**SECTION A**

<table>
<thead>
<tr>
<th>QN</th>
<th>Correct Option</th>
<th>HINTS/SOLUTION</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(b)</td>
<td>Least composite number is 4 and the least prime number is 2. LCM(4,2) : HCF(4,2) = 4:2 = 2:1</td>
<td>1</td>
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<tr>
<td>2</td>
<td>(a)</td>
<td>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 )</td>
<td>1</td>
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<tr>
<td>3</td>
<td>(b)</td>
<td>By Pythagoras theorem The required distance ( =\sqrt{(200^2 + 150^2)} ) ( = \sqrt{(40000+ 22500)} = \sqrt{62500} ) = 250m. So the distance of the girl from the starting point is 250m.</td>
<td>1</td>
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<tr>
<td>4</td>
<td>(d)</td>
<td>Area of the Rhombus = ( \frac{1}{2} ) (24 x 32)= 384 cm². Using Pythagoras theorem side² = ( \frac{1}{2}d_1^2 + \frac{1}{2}d_2^2 ) = 12² +16² = 144 +256 =400 Side = 20cm Area of the Rhombus = base x altitude 384 = 20 x altitude So altitude = 384/20 = 19.2cm</td>
<td>1</td>
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<tr>
<td>5</td>
<td>(a)</td>
<td>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</td>
<td>1</td>
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<tr>
<td>6</td>
<td>(d)</td>
<td>Ratio of altitudes = Ratio of sides for similar triangles So AM:PN = AB:PQ = 2:3</td>
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<td>7</td>
<td>(b)</td>
<td>( 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 ) ( \beta ) is 90°</td>
<td>1</td>
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<tr>
<td>8</td>
<td>(c)</td>
<td>Since it has a terminating decimal expansion, so prime factors of the denominator will be 2,5</td>
<td>1</td>
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<tr>
<td>9</td>
<td>(a)</td>
<td>Lines x=a is a line parallel to y axis and y=b is a line parallel to x axis. So they will intersect.</td>
<td>1</td>
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<tr>
<td>10</td>
<td>(d)</td>
<td>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</td>
<td>1</td>
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<tr>
<td>11</td>
<td>(b)</td>
<td>( a^2=23/25 ), then ( a = \sqrt{23}/5 ), which is irrational</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>(c)</td>
<td>LCM X HCF = Product of two numbers 36 X 2 = 18 X x x = 4</td>
<td>1</td>
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<tr>
<td>13</td>
<td>(b)</td>
<td>( \tan A= \sqrt{3} = \tan 60° ) so ( \angle A=60° ). Hence ( \angle C = 30° ). So ( \cos A \cos C- \sin A \sin C = (1/2)x (\sqrt{3}/2) - (\sqrt{3}/2)x (1/2) =0 )</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>(a)</td>
<td>( 1.x +1.x +2.x =180° ), ( x = 45° ). ( \angle A, \angle B ) and ( \angle C ) are 45°, 45° and 90° respectively. ( \frac{\sec A \ - \ \tan A}{\cosec B \ - \ \cot B} = \frac{\sec 45 \ - \ \tan 45}{\cosec 45 \ - \ \cot 45} = \frac{\sqrt{2} \ - \ 1}{\sqrt{2} \ - \ 1} = 1 )</td>
<td>1</td>
</tr>
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15. **(d)**
Number of revolutions = \( \frac{\text{total distance}}{\text{circumference}} = \frac{176}{2 \times \frac{22}{7} \times 0.7} = 40 \)

16. **(b)**
\[
\begin{align*}
\text{perimeter of } \triangle ABC &= \frac{BC}{7.5} \\
\text{perimeter of } \triangle DEF &= \frac{EF}{2} \\
\text{perimeter of } \triangle DEF &= \frac{2}{4} \cdot \frac{2}{7} \cdot \frac{7}{0} = 40
\end{align*}
\]
So, perimeter of \( \triangle DEF = 15 \text{ cm} \)

17. **(b)**
Since \( DE \parallel BC \), \( \triangle ABC \sim \triangle ADE \) (By AA rule of similarity)
\[
\frac{AD}{DE} = \frac{BC}{EF} \quad \text{So, DE} = 6 \text{ cm}
\]

18. **(a)**
Dividing both numerator and denominator by \( \cos \beta \),
\[
\frac{4 \sin \beta - 3 \cos \beta}{4 \sin \beta + 3 \cos \beta} = \frac{3 - 3}{3 + 3} = 0
\]

19. **(d)**
\(-2(–5x + 7y = 2) \) gives \( 10x - 14y = -4 \). Now \( \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} = -2 \)

20. **(a)**
Number of Possible outcomes are 26
Favorable outcomes are M, A, T, H, E, I, C, S
probability = \( \frac{8}{26} = \frac{4}{13} \)

SECTION B

21. **(c)**
Since HCF = 81, two numbers can be taken as 81x and 81y,
\[
\text{ATQ } 81x + 81y = 1215
\]
Or \( x + y = 15 \) which gives four co prime pairs:
1,14
2,13
4,11
7,8

22. **(c)**
Required Area is area of triangle \( ACD = \frac{1}{2}(6)2 = 6 \text{ sq units} \)

23. **(b)**
\[
\tan \alpha + \cot \alpha = 2 \text{ gives } \alpha = 45^\circ. \text{ So } \tan \alpha = \cot \alpha = 1
\]
\[
\tan^2 \alpha + \cot^2 \alpha + \sin^2 \alpha = 3 \sin \alpha \cos \alpha
\]
\[
2 \sin^2 \alpha - 3 \sin \alpha \cos \alpha + \cos^2 \alpha = 0
\]
\[
(2\sin \alpha - \cos \alpha)(\sin \alpha - \cos \alpha) = 0
\]
\[
\therefore \cot \alpha = 2 \text{ or } \cot \alpha = 1
\]

24. **(a)**
Adding the two given equations we get: \( 348x + 348y = 1740 \).
So \( x + y = 5 \)

25. **(c)**
LCM of two prime numbers = product of the numbers
\[
\text{So p} = 17 \text{ & q} = 13
\]
\[
\therefore 3p - q = 51 - 13 = 38
\]

26. **(a)**
Probability that the card drawn is neither a king nor a queen
\[
\frac{52-8}{52} = \frac{44}{52} = \frac{11}{13}
\]

27. **(b)**
Outcomes when 5 will come up at least once are:
\((1,5), (2,5), (3,5), (4,5), (5,5), (6,5), (5,1), (5,2), (5,3), (5,4) \text{ and } (5,6)\)
Probability that 5 will come up at least once = \( 11/36 \)

28. **(c)**
\[
1 + \sin^2 \alpha = 3 \sin \alpha \cos \alpha
\]
\[
\sin^2 \alpha + \cos^2 \alpha + \sin^2 \alpha = 3 \sin \alpha \cos \alpha
\]
\[
2 \sin^2 \alpha - 3 \sin \alpha \cos \alpha + \cos^2 \alpha = 0
\]
\[
(2\sin \alpha - \cos \alpha)(\sin \alpha - \cos \alpha) = 0
\]
\[
\therefore \cot \alpha = 2 \text{ or } \cot \alpha = 1
\]

29. **(a)**
Since ABCD is a parallelogram, diagonals AC and BD bisect each other, \( \therefore \) mid point of AC = mid point of BD
30. \( \Delta ACD \sim \Delta ABC \) (AA)
\[
\therefore \frac{AC}{AB} = \frac{AD}{AC} \quad (CPST)
\]
8/AB = 3/8
This gives AB = 64/3 cm.
So BD = AB – AD = 64/3 -3 = 55/3 cm.

31. 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

32. \( \cot y°/\cot x° = \frac{AC/BC}{AC/CD} = CD/BC = CD/2CD = \frac{1}{2} \)

33. The smallest number by which \(1/13\) should be multiplied so that its decimal expansion terminates after two decimal points is \(13/100\) as 113 \cdot \frac{13}{100} = \frac{1}{100} = 0.01
Ans: 13/100

34. \( \Delta ABE \) is a right triangle & FDGB is a square of side \(x\) cm
\( \Delta AFD \sim \Delta DGE \) (AA)
\[
\therefore \frac{AF}{FD} = \frac{DG}{GE} \quad (CPST)
\]
\[
\frac{16-x}{x} = \frac{x}{8-x} \quad (CPST)
\]
128 = 24x or \(x = 16/3\) cm

35. Since P divides the line segment joining R(-1, 3) and S(9,8) in ratio k:1.
\[
\therefore \text{coordinates of P are } \left( \frac{9k-1}{k+1}, \frac{8k+3}{k+1} \right)
\]
Since P lies on the line x – y +2 = 0, then
\[
9k-1 -8k-3 +2k+2 = 0
\]
which gives k = 2/3

36. 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
= \(\frac{1}{2} \times 14 \times 14 = 98\) cm²
Let O be the center of the circle. OA = OB = AB =1cm.

So ∆OAB is an equilateral triangle and ∴ ∠AOB =60°

Required Area= 8x Area of one segment with r=1cm, θ = 60°

\[ \text{Required Area} = 8 \times \left( \frac{60}{360} \pi \times 1^2 - \frac{\sqrt{3}}{4} \times 1^2 \right) \]

\[ = 8 \left( \frac{\pi}{6} - \frac{\sqrt{3}}{4} \right) \text{cm}^2 \]

38  (b) Sum of zeroes = 2 + \frac{1}{2} = -5/p
i.e. 5/2 = -5/p . So p = -2
Product of zeroes = 2x \frac{1}{2} = r/p
i.e. r/p = 1 or r = p = -2

39  (c) \[ 2\pi =100. \text{ So Diameter} = 2r =100/\pi = \text{diagonal of the square.} \]
side√2 = diagonal of square = 100/π
∴ side = 100/√2π = \frac{50\sqrt{2}}{π}

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

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

42  (b) When Annie touches the pool, her height =0 feet
i.e. -16t² + 8t + 48 =0 above water level
2t² - t -6 = 0
2t² - 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

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) h₁ = 48ft
p(0)=k(0²- 0 -2)= 48
i.e. -2k = 48
So the polynomial is -24(t² - t -2) = -24t² + 24t + 48.

44  (c) A polynomial q(t) with sum of zeroes as 1 and the product as -6 is given by
q(t) = k(t² - (sum of zeroes)t + product of zeroes)
= k(t² -1t + -6) 
.........(1)
When t=0 (initially) q(0) = 48ft
\[ q(0) = k(0^2 - 1(0) - 6) = 48 \]
\[ \text{i.e.} \quad -6k = 48 \quad \text{or} \quad k = -8 \]
Putting \( k = -8 \) in equation (1), reqd. polynomial is
\[ -8(t^2 - t + 6) = -8t^2 + 8t + 48 \]

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,
\[ \text{i.e.} \quad k = 3. \]

46. (a) Centroid of \( \Delta \)EHJ with \( E(2,1), H(-2,4) \) & \( J(-2,-2) \) is
\[ \left( \frac{2+(-2)+(-2)}{3}, \frac{1+4+(-2)}{3} \right) = \left( \frac{-2}{3}, 1 \right) \]

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 \( A G \).
So coordinates of \( P \) will be \( \left( \frac{3+1}{2}, \frac{6+(-3)}{2} \right) = \left( 2, \frac{3}{2} \right) \)

48. (a) Let the point on \( x \) axis equidistant from \( I(-1,1) \) and \( E(2,1) \) be \( (x,0) \)
then \[ \sqrt{(x+1)^2 + (0-1)^2} = \sqrt{(x-2)^2 + (0-1)^2} \]
\[ x^2 + 1 + 2x + 1 = x^2 + 4 - 4x + 1 \]
\[ 6x = 3 \]
\[ \text{So} \quad x = \frac{1}{2} . \]
\[ \therefore \text{the required point is} \left( \frac{1}{2}, 0 \right) \]

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 \( KQ : QE = 2:1 \)
\[ Q(x, y) = \left( \frac{2x+1x-4}{3}, \frac{2x+1x1}{3} \right) = (0,1) \]

50. (d) Let the point on \( y \) axis equidistant from \( B(4,3) \) and \( C(4,-1) \) be \( (0,y) \)
then \[ \sqrt{(4 - 0)^2 + (3 - y)^2} = \sqrt{(4 - 0)^2 + (y + 1)^2} \]
\[ 16 + y^2 + 9 - 6y = 16 + y^2 + 1 + 2y \]
\[ -8y = -8 \]
\[ \text{So} \quad y = 1. \]
\[ \therefore \text{the required point is} \ (0,1) \]