Subject Mathmatics From NCERT Book

1. Exercise - 1.1

Q1. Is zero is rational number? Can you write it in the form $\frac{p}{q}$, where q and p are integer $q \neq 0$.

Solve ⇒ Yes, Zero is a rational numbers Because it is a form $\frac{p}{q} = \frac{0}{1}$ Ans

Q2. Find Six rational numbers between 3 and 4.

Solve ⇒ $N = 6$ $\quad (N+1) = 6+1 = 7$

$\frac{3}{1} \times \frac{7}{7} = \frac{21}{7}$, $\frac{4}{1} \times \frac{7}{7} = \frac{28}{7}$

Rational number between $\frac{21}{7}$ and $\frac{28}{7}$.

⇒ $\frac{22}{7}, \frac{23}{7}, \frac{24}{7}, \frac{25}{7}, \frac{26}{7}, \frac{27}{7}$ Ans

0. Exercise 1.3

Q3. Express the following in the form $\frac{p}{q}$ where p and q and integers $q \neq 0$.

Date 15/5/23

(i) $0.\overline{6}$ ⇒

Solve ⇒ Let $x = 0.6666$ —— (I)

by equation (I) × 10

$10x = 6.6666$

Substract equation (ii) from (I)

$$\begin{aligned} 10x &= 6.6666 \\ - \quad x &= 6.66666 \\ \hline 9x &= 6.0000 \end{aligned}$$ Ans

$x = \frac{\cancel{6}^{2}}{\cancel{9}_{3}}$ $\boxed{x = \frac{2}{3}}$ Ans

(ii) $0.4\overline{7}$

Solve ⇒ Let $x = 0.47777$

eq. $10x = 4.7777$

By equation (i) × 10

$100x = 47.7$ —— (ii)

Substract equation (ii) from (i)

$$\begin{aligned} 100x &= 47.7777 \\ - \; 10x &= 4.7777 \\ \hline 90x &= 43.0000 \end{aligned}$$

$x = \frac{43}{90}$ Ans

(iii) $0.\overline{001}$

Solve ⇒ Let $x = 0.001001001$ —— (i)

by equation (i) × 1000

$1000x = 1.001001.$ —— (2)

by equation (ii) − (i)

$1000x = 1.001001$ —— (ii)

$- \quad x = 0.001001$ —— (i)

$999x = 1.000000$

$x = \frac{1}{99}$ Ans

Ex ⇒ 1.3

(1) ~~State~~ ~~wh~~ Write the following in decimal form. and say what kind of decimal expansion each has

(a) $\frac{36}{100}$ ⇒ Terminating

$100 \overline{)360} (0.36$
-300
$\times 600$
600
$\times\times\times$

(B) $\frac{1}{11}$ ⇒ Non-terminating

⇒ $11 \overline{)100} (0.0999$
99
$\times 100$
-99
$\times 99$
$\times 1$

(c) $4\frac{1}{8} = \frac{33}{8}$ = Terminating

$8 \overline{)33} ($
32
$\times 10$
-8
20
16
$\times$

40
40
$\times\times$

(d) $\frac{2}{11} \Rightarrow$ Non - terminating (e) $\frac{8}{13} \Rightarrow$ Non - terminating repeating

$$11 \overline{)20} (0.181$$
-11, 90, 88, 20, -11, 9

$$13 \overline{)30} (2.37692$$
-26, 40, 39, 100, -91, 90, -78, 120, -117, 30, -26, 4

(7) $\Rightarrow \frac{329}{4} = 82.25$ Terminating decimal

$$4 \overline{)329} (82.25$$
32, 29, -8, 10, -8, 20, 20, $\times\times$

(2) You know that $\frac{1}{7} = 0.\overline{142857}$. Can you predict what the decimal expansion of $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}, \frac{6}{7}$ are with actually doing the long division ? If so how?

Solve $\Rightarrow$ (1) $\frac{1}{7} \Rightarrow 0.\overline{142857}$ Ans

(2) $\frac{2}{7} \Rightarrow 2 \times \frac{1}{7} \Rightarrow 2 \times 0.\overline{142857}$ Ans

③ $\frac{3}{7} \Rightarrow \frac{3}{7} \times \frac{1}{7} \Rightarrow 3 \times 0.\overline{142857}$ Ans

④ $\frac{4}{7} \Rightarrow \frac{4}{7} \times \frac{1}{7} \Rightarrow 4 \times 0.\overline{142857}$ Ans

⑤ $\frac{5}{7} \Rightarrow \frac{5}{7} \times \frac{1}{7} \Rightarrow 5 \times 0.\overline{142857}$ Ans

⑥ $\frac{6}{7} \Rightarrow \frac{6}{7} \times \frac{1}{7} \Rightarrow 6 \times 0.142857 = 0.\overline{857142}$ Ans

Q8. Find three different irrational no between the rational no. $\frac{5}{7}$ and $\frac{9}{11}$.

Solve ⇒ 0.714285 ____, ____, ____ $\frac{9}{11} = 0.\overline{81}$

0.72387
0.733842
0.745976 Ans

Q9. Classify the following no are as rational or irrational.

(i) $\sqrt{23} \Rightarrow \sqrt{23}$ is irrational no Ans

(ii) $\sqrt{225} \Rightarrow \sqrt{15 \times 15} \Rightarrow (\sqrt{15})^2 \Rightarrow \frac{15}{1} \Rightarrow$ Rational no the

(iii) $0.3796 \Rightarrow 0.3796$ is terminating
Hence, this no is a rational no.

(iv) $7.478478 \Rightarrow 7.478478$ non-terminating repeating. Hence, these no are rational no.

(v) $1.101001000100001\ldots \Rightarrow 1.101001000100001\ldots$ is a non-terminating non recurring.
Hence, these no are irrational no.

Exercise ⇒ 1.2

3. Show how $\sqrt{5}$ can be represented on number line.

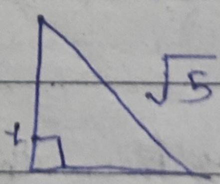
$\Rightarrow H^2 = l^2 + b^2$ In right angle $\triangle OAB$

$\Rightarrow (OA)^2 = (AB)^2 + (BO)^2$ $\sqrt{5}$

$\Rightarrow (OA)^2 = 1^2 + 2^2$ $\Rightarrow \sqrt{4+1}$

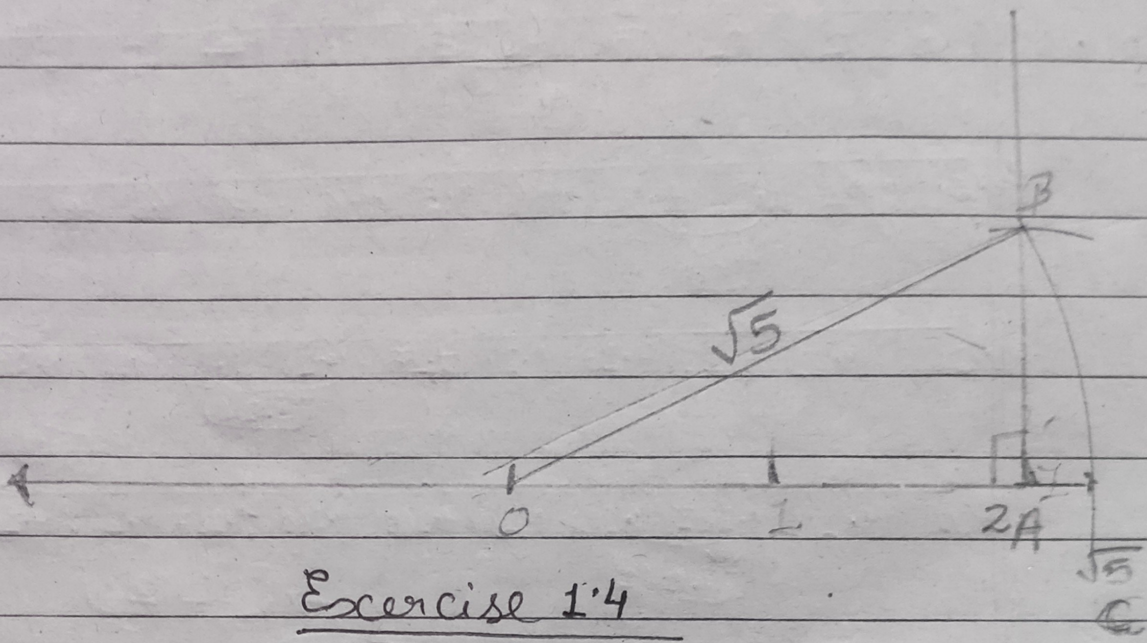
$\Rightarrow (OA)^2 = 1 + 4$ $\Rightarrow \sqrt{(2)^2 + (1)^2}$

$\Rightarrow (OA)^2 = 5$ $\Rightarrow$



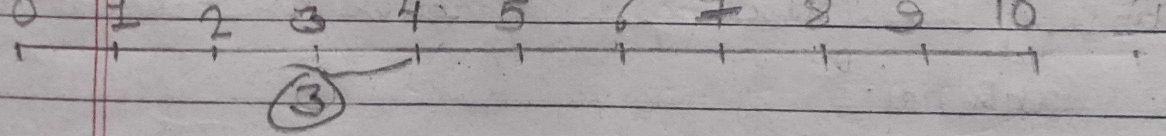
$\Rightarrow OA = \sqrt{5}$

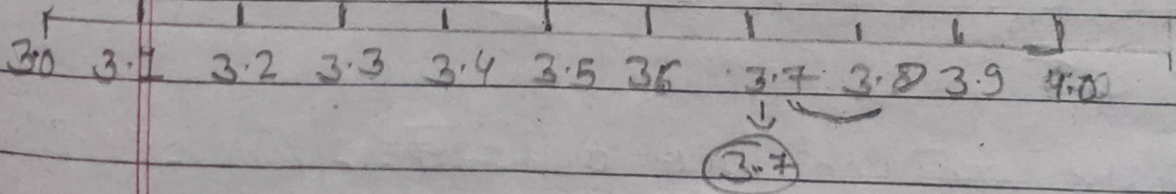
Point C Represents $\sqrt{5}$ on the number line

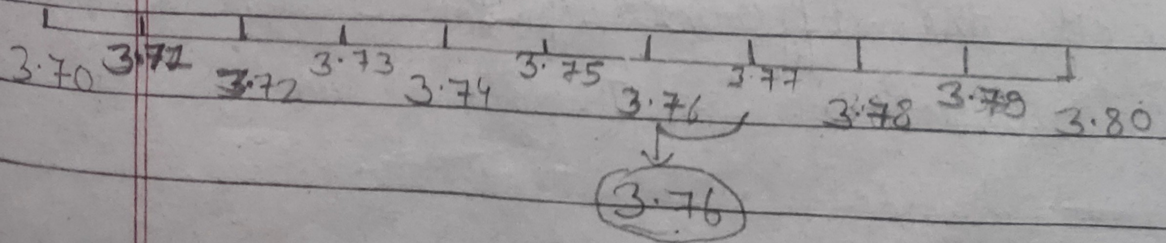


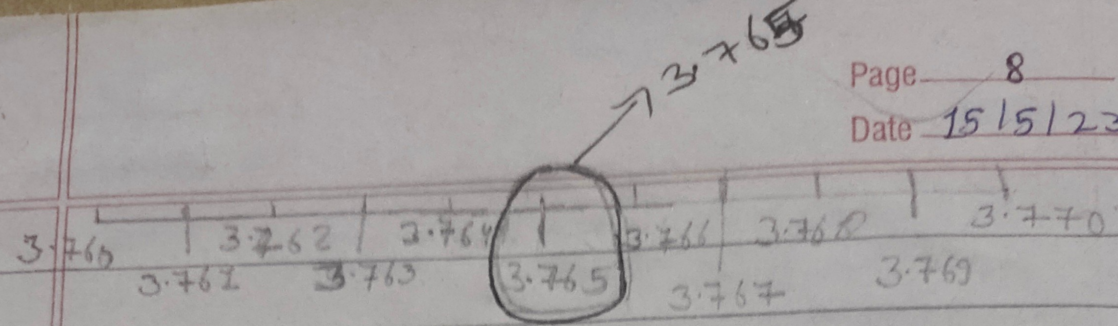
Excercise 1.4

1. visualise 3.765 on the number line, using successive magnification.





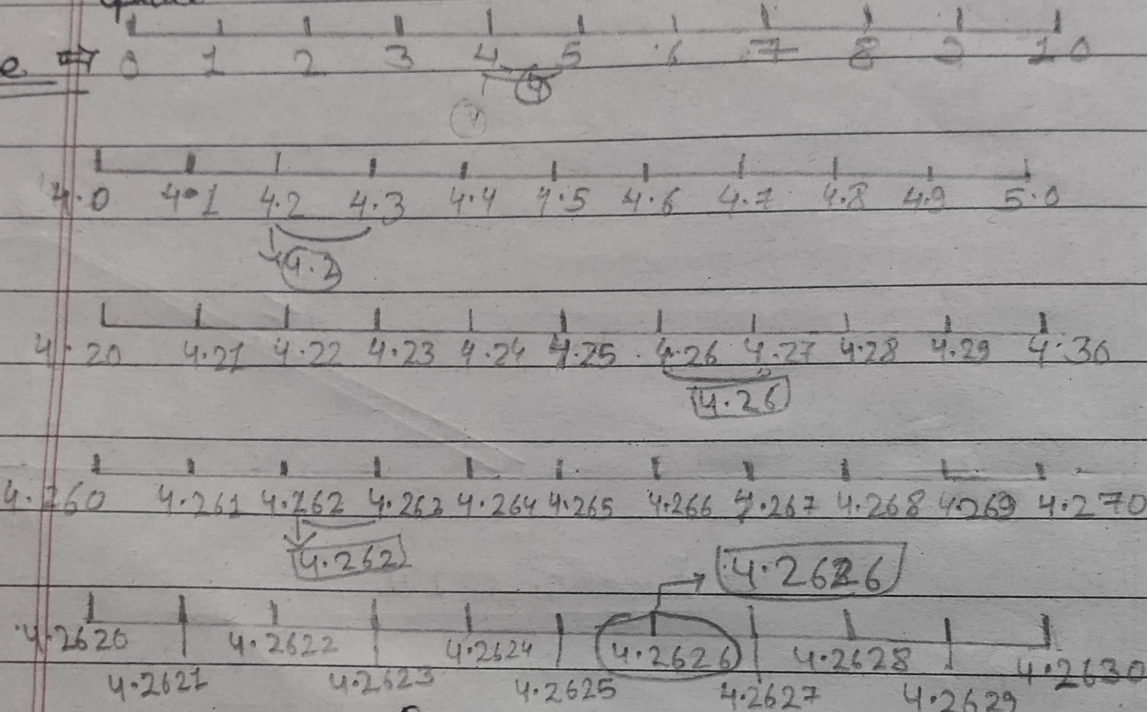




Q2. visualise $4.\overline{26}$ on the number line, up to 4 decimal place.

$\Rightarrow 4.\overline{26} \Rightarrow 4.\overline{2626}$

Solve ⇒



Excercise 1.5

Q1. Classify the following numbers as rational number or irrational.

(i) $2 - \sqrt{5}$

Solve ⇒ 2 is rational no and $\sqrt{5}$ is an irrational no and the difference of the rational no and an irrational no is Irrational no.

(ii) $(3+\sqrt{23}) - \sqrt{23}$

$\Rightarrow$ $3+\cancel{\sqrt{23}} - \cancel{\sqrt{23}}$

$\Rightarrow$ 3 is a rational no.

(iii) $\frac{2\sqrt{7}}{7\sqrt{7}}$

$\Rightarrow$ $\frac{2}{7}\frac{\sqrt{7}}{\sqrt{7}}$, $\frac{2}{7}$ is a rational no.

(iv) $\frac{1}{\sqrt{2}} = 1 \div \sqrt{2}$

$\Rightarrow$ 1 is a rational no and $\sqrt{2}$ is an irrational no this is irrational No.

(v) 2π

$\Rightarrow$ 2 is a rational no and π is irrational. Hence, the product of rational and irrational no is irrational.

(vi) $2\pi r$

$\Rightarrow$ Circumference of circle $= 2\pi r$

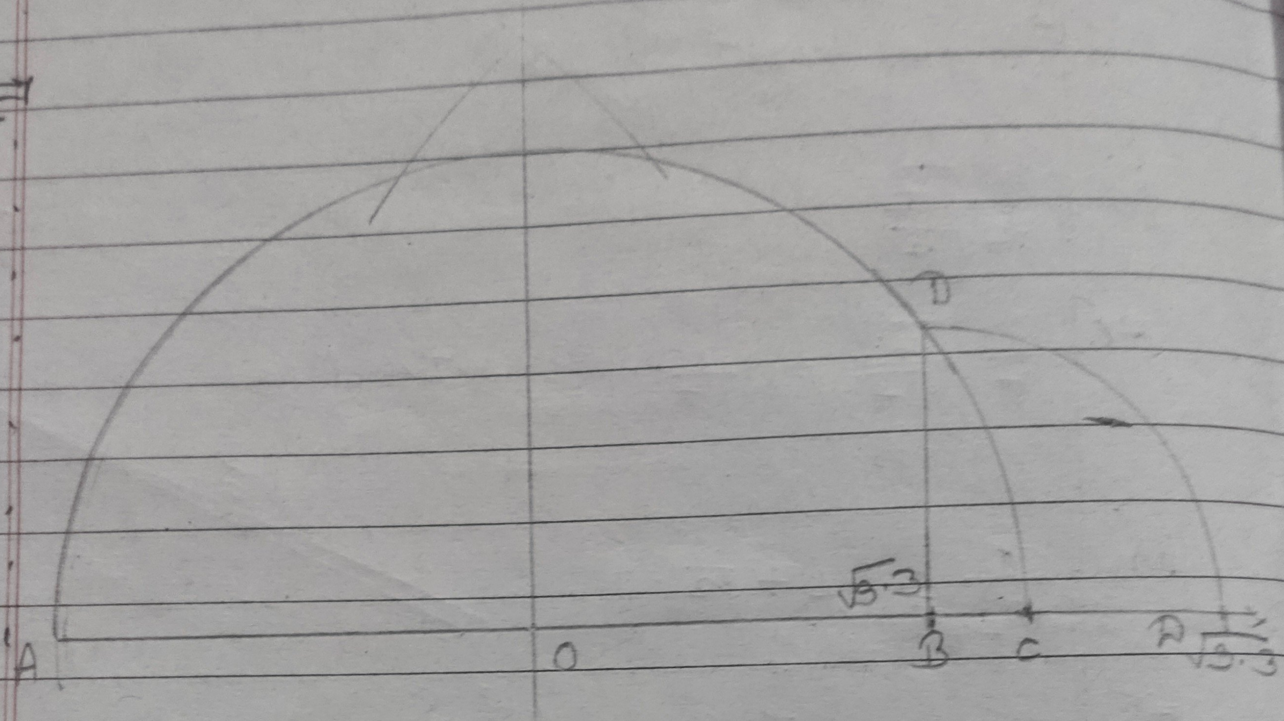
$= C = rd \Rightarrow r = \frac{C}{d}$

Quotient of two irrational no always irrational.

π is irrational no so $r \neq \frac{C}{d}$.

(4) Represent $\sqrt{9.3}$ on the number line.

Solve ⇒



(5) Rationalise the denominator of the following :-

(i) $\frac{1}{\sqrt{7}} \Rightarrow \frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} \Rightarrow \frac{\sqrt{7}}{(\sqrt{7})^2} = \frac{\sqrt{7}}{7}$ Ans

(ii) $\frac{1}{\sqrt{7}-\sqrt{6}} \Rightarrow \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}}{\sqrt{7}} + \frac{\sqrt{6}}{\sqrt{6}} \Rightarrow \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7})^2 - (\sqrt{6})^2}$

$\Rightarrow \sqrt{7}+\sqrt{6}$ Ans

(iii) $\frac{1}{\sqrt{5}+\sqrt{2}} \Rightarrow \frac{1}{\sqrt{5}+2} \times \frac{\sqrt{5}}{\sqrt{5}} - \frac{\sqrt{2}}{\sqrt{2}} \Rightarrow \frac{\sqrt{5} - \sqrt{2}}{(\sqrt{5})^2 - (\sqrt{2})^2}$

$\Rightarrow \frac{\sqrt{5}-\sqrt{2}}{5-2} \Rightarrow \frac{\sqrt{5}-\sqrt{2}}{3}$ Ans

(iv) $\frac{1}{\sqrt{7}-2}$

Solve $\Rightarrow \frac{1}{\sqrt{7}-2} \times \frac{\sqrt{7}+2}{\sqrt{7}+2} = \frac{\sqrt{7}+2}{(\sqrt{7})^2 + (2)^2}$

$\Rightarrow \frac{\sqrt{7}+2}{7 - 4} \Rightarrow \frac{\sqrt{7}+2}{3}$ Ans

Excercise 1.6

1. Find :-

(i) $64^{\frac{1}{2}} \Rightarrow (2\times2\times2\times2\times2\times2)^{\frac{1}{2}} = (2^6)^{\frac{1}{2}} = 2^{\cancel{6}^{3}\times\frac{1}{\cancel{2}}} = 2^3$ Ans

(ii) $32^{\frac{1}{5}} \Rightarrow (2\times2\times2\times2\times2)^{\frac{1}{5}} = (2^5)^{\frac{1}{5}} = 2^{\cancel{5}\times\frac{1}{\cancel{5}}} = 2^1 = 2$ Ans

(iii) $125^{\frac{1}{3}} \Rightarrow (5\times5\times5)^{\frac{1}{3}} = (5^3)^{\frac{1}{3}} = 5^{\cancel{3}\times\frac{1}{\cancel{3}}} = 5$ Ans

2. Find

(i) $9^{\frac{3}{2}} \Rightarrow (3\times3)^{\frac{3}{2}} = (3^2)^{\frac{3}{2}} = 3^{\cancel{2}\times\frac{3}{\cancel{2}}} \Rightarrow 3^3 = 3\times3\times3 = 27$ A

(ii) $32^{\frac{2}{5}} \Rightarrow (2\times2\times2\times2\times2)^{\frac{2}{5}} = (2^5)^{\frac{2}{5}} = 2^{\cancel{5}\times\frac{2}{\cancel{5}}} = 2^2 = 2\times2 = 4$ A

(iii) $16^{\frac{3}{4}} \Rightarrow (2\times2\times2\times2)^{\frac{3}{4}} = (2^4)^{\frac{3}{4}} = 2^{\cancel{4}\times\frac{3}{\cancel{4}}} = 2^3 = 2\times2\times2 = 8$ Ans

(iv) $125^{-\frac{1}{3}} \Rightarrow (5\times5\times5)^{-\frac{1}{3}} = 5^{3\times\left(\frac{-1}{3}\right)} = 5^{-1} = \frac{1}{5}$ Ans

Q3. Simplify :-

(i) $2^{\frac{2}{3}} \cdot 2^{\frac{1}{5}} \Rightarrow 2^{\frac{2}{3}+\frac{1}{5}} \Rightarrow 2^{\frac{10+3}{15}} = 2^{\frac{13}{15}}$ Ans

(ii) $\left[\frac{1}{3^3}\right]^7 \Rightarrow \frac{1}{3^{3\times7}} = \frac{1}{3^{21}} = 3^{-21}$ Ans

(iii) $\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}} \Rightarrow 11^{\frac{1}{2}} \times 11^{-\frac{1}{4}} = 11^{\frac{1}{2}+\left(-\frac{1}{4}\right)} = 11^{\frac{1}{2}-\frac{1}{4}} = 11^{\frac{1}{2}}$ Ans

(iv) $7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}} \Rightarrow (7\times8)^{\frac{1}{2}} = 56^{\frac{1}{2}}$ Ans

Ch ⇒ 2 Polynomials

Ex ⇒ 2.1

1. Which of the following expressions are polynomials in one variable and which are not? state reason for your answer.

(i) $4x^2 - 3x$

⇒ Yes, this expressions is a polynomial is one variable (x).

(ii) $y^2 + \sqrt{2}$

⇒ Yes, this expressions is a polynomial is one variable (y)

(iii) $3\sqrt{t} + t\sqrt{2}$

⇒ No, it can be observed that the exponents of variable (t) in term $3\sqrt{t}$ is $\frac{1}{2}$, which is not a whole no. Therefore, this expressions is not a polynomials.

(iv) $y + \frac{2}{y}$ ⇒ It is not polynomial as power of y is -1

⇒ which is not a whole number.

(v) $x^{10} + y^3 + t^{50}$

⇒ No, it can be observed that this expressions is a polynomial in three variables x, y and therefore, This expression is not a polynomial in one variable but is polynomial in 3 variables.

Q2. Write the coefficients of x^2 in each of the following.

(i) $2 + x^2 + x$

⇒ The coefficient in $2 + x^2 + x$ of x^2 is 1.

(ii) $2 - x^2 + x^3$

⇒ The coefficient $2 - x^2 + x^3$ of x^2 is -1.

(iii) $\frac{\pi}{2}x^2 + x$

⇒ The coefficient in $\frac{\pi}{2}x^2 + x$ of x^2 is $\frac{\pi}{2}$.

(iv) $\sqrt{2}x - 1$

⇒ The coefficient in $\sqrt{2}x - 1$ of x^2 is 0.

Q4. Write the degree of each of the following polynomials :-

(i) $5x^3 + 4x^2 + 7x$

⇒ Degree of polynomial $= 3$.

(ii) $4 - y^2$

⇒ Degree of Polynomial $= 2$.

(iii) $5t - \sqrt{7}$

⇒ Degree of Polynomial $= 1$.

(iv) 3

⇒ Degree of Polynomial $= 0$.

Q8.

Exercise 2.2

Q3. Verify whether the following are zeroes of the Polynomial, Indicated aganist them.

(i) $P(x) = 3x + 1; x = -\frac{1}{3}$

Solve $\Rightarrow P(-\frac{1}{3}) = \cancel{3}x(-\frac{1}{\cancel{3}}) + 1$

$\Rightarrow -1 + 1$

$\Rightarrow 0$

$\therefore \frac{-1}{3}$ is zero of $P(x)$

(ii) $P(x) = 5x - \pi, x = \frac{4}{5}$

Solve $\Rightarrow P(\frac{4}{5}) = \cancel{5}(\frac{4}{\cancel{5}}) - \pi$

$\Rightarrow 4 - \pi$

$\Rightarrow 4 - \pi \neq 0$

$\therefore \frac{4}{5}$ is not zero of $p(x)$

(iii) $P(x) = x^2 - 1, x - 1, -1$

Solve $\Rightarrow P(1) = 1^2 - 1$

$\Rightarrow 1 - 1 = 0$

$\Rightarrow P(-1) = (-1)^2 - 1$

$= 1 - 1$

$\Rightarrow 0$ Ans

$\therefore -1, 1$ both are zeroes of $P(x)$

(iv) $P(x) = (x+1)(x-2), x = -1, 2$

Solve $\Rightarrow P(-1) = (-1+1) \cdot (-1-2)$

$\Rightarrow (1-1) \cdot (-3)$

$\Rightarrow (0)(-3) = 0$

$\Rightarrow P(2) = (2+1)(2-2)$

$\Rightarrow (3)(0)$

$\Rightarrow 0$

$\therefore -1, 2$ Both are zeroes of $P(x)$

(v) $P(x) = x^3, x = 0$

Solve $\Rightarrow P(0) = 0^3$

$\Rightarrow 0$ Ans

$\therefore 0$ is zeroes of $P(x)$

(viii) $P(x) = 2x + 1, x = \frac{1}{2}$

Solve $\Rightarrow P(\frac{1}{2}) = \cancel{2}(\frac{1}{\cancel{2}}) + 1$

$\Rightarrow 1 + 1 = 2$

$\therefore \Rightarrow \frac{1}{2}$ is not a zero of $P(x)$

(vi) $P(x) = lx + m$; $x = \frac{-m}{l}$

$\Rightarrow P\left(\frac{-m}{l}\right) = \cancel{l}\left(\frac{-m}{\cancel{l}}\right) + m$

$\Rightarrow -m + m$

$\Rightarrow 0$ Ans

(vii) $P(x) = 3x^2 - 1$, $x = \frac{-1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$

$\Rightarrow P\left(\frac{-1}{\sqrt{3}}\right) = 3\left(\frac{-1}{\sqrt{3}}\right)^2 - 1$

$\Rightarrow \cancel{3}\left(\frac{1}{\cancel{3}}\right) - 1 \Rightarrow 0$ Ans

$\Rightarrow P\left(\frac{1}{\sqrt{3}}\right) = 3 \cdot \left(\frac{1}{\sqrt{3}}\right)^2 - 1$

$\Rightarrow 0$

$\therefore \frac{-1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$ are zeroes of $P(x)$.

Q4. Find the ~~area~~ zero of the Polynomials in each of the following Cases:-

(i) $P(x) = x + 5$

Solve $\Rightarrow$ $x + 5 = 0$

$x = -5$ Ans

(ii) $P(x) = x - 5$

Solve $\Rightarrow$ $x - 5 = 0$

$\Rightarrow$ $x = 5$ Ans

(iii) $P(x) = 2x + 5$

Solve $\Rightarrow$ $2x + 5 = 0$

$2x = -5$

$x = \frac{-5}{2}$ Ans

(iv) $P(x) = 3x - 3$

Solve $\Rightarrow$ $3x - 2 = 0$

$3x = 2$

$x = \frac{2}{3}$ Ans

(vi) $P(x) = ax$, $a \neq 0$

Solve $\Rightarrow$ $ax = 0$

$x = \frac{0}{a}$

$x = 0$ Ans

(vii) $P(x) = (x + d)$; $c \neq 0$, c, d are real number.

Solve $\Rightarrow$ $cx + d = 0$, $cx = -d$; $x = \frac{-d}{c}$ A

Exercise ⇒ 2.3

Q1. Find the remainder when x^3+3x^2+3x+1 is divided by

(i) $x+1$

Solve ⇒ $x+1 \Rightarrow 0$

$x=-1$

x^3+3x^2+3x+1

$(-1)^3+3(-1)^2+3(-1)+1$

$-1+3(1)-3+1$

$-1+3-3+1$

(ii) $x-\frac{1}{2}$

Solve ⇒ $x-\frac{1}{2}=0$

$\therefore x=\frac{1}{2} \Rightarrow x^3+3x^2+3x+1$

$\Rightarrow \left(\frac{1}{2}\right)^3+3\left(\frac{1}{2}\right)^2+3\left(\frac{1}{2}\right)+1$

$\Rightarrow \frac{1}{8}+3\left(\frac{1}{4}\right)+\frac{3}{2}+1$

$\Rightarrow \frac{1}{8}+\frac{3}{4}+\frac{3}{2}+\frac{1}{1} \Rightarrow \frac{1+6+12+8}{8}$

$\Rightarrow \frac{27}{8}$ Ans

(iii) x

Solve ⇒ $x=0$

$\Rightarrow x^3+3x^2+3x+1$

$\Rightarrow 0^3+3(0)^2+3(0)+1$

$\Rightarrow 0+0+0+1$

$\Rightarrow 1$ Ans

(iv) $x+\pi$

Solve ⇒ $x+\pi=0$

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

$\Rightarrow \pi^3+3(-\pi)^2+3(-\pi)+1$

$\Rightarrow \pi^3+3\pi^2-3\pi+1$ Ans

(v) $(5+2x)$

Solve ⇒ $5+2x=0$

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

$\Rightarrow x^3 + 3x^2 + 3x + 1$

$\Rightarrow \left(\frac{-5}{2}\right)^2 + 3\left(\frac{-5}{2}\right)^2 + 3\left(\frac{-5}{2}\right) + 1$

$\Rightarrow \frac{-125}{8} + 3\left(\frac{25}{4}\right) + 3\left(\frac{-5}{2}\right) + 1$

$\Rightarrow \frac{-125}{8} + \frac{75}{4} - \frac{15}{2} + 1 \Rightarrow \frac{-125 + 150 - 60 + 8}{8}$

$\Rightarrow \frac{158 - 185}{8} \Rightarrow \frac{-27}{8}$ Ans

Q2. Find the remainder when $x^3 - ax^2 + 6x - a$ is divided by $x - a$.

Solve $\Rightarrow$ $x - a$, $x - a = 0$, $x = a$

$\Rightarrow x^3 - ax^2 + 6x - a$

$\Rightarrow a^3 - a(a)^2 + 6(a) - a$

$\Rightarrow \cancel{a^3} - \cancel{a^3} + 6a - a$

$\Rightarrow 0 + 5a$

$\Rightarrow 5a$ Ans

Q3. Check whether $7 + 3x$ is the factor of $P(x) = 3x^3 + 7x$

Solve $\Rightarrow$ $7 + 3x = 0$

$x = \frac{-7}{3}$

$P(x) = 3x^3 + 7x$

$P\left(\frac{-7}{3}\right) = 3\left(\frac{-7}{3}\right)^3 + 7\left(\frac{-7}{3}\right)$

$\Rightarrow 3\left(-\frac{\cancel{343}\,49}{\cancel{27}\,9}\right) - \frac{49}{3}$

$\Rightarrow \frac{-343}{9} - \frac{49}{3} \Rightarrow \frac{-343-147}{9} = -490$ Ans

$7+3x$ is not a factor of $P(x)$ as remainder is not equal to zero.

Exercise 2.4

1. Determine the which of the following polynomials has $(x+1)$ a factor.

(i) x^3+x^2+x+1

Solve $\Rightarrow x+1=0$

$x=-1$

$\Rightarrow x^3+x^2+x+1$

$\Rightarrow (-1)^3+(-1)^2+(-1)+1$

$\Rightarrow -1+1-1+1$

$\Rightarrow 2-2$

$\Rightarrow 0$ Ans

$\therefore$ $x+1$ is factor of given Polynomials

(ii) $x^4+x^3+x^2+x+1$

$\Rightarrow x+1=0$

$x=-1$

$\Rightarrow x^4+x^3+x^2+x+1$

$\Rightarrow (-1)^4+(-1)^3+(-1)^2+(-1)+1$

$\Rightarrow 1-1+1-1+1$

$\Rightarrow 3-2=1$

$\Rightarrow 1$ Ans

$\therefore$ $x+1$ is not factor of given Polynomials

Q2. use the Factor theorem to determine whether $g(x)$ is a factors of $P(x)$ in each of the following cases

(i) $P(x) = 2x^3 + x^2 - 2x - 1$, $g(x) = x + 1$

$\Rightarrow x + 1 = 0$

$x = -1$

$P(x) = 2x^3 + x^2 - 2x\cancel{(-1)} - 1$

$\Rightarrow 2(-1)^3 + (-1)^2 - 2(-1) - 1$

$\Rightarrow 2(-1) + 1 + 2 - 1$

$\Rightarrow -2 + 1 + 2 - 1$

$\Rightarrow 3 - 3$

$\Rightarrow 0$ Ans $g(x)$ is factor of $P(x)$

(ii) $P(x) = x^3 + 3x^2 + 3x + 1$, $g(x) = x + 2$

Solve $\Rightarrow x + 2 = 0$

$x = -2$

$P(x) = x^3 + 3x^2 + 3x + 1$

$P(-2) = (-2)^3 + 3(-2)^2 + 3 + (-2) + 1$

$\Rightarrow -8 + 3(4) - 6 + 1$

$\Rightarrow -8 + 12 - 6 + 1$

$\Rightarrow 13 - 14$

$\Rightarrow -1$ Ans $g(x)$ is not factor of $P(x)$

(iii) $P(x) = x^2 - 4x^2 + x + 6$; $g(x) = x - 3$.

Solve ⇒ $x-3=0$

$x=3$

⇒ $P(x) = x^3 - 4x^2 + x + 6$

⇒ $P(3) = (3)^3 - 4(3)^2 + (3) + 6$

⇒ $27 - 4(9) + 9$

⇒ $36 - 36$

⇒ 0 Ans So, $g(x)$ is a factor of $P(x)$

Q4. Factorize :-

(i) $12x^2 - 7x + 1$

Solve ⇒ $12x^2 - 4x - 3x + 1$

⇒ $4x(3x-1) - 1(3x-1)$

⇒ $(4x-1) \cdot (3x-1)$ Ans

(ii) $2x^2 + 7x + 3$

Solve ⇒ $2x^2 + 6x + x + 3$

⇒ $2x(x+3) + 1(x+3)$

⇒ $(2x+1) \cdot (x+3)$ Ans

(iii) $6x^2 + 5x - 6$

Solve ⇒ $6x^2 + 9x - 4x - 6$

⇒ $3x(2x+3) - 2(2x+3)$

⇒ $(3x-2) \cdot (2x-3)$ Ans

(iv) $3x^2 - x - 4$

Solve ⇒ $3x^2 + 3x - 4x - 4$

⇒ $3x(x+1) - 4(x+1)$

⇒ $(3x-4)\ (x+1)$

Q5. Factorize :-

(i) $x^3 - 2x^2 - x + 2$ $x-1=0,\ x=1$

⇒ Let $x-1$ is factor of Polynomials $(x \neq 1)$

$$\begin{array}{r} x^2 - x \\ x-1 \overline{\big) x^3 - 2x^2 - x + 2} \\ \underline{-x^3 - x^2 } \\ x^2 - x + 2 \\ \underline{-x^2 + x } \\ -2x + 2 \\ \underline{-2x + 2} \\ 0 \end{array}$$

$\Rightarrow x^3 - 2x^2 - x + 2$

$\Rightarrow x^3 - 2(1)^2 - 1 + 2$

$\Rightarrow 1 - 2(1) - 1 + 2$

$\Rightarrow 3 - 3 = 0$ Ans

$\Rightarrow x^2 - x - 2$

$\Rightarrow x^2 + x - 2x - 2$

$\Rightarrow x(x+1) - 2(x+1)$

$\Rightarrow (x-2)\cdot(x+1)\cdot(x-1)$ Ans

(ii) $x^3 - 3x^2 - 9x - 5$

Solve $\Rightarrow$ let $x+1$ is factor of polynomial

$x + 1 = 0$

$\Rightarrow x = -1$

$\Rightarrow x^3 - 3x^2 - 9x - 5$

$\Rightarrow (-1)^3 - 3(-1)^2 - 9(-1) - 5$

$\Rightarrow -1 - 3(1) + 9 - 5$

$\Rightarrow -1 - 3 + 9 - 5$

$\Rightarrow 9 - 9$

$\Rightarrow 0$ Ans

$$\begin{array}{r} x^2 - 4x - 5 \\ x+1 \overline{\big) x^3 - 3x^2 - 9x - 5} \\ \underline{-x^3 + x^2 } \\ -4x^2 - 9x - 5 \\ \underline{-4x^2 - 4x } \\ -5x - 5 \\ \underline{-5x - 5} \\ 0 \end{array}$$

$\Rightarrow x^2 - 4x - 5 \Rightarrow x^2 + x - 5x - 5$

$\Rightarrow x(x+1) - 5(x+1)$

$\Rightarrow (x-5)\cdot(x+1)(x+1)$ Ans

(iii) $x^3+13x^2+32x+20$ $\quad +1 \times +1$

Solve $\Rightarrow x^3+13x^2+32x+20$

Let $x+1$ is factor of polynomial.

$\Rightarrow x+1=0 \quad , \quad x=-1$

$\Rightarrow x^3+13x^2+32x+20$

$\Rightarrow (-1)^3+13(-1)^2+32(-1)+20$

$\Rightarrow -1+13(1)-32+20$

$\Rightarrow -1+13-32+20$

$\Rightarrow 33-33$

$\Rightarrow 0$ Ans

$$
\begin{array}{r|l}
 & x^2+12x+20 \\
x+1 & x^3+13x^2+32x+20 \\
 & -x^3+x^2 \\
\hline
 & 12x^2+32x+20 \\
 & -12x^2+12x \\
\hline
 & 20x+20 \\
 & -20x+20 \\
\hline
 & 0
\end{array}
$$

$\Rightarrow x^2+12x+20$

$\Rightarrow x^2+2x+10x+20$

$\Rightarrow x(x+2)+10(x+20)$

$\Rightarrow (x+10)\cdot(x+2)\cdot(x+1)$ Ans

(iv) $2y^3+y^2-2y-1$ $\quad (a^2-b^2)=(a+b)(a-b)$

Solve $\Rightarrow y^2(2y+1)-1\cdot(2y+1)$

$\Rightarrow (y^2-1^2)\ (2y+1)$

$(y+1)\ (y-1)\cdot(2y+1)$ Ans

Excercise 2.5

(i) $(x+4)\ (x+10)$

Solve ⇒ $A = 4$ and $B = 10$, $(x+4)\cdot(x+10)$

⇒ $x^2 + ax + bx + ab$

⇒ $x^2 + x(4+10) + 4 \times 10$

⇒ $x^2 + 14x + 40x$ Ans

(ii) $(x+8)\ (x-10)$

Solve ⇒ $A = 8$ and $B = -10$

⇒ $x^2 + Ax - Bx - AB$

⇒ $x^2 + x(8 + (-10) + 8 \times (-10)$

⇒ $x^2 + 2x - 80$ Ans

(iii) $(3x+4)\ (3x-5)$

Solve ⇒ $(x+a)(x+b) = x^2 + (a+b)x + ab$

$(3x)^2 + [4 + (-5)]\ 3x + 4(-5)$

$9x^2 + (4-5)\ 3x - 20$

$9x^2 + 3x - 20$ Ans

(iv) $\left(y^2 + \frac{3}{2}\right)\cdot\left(y^2 - \frac{3}{2}\right)$

Solve ⇒ $(a+b)(a-b) = a^2 - b^2$

$(y^2)^2 - \left(\frac{3}{2}\right)^2$

$\Rightarrow y^4 - \frac{9}{4}$ Ans

(v) $(3-2x)\ (3+2x)$

Solve $\Rightarrow (a-b)\cdot(a+b) = a^2 - b^2$

$\Rightarrow 3^2 - (2x)^2$

$\Rightarrow 9 - 4x^2$ Ans

Q2. Evaluate the following products without Multiply directly:

(i) 103×107

Solve $\Rightarrow (100+3)\ (100+7)$

$(x+a)\cdot(x+b) = x^2 + (a+b)x + ab$

$\Rightarrow 100^2 + (3+7)100 + 3\times 7$

$\Rightarrow 10000 + (10)\ 100 + 21$

$\Rightarrow 10,000 + 1,000 + 21$

$\Rightarrow 11,021$ Ans

(ii) 95×96

Solve $\Rightarrow (100-5)\quad(100-4)$

$\Rightarrow (x+a)\cdot(x+b) = x^2 + (a+b)x + ab$

$\Rightarrow 100^2 + (-5-4)\ 100 + (-4)(-5)$

$\Rightarrow 10{,}000 - (-9)\,100 + 20$

$\Rightarrow 10{,}000 - 900 + 20$

$\Rightarrow 10020 - 900$

$\Rightarrow 9120$ Ans

(iii) 104×96

Solve $\Rightarrow$ $(100+4)\cdot(100-4)$

$(a+b)(a-b) = a^2 - b^2$

$\Rightarrow 100^2 - 4^2$

$\Rightarrow 10000 - 16$

$\Rightarrow 9984$ Ans

Q7 Evaluate the following using suitable identities:-

(i) 99^3

Solve $\Rightarrow$ $(100-1)^3$

$\Rightarrow (a+b)^3 = a^3 + b^3 + 3a^2b + 3ab^2$

$\Rightarrow (100)^3 + (-1)^3 + 3(100)^2(-1) + 3(100)(-1)^2$

$\Rightarrow 1{,}000{,}000 - 1 - 3\cdot(10{,}000) + 300\cdot(1)$

$\Rightarrow 1{,}000{,}000 - 1 - 30{,}000 + 300$

$\Rightarrow 1{,}000{,}300 - 30001$

$\Rightarrow 970{,}299$ Ans

(ii) 102^3

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Solve ⇒ $(102)^3 = (100+2)$

⇒ $(a+b)^3 = a^3 + b^3 + 3a^2b + 3ab^2$

⇒ $100^3 + 2^3 + 3(100)^2 \cdot (2) + 3(100)(2)^2$

⇒ $1,000,000 + 8 + 6(10,000) + 300(4)$

⇒ $1,000,000 + 8 + 60,000 + 1200$ Ans

⇒ $1,061,208$ Ans

(iii) $(998)^3$

Solve ⇒ $(1000 - 2)^3$

⇒ $(a+b)^3 = a^3 + b^3 + 3a^2b + 3ab^2$

⇒ $1000^3 + (-2)^3 + 3(1000)^2 \cdot (-2) + 3(1000)(-2)^2$

⇒ $1,000,000,000 - 8 - 6(1,000,000) + 12000$

⇒ $1,000,000,000 - 8 - 6,000,000 + 12,000$

⇒ $1,000,012,000 - 6,000,008$

⇒ $994,011,992$ Ans

Q8. Factorise each of the following :-

(i) $8a^3 + b^3 + 12a^2b + 6ab^2$

Solve ⇒ $a^3 + b^3 + 3a^2b + 3ab^2 = (a+b)^3$

⇒ $(2a)^3 + (b)^3 + 3(2a)^2 b + 3(2a)(b)^2$

⇒ $(2a+b)^3$ Ans

$(2a+b)\quad(2a+b)\quad(2a+b)$ Ans

(ii) $8a^3 - b^3 - 12a^2b + 6ab^2$

Solve $\Rightarrow$ $a^3 + b^3 + 3a^2b + 3ab^2 = (a+b)^3$

$(2a)^3 + (-b)^3 + 3(2a)^2 \cdot (-b) + 3(2a)(-b)^2$.

$\Rightarrow [2a + (-b)]^3$

$\Rightarrow (2a - b)^3$ Ans

$(2a-b) \cdot (2a-b) \cdot (2a-b)$

(iii) $27 - 125a^3 - 135a + 225a^2$

Solve $\Rightarrow$ $a^3 + b^3 + 3a^2b + 3ab^2 = (a+b)^3$

$\Rightarrow (3)^3 + (-5a)^3 + 3(3)^2 (-5a) + 3(3) \cdot (-5a)^2$.

$\Rightarrow [3 + (-5a)]^3$

$\Rightarrow (3-5a)^3$

$\Rightarrow (3-5a)(3-5a) \cdot (3-5a)$ Ans

(iv) $64a^3 - 27b^3 - 144a^2b + 108ab^2$

Solve $\Rightarrow$ $a^3 + b^3 + 3a^2b + 3ab^2 = (a+b)^3$

$\Rightarrow (4a)^3 + (-3b)^3 + 3(4a)^2 \cdot (-3b) + 3(4a \cdot (-3b)^2$

$\Rightarrow [4a - 3b]^3$

$\Rightarrow (4a-3b) \quad (4a-3b) \quad (4a-3b)$ Ans

(v) $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$

Solve $\Rightarrow$ $a^3 + b^3 + 3a^2b + 3ab^2 = (a+b)^3$

$\Rightarrow (3p)^3 + \left(-\frac{1}{6}\right)^3 + 3(3p)^2 \cdot \left(\frac{1}{6}\right) + 3(3p)\left(-\frac{1}{6}\right)^2$

$\Rightarrow \left[\left(3p + \left(-\frac{1}{6}\right)\right]^3$

$\Rightarrow \left(3p + \frac{1}{6}\right)$

$\Rightarrow \left(3p + \frac{1}{6}\right) \cdot \left(3p + \frac{1}{6}\right) \left(3p + \frac{1}{6}\right)$

Q9. Verify: (i) $x^3 + y^3 = (x+y) \cdot (x^2 - xy + y^2)$

Solve $\Rightarrow$ By RHS

$\Rightarrow x(x^2 - xy + y^2) + y(x^2 - xy + y^2)$

$\Rightarrow x^3 - \cancel{x^2y} + \cancel{xy^2} + \cancel{x^2y} - \cancel{xy^2} + y^3$

$\Rightarrow x^2 + y^3$

$\Rightarrow$ LHS = RHS

(ii) $(x^3 - y^3) = (x-y)(x^2 + xy + y^2)$

Solar $\Rightarrow$ By R.H.S

$\Rightarrow x(x^2 + xy + y^2) - y(x^2 + xy + y^2)$

$\Rightarrow x^2 + \cancel{x^2y} + \cancel{xy^2} - \cancel{x^2y} - \cancel{xy^2} - y^3$

$\Rightarrow x^3 - y^3$

L.H.S = R.HS

The End