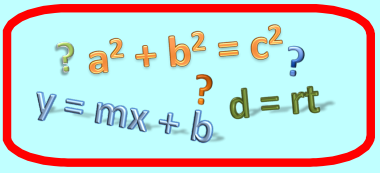
Math 115

Spring 2018

Lecture 18



Use exponential rules to Simplify

① $x^8 \cdot x^5 = x^{8+5} = \boxed{x^{13}}$

② $(x^8)^5 = x^{8 \cdot 5} = \boxed{x^{40}}$

③ $(-2x^4)^3 = (-2)^3 (x^4)^3 = \boxed{-8x^{12}}$

④ $(x^6)^4 \cdot (x^5)^3 = x^{24} \cdot x^{15} = \boxed{x^{39}}$

⑤ $(-3x^5y^2)^4 \cdot y^7 = (-3)^4 (x^5)^4 (y^2)^4 \cdot y^7 = 81x^{20}y^8y^7 = \boxed{81x^{20}y^{15}}$

⑥ $\frac{x^{12}}{x^{10}} = x^{12-10} = \boxed{x^2}$

⑦ $\frac{(x^6)^5}{(x^{10})^3} = \frac{x^{30}}{x^{30}} = \boxed{1}$

$x^{30-30} = x^0 = 1$ $\boxed{x \neq 0}$

⑧ $\frac{(x^5)^5}{(x^3)^8} = \frac{x^{25}}{x^{24}}$

$= x^{25-24}$

$= x^1 = \boxed{x}$

⑨ $x^{-4} = \boxed{\frac{1}{x^4}}$

⑩ $(x^5)^{-3}$

$= x^{-15}$

$= \boxed{\frac{1}{x^{15}}}$

⑪ $\left(\frac{x^2}{5}\right)^3 = \frac{(x^2)^3}{5^3}$

$= \boxed{\frac{x^6}{125}}$

⑫ $\left(\frac{2x^3}{3y^2}\right)^4 = \frac{2^4(x^3)^4}{3^4(y^2)^4}$

$= \boxed{\frac{16x^{12}}{81y^8}}$

⑬ $\frac{x^6 y^{-4}}{x^{-2} y^{10}}$

$= \frac{x^6 x^2}{y^{10} y^4} = \boxed{\frac{x^8}{y^{14}}}$

⑭ $\left(\frac{2x}{5y^2}\right)^{-3}$

$= \left(\frac{5y^2}{2x}\right)^3$

$= \boxed{\frac{125y^6}{8x^3}}$

(15) $\left(\frac{-4x^{-2}}{3y^{-5}}\right)^3$

$= \left(\frac{-4y^5}{3x^2}\right)^3$

$= \boxed{\frac{-64y^{15}}{27x^6}}$

(16) $\left(\frac{-5x^{-6}}{2y^{-8}}\right)^{-2}$

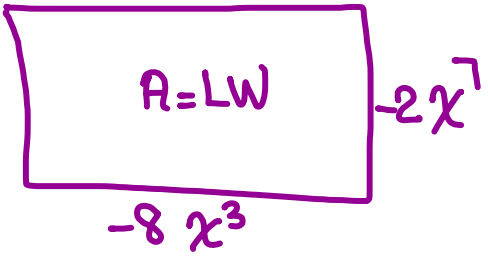
$= \left(\frac{-5y^8}{2x^6}\right)^{-2}$

$= \left(\frac{2x^6}{-5y^8}\right)^{2}$

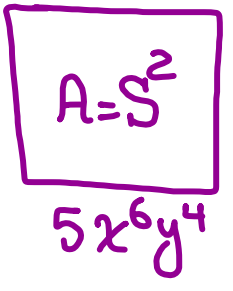
$= \boxed{\frac{4x^{12}}{25y^{16}}}$

Find the area

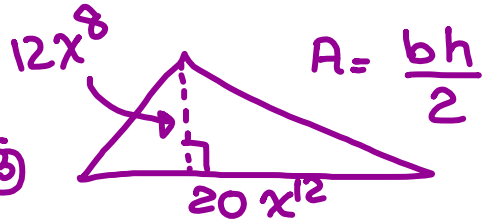
(1)



(2)



(3)



$A = \frac{\cancel{20}^{10}x^{12} \cdot 12x^8}{\cancel{2}} = \boxed{120x^{20}}$

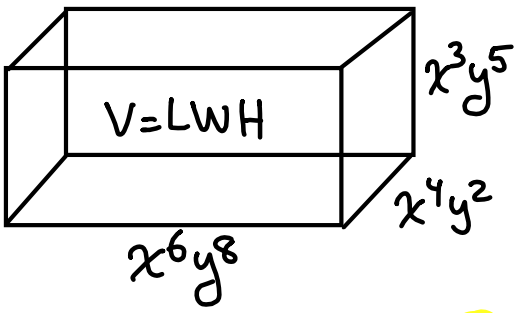
(1) $A = (-8x^3)(-2x^7)$

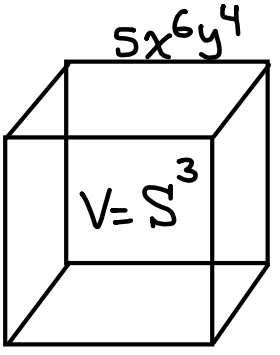
$= \boxed{16x^{10}}$

(2) $A = (5x^6y^4)^2$

$= \boxed{25x^{12}y^8}$

Find the Volume:





$V = x^6y^8 \cdot x^4y^2 \cdot x^3y^5$

$= x^{13}y^{15}$

$V = (5x^6y^4)^3$

$= 125\,x^{18}y^{12}$

Scientific Notation

$N \times 10^n$ ← any integer

$1 \le N < 10$

6.2×10^{12} , 1.25×10^{-8}

10^{12}: Large number

10^{-8}: Small number

6.2×100000000000 (12 zeros.)

6.200000000000

$6,200,000,000,000$

00000001.25

0.00000000125

Write 2250000000 in S.N.

$= 2.25 \times 10^{9}$

Write 0.000000000000000085 in S.N.

$= 8.5 \times 10^{-15}$

Simplify: $(2.5 \times 10^{17}) \cdot (3.2 \times 10^{8})$

$= 8 \times 10^{17+8} = 8 \times 10^{25}$

Simplify: $(8.3 \times 10^{12}) \cdot (7.2 \times 10^{17})$

$= 59.76 \times 10^{29}$ ($1 \le N < 10$)

$= 5.976 \times 10^{1} \times 10^{29}$

$= 5.976 \times 10^{30}$

Simplify

$(8.9 \times 10^{-13})(9.2 \times 10^{-25})$

$= 81.88 \times 10^{-38}$

$= 8.188 \times 10^{1} \times 10^{-38}$

$= 8.188 \times 10^{-37}$

Simplify

$$\frac{4.2 \times 10^{-7}}{3 \times 10^{8}} = 1.4 \times 10^{-7-8}$$

$$= 1.4 \times 10^{-15}$$

$$\frac{1.25 \times 10^{7}}{5 \times 10^{20}} = .25 \times 10^{7-20}$$

$$= 2.5 \times 10^{-1} \times 10^{-13} = 2.5 \times 10^{-14}$$

Simplify

$$\frac{2.25 \times 10^{15}}{9 \times 10^{-15}} = .25 \times 10^{15-(-15)}$$

$$= 2.5 \times 10^{-1} \times 10^{30}$$

$$= 2.5 \times 10^{29}$$

Simplify

$$\frac{(7.5 \times 10^{-6}) \cdot (4.2 \times 10^{-15})}{5 \times 10^{28}}$$

$$= 6.3 \times 10^{-6+(-15)-28}$$

$$= \boxed{6.3 \times 10^{-49}}$$

Number • Variables (whole number exponent)

is called Monomial.

$5x^3$, $-2x^{6}y^{4}$, $\frac{2}{3}xyz$, $-\frac{2}{5}xy^2$

Coefficient

Power or Sum of powers ⇒ Degree

$-3x^5$ Monomial

Coef. $= -3$, Degree $= 5$

$\frac{4}{5}x^3y^7$ Monomial

Coef. $= \frac{4}{5}$, Degree $= 3+7=10$

A monomial without variable is Called Constant. Degree is 0.

5 Monomial ✓ Constant ✓ D=0 ✓ -100

Binomial : Sum of two monomials

$x^3 - 2y^3$ $4x^3 + 10x$ $5x - 8$ $a+b$ $a-b$

Trinomial : Sum of three monomials

x^2-5x+3, ex^4-5x^2+7, $x^2-2xy+y^2$

Polynomial : Sum of monomials.

$2x^3-5x^2+7x-6$, $5x^4+3x^3y-5x^2y^2-10$

Simplify

$4x^5 - 7x^3 + 18x^4 - 2x^3 - 3x^5 + 17x - 8x^4$

$= 1x^5 - 9x^3 + 10x^4 + 17x$

$= x^5 + 10x^4 - 9x^3 + 17x^1$

D=5 C=1 | D=4 C=10 | D=3 C=-9 | D=1 C=17

D = 5

L.C. = 1

No Constant

Simplify

$4(x^3 - 2x^2 + 5) - (x^3 - 8x + 12)$

$= 4x^3 - 8x^2 + 20 - x^3 + 8x - 12$

$= 3x^3 - 8x^2 + 8x + 8$

$3x^3$: D = 3, C = 3 ; $-8x^2$: D = 2, C = −8 ; $8x$: D = 1, C = 8 ; 8: D = 0, Constant

D = 3 L.C. = 3 Constant = 8

Find Degree & Coef. of each term, then determine the D & L.C. of the Polynomial:

$-12x^2y^3 + 8xy^2 - 100 + 125xy$

$-12x^2y^3$: D = 2+3 = 5, C = −12 ; $8xy^2$: D = 1+2 = 3, C = 8 ; -100: D = 0, Constant ; $125xy$: D = 1+1 = 2, C = 125

D = 5, L.C. = −12, Const. −100

$-12x^2y^3 + 8xy^2 + 125xy - 100$

Simplify

$(5x^3)(-4x^7) = -20x^{10}$

Monomial

D = 10

C = -20

$(-8x^4y^6)(-6x^2y^7)$

$= 48x^6y^{13}$

Monomial

D = 6+13 = 19

C = 48

Multiply binomials by FOIL method:

$(x+3)(x+7)$

F irst ones

O utside

I nside

L ast

$= x^2 + 7x + 3x + 21$

$= x^2 + 10x + 21$

Trinomial, D=2, L.C.=1, Const.=21

Multiply: $(2x+5)(x-2)$

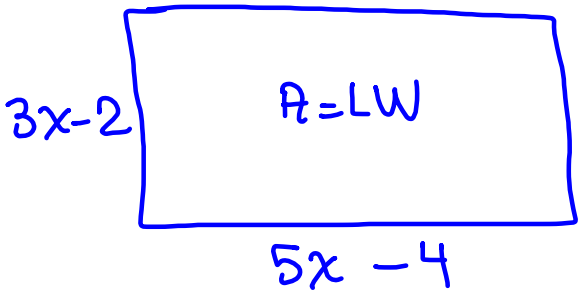
$= 2x^2 - 4x + 5x - 10$

$= 2x^2 + x - 10$

Trinomial

D=2, L.C.=2, Const.=-10

Find the area



$A = (5x-4)(3x-2)$

$= 15x^2 - 10x - 12x + 8$

$= 15x^2 - 22x + 8$

Trinomial

D=2

L.C.=15

Const.=8

use foil method to multiply

① $(x+5)(x-5)$

$= x^2 - 5x + 5x - 25 = \boxed{x^2 - 25}$

D=2
LC=1
Const -25
Binomial

② $(3x-7)(3x+7)$

$= 9x^2 + 21x - 21x - 49$

$= \boxed{9x^2 - 49}$

D=2 Const.
L.C.=9 -49

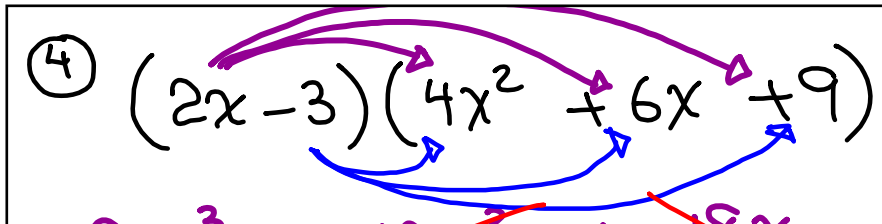
③ $(x+5)(x^2 - 5x + 25)$

$= x^3 - 5x^2 + 25x + 5x^2 - 25x + 125$

$= \boxed{x^3 + 125}$

Binomial
D=3
L.C.=1
Const =125

④ $(2x-3)(4x^2 + 6x + 9)$



$= 8x^3 + 12x^2 + 18x - 12x^2 - 18x - 27$

$= \boxed{8x^3 - 27}$

Binomial

D=3 Const. = -27

L.C. = 8

Multiply:

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

$$= (x^2 - 2x + 2x - 4)(x^2+4)$$

$$= (x^2-4)(x^2+4)$$

$$= x^4 + 4x^2 - 4x^2 - 16 = \boxed{x^4 - 16}$$

For now, use FOIL to multiply:

$$(2x+5)^2 = (2x+5)(2x+5)$$

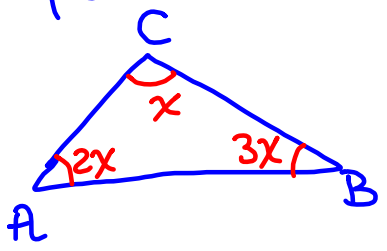
$$= 4x^2 + 10x + 10x + 25$$

$$= \boxed{4x^2 + 20x + 25}$$

In triangle ABC, Angle A is twice angle C. Angle B is 3 times angle C.

1) Draw & label such triangle

2) find all three angles.



we know $A + B + C = 180^\circ$

$2x + 3x + x = 180$

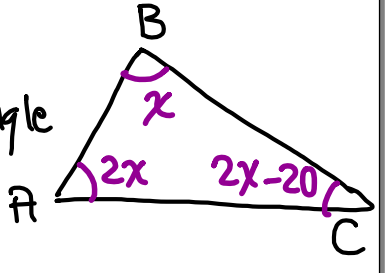
$6x = 180$ $\quad x = 30$

$\angle C = 30^\circ$

$\angle A = 60^\circ$, $\angle B = 90^\circ$

In triangle ABC, angle A is twice angle B. angle C is 20° less than angle A.

① Draw & label such triangle



② find all three angles.

$A + B + C = 180$

$2x + x + 2x - 20 = 180$

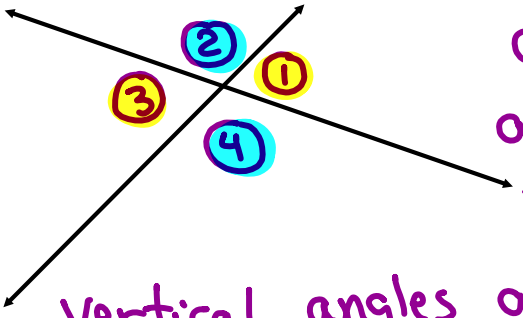
$5x = 200$

$x = 40$

$\angle B = 40^\circ$

$\angle A = 80^\circ$

$\angle C = 60^\circ$



Opposite angles are called Vertical angles.

Vertical angles are equal.

$\textcircled{1} = \textcircled{3}$ $\quad \textcircled{2} = \textcircled{4}$

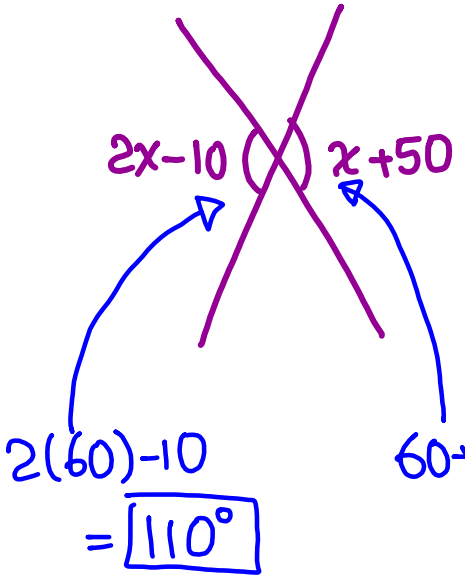
Adjacent angles are Supplementary.

Add up to $180°$.

$\textcircled{1} + \textcircled{2} = 180°$ $\quad \textcircled{2} + \textcircled{3} = 180°$

$\textcircled{1} + \textcircled{4} = 180°$ $\quad \textcircled{3} + \textcircled{4} = 180°$

Find x and marked angles:



Vertical angles. They Must be equal.

$\boxed{2x-10} = \boxed{x+50}$

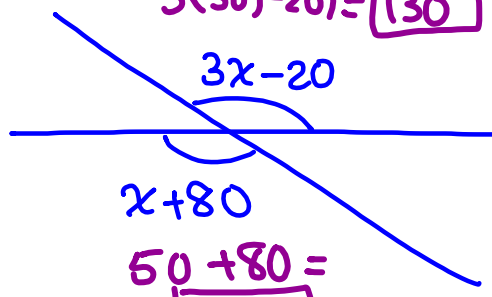
$2x - x = 50 + 10$

$x = 60$

$2(60)-10 = \boxed{110°}$

$60+50 = \boxed{110°}$

Find x and marked angles.



$3(50)-20 = \boxed{130^\circ}$

Vertical Angles are equal

$3x-20 = x+80$

$3x - x = 80 + 20$

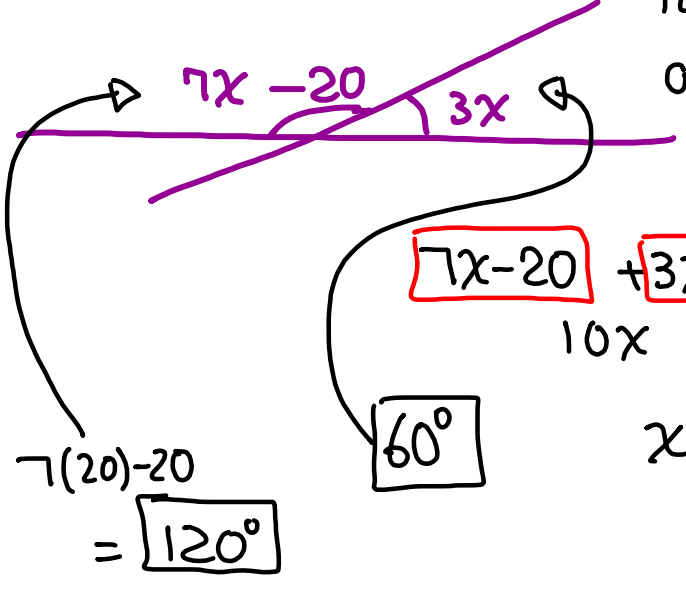
$2x = 100$

$\boxed{x = 50}$

$50 + 80 =$

$\boxed{130^\circ}$

Find x, and marked angles



Adjacent angles are Supplementary.

Their sum $= 180^\circ$

$7x-20 + 3x = 180^\circ$

$10x = 200$

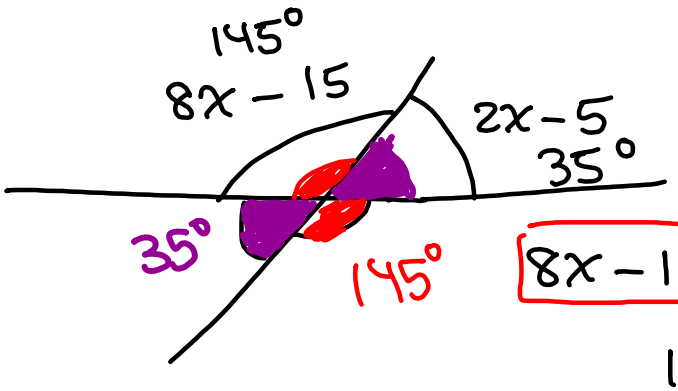
$x = 20$

$\boxed{60^\circ}$

$7(20)-20$

$= \boxed{120^\circ}$

Find all four angles marked below



$8x - 15 + 2x - 5 = 180$

$10x - 20 = 180$

$10x = 200$

$x = 20$

Work on SG as well as More geometry on word Problem website.