Holyfaith presentation school.
Rawalpora Srinagar.

CLASS:10TH

SUBJECT:MATHEMATICS SESSION:

2024 - 2025

Chapter 1
RealNumber

EXERCISE 1.1

1. Expresseachnumberasaproductofitsprimefactors:

(i) 140

(ii) 156

(iii) 3825

(iv) 5005

(v) 7429

Solution:

(i) $140=2\times2\times5\times7=2_2\times5\times7$

(ii) $156=2\times2\times3\times13=2_2\times3\times13$

(iii) $3825=3\times3\times5\times5\times17=3_2\times5_2\times17$

(iv) $5005 =5\times7\times11\times13$

(v) $7429=17\times19\times23$

2. FindtheLCMandHCFofthefollowingpairsofintegersandverifythatLCM×HCF=productofthe two numbers.

(i) 26and91

(ii) 510and92

(iii) 336and54

Solution:

(i) 26and91

$26=2\times13$

$91=7\times13$

13is thelargestnumberwhich divides both26 and91. So,HCF= 13.

$LCM=2\times7\times13=182$

Product of the two numbers $=26\times91=2366$ HCF ×

LCM = $13 \times 182 = 2366$

Hence,productoftwonumbers=HCF×LCM

(ii) 510and92

510=2×3×5×17

92=2×2×23

2is thelargestnumberwhich divides both510 and92. So,HCF= 2.

LCM=2×2×3×5×17×23=23460

Product of the two numbers= 510 ×92= 46920

HCF × LCM = 2 × 23460 = 46920

Hence,productoftwonumbers=HCF×LCM

(iii) 336and54

336=2×2×2×2×3×7=2_4×3×7

54=2×3×3×3=2×3_3

6is thelargestnumberwhich divides both336 and54. So,HCF= 6.

LCM=2_4×3_3×7=3024

Product of the numbers = 336 ×54= 18144

HCF × LCM = 6 × 3024 = 18144

Hence,productoftwonumbers=HCF×LCM

3. FindtheLCMandHCFofthefollowingintegersbyapplyingtheprimefactorizationmethod.

(i) 12,15and21

(ii) 17,23and29

(iii) 8,9and25

Solution:

(i) 12,15and2112=2_2×315=3×

5

21=3×7

3is thelargestnumberwhich divides 12,15 and21.So, HCF= 3.

LCM=2_2×3×5×7=420

(ii) 17,23and29

17=1×17

$23 = 1 \times 23$ $29 = 1 \times 29$

1 is the largest number which divides 17, 23 and 29. So, HCF = 1.

$LCM = 17 \times 23 \times 29 = 11339$

(iii) 8, 9 and 25

$8 = 2 \times 2 \times 2$

$9 = 3 \times 3$

$25 = 5 \times 5$

1 is the largest number which divides 8, 9 and 25. So, HCF = 1.

$LCM = 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5 = 1800$

4. Given that $HCF(306, 657) = 9$, find $LCM(306, 657)$.

Solution:

$HCF(306, 657) = 9$

We know that, Product of two numbers is equal to product of their LCM and HCF.

$LCM \times HCF = 306 \times 657$

$$LCM = \frac{306 \times 657}{HCF} = \frac{306 \times 657}{9}$$

$LCM = 22338$

5. Check whether 6^n can end with the digit 0 for any natural number n.

Solution:

If any number ends with the digit 0, it should be divisible by 10 or in other words the prime factorization of the number must include 2 and 5 both.

Prime factorization of $6^n = (2 \times 3)^n$

We can see that 5 is not a prime factor of 6^n.

Hence, for any value of n, 6^n will not be divisible by 5.

Therefore, 6^n cannot end with the digit 0 for any natural number n.

6. Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ are composite numbers.

Solution:

Therearetwotypesofnumbers,namely–primeand composite.Primenumbershaveonly twofactors namely 1 and the number itself whereas composite numbers have factors other than 1 and itself.

Itcanbeobserved that

$7\times11\times13+13=13\times(7\times11+1)=13\times(77+1)$

$=13\times78$

$=13\times13\times6$

Thegivenexpression has6and13asitsfactors.Therefore, itisacompositenumber.

$7\times6\times5\times4\times3\times2\times1+5=5\times(7\times6\times4\times3\times2\times1+1)$

$=5\times(1008+1)$

$=5\times1009$

1009 cannot be factorised further. Therefore, the given expression has 5 and 1009 as its factors. Hence, it is a composite number.

7. There is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field, while Ravi takes 12 minutes for the same. Suppose they both start at the same point and at the same timeandgointhesamedirection.Afterhowmany minuteswillthey meetagainatthestartingpoint?

Solution:

ItisgiventhatRaviandSoniadonottakesameoftime.Ravi takeslessertimethanSoniafor completing 1 round of the circular path.

Astheyaregoingin thesamedirection,theywill meetagainwhenRaviwillcomplete 1 roundofthat circular path with respect to Sonia.

(i) e.,WhenSonia completesoneroundthenRavi completes 1.5 rounds.Sotheywillmeetfirst time at the time which is a common multiple of the time taken by them to complete 1 round

i.e.,LCMof18minutesand12minutes. Now

$18=2\times3\times3=2\times3^2$and,$12=2\times2\times3=2^2$

$\times3$

LCMof12 and18=productoffactorsraisedtohighestexponent$=2^2\times3^2=36$

Therefore, Raviand Soniawillmeettogetheratthestartingpointafter36minutes.

EXERCISE1.2

1. Provethat$\sqrt{5}$isirrational.

Solution:

Letusassume,onthecontrary,that$\sqrt{5}$isarationalnumber.Therefore,wecanfindtwoco-prime integers , b (b ≠ 0) such that $\sqrt{5} = \frac{}{b}$

$\sqrt{5} = \frac{}{b}$

$= \sqrt{5}b$

$^2 = 5b^2$

Therefore, ^{2}isdivisibleby5,then isalso divisibleby5.

So, $^2=(5k)^2=5(5k^2)=5b^2$ $b^2=5k^2$

Thismeansthatb^2isdivisibleby5 andhence,b isdivisibleby5. This implies that and b have 5 as a common factor.

Andthis is acontradictiontothefactthat andbareco-prime.

Soourassumptionthat$\sqrt{5}$isrationaliswrong.

Hence,$\sqrt{5}$cannotbearationalnumber.Therefore,$\sqrt{5}$isirrational.

2. Provethat$3 + 2\sqrt{5}$is irrational.

Solution:

Let us assume, on the contrary, that $3 + 2\sqrt{5}$is rational.

Therefore,wecanfindtwointegers ,b(b≠0) suchthat

$3 + 2\sqrt{5} = \frac{}{b}$

$2\sqrt{5} = \frac{}{b} - 3$

1

$\sqrt{5} = \frac{1}{2}\left(\frac{}{b} - 3\right)$

Since andbareintegers, $\frac{1}{2}\left(\frac{}{b} - 3\right)$willalsoberationalandtherefore,$\sqrt{5}$ is rational.

Thiscontradictsthefactthat$\sqrt{5}$isirrational.

Hence,ourassumptionthat $3+2\sqrt{5}$isrationalisfalse.
Therefore, $3+2\sqrt{5}$is irrational.

3. Provethatthefollowingareirrationals: (i) $\frac{1}{\sqrt{2}}$

(ii) $7\sqrt{5}$
(iii) $6+\sqrt{2}$

Solution:

(i) $\frac{1}{\sqrt{2}}$

Letus assumethat$\frac{1}{\sqrt{2}}$is rational.

Therefore, wecanfindtwo integers ,b(b≠0)such that

1

—= =¯√2 bb

$\sqrt{2}=$

bisrationalas andbareintegers.

Therefore,√2isrational.

This contradicts the fact that √2 is irrational.

Hence,ourassumptionisfalseand$\frac{1}{\sqrt{2}}$isirrational.

(ii) $7\sqrt{5}$

Letusassumethat$7\sqrt{5}$isrational. Therefore,wecan findtwo integers ,b(b≠0)such that$7\sqrt{5}=$ b

$\therefore\sqrt{5}$

7b

is rationalasaandbare integers.
7b

Therefore,√5shouldberational.

Thiscontradictsthefactthat√5isirrational.

Therefore, our assumption that $7\sqrt{5}$ is rational is false. Hence, $7\sqrt{5}$ is irrational.

(iii) $6+\sqrt{2}$

Let $6+\sqrt{2}$ be rational. Therefore, we can find two integers ,b(b≠0) such that
$6+\sqrt{2} =$ b

$\sqrt{2}$
$=$ −6b

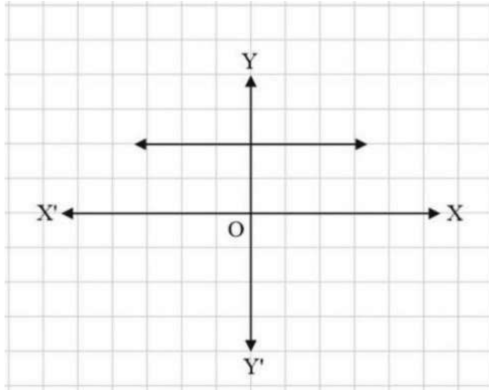
Since and b are integers, a−6 is a rational number and hence, √2b should be rational.

This contradicts the fact that √2 is irrational.
Therefore, our assumption is false and hence, $6+\sqrt{2}$ is irrational.

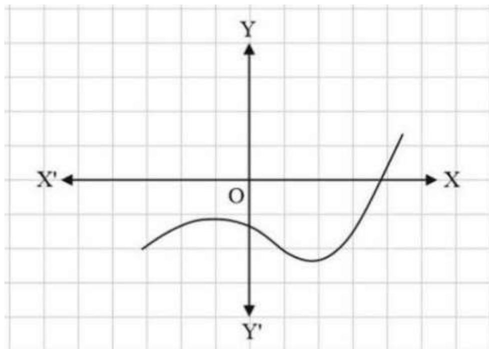
Chapter 2
POLYNOMIALS
Ex 2.1

1. The graphs of =( ) are given in following figure, for some polynomials ( ). Find the number of zeroes of ( ), in each case.

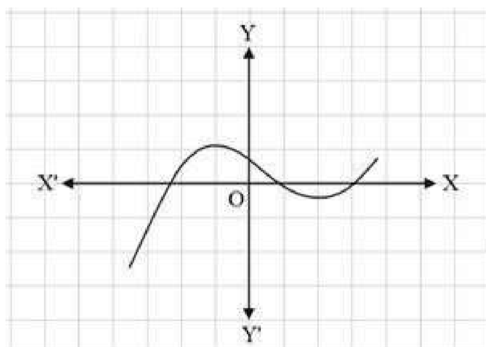
(i)



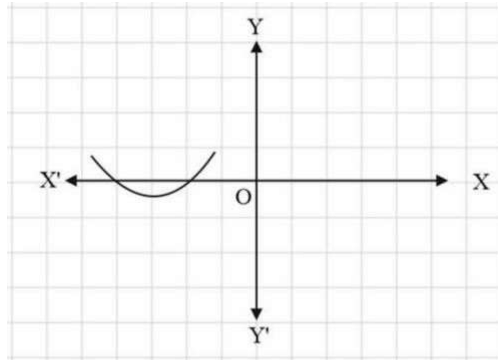
(ii)



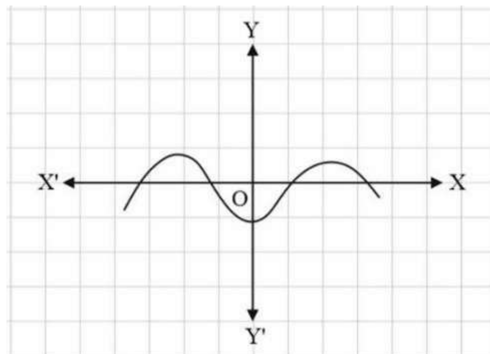
(iii)



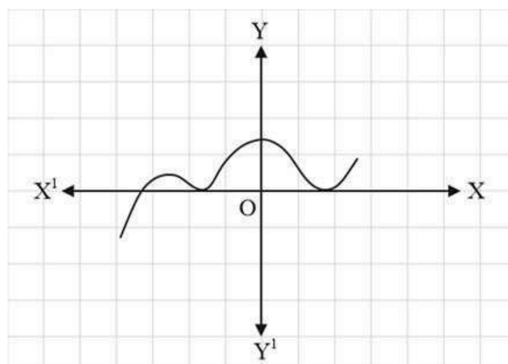
(iv)



(v)



(vi)



Solution:

(i) Sincethegraphof( ) doesnotcuttheX-axisatall.Therefore,thenumber ofzeroesis .

(ii) Asthe graphof( )intersectsthe X-axisat only point.Therefore,the numberofzeroesis .

(iii) Since the graphof( )intersectsthe X-axisat points.Hence,the numberofzeroesis3.

(iv) Asthe graphof( )intersectsthe X-axisat points.So,the numberofzeroesis .

(v) Sincethe graphof( )intersectstheX-axisat points.Therefore,the numberofzeroesis .

(vi) Asthe graphof( )intersectsthe X-axisat points.So,the numberofzeroesis .

Exercise2.2

1. Findthezeroesofthefollowingquadraticpolynomialsandverifytherelationshipbetweenthezeroes and the coefficients.

(i) $_2 - 2 \quad - 8$

(ii) $4 \quad _2 - 4 \quad + 1$

(iii) $6 \quad _2 - 3 - 7$

(iv) $4 \quad _2 + 8$

(v) $_2 - 15$(vi)$3 \quad _2 - \quad - 4$

Solution:

(i) $_2 - 2 \quad - 8$

$= \; _2 - 4 \quad + 2 \quad - 8$ [Factorisationbysplittingthemiddleterm]

$= (\quad - 4) + 2(\quad - 4)$

$= (\quad - 4)(\quad + 2)$

Weknowthat thezeroesofthequadraticpolynomial $_2 + \quad +$ arethesameastherootsof the quadratic equation $_2 + \quad + \quad = 0$.

Therefore,byequatingthegivenpolynomial tozero.Weget,

$_2 - 2 \quad - 8 = 0$

$(\quad - 4)(\quad + 2) = 0$

$- 4 = 0$or $+ 2 = 0$

$= 4$or $= -2$

Therefore,thezeroes of $^2 - \quad 2 \quad - 8$are4and-2.

Sum of zeroes $= 4 - 2 = 2 = \frac{-(-2)}{1}$ $= -$______________(Coefficientof $_2$)

$\frac{(-8)}{1}$

Coefficientof

Product ofzeroes$= 4 \times (-2) = -8 =$ $=$____________Constantterm$_2$

Coefficientof

Hence,therelationshipbetweenthe zeroesandthecoefficientsisverified.

(ii) $4 \;_2 -4 \; +1=(2 \; -1)_2$ [Since, $_2 -2 \; + \;_2 = (\; - \;)_2$]

Weknowthat thezeroesofthequadraticpolynomial $_2+ \; +$ arethesameastherootsof the quadratic equation $_2+ \; + \; = 0$.

Therefore,byequatingthegivenpolynomial tozero.Weget,

$4 \;_2 -4 \; +1=0$

$(2 \; -1)_2 =0$

Cancellingsquareonboththesides,

$2 \; -1=0$

$=\frac{1}{2}$

Therefore,thezeroesof$4 \;_2 -4 \; +1$are$\frac{1}{2}$and$\frac{1}{2}$.

Sumofzeroes $=\frac{1}{2}+\frac{1}{2}=1=\frac{-(-4)}{4}=-$____________________(Coefficientof(Coefficientof $_2$))

Productofzeroes$=\frac{1}{2}\times\frac{1}{2}=\frac{1}{4}=$Coefficientof Constantterm $_2$

Hence,therelationshipbetweenthe zeroesandthecoefficientsisverified.

(iii) $6 \;_2 -3-7 \; =6 \;_2 -7 \; -3$

$=6 \;_2 -9 \; +2 \; -3$ [Factorisationbysplittingthemiddleterm]

$=3(2 \; -3)+(2 \; -3)$

$=(3 \; +1)(2 \; -3)$

Weknowthat thezeroesofthequadraticpolynomial $_2+ \; +$ arethesameastherootsof the quadratic equation $_2+ \; + \; = 0$.

Therefore,byequatingthegivenpolynomial tozero.Weget,

$6 \;_2 -3-7 \; =0$

$3 \; +1=0$or$2 \; -3=0$

$=\frac{-1}{3}$or $=\frac{3}{2}$

Therefore,thezeroesof$6 \;_2 -3-7$ are$\frac{-1}{3}$and$\frac{3}{2}$.

Sumofzeroes$=\frac{-1}{3}+\frac{3}{2}=\frac{7}{6}=\frac{-(-7)}{6}=-$____________________Coefficient of(Coefficientof $_2$)

Productofzeroes=$\frac{-1}{3}\times\frac{3}{2}=\frac{-1}{2}=\frac{-3}{6}=$Coefficientof Constantterm 2

Hence,therelationshipbetweenthe zeroesandthecoefficientsisverified.

(iv) 4 2+8 =4 2+8 +0=4(+2)

Weknowthat thezeroesofthequadraticpolynomial 2+ + arethesameastherootsof the quadratic equation 2 + + = 0.

Therefore,byequatingthegivenpolynomial tozero.Weget,

4 2+8 =0

4 =0or +2=0

=0or =−2

So,the zeroesof4 2+8 are 0and−2.

Sumofzeroes=0+(−2)=−2=$\frac{-8}{4}$=-____________________Coefficient of(Coefficient of 2)

Productof zeroes=0×(−2)=0=$\frac{0}{4}$=Coefficientof Constantterm 2

Hence,therelationshipbetweenthe zeroesandthecoefficientsisverified.

(v) $t^2 - 15 = t^2 - 0.t - 15 = (t - \sqrt{15})(t + \sqrt{15})$[Since, 2− 2= (+)(−)]

Weknowthat thezeroesofthequadraticpolynomial 2+ + arethesameastherootsof the quadratic equation 2 + + = 0.

Therefore,byequatingthegivenpolynomial tozero.Weget,

2−15=0

$-\sqrt{15} = 0$or $+\sqrt{15} = 0$

$= \sqrt{15}$or $= -\sqrt{15}$

Therefore, thezeroesof $^2 - 15$ are $\sqrt{15}$ and $-\sqrt{15}$

Sumofzeroes= $\sqrt{15} + (-\sqrt{15}) = 0 = — =$ ———————−10 −(Coefficientof(Coefficientof 2))

Productofzeroes= $(\sqrt{15})(-\sqrt{15}) = -15 = \frac{-15}{1} =$Coefficiento Constanttermf 2

Hence,therelationshipbetweenthe zeroesandthecoefficientsisverified.

(vi) $3\ {}^2 -\ \ -4$

$=3\ {}^2 -4\ \ +3\ \ -4$ [Factorisationbysplittingthemiddleterm]

$=(3\ \ -4)+(3\ \ -4)$

$=(3\ \ -4)(\ \ +1)$

Weknowthat thezeroesofthequadraticpolynomial ${}^2+\ \ +$ arethesameastherootsof the quadratic equation ${}^2+\ \ +\ \ =0$.

Therefore,byequatingthegivenpolynomial tozero.Weget,

$3\ {}^2-\ \ -4=0$

$3\ \ -4=0$ or $\ +1=0$

$=\frac{4}{3}$ or $\ =-1$

Hence,the zeroes of $3\ {}^2-\ \ -4$ are $\frac{4}{3}$ and -1.

Sum of zeroes $=\frac{4}{3}$ $\frac{1}{3}$ $\frac{-(-1)}{3}$ $+(-1)=$ $==-$ ______________(Coefficientof 2)

$\frac{4}{3}$ $\frac{-4}{3}$ Coefficientof

Productofzeroes = $(-1)=$ $=$ Constantterm2

Coefficientof

Hence,therelationshipbetweenthe zeroesandthecoefficientsisverified.

2. Findaquadraticpolynomialeachwiththegivennumbersasthesumandproductofitszeroes respectively.

(i) –, –

(ii) √ ,

(iii) ,√ –

(iv) ,

(v) – – ,

(vi) ,

Solution:

(i) Weknowthatif arethezeroesofaquadraticpolynomial ( ), hen,thepolynomial( )canbewrittenas( ) ={ 2 − (+) + }or,

( )={ 2−(Sumofthezeroes)+Productofthezeroes},where isanon-zerorealnumber.

<u>Given:</u>sumoftheroots= + = $\frac{1}{4}$andproductof theroots= =−1

Hence,thequadraticpolynomial( )canbewrittenas:

( ) = { 2 $\frac{-}{4}$ − 1 − 1}

$= \{\frac{4x^2 - x - 4}{4}\}$

Bytaking =4,wegetoneofthequadraticpolynomialswhichsatisfythegivenconditions. Therefore, the quadratic polynomial is (4 2− − 4).

(ii) Weknowthatif arethezeroesofaquadraticpolynomial ( ), hen,thepolynomial( )canbewrittenas( ) ={ 2 − (+) + }or,

( )={ 2−(Sumofthezeroes)+Productofthezeroes}, where isanon-zerorealnumber. <u>Given:</u>sum of the roots = $+\beta = \sqrt{2}$and product of the roots = = $\frac{1}{3}$

Hence,thequadraticpolynomial( )canbewrittenas:

$$(x) = a\{x^2 - \sqrt{2}x + \frac{1}{3}\}$$

$$= a\left\{\frac{3x^2 - 3\sqrt{2}x + 1}{3}\right\}$$

Bytaking =3,wegetoneofthequadraticpolynomialswhichsatisfythegivenconditions. Therefore, the quadratic polynomial is $\left(3x^2 - 3\sqrt{2}x + 1\right)$.

(iii) Weknowthatif arethezeroesofaquadraticpolynomial ( ), hen,thepolynomial( )canbewrittenas( ) ={ 2 − (+) + }or,

( )={ 2−(Sumofthezeroes)+Productofthezeroes},where isanon-zerorealnumber.

Given: sum of the roots = + = 0 and product of the roots = $= \sqrt{5}$

Hence, the quadratic polynomial ( ) can be written as:

$(x) = a\{x^2 - 0.x + \sqrt{5}\}$

$= a\{x^2 + \sqrt{5}\}$

By taking = 1, we get one of the quadratic polynomials which satisfy the given conditions. Therefore, the quadratic polynomial is $(x^2 + \sqrt{5})$.

(iv) We know that if are the zeroes of a quadratic polynomial ( ), hen, the polynomial ( ) can be written as ( ) = { 1 − (+) + } or,

( ) = { 2 − (Sum of the zeroes) + Product of the zeroes}, where is a non-zero real number. Given: sum of the roots = + = 1 and product of the roots = = 1

Hence, the quadratic polynomial ( ) can be written as:

( ) = { 2 − 1. + 1}

= { 2 − + 1}

By taking = 1, we get one of the quadratic polynomials which satisfy the given conditions. Therefore, the quadratic polynomial is (2 − + 1).

(v) We know that if are the zeroes of a quadratic polynomial ( ), then, the polynomial ( ) can be written as ( ) = { 2 − (+) + } or,

( ) = { 2 − (Sum of the zeroes) + Product of the zeroes}, where is a non-zero real number.

Given: sum of the roots = + $= -\frac{1}{4}$ and product of the roots = $= \frac{1}{4}$

Hence, the quadratic polynomial ( ) can be written as:

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

( ) = { 1 + 1 − + 1}

4 4

Bytaking $=4$,wegetoneofthequadraticpolynomialswhichsatisfythegivenconditions. Therefore, the quadratic polynomial is $(4\ {}_{2}+\ \ +1)$.

(vi) Weknowthatif arethezeroesofaquadraticpolynomial ( ), hen,thepolynomial( )canbewrittenas( ) ={ $_2$− (+) + }or,

( )={ $_2$−(Sumofthezeroes)+Productofthezeroes}, where isanon-zerorealnumber. Given:sum of the roots = + =4 and product of the roots = = 1

Hence,thequadraticpolynomial( )canbewrittenas:

( )={ $_2$−4 +1}

Bytaking $=1$,wegetoneofthequadraticpolynomialswhichsatisfythegivenconditions. Therefore, the quadratic polynomial is ($_2$ − 4 + 1).

ChapterNo15

Probability

EXERCISE 15.1

1. Completethefollowingstatements:

(i) ProbabilityofaneventE+Probabilityoftheevent‘notE’=________________.

(ii) Theprobabilityof anevent that cannothappenis _____________.Suchaneventis called ___________.

(iii) Theprobabilityof anevent that is certaintohappenis ______________.Suchaneventis called ___________.

(iv) Thesumoftheprobabilitiesofalltheelementaryeventsofanexperiment is_____ ______.

(v) The probability of an event is greater than or equal to ___________andlessthanorequal to ____________.

Solution:

(I) 1

(II) 0,impossibleevent

(III) 1,sureeventorcertainevent

(IV) 1

(V) 0, 1

2. Which of the following experiments have equally likely outcomes? Explain. (i) Adriverattemptsto start a car. The car starts or does not start.

(ii) Aplayerattemptstoshootabasketball.She/heshoots ormisses theshot.

(iii) Atrialismadeto answeratrue-falsequestion. Theanswerisrightorwrong.(iv)Ababyis born. It is a boy or a girl.

Solution:

(I) It is not equally likely event. If condition of car is good, it's starting chance is high and if condition isbadit'sstartingchanceislow.Also,itdependsonvariousotherfactorsandfactors for both the conditions are not same.

(II) Itisnotequallylikelyevent,asitdependsonplayertoplayeralongwiththeirability.

(III) Itisanequallylikely event.Wehaveonlytwopossibleoutcomeand chancesforboth tohappen is equal.

(IV) Itisanequallylikely event.Wehaveonlytwopossibleoutcomeand chancesforboth tohappen is equal.

3. Whyistossingacoin considered tobeafairwayof decidingwhichteamshouldgettheballatthe beginning of a football game?

Solution: Whenacoin istossed,ithasonly twopossibleoutcomesand theyare equallylikely.Hence,tossing of a coin is considered as a fair way to decide which team should get the ball at the beginning of a football game.

4. Whichofthefollowingcannotbetheprobabilityofanevent?

(A) $\frac{2}{3}$(B)-1.5(C) 15%

(D) 0.7

Solution: Asweknowthattheprobabilityofan eventisalwaysgreaterthanorequal to 0 andlessthanorequal to one. Hence, from given alternatives -1.5 can't be a probability of an event.

5. If$P(E)=0.05$,what istheprobabilityof'notE'?

Solution: $P(\overline{E})=1-P(E)=1-0.05=0.95$

Hence,theprobabilityof'notE'is0.95.

6. Abagcontainslemonflavouredcandiesonly.Malinitakesoutonecandywithoutlooking intothebag. What is the probability that she takes out?

(i) anorangeflavouredcandy?

(ii) alemonflavouredcandy?

Solution:

(i) Thebagcontainslemonflaouredcandiesonly.Hence,eventthatMalinitakesoutanorange flavoured candy, is an impossible event.

P(anorangeflavouredcandy)=0

(ii) Thebagcontainslemonflavouredcandiesonly.So,theeventthatMalinitakesoutalemon flavoured candy, is a sure event.

P(alemonflavouredcandy)=1

7. Itisgiven thatinagroup of3students, theprobability of2studentsnothaving thesamebirthday is 0.992.What istheprobabilitythatthe2studentshavethe samebirthday?

Solution:

Twostudentswilleitherhavesamebirthday,or they willnothavethesamebirthday. Hence these

two events are complementary events to each other. So,

Probability that twostudentsarenothavingsamebirthday=P(E)=0.992

Probailitythat twostudentsarehavingsamebirthdayP(E′)=1−P(E)=1−

0.992=0.008

8. Abagcontains3 redballsand5 blackballs.Aballisdrawnatrandomfrom thebag. What is the probability that the ball drawn is (i) red? (ii) not red?

Solution: Totalnumberofballs in thebag=3+5=8

(i) Numberofredballs=3

Probailityofdrawingaredball

$$= \frac{\text{Numberoffavourableoutcomes}}{\text{Thetotalnumberofoutoomes}} = \frac{\text{Numberofredball}}{\text{Totalnumberofball}} = \frac{3}{8}$$

(ii) Probabilityofnotdrawingaredball=1−Probabilityofdrawingaredball

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

$= \frac{5}{8}$

9. A boxcontains 5 redmarbles, 8 whitemarbles and 4 greenmarbles.Onemarbleis takenoutofthebox at random. What is the probability that the marble taken out will be

(i) red?

(ii) white?

(iii) notgreen?

Solution:

Total number of marbles =5+8+4=17 (i) Number of red marbles = 5

Probabilityofdrawingaredmarble

$$= \frac{\text{Numberoffavourableoutcomes}}{} = \frac{\text{Numberofredmarbles}}{} = \frac{5}{} =$$

Totalnumberofoutcomes Totalnumberofmarbles 17

(ii) Numberofwhitemarbles=8Probabilityofdrawinga white marble

$= \frac{\text{Numberoffavourableoutcomes}}{\text{Totalnumberofoutcomes}} = \frac{\text{Numberofwhitemarbles}}{\text{Totalnumberofmarbles}} = \frac{8}{17}$

(iii) Numberofgreenmarbles=4Probabilityofdrawingagreen marble

$= \frac{\text{Numberoffavourableoutcomes}}{\text{Totalnumberofoutcomes}} = \frac{\text{Numberofgreenmarbles}}{\text{Total number of marbles}} = \frac{4}{17}$

Hence,probabilityofnotdrawingagreenmarble

$=1-\text{Probabilityofdrawingagreenmarble}=1-\frac{4}{17}=\frac{13}{17}$

10. A piggybankcontains hundred 50p coins,fifty ₹1 coins,twenty ₹2 coins andten ₹5 coins.Ifitis equally likely that one of the coins will fall out when the bank is turned upside down, what is the probability that the coin

(i) Willbea50 pcoin?

(ii) Willnotbea ₹5coin?

Solution:

Totalnumberofcoinsinapiggybank=100+50+20+10=180

(I) Numberof50pcoins=100

Probabilitythatthefallencoinwillbea50pcoin

$= \frac{\text{Numberoffavourableoutcomes}}{\text{Totalnumberofoutcomes}} = \frac{100}{180} = \frac{5}{9}$

(II) Numberof ₹5coins=10

Probabilitythatthefallencoinwillbea₹5 coin

$= \frac{\text{Numberoffavourableoutcomes}}{\text{Totalnumberofoutcomes}} = \frac{10}{180} = \frac{1}{18}$

Probabilitythatthefallencoinwillnotbea₹5coin$=1-\frac{1}{18}=\frac{17}{18}$

11. Gopibuysafishfrom ashopforhisaquarium.Theshopkeepertakesoutonefishatrandomfromatank containing 5 male fish and 8 female fish (see figure). What is the probability that the fish taken out is a male fish?

Solution:

Totalnumberoffishesin thetank =5+8=13

Number of male fishes in the tank = 5

Probability that a male fish is taken out

$$= \frac{\text{Numberoffavourableoutcomes}}{\text{Totalnumberofoutcomes}} = \frac{\text{Numberofmalefishes inthetank}}{\text{Total numberoffishesin thetank}} = \frac{5}{13}$$

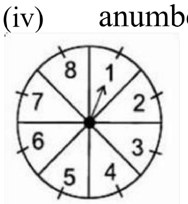
12. Agameofchanceconsistsofspinningan arrowwhichcomestorestpointingatoneofthenumbers 1,2, 3,4,5,6,7,8 (see Fig.), and these are equally likely outcomes. What is the probability that it will point at

(i) 8?

(ii) anoddnumber?

(iii) anumbergreaterthan2?

(iv) anumberless than9?



Solution:

Totalnumberofpossible outcomes=8

(i) Probabilityofpointingat 8 $= \frac{\text{Number of favourable outcomes}}{\text{Totalnumberofoutcomes}} = \frac{1}{8}$

(ii) Totaloddnumbers=4

Probabilityofpointingatanoddnumber $= \frac{\text{Number of favourableoutcomes}}{\text{Totalnumberofoutcomes}} = \frac{4}{8} = \frac{1}{2}$

(iii) Totalnumbers greaterthan2=6

Probabilityofpointingatanumbergreaterthan2

$$= \frac{\text{Numberoffavourableoutcomes}}{\text{Totalnumberofoutcomes}} = \frac{6}{8} = \frac{3}{4}$$

(IV) Totalnumbers lessthan9=8

Probabilityofpointingatanumberless than9 $= \frac{8}{8} = 1$

13. Adieisthrownonce.Findtheprobabilityofgetting

(i) aprimenumber;

(ii) a numberlyingbetween 2and6;(iii) anoddnumber.

Solution:

Possibleoutcomesinthrowing adieare1,2,3,4,5,6.

Hence,totalnumberofpossibleoutcomes=6

(i) NumberofPrimenumbers=3 (2,3and5)

Probabilityofgettingaprimenumber= $\frac{\text{Number of prime number}}{\text{Totalnumberofpossibleoutcomes}} = \frac{3}{6} = \frac{1}{2}$

(ii) Numberofnumberslyingbetween 2 and6=3Probabilityofgettinganumber lying between 2 and 6

$= \frac{\text{Numberofnumberslyingbetween2and6}}{\text{Total numberofpossibleoutcomes}} = \frac{3}{6} = \frac{1}{2}$

(iii) Number ofOddnumbers=3(1,3and5)Probability ofgettinganodd number

$= \frac{3}{6} = \frac{1}{2}$

14. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting (i) aking of red colour

(ii) afacecard

(iii) aredfacecard

(iv) thejackofhearts

(v) aspade

(vi) thequeenofdiamonds

Solution:

Totalnumberofcards =52

(i) Totalnumberofkingsofredcolour =2

Probabilityofgettingakingofredcolour= $\frac{\text{Number offavourableoutcomes}}{\text{Totalnumberofoutcomes}}$

$= \frac{2}{52} = \frac{1}{26}$

(ii) Totalnumberoffacecards=12

Probabilityofgettingafacecard= $\frac{\text{Number of favourableoutcomes}}{\text{Totalnumberofoutcomes}} = \frac{12}{52} = \frac{3}{13}$

(iii) Totalnumberofredfacecards=6

Probabilityofgettingaredfacecard= $\frac{\text{Number of favourableoutcomes}}{\text{Totalnumberofoutcomes}} = \frac{6}{52} = \frac{3}{26}$

(iv) Totalnumberofjacksofhearts=1

Probabilityofgettingajackofhearts= $\frac{\text{Number of favourableoutcomes}}{} = \frac{1}{52}$

(v) Totalnumber ofspadecards=13Probability ofgetting aspade card= $\frac{\text{Number of favourable outcomes}}{\text{Totalnumberofoutcomes}} = \frac{13}{52} = \frac{1}{4}$

(vi) Totalnumberofqueenofdiamonds=1

Probabilityofgettingaqueenofdiamonds= $\frac{\text{Number of favourableoutcomes}}{\text{Totalnumberofoutcomes}} = \frac{1}{52}$

15. Five cards − the ten, jack, queen, king and ace of diamonds, are well-shuffled with their face downwards.Onecardisthenpickedup atrandom.(i)Whatistheprobability that thecard isthequeen?

(ii) Ifthequeenis drawnandputaside,whatistheprobabilitythatthesecondcardpickedupis(a) anace?(b)aqueen?

Solution:

(i) Totalnumberofcards=5Totalnumberof queen =1Probabilityof pickingupaqueen= $\frac{\text{Number offavourableoutcomes}}{\text{totalnumberofoutcomes}} = \frac{1}{5}$

(ii) Whenthequeenisdrawnandputaside,thetotalnumberofremainingcards=4

(a) Totalnumberofaces=1Probabilityofpickingupanace= $\frac{1}{4}$

(b) Asqueenisalreadydrawnout,totalnumberofqueensleft=0

Probabilityofpickingupaqueen= $\frac{0}{4}$=0

16. 12defectivepens areaccidentally mixed with 132 good ones. Itis notpossibleto justlook atapen and tell whether or not it is defective. One pen is taken out at random from this lot. Determine the probability that the pen taken out is a good one.

Solution:

Totalnumberofpens12 + 132=144

Totalnumberofgoodpens=132Probabilitythatagoodpenistaken out = $\frac{\text{Number offavourableoutcomes}}{\text{totalnumberofoutcomes}} = \frac{132}{144} = \frac{11}{12}$

17. (i) A lotof20 bulbs contain4 defectiveones. Onebulb is drawn atrandomfromthelot. Whatis the probability that this bulb is defective?

(ii)Supposethebulbdrawnin(i)isnotdefectiveandisnotreplaced.Nowonebulbisdrawnat random from the rest. What is the probability that this bulb is not defective?

Solution:

(i) Totalnumberofbulbs =20 Totalnumberofdefectivebulbs =4 Probabilityofdrawinga defective bulb = $\frac{\text{Number of defecetive bulbs}}{\text{Totalnumberofbulbs}} = \frac{4}{20} = \frac{1}{5}$

(ii) Remainingnumberofbulbs =19

Remaining totalnumber of non-defectivebulbs=16−1=15

Probability thatdrawn bulb is notdefective = $\frac{15}{19}$

18. A box contains90 discs which arenumbered from1 to90. If onediscis drawn atrandomfrom thebox, find the probability that it bears (i) a two-digit number (ii) a perfect square number (iii) a number divisible by 5.

Solution:

Totalnumberofdiscs=90

(i) Totalnumberoftwo-digit numbersbetween1and90=81

Probability of drawing a two-digit number$= \frac{81}{90} = \frac{9}{10}$

(ii) Perfectsquaresfrom1to90are1,4,9,16,25,36,49, 64,and81

Totalnumberofperfectsquaresfrom1to90 =9Probabilityofdrawinga perfect square $= \frac{9}{90} = \frac{1}{10}$

(iii) Numbersfrom1to90thataredivisibleby5are 5,10,15,20,25,30,35,40,45,50,55,60,65,70,75,80,85,and90.

Totalnumbersdivisibleby5=18

Probability of drawing anumber divisibleby5=$\frac{18}{90}$=$\frac{1}{5}$

19. Achildhasadiewhosesixfacesshowthelettersasgivenbelow:

A B C D E A

Thedieisthrownonce.Whatistheprobabilityofgetting(i)A?(ii)D?

Solution:

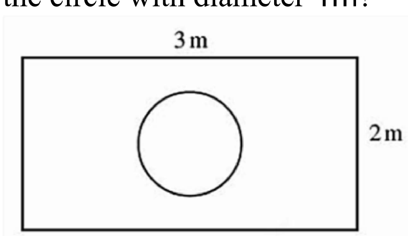
Totalnumberofpossibleoutcomesondie =6

(i) TotalnumberoffaceswithletterAonit=2Hence, P(gettingA)=$\frac{2}{6}$=$\frac{1}{3}$

(ii) TotalnumberoffaceswithletterDon it=1

Hence,P(gettingD)=$\frac{1}{6}$

20. Supposeyoudropadieatrandomontherectangular regionshowninfigure.Whatistheprobabilitythat it will land inside the circle with diameter 1m?



Solution:

Areaoftherectangle=l×b=3m×2m=6m^2

Diameter of the circle =1 ∴ Radius of thecircle =$\frac{1}{2}$

Areaofthe circle=πr^2= $\pi \left(\frac{1}{2}\right)^2 = \frac{\pi}{4} m^2$ P (die will land inside the circle)=$\frac{\text{favourablearea}}{}$ = $\frac{\frac{\pi}{4}}{}$ = $\frac{\pi}{24}$

21. A lot consists of 144 ball pens of which 20 are defective and the others are good. Nuri will buy a pen if itisgood,butwillnotbuyif itisdefective.Theshopkeeperdrawsonepenatrandom andgivesittoher. What is the probability that (i) She will buy it?

ii) Shewillnotbuy it?

Solution:

Thetotalnumberofpens=144

Totalnumber of defectivepens=20Totalnumberof good pens =144−20=124

(i) P(Nuribuysapen)=probabilityofdrawingagoodpen $= \frac{\text{Totalnumberofgood pens}}{\text{Thetotalnumber ofpens}} = \frac{124}{144} = \frac{31}{36}$

(ii) P(Nuriwillnotbuyapen)=probabilityofdrawingadefectivepen $= \frac{\text{Totalnumber of defective pens}}{\text{The total number of pens}} = \frac{20}{144} = \frac{5}{36}$

22. Twodice,oneblueandonegrey,arethrownatthesametime.

(i) Completethefollowingtable:

Event'Sumon two.dice'	2	3	4	5	6	7	8	9	10	11	12
Probability	$\frac{1}{36}$						$\frac{5}{36}$				$\frac{1}{36}$

(ii) A student argues that ‘there are 11 possible outcomes 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12. Therefore,eachofthemhasaprobability $\frac{1}{11}$.Doyouagreewiththisargument? Justifyyour answer.

Solution:

(i) Togetsumas2,possibleoutcomeis(1,1).

Togetsumas3,possibleoutcomesare(2,1)and(1,2).

Togetsumas4,possibleoutcomesare(3,1),(1,3),(2, 2).

Togetsumas5,possibleoutcomesare(4,1),(1, 4)(2, 3),(3,2).

Togetsumas6,possibleoutcomesare(5,1),(1, 5)(2,4),(4,2),(3,3).

Togetsumas7,possibleoutcomesare(6,1),(1,6)(2,5),(5,2),(3,4)(4,3).

Togetsumas8,possibleoutcomesare(6,2),(2, 6),(3, 5), (5, 3), (4,4).

Togetsumas9,possibleoutcomesare(3,6),(6,3)(6,3),(4,5),(5,4).

Togetsumas10,possibleoutcomesare(4,6),(6,4),(5,5).

To get sum as 11, possible outcomes are (5, 6), (6,5).

To get sum as 12, possible outcomes are (6, 6).

Totalnumberofoutcomes=36

Event'Sumoftwodice'	2	3	4	5	6	7	8	9	10	11	12
Probability	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$

(ii) Student isarguingbythinkingthateventsareequallylikelybutsince, thesum2,3,4,5,6,7,8,9, 10,11 and 12 are not equally likely, so the probability of each of the sums will not be $\frac{1}{11}$.

23. Agameconsistsoftossingaone-rupeecoin3times andnotingitsoutcomeeachtime.Hanifwinsif all the tosses give the same result i.e., three heads or three tails, and loses otherwise. Calculate the probability that Hanif will lose the game.

Solution:

Thereare8possibleoutcomes, whichare

{HHH,TTT,HHT,HTH,THH,TTH,THT,HTT}.

Number of favourable outcomes = 2 (TTTandHHH)P(Hanifwillwin the game) = $\frac{2}{8}$= $\frac{1}{4}$

P(Hanifwilllosethegame)=1−$\frac{1}{4}$=$\frac{3}{4}$

Adieisthrowntwice.What istheprobabilitythat

(i) 5willnotcomeupeithertime?

(ii) 5willcomeupatleastonce?

[**Hint:**Throwingadietwiceandthrowingtwodicesimultaneouslyaretreatedasthesame experiment]

Solution:

Totalnumberofoutcomes=6×6=36

(i) Numberofoutcomeswhen5comes up eithertimeare (5,1),(5,2),(5,3),(5,4),(5,5),(5,6),(1,5),(2,5),(3,5),(4,5),(6,5).
Number of favourable cases = 11

P(5willcomeupeithertime)=$\frac{11}{36}$

P(5 willnotcomeup either time)=1−$\frac{11}{36}$=$\frac{25}{36}$

(ii) Number of cases when 5 will come at least once = 11 P (5 will come at least once) = $\frac{11}{36}$

24. Whichofthefollowing argumentsarecorrectandwhicharenotcorrect? Givereasonsforyour answer.

(i) Iftwocoinsaretossedsimultaneouslytherearethreepossibleoutcomes −twoheads,twotails or one of each. Therefore, for each of these outcomes, the probability is $\frac{1}{3}$.

(ii) Ifadieisthrown,therearetwopossibleoutcomes − anoddnumberoran evennumber. Therefore, the probability of getting an odd number is $\frac{1}{2}$.

Solution:

(i)Thegivenstatementisincorrectsince, all threeoutcomesarenotequally likely.Whentwocoinsare tossed simultaneously, then possible outcomes are (H, H),(H,T), (T, H), and (T, T).

So,theprobabilityofgettingtwoheads is $\frac{1}{4}$;probabilityofgettingtwotailsis $\frac{1}{4}$ andprobability ofgettingoneofeach is $\frac{2}{4}=\frac{1}{2}$.

(iii) Thegivenstatementiscorrectsince,anoddnumber andanevennumberareequallylikely. When a die is thrown possible outcomes are 1, 2, 3,4, 5, and 6. Out of which

1,3,5are oddand2,4,6areevennumbers.

Inotherwords,itcanbesaidthatwhenadieisthrown,thereare twopossibleoutcomes −an odd number or an even number as these outcomes are equally likely. So, the probability of getting an odd number = $\frac{3}{6}=\frac{1}{2}$.