(8 pts) 1. Evaluate the following expression for \( a = -3 \) and \( b = 4 \):
\[
10(2a + b) \div (a^2 - b) + |6a|
\]
\[
10(-3 + 4) \div ((-3)^2 - 4) + |6(-3)|
\]
\[
= 10(-6 + 4) \div (9 - 4) + |-18|
\]
\[
= 10(-2) \div 5 + 18
\]
\[
= -20 \div 5 + 18
\]
\[
= -4 + 18 = 14
\]

(6 pts) 2. Multiply and express your answer in scientific notation.
\[
(8.2 \times 10^{-25})(2.5 \times 10^{11})
\]
\[
= 20.5 \times 10^{-25+11}
\]
\[
= 20.5 \times 10^{-14}
\]
\[
= 2.05 \times 10^1 \times 10^{-14}
\]
\[
= 2.05 \times 10^{-13}
\]

(8 pts) 3. Perform the indicated operations and simplify. Do not use a calculator. Express your answer as a fraction in lowest terms.
\[
\left(\frac{4}{5} - \frac{2}{3}\right) \div \frac{8}{25}
\]
\[
= \left(\frac{12}{15} - \frac{10}{15}\right) \div \frac{8}{25}
\]
\[
= \frac{2}{15} \times \frac{25}{8}
\]
\[
= \frac{1}{3} \times \frac{5}{4} = \frac{5}{12}
\]
(10 pts) 4. Shane is going to invest $4200 at a simple interest rate of 8.5%. Use the formula,
\[ A = P + Prt \]
to find how long it will take for the investment to be worth $6300. Round your answer to one decimal place.

\[
4200 + (4200)(0.085)(t) = 6300 \\
4200 + 357t = 6300 \\
357t = 2100 \\
t \approx 5.9
\]

5.9 years

(8 pts) 5. Solve \( W = \frac{2c + d}{4} \) for \( c \).

\[
4W = 2c + d \\
4W - d = 2c \\
\frac{4W - d}{2} = c
\]

\[ c = \frac{4W - d}{2} \text{ or } 2W - \frac{d}{2} \]

(8 pts) 6. Simplify.

\[
4x - [3 - 2(5x + 6)] + 2x - 6 \\
= 4x - [3 - 10x - 12] + 2x - 6 \\
= 4x - (-10x - 9) + 2x - 6 \\
= 4x + 10x + 9 + 2x - 6 \\
= 16x + 3
\]

16x + 3
(12 pts) 7. Solve the following equations for $x$.

(6 pts) (a) $11x = \frac{1}{4}(24 + 4x)$

$11x = 6 + x$
$10x = 6$
$x = \frac{6}{10} = \frac{3}{5}$

(6 pts) (b) $3(2x - 1) = 5(x + 2)$

$6x - 3 = 5x + 10$
$x = 13$

(20 pts) 8. Simplify completely. Do not leave negative exponents in your answer.

(6 pts) (a) $\left(6x^{-12}y^3\right)\left(-2x^8y^2\right)$

$= -12x^{-12+8}y^{3+2}$
$= -12x^{-4}y^7$

(6 pts) (b) $\left(3a^4b^{-3}\right)^{-3}$

$= 3^{-3}a^{-12}b^9$
$= \frac{b^9}{3^3a^{12}}$

(8 pts) (c) $\frac{5x^0x^{-9}y^{-4}z^3}{25x^{-7}y^3z^{12}}$

$= \frac{5x^7z^3}{25x^9y^3y^9z^{12}}$
$= \frac{1}{5x^2y^7z^9}$
(8 pts) 9. Translate the following expression into a mathematical equation. DO NOT SOLVE THE EQUATION: A boat travels at a rate of 23 km/h in still water. It is traveling in a river that has a current of 8 km/h. How long would it take the boat to travel 75 km downstream. (Name a variable and set up an equation)

let \( t \) = time for boat to travel 75 km downstream

\[
\begin{array}{|c|c|c|}
\hline
 & r & t \\
\hline
downstream & 23 & 8 \\
75 & t & \\
\hline
\end{array}
\]

(rate)(time)=distance

\[(23 + 8)t = 75\]

(23 + 8)\( t \) = 75 or \( 31t = 75 \)

(12 pts) 10. A piece of wire 15 meters long is cut into three pieces. The second piece is \( \frac{1}{3} \) as long as the first piece, while the third piece is 4 meters longer than the second piece. Find the length of each piece. (Name a variable, set up an equation, and solve.)

let \( x \) = length of the first piece

then \( \frac{1}{3} x \) = length of the second piece

and \( \frac{1}{3} x + 4 \) = length of third piece

\[
x + \frac{1}{3} x + \frac{1}{3} x + 4 = 15
\]

\[
x + \frac{2}{3} x = 11
\]

\[
\frac{5}{3} x = 11
\]

\[
x = (11) \left( \frac{3}{5} \right) = \frac{33}{5}
\]

length of first piece = \( 6.6 \) m

length of second piece = \( 2.2 \) m

length of third piece = \( 6.2 \) m