المدرسة الدولية للإبداع

INTERNATIONAL
SCHOOL OF INNOVATION

Family Name ………………..............

First Name ………………………….

Mathematics, Grade 7

Teacher: Carla Shibli

SUMMER WORK

ACADEMIC YEAR 2017 - 2018

Order of Operations

Please	**1 -** **P**arenthesis	( )	
Excuse	**2 -** **E**xponents		
My	**3 -** **M**ultiply	×	From left
Dear	**or** **D**ivide	÷	
Aunt	**4-** **A**dd	+	From left
Sally	**or** **S**ubtract	−	

Addition and Subtraction of Integers

A **signed number** is preceded by: **+ positive number** **− negative number**

0: has no sign.

Opposite signed numbers have same numerical part but opposite signs.

(+) → (-) ; (-) → (+)

Addition of Signed numbers: 2 cases:

1- have same sign: the result have same sign and we add. (+) + (+) = + ; (-) + (-) = -

2- have different signs: the sign of result is as the greatest and we subtract.
(+) + (-) ; (-) + (+)

Subtraction of signed numbers, follow steps:

- Write first number as it is.
- Change – into +.
- Write opposite of second number.

1) **Perform:**

Addition of signed numbers:

(+3) + (+6) = …………….. ; (+9) + (+2) = …………….. ; (+7) + 1 = …………… ; 0 + (+6) = ………….

(-6) + (-2) = ……………… ; (-11) + (-5) = ……………… ; (-5) + (-3) = …………… ; (-2) + 0 = ………….

(+8) + (-4) = ……………. ; (+11) + (-7) = …………… ; (-2) + (+5) = ……………… ; (+6) + (-1) = ………….

(-10) + 6 = ………………. ; (-7) + (+7) = ……………… ; (+17) + (-17) = ………………..

Subtraction of signed numbers:

(+6) – (+7) = ……………………………………………….. ; (-9) – (-4) = ………………………………………………….

(-10) – (+5) = ……………………………………………. ; (-8) – (-8) = …………………………………………………

(+8) – (-4) = ……………………………………………... ; (+7.5) – (+7.5) = ……………………………………………….

Expressions:

(+5) + (+2) + (+7) + (+6) = ...

(-3) + (-8) + (-4) = ...

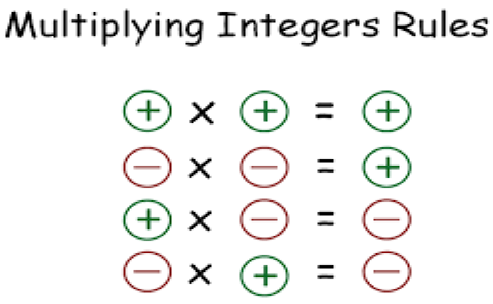
(+7) + (-5) – (+2) = ...

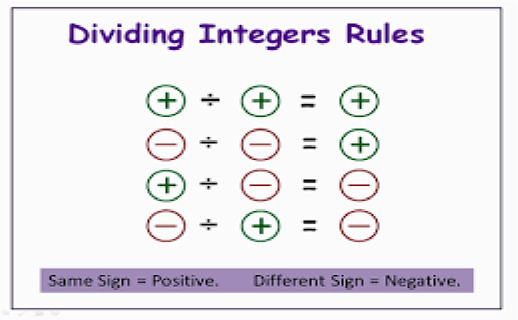
(-9) – (+7) + (-1) = ...

(+8) – (-5) – (-3) = ...

(-4) + 10 + (+3) – (+8) = ...

Multiplication and Division of Integers





1) <u>Calculate:</u>

(-2) × (-6) = ... ; (9) × (-3) = ... ; (-6) × 5 = ... ; 8 × 3 = ...

(-2) × (-5) × (7) = ... ; (5.7) × (-1) = ... ; 9 × 3 × (-5) = ...

(-3) × 2 × 9 = ... ; 6 × (-3) × 5 × (-1) = ... ; (-0.7) × 4 × (-3) = ...

$\frac{-32}{4}$ = ... ; $\frac{-35}{-5}$ = ... ; $\frac{2}{5}$ = ... ; $\frac{3}{-10}$ = ...

2) <u>Complete:</u>

27 = (-9) × .... ; (-15) × .... = 15 ; (-6) × .... = -36 ; 14 × .... = -14

(-71) × .... = 0 ; -72 = ... × .... ; 33 = (-11) × .... ; 15 = ... × ....

.... × (-1) = 20 ; .... × (-2) = 10 ; 28 × .... = 0 ; (-7) × .... = -70

$\frac{25}{.......}$ = -5 ; $\frac{........}{-4}$ = -7 ; $\frac{-90}{-9}$ = ... ; $\frac{-77}{.........}$ = -11 ; $\frac{...........}{-6}$ = 6

Powers

Power is to represent repetition of multiplication. A repeated multiplication sentence is written in power form.

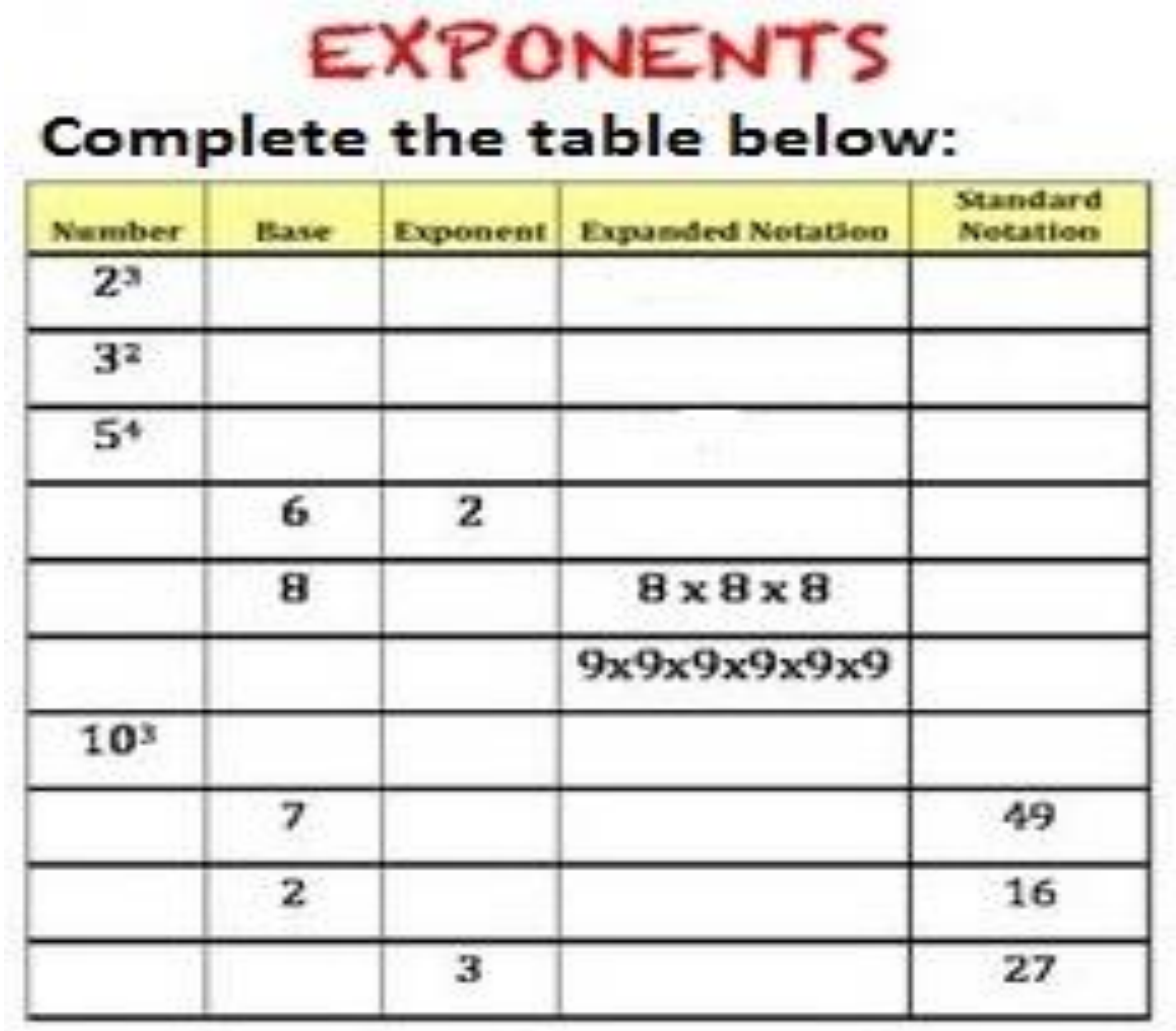
Power form: a^n (a: is the base; n: is the power or exponent).

$a^n = a \times a \times a \times a \times a ....$ (multiply "a" by itself n times)

Powers of 10: have base 10.

Denoted by $10^n = \boxed{1}\underbrace{0000000}_{\text{n zeroes}}.....$

$$\boxed{\begin{array}{c} a^0 = 1 \\ a^1 = a \end{array}}$$



EXPONENTS

Complete the table below:

Number	Base	Exponent	Expanded Notation	Standard Notation
2^3				
3^2				
5^4				
	6	2		
	8		8 x 8 x 8	
			9x9x9x9x9x9	
10^3				
	7			49
	2			16
		3		27

Rules of powers:

$$a^m \times a^n = a^{m+n}$$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$(a^m)^n = a^{mxn}$$

$$(a\times b)^n = a^n \times b^n$$

$$a^1 = a$$

$$a^0 = 1$$

Perform:

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

$4 \times 4^2 =$ ____

$7^0 \times 7^2 =$ ____

$10^4 \times 10^5 =$ ____

$1^3 \times 1^6 =$ ____

$9 \times 9^3 =$ ____

$10^7 \times 10^3 =$ ____

$(\frac{4}{5})^3 =$ ………………………… ; $(\frac{7}{9})^2 =$ ……………………….. ; $(\frac{6}{4})^2 =$ …………………

$(\frac{2}{10})^4 =$ ………………………………….. ; $(\frac{3}{2})^4 =$ ……………………………………………..

$(3^2)^3 =$ ………………………………………………………………………………..

$(2^4)^2 =$ …………………………………………………………………………

$(10^5)^2 =$ …………………………………………………………………………….

$(13^8)^0 =$ …………………………………………………………………………

$(1^7)^5 =$ …………………………………………………………………………

$(0^8)^3 =$ …………………………………………………………………………

$(10^3)^4 =$ ……………………………………………………………………..............

$(100^2)^1 =$ ………………………………………………………………………..

$(2 \times 3)^3 =$ …………………………………………………………………………

$(4 \times 5)^2 =$ ………………………………………………………………………

$(6 \times 2)^2 =$ …………………………………………………………………………

$(11 \times 8)^0 =$ …………………………… ; $3^2 \times 2^2 \times 5^2 =$ …………………………………

……………………………………………………………..

$(4^2)^2 \times 4 =$ ……………………………………………………………………...

$0^{11} =$ …………………… ; $200^3 =$ ……………………………………………………

$4000^2 =$ ………………………………………………………………………………

$300^3 =$ …………………………………………………… ; $486^0 =$ ……………………..

Fractions

Fraction Form: $\frac{\boldsymbol{numerator}}{\boldsymbol{denominator}}$ **.** **(** $\frac{\boldsymbol{a}}{\boldsymbol{b}}$ **)**

$\frac{a}{1} = a$; $\frac{0}{b} = 0$; $\frac{a}{a} = 1$

To simplify (reduce) a fraction, is to make the given fraction smaller. Divide the numerator and denominator by a common factor.

Criteria of divisibility: A number is divisible by:

- **2:** if the ones is even (0, 2, 4, 6, 8)
- **3**: if the sum of digits is a multiple of 3.
- **4**: if the ones and tens are a multiple of 4.
- **5**: if the ones is 0 or 5.
- **6**: if it is divisible by 2 and 3.
- **9**: if the sum of digits is a multiple of 9.
- **10**: if the ones is 0.

Given a fraction $\frac{\boldsymbol{a}}{\boldsymbol{b}}$:

- If a and b are relatively prime (G.C.D. (a , b) = 1) then the fraction is irreducible.
- If a = 1; then the fraction is irreducible.

Methods to simplify (reduce) a fraction:

1- Method of successive division: Try to divide the fraction (numerator and denominator) staring from 2 and so on…. (Use criteria of divisibility).

2- Method of G.C.D.: Find the G.C.D. of both the numerator and denominator then divide the fraction by the G.C.D.
3- Method of prime factorization: Write both the numerator and denominator as prime factors then divide by cancelling the similars.

To find equivalent fraction either we multiply or divide the fraction (numerator and denominator) by the same number.

<u>Addition and Subtraction of fractions:</u>

We have 2 cases:

1- **<u>Like fractions:</u>** If they have the same denominators). We get a result fraction. Its denominator is as den. (1) and den. (2). Its numerator: add or subtract numerators (1 and 2).
2- **<u>Unlike fractions:</u>** If they have different denominators. We change them into like fractions.

(Multiply all fraction 1 by denominator 2 then multiply all fraction 2 by denominator 1). Back to case 1.

<u>Multiplication of fractions:</u>

In result fraction, multiply numerator 1 and numerator 2 then multiply denominator 1 and denominator 2). Reduce if possible.

<u>Division of fractions:</u>

Steps:

- Write fraction 1 as it is.
- Change ÷ into ×.
- Find the reciprocal of fraction 2. (Reciprocal of fraction: Shift both numerator and denominator).

Back to multiplication of fractions.

<u>Question # 1:</u>

Complete the equivalent fractions:

$\frac{4}{7} = \frac{\dots\dots}{63}$; $\frac{1}{12} = \frac{5}{\dots\dots}$; $\frac{3}{10} = \frac{\dots\dots}{90}$; $\frac{8}{5} = \frac{88}{\dots\dots}$; $\frac{6}{11} = \frac{\dots\dots}{33}$

$\frac{10}{6} = \frac{5}{\dots\dots}$; $\frac{36}{44} = \frac{\dots\dots}{11}$; $\frac{54}{24} = \frac{9}{\dots\dots}$; $\frac{48}{64} = \frac{\dots\dots}{8}$; $\frac{25}{45} = \frac{5}{\dots\dots}$

$\frac{77}{99} = \frac{\dots\dots}{9}$; $\frac{72}{27} = \frac{8}{\dots\dots}$; $\frac{60}{45} = \frac{\dots\dots}{15} = \frac{4}{\dots\dots}$

$\frac{48}{72} = \frac{24}{\dots\dots} = \frac{\dots\dots}{18} = \frac{6}{\dots\dots} = \frac{\dots\dots}{3}$.

$\frac{51}{\ldots\ldots\ldots} = \frac{17}{21}$; $\frac{75}{\ldots\ldots\ldots} = \frac{3}{5}$; $\frac{108}{\ldots\ldots\ldots} = \frac{12}{11}$.

Question # 2:

Reduce the following fractions:

a) By method of successive division:

$\frac{15}{21} =$ ______________ ; $\frac{18}{30} =$ ______________________ ; $\frac{14}{8} =$ ____________ ;

$\frac{35}{50} =$ _______________ ; $\frac{24}{40} =$ ______________________ ; $\frac{30}{9} =$ _____________ ;

$\frac{84}{48} =$ _______________________________ ; $\frac{70}{100} =$ ________________________________;

$\frac{350}{420} =$ ____

$\frac{1080}{420} =$ ____

b) By method of G.C.D.:

$\frac{72}{48} =$ ____________________________

$\frac{90}{120} =$ ________________________________

$\frac{144}{216}$ = ______________________________

$\frac{840}{2520}$ = ______________________________

c) <u>By method of prime factors.</u>

$\frac{72}{48}$ = ____

$\frac{90}{120}$ = ____

$\frac{144}{216}$ = ____

$\frac{840}{2520}$ = ____

Question # 3:

Perform (Reduce the result fraction if possible):

Addition and subtraction of like fractions:

1) $\frac{2}{9} + \frac{2}{9} =$

2) $\frac{2}{11} + \frac{2}{11} =$

3) $\frac{5}{12} + \frac{3}{12} =$

4) $\frac{3}{9} + \frac{3}{9} =$

5) $\frac{1}{4} + \frac{2}{4} =$

6) $\frac{2}{7} + \frac{2}{7} =$

7) $\frac{11}{16} - \frac{3}{16} =$

8) $\frac{7}{10} - \frac{1}{10} =$

9) $\frac{5}{7} - \frac{3}{7} =$

10) $\frac{17}{12} - \frac{8}{12} =$

Addition and subtraction of unlike fractions:

1) $\frac{3}{8} - \frac{1}{6} =$

2) $\frac{2}{3} + \frac{5}{7} =$

3) $\frac{7}{9} + \frac{3}{10} =$

4) $\frac{5}{4} - \frac{3}{8} =$

5) $\frac{9}{5} + \frac{2}{7} =$

6) $\frac{4}{3} - \frac{7}{10} =$

7) $\frac{8}{7} - \frac{4}{9} =$

8) $\frac{7}{6} + \frac{5}{8} =$

9) $\frac{7}{4} + \frac{5}{3} =$

10) $\frac{12}{10} - \frac{3}{4} =$

11) $\frac{5}{6} - \frac{4}{5} =$

12) $\frac{6}{4} + \frac{5}{3} =$

13) $3 - \frac{6}{5} =$

14) $\frac{4}{5} + 1 =$

Multiplication and division of fractions:

1) $\frac{2}{7} \times \frac{3}{5} =$ 2) $\frac{5}{8} \times \frac{2}{3} =$ 3) $\frac{8}{9} \times \frac{6}{10} =$

4) $\frac{7}{15} \times 9 =$ **5)** $\frac{198}{23} \times \frac{23}{198} =$

6) $\frac{1}{2} \times \frac{5}{4} =$ 7) $\frac{1}{4} \times \frac{5}{3} =$ 8) $\frac{10}{3} \times \frac{11}{6} =$

$\frac{1}{6} \div \frac{8}{11} =$ $\frac{11}{2} \div \frac{1}{2} =$ $\frac{1}{2} \div \frac{1}{2} =$

$\frac{9}{11} \div \frac{5}{6} =$ $\frac{3}{8} \div \frac{5}{12} =$ $\frac{8}{12} \div 4 =$

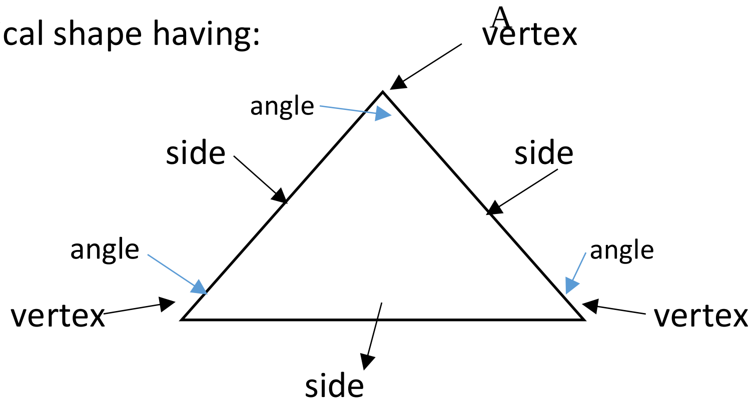
$\frac{13}{7} \div \frac{13}{7} =$ $\frac{15}{4} \div 9 =$

$\frac{10}{21} \div \frac{8}{9} =$ $18 \div \frac{7}{12} =$

Triangles

Triangle: is a geometrical shape having:

- 3 sides
- 3 vertices
- 3 angles

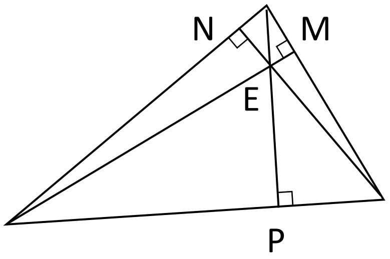


The sum of angles in a triangle is 180°.

Remarkable lines in a triangle.

1) **Heights (perpendiculars or altitudes) of a triangle:** The height is a line from the vertex perpendicular to the opposite side. **(To draw a height, use a set square).**

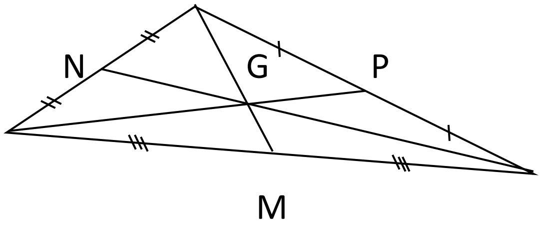
In a triangle, the 3 heights are concurrent (they intersect) at a point called the **orthocenter**.



2) **Medians of a triangle:** The median is a line from the vertex to the midpoint of the opposite side. **(To draw the median, use a long ruler).**

To find the midpoint of a segment, divide its measure by 2.

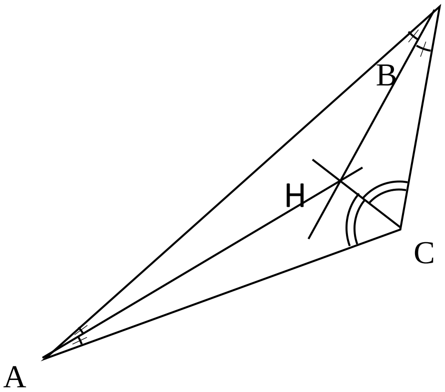
In a triangle, the 3 medians are concurrent at a point called **the centroid (center of gravity).**



3) **Bisectors in a triangle:** The bisector is a line that divides an angle into 2 equal angles. **(To draw the bisector, use a protractor).**

We measure the angle then divide this measure by 2.

In a triangle, the 3 bisectors are concurrent at a point called the **incenter.**



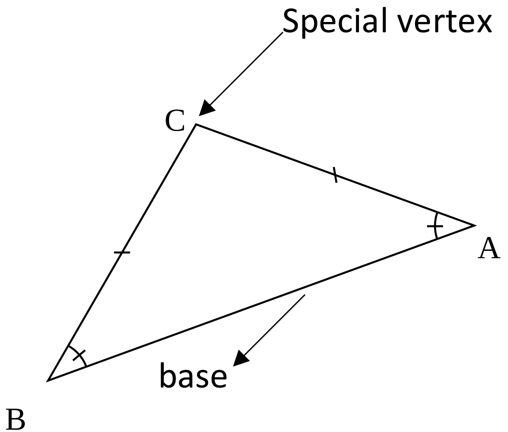
4) **Perpendicular bisectors in a triangle:** It is a line perpendicular to the side at its midpoint. **(To draw a perpendicular bisector, use long ruler and set square).**

In a triangle, the 3 perpendicular bisectors are concurrent at a point which is the center of the circle circumscribed about the triangle (the circle passes in the 3 vertices).

Particular Triangles:

1) **Isosceles Triangle:** It has 2 equal sides and 2 equal vertices.

All isosceles triangles has a special vertex (from where the equal sides are issued) and a special side called the base (opposite to the special vertex). The equal angles are on the base.

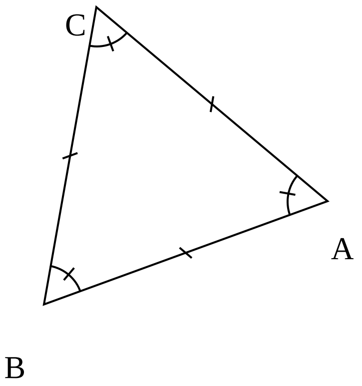


CAB is an isosceles triangle of vertex C

C is the special vertex and AB is the base

CA = CB and $\widehat{CBA}$ = $\widehat{CAB}$

2) **Equilateral Triangle:** It has 3 equal sides and 3 equal angles (the measure of each angle is 60°).



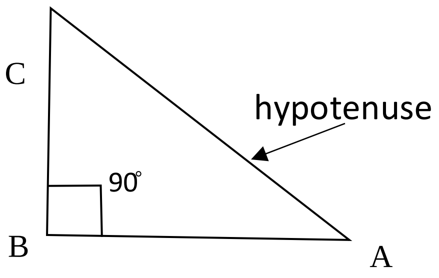
ABC is an equilateral triangle

CA = CB = AB

$\widehat{CBA}$ = $\widehat{CAB}$ = $\widehat{ACB}$ = 60°.

3) **Right Triangle:** It has a right angle = 90°.

In a right triangle, the side opposite to the right angle is called **the hypotenuse.**



Triangle ABC is right at $\hat{B}$. Then

$\hat{B}$ = 90°.

[AC] is opposite to $\hat{B}$ then [AC] is the hypotenuse.

<u>Construction of a triangle:</u> there are 3 cases: ***Construct a triangle knowing:***

1) ***Measure of 3 sides:*** (We use a long ruler and a compass). **Steps:**

-Draw any of the 3 sides (mainly the longest) and name it using the long ruler.

-Open the compass on the long ruler as the measure of 2nd side then draw an arc.

-Open the compass on the ruler as the measure of 3rd side then draw an arc.

The intersection of the 2 arcs is the third vertex.

2) ***Measure of 2 sides and one angle:*** we use long ruler and a protractor. **Steps:**

-Draw one of the 2 sides using a long ruler.

- Draw the angle on the given vertex using a protractor.

-Join the angle with vertex as the measure of the 2nd side.

3) ***Measure of one side and 2 angles:*** We use a long ruler and a protractor. **Steps:**

-Draw the given side using the long ruler.

- Assign the first angle on the given vertex.

-Assign the second angle on the given vertex.

The intersection of the 2 lines of both angles gives the 3rd vertex.

Algebraic Expressions

<u>Numerical Expression</u> is a mathematical sentence containing numbers and operations (+, −, ×, ÷).

ex.: $4 + 6 \times 3 - 10$

<u>Algebraic Expression</u> is a collection of letters called variables (unknowns) and numbers organized together using operations. ex.: $5x + 2y \times 3 - 6$; $\underbrace{4x^2}_{\textbf{term}} - \underbrace{2x}_{\textbf{term}} + 7$

Each term in the algebraic expression is called **a monomial.**

ex.: in the monomial: $4x^2$. Coefficient is “4” and variable is “x”

ex.: in the monomial: $-5x^3yz^2$. Coefficient is “-5” and variable is “x” , “y” and “z”.

When 2 or more variables are multiplied together, they are written in **a literal writing.**

ex.: $a \times b$ **is written**: ab ; $a + a$ **is written**: $2a$; $-1 \times a$ **is written:** $-a$; $7 \times x^2 \times y$ **is written:** $\mathbf{7x^2y}$

Exercise:

1) **Write the following literally:**

$3 \times a$ ________ ; $-6 \times a^2 \times b$ ___________ ; $\frac{1}{2} \times x^3 \times y^2$ _____________ ; $-5 \times a^4 \times b^3$ ______________

$7 \times a \times c^2 + 4 \times b^3 \times c$ ____________________________ ; $y \times y \times y \times y$ _________ ; $0 \times a \times b$ ___________

<u>Like Terms</u> (Like Monomials) these terms have the same variables, same powers but different coefficients.

ex.: $2xy$ and $-8xy$ are like terms.

a^2bc^3 and $10a^2bc^3$ are like terms.

$9x^4$ and $5x^2$ are not like terms.

$-7xyz^3$, $4x^2yz^3$ and $-2xy^2z^3$ are not like terms.

Exercise:

2) **Collect the like terms:**

$5x^2y^2z$; $-3x^2y$; $-x^3z$; $6x^2y$; $-9y^3$; $-4x^3z$; $-5xy^2z$; $-8x^2y^2z$; $11y^3$; $-3x^3z$; $5xz^3$

$\frac{1}{4}y^3$; $-0.6x^3z$.

____

____

<u>Numerical Value of an algebraic expression:</u> is the result obtained when replacing the letters (variables or unknowns) by given numbers (values) and performing the operations.

ex.: $2x + 3y^2$ for $x = -1$ and $y = 2$ replace x by -1 and y by 2

$2 \times (-1) + 3 \times (2)^2 = -2 + 3 \times 4 = -2 + 12 = 10$

Exercise:

3) **Find the numerical values of the following algebraic expressions:**

a) $3x + 5y$ for $x = 4$ and $y = 1$ ____

b) $-2xy$ for $x = -1$ and $y = -2$ ____

c) $-2x^2 + 3y$ for $x = -2$ and $y = -3$ ____

d) $a^2b - 3b^2$ for $a = -1$ and $b = 2$ ____

e) $4 a b^2 + a^2 - b^3$ for $a = -2$ and $b = 3$ ______________________________

____

f) $-2 x y^2 z^3 t$ for $x = 5$, $y = 2$, $z = -3$ ______________________________

____

g) $3 x y^2 - 2 x^2 + 7 y - y^3$ for $x = 5$, $y = -1$ ______________________________

____

<u>**Multiplication of Monomials**</u>: the obtained product is the multiplication of the coefficients and we add the exponents of same variables.

ex.: $3 x^2 \times 7 x^4 = 21 x^6$ ($3 \times 7 = 21$; we add the exponents 2 and 4 of the variable x)

$x^2 y^3 z \times -3 x^3 y z^4 = -3 x^5 y^4 z^5$

$-2a b^3 c^2 \times -5 a b^4 = 10 a^2 b^7 c^2$

Exercise:

4) **Multiply the monomials:**

$x^3 \times 3 x^5 =$ ____________ ; $-4 a^2 b^2 \times 5 a^3 b^2 =$ ____________ ; $-x^3 y z^2 \times 2 x^2 y^3 =$ ______________

$-6 a^3 b^2 c \times (-3 a^2 b^4) =$ ___________________ ; $2 a b c d \times 4 a b =$ ________________

$-9 x^4 \times (-x^3 y^2 z^4) =$ ______________________ ; $3 a^3 b^2 c^3 \times 5 b^4 c^5 =$ ___________________________

$-3 x^2 y^2 z^4 t \times 3 x^4 y^5 t^4 =$ _______________________ ; $7 a b c^5 \times 5 b^4 =$ _________________________

$4 a^2 b^2 \times (-2 a^3) \times 5 a^2 b^3 c^2 =$ ____________________________

<u>**Perform calculation on algebraic expression:**</u>

Reducing like terms is to replace all the like terms by a unique term when adding or subtracting their coefficients.

ex.: $\underline{2 x^3} - 5 x^2 y + \underline{4 x^3} = 6 x^3 - 5 x^2 y$

$\underline{5 a b^2} \utilde{- 3 a^3} + \underline{a b^2} \utilde{- 5 a^3} \underline{- 4 a b^2} = 2 a b^2 - 8 a^3$

Exercise:

5) **Reduce the like terms to calculate the algebraic expressions:**

a) $-4xy^2 + 2x^2y^2 - 6x^2y + 5y^3 - 4x^2y^2 + 7xy^2 - 3x^3 - 3x^2y$

____

b) $3x^3y^2z + 5xy^2 - 6x^2y^2 + 2x^3y^2z - 3x^2y^2 - x^2y - 5xy^2 + 5x^3y^2z$

____

c) $5ab^3c + 2a^2b^3c - abc^2 + 7ab^2c^2 - 4a^2b^3c - 4abc^2 - 7ab^3c + 2ab^2c^2$

____

Expanding – Factorization

Expanding an algebraic expression is to get rid of the parenthesis by multiplying.

Rules to expand an algebraic expression:

1) a, b and m being integers, then: $\mathbf{m\,(a + b) = ma + mb}$

2) $\mathbf{m\,(a - b) = ma - mb}$; **3)** $\mathbf{(m + n)\,(a + b) = m\,a + m\,b + n\,a + n\,b}$

Exercise:

1) Expand the following:

$3\,(x + 6) =$ .... ; $4\,(2x + 1) =$ .... ; $2\,(7 + y) =$ ....

$-5\,(3x + 1) =$ .... ; $7\,(4y + 3) =$ .... ; $-\,(9x + 5) =$ ....

$4\,(-x + 2) =$ .... ; $-2\,(3x - 1) =$ .... ; $-7\,(-2x - 3) =$ ....

$-5(y - 7) =$ .... ; $-3\,(3x^2 - 2) =$ .... ; $5\,(1 + 2y^2) =$ ....

$6\,(-2x^3 - 3) =$ .... ; $-4\,(-y^4 - 3) =$ .... ; $-\,(-x^2 - 5) =$ ....

$3x\,(2x - 1) =$ .... ; $4y\,(3 + 2y) =$ .... ; $-5x\,(2x - 1) =$ ....

$-2y^2\,(3y + 1) =$ .... ; $4x\,(-2x - 3) =$ .... ; $-x^2\,(5 + 2x) =$ ....

$2x^2y\,(3x + 5xy) =$ .... ; $-3abc\,(2a^2b - 3ab^2c^3) =$ ....

$-5x^3y^2z\,(-x^2y - 2y^3z^3) =$ ....

Expand and reduce if possible:

$(x + 3)\,(x + 4) =$ ....

$(2x - 4)\,(x + 3) =$ ....

$(3ab + 1)\,(a + 4) =$ ....

$(4a + b)(- 3a – 2) =$ ……..

$(2x^2 - 1)(3x + 1) =$ ………..

$(4x^3 – 3)(2x^2 + 1) =$ ………

$(3a^2b + 4)(-2a – b) =$ ……

$(x - 2)(x + 2) =$ ………

$(3x + 5)(3x – 5) =$ ………

$(x – 1)(x – 2)(x + 3) =$ ………

……..

$(- 3m + 2)(7m^2 – 5n + 1) =$ ………

………

$x(3x + 5) + (3x + 5)(2x – 5) =$ ……

………

$(-2x^2 + 3x – 2x^3) – (-5x^4 + 9 – 5x + 13x^2) =$ ……………………………………………………………………………………..

……….

$(2x – y^2 – 2xy) – (xy – x – 3y^2 – 3x -8y^2) =$

………..

……….

$(7y^2 + 4y^3 + 2y) + (7 + y + 3y^2 + y^3) =$

……

……….

2) Calculate the numerical value in each case:

$3x(x -2)$ for $x = 1$ ………

for $x = - 2$ ………..

$(y + 2)(y – 2)$ for $y = 0$ ………

for $y = 2$ ………

$(y – 1)(y^2 – y + 1)$ for $y = 0$ ……..

for $y = 1$ ………..

for $y = - 1$ ………

$2a - a^2 + 2a^3 - 5$ for $a = 0$ ………

for $a = 2$

………

for $a = -1$ ……

3) **Write 2 monomials similar to each of the following:**

$2xy^2$ …………………………………………………………… ; $3a^2bc^3$ …………………………………………………………………………

$-3x^2y^2z^4$ …………………………………………………………………… ; $1.5xyzt$ ……………………………………………………………………

Factorizing an algebraic expression is to take a common factor between all the monomials using parenthesis.

This common factor might be: - a sign - a coefficient - a variable / variables

- a monomial - a binomial

4) **Factorize:**

$-a - 2b =$ ____________ ; $-4x - 7 =$ _____________ ; $-5x^2 - 9y =$ ________________ ; $-2 - 3a =$ ____________

$2a - 4 =$ ____________ ; $4x^2 + 6a =$ _____________ ; $6x - 9 =$ ______________ ; $10 + 6a^2 =$ ________________

$-4x - 10y =$ ______________ ; $-5x^3 - 15 =$ _____________ ; $-12y - 20x^2 =$ ___________________

$3xy + 7x =$ ___________ ; $5x^2 - 3x =$ ___________ ; $8ab + 5a =$ _____________ ; $-2a - 5a^2 =$ ___________

$4xyz + 6x =$ _______________ ; $7x^2y - 9x^2 =$ ________________ ; $-5xy^2 - 9x^2y =$ _________________

$6a^3b^2 - 8a^2b^2 =$ ____________________ ; $-6x^3y^3z - 9x^3y =$ __________________________

$-12a^2b^2c - 8abc =$ ___________________ ; $-21xy^3z - 35y^2z =$ ______________________

$10ab^3c^2 + 25ac^2 =$ _______________________ ; $18a^2b^2c - 30ab =$ ___________________________

$2(x + 1) - x(x + 1) =$ _________________________ ; $-5y(3 + y) + 3(3 + y) =$ __________________________

$(2x + 3) - 5x(2x + 3) =$ _________________________ ; $7a(a - 6) + 4a(a - 6) =$ ___________________________

$3x(2x^2 + 1) - 7y(2x^2 + 1) =$ _______________________ ; $3(x - 7) + 2y(x - 7) =$ __________________________

$5y(-x - 4) - (-x - 4) =$ ___________________________ ; $7x^2(3x - 5) + (3x - 5) =$ _________________________

$(7x - 5) - 3a^2(7x - 5) =$ _________________________ ; $6(3a + 4) - 8b(3a + 4) =$ __________________________

Equations

Equation of the first degree in x has the variable “x” as an unknown.

Each first degree equation has one and only one solution (one root). We will get only one value of the given variable.

<u>**To solve a first degree equation**</u> is to get the value of the variable or unknown which satisfies it.

Example:

$\overbrace{\mathbf{3x + 1}}^{\text{First side}} = \overbrace{\mathbf{4}}^{\text{second side}}$ is a first degree equation in the variable “x”.

Let’s solve it: *<u>Steps:</u>*

Get all the variables to side (1) and all the fixed numbers to side (2).

Reduce the equation to the form **ax = b.**

The solution (root) of this equation is $\mathbf{x = \frac{b}{a}}$ **.**

3x + 1 = 4 <u>**Solve:**</u> $3x = 4 - 1$ $3x = 3$ $x = \frac{3}{3}$ $x = 1$

So, x = 1 is a solution (root) that satisfies the equation 3x + 1 = 4

<u>Exercises:</u>

1) **Verify whether the given number is a root (solution) of the equation:**

> *Replace the given value of the variable in the equation, then after calculation if the 2 sides of the equation are equal then the given value of the variable is a solution (root).*
>
> *If the 2 sides of the equation are not equal, then the given value of the variable is not a solution (root).*

$x + 5 = 8$ $x = 3$ ……………………………………………………………………………………

$7 - x = 5$ $x = 2$ ……………………………………………………………………………………

$4x = 8$ $x = 0$ ……………………………………………………………………………………

$5x = 10$ $x = 2$ ……………………………………………………………………………………

$3x = 9$ $x = 3$ ……………………………………………………………………………………

$x - 4 = 6$ $x = -2$ ……………………………………………………………………………………

$2x + 5 = 7$ $x = 2$ ……………………………………………………………………………………

$x = 1$ ……………………………………………………………………………………

$5x - 3 = 2x + 6$ $x = 2$ ……………………………………………………………

$x = 0$ ……………………………………………………………

$x = 3$ ……………………………………………………………

$\frac{x+3}{5} = \frac{x+1}{4}$ $x = 0$ ……………………………………………………………

$x = -8$ ……………………………………………………………

$x = 7$ ……………………………………………………………

2) Solve the equations:

Simple equations **$a\,x = b$** 1 solution (1 root) $\boldsymbol{x = \frac{b}{a}}$

$2\,x = 6$ …………………………… ; $5\,x = 20$ ……………………………

$-4\,x = 12$ …………………………… ; $-7\,y = -35$ ……………………………

$3\,x = -18$ …………………………… ; $6\,a = 10$ ……………………………

$9\,b = -6$ …………………………… ; $-8\,y = -20$ ……………………………

$9\,x = 0$ …………………………… ; $11\,z = 0$ ……………………………

$30\,y = 18$ …………………………… ; $-12\,a = -30$ ……………………………

$\frac{5\,x}{9} = 0$ …………………………… ; $\frac{3\,x}{5} = \frac{12}{5}$ ……………………………

$\frac{-4\,y}{7} = \frac{1}{7}$ …………………………… ; $\frac{16\,a}{3} = \frac{10}{3}$ ……………………………

$3\,x - 2 = 7$ ……………………………………………………………

$5\,x - 8 = 2$ ……………………………………………………………

$2\,x = 4\,x - 6$ ……………………………………………………………

$-3\,x + 5 = -7\,x - 5$ ……………………………………………………………

$4\,x - 1 = 3\,x + 5$ ……………………………………………………………

$x + 8 - 5x = -2\,x + 4$ ……………………………………………………………

$\frac{y-3}{4} + 2\,y = 1$ ……………………………………………………………

……………………………………………………………………………

$\frac{2x}{5} - x = \frac{3x - 7}{2}$ ……

………..

3) Write the following as an equation then solve it:

The product of a number and 5 is 10.

…………………………………………………………………………………………………

The product of a number and -3 is – 12.

………………………………………………………………………………………………..

The quarter of a number is 5.

………

The sum of 4 and a number is 7.

……..

The difference between 6 and double a number is 13.

……………………………………………………………………………..

The sum of triple a number and 1 is 4.

…………………………………………………………………………………………………...

The quotient of double a number by 7 is 2.

…………………………………………………………………………………………