

1. State whether the following are Rational or Irrational and why (1 mark each)

a. $\sqrt{144} = 12$

Rational - Q
- exact root

b. $\sqrt[3]{17}$

Irrational - \bar{Q}
- not an exact root

c. $\sqrt[3]{125} = 5$

Rational - Q
- exact root

d. $-\frac{2}{5}$

Rational - Q
- fraction of integers

e. $0.\bar{15} = \frac{15}{99}$

Rational - Q
- repeating decimal

f. $\sqrt{8}$

Irrational - \bar{Q}
- not an exact root

2. Express each Radical in Simplest Form. (1 mark each)

a. $\sqrt{12} = \sqrt{4 \cdot 3} = 2\sqrt{3}$

b. $2\sqrt{45} = 2\sqrt{9 \cdot 5} = 2 \cdot 3\sqrt{5} = 6\sqrt{5}$

c. $\sqrt{200xy^2} = \sqrt{100 \cdot 2 \cdot x \cdot y^2} = 10y\sqrt{2x}$

3. Write as a radical and evaluate.

a. $25^{0.5} = 25^{\frac{1}{2}} = \sqrt{25} = 5$

b. $16^{\frac{3}{4}} = (\sqrt[4]{16})^3 = (4)^3 = 64$

4. Write each Radical in Exponential Form. Do not evaluate.

a. $\sqrt[3]{4^5} = 4^{\frac{5}{3}}$ (Note: "boots" and "hat" annotations)

b. $(\sqrt{3})^4 = 3^2 = 3^2$

c. $\sqrt[3]{\sqrt{x^3}} = (x^{\frac{3}{2}})^{\frac{1}{3}} = x^{\frac{1}{2}} = \sqrt{x}$

5. Simplify and Evaluate. Show all of your work and answers must be left with positive exponents

a. $(2^{-2} + 2^{-1})^2 = (\frac{1}{2} + \frac{1}{2})^2 = (\frac{2}{2})^2 = 1^2 = 1$

b. $(\frac{2}{3})^4 (\frac{2}{3})^7 = (\frac{2}{3})^{11} = \frac{2048}{177147}$

c. $(16x^8y^{-4})^{\frac{3}{4}} = (2^4x^8y^{-4})^{\frac{3}{4}} = 2^3x^6y^{-3} = \frac{8x^6}{y^3}$

d. $-\frac{1}{4}x^7y^{-3} = -\frac{x^7}{4y^3}$

e. $5(-2)^{-5} = \frac{1}{5(-2)^5} = \frac{1}{5(-32)} = -\frac{1}{160}$

f. $-\frac{3x^5y^{-5}}{12x^{-2}y^{-2}} = -\frac{3x^5y^{-5}}{12x^{-2}y^{-2}} = -\frac{1}{4}x^7y^{-3}$

g. $-\frac{x^7}{4y^3}$ or $-\frac{x^7}{4y^3}$

h. $2^3x^6y^{-3} = \frac{8x^6}{y^3}$

i. $(\sqrt[4]{16})^3x^6y^{-3} = 4^3x^6y^{-3} = \frac{64x^6}{y^3}$

j. $2^3x^6y^{-3} = \frac{8x^6}{y^3}$

6. Factor each trinomial.

a) $m^2 - 13m + 42$

simple
 $x = 42$
 $+ = -13$
 $-6, 7$
 $(m-6)(m-7)$

d) $8x^2 + 8xy - 6y^2$

gcf, decomp
 $x = -12$
 $+ = +4$
 $+6, 2$
 $2(4x^2 + 4xy - 3y^2)$
 $2[4x^2 + 6xy - 2xy - 3y^2]$
 $2[2x(2x+3y) - y(2x+3y)]$
 $2(2x+3y)(2x-y)$

b) $2m^2 + 10m + 8$

gcf, simple
 $x = 4$
 $+ = 5$
 $2(m^2 + 5m + 4)$
 $2(m+1)(m+4)$

e) $27m^3 - 12m$

gcf, decomp.
 $3m(9m^2 - 4)$
 $3m(3m+2)(3m-2)$

c) $4x^2 - 5x - 6$

Decomp.
 $x = -24$
 $+ = -5$
 $-8, +3$
 $4x^2 - 8x + 3x - 6$

$4x(x-2) + 3(x-2)$
 $(x-2)(4x+3)$

f) $\sqrt{9x^2 + 36x + 36}$

perfect square trinomial
 $(3x+6)^2$

$2(3x)(6) = 36x$

check middle term or

$(3x+6)(3x+6)$

$9x^2 + 18x + 18x + 36$

$9x^2 + 36x + 36$

complete Decomp.
 $x=6$
 $+ = -7$

h) $2(2x+1)^2 - 7(2x+1) + 3$

let $y = 2x+1$
 $2y^2 - 7y + 3$

$2y^2 - y - 6y + 3$

$y(2y-1) - 3(2y-1)$

$(2y-1)(y-3), y = 2x+1$

$(2(2x+1)-1)(2x+1-3)$

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

g) $\frac{1x^2}{9} - 4y^2$

diff²

$(\frac{x}{3} + 2y)(\frac{x}{3} - 2y)$

or $\frac{1}{9}(x^2 - 36y^2)$

$= \frac{1}{9}(x+6y)(x-6y)$