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$20x^3 \div 5x^2 = 4x$
$30a^4 \div 6a^2 = 5a^2$

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Similar triangles
SAS, ASA, AAS, SSS, AAS, AAA,

M9 - Remember

$2^3 \times 5^2 \neq 10^5$ $\quad$ $2^3 \times 5^3 \neq 10^3$

Algebra

$a(b) = a \times b = ab$

$a(-b) = a \times (-b) = -ab$
$2(-3) = 2 \times (-3) = -6$

$-a(-b) = -a \times (-b) = +ab$
$-2(-3) = -2 \times (-3) = +6$

$-a(b) = -a \times (b) = -ab$
$-2(3) = -2 \times (3) = -6$

Exponents
Laws
Need same base!

$2^3 = 2 \times 2 \times 2$
$3 \times 3 = 3^2$

$3^2 - 2^2 \neq 1^2$

Mistakes
Never multiply the base by the exponent
$2^3 \neq 2 \times 3$
$3^2 \neq 3 \times 2$

$2^3 = 8$	$2^4 = 16$	Negative numbers without brackets stay negative $-2^3 = -8$ $\quad$ $-2^4 = -16$
Negative numbers with brackets to odd exponents stay negative. $(-2)^3 = -8$	*Negative numbers with brackets to even exponents become positive* $(-2)^4 = 16$	Unnecessary brackets $-(2)^3 = -8$ $\quad$ $-(2)^4 = -16$ $(-2^3) = -8$ $\quad$ $(-2^4) = -16$
$-(-2)^3 = 8$	$-(-2)^4 = -16$	$-(-2)^3 = 8$ $\quad$ $-(-2)^4 = -16$

Polynomials

Remember to circle the term's sign!

$2 - 2x + 3 + 4x$
$= 2 + 3 - 2x + 4x$
$= 5 + 2x$

Can only add or subtract Like Terms

Or

Cannot add or subtract unlike terms

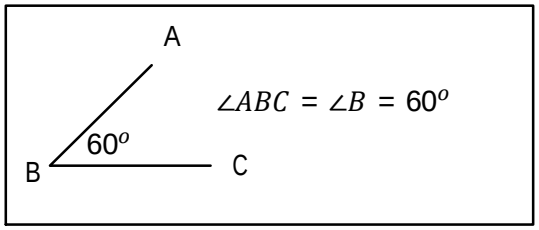
Inequality:
-The alligator eats the bigger number.
-When graphing inequalities/solving treat the inequality sign like an equal sign.
-Divide /Multiply by a negative: Change the direction of the sign .

$Greater\ than: >$
$Greater\ than\ or\ equal\ to: \geq$
$Less\ than: <$
$Less\ than\ or\ equal\ to: \leq$
$Does\ not\ equal: \neq$

$\leq, \geq$ $\quad$ [ ] ——
Included $\quad$ (closed, square, solid)

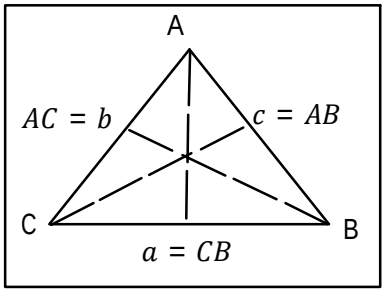
$<, >$ $\quad$ ○ $\quad$ ( ) $(-\infty, \infty)$ – – – –
Not Included $\quad$ (open, round, dotted)

Circles



$\angle ABC = \angle B = 60^o$

ΔABC



M9 - 2.0 - Real/Irrational/Rational/Integers/Whole/Natural Review

Real Numbers

$(\ldots\ -\frac{3}{1}, -\frac{5}{2}, -\frac{1}{1}, -\frac{1}{7}, \frac{0}{1}, \frac{1}{13}, \frac{1}{17}, \frac{2}{3}, \frac{1}{1}, \frac{2}{1}, \pi, \sqrt{2}\ \ldots)$

Irrational Numbers

$(\ldots, e, \pi, 5.49\ldots, \sqrt{2}\ \ldots, \ldots)$

Decimal: - **Does not end**
- **Does not repeat**

OR

Cannot be expressed as a fraction

Rational Numbers

$(\ldots\ -\frac{5}{2}, -\frac{2}{1}, -\frac{3}{2}, -\frac{1}{1}, \frac{0}{1}, \frac{1}{2}, \frac{2}{3}, \frac{1}{1}, \frac{3}{1}, \ldots)$

Decimal: - **end**s
- **repeats**

OR

Can be expressed as a fraction

Integers

$(\ldots\ -3, -2, -1, 0, 1, 2, 3, \ldots)$

Whole Numbers

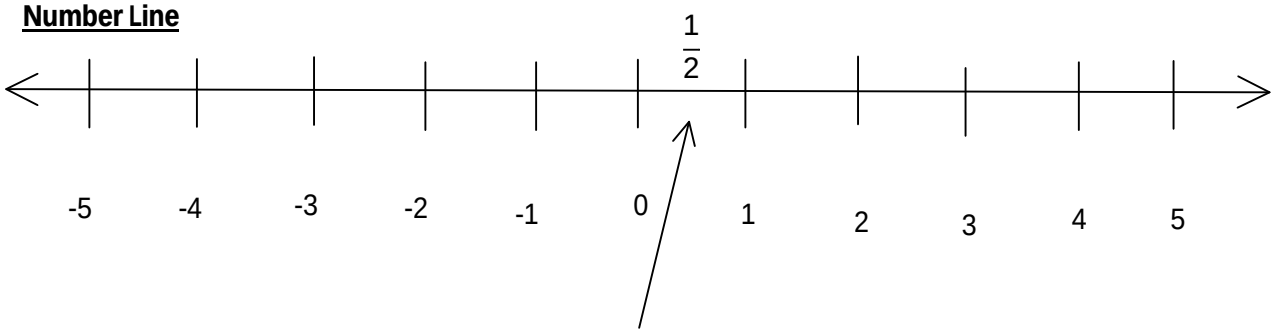
(0, 1, 2, 3, ...)

Natural Numbers

(1, 2, 3, ...)

- All numbers are real.
- Irrational numbers cannot be expressed as a fraction.
- Rational numbers can be expressed as a fraction.

Number Line



A number can be shown on a number line with a dot and the number above or below.

M9 - 3.0 - Exponents Review

Base → 7^2 ← Exponent

Remember:
-Never multiply the base by the exponent
-Must have same base to use laws.

	Rule:	**Example:**	
1)	$2^3 \times 2^2 = 2^{3+2} = 2^5 = 32$	$2^3 \times 2^2 = (2 \times 2 \times 2) \times (2 \times 2) = 2^5$	*Add exponents*
2)	$\frac{3^5}{3^2} = 3^{5-2} = 3^3 = 27$	$\frac{3^5}{3^2} = \frac{3 \times 3 \times 3 \times \cancel{3} \times \cancel{3}}{\cancel{3} \times \cancel{3}} = 3^3$	*Subtract exponents*
3)	$(2^2)^3 = 2^{2\times3} = 2^6 = 64$	$(2^2)^3 = (2 \times 2) \times (2 \times 2) \times (2 \times 2) = 2^6$	*Multiply exponents*
	$(2x)^3 = 2^3x^3 = 8x^3$	$(2x)^3 = (2x) \times (2x) \times (2x) = 8x^3$	*Distribute exponents*
	$\left(\frac{3}{5}\right)^2 = \frac{3^2}{5^2} = \frac{9}{25}$	$\left(\frac{3}{5}\right)^2 = \frac{3}{5} \times \frac{3}{5} = \frac{3^2}{5^2} = \frac{9}{25}$	*Distribute exponents*

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4) $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$ *Bring to the bottom, make exponent positive*

$\frac{1}{3^{-2}} = \frac{3^2}{1} = 9$ *Bring to the top, make exponent positive*

---

5) $-2^2 = -2 \times 2 = -4$ $\boxed{-2^2 = (-2^2)}$ *Negative numbers WITHOUT brackets stay NEGATIVE*

$(-2)^2 = (-2) \times (-2) = 4$ *Negative numbers with brackets to EVEN exponents become POSITIVE*

$(-4)^3 = (-4) \times (-4) \times (-4) = -64$ *Negative numbers with brackets to ODD exponents stay NEGATIVE*

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6) $5^0 = 1$ *Anything (nonzero) to the 0 is 1.*

$8^1 = 8$ *Anything to the 1 is itself.*

$1^{12} = 1$ *1 to the anything is 1.*

0 to the (positive) anything is 0.

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7) *Theory*

$3^3 = 27$ ÷ 3

$3^2 = 9$ ÷ 3

$3^1 = 3$ ÷ 3

$3^0 = 1$

$3^{-1} = \frac{1}{3^1} = \frac{1}{3}$

$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

$x \times x = x^2$
$x \times x^2 = x^3$

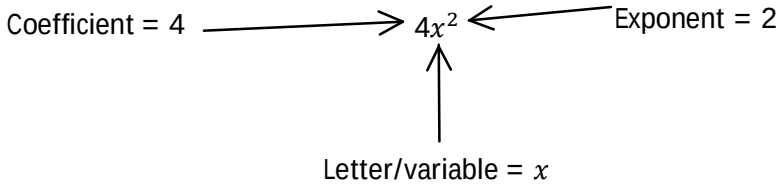
$\frac{x^3}{x^2} = \frac{x \times x \times x}{x \times x} = x$
$\frac{x^2}{x} = \frac{x \times x}{x} = x$
$\frac{x^3}{x} = \frac{x \times x \times x}{x} = x^2$
$\frac{x}{x} = 1$
$\frac{x}{x^2} = \frac{\cancel{x}1}{x \times \cancel{x}} = \frac{1}{x}$

$\frac{x^3}{x^2} = x$
$\frac{x^2}{x} = x$
$\frac{x^3}{x} = x^2$
$\frac{x}{x} = 1$
$\frac{x}{x^2} = \frac{1}{x}$

M9 - 3.0 - Exponents Table

^	0	1	2	3	4	5	6	7	8	9	10
0		0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1
2	1	2	**4**	8	**16**	32	**64**	128	**256**	**512**	**1024**
3	1	3	9	27	**81**	243	**729**				
4	1	4	**16**	**64**	**256**	**1024**					
5	1	5	25	125	625						
6	1	6	36	216							
7	1	7	49	343							
8	1	8	**64**	**512**							
9	1	9	**81**	**729**							
10	1	10	100	1000							
11	1	11	121								
12	1	12	144								
13	1	13	169								
14	1	14	196								
15	1	15	225								
16	1	16	**256**								
17	1	17	289								
18	1	18	324								
19	1	19	361								
20	1	20	400	8000							

M9 - 5.0 - Algebraic Expressions Review



Coefficient: a number in front of a variable

Variable: a letter

Exponent: $3^2 = 3 \times 3 = 9$
$5^3 = 5 \times 5 \times 5 = 125$

Like term: same letter(s), same exponent(s).

Term		Like terms
2	_____ _____	1, 2, 3, 4, 5, 6, ...
a	_____ _____	a, 2a, 3a, 4a, ...
x	_____ _____	$x, 2x, 3x, 4x, \ldots$
a^2	_____ _____	$a^2, 2a^2, 3a^2, 4a^2, \ldots$

Adding and Subtracting like terms.

$a + a = 2a$
$3a + 2a = 5a$
$6a - 3a = 3a$
$a^2 + a^2 = 2a^2$

Add or subtract coefficients.

$a + 1 = a + 1$

You can only add and subtract like terms.

You cannot add or subtract unlike terms.

Multiplying and Dividing

$a \times a = a^2$
$2a \times 3a = 6a^2$
$3x^2 \times 5x^3 = 15x^5$

Multiply coefficients, add exponents

$20x^3 \div 5x^2 = 4x$
$30a^4 \div 6a^2 = 5a^2$

Divide coefficients, subtract exponents

Degree of term: The variable exponent or sum of variable exponents.

Term	Degree:	
x^2	2	
$x^2(y^3)$	5	
$8 = 8x^0$	0	Numbers have a degree of "zero"
x^1	1	

Leading Term: The term with the highest degree.

Degree of polynomial: Degree of highest degree term.

Polynomial	Leading Term:	Degree of Polynomial
$x^2 - 4$	x^2	2
$2x^2 - 5x^3$	$-5x^3$	3
$3x + 2$	$3x$	1
$8x^2y + 5x + 2$	$8x^2y$	3

Polynomial: Terms with variables with whole number exponents.

	Examples:
Monomial: One term.	$2, x, x^2, 2xy, 5z, 10$
Binomial: Two terms.	$x + 2, x^2 - 4, xy + 5, 3x^2 + y^2, 2x^2 + x$
Trinomial: Three terms.	$x^2 + 5x + 6, a + b + c$
Polynomial: Monomials, Binomials, Trinomials and more than three terms.	$2, x + 2, x^2 + 5x + 6, a + b + c + d + e$

Not Polynomial: $\sqrt{x}, \frac{1}{x}, x^{-2}, 2^x$

M9 - 9.0 - Inequalities Review

5 is less than 8. $5 < 8$
8 is greater than 5. $8 > 5$

7 is less than or equal to 7. $7 \leq 7$
9 is greater than or equal to 7. $9 \geq 7$

The alligator eats the bigger section.

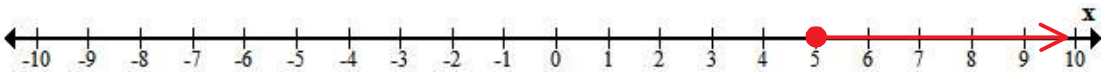
$5 \lessdot 8$

$\leq, \geq$ ● [ ] ——
Included (closed, square, solid)

$<, >$ ○ ( ) $(-\infty, \infty)$ – – – –
Not Included (open, round, dotted)

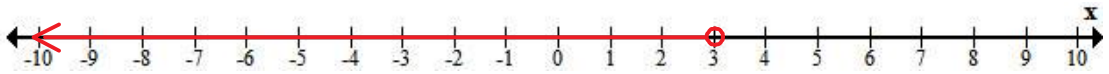
Sketching Inequalities

$x \geq 5$

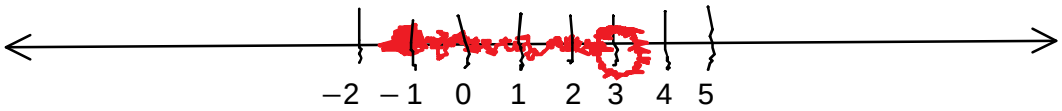


Place a **closed circle** at 5 on the number line (when a x can equal 5)
Draw a line with an arrow to the right (greater than)

$x < 3$



Place an **open circle** at 3 (when x cannot equal 3)
Draw a line with an arrow to the left (less than)



$-1 \leq x < 3$ Inbetween

M9 - 10.0 - Circles Review

Parallel Line Rules

Angles on a line sum to 180. (supplementary)
Opposite angles are equal.
Alternate interior angles equal.
Corresponding angles equal.
Co-Interiors angles add to 180^o
Angles on a point add to 360^o

Methods

Rotate the Page
Extend Parallel lines
Extend the transversal lines
Draw a radius/Connect Points
Draw a radius to exterior point

Identify an unknown as "x"

Equal/Parallel Lines

Tick/Double Tick The Equal Lines
Arrow the Parallel Lines
If multiple act accordingly

Identifying Angles in Circles

1. Make a slice of pie with your left and right hand.
2. Central/inscribed angle is between your index fingers.
3. Arc/chord is crust of piece of pie.
4. Shade Arc

Finding Shared Arcs/Chords

Do you see an angle measure?
What type of angle is it?
Where is its arc/chord?
Shade in its arc.
Are there any other angles from that arc/chord.

Circle Rules

Central angles from same/equal chords are equal.
Inscribed angles from same/equal chords are equal.

Inscribed angles are half central angles from same/equal chords.
Central angles are twice inscribed angles from same/equal chords

Opposite angles in a cyclic quadrilateral sum to 180.

Tangent lines are perpendicular to radius.
Perpendicular bisector of a chord passes through center of circle.
Tangents to exterior points are equal.
Inscribed angles in a semi-circle equal $90^{o.}$

The angle between the tangent and the chord is equal to the inscribed angle on the opposite side of the chord.

Triangles

Draw Triangles
$180^0 in\ a\ triangle$
Isosceles
Equilateral
Right - Pythagoras

Polygons

$Sum\ of\ Interior\ Angles = (n-2) \times 180$

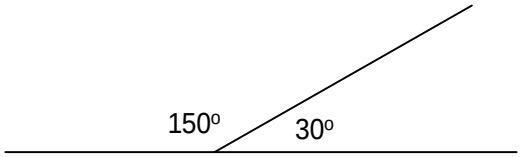
$Interior\ Angle = \frac{Sum}{n} = \frac{(n-2) \times 180}{n}$

$n = \#\ of\ sides$

$Interior + Exterior = 180^o$

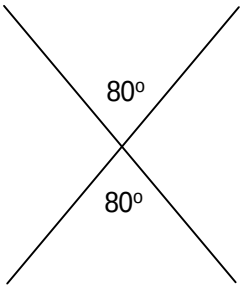
$Sum\ of\ all\ Exterior\ Angles\ sum\ to\ 360$

M9 - 10.1 - Parallel Lines Rules Review



$\angle 1 + \angle 2 = 180^o$

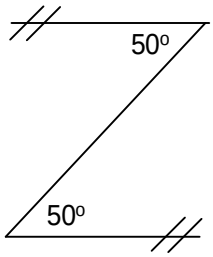
Angles on a line sum to 180. (supplementary)



Opposite angles are equal.

$\angle 1 = \angle 2$

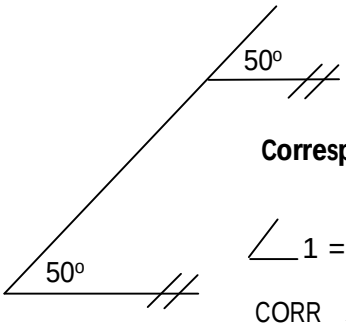
OPP $\angle$'s =



Alternate interior angles equal.

$\angle 1 = \angle 2$

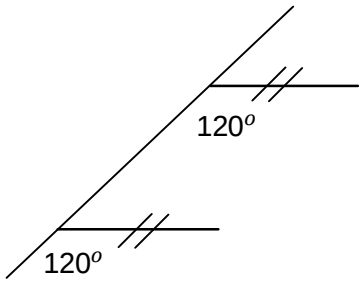
Alt int. $\angle$'s =



Corresponding angles equal.

$\angle 1 = \angle 2$

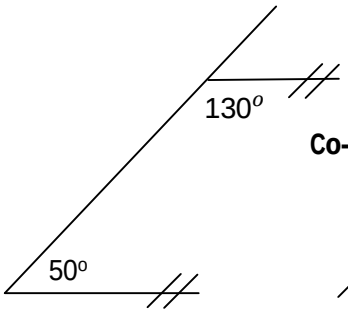
CORR $\angle$'s =



Corresponding angles equal.

$\angle 1 = \angle 2$

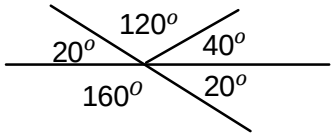
CORR $\angle$'s =

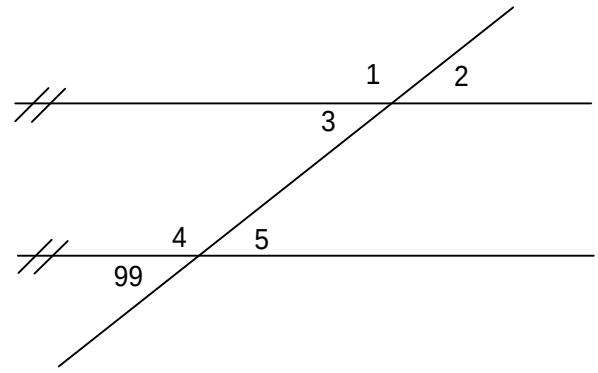


Co-Interiors $\angle$ add to 180°

$/\!/$: parallel lines.

Angles on a point add to 360^o





$\angle 1 + \angle 2 = 180^o$

$\angle 3 = \angle 2$

$\angle 3 = \angle 5$

$\angle 1 = \angle 4$

$\angle 3 + \angle 4 = 180^o$

Angles on a line sum to 180.

OPP $\angle$'s =

Alt int. $\angle$'s =

CORR $\angle$'s =

$Co-Interior \angle add\ to\ 180^o$

Parallel lines: lines that never touch
Transversal: a line passing through parallel lines.
Alternate: angles across a transversal.
Interior: angles inside parallel lines.
Co-interior: angles inside parallel lines on the same side of a transversal

$/\!/$: parallel lines.

Extend the Lines