

1. Prove that the value of the following expressions is a rational number.

Example:

$$(\sqrt{3} - 1)(\sqrt{3} + 1) = \sqrt{3} \cdot \sqrt{3} + \sqrt{3} \cdot 1 - 1 \cdot \sqrt{3} - 1 = \sqrt{3} \cdot \sqrt{3} - 1 = (\sqrt{3})^2 - 1 = 3 - 1 = 2$$

- a. $(\sqrt{7} - 1)^2 + (\sqrt{7} + 1)^2$
 b. $(\sqrt{7} - 2)^2 + 4\sqrt{7}$
2. Without using calculator compare:

$3 \dots \sqrt{11}$

$11 \dots \sqrt{110}$

$22 \dots \sqrt{484}$

$5 \dots \sqrt{20}$

$17 \dots \sqrt{299}$

$35 \dots \sqrt{1215}$

3. 6 painters can paint the house in 5 days. How many painters are needed to do the job in 3 days?
4. John wrote the letters "J", "o", "h", and "n" on 4 index cards. After that, he turned them blank side up, mixed them, aligned them, and turned them back to the "letter" side. How likely is it that he will get his name written on the cards?

J	o	h	n
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 (Hint: Probability is the ratio of the number of ways the desired outcome can happen to all possible outcomes.)

5. Solve the following equations:

a. $2(x - 1) = \frac{2}{3}(x + 5)$; b. $2x - (5x - 7) = -1$ c. $\frac{x - 2}{x - 1} = 3$

6. Do the following arithmetic operations with binary numbers. Do them without converting the numbers to decimal form.

a. $110101_2 + 111011_2$; b. $10101_2 \times 1011_2$;

c. $(10101_2 + 1101_2) \times 10110_2$

7. Simplify:

a. $\left(\frac{5a^2b^5}{4a^3b^3}\right)^3$; b. $(2z^2 \cdot 3z^3 \cdot z)^2$; c. $\frac{(-ab)^8}{(ab)^2}$;

d. $\left(\frac{3ab^3}{15b}\right)^2 \cdot \frac{75c}{a^2b^6}$; e. $\left(\frac{3a^5b^2}{21ab}\right)^2 \cdot \frac{7^4}{a^{16}b^2}$; f. $\frac{(-ab)^8}{(ab)^2}$