

All exam answers are to be in simplest form. A scientific calculator may be used. No notes, no books, no homework may be used while taking this exam. Use blank spaces on the exam to show your work. Attach all scratch paper to the exam.

Evaluate each expression.

1) -5^3

Answer: -125

$$-5^3 = -(5)(5)(5) = \underline{-125}$$

2) $9 \cdot 5^3$

Answer: 1125

$$9 \cdot 5 \cdot 5 \cdot 5 = \underline{1125}$$

3) $(\frac{1}{5})^{-3}$

Answer: 125

$$(\frac{1}{5})^{-3} = (\frac{5}{1})^3 = 5 \cdot 5 \cdot 5 = \underline{125}$$

4) 5^{-4}

Answer: $\frac{1}{625}$

$$5^{-4} = \frac{1}{5^4} = \frac{1}{5 \cdot 5 \cdot 5 \cdot 5} = \underline{\frac{1}{625}}$$

Simplify each expression. Write the result using positive exponents only.

5) $6^{-1} + 7^{-1}$

Answer: $\frac{13}{42}$

$$6^{-1} + 7^{-1} = \frac{1}{6} + \frac{1}{7} \quad \text{LCD} = 42$$

$$\frac{1}{6} \cdot \frac{7}{7} + \frac{1}{7} \cdot \frac{6}{6} = \frac{7}{42} + \frac{6}{42} = \underline{\frac{13}{42}}$$

6) $(3x^3)^2(2x)^{-3}$

Answer: $\frac{9x^3}{8}$

$$= 9x^6 \cdot 2^{-3}x^{-3}$$

$$= 9 \cdot 2^{-3}x^6 \cdot x^{-3}$$

$$= 9 \cdot 2^{-3}x^3 = \frac{9x^3}{2^3} = \underline{\frac{9x^3}{8}}$$

7) $\frac{x^{-2}}{x^{-8}}$

Answer: x^6

$$\frac{x^{-2}}{x^{-8}} = x^{-2 - (-8)}$$

$$= x^{-2+8} = \underline{x^6}$$

8) $\frac{p^8}{p^{-1}}$

Answer: p^9

$$= p^{8 - (-1)} = p^{8+1} = \underline{p^9}$$

$$9) \left(\frac{xy^6}{x^4y} \right)^{-2}$$

Answer: $\frac{x^6}{y^{10}}$

$$= \frac{x^{-2}y^{-12}}{x^{-8}y^{-2}} = x^{-2-(-8)}y^{-12-(-2)} = x^6y^{-10} = \frac{x^6}{y^{10}}$$

$$10) \frac{5^{-9}x^{-2}y^3}{5^{-6}x^{-5}y^6}$$

Answer: $\frac{x^3}{125y^3}$

$$= 5^{-9-(-6)}x^{-2-(-5)}y^{3-6} = 5^{-3}x^3y^{-3} = \frac{x^3}{5^3y^3} = \frac{x^3}{125y^3}$$

Express the number in scientific notation.

11) 0.000018619

Answer: 1.8619×10^{-5}

MOVE DECIMAL 5 PLACES TO RIGHT \swarrow BECAUSE # IS < 1
 $0.000018619 = 1.8619 \times 10^{-5}$

12) 57,000

Answer: 5.7×10^4

$57000 = 5.7 \times 10^4$ ← POSITIVE BECAUSE # IS > 1
 MOVE D.P. 4 PLACES TO LEFT

Write the number in standard form.

13) 4.33×10^3

Answer: 4330

4.33×10^3 ← MOVE d.p. 3 PLACES TO RIGHT
 $4.330 \times 10^3 = 4330$

14) 8.55×10^{-5}

8.55×10^{-5} ← MOVE d.p. 5 PLACES TO LEFT
 $.00008.55 \times 10^{-5} = 0.0000855$

Simplify. Write the answer in standard form.

15) $(2 \times 10^{-3})(7 \times 10^{-2})$

Answer: 0.00014

$= 2 \cdot 7 \times 10^{-3+(-2)} = 14 \times 10^{-5}$ ← d.p. MOVES 5 PLACES TO LEFT
 $= 0.00014 \times 10^0 = 0.00014$

Complete the table for the polynomial and answer the question.

16) a) Polynomial: $6xy^6 - 6x^4y^3z + 6x^6y - 4$

Term	Numerical Coefficient	Degree of Term
$6xy^6$	6	7
$-6x^4y^3z$	-6	8
$6x^6y$	6	7
-4	-4	0

b) What is the degree of the polynomial? 8

Simplify the following by combining like terms:

$$17) 3.8x^3 - 6.6x + 11.9 + 1.8x - x^3 - 8.5 = 3.8x^3 - x^3 - 6.6x + 1.8x + 11.9 - 8.5$$

Answer: $2.8x^3 - 4.8x + 3.4$

$$= \underline{2.8x^3 - 4.8x + 3.4}$$

Perform the indicated operations.

$$18) (3y^6 - 8y^5 + 2y) + (4y^6 + 4y^5 + 6y) = 3y^6 - 8y^5 + 2y + 4y^6 + 4y^5 + 6y$$

Answer: $7y^6 - 4y^5 + 8y$

$$3y^6 + 4y^6 - 8y^5 + 4y^5 + 2y + 6y$$

$$\underline{7y^6 - 4y^5 + 8y}$$

$$\begin{array}{r}
 19) 2y^6 + 16y^4 + 14y \\
 \underline{-(9y^6 - 6y^4 - 5y)} \\
 \text{Answer: } -7y^6 + 22y^4 + 19y
 \end{array}
 = \begin{array}{r}
 2y^6 + 16y^4 + 14y \\
 -9y^6 + 6y^4 + 5y \\
 \hline
 -7y^6 + 22y^4 + 19y
 \end{array}
 \leftarrow \text{NOTE SIGN CHANGES!}$$

Perform the indicated operations.

20) Subtract $-1 + 7x^7 + 5x^8 + 5x^6 + 8x$ from the sum of $-9x^6 + 8x - 7$ and $8x^8 - 5x^7$.

Answer: $3x^8 - 12x^7 - 14x^6 - 6$

$$\begin{array}{r}
 (-9x^6 + 8x - 7) + (8x^8 - 5x^7) - (-1 + 7x^7 + 5x^8 + 5x^6 + 8x) = \\
 -9x^6 + 8x - 7 + 8x^8 - 5x^7 + 1 - 7x^7 - 5x^8 - 5x^6 - 8x = \leftarrow \text{NOTE SIGN CHG FOR SUBTRACTION!} \\
 8x^8 - 5x^8 - 5x^7 - 7x^7 - 9x^6 - 5x^6 + 8x - 8x - 7 + 1 = \\
 \underline{3x^8 - 12x^7 - 14x^6 - 6}
 \end{array}$$

Multiply.

21) $(x - 9)(-4x - 1)$

Answer: $-4x^2 + 35x + 9$

$$\begin{array}{r}
 \text{F} \quad \text{O} \quad \text{I} \quad \text{L} \\
 = -4x^2 - x + 36x + 9 \\
 = \underline{-4x^2 + 35x + 9}
 \end{array}$$

22) $\left(4x + \frac{1}{2}\right)\left(4x - \frac{1}{2}\right)$

Answer: $16x^2 - \frac{1}{4}$

CAN FOIL OR SQUARE THE FIRST TERMS
MINUS THE SQUARE OF THE SECOND TERMS.

23) $3x^5(5x^3 + 8x^2 - 12)$

Answer: $15x^8 + 24x^7 - 36x^5$

USE THE DISTRIBUTIVE PROPERTY

$$3x^5(5x^3 + 8x^2 - 12)$$

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

Answer: $25x^2 + 30x + 9$

CAN USE FOIL $\rightarrow (5x+3)(5x+3)$
 $5x^2 + 15x + 15x + 9$
 $25x^2 + 30x + 9$

OR SQUARE 1ST & LAST TERMS & FOR THE MIDDLE TERM, MULTIPLY THE ORIGINAL 2 TERMS TOGETHER & DOUBLE IT. $(5x)^2 + 2(3 \cdot 5x) + (3)^2 =$
 $25x^2 + 30x + 9$

25) $(9x - 2)^2$

Answer: $81x^2 - 36x + 4$

$(9x)^2 - 2(2 \cdot 9x) + (2)^2$
 $81x^2 - 36x + 4$

SEE ABOVE

26) $(x^2 + 6b)(x^2 - 6b)$

Answer: $x^4 - 36b^2$

CAN FOIL THIS BUT EASIER TO USE

THIS: \rightarrow SQUARE THE FIRST TERM & SUBTRACT THE SQUARE OF THE SECOND TERM.

$(x^2)^2 - (6b)^2 = \underline{x^4 - 36b^2}$

27) $(x+10)(x^3+2x-5)$

Answer: $x^4 + 10x^3 + 2x^2 + 15x - 50$

$(x+10)(x^3+2x-5) =$
 $x^4 + 2x^2 - 5x + 10x^3 + 20x - 50$
 $x^4 + 10x^3 + 2x^2 + 15x - 50$

Perform the division.

$$28) \frac{6x^4 + 12x^3 + 4x^2}{2x^3}$$

$$= \frac{6x^4}{2x^3} + \frac{12x^3}{2x^3} + \frac{4x^2}{2x^3} = \underline{3x + 6 + \frac{2}{x}}$$

Answer: $3x + 6 + \frac{2}{x}$

Divide.

$$29) (x^2 + 16x + 63) \div (x + 7)$$

Answer: $x + 9$

$$\begin{array}{r} x+9 \\ x+7 \overline{) x^2 + 16x + 63} \\ \underline{-x^2 - 7x} \\ 9x + 63 \\ \underline{-9x - 63} \\ 0 \end{array}$$

$$\underline{x+9}$$

$$30) \frac{x^3 + 1000}{x + 10}$$

Answer: $x^2 - 10x + 100$

$$\begin{array}{r} x^2 - 10x + 100 \\ x+10 \overline{) x^3 + 0x^2 + 0x + 1000} \\ \underline{-x^3 + 10x^2} \\ -10x^2 + 0x \\ \underline{+10x^2 - 100x} \\ 100x + 1000 \\ \underline{-100x + 1000} \\ 0 \end{array}$$

FILL IN MISSING
TERMS

$$\underline{x^2 - 10x + 100}$$