

(1) The difference between two numbers is $\frac{5}{12}$. If $\frac{3}{4}$ of the larger number is $\frac{3}{8}$ more than $\frac{1}{2}$ of the smaller, find the larger number.

(2) Without a calculator, compute (Is there a shorter way of doing it than the straightforward multiplication?)
 $19999 \cdot 20001$

(3) Expand

(a) $2x(a + 2b + 3c)$

(b) $-3y(a - ay + by)$

(c) $(a^2 + 2a + 1)(a + 1)$

(d) $(b^2 - 2b + 1)(b - 1)$

(e) $(4x - 7y)(4x + 7y)$

(f) $(6x^2 - y)(7x^2 - 2x - 5)$

(4) Factor (i.e., write as a product) the following expressions:

(a) $ac + ab$

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

(c) $x^2 - 2x - yx + 2y$

(d) $4x^2 - 4x + 1$

(e) $4x^2 + 16x + 2xy + 8y$

(f) $x^2(x + 4) + 5(x + 4)$

(g) $100x^8y^2 - 16x^4y^6$

(h) $a^2 + 4ab + 4b^2$

(i) $a^2 - 2a + 1$

(j) $x^2 - 7$ [Hint: $7 = (\sqrt{7})^2$.]

(k) $a^4 - b^4$ [Hint: $a^4 = (a^2)^2$.]

- (5) John takes 15 min to walk from school to the bus station. Jim takes 20 min to walk from the school to the bus station. If the difference in their speeds is 2 km/h, how far is the station from the school?

- (6) Simplify:

$$(a) \frac{1}{x+1} - \frac{1}{x-1} \quad (b) \left(1 + \frac{1}{x}\right) \div (x+1) \quad (c) \left(1 + \frac{1}{x}\right) \div \left(1 - \frac{1}{x}\right)$$

- (7) Simplify. When you have roots and radicals, reduce the expression to the product/ratio of radicals of simplest numbers. Assume all variables stand for positive numbers.

(a) $\sqrt{75}$

(b) $\sqrt{180}$

(c) $\sqrt{98}$

(d) $\sqrt[4]{128}$

(e) $18^{2/3} \div 6^{1/2}$

(f) $81^{3/4} \cdot 64^{2/3}$

(g) $\sqrt{50n^6}$

(h) $\sqrt{72x^4y^2}$

(i) $\sqrt{27a^3b^7}$

(j) $\sqrt{98a^7b^5}$

(k) $\sqrt[3]{x^5}$

(l) $\sqrt[3]{64q^8}$

(m) $\sqrt{\frac{18p^5q^7}{32pq^2}}$