SUBMITTED BY: Niranjana Bhadra (16.04.19)

FOR GOD AND COUNTRY

ST. LAWRENCE HIGH SCHOOL

1st Term Exam – 2019

Sub: Algebra and Geometry **Class: 8** **F. M. : 80**
Duration: 2hrs 30 mins **Date: 13.04.19**

Group – A

1. Choose the correct option for the following questions.(Answer all the questions) 5x1=5

i) The value of $(5-1)^{-1}$ is

d) $\frac{1}{4}$

ii) What should be multiplied with $\frac{a^2x}{by^2}$ to get $\frac{ax}{by}$?

d) $\frac{y}{a}$

Iii) Two sides of a triangle are 7cm and 5cm. what can be the highest measure of the 3rd side among the given options?

d) 11.9cm

iv)What should be added with (x^2+2) to make it a perfect square number?

b) $\frac{1}{x^2}$

v) Two angles of a triangle are 60^0 *and* 65^0. Which option of the following options is correct?

d) Side opposite to 65^0 angle is the largest side.

2. Fill in the blanks. (Answer all the questions)
5x1=5

i) $\frac{(-2)^{-3}}{(4)^{-2}} = \frac{(4)^2}{(-2)^3} = \frac{16}{-8} = -2$

ii) For a right angled triangle, the side opposite to ***90^0 angle or right angle*** is the largest side.

iii) $(a^2b^{-1})^2 \times (a^{-4}b^2) = a^4b^{-2} \times a^{-4}b^2 = a^0b^0 = \mathbf{1}.$

iv) $a^2 - 16b^2 = (a+4b)^2 -$ ***$(8ab+32b^2)$.***

v) In an obtuse angle triangle one angle is **greater or >** than 90^0.

3. Write 'True' or 'False'. (Don't write 'T' or 'F'). (Answer all the questions)
5x1=5

i) If two sides of a triangle are equal then angles opposite to those sides will also be equal. - **True**

ii) Both the diagonals of any quadrilateral are always greater than its all sides.- **False**

iii) $xy \times (x-y)$ is greater by x^2y than $-xy^2$.- **True**

iv) $\left(\frac{a^3}{b^{-1}}\right)^2$ is equal to $\left(\frac{a^2}{b^{-1}}\right)^3$.- **False**

v) $3x^2 + 4x + 1 + x^2$ is not a perfect square number. - **False**

Group - B

(For this group explanation and diagrams are needed where applicable)

6. Very Short Answer Type Questions. (Answer all the questions) **5x2=10**

i) **Without actual multiplication, find the square of 99.99**

Ans: $(99.99)^2 = (100 - 0.01)^2$

$=(100)^2 - 2 \times 100 \times 0.01 + (0.01)^2$

$=10000 - 2 + 0.0001$

$=9998+0.0001$

$=9998.0001$

ii) **Simplify : $(6x^2 - 1) - (3x^2 - 6x + 2)$.**

Ans: $(6x^2 - 1) - (3x^2 - 6x + 2)$.

$= 6x^2 - 1 - 3x^2 + 6x - 2$

$=3x^2 + 6x - 3$

iii) **Simplify : $\frac{14a^2b+7ab}{-7ab}$.**

Ans: $\frac{14a^2b+7ab}{-7ab}$

$= \frac{14a^2b}{-7ab} + \frac{7ab}{-7ab}$

$= -2a - 1$

iv) **Simplify: $(xy^{-1})^2 \times (xy)^{-2}$.**

Ans: $(xy^{-1})^2 \times (xy)^{-2}$

$= x^2y^{-2} \times x^{-2}y^{-2}$.

$=x^0y^{-4}$

$=y^{-4}$ or $=\frac{1}{y^4}$

v) **Determine the value of x, if $16x = (62)^2 - (26)^2$.**

Ans: $16x = (62)^2 - (26)^2$.

Or, $16x = (62 + 26)(62 - 26)$

Or, $16x = 88 \times 36$

Or, $x = \frac{88 \times 36}{16}$

Or, $x = 198$

7. Short answer type question.(Any five) **5x3=15**

i) **Divide: $-\frac{4}{5}a^2b^2c^4$ by $-\frac{6}{15}abc^2$.**

Ans: $-\frac{4}{5}a^2b^2c^4 \div -\frac{6}{15}abc^2$

$= \frac{-4a^2b^2c^4}{5} \div \frac{-6abc^2}{15}$

$= \frac{-4a^2b^2c^4}{5} \times \frac{15}{-6abc^2}$

$= 2abc^2$

ii) **Simplify: $(2x^2 - 3x - 1) \times (x - 5)$.**

Ans: $(2x^2 - 3x - 1) \times (x - 5)$

$=2x^2.x - 3x.x - 1.x - 2x^2.5 + 3x.5 + (1 \times 5)$

$= 2x^3 - 3x^2 - x - 10x^2 + 15x + 5$

$= 2x^3 - 13x^2 + 14x + 5$

iii) **Simplify:** $\{(2)^a\}^x \times \{(2)^{-x}\}^a$.

Ans: $\{(2)^a\}^x \times \{(2)^{-x}\}^a$

$= (2)^{ax} \times (2)^{-xa}$

$= (2)^{ax-ax}$

$= 2^0$

$= 1$

iv) **Simplify:** $\left(\frac{1}{2^{-1}} + \frac{1}{3^{-1}}\right)^{-1}$.

Ans: $\left(\frac{1}{2^{-1}} + \frac{1}{3^{-1}}\right)^{-1}$

$= (2^1 + 3^1)^{-1}$

$= (5)^{-1}$

$= \frac{1}{5}$

v) **Find the value of $4x^2 + \frac{1}{x^2}$ when $2x + \frac{1}{x} = 2$.**

Ans: Given , $2x + \frac{1}{x} = 2$

Squaring both the sides of the above equation, we get

$\left(2x + \frac{1}{x}\right)^2 = 2^2$

Or, $4x^2 + 2.2x.\frac{1}{x} + \frac{1}{x^2} = 4$

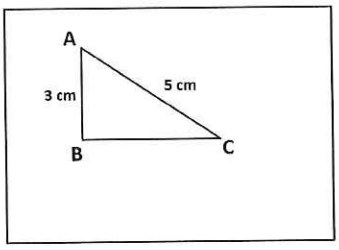
Or, $4x^2 + 4 + \frac{1}{x^2} = 4$

Or, $4x^2 + \frac{1}{x^2} = 4 - 4$

Or, $4x^2 + \frac{1}{x^2} = 0$

vi) **In triangle ABC, <ABC is a right angle. AB=3cm and AC=5cm. Find out the measure of BC.**

Ans: According to the sum, the triangle will be as shown in the figure.



Now, by Pythagoras theorem, $(AB)^2 + (BC)^2 = (AC)^2$

Or, $9 + (BC)^2 = 25$

Or, $(BC)^2 = 25 - 9$

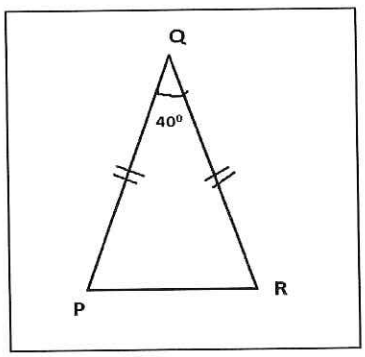
Or, $(BC)^2 = 16$

Or, BC = 4

Hence the measure of BC side will be 4 cm.

vii) **In triangle PQR, it is given that PQ=QR and $< PQR = 40^0$. Determine <QPR .**

Ans: According to the sum, the triangle will be as shown in the figure.



As it is an isosceles triangle, where PQ = QR, hence the angles opposite to those will also be equal. i.e <QPR = < QRP = x (let)

Then $x + x + 40^0 = 180^0$ [as the sum of three angles of a triangle is 180^0]

Or, $2x = 180^0 - 40^0$

Or, $x = 70^0$

Hence , <QPR = x = 70^0

Group C

I. Answer the following questions(any 8) **5 x 8 = 40**

1. If $\left(x-\frac{1}{x}\right)=4$ find the value of $(x^4+\frac{1}{x^4})$

Ans: $\left(x-\frac{1}{x}\right)=4$

Squaring on both sides of the equation, we have $\left(x-\frac{1}{x}\right)^2=16$

Or, $\left(x^2-2+\frac{1}{x^2}\right)=16$

Or , $\left(x^2+\frac{1}{x^2}\right)=16+2$

Or, $\left(x^2+\frac{1}{x^2}\right)=18$

Squaring on both sides of the equation

$\left(x^2+\frac{1}{x^2}\right)^2=18^2$

$Or, \left(x^4+2+\frac{1}{x^4}\right)=324$

Or $\left(x^4+\frac{1}{x^4}\right)=324-2=322$. **Ans**

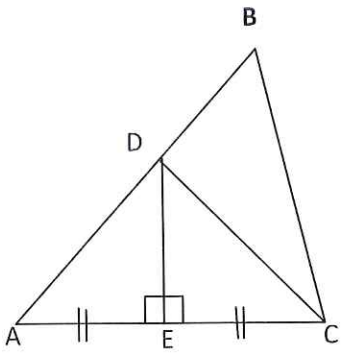
2. What must be subtracted from $x^4+6x^3+13x^2+13x+8$ so that the resulting polynomial is exactly divisible by x^2+3x+2?

Ans: Dividing $x^4+6x^3+13x^2+13x+8$ by by x^2+3x+2 we have

$$
\begin{array}{r|l}
 & x^2+3x+2 \\
\hline
x^2+3x+2 & x^4+6x^3+13x^2+13x+8 \\
 & \underline{-x^4-3x^3-2x^2} \\
 & 3x^3+11x^2+13x+8 \\
 & \underline{-3x^3-9x^2-6x} \\
 & 2x^2+7x+8 \\
 & \underline{-2x^2-6x-4} \\
 & x+4
\end{array}
$$

Ans: The remainder is **x+4** and must be subtracted from the quotient to make it exactly divisible by the divisor.

3. **In a triangle ABC, the perpendicular bisector of AC meets AB at D. Prove that AB= BD +DC**



Ans: In Triangles ADE and DEC:
Given AE=EC, <DEA=<DEC=90°, DE is common
Therefore the triangles are congruent by SAS congruency.
AD= DC (cpct)
AB= AD+ BD= DC + BD.
Hence proved.

4. **If $4^x+4^x+4^x+4^x+4^x+4^x+4^x+4^x=\frac{1}{512}$ then what is the value of $-\frac{3}{x}$?**

Ans: We have 8. $4^x=\frac{1}{512}$
Or, $2^3 . 2^{2x} = 2^{-9}$
Or, $2^{(3+2x)} = 2^{-9}$
When bases are same the powers can be equated. Therefore,
We have, 3+2 x =-9
Or 2x = -9-3
Or 2x = -12
Or x=-6
Therefore $-\frac{3}{x}=\frac{-3}{-6}=\frac{1}{2}$

5. **Multiply $x^2 + xy - y^2$ by $x^2 - xy + y^2$**

Ans: $(x^2 + xy - y^2)(x^2 - xy + y^2)$

$= x^2 . (x^2 - xy + y^2) + xy . (x^2 - xy + y^2) - y^2 . (x^2 - xy + y^2)$

$= x^4 - x^3y + x^2y^2 + x^3y - x^2y^2 + xy^3 - x^2y^2 + xy^3 - y^4$

$= x^4 - x^2y^2 + 2xy^3 - y^4$ **(Ans)**

6. **Can 6 metres, 8 metres and 10 metres form the sides of a right angled triangular field?**
Ans: Yes
We know by Pythagoras theorem that for a right angled triangle base ^{2} +perpendicular ^{2} = hypotenuse^2 where hypotenuse is the largest side of the triangle.
In the given question $6^2+8^2 = 36 + 64 = 100 = 10^2$
hence the given sides can form a right angled triangular field.

7. **The angles of a quadrilateral are in the ratio 2 : 3: 5 : 8. Find the measure of each of the four angles.**

Ans: We know that the sum of four angles of a quadrilateral $=360^o$
Given the ratio of the angles is 2:3:5:8.
Let the common factor be x.

Then $2x+ 3x+ 5x+ 8x =360^o$

$18x = 360^o$

Or $x= 20^o$

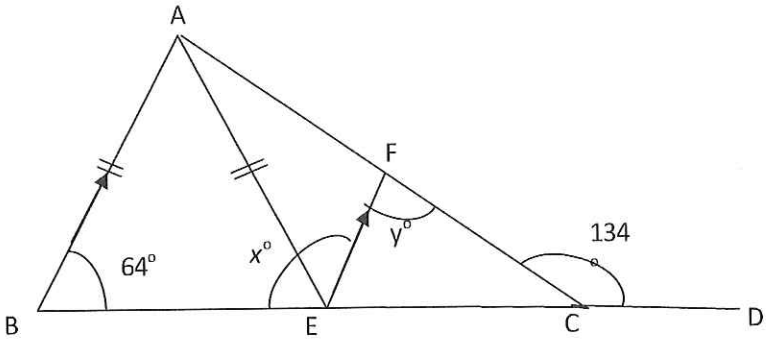
Therefore the angles are $2x20^o$, $3x\ 20^o$, $5x\ 20^o$ and $8x20^o$

Ans: 40^o, 60^o, 100^o, 160^o

8. **Find the product of (a-b-c) and (a-b+c)**
Ans: (a-b-c)(a-b+c)
={(a-b)-c}{(a-b)+c}
Let (a-b) be m
Therefore the expression becomes
(m-c)(m+c)
Using the identity $(x+y)(x-y) =x^2-y^2$, we have
m^2-c^2
$=(a-b)^2-c^2$
Using identity $(x-y)^2 = x^2-2xy +y^2$, the expression becomes
$a^2-2ab+b^2-c^2$ (Ans)

9. **When the sun is directly overhead a 4 m rod is held in an inclined position so that its shadow is 3 m long. How much higher is one end of the rod than the other?**
Ans: 4 cm is the inclined end of the rod. We can assume it as hypotenuse, 3 m is the base. We require to find the perpendicular height of a right angled triangle. We may use the Pythagoras theorem as follows:
height $=\sqrt{(\text{hypotenuse}^2-\text{base}^2)}$
Height$= \sqrt{(4^2-3^2)} =\sqrt{(16-9)} = \sqrt{7}=$ **2.65m (Ans)**

10. **Find the value of x and y in the adjoining diagram where similar markings show equal sides and similar arrowheads show parallel lines.**



Ans: In triangle AB is parallel to EF and BE is transversal.
Therefore $x^o + 64^o = 180^o$ (Co-interior angles)

$x^o = 180^o - 64^o = 116^o$

Now, <FEC is corresponding angle to <ABE
So, <FEC = 64^o

In triangle EFC, <FCD is the external angle and <FEC and <EFC are opposite to it.
Since external angle = sum of internal opposite angles of a triangle
We have, $y^o + 64^o = 134^o$
Or, $y^o = 134^o - 64^o = 70^o$

The required angles are **$x^o = 116^o$ and $y^o = 70^o$**