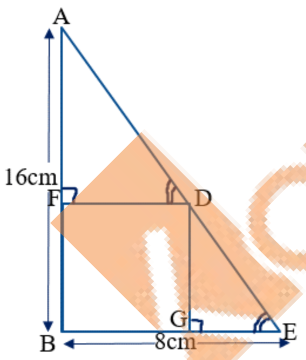
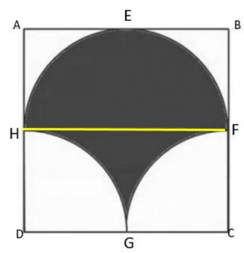
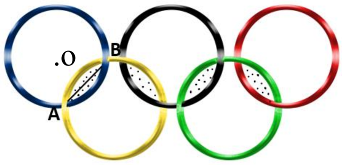
Marking Scheme
Class- X Session- 2021-22
TERM 1
Subject- Mathematics (Standard)

SECTION A			
QN	**Correct Option**	**HINTS/SOLUTION**	**MARKS**
1	**(b)**	Least composite number is 4 and the least prime number is 2. LCM(4,2) : HCF(4,2) = 4:2 = 2:1	**1**
2	**(a)**	For lines to coincide: $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ so, $\frac{5}{15} = \frac{7}{21} = \frac{-3}{-k}$ i.e. k= 9	**1**
3	**(b)**	By Pythagoras theorem The required distance $=\sqrt{(200^2 + 150^2)}$ $= \sqrt{(40000+ 22500)} = \sqrt{(62500)} = 250$m. So the distance of the girl from the starting point is 250m.	**1**
4	**(d)**	Area of the Rhombus = $\frac{1}{2} d_1 d_2 = \frac{1}{2}$ x 24 x 32= 384 cm². Using Pythagoras theorem side² = $(\frac{1}{2}d_1)^2 + (\frac{1}{2}d_2)^2 = 12^2 + 16^2 = 144 + 256 = 400$ Side = 20cm Area of the Rhombus = base x altitude 384 = 20 x altitude So altitude = 384/20 = 19.2cm	**1**
5	**(a)**	Possible outcomes are (HH), (HT), (TH), (TT) Favorable outcomes(at the most one head) are (HT), (TH), (TT) So probability of getting at the most one head =3/4	**1**
6	**(d)**	Ratio of altitudes = Ratio of sides for similar triangles So AM:PN = AB:PQ = 2:3	**1**
7	**(b)**	$2\sin^2\beta - \cos^2\beta = 2$ Then $2\sin^2\beta - (1- \sin^2\beta) = 2$ $3\sin^2\beta = 3$ or $\sin^2\beta = 1$ β is 90°	**1**
8	**(c)**	Since it has a terminating decimal expansion, so prime factors of the denominator will be 2,5	**1**
9	**(a)**	Lines x=a is a line parallel to y axis and y=b is a line parallel to x axis. So they will intersect.	**1**
10	**(d)**	Distance of point A(-5,6) from the origin(0,0) is $\sqrt{(0+5)^2 + (0-6)^2} = \sqrt{25+36} = \sqrt{61}$ units	**1**
11	**(b)**	$a^2=23/25$, then $a = \sqrt{23}/5$, which is irrational	**1**
12	**(c)**	LCM X HCF = Product of two numbers 36 X 2 = 18 X x $x = 4$	**1**
13	**(b)**	tan A= $\sqrt{3}$ = tan 60° so ∠A=60°, Hence ∠C = 30°. So cos A cos C- sin A sin C = (1/2)x ($\sqrt{3}$/2) - ($\sqrt{3}$/2)x (1/2) =0	**1**
14	**(a)**	1x +1x +2x =180°, x = 45°. ∠A , ∠B and ∠C are 45°, 45° and 90°resp. $\frac{\sec A}{\operatorname{cosec} B} - \frac{\tan A}{\cot B} = \frac{\sec 45}{\operatorname{cosec} 45} - \frac{\tan 45}{\cot 45} = \frac{\sqrt{2}}{\sqrt{2}} - \frac{1}{1}$ = 1-1= 0	**1**

15	**(d)**	Number of revolutions= $\frac{\text{total distance}}{\text{circumference}} = \frac{176}{2 \text{ X} \frac{22}{7} \text{X } 0.7}$ $= 40$	**1**
16	**(b)**	$\frac{\text{perimeter of } \Delta ABC}{\text{perimeter of } \Delta DEF} = \frac{BC}{EF}$ $\frac{7.5}{\text{perimeter of } \Delta DEF} = \frac{2}{4}$. So perimeter of ΔDEF = 15cm	**1**
17	**(b)**	Since DE‖ BC, $\Delta ABC \sim \Delta ADE$ (By AA rule of similarity) So $\frac{AD}{AB} = \frac{DE}{BC}$ i.e. $\frac{3}{7} = \frac{DE}{14}$. So DE = 6cm	**1**
18	**(a)**	Dividing both numerator and denominator by cosβ, $\frac{4 \sin\beta - 3\cos\beta}{4\sin\beta + 3\cos\beta} = \frac{4\tan\beta - 3}{4\tan\beta + 3} = \frac{3-3}{3+3}$ =0	**1**
19	**(d)**	-2(–5x + 7y = 2) gives 10x – 14y = –4. Now $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ = -2	**1**
20	**(a)**	Number of Possible outcomes are 26 Favorable outcomes are M, A, T, H, E, I, C, S probability = 8/26 = 4/13	**1**
		SECTION B	
21	**(c)**	Since HCF = 81, two numbers can be taken as 81x and 81y, ATQ 81x + 81y = 1215 Or x+y = 15 which gives four co prime pairs- 1,14 2,13 4,11 7, 8	**1**
22	**(c)**	Required Area is area of triangle ACD = ½(6)2 = 6 sq units	**1**
23	**(b)**	tan α + cot α = 2 gives α=45°. So tan α = cot α = 1 $\tan^{20}\alpha + \cot^{20}\alpha = 1^{20} + 1^{20}$ = 1+1 = 2	**1**
24	**(a)**	Adding the two given equations we get: 348*x* + 348*y* = 1740. So *x* +*y* =5	**1**
25	**(c)**	LCM of two prime numbers = product of the numbers 221= 13 x 17. So p= 17 & q= 13 ∴3p - q= 51-13 =38	**1**
26	**(a)**	Probability that the card drawn is neither a king nor a queen $= \frac{52-8}{52}$ = 44/52 = 11/13	**1**
27	**(b)**	Outcomes when 5 will come up at least once are- (1,5), (2,5), (3,5), (4,5), (5,5), (6,5), (5,1), (5,2), (5,3), (5,4) and (5,6) Probability that 5 will come up at least once = 11/36	**1**
28	**(c)**	$1+ \sin^2\alpha = 3 \sin\alpha \cos\alpha$ $\sin^2\alpha + \cos^2\alpha + \sin^2\alpha = 3 \sin\alpha \cos\alpha$ $2 \sin^2\alpha - 3\sin\alpha \cos\alpha + \cos^2\alpha = 0$ (2sinα -cos α)(sinα- cosα) =0 ∴cotα = 2 or cotα = 1	**1**
29	**(a)**	Since ABCD is a parallelogram, diagonals AC and BD bisect each other, ∴ mid point of AC= mid point of BD	**1**

		$\left(\frac{x+1}{2}, \frac{6+2}{2}\right) = \left(\frac{3+4}{2}, \frac{5+y}{2}\right)$ Comparing the co-ordinates, we get, $\frac{x+1}{2} = \frac{3+4}{2}$. So, x= 6 Similarly, $\frac{6+2}{2} = \frac{5+y}{2}$. So, y= 3 ∴(x, y) = (6,3)	
30	**(c)**	ΔACD ~Δ ABC(AA) $\therefore \frac{AC}{AB} = \frac{AD}{AC}$ (CPST) 8/AB = 3/8 This gives AB = 64/3 cm. So BD = AB – AD = 64/3 -3 = 55/3cm.	**1**
31	**(d)**	Any point (*x*, *y*) of perpendicular bisector will be equidistant from A & B. $\therefore \sqrt{(x-4)^2 + (y-5)^2} = \sqrt{(x+2)^2 + (y-3)^2}$ Solving we get -12x – 4y + 28=0 or 3x + y – 7=0	**1**
32	**(b)**	$\frac{\cot y^\circ}{\cot x^\circ} = \frac{AC/BC}{AC/CD}$ = CD/ BC = CD/ 2CD = ½	**1**
33	**(a)**	The smallest number by which 1/13 should be multiplied so that its decimal expansion terminates after two decimal points is 13/100 as $\frac{1}{13}$ x $\frac{13}{100}$ = $\frac{1}{100}$ = 0.01 Ans: 13/100	**1**
34	**(b)**	 ΔABE is a right triangle & FDGB is a square of side x cm ΔAFD ~Δ DGE(AA) $\therefore \frac{AF}{DG} = \frac{FD}{GE}$ (CPST) $\frac{16-x}{x} = \frac{x}{8-x}$ (CPST) 128 = 24x or x = 16/3cm	**1**
35	**(a)**	Since P divides the line segment joining R(-1, 3) and S(9,8) in ratio k:1 ∴ coordinates of P are $\left(\frac{9k-1}{k+1}, \frac{8k+3}{k+1}\right)$ Since P lies on the line x – y +2=0, then $\frac{9k-1}{k+1} - \frac{8k+3}{k+1} + 2 = 0$ 9k -1 -8k-3 +2k+2 =0 which gives k=2/3	**1**
36	**(c)**	Shaded area = Area of semicircle + (Area of half square – Area of two quadrants) = Area of semicircle +(Area of half square – Area of semicircle) = Area of half square = ½ x 14 x14 = 98cm²  	**1**

37	**(d)**	 Let O be the center of the circle. OA = OB = AB =1cm. So ΔOAB is an equilateral triangle and ∴ ∠AOB =60° Required Area= 8x Area of one segment with r=1cm, ϴ= 60° $= 8x(\frac{60}{360} \text{ x } \pi \text{ x } 1^2 - \frac{\sqrt{3}}{4} \text{ x } 1^2)$ $= 8(\pi/6 - \sqrt{3}/4)cm^2$	**1**
38	**(b)**	Sum of zeroes = 2 + ½ = -5/p i.e. 5/2 = -5/p . So p= -2 Product of zeroes = 2x ½ = r/p i.e. r/p = 1 or r = p = -2	**1**
39	**(c)**	2πr =100. So Diameter = 2r =100/π = diagonal of the square. side√2 = diagonal of square = 100/ π ∴ side = 100/√2π = 50√2/π	**1**
40	**(b)**	$3^{x+y} = 243 = 3^5$ So $x+y$ =5-----------------------------------(1) $243^{x-y} = 3$ $(3^5)^{x-y} = 3^1$ So 5x -5y =1--------------------------------(2) Since : $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$, so unique solution	**1**
		SECTION C	
41	**(c)**	Initially, at t=0, Annie's height is 48ft So, at t =0, h should be equal to 48 $h(0) = -16(0)^2 + 8(0) + k = 48$ So k = 48	**1**
42	**(b)**	When Annie touches the pool, her height =0 feet i.e. $-16t^2 + 8t + 48 = 0$ above water level $2t^2 - t - 6 = 0$ $2t^2 - 4t + 3t - 6 = 0$ 2t(t-2) +3(t-2) =0 (2t +3) (t-2) =0 i.e. t= 2 or t= -3/2 Since time cannot be negative , so t= 2seconds	**1**
43	**(d)**	t= -1 & t=2 are the two zeroes of the polynomial p(t) Then p(t)=k (t- -1)(t-2) = k(t +1)(t-2) When t = 0 (initially) h_1 = 48ft $p(0)=k(0^2- 0 -2)= 48$ i.e. -2k = 48 So the polynomial is $-24(t^2- t -2) = -24t^2 + 24t + 48$.	**1**
44	**(c)**	A polynomial q(t) with sum of zeroes as 1 and the product as -6 is given by $q(t) = k(t^2$ - (sum of zeroes)t + product of zeroes) $= k(t^2 -1t + -6)$ ………..(1) When t=0 (initially) q(0)= 48ft	**1**

		q(0)=k(0^2- 1(0) -6)= 48 i.e. -6k = 48 or k= -8 Putting k = -8 in equation (1), reqd. polynomial is -8(t^2 -1t + -6) = -8t^2 + 8t + 48	
45	**(a)**	When the zeroes are negative of each other, sum of the zeroes = 0 So, -b/a = 0 $-\frac{(k-3)}{-12} = 0$ $+\frac{k-3}{12} = 0$ k-3 = 0, i.e. k = 3.	**1**
46	**(a)**	Centroid of ΔEHJ with E(2,1), H(-2,4) & J(-2,-2) is $(\frac{2+-2+-2}{3}, \frac{1+4+-2}{3})$ = **(-2/3, 1)**	**1**
47	**(c)**	If P needs to be at equal distance from A(3,6) and G(1,-3), such that A,P and G are collinear, then P will be the mid-point of AG. So coordinates of P will be $(\frac{3+1}{2}, \frac{6+-3}{2})$ = **(2, 3/2)**	**1**
48	**(a)**	Let the point on x axis equidistant from I(-1,1) and E(2,1) be (x,0) then $\sqrt{(x+1)^2+(0-1)^2} = \sqrt{(x-2)^2+(0-1)^2}$ x^2 + 1 + 2x +1 = x^2 + 4 - 4x +1 6x = 3 So x = ½ . ∴ the required point is (½, 0)	**1**
49	**(b)**	Let the coordinates of the position of a player Q such that his distance from K(-4,1) is twice his distance from E(2,1) be Q(x, y) Then KQ : QE = 2: 1 Q(x, y) = $(\frac{2 \text{ X } 2+1 \text{ X}-4}{3}, \frac{2 \text{ X } 1+1 \text{ X } 1}{3})$ = (0,1)	**1**
50	**(d)**	Let the point on y axis equidistant from B(4,3) and C(4,-1) be (0,y) then $\sqrt{(4-0)^2+(3-y)^2} = \sqrt{(4-0)^2+(y+1)^2}$ 16 + y^2 + 9 - 6y = 16 + y^2 + 1 + 2y -8y = -8 So y = 1 . ∴ the required point is (0, 1)	**1**