

DELHI PUBLIC SCHOOL, JAMMU

SESSION 2020-21

FOUNDATION WORKSHEET

SUBJECT: MATHEMATICS

1. **Composite Numbers:** A positive integer that has at least one divisor other than 1 and itself e.g. 4, 6, 8, 9, 10...

$$4 = 1, 2, 4$$

2. **Prime Number:** A +ve number having only two factors i.e 1 & itself.

e.g. 2, 3, 5, 7, 11, 13,

2 is smallest and even prime no.

3. **Twin Prime Numbers:** It is a pair of prime numbers having difference 2.

e.g. (3, 5), (5, 7), (11, 13)

4. **Co-Prime Numbers:** Those two numbers whose highest common factor is one.

(2, 3), (3, 8)

5. **Perfect Number:** It is a +ve integer that is equal to the sum of its +ve divisors.

e.g. 6, 28, 496, 8128,

$$6 = 1, 2, 3$$

$$6 = 1 + 2 + 3 = 6$$

Q1. Express each of the following as a rational number of the form $\frac{p}{q}$:

$$\left(\frac{3}{8}\right)^{-2} \times \left(\frac{4}{5}\right)^{-3}$$

Sol. $\frac{1}{\left(\frac{3}{8}\right)^2} \times \frac{1}{\left(\frac{4}{5}\right)^3}$

$$= \frac{1}{\frac{3^2}{8^2}} \times \frac{1}{\frac{4^3}{5^3}} \Rightarrow \frac{1}{9} \times \frac{1}{\frac{64}{125}} \Rightarrow \frac{64}{9} \times \frac{125}{64} = \frac{125}{9}$$

Q2. By that number should $(-24)^{-1}$ be divided so that the quotient may be 3^{-1} ?

Sol. Let the required number be x. Then,

$$(-24)^{-1} \div x = 3^{-1}$$

$$\frac{(-24)^{-1}}{x} = 3^{-1}$$

$$3^{-1} \times x = (-24)^{-1} \text{ (By cross multiplication)}$$

$$x = \frac{(-24)^{-1}}{(3)^{-1}} = \frac{3}{-24} = \frac{-1}{8}$$

Q3. Find the values of each of the following:

(i) $3^{-1} + 4^{-1}$

Sol. $\frac{1}{3} + \frac{1}{4} \Rightarrow \frac{4+3}{12} = \frac{7}{12}$

(ii) $(3^{-1} + 4^{-1} + 5^{-1})^0$

$$\Rightarrow \left(\frac{1}{3} + \frac{1}{4} + \frac{1}{5}\right)^0 \Rightarrow \left(\frac{20+15+12}{60}\right)^0 = \left(\frac{47}{60}\right)^0 = 1$$

Q4. Find the value of x so that

$$\left(\frac{5}{3}\right)^{-5} \times \left(\frac{5}{3}\right)^{-11} = \left(\frac{5}{3}\right)^{8x}$$

Q5. By what number should $\left(\frac{1}{2}\right)^{-1}$ be multiplied so that the product may be equal to $\left(\frac{-4}{7}\right)^{-1}$?

Q6. The size of a red blood cell is 0.000007 m and the size of a plant cell is 0.00001275m. Compare these two.

Simplification of Addition and Subtraction

Q1. Add

$$\frac{5}{7} + \frac{3}{7} \quad \text{Take L.C.M of denominators}$$

$$= \frac{5+3}{7} = \frac{8}{7}$$

Q2. $\frac{4}{5} - \frac{2}{5}$

$$= \frac{4-2}{5} \quad \text{Take L.C.M of denominator}$$

$$= \frac{2}{5}$$

Q3. $\frac{5}{7} + \frac{4}{6} + \frac{3}{5}$ Take L.C.M of denominators

$$= \frac{150+140+126}{210}$$

$$= \frac{416}{210}$$

$$= \frac{208}{105}$$

5	7-5-6
6	7-1-6
7	7-1-1
	1-1-1

$$5 \times 6 \times 7 = 210$$

Q4. $\frac{5}{7} + \frac{3}{2} - \frac{9}{7}$

Sol. $\frac{5}{7} + \frac{3}{2} - \frac{9}{7}$ Take L.C.M of denominator

$$= \frac{10+21-18}{14}$$

$$= \frac{31-18}{14}$$

$$= \frac{13}{14}$$

Q5. $\frac{5}{7} \times \frac{2}{3} + \frac{1}{4} - \frac{3}{2}$

Sol. $\frac{5}{7} \times \frac{2}{3} + \frac{1}{4} - \frac{3}{2}$

$$= \frac{10}{21} + \frac{1}{4} - \frac{3}{2}$$

$$= \frac{40+21-126}{84}$$

$$= \frac{61-126}{84}$$

$$= \frac{65}{84}$$

Applying BODMAS

Take L.C.M of denominator

Practice Questions:

(i) $\frac{5}{9} + \frac{3}{4} - \frac{7}{8}$

(ii) $\frac{2}{5} + \frac{7}{5} \times \frac{1}{3} - \frac{8}{9}$

(iii) $\frac{4}{5} \left(\frac{5}{7} + \frac{6}{3} - \frac{1}{2} \right)$

(iv) $\left(\frac{8}{9} \times \frac{7}{6} \right) + \left(\frac{9}{7} \times \frac{1}{9} \right)$

(v) $\frac{5}{3} \left(\frac{7}{6} + \frac{3}{9} \div \frac{3}{9} \right)$

(vi) $\left(\frac{8}{9} \times \frac{4}{6} \right) - \left(\frac{3}{2} \times \frac{1}{10} \right)$

Area and Volume

1) Find length of arc, Perimeter and area of semi-circle of radius 7cm.

Sol. Rod $\text{\textcircled{R}}$ = 7cm.

$$\text{Length of arc} = \pi r = \frac{22}{7} \times (7)$$

$$\text{Perimeter} = \pi r + 2r = \frac{22}{7} \times 7 + 2 \times 7$$

$$\text{Area} = \pi r^2 = \frac{22}{7} \times 7 \times 7$$

2) Find Area of Trapezium of parallel sides 7cm and 12cm and distance between parallel sides equal to 6cm.

Sol. Base (b_1) = 7cm

Base (b_2) = 12cm

Height (h) = 6cm

$$\text{Area of Trapezium} = \frac{1}{2} \times (b_1 + b_2) \times h$$

$$= \frac{1}{2} \times (7 + 12) \times 6$$

3) Find surface area and volume of cuboid of length 20cm, 14cm, 18cm.

Sol. length (l) = 20cm

Breadth (b) = 14cm

Height (h) = 18cm

$$\text{Volume} = l \times b \times h$$

$$\text{S.A} = 2(lb + bh + hl)$$

4) Radius of cylinder $\text{\textcircled{R}}$ = 7cm

Height (h) = 10cm

Find Volume and Surface area.

Sol. Radius $\text{\textcircled{R}}$ = 7cm

Height (h) = 10cm

$$\text{Volume} = \pi r^2 h$$

$$\text{S.A} = 2\pi r(h + r)$$

5) Radii of two spheres be 7cm and 14cm. Find ratio of Surface areas and ratio of volumes.

Sol. Radius (r_1) = 7cm Radius (r_2) = 14cm

$$\frac{\text{S.A. of 1st } (S_1)}{\text{S.A. of 2nd } (S_2)} = \frac{4\pi r_1^2}{4\pi r_2^2} = \frac{r_1^2}{r_2^2}$$

$$\frac{\text{Volume of 1st } (V_1)}{\text{Volume of 2nd } (V_2)} = \frac{4\pi r_1^3}{4\pi r_2^3} = \frac{r_1^3}{r_2^3}$$

Probability

Example: A coin tossed 500 times with the following frequencies of two outcomes:

Head 240 times, tail 260 times

Sol. It is given that Probability of occurrence of these events

$$P(A) = \frac{\text{No. of trials}}{\text{Total No. of trials}} = \frac{240}{500} = 0.48$$

$$P(B) = \frac{\text{No. of trials}}{\text{Total No. of trials}} = \frac{260}{500} = 0.52$$

Example 2. The Probability that it will rain is 0.85 what is the probability that it will not rain tomorrow.

Sol. Total probability is equal to 1

$$\text{So, } P(\text{not rain}) = 1 - 0.85 = 0.15$$

Practice Questions:

Q1. A die is thrown Find the probability of getting

(i) A Prime Number

(ii) 2 or 4

(iii) A multiple of 2 or 3

(iv) A Number greater than 6

Q2. A card is drawn at random from a pack of 52 cards. Find the probability that the card drawn is

(i) A black king

(ii) black and a king

(iii) '10' of spade

(iv) a heart

(v) a red card

(vi) a black card

Q3. A bag contains 5 White and 7 Red balls. One ball is drawn at random what is the Probability that ball drawn is white.

Topic: Linear Equations

1) Solve for x

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

By Cross Multiplication

$$4(4x + 3) = 3(5x + 1)$$

$$\Rightarrow 16x + 12 = 15x + 3$$

Transposing like terms, we get

$$\Rightarrow 16x - 15x = 3 - 12$$

$$\Rightarrow x = -9$$

\therefore Solution of equation is -9.

2) The denominator of a Rational Number is four times its numerator. If 9 is added to Numerator the new number becomes $\frac{5}{2}$. Find the Rational Number.

Sol. Let the Numerator of a Rational Number be x.

\therefore Denominator of a Rational Number = 4x

[\therefore Denominator is 4 times its Numerator]

Now,

Adding 9 to Numerator, then Numerator becomes x + 9

According to Question

$$\frac{x+9}{4x} = \frac{5}{2} \quad \left[\because \text{New Number becomes } \frac{5}{2}, \text{ If we add 9 to Numerator of Original Rational Number} \right]$$

By Cross Multiplication we get

$$5(4x) = 2(x+9)$$

$$\Rightarrow 20x = 2x + 18$$

Transposing 2x to L.H.S we get

$$20x - 2x = 18$$

$$\Rightarrow 18x = 18$$

$$\Rightarrow x = \frac{18}{18}$$

$$\Rightarrow x = 1$$

Thus, Original Rational Number = $\frac{x}{4x}$

$$= \frac{1}{4(1)}$$

$$= \frac{1}{4}$$

3) Denominator of a Rational Number is 5 less than its Numerator. If seven is added to numerator and the denominator becomes 5 times then the new number becomes 1. Find the original Rational Number.

4) Find the value of p

$$\frac{6p+8}{5} = \frac{-3p+7}{3}$$

5) Solve and check

$$\frac{2p+3}{5} + \frac{3p-5}{2} = \frac{p+7}{3}$$

BODMAS

When two or more than two operations are present, we use a basic rule to simplify

BODMAS

B Bracket

O Of

D Division

M Multiplication

A Addition

S Subtraction

Example: Simplify

$$90 - 7 \times 8 + 8 \div 2$$

Solution:

$$90 - 7 \times 8 + (8 \div 2) \quad (\text{Division})$$

$$90 - (7 \times 8) + 4 \quad (\text{Multiplication})$$

$$90 - 56 + 4 \quad (\text{Addition})$$

$$94 - 56 \quad (\text{Subtraction})$$

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Q1. $64 \div 16 \times (3 + 2)$

Q2. $(5 \times 12) + 6$

Q3. $\{5 + (48 \div 12)\} \div 2 \times 3$

Q4. $30 \times 2 + 18 \div 3$

Q5. $(7 \div 7 \times 7 + 7 - 7) - (5 - 5 + 5 \times 5 \div 5)$

Solution

$$(1 \times 7 + 7 - 7) - (5 - 5 + 5 \times 1)$$

$$(7 + 7 - 7) - (5 - 5 + 5)$$

$$(14 - 7) - (10 - 5)$$

$$7 - 5 = 2$$

Q6. $13 \times 2 - 4$

Q7. $21 + 36 - 15 \div 3$

Q8. $18 - 12 \div 4 + 4 \times 4$

Q9. $102 - 12 \times 6 + 12 \div 2$

Q10. $8 + 4 \times 3 - 3 + 1 - 16 \div 4 - 6$

EXPONENT & RADICALS

1) Find the value of x so that

$$(-2)^3 \times (-2)^{-6} = (-2)^{2x-1}$$

Sol. $(-2)^3 \times (-2)^{-6} = (-2)^{2x-1}$

Since bases are same, powers are added

$$\Rightarrow (-2)^{3+(-6)} = (-2)^{2x-1}$$

$$\Rightarrow (-2)^{-3} = (-2)^{2x-1}$$

$$\Rightarrow -3 = 2x - 1$$

$$\Rightarrow -3 + 1 = 2x$$

$$\Rightarrow -2 = 2x$$

$$x = \frac{-2}{2} = -1$$

2) If $5^{3x-1} \div 25 = 125$, find x

Sol. $\frac{5^{3x-1}}{5^2} = 125$

$$\Rightarrow 5^{3x-1-2} = 5^3$$

$$\Rightarrow 3x - 1 - 2 = 3$$

$$\Rightarrow 3x - 3 = 3$$

$$\Rightarrow 3x = 3 + 3$$

$$\Rightarrow 3x = 6$$

$$\Rightarrow x = \frac{6}{3} = 2$$

Unsolved:

1) Find the value of x so that

$$\left(\frac{-5}{3}\right)^{-2} \times \left(\frac{-5}{3}\right)^{-14} = \left(\frac{5}{3}\right)^{8x}$$

2) Find the value of x if

$$x = (100)^{1-4} \div (100)^0$$

3) If $\frac{5^m \times 5^3 \times 5^{-2}}{5^{-5}}$, 5^{12} , find m .