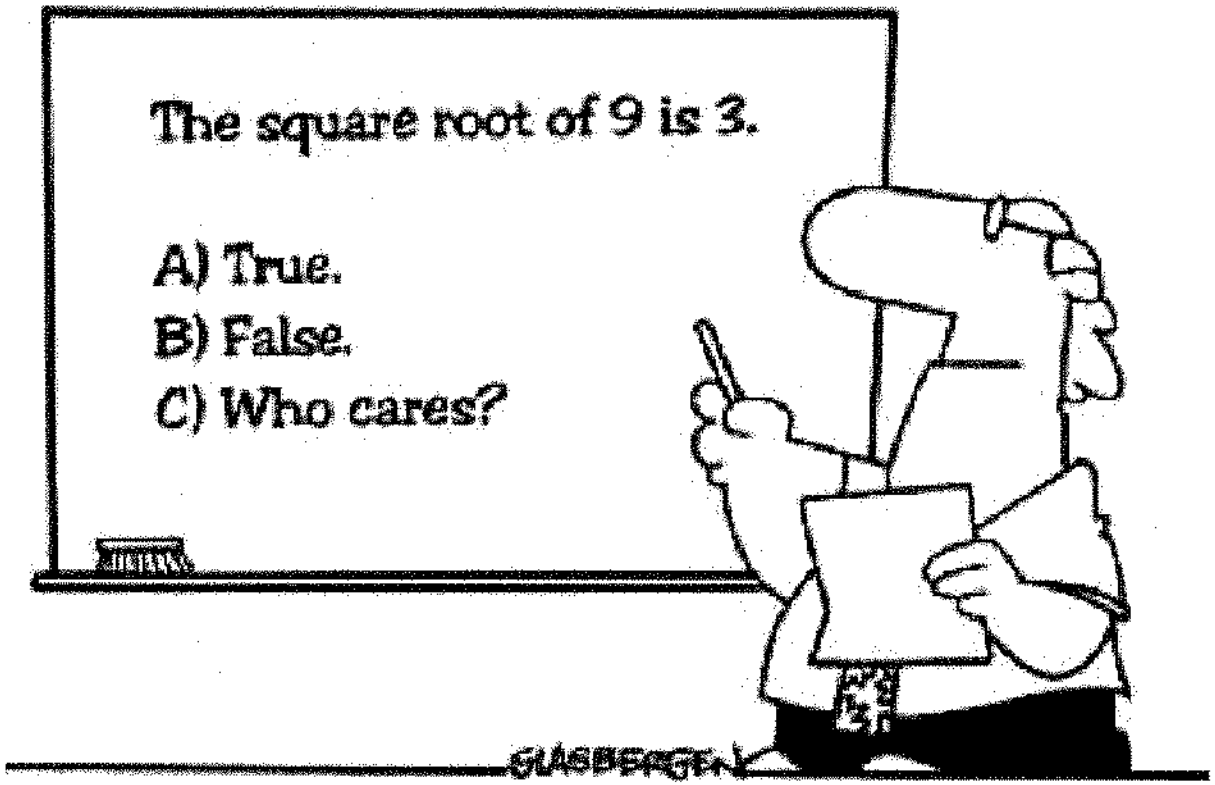
Square Root Review
Solving By Factoring

Notes
Day 1

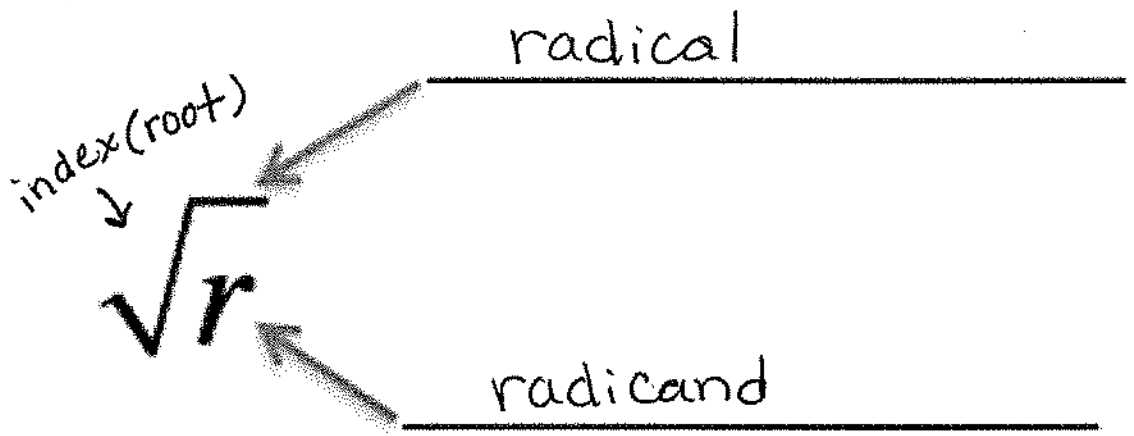


Many students actually look forward to Mr. Atwadder's math tests.

Perfect Squares

$1^2 = 1$	$7^2 = 49$
$2^2 = 4$	$8^2 = 64$
$3^2 = 9$	$9^2 = 81$
$4^2 = 16$	$10^2 = 100$
$5^2 = 25$	$11^2 = 121$
$6^2 = 36$	$12^2 = 144$

Square Root Review



not written for square roots

$\sqrt{r}$ ← radical is a square root symbol when index is 2.

Square Root Properties

- Multiplication: $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$
- Division: $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

*There are NO sum ($\sqrt{a+b}$) or difference ($\sqrt{a-b}$) properties!!!

Simplifying Radicals

$\sqrt{r}$ (index of 2)

*A radical is fully simplified when...

(For square roots (index is 2))

- the radicand has NO perfect square factors other than 1
- there is NO radical in the denominator
- the radicand does NOT involve decimals
- the radicand is positive

ex: Simplify.

a) $\sqrt{25} = \sqrt{5^2} = \boxed{5}$

$= \sqrt{5 \cdot 5}$

5 | 25
5

b) $\sqrt{9} = \sqrt{3^2} = \boxed{3}$

3 | 9
3

ex: Simplify.

c) $\sqrt{100} = \sqrt{10^2} = 10$

d) $-\sqrt{16}$

$-1 \cdot \sqrt{16}$

$4 \quad 4$

$-1 \cdot 4 = -4$

ex: Simplify.

e) $2\sqrt{36}$

$6 \mid 36$, 6

$= 2 \cdot 6$

$= \boxed{12}$

* f) $5\sqrt{-64}$

↑ Can't do this yet

$(?)^2 = \overset{\text{neg}}{\downarrow} -64$

$(8)^2 = 64$

$(-8)^2 = 64$

ex: Simplify.

g) $\sqrt{9} - \sqrt{1}$

↑ Subtract

$3 - 1 = \boxed{2}$

h) $\sqrt{100}\sqrt{4}$

$= 10 \cdot 2$

$= \boxed{20}$

ex: Simplify.

i) $\sqrt{12}$

$3 \mid 12$
$2 \mid 4$
2

$2 \mid 12$
$2 \mid 6$
3

$\boxed{2\sqrt{3}}$

i) $\sqrt{27}$

$3 \mid 27$
$3 \mid 9$
3

$\boxed{3\sqrt{3}}$

Side note:

$\sqrt[3]{27}$

$3 \mid 27$
$3 \mid 9$
3

$= \boxed{3}$

ex: Simplify.

k) $\sqrt{500}$

$5 \mid 500$

$10 \mid 100$

10

$10\sqrt{5}$

l) $\sqrt{98}$

$2 \mid 98$

$7 \mid 49$

7

45
$+4$
49

$= 7\sqrt{2}$

ex: Simplify.

m) $3\sqrt{72}$

$\downarrow$

$3 \cdot 6\sqrt{2}$

$= \boxed{18\sqrt{2}}$

$2 \mid 72$

$6 \mid 36$

6

$35 + 1 = 36$

$8 \mid 72$

$3 \mid 9$

3

$2 \mid 8$

$2 \mid 4$

2

$2 \cdot 3\sqrt{2}$

$6\sqrt{2}$

n) $\sqrt{\frac{9}{64}} = \frac{\sqrt{9}}{\sqrt{64}} = \boxed{\frac{3}{8}}$

* Rationalize w/ a conjugate pair

ex: Simplify.

s) $\dfrac{4}{(2-\sqrt{3})} \cdot \dfrac{(2+\sqrt{3})}{(2+\sqrt{3})}$ — Distribute the 1

Foil

add ( )

$= \dfrac{8+4\sqrt{3}}{4+2\sqrt{3}-2\sqrt{3}-\sqrt{9}}$ — do not add b/c of PEMDAS $\neq 12\sqrt{3}$

$= \dfrac{8+4\sqrt{3}}{4-3} = \dfrac{8+4\sqrt{3}}{1}$

$= \boxed{8+4\sqrt{3}}$ NO $\neq 12\sqrt{3}$ NO NO NO

t) $\dfrac{2}{(1+\sqrt{5})} \cdot \dfrac{(1-\sqrt{5})}{(1-\sqrt{5})}$ — 1

Foil

add ( )

$= \dfrac{2-2\sqrt{5}}{1-\sqrt{5}+\sqrt{5}-\sqrt{25}} = \dfrac{2-2\sqrt{5}}{1-5}$

$= \dfrac{2-2\sqrt{5}}{-4} = \dfrac{2}{\ominus 4} \ominus \dfrac{2\sqrt{5}}{\ominus 4} = \boxed{-\dfrac{1}{2}+\dfrac{\sqrt{5}}{2}}$

simplify

Do not leave a negative in the denominator

ex: Simplify.

u) $\dfrac{5}{(3-\sqrt{2})} \cdot \dfrac{(3+\sqrt{2})}{(3+\sqrt{2})}$ (Foil)

$= \dfrac{15+5\sqrt{2}}{9+3\sqrt{2}-3\sqrt{2}-\sqrt{4}}$

$= \dfrac{15+5\sqrt{2}}{7}$

$= \boxed{\dfrac{15}{7} + \dfrac{5\sqrt{2}}{7}}$

v) $\dfrac{\sqrt{2}}{(1+\sqrt{3})} \cdot \dfrac{(1-\sqrt{3})}{(1-\sqrt{3})}$ (Foil)

$= \dfrac{\sqrt{2}-\sqrt{6}}{1-\sqrt{3}+\sqrt{3}-\sqrt{9}} = \dfrac{\sqrt{2}-\sqrt{6}}{-2}$

$= \dfrac{\sqrt{2}}{-2} \ominus \dfrac{\sqrt{6}}{-2}$

$= \boxed{-\dfrac{\sqrt{2}}{2} + \dfrac{\sqrt{6}}{2}}$

Solving Quadratic Equations By Factoring

*Use solving by factoring when given a quadratic that is factorable.

Find the variable.

ex: Solve. (Find the roots of the equation.)

solutions

2 solutions

a) $x^2 - x - 30 = 0$

no gcf

-30

$1x \quad 1x$

$+5 \quad -6$

$(x+5)(x-6) = 0$

$x+5=0 \quad | \quad x-6=0$

$-5 \quad -5 \quad | \quad +6 \quad +6$

$x=-5 \quad | \quad x=6$

(1) Set equation = 0

zero

(2) Factor

(3) Set each factor = 0

(zero product property)

b) $-2x^2 + 34x = 0$

$-2x$ $-2x$ ✓

gcf

$-2x(x-17)=0$

$\frac{-2x}{-2} = \frac{0}{-2}$ OK | $x-17=0$

$+17 \quad +17$

$x=0$ | $x=17$

c) $x^2 = 64$

$-64 \quad -64$

$x^2 - 64 = 0$

no gcf

DOS

$(x+8)(x-8)=0$

$x+8=0$ | $x-8=0$

$x=-8$ | $x=8$

or $x = \pm 8$

combined ✓ 2 solutions

2 solutions

d) $4x^2 + 4x + 1 = 0$ ✓ PST

no gcf

$(2x+1)(2x+1)=0$

$2x+1=0$
$-1 \quad -1$

$\frac{2x}{2} = \frac{-1}{2}$

$x = -\frac{1}{2}, -\frac{1}{2}$

$+4$

$\frac{4x}{+2}$ $\frac{4x}{+2}$

$\frac{2x}{+1}$ $\frac{2x}{+1}$

$x = -\frac{1}{2}$ w/ multiplicity of 2 (occurs twice)

e) $4x^2 - 17x - 15 = 0$ ✓

no gcf

$(4x+3)(x-5)=0$

$4x+3=0$ | $x-5=0$
$-3 \quad -3$ | $x=5$

$\frac{4x}{4} = \frac{-3}{4}$

$x = \frac{-3}{4}$

-60

1 60
2 30
3 20
4 15
5 12

$\frac{4x}{+3}$ $\frac{4x}{-20}$

$\frac{1x}{-5}$

$-5 \quad -12$ ✗

f) $7x^2 - 42 = -35x$

$+35x \quad +35x$

$7x^2 + 35x - 42 = 0$

$\frac{7x^2}{7} + \frac{35x}{7} - \frac{42}{7} = 0$

gcf

$7(x^2 + 5x - 6) = 0$

$7(x-1)(x+6) = 0$

$7 \neq 0$ ↑ no variable here

$x - 1 = 0$ | $x = 1$

$x + 6 = 0$ | $x = -6$

-6

$+2 \quad +3x$

$1x \quad 1x$

$-1 \quad +6$

g) $x(x-4) = -4$

Do not use these factors b/c NOT zero ↑

$x^2 - 4x = -4$

$+4 \quad +4$

$x^2 - 4x + 4 = 0$

$+4$

$1x \quad 1x$

$-2 \quad -2$

$(x-2)(x-2) = 0$

$x - 2 = 0$

$x = 2$ w/ mult. of 2