$\boxed{\text{Algebra 2}}$ MONDAY 11-26-12 $\boxed{\text{CLASS NOTES}}$

Mini Review - Permutations $_nP_r$

Combinations $_nC_r$

Trig. Functions

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3 STUDENTS IN 3 seats $\Rightarrow 3! = \boxed{6}$

(Ex) 3 STUDENTS IN 2 seats $\Rightarrow$

$$_3P_2 = \frac{3!}{(3-2)!} = \frac{6}{1!} = \boxed{6}$$

(Ex) H, C, J

SEAT 1	SEAT 2	OUTCOME
H	C	HC
	J	HJ
C	H	CH
	J	CJ
J	H	JH
	C	JC

(Ex) 2 STUDENTS IN 3 seats $\Rightarrow {}_3P_2 = \boxed{6}$

(Ex) H, C, let X be empty

1ST	2ND	3RD	OUTCOME
X	H	C	XHC
	C	H	XCH
H	X	C	HXC
	C	X	HCX
C	X	H	CXH
	H	X	CHX

7 ACTIVITIES IN 2 days $\Rightarrow$

$${}_7P_2 = \frac{7!}{(7-2)!} = \frac{7!}{5!} = 7 \cdot 6 = 42$$

2 ACTIVITIES IN 7 days $\Rightarrow$

$${}_7P_2 = 42$$

$${}_7C_2 = \frac{7!}{(7-2)!\,2!} = \frac{7 \cdot 6}{2 \cdot 1} = \frac{42}{2} = \boxed{21}$$

COMBINATION CAN BE FOUND IN PASCAL' Δ

row column

Pascal's Triangle and $_nC_r$

COMBINATIONS

Row 0 → 1

Ex

Column 0 → 1 2 1 ← Row 2 Col 2

http://www.mathsisfun.com/pascals-triangle.html

So Pascal's Triangle could also be an **"n choose k"** triangle like this:

r

(Note how the top row is **row zero** and also the leftmost column is zero)

$$
\begin{array}{ccccccccc}
 & & & & \binom{0}{0} & & & & \\
 & & & \binom{1}{0} & & \binom{1}{1} & & & \\
 & & \binom{2}{0} & & \binom{2}{1} & & \binom{2}{2} & & \\
 & \binom{3}{0} & & \binom{3}{1} & & \binom{3}{2} & & \binom{3}{3} & \\
\binom{4}{0} & & \binom{4}{1} & & \binom{4}{2} & & \binom{4}{3} & & \binom{4}{4}
\end{array}
$$

Example: Row 4, term 2 in Pascal's Triangle is "6" ...

... let's see if the formula works:

$$4C_2 \Rightarrow \binom{4}{2} = \frac{4!}{2!(4-2)!} = \frac{4!}{2!2!} = \frac{4\cdot 3\cdot 2\cdot 1}{2\cdot 1\cdot 2\cdot 1} = 6$$

Yes, it works! Try another value for yourself.

This can be very useful ... you can now work out any value in Pascal's Triangle **directly** (without calculating the whole triangle above it).

Polynomials

Pascal's Triangle can also show you the coefficients in binomial expansion:

Power	Binomial Expansion	Pascal's Triangle
2	$(x + 1)^2 = \mathbf{1}x^2 + \mathbf{2}x + \mathbf{1}$	1, 2, 1
3	$(x + 1)^3 = \mathbf{1}x^3 + \mathbf{3}x^2 + \mathbf{3}x + \mathbf{1}$	1, 3, 3, 1
4	$(x + 1)^4 = \mathbf{1}x^4 + \mathbf{4}x^3 + \mathbf{6}x^2 + \mathbf{4}x + \mathbf{1}$	1, 4, 6, 4, 1
	... etc ...	

$$_{10}C_6 = \frac{10!}{(10-6)!\,6!} = \frac{10\cdot 9\cdot 8\cdot 7}{4\cdot 3\cdot 2\cdot 1} = \boxed{210}$$

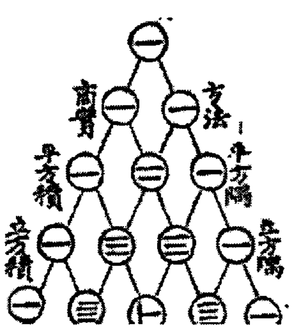
The First 15 Lines

For reference, I have included row 0 to 14 of Pascal's Triangle

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1
1 9 36 84 126 126 84 36 9 1
1 10 45 120 210 252 $\boxed{210}$ 120 45 10 1
1 11 55 165 330 462 462 330 165 55 11 1
1 12 66 220 495 792 924 792 495 220 66 12 1
1 13 78 286 715 1287 1716 1716 1287 715 286 78 13 1
1 14 91 364 1001 2002 3003 3432 3003 2002 1001 364 91 14 1

$_{10}C_6$

$\boxed{210}$ = row 10
col 6



The Chinese Knew About It

This drawing is entitled "The Old Method Chart of the Seven Multiplying Squares". View Full Image

It is from the front of Chu Shi-Chieh's book *"Ssu Yuan Yü Chien" (Precious Mirror of the Four Elements)*, written in **AD 1303** (over 700 years ago, and more than 300 years before Pascal!), and in the book it says the triangle was known about more than two centuries before that.

http://www.mathsisfun.com/pascals-triangle.html

Ch. 10-1 Right Angle Trigonometry

- Vocabulary
- SOHCAHTOA
- 30-60-90 / 45-45-90
- The Reciprocal Trig. Functions

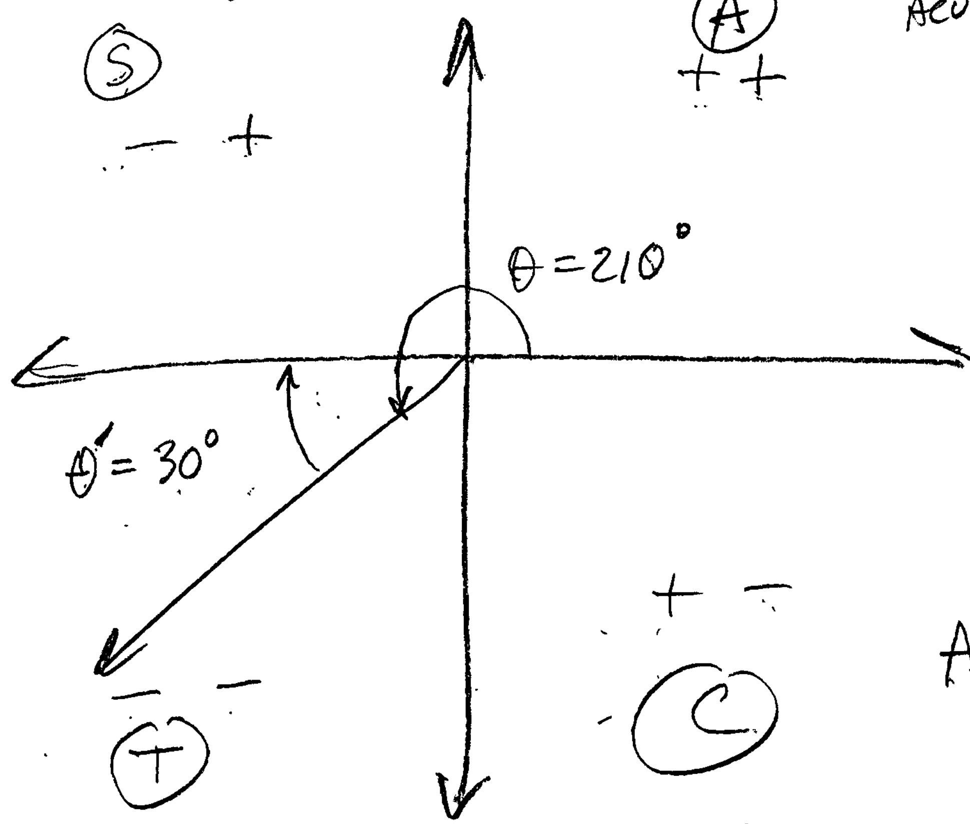
Ch 10-2 Angles of Rotation
Ch 10-3 The Unit Circle

- +, - Angles, initial/terminal side
- Reference Angles
- Trig Functions given P(x, y)
  Ex 4 - Pg 702 P(4, -5)
- radian
- Unit Circle
- Quadrantal Angles
- ASTC
- Trig Functions of any angle

REF
"back to X axis"
ACUTE

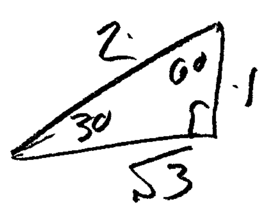
θ = theta
θ' = theta prime

EXACT $\sin 210°$



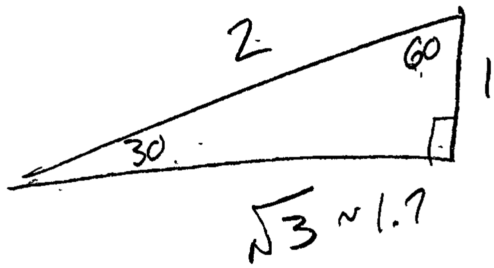
ASTC

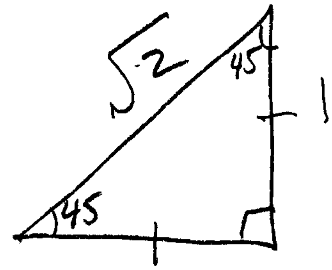
$\boxed{\sin 210 = -\sin 30 = -\frac{1}{2}} = -.5000$

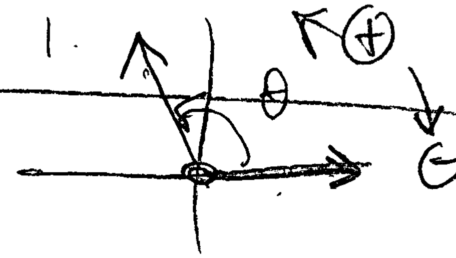


SIN $\frac{O}{H}$	CSC $\frac{H}{O}$	cosecant
COS $\frac{a}{H}$	sec $\frac{H}{a}$	secant
tan $\frac{O}{a}$	cot $\frac{a}{O}$	cotangent

SOH CAH TOA

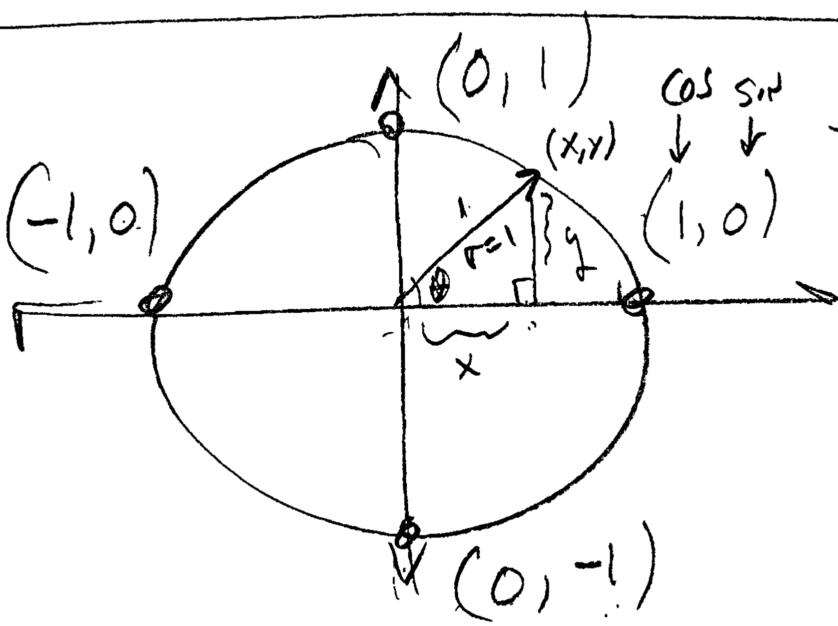






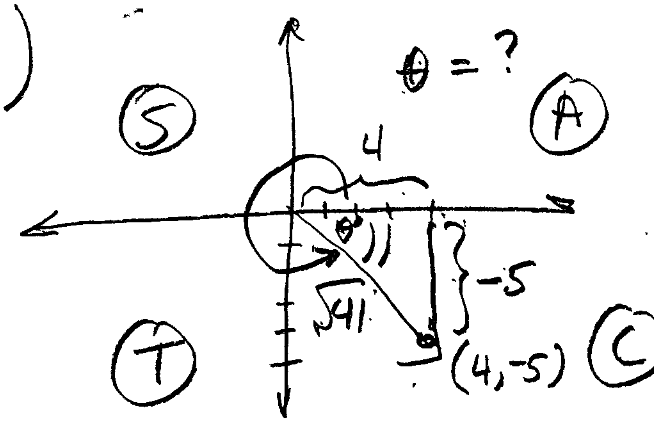
$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

Quadrantal Angle An angle whose terminal side is on the x or y axis



$$\tan = \frac{y}{x} = \frac{0}{1} = 0$$

* Ex 4 pg 702 $P(4,-5)$



$\sin\theta = -\sin\theta'$

$$\boxed{\sin\theta = -\frac{5}{\sqrt{41}} = -\frac{5\sqrt{41}}{41}}$$

EXACT VALUE

$(hyp)^2 = 4^2 + (5)^2$

$(hyp)^2 = 16 + 25$

$(hyp)^2 = 41$

$hyp = \sqrt{41}$

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* Find the trig. functions (only $\sin\theta$ shown) for an angle with a terminal side at $P(4,-5)$

Tip: Use Pythagorean Theorem to find hypotenuse first.