-1)^3(b^{-1})^3(d^4)^3}{-81(3^{-3})(b^2)^{-3}d^{-3}} \\ &= \frac{343b^{16}d^4(-1)b^{-3}d^{12}}{-81\left(\frac{1}{3^3}\right)b^{-6}d^{-3}} \\ &= \frac{+343(-1)b^{16}b^{-3}d^4d^{12}}{\left(-\frac{81}{27}\right)b^{-6}d^{-3}} \\ &= \left(\frac{-343}{-3}\right)\left(\frac{b^{13}}{b^{-6}}\right)\left(\frac{d^{16}}{d^{-3}}\right) \\ &= \frac{343}{3}b^{19}d^{19} \end{aligned}$$

(7)

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)

Perimeter

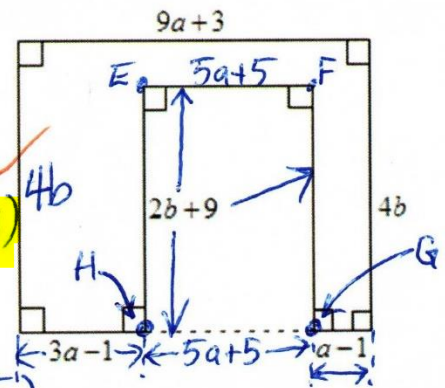
$$\begin{aligned}
 P &= 9a+3+4b+a-1+2b+9 \\
 &\quad +5a+5+2b+9+3a-1 \\
 &\quad +4b \\
 &= 9a+a+5a+3a+4b+2b \\
 &\quad +2b+4b+3-1+9+5 \\
 &\quad +9-1 \\
 &= 18a+12b+24 \text{ units}
 \end{aligned}$$

Area

A = area rectangle ABCD -
area rectangle EFGH

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

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



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

Hint: You need to use the Pythagorean Theorem.

By the Pythagorean Theorem,

$$a^2 + (3x)^2 = (5x)^2$$

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

$$\therefore a^2 = 25x^2 - 9x^2$$

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

$$\therefore a = \sqrt{16x^2} = 4x$$

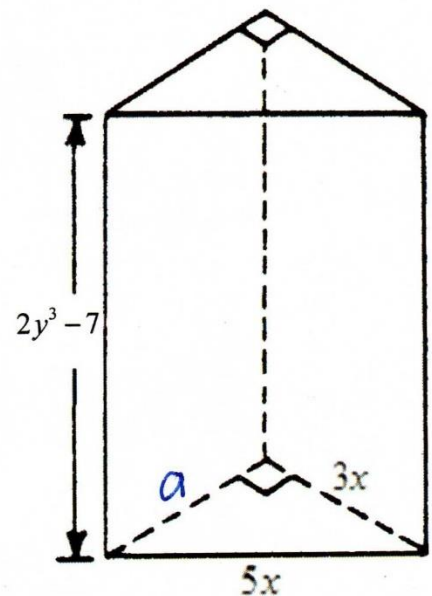
Surface Area

$$= 2(A_{\text{base}}) + A_{\text{lateral surface}}$$

$$= \frac{2}{1} \left(\frac{3x(4x)}{2} \right) + (3x+4x+5x)(2y^3-7)$$

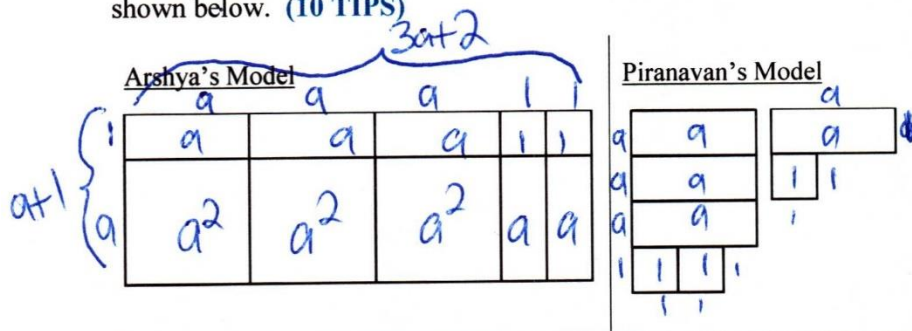
$$= 12x^2 + 12x(2y^3-7)$$

$$= 12x^2 + 24xy^3 - 84x \text{ units}^2$$

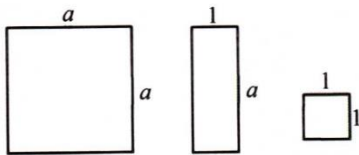


KU	APP	TIPS	COM
- 0	- 0	- 0	- 0

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 $(3a+2)(a+1)$. Their geometric models are shown below. (10 TIPS)



The Dimensions of the Shapes they used in their Models



Which model correctly demonstrates how $(3a+2)(a+1)$ 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!!

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

But,

$$A_{\text{Arshya's Model}} = a^2 + a^2 + a^2 + a + a + a + a + 1 + 1 = 3a^2 + 5a + 2$$

$$\therefore (3a+2)(a+1) = 3a^2 + 5a + 2$$

Applying the distributive property gives the same result:

$$(3a+2)(a+1) = 3a^2 + 3a + 2a + 2 = 3a^2 + 5a + 2$$

$$A_{\text{Piranavan's Model}} = a + a + a + a + 1 + 1 + 1 = 4a + 3$$

His model works for the expression $(3a+2) + (a+1)$ but not for $(3a+2)(a+1)$

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.

$$\text{gnanachandran} = aaaa cdghnnmr = a^4 cdgh n^4 r$$

+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!