

Calculators are not allowed. Answers may be left as improper fractions, mixed numbers, or decimals. Box your final answers. If you need more space, you may continue your work on the back of the page.

1. Find the prime factorization of the following numbers.

- (a) 72
- (b) 108
- (c) 144
- (d) 243

2. Find the greatest common factor of the following pairs of numbers..

- (a) 72 and 108
- (b) 108 and 144
- (c) 72 and 243

3. Perform the following operations and simplify all answers.

- (a) $\frac{3}{2} \left(\frac{1}{72} - \frac{1}{108} \right) + 1$
- (b) $\left(\sqrt{3 \left(\frac{7}{108} - \frac{1}{144} \right)} - 1 \right)^2$
- (c) $\frac{\frac{32}{243}}{\frac{1}{3}} \cdot \frac{9}{8} - \frac{1}{3}$

4. Let $a = 2\frac{1}{5}$, $b = 3\frac{2}{3}$, $c = -\frac{3}{4}$, $d = -1\frac{5}{6}$. Evaluate the following expressions.

- (a) $a(b - c)$
- (b) $a(b - c^2)$
- (c) $ad - bc$
- (d) $\frac{a - c}{d - b}$

5. A recipe requires 6 cups of flour to make 42 cookies. According to this recipe, how many cups of flour are required to make 154 cookies?

6. The price of a stock increases by 20% to end the day at \$114. What was the price of the stock before the increase?

7. They say that a baby elephant's weight increases by 50% every month for the first 4 months of its life. If a baby elephant is born weighing 100lbs, how much will it weigh after 1 month? 2 months? 3 months? 4 months? How much weight did the baby elephant gain in its first month? Second month? Third month? Fourth month?

8. Simplify the following expressions and eliminate any negative exponents.

- (a) $\left(\frac{2^{-1}x^5y^{-2}}{3x^{-8}y^3} \right)^{-2}$
- (b) $\left(\frac{(5a^2b^{-4}c)^{-1}}{(10a^{-2}b^7c^{-3})^{-2}} \right)^3$

$$(c) \left(\frac{4x^2yz^{-3}}{2^{-1}x^{-3}y^{-1}z^4} \right)^{-1} \left(\frac{1}{16x^{-2}y^{12}} \right)^{-1}$$

9. Simplify the following polynomial expressions.

$$(a) \left(3x^3 - \frac{1}{4}x^2 - 6x + \frac{5}{6} \right) + \left(\frac{5}{2}x^3 - 4x^2 + \frac{2}{5}x + \frac{1}{3} \right) - \left(x^3 + \frac{7}{6}x^2 + x - 5 \right)$$

$$(b) (x^5 - 5x^3 + 3x)(x^6 - 2x^4 - x^2 - 4)$$

$$(c) (3x - 4)^3$$

$$(d) \frac{18x^4y^2 - 12x^3y^3 + 6x^2y^4}{3x^2y}$$

10. Factor the following polynomial completely.

$$(a) 2x^3 - 18x^2 - 72x$$

$$(b) 49x^4 + 70x^2y^3 + 25y^6$$

$$(c) 64a^{12}b^{16} + 144a^{11}b^{20} + 81a^{10}b^{24}$$

$$(d) x^3 - x$$

$$(e) 24x^2z - 54y^2z$$

$$(f) 6x^2 + 11x - 21$$

$$(g) x^3 + x^2 - 9x - 9$$

$$(h) 81a^4b^8 - 16c^8d^{12}$$

11. Simplify the following radical expressions. Rationalize all denominators. Assume all variables represent positive numbers.

$$(a) \sqrt{48x^4y^5}$$

$$(b) \sqrt{98} + \sqrt{18} - \sqrt{128}$$

$$(c) \frac{3}{\sqrt{3}}$$

$$(d) \frac{2\sqrt{3}}{3\sqrt{2}}$$

12. Solve the following linear equations for x .

$$(a) 4x - 3 = 2x + 1$$

$$(b) 2(1 - 3x) = -1$$

$$(c) \frac{12 - x}{x + 3} = \frac{3}{5}$$

13. Solve the following nonlinear equations.

$$(a) 2x^2 = x + 21$$

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

$$(c) 3x^2 + 3x + 4 = x^2 + 12x$$

$$(d) 6x(x - 1) = 21 - x$$