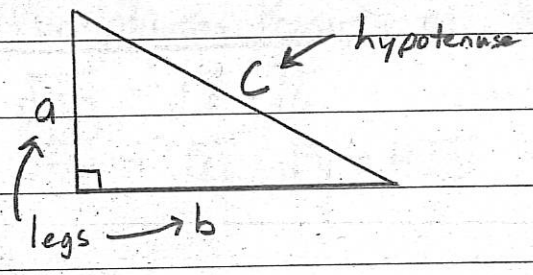
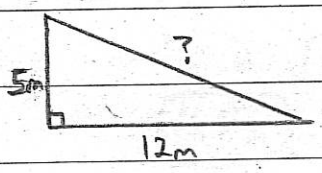
The Pythagorean Theorem



$$c^2 = a^2 + b^2$$

Find the missing side length.

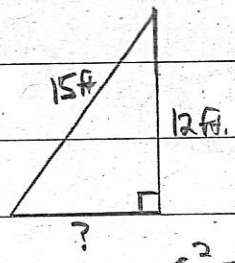
① 

$c^2 = a^2 + b^2$

$c^2 = 5^2 + 12^2$

$\sqrt{c^2} = \sqrt{169}$

$c = 13m$

② 

$c^2 = a^2 + b^2$

$15^2 = a^2 + 12^2$

$225 = a^2 + 144$

$-144 \quad -144$

$\sqrt{81} = \sqrt{a^2}$

$9ft = a$

The Converse of the Pythagorean Theorem

IF $c^2 = a^2 + b^2$, then the triangle is a right triangle.

Determine if the side lengths result in a right triangle.

③ 4, 8, 10

$10^2 \stackrel{?}{=} 4^2 + 8^2$

$100 \stackrel{?}{=} 16 + 64$

$100 \neq 80$ No

④ 10, 24, 26

$26^2 \stackrel{?}{=} 10^2 + 24^2$

$676 \stackrel{?}{=} 100 + 576$

$676 = 676$ Yes, it is a right triangle

Simplifying Radicals

Multiplication Property of Square Roots

$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$

$\sqrt{48} = \sqrt{16} \cdot \sqrt{3} = 4\sqrt{3}$

Simplify each radical expression.

① $\sqrt{72} = \sqrt{9} \cdot \sqrt{4} \cdot \sqrt{2}$
$= 3 \cdot 2 \cdot \sqrt{2}$
$= \boxed{6\sqrt{2}}$

② $\sqrt{54y^9} = \sqrt{9y^8} \cdot \sqrt{6y}$
$= \boxed{3y^4\sqrt{6y}}$

③ $2\sqrt{7b} \cdot 3\sqrt{14b^2} = 6\sqrt{98b^3}$
$= 6 \cdot \sqrt{49b^2} \cdot \sqrt{2b}$
$= 6 \cdot 7b \cdot \sqrt{2b}$
$= \boxed{42b\sqrt{2b}}$

④ $\sqrt{\frac{8x^3}{50x}} = \sqrt{\frac{4x^2}{25}}$
$= \frac{\sqrt{4x^2}}{\sqrt{25}} = \boxed{\frac{2x}{5}}$

Division Property of Square Roots

$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

$\sqrt{\frac{36}{49}} = \frac{\sqrt{36}}{\sqrt{49}} = \frac{6}{7}$

Rationalize the denominator.

⑤ $\frac{\sqrt{3}}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \boxed{\frac{\sqrt{21}}{7}}$

Operations with Radical Expressions

What is the simplified form of each expression?

① $\sqrt{5} - 8\sqrt{5}$

$-7\sqrt{5}$

② $4\sqrt{7} + 2\sqrt{28}$

$4\sqrt{7} + 2\sqrt{4}\cdot\sqrt{7}$

$4\sqrt{7} + 4\sqrt{7}$

$8\sqrt{7}$

③ $(\sqrt{6} - 2\sqrt{3})(4\sqrt{3} + 3\sqrt{6})$ ← FOIL

$4\sqrt{18} + 3\sqrt{36} - 8\sqrt{9} - 6\sqrt{18}$

$4\cdot\sqrt{9}\cdot\sqrt{2} + 3\cdot 6 - 8\cdot 3 - 6\sqrt{9}\cdot\sqrt{2}$

$4\cdot 3\cdot\sqrt{2} + 18 - 24 - 6\cdot 3\cdot\sqrt{2}$

$12\sqrt{2} + 18 - 24 - 18\sqrt{2}$

$-6\sqrt{2} - 6$

Rationalize the denominator.

④ $\frac{10}{\sqrt{7}-\sqrt{2}} \cdot \frac{\sqrt{7}+\sqrt{2}}{\sqrt{7}+\sqrt{2}}$ ← conjugate

$\frac{10(\sqrt{7}+\sqrt{2})}{7-2}$

$\frac{10(\sqrt{7}+\sqrt{2})}{5}$

$2(\sqrt{7}+\sqrt{2})$

$2\sqrt{7}+2\sqrt{2}$

Find the solution. Round-Tenths

⑤ $\frac{1+\sqrt{5}}{2} = \frac{4}{w}$

$\frac{w(1+\sqrt{5})}{1+\sqrt{5}} = \frac{8}{1+\sqrt{5}} \cdot \frac{1-\sqrt{5}}{1-\sqrt{5}}$

$= \frac{8(1-\sqrt{5})}{1-5}$

$= \frac{8(1-\sqrt{5})}{-4}$

$= -2(1-\sqrt{5})$

$= -2+2\sqrt{5} \approx 2.5$

Solving Radical Equations

Solve each equation.

① $\sqrt{x} - 5 = -2$

$+5 \quad +5$

$\sqrt{x}^2 = 3^2$

$x = 9$

② $\sqrt{7x-4}^2 = \sqrt{5x+10}^2$

$7x - 4 = 5x + 10$

$-5x \quad -5x$

$2x - 4 = 10$

$+4 \quad +4$

$\frac{2x}{2} = \frac{14}{2}$

$x = 7$

③ $(-y)^2 = \sqrt{y+6}^2$

$y^2 = y + 6$

$-y-6 \quad -y-6$

$y^2 - y - 6 = 0$

$(y-3)(y+2) = 0$

$y = 3, \; y = -2$

$-y = \sqrt{y+6}$ $\quad -y = \sqrt{y+6}$

$-3 = \sqrt{3+6}$ $\quad 2 = \sqrt{-2+6}$

$-3 = \sqrt{9}$ $\quad 2 = \sqrt{4}$

$-3 \neq 3$ $\quad 2 = 2$

↑ Extraneous Solution

$y = -2$

④ $\sqrt{3y} + 8 = 2$

$-8 \quad -8$

$\sqrt{3y}^2 = -6^2$

$\frac{3y}{3} = \frac{36}{3}$

$y = 12$

$\sqrt{3y} + 8 = 2$

$\sqrt{3 \cdot 12} + 8 = 2$

$\sqrt{36} + 8 = 2$

$6 + 8 = 2$

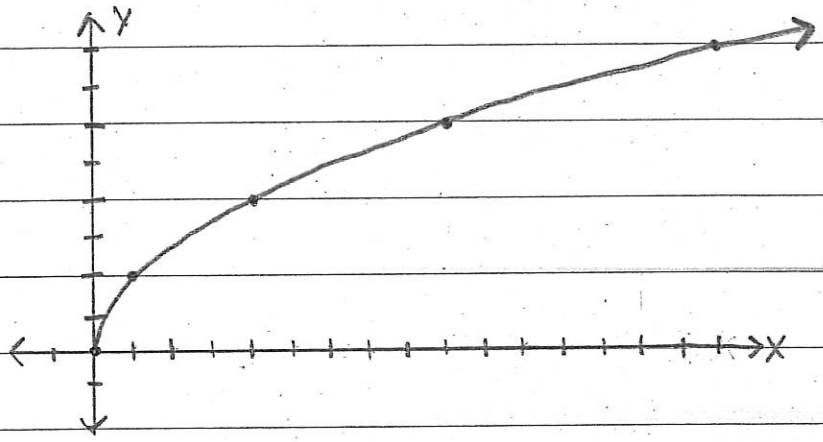
$14 \neq 2$

No Solution

Graphing Square Root Functions

Make a table of values and graph $y = 2\sqrt{x}$

x	y
0	0
1	2
4	4
9	6
16	8



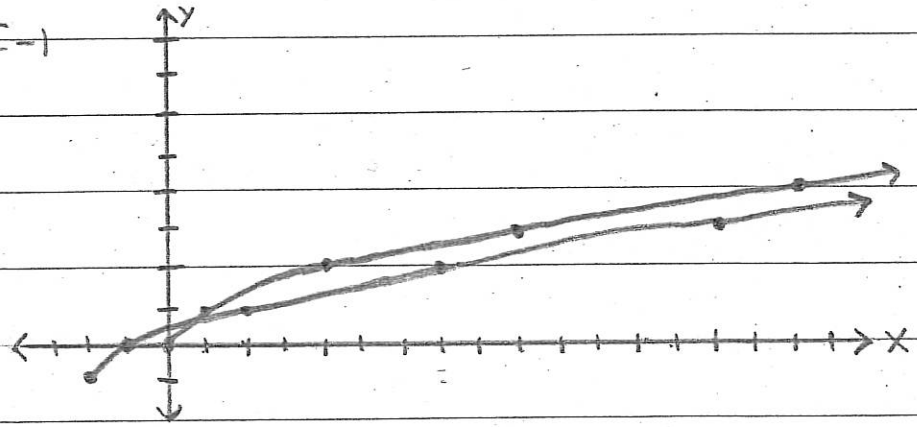
Graph $y = \sqrt{x}$ and $y = \sqrt{x+2} - 1$.

$y = \sqrt{x}$

x	y
0	0
1	1
4	2
9	3
16	4

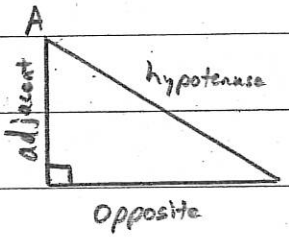
$y = \sqrt{x+2} - 1$

x	y
-2	-1
-1	0
2	1
7	2
14	3



Trigonometric Ratios

Name	Written	Definition
Sine of $\angle A$	$\sin A$	$\frac{\text{opposite}}{\text{hypotenuse}}$
Cosine of $\angle A$	$\cos A$	$\frac{\text{adjacent}}{\text{hypotenuse}}$
Tangent of $\angle A$	$\tan A$	$\frac{\text{opposite}}{\text{adjacent}}$



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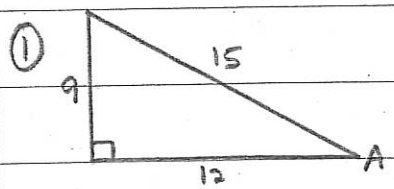
What are $\sin A$, $\cos A$, and $\tan A$ for the triangle?

① 

$\sin A = \frac{9}{15}$ $\quad \cos A = \frac{12}{15}$ $\quad \tan A = \frac{9}{12}$

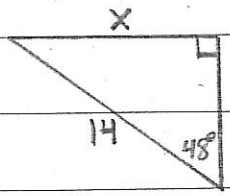
Find the value of each expression. Round - ten-thousandth

② $\sin 23° = .3907$

③ $\cos 84° = .1045$

④ $\tan 56° = 1.4826$

Find the value of x to the nearest tenth.



$\sin 48° = \frac{x}{14}$

$x = 14(\sin 48°)$

$x \approx 10.4$