COMMON PRE-BOARD EXAMINATION 2024-25

Subject: MATHEMATICS (BASIC) -241

Class X

MARKING SCHEME

Time: 3 hrs | Max. Marks: 80 | Date: 04-12-2024

General Instructions:

1. This Question Paper has 5 Sections A - E.
2. Section **A** has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section **B** has 5 questions carrying 02 marks each.
4. Section **C** has 6 questions carrying 03 marks each.
5. Section **D** has 4 questions carrying 05 marks each.
6. Section **E** has 3 Case Based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$, wherever required if not stated.

SECTION A			
Q.1.	**(C)** p^3	**Q.11.**	**(B)** $\angle B = \angle D$
Q.2.	**(D)** 3, 1	**Q.12.**	**(A)** 10 cm
Q.3.	**(C)** no real roots	**Q.13.**	**(B)** $\frac{b}{\sqrt{b^2-a^2}}$
Q.4.	**(D)** –1	**Q.14.**	**(D)** 3.5
Q.5.	**(A)** 90°	**Q.15.**	**(C)** $\frac{3}{4}$
Q.6.	**(D)** 10	**Q.16.**	**(B)** -124
Q.7.	**(C)** $\frac{7}{\sqrt{113}}$	**Q.17.**	**(A)** 7
Q.8.	**(A)** 4 : 7	**Q.18.**	**(A)** 3
Q.9.	**(D)** 16	**Q.19.**	(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)
Q.10.	**(C)** –1	**Q.20.**	(d) Assertion (A) is false, but reason (R) is true

SECTION B

Section B consists of 5 questions of 2 marks each

Q.21. (a)

Mid point of BD $=\left(\frac{5-1}{2}, \frac{4+6}{2}\right)=(2, 5)$ ½

$\Rightarrow$ Mid point of AC = Mid point of BD

Hence, ABCD is a parallelogram. ½

Mid point of AC $=\left(\frac{3+1}{2}, \frac{8+2}{2}\right) = (2, 5)$ 1

(OR)

(b)

$AB^2 = 3^2 + 4^2 = 25$ ½

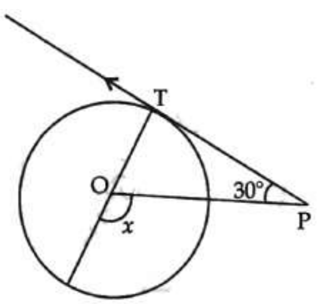
$BC^2 = 7^2 + 1^2 = 50$ ½

$AC^2 = 4^2 + 3^2 = 25$ ½

$\Rightarrow BC^2 = AB^2 + AC^2$

$\therefore \Delta ABC$ is a right-angled triangle. ½

Q.22.



$\angle OTP = 90°$ (tangent $\perp$ radius at the point of contact) *1*

Getting $x = 120°$ *1*

Q.23. (a)

Here $d = \frac{1}{12} - \frac{1}{15} = \frac{1}{60}$ $\frac{1}{2}$

$\therefore S_{15} = \frac{15}{2}\left[\frac{2}{15} + 14 \times \frac{1}{60}\right]$ 1

$= \frac{15}{2} \times \frac{22}{60} = \frac{11}{4}$ $\frac{1}{2}$

(OR)

(b) For a, 7, b, 23, …. to be in AP it should satisfy the condition,

$a_2 - a_1 = a_3 - a_2 = a_4 - a_3 = d$

7 - a = b - 7 = 23 - b …(1) ½

By equating,

b - 7 = 23 - b

2b = 30$\Rightarrow$ b = 15 ½

And, 7 - a = b - 7

7 - a = 15 – 7 $\Rightarrow$ a = - 1 1

Therefore, the sequence - 1, 7, 15, 23 is an AP.

Q.24. $5 \operatorname{cosec}^2 45° - 3 \sin^2 90° + 5 \cos 0°$

$= 5(\sqrt{2})^2 - 3(1)^2 + 5(1)$ 1

$= 12$ 1

Q.25.

Class	$0-20$	$20-40$	$40-60$	$60-80$	$80-100$
Frequency	8	7	12	5	3

Modal class is 40 – 60 ½

$\text{Mode} = L + \frac{f_0 - f_1}{2f_0 - f_1 - f_2} \times h$ ½

½

$= 40 + \left(\frac{12-7}{24-7-5}\right) \times 20$ ½

$= 48.3$

SECTION C

Section C consists of 6 questions of 3 marks each

Q.26. Let us assume that $5 - 2\sqrt{2}$ be a rational number. ½

$\therefore 5 - 2\sqrt{2} = \frac{p}{q}$, where p and q are integers and $q \neq 0$.

$\Rightarrow \sqrt{2} = \frac{5q - p}{2q}$ 1

RHS is a rational number. So, LHS is also a rational number which contradict the given fact that $\sqrt{2}$ is an irrational number. 1

So, our assumption is wrong. ½

Hence. $5 - 2\sqrt{2}$ is an irrational number.

Q.27. Let the points A(2, 1) and B(5, −8) is trisected at the points P(x, y) and Q(a, b).

Thus, AP = PQ = QB

Therefore, P divides AB internally in the ratio 1 : 2 ½

then the coordinates (x, y) = $\left(\frac{mx_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n}\right)$ ½

$(x, y) = \left(\frac{1(5)+2(2)}{1+2}, \frac{1(-8)+2(1)}{1+2}\right)$

$\Rightarrow (x, y) = \left(\frac{5+4}{3}, \frac{-8+2}{3}\right)$

$\Rightarrow (x, y) = \left(\frac{9}{3}, \frac{-6}{3}\right)$

$\Rightarrow (x, y) = (3, -2)$ 1 ½

Therefore, (3,-2) satisfies the equation 2x-y+k=0

$2(3) - (-2) + k = 0$ ½

$k = -8$

(OR)

Let O(2a-1,7) is the center and A(-3,-1) is on the circumference then

OA=r=20/2=10 ½

$OA^2 = 10^2 = 100$ ½

$or\ (2a-1+3)^2 + (7+1)^2 = 100$

$(2a+2)^2 + 64 = 100$

$4a^2 + 8a + 4 + 64 = 10$

$4a^2 + 8a - 32 = 0$ 1 ½

$a^2 + 2a - 8 = 0$ ½

$(a+4)(a-2) = 0$

$Hene\ a = -4\ and\ 2$

Q.28. L.H.S. $= (1 + \tan A)^2 - \sec^2 A$ 1

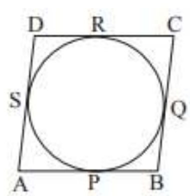
$= 1\ \tan^2 A + 2\ \tan A - \sec^2 A$ 1

$= \sec^2 A + 2\tan A - \sec^2 A$

$= 2\ \tan A =$ R.H.S. 1

Q.29.

Correct figure $\frac{1}{2}$



AP = AS
BP = BQ
CQ = CR
DR = DS

} Tangents from external point 1

AB + DC = AP + PB + DR + RC

= AS + BQ + DS + CQ

= AD + BC 1

Since, ABCD is a llgm, AB = DC, AD = BC

2AB = 2AD

AB = AD

⇒ ABCD is a rhombus $\frac{1}{2}$

(OR)

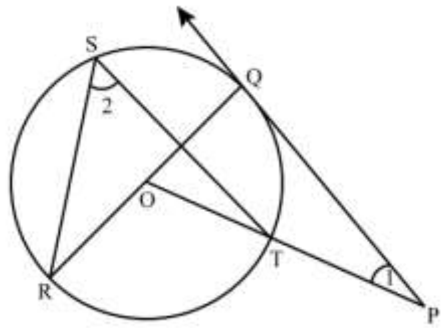
∠ROT=2∠RST

Also, ∠ROT=∠POR=130°

So, we get:

⇒130°=2∠RST⇒∠RST=65°......(1) 1

Therefore, ∠2=65°



⇒∠ROT+∠QOT=180°

⇒130°+∠QOT=180°⇒∠QOT=50°......(2) 1

Now, in ΔPOQ, we have,

∠PQO=90° (angle subtended by a tangent at a circle)

∠QOT=50° So, we get: 1

⇒∠QOT+∠PQO+∠OPQ=180°⇒50°+90°+∠1=180°⇒∠1=180°−140°⇒∠1=40°

Q.30.

CI	f_i	x_i	d_i	u_i	f_iu_i
0-10	5	5	–30	–3	–15
10-20	10	15	–20	–2	–20
20-30	18	25	–10	–1	–18
30-40	30	35	0	0	0
40-50	20	45	10	1	20
50-60	12	55	20	2	24
60-70	5	65	30	3	15
Total	100				6

Table 1

½

$$\text{mean} = A + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$$

$$= 35 + \frac{6}{100} \times 10$$

1½

$$= \frac{356}{10} \text{ or } 35.6$$

Q.31. $2x + 3y = 11$ ----------------(1)

$2x - 4y = -24$ -----------------(2) 1

Solving (1) and (2), we get x = -2 1

y = 5

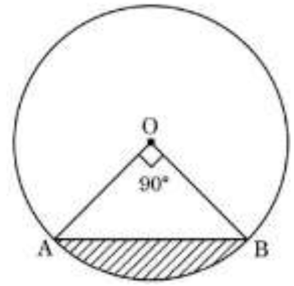
$y = mx + 3$

$m = -1$ 1

SECTION D

Section D consists of 4 questions of 5 marks each

Q.32.



Area of sector AOB = $\frac{22}{7} \times 7 \times 7 \times \frac{90}{360}$ — 1

$= \frac{77}{2}$ cm^2 — $\frac{1}{2}$

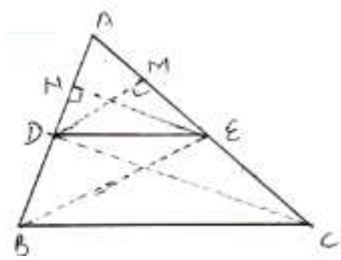
Area of Δ AOB $= \frac{1}{2} \times 7 \times 7 = \frac{49}{2}$ cm^2 — 1

$\therefore$ Shaded area $= \frac{77}{2} - \frac{49}{2} = \frac{28}{2} = 14$ cm^2 — 1

Length of arc AB $= 2 \times \frac{22}{7} \times 7 \times \frac{90}{360} = 11$ cm — $1\frac{1}{2}$

Q.33.

For Figure: 1



Given : In Δ ABC, DE || BC — $\frac{1}{2}$

To prove : $\frac{AD}{DB} = \frac{AE}{EC}$ — $\frac{1}{2}$

Const.: Join BE, CD. Draw DM $\perp$ AC and EN $\perp$ AB — $\frac{1}{2}$

Proof : $\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2} \times AD \times EN}{\frac{1}{2} \times DB \times EN} = \frac{AD}{DB}$ ________ (i) — 1

Similarly $\frac{ar(\Delta ADE)}{ar(\Delta CDE)} = \frac{AE}{EC}$ ________ (ii) — $\frac{1}{2}$

Δ BDE and Δ CDE are on the same base DE and between the same parallel lines BC and DE.

$\therefore$ ar(Δ BDE) = ar(Δ CDE) ________ (iii) — $\frac{1}{2}$

From (i), (ii) and (iii), we get $\frac{AD}{DB} = \frac{AE}{EC}$ — $\frac{1}{2}$

Q.34. Let the tens and units digits of the required number be x and y respectively.

Then,

$xy = 18 \Rightarrow y = \frac{18}{x}$ $\quad \ldots(i)$ ½

And, $(10x + y) - 63 = 10y + x$

$\Rightarrow \quad 9x - 9y = 63 \Rightarrow x - y = 7 \quad \ldots(ii)$ 1

Putting $y = \frac{18}{x}$ from (i) into (ii), we get

$x - \frac{18}{x} = 7$ 1 ½

$\Rightarrow x^2 - 18 = 7 \Rightarrow \quad x^2 - 7x - 18 = 0$

$\Rightarrow x^2 - 9x + 2x - 18 = 0 \Rightarrow x(x-9) + 2(x-9) = 0$

$\Rightarrow (x-9)(x+2) = 0 \Rightarrow x - 9 = 0$ or $x + 2 = 0$ 1 ½

$\Rightarrow x = 9$ or $x = -2$

$\Rightarrow x = 9 \quad [\because$ a digit cannot be negative].

Putting x=9 in (i), we get y=2. ½

Thus, the tens digit is 9 and the units digit is 2.

Hence, the required number is 92.

(OR)

Let age of father = x years 1

and age of son = (45 – x) years

Five years ago, age of father = (x – 5) years 1

Age of son = (40 – x) years 1

A. T. Q., (x – 5) (40 – x) = 124

$x^2 - 45x + 324 = 0$ 1

(x – 36) (x – 9) = 0 $\frac{1}{2}$

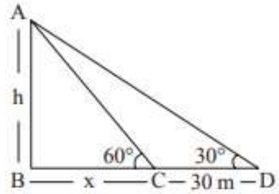
x = 36, x = 9 (rejected) $\frac{1}{2}$

⇒ Father's age = 36 years and son's age = 9 years

Q.35.

Let h be the height of the tree and x be the width of the bank

Sol.



Correct figure — 1

In right ΔABC

$\tan 60° = \frac{h}{x}$

$\sqrt{3}x = h$ ...(1) — 1

In rt ΔABD $\tan 30° = \frac{h}{30+x} \Rightarrow \frac{30+x}{\sqrt{3}} = h$ ...(2) — 1 ½

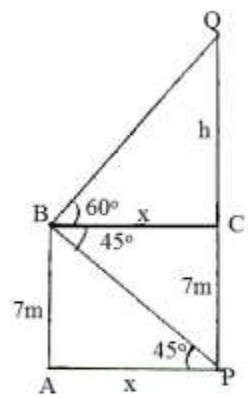
Solving (1) & (2) x = 15m, $h = 15\sqrt{3}$ m = 25.98 m — 1 ½

The height of the tree = 25.98 m and the width of the bank=15 m

OR

The height of the building = 7 m, height of the tower = (7 + h) m

For figure 1



In Δ ABP, $\tan 45° = \frac{7}{x} \Rightarrow x = 7$ — $1+\frac{1}{2}$

In Δ BCQ, $\tan 60° = \frac{h}{x} \Rightarrow h = \sqrt{3}\,x$ — $1+\frac{1}{2}$

$h = 7\sqrt{3}$ m — $\frac{1}{2}$

$\therefore$ Height of tower = PQ = 7 + h

$= 7 + 7\sqrt{3} = 7(1+\sqrt{3})$ m — $\frac{1}{2}$

The height of the tower = $7(1+\sqrt{3})$ m

SECTION E

Case study- based questions are compulsory

Q.36. **Case study-based question 1:**

(i) P (favourite colour being white) = $\frac{120}{360}$ or $\frac{1}{3}$ 1

(ii) P (favourite colour being blue or green) = $\frac{60+60}{360}$ or $\frac{1}{3}$ 1

(iii) (a) Let total number of students be x ⇒ $\frac{15}{x} = \frac{1}{4}$ 1

⇒ x = 60 or total 60 students participated in survey. 1

OR

(iii)(b) P (favourite colour being red or blue) = $\frac{60+30}{360}$ or $\frac{1}{4}$ 2

Q.37. **Case study-based question 2:**

Now, answer the following questions based on the above given information.

(i) -1 *and* 3 1

(ii) $-1 \times 3 = -3$ 1

(iii)(a) $x^2 - (\alpha + \beta)x + \alpha\beta$ ½

$= x^2 - 2x - 3$ 1 ½

(OR)

(iii)(a) sum = -2, product =1/3

$x^2 - (\alpha + \beta)x + \alpha\beta = x^2 + 2x + \frac{1}{3} = \frac{1}{3}(3x^2 + 6x+1)$ 1+1

Q.38. **Case study-based question 3:**

(i) Volume of material = 3·14 × 2 ×2 × 10 = 125·6 cm^3 or 880/7 1

(ii) Inner SA of the bowl = 2 × 3·14 × 25 = 157 cm^2 or 1100/7 1

(iii) (a) Volume of the metal = $\frac{2}{3}$ ×3·14 × ($6^3 - 5^3$) 1

= 190·5 cm^3 1

OR

(iii) (b) Total SA of mallet = 2 ×3·14 ×2 (2 + 10) 1

= 150·7 cm^2 1

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