

Test on Monomial and polynomial operations.

Name KEY WITH NOTES

Use the rules for exponents to simplify each of the following.

1.  $(j^5 k^3 m^2)(j^2 k^2 m)$

$= J^7 K^5 M^3$

1.  $J^7 K^5 M^3$

- ADD EXPONENTS FOR LIKE BASES

2.  $(3a^3 b^2 c^5)(2a^2 b^6 c^3)$

$= 6A^5 B^8 C^8$

2.  $6A^5 B^8 C^8$

- MULTIPLY COEFFICIENTS
- ADD EXPONENTS FOR LIKE BASES

3.  $(-5xy^9 z^2)(2x^4 y^5 z^2)$

$= -10x^5 y^{14} z^4$

3.  $-10x^5 y^{14} z^4$

- MULTIPLY COEFFICIENTS
- ADD EXPONENTS FOR LIKE BASES

4.  $(4e^2 f^3 g^5)(3e^3 f^2 g^2)(5e^2 f^7 g^3)$

$= 60E^7 F^{12} G^{10}$

4.  $60E^7 F^{12} G^{10}$

5.  $(2x^5 y^2 z^4)^3$

$2^3 x^{15} y^6 z^{12} = 8x^{15} y^6 z^{12}$

5.  $8x^{15} y^6 z^{12}$

- POWER TO ALL POWERS
- MULTIPLY POWER BY POWER

6.  $\left(\frac{5e^2 f^{-5} g^7}{20e^6 f^3 g^2}\right)$

$= \frac{1 G^5}{4 E^4 F^8}$

6.  $\frac{1 G^5}{4 E^4 F^8}$

- REDUCE COEFFICIENTS

THEN LET "ANIMALS GO TO WAR"  
(NEGATIVE EXPONENTS FORCE VARIABLE TO OTHER SIDE OF FRACTION)

7.  $\left(\frac{3m^5 x^{-5} y^5}{12m^2 x^{-3} y^{-2}}\right)$

$= \frac{1 M^3 y^7}{4 x^2}$

7.  $\frac{1 M^3 y^7}{4 x^2}$

- REDUCE COEFFICIENTS

THEN "ANIMALS GO TO WAR"

8.  $\left(\frac{35a^{-2} b^2 c^5}{14a^2 b^{-3} c^{-3}}\right)^2$

$= \left(\frac{5 B^5 C^8}{2 A^4}\right)^2 = \frac{25 B^{10} C^{16}}{4 A^8}$

8.  $\frac{25 B^{10} C^{16}}{4 A^8}$

- WAR
- THEN POWER TO POWER

9.  $\left(\frac{27a^{-12} b c^5 d^{11}}{35a^{11} b^{-3} c^{-3} d^5}\right)^0$

$= 1$

9.  $1$

- ANYTHING TO THE POWER OF ZERO IS ONE

$$10. \left( \frac{8x^{-3}y^9z^6}{30x^5y^{-3}z^{-2}} \right)^2 = \left( \frac{4}{15} \frac{x^{-6}y^{18}z^{12}}{x^8} \right)^2 = \frac{16}{225} \frac{x^{-12}y^{36}z^{24}}{x^{16}}$$

• WAR

• POWER TO POWER

$$10. \frac{16}{225} \frac{x^{-12}y^{36}z^{24}}{x^{16}}$$

$$11. (-3a^2b^{-4}c^5)^3 = (-3)^3 a^6 b^{-12} c^{15} = \frac{-27A^6 c^{15}}{B^{12}}$$

• POWER TO POWER

$$11. \frac{-27A^6 c^{15}}{B^{12}}$$

$$12. 3x^2y^3(5x^3y+2x^2y-7x) = 15x^5y^4 + 6x^4y^4 - 21x^3y^3$$

• DISTRIBUTE

MULTIPLY COEFFICIENTS, ADD  
EXPONENTS TO LIKE BASES

$$12. \frac{15x^5y^4 + 6x^4y^4 - 21x^3y^3}{}$$

$$13. 5a^3b(2a^4b^3 + 8a^3b^2 - 3a^2b) = 10A^7B^4 + 40A^6B^3 - 15A^5B^2$$

• DISTRIBUTE

MULTIPLY COEFFICIENTS  
ADD EXPONENTS TO LIKE BASES.

$$13. \frac{10A^7B^4 + 40A^6B^3 - 15A^5B^2}{}$$

$$14. 7a^2b^3(2a^3b + 5a^2b - 7b) = 14A^5B^4 + 35A^4B^4 - 49A^2B^4$$

$$14. \frac{14A^5B^4 + 35A^4B^4 - 49A^2B^4}{}$$

$$15. 9e^3f(3e^3f^3 + 2e^2f^2 - 5ef)$$

$$15. \frac{27E^6F^4 + 18E^5F^3 - 45E^4F^2}{}$$

$$= 27E^6F^4 + 18E^5F^3 - 45E^4F^2$$

Use **Scientific Notation** to answer each of the following, round **final answer** to the nearest hundredth.

$$16. \frac{(8.35 \times 10^{11}) - (9.63 \times 10^{10}) - (4.52 \times 10^{11})}{(6.27 \times 10^{-9}) \cdot (1.13 \times 10^{-3})}$$

$$4.05 \times 10^{22}$$

$$16. \frac{4.05 \times 10^{22}}{}$$

$$17. \frac{(4.29 \times 10^6) \cdot (1.18 \times 10^{-11}) \cdot (4.77 \times 10^{-7})}{(6.72 \times 10^{-5}) + (8.7 \times 10^{-4})}$$

$$2.58 \times 10^{-8}$$

$$17. \frac{2.58 \times 10^{-8}}{}$$

$$18. \frac{(1.347 \times 10^3) + (5.729 \times 10^2) - (6.114 \times 10^4)}{(4.311 \times 10^8) - (4.578 \times 10^9)}$$

$$1.43 \times 10^{-5}$$

$$18. \frac{1.43 \times 10^{-5}}{}$$

$$19. \frac{(8.27 \times 10^7) \cdot (4.13 \times 10^{-11}) \cdot (6.22 \times 10^{-5})}{(9.98 \times 10^{-11}) \cdot (2.13 \times 10^9)} \quad 9.99 \times 10^{-7}$$

$$19. \underline{9.99 \times 10^{-7}}$$

$$20. (3.2 \times 10^{17})(1.7 \times 10^{-3}) \quad 5.44 \times 10^{14}$$

$$20. \underline{5.44 \times 10^{14}}$$

$$21. (5.1 \times 10^{-9})(2.4 \times 10^{22}) \quad 1.22 \times 10^{14}$$

$$21. \underline{1.22 \times 10^{14}}$$

Combine like terms with indicated operation.

$$22. (A^2 + AB - 3B^2) + (4A^2 - AB + B^2)$$

$$(+)$$

$$\begin{array}{r} 4A^2 - AB + B^2 \\ \hline 5A^2 - 2B^2 \end{array}$$

\* NO NEW ANIMALS WHEN  
ADDING AND SUBTRACTING

$$22. \underline{5A^2 - 2B^2}$$

$$23. (x^2 + xy - 2y^2) - (5x^2 - xy + y^2)$$

$$\begin{array}{r} -5x^2 + xy - y^2 \\ \hline -4x^2 + 2xy - 3y^2 \end{array}$$

\* BE SURE TO CHANGE THE  
SIGN OF ALL THE TERMS FOLLOWING  
A SUBTRACTION SIGN.

$$23. \underline{-4x^2 + 2xy - 3y^2}$$

$$24. (x^2 - 3x) - (2x^2 + 5x)$$

$$\begin{array}{r} -2x^2 - 5x \\ \hline -x^2 - 8x \end{array}$$

$$24. \underline{-x^2 - 8x}$$

$$25. -\frac{1}{3}m(6m+9) - 5(2m^2+7m-2)$$

$$\begin{array}{r} -2m^2 - 3m - 10m^2 - 35m + 10 \\ \hline -12m^2 - 38m + 10 \end{array}$$

$$25. \underline{-12m^2 - 38m + 10}$$

$$26. \frac{3}{5}y(10y+25) - \frac{2}{3}(9y^2+6y-12)$$

$$\begin{array}{r} 6y^2 + 15y - 6y^2 - 4y + 8 \\ \hline 11y + 8 \end{array}$$

$$26. \underline{11y + 8}$$

DISTRIBUTE  
THEN COMBINE  
LIKE TERMS

Use (F.O.I.L.) or the double distributing idea.

$$27. \begin{array}{r} (2x-3)(5x+7) \\ \phantom{(2x-3)} \overline{-15x-21} \\ 10x^2+14x \\ \phantom{10x^2+14x} \overline{10x^2-x-21} \end{array}$$

TO DOUBLE DISTRIBUTE:

- 1) DISTRIBUTE RIGHTMOST TERM FROM FIRST PART
- 2) SHIFT & DISTRIBUTE LEFT MOST TERM FROM FIRST PART
- 3) COMBINE MIDDLE TERM

$$27. \underline{10x^2 - x - 21}$$

$$28. \begin{array}{r} (5m-2)(5m+2) \\ \phantom{(5m-2)} \overline{-10m-4} \\ 25m^2+10m \\ \phantom{25m^2+10m} \overline{25m^2-4} \end{array}$$

\* NO SURPRISE

IT WAS A "DIFFERENCE OF TWO SQUARES"

$$28. \underline{25m^2 - 4}$$

$$29. \begin{array}{r} (11g+2)(3g+5) \\ \phantom{(11g+2)} \overline{6g+10} \\ 33g^2+55g \\ \phantom{33g^2+55g} \overline{33g^2+61g+10} \end{array}$$

$$29. \underline{33g^2 + 61g + 10}$$

$$30. (13p-21)(13p+21) \\ 169p^2 - 441$$

\* DIFFERENCE OF TWO SQUARES

$$30. \underline{169p^2 - 441}$$

$$31. \begin{array}{r} 25x \\ (25x-2)(x+1) \\ \phantom{(25x-2)} \overline{-2x} \\ 25x^2 + 23x - 2 \end{array}$$

TO FOIL:

- 1) FIRST TERM FROM EACH PARENTHESES GETS MULTIPLIED
- 2) OUTER MOST TERMS
- 3) INNER MOST TERMS
- 4) LAST TERM FROM EACH

$$31. \underline{25x^2 + 23x - 2}$$

$$25x^2 + 23x - 2$$

$$32. \begin{array}{r} 45b \\ (9b+5)(9b+5) \\ \phantom{(9b+5)} \overline{45b} \\ 81b^2 + 90b + 25 \end{array}$$

$$32. \underline{81b^2 + 90b + 25}$$

$$81b^2 + 90b + 25$$

$$33. (7w+5)^2 \\ \begin{array}{r} 35w \\ (7w+5)(7w+5) \\ \phantom{(7w+5)} \overline{35w} \\ 49w^2 + 70w + 25 \end{array}$$

\* PERFECT SQUARE, WRITE IT TWICE & FOIL

$$33. \underline{49w^2 + 70w + 25}$$

$$49w^2 + 70w + 25$$

$$34. \begin{array}{r} 270r \\ (15r-18)(15r+18) \\ \phantom{(15r-18)} \overline{-270r} \\ 225r^2 - 324 \end{array}$$

\* DIFFERENCE OF TWO SQUARES

$$34. \underline{225r^2 - 324}$$

$$225r^2 - 324$$

35.  $(9f+2)^2$  \* PERFECT SQUARE, WRITE IT TWICE

$$\begin{array}{r} 18f \\ (9f+2)(9f+2) \\ 18f \\ \hline 81f^2 + 36f + 4 \end{array}$$

35.  $\underline{81F^2 + 36F + 4}$

36.  $(6t-11)(6t+11)$  \* DIFFERENCE OF TWO SQUARES

$$\begin{array}{r} 66t \\ (6t-11)(6t+11) \\ -66t \\ \hline \end{array}$$

36.  $\underline{36t^2 - 121}$

$$36t^2 - 121$$

37.  $(2m-5)(3m^2-2m+4)$  \* MUST DOUBLE DISTRIBUTE

$$\begin{array}{r} \phantom{6m^3} - 15m^2 + 10m - 20 \\ 6m^3 - 4m^2 + 8m \\ \hline 6m^3 - 19m^2 + 18m - 20 \end{array}$$

37.  $\underline{6M^3 - 19M^2 + 18M - 20}$

38.  $(e-f)(e^2-2ef+f^2)$  \* DOUBLE DISTRIBUTE

$$\begin{array}{r} -e^2f + 2ef^2 - f^3 \\ e^3 - 2e^2f + ef^2 \\ \hline e^3 - 3e^2f + 3ef^2 - f^3 \end{array}$$

38.  $\underline{E^3 - 3E^2F + 3EF^2 - F^3}$

39.  $(n-1)(n+2)(n-3)$  \* FOIL THEN DOUBLE DISTRIBUTE

39.  $\underline{N^3 - 2N^2 - 5N + 6}$

$$\begin{array}{r} (n-1)(n^2-n-6) \\ -n^2+n+6 \\ \hline n^3 - n^2 - 6n \end{array} \quad n^3 - 2n^2 - 5n + 6$$

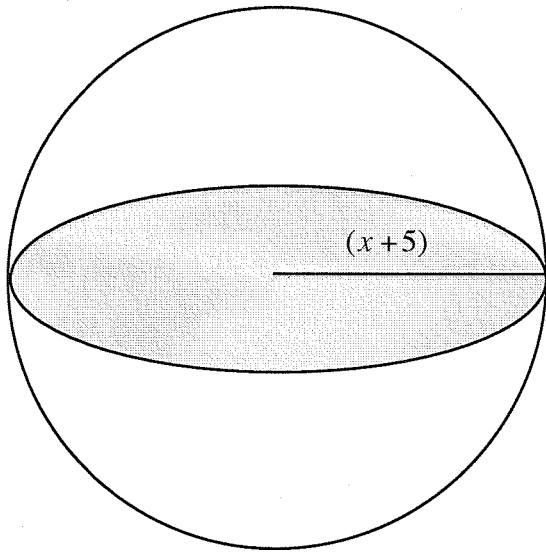
40.  $(x-5)(x+6)(x-3)$  \* SAME AS PREVIOUS PROBLEM

40.  $\underline{X^3 - 2X^2 - 33X + 90}$

$$\begin{array}{r} (x-5)(x^2+3x-18) \\ -5x^2-15x+90 \\ \hline x^3+3x^2-18x \end{array}$$

$$x^3 - 2x^2 - 33x + 90$$

41. Find the **volume** and **surface area** of the sphere.



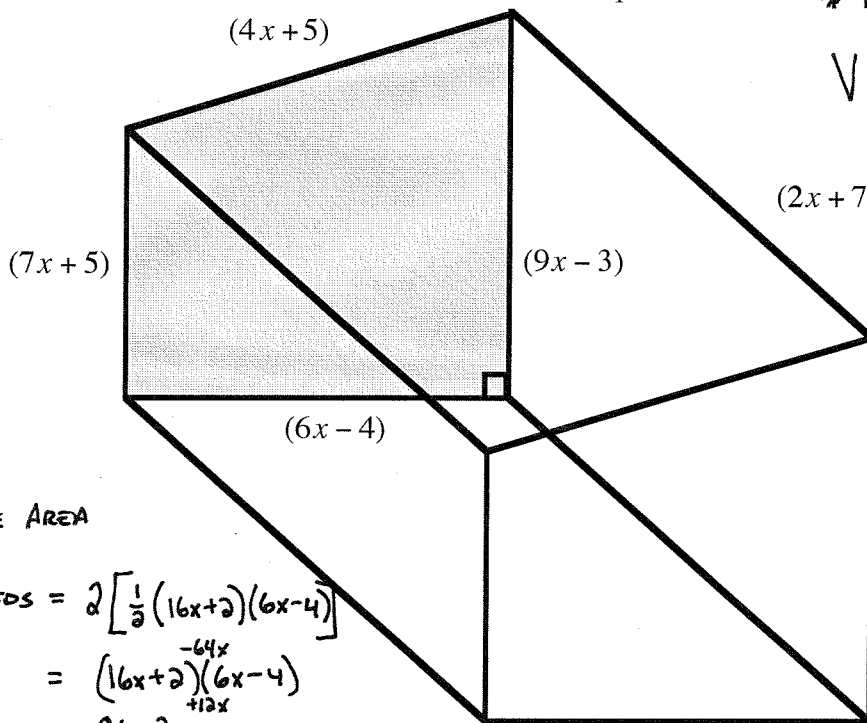
$$\begin{aligned}
 V &= \frac{4}{3} \pi r^3 \\
 &= \frac{4}{3} \pi (x+5)(x+5)(x+5) \\
 &= \frac{4}{3} \pi (x+5)(x^2 + 10x + 25) \\
 &= \frac{4}{3} \pi \frac{5x^2 + 50x + 125}{x^2 + 10x + 25} \\
 &= \frac{4}{3} \pi \frac{x^3 + 15x^2 + 75x + 125}{x^2 + 10x + 25}
 \end{aligned}$$

\* RECYCLE ANSWER TO MAKE LESS WORK

Volume  $\frac{4}{3} \pi x^3 + 20\pi x^2 + 100\pi x + \frac{500}{3} \pi$

Surface Area  $4\pi x^2 + 40\pi x + 100\pi$

42. Find the **volume** and **surface area** of the sphere.



\* RECYCLE ANSWERS

$$\begin{aligned}
 V &= B l \\
 &= \frac{1}{2} (b_1 + b_2) h \cdot l \\
 (2x+7) &= \frac{1}{2} (7x+5 + 9x-3) (6x-4) (2x+7) \\
 &= \frac{1}{2} (16x+2) (6x-4) (2x+7) \\
 &= (8x+1) \frac{(6x-4)(2x+7)}{-8x} \\
 &= (8x+1) (12x^2 + 34x - 28) \\
 &= 96x^3 + 272x^2 - 224x - 28
 \end{aligned}$$

Volume  $96x^3 + 272x^2 - 190x - 28$

SURFACE AREA

$$\begin{aligned}
 \text{2 TRAPEZOIDS} &= 2 \left[ \frac{1}{2} (16x+2)(6x-4) \right] \\
 &= (16x+2)(6x-4) \\
 &= 96x^2 - 52x - 8
 \end{aligned}$$

$$\text{4 SIDES} = [7x+5 + 6x-4 + 9x-3 + 4x+5] (2x+7)$$

$$\begin{aligned}
 \text{* UNFOLD THE SIDES TO MAKE A GIANT RECTANGLE} \\
 &= (26x+3) \frac{182x}{6x} (2x+7) \\
 &= 52x^2 + 182x + 21
 \end{aligned}$$

Surface Area  $148x^2 + 136x + 13$

$$\text{2 TRAPEZOIDS} + \text{4 SIDES} = 148x^2 + 136x + 13$$