BOARD OF SECONDARY EDUCATION, MANIPUR
SCORING KEY FOR H.S.L.C. EXAMINATION 2020
**SUBJECT : MATHEMATICS**

| QNo. | Key | Mark for each point | Total Marks |
|---|---|---|---|
| 1 | B | 1 | 1 |
| 2 | C | 1 | 1 |
| 3 | A | 1 | 1 |
| 4 | D | 1 | 1 |
| 5 | A | 1 | 1 |
| 6 | e.g. 3 and – 3 | 1 | 1 |
| 7 | If $p(x)$ is a polynomial of degree $\geq 1$ and $a$ is any real number, then $x-a$ is a factor of $p(x)$ if and only if $p(a)=0$ | 1 | 1 |
| 8 | $7+(n-1).3=58 \quad \Rightarrow \quad n=18 \in N$<br>Yes, 58 is a term of the given AP. | 1 | 1 |
| 9 | If there is only one point common to a circle and a line, then the line is called a tangent to the circle. | 1 | 1 |
| 10 | Required area = $\frac{1}{2}[0+1.(7-5)+6.(5-3)]=7\ sq.km.$ | 1 | 1 |
| 11 | Here, $2\pi r - r = 37 \quad \Rightarrow \quad r=\frac{37}{2\pi-1}=\frac{37}{\frac{44}{7}-1}=7$<br>$\therefore$ Radius of the circle = 7 $cm$ | 1 | 1 |
| 12 | $V=\frac{1}{3}\pi h\left(r_1^2+r_1r_2+r_2^2\right)$ | 1 | 1 |
| 13 | Events are said to be independent if the occurrence of one has no effect on the occurrence of the other or others. | 1 | 1 |
| 14 | Zero of $x+a$ is $-a$<br>Putting $x=-a$ we have<br>$x^n-a^n=(-a)^n-a^n=\{(-1)^n-1\}a^n=0$ only when $n$ is even<br>$\therefore$ $x^n-a^n$ is divisible by $x+a$ only when $n$ is even. | 1<br>1 | 2 |
| 15 | Multiples of 7 lying between 50 and 150 form the finite A.P.<br>56, 63, 70, ……………., 147<br>If $n$ be the number of term, then $56+7.(n-1)=147$<br>$\therefore$ $n=14$<br>Required sum = $\frac{n}{2}(a+l)=\frac{14}{2}(56+147)=1421$ | 1<br>1 | 2 |
| 16 | (a) The angle of elevation of a point observed is the angle formed by the line of sight with the horizontal when the point being observed is above the horizontal through the eye.<br>(b) The angle of depression of a point observed is the angle formed by the line of sight with the horizontal when the point observed is below the horizontal through eye. | 1<br>1 | 2 |

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|---|---|---|---|
| 17 | Here,<br>$r_1 = 17.5\ cm,\quad r_2 = 10.5\ cm,\quad h = 24\ cm$<br>$\therefore\quad l = \sqrt{(r_1 - r_2)^2 + h^2} \;=\; \sqrt{7^2 + 24^2} \;=\; 25\ cm$<br>Required C.S.A. = $\pi\, l(r_1 + r_2) \;=\; \frac{22}{7} \times 25(17.5 + 10.5) \;=\; 2200\ cm^2$ | 1<br>1 | 2 |
| 18 | When a coin is tossed, the sample space is given by<br>$S = \{HH, HT, TH, TT\}$<br>Out of the 4 possible outcomes only one (i.e. TT) is favourable to the event A of getting tail in both the cases.<br>$\therefore$ Required probability = P(A) = $\frac{1}{4}$ | 1<br>1 | 2 |
| 19 | For any integer $a$, consider the three consecutive odd integers<br>$2a-1,\quad 2a+1$ and $2a+3$<br>By Euclid's division lemme, the integer $a$ is of the form $3q$ or $3q+1$ or $3q+2$<br>Case I : If $a = 3q,$ then $2a+3 = 6q+3 = 3(2q+1)$<br>Case II : If $a = 3q+1,$ then $2a+1 = 6q+3 = 3(2q+1)$<br>Case III : If $a = 3q+2,$ then $2a-1 = 6q+3 = 3(2q+1)$<br>Thus, in any of the possible cases one of the consecutive odd integers $2a-1,\quad 2a+1$ and $2a+3$ is a multiple of 3. | 1<br>1<br>1 | 3 |
| 20 | Book corollary | 1+1+1 | 3 |
| 21 | Graph of the first equation<br>Graph of the second equation<br>The line intersect at the point (3, 2) $\quad \therefore x = 3,\quad y = 2$ | 1<br>1<br>1 | 3 |
| 22 | Book article 5.4 | 3 | 3 |
| 23 | Book theorem 8.1 | 3 | 3 |
| 24 | Suppose the $y$-axis divides the line segment joining the points $A(3,-5)$ and $B(-4,2)$ in the ratio $m : n$<br>Then the point of division $C(x,y)$ is given by<br>$x = \frac{m.(-4) + n.3}{m+n} = \frac{-4m+3n}{m+n}$<br>And $\quad y = \frac{m.2 + n.(-5)}{m+n} = \frac{2m-5n}{m+n}$<br>Since $C(x,y)$ lies on the $y$-axis, therefore $x = 0$<br>$\Rightarrow\quad -4m+3n = 0 \quad\Rightarrow\quad 4m = 3n \quad\Rightarrow\quad m:n = 3:4$<br>Also then, $\quad y = \frac{6-20}{7} = -2$<br>$\therefore\quad$ the coordinates of the point of division are $(0,-2)$ | 1<br>1<br>1 | 3 |
| 25 | Book article 3.10 | 4 | 4 |

| | | | |
|---|---|---|---|
| 26 | Let the speed of the train starting from A be $x$ km/hr and that of the train starting from B be $y$ km/hr. Suppose the two trains meet $t$ hours after start so that<br>$x.t + y.t = 600$ *i.e.* $t = \frac{600}{x+y}$ …………………… (1)<br>By the given conditions, we have<br>$x(t+9) = 600 \Rightarrow x = \frac{600}{t+9}$ …………………… (2)<br>And $y(t+4) = 600 \Rightarrow y = \frac{600}{t+4}$ …………………… (3)<br>Eliminating $x$ and $y$ from (1), (2) and (3), we have<br>$t = \frac{600}{\frac{600}{t+9}+\frac{600}{t+4}} \Rightarrow t = \left(\frac{1}{t+9}+\frac{1}{t+4}\right) = 1$<br>$\Rightarrow t(2t+13) = (t+9)(t+4) \Rightarrow t^2 = 36 \Rightarrow t = 6$<br>By (2), $x$ = 40 km/hr and by (3) $y$ = 60 km/hr | 1<br><br>1<br><br>1<br>1 | 4 |
| Or | Let the two sums invested be Rs. $x$ and Rs. $y$ respectively.<br>By the given conditions, we have<br>$\frac{8x}{100}+\frac{12y}{100} = 7200$<br>$\Rightarrow 2x+3y = 175000$ ……………………………(1)<br>And $\frac{10x}{100}+\frac{14y}{100} = 8600$<br>$\Rightarrow 5x+7y = 430000$ ……………………………(2)<br>Multiplying (1) by 5 and (2) by 2 we have<br>$10x+15y = 875000$<br>and $10x+14y = 860000$<br>on subtraction, we get $y = 15000$<br>$\therefore$ by (1) , $x = \frac{1}{2}(175000-45000) = 65000$<br>The sums invested are Rs. 65000 and Rs. 15000. | 1<br>1<br><br>1<br><br>1 | 4 |
| 27 | Book result | 4 | 4 |
| 28 | Book theorems | 5 | 5 |
| 29 | Book construction | 5 | 5 |

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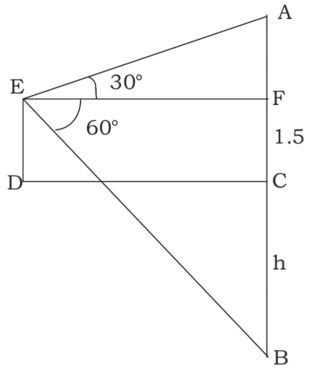
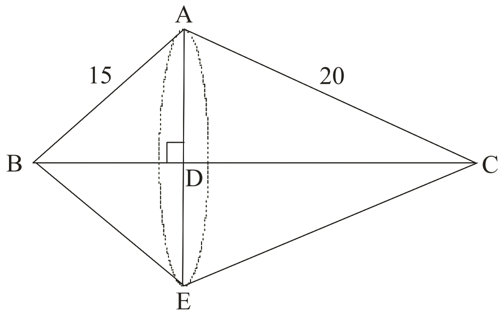
|---|---|---|---|
| 30 | Let E be the position of the man's eye at a height DE = 1.5 m above the horizontal water level CD of the point. Let A be position of the bird and B be its reflection in the pond so that AB is perpendicular to the water surface and its mid-point C lies on the water surface CD. | 1 | |
| | Draw $EF \perp AB$ and join EA, EB. | | |
| |  | | |
| | Let $h$ be the height of the bird above the pond. | | |
| | Then, $AC = BC = h, \quad AF = h - CF = h - DE = h - 1.5$ | 1 | |
| | And $BF = BC + CF = h + 1.5$ | | |
| | In the right $\Delta AEB$ by the given condition $\angle EAF = 30^\circ$ | | |
| | $\therefore \quad \tan 30^\circ = \frac{AF}{EF} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h-1.5}{EF}$ ……………………………..(1) | 1 | |
| | Again, in the right $\Delta BEF$ by the given condition $\angle BEF = 60^\circ$ | | 5 |
| | $\therefore \quad \tan 60^\circ = \frac{BF}{EF} \Rightarrow \sqrt{3} = \frac{h+1.5}{EF}$ ……………………………..(2) | 1 | |
| | Dividing (2) by (1) we get | | |
| | $3 = \frac{3+1.5}{h-1.5} \Rightarrow 3h - 4.5 = h + 1.5 \Rightarrow h = 3$ | | |
| | i.e. the height of the bird above the pond = 3 m | 1 | |
| 31 | Let ABC be a right triangle right angled at A, in which AB = 15 cm and AC = 20 cm | | |
| | Then $BC = \sqrt{15^2 + 20^2} = 25cm$ | | |
| | Draw $AD \perp BC$ and produce it to E so that AD = DE | | |
| |  | | |
| | The double cone formed AE as diameter of the common base and BD and CD as heights | | |
| | Now, $\frac{1}{2}.AB \times AC = \frac{1}{2}BC.AD =$ area of ΔABC | 1 | |
| | $\Rightarrow \quad 15 \times 20 = 25 \times AD$ | | |
| | $\therefore$ AD = 12 cm | | |
| | i.e. radius of the common base of the double cone = 12 cm | | |
| | Volume of the double cone =volume of Cone BAE + volume of cone CAE | 1 | 6 |
| | $= \frac{1}{3}\pi.AD^2(BD+CD) = \frac{1}{3}\pi.AD^2\ BC$ | | |
| | $= \frac{1}{3}\pi \times 12^2 \times 25 = 1200\pi(cm^3)$ | 1 | |
| | Surface area of the double cone = CSA of cone BAE + CSA of cone CAE | | |
| | $= \pi.AD.(AB+AC) = \pi.12.(15+20)$ | 1 | |
| | $= 420\pi(cm^3)$ | | |

Or

We have,

$5\ km/hr = 5000\ m/hr$ and $35\ cm = 0.35\ m$ — 1

Let the water level in the tank rise by 0.35m in $t$ hours.

Volume of water that flows through the pipe of radius 7 cm = 0.07 m, during $t$ hours

$$= \pi.(0.07)^2 \times 5000\, t\ (m^3) = \frac{22}{7} \times 0.07 \times 0.07 \times 5000\, t$$ — 1

$$= 77\, t (m^3)$$ — 1 — 6

Also, volume of a rectangular tank of base 30mX22m and height 0.35m

= 30 x 22 x 0.35

= 3x77 ($m^3$) — 1

By the condition,

$77\, t = 3x77$ — 1

$\Rightarrow t = 3$

Hence, required time = 3 hours. — 1

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Taking $x$ and $y$ as the two missing frequencies, the given data can be modified as follows :

| Class | Mid value $x_i$ | Frequency $f_i$ | Cu.Freq. | $u_i = \frac{x_i - 65}{10}$ | $f_i u_i$ |
|---|---|---|---|---|---|
| 30 – 40 | 35 | 3 | 3 | – 3 | – 9 |
| 40 – 50 | 45 | $x$ | $x + 3$ | – 2 | – 2$x$ |
| 50 – 60 | 55 | 12 | $x + 15$ | – 1 | – 12 |
| 60 – 70 | 65 | 15 | $x + 30$ | 0 | 0 |
| 70 – 80 | 75 | $y$ | $x + y + 3$ | 1 | $y$ |
| 80 – 90 | 85 | 3 | $x + y + 33$ | 2 | 6 |
| 90 – 100 | 95 | 2 | $x + y + 35$ | 3 | 6 |
| | | N= $x$+$y$+35 | | | $y - 2x - 9$ |

1 — 1 — 1

By the given conditions, we have

$N = 50$

$\Rightarrow x + y + 35 = 50$

$\Rightarrow x + y = 15$ ……………………………….(1) — 1

And $\bar{x} = a + h\bar{u}$

$$\Rightarrow 62 = 65 + 10 \times \frac{y - 2x - 9}{50}$$ — 6

$\Rightarrow 310 = 325 + y - 2x - 9$

$\Rightarrow 2x - y = 6$ ……………………………….(2) — 1

Solving (1) and (2) we get

$x = 7$ and $y = 8$ — 1

$\therefore$ Frequency of class 40 – 50 is 7 and that of class 70 – 80 is 8.