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Class - X (Session 2024-25) MATHEMATICS BASIC (Code No.241)

[Marking Scheme]

Section-A

1) C, 5 1mark
2) D, no solution 1mark
3) A, (2,-5) 1mark
4) B, -22 1mark
5) C, 8 units 1mark
6) A, 8 cm 1mark
7) A, 0^{0} 1mark
8) B, xy^2 1mark
9) B,2 1mark
10) C, 6 cm 1mark
11) C, Median 1mark
12) B, 2.25 cm 1mark
13) D, Cos A 1mark
14) A, 90 cm^2 1mark
15) B, 3/13 1mark
16) A, 3 cm 1mark
17) C, 2 distinct real roots 1mark
18) B, 20 cm 1mark
19) A 1mark
20) C 1mark

Section- B

21) Let A be the first term and d is the common difference of AP.

11^{th} term = a_{11} = a + 10d. and 16^{th} term = a_{16} = a+ 15d 1mark

On subtracting equation (1) from (2), we get,

5d = 35 , so d = 7

Substituting the value of d in equation (1), we get,

a + 10x7 = 38

a = 38 – 70 = -32

Now, 31^{st} term($a_{31)}$ = a + 30d = -32 + 30x7 = -32 + 210 = 178 1mark

OR

First, determine the AP,

105,112,119,………..994 1mark

Here, a = 105, d 112-105 = 7

Let there be 'n' terms of AP, then nth term = 994

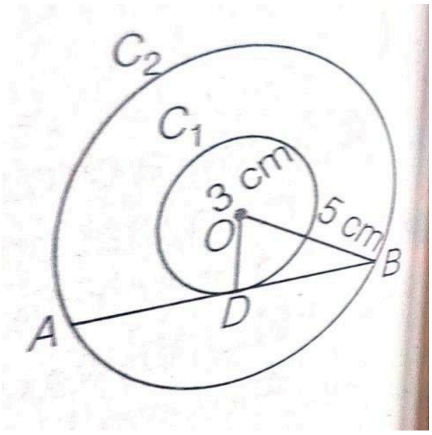
So, by nth term formula,

105 + (n-1)7 = 994

Solve and get answer, n = 128 1mark

22) substituting the correct values and solve (1+1)mark

$\sqrt{3}/2$ x $\sqrt{3}/2$ + 1/2+ 1/2 = 3/4+1/4 = 4/4 = 1



23) In right angled triangle ODB, by PGT, (1+1)

$OB^2 = OD^2 + DB^2$

$5^2 = 3^2 + DB^2$

$DB^2 = 25 – 9 = 16$

DB = 4 cm(taking positive square root)

Therefore, length of AB = 2AD = 2 x 4 = 8 cm

24) Let P(5,-2),Q(6,4) and R(7,-2) be the given points, then by using distance formula,

We get, length of PQ = $\sqrt{37}$ units (1+1)mark

Length of QR = $\sqrt{37}$ units

Length of RP = 2 units.

Here, PQ = QR

Hence, P,Q and R are the vertices of an isosceles triangle.

OR

Given point P(x,y) is equidistant from the points A(5,1) and B(1,5). (1+1)mark

So, AP = BP

$AP^2 = BP^2$

$(x-5)^2 + (y-1)^2 = (x-1)^2 + (y-5)^2$

Using identity $(a-b)^2 = a^2 + b^2 - 2ab$

we ,get, required result as, $x = y$

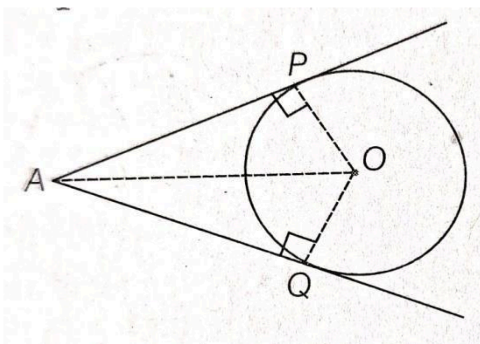
25) Here, maximum frequency is 18 and the class corresponding to this frequency is 40- 60.
So, the model class is 40-60.
Here, $l = 40$, $f_1 = 18$, $f_0 = 6$, $f_2 = 10$ and $h = 20$
Using the formula, Mode = $l + (f_1-f_0 /2f_1 - f_0 - f_2)x\ h$ (1+1)mark
Mode = 40 + (18-6 / 2 x18 – 6 -10) x 20
Mode = 40 +12 = 52

Section - C

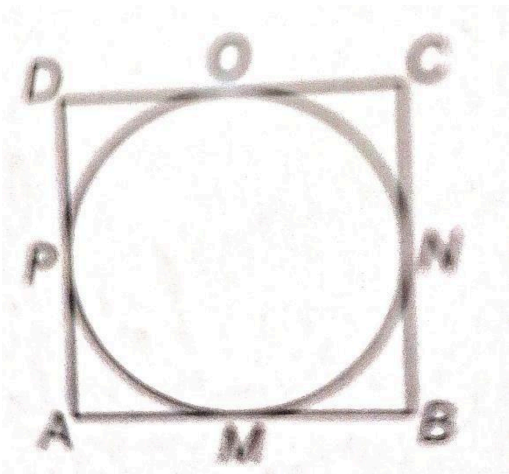
26) Let us assume that $\sqrt{3}$ is irrational number. Let $\sqrt{3} = a/b$ where a, b are co primes and b is not equal to zero.Now $\sqrt{3}=a/b \rightarrow 3=(a/b)^2 \rightarrow 3b^2 = a^2$, a^2 is divisible by 3. (3marks)

$\rightarrow$a is divisible by 3 :
. let a = 3c
$a^2= 9c^2 \rightarrow 3b^2 = 9c^2 \rightarrow b^2 = 3c^2$,a and b are divisible by 3. This contradicts our supposition that a/b are co primes .Hence our assumption is wrong. Hence $\sqrt{3}$ is an irrational number..

27) In ΔOPA and ΔOQA, we have,
OP = OQ. (radii of a circle)
$\angle OPA = \angle OQA = 90^o$(angle between radius and point of contact) (1+1+1)mark
OA = OA. (common side)



So by RHS congruence rule,
$\Delta OPA \cong \Delta OQA$
Hence, by CPCT, AP = AQ
OR



We know that, the tangents to a circle from an external point are equal in length.
So, AM = AP, BM = BN, CO = CN and DO = DP
On adding all above equations, we get
(AM + BM) + (CO + DO) = AP + BN + CN +DP
AB + CD = (AP+ PD) + (BN + NC) = AD + BC……(1)
Given, ABCD is a parallelogram.
So, AB = CD and BC = AD ……….(2) (1+1+1)m
Then, from eq.(1) ,we get,
2AB = 2BC
AB = BC …………..(3)
From eq.(2) and (3) ,we get, AB = BC = CD = DA
Hence, ABCD is a rhombus.

28) LHS: (Cosec A- Cot A)² = (1/ Sin A - Cos A/ Sin A)² (1+1+1)m
= (1 – Cos A / SinA)² = (1 – Cos A)² / Sin² A
= (1-CosA)² / (1- Cos²A) = (1-CosA)(1-CosA) / (1+CosA)(1-CosA)
= 1 – Cos A / 1 + Cos A = RHS. Proved

29) Let the required natural numbers be ‘x’ and ‘x+3’ ,then by ATQ, (1+1+1)m
1/x - 1/ x+3 = 3/28
= x² + 3x – 28 = 0
x² +7x - 4x – 28 = 0
x = -7 or x = 4
But -7 is not a natural numbers, so x= 4
Hence, required numbers are 4 and 7.

30) Using Section formula,
(x ,y) = $(mx_2 + nx_1)$ / m+ n , $(my_2 + ny_1)$/ m +n (1+1+1)mark
And putting the values ,we get,
m : n = 2:7
OR
Using section formula,
for getting the coordinates of the points of trisection as
P(8/3, -7/3) and Q(10/3, -5/3)

31) (1+1+1)mark

1. Let us make the following table.

Class	Frequency (f_i)	x_i	$d_i = x_i - a$	$f_i d_i$
2-8	6	$\frac{2+8}{2} = 5$	$5 - 17 = -12$	$6(-12) = -72$
8-14	3	$\frac{8+14}{2} = 11$	$11 - 17 = -6$	$3(-6) = -18$
14-20	12	$\frac{14+20}{2} = 17 = a$	$17 - 17 = 0$	$12 \times 0 = 0$
20-26	11	$\frac{20+26}{2} = 23$	$23 - 17 = 6$	$11 \times 6 = 66$
26-32	8	$\frac{26+32}{2} = 29$	$29 - 17 = 12$	$8 \times 12 = 96$
Total	$\Sigma f_i = 40$			$\Sigma f_i d_i = 72$

Here, $a = 17$, $\Sigma f_i = 40$ and $\Sigma f_i d_i = 72$

$\therefore$ Mean $(\bar{x}) = a + \frac{\Sigma f_i d_i}{\Sigma f_i} = 17 + \frac{72}{40} = 17 + 1.8 = 18.8$

Section- D

32) Let the cost of one bat = Rs. x   and cost of one ball = Rs. y   (1+1+3)mark

Then according to the question,

7x + 6y = 3800 ……….(1), and

3x + 5y = 1750 ………...(2)

After solving equation (1) and (2), we get , x = 500 and y = 50

OR

For infinite number of solutions, $a_1/a_2 = b_1/ b_2= c_1/c_2$

Putting the respective values,

2/ a-b = 3 / a+b = -7 / -(3a+ b-2)

On taking first two terms and solve,we get, a = 5b ……..(1)

On taking last two terms and solve, we get, 2b = a-3 …….(2)

Now, on solving equation (1) and (2) we get,

a = 5 and b = 1

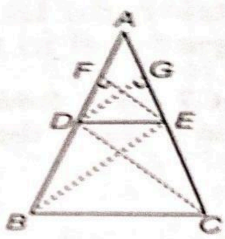
33) Statement of BPT: 1+1+3

Correct figure

Correct proof

Given A ΔABC in which a line DE parallel to BC intersects AB at D and AC at E, i.e. $DE \parallel BC$.

To prove $\frac{AD}{DB} = \frac{AE}{EC}$



Construction Join BE and CD.

Draw $EF \perp AB$ and $DG \perp AC$.

Proof $$\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2} \times AD \times EF}{\frac{1}{2} \times DB \times EF} = \frac{AD}{DB} \quad \ldots(i)$$

$\left[\because \text{Area of triangle} = \frac{1}{2} \times \text{Base} \times \text{Height}\right]$

Similarly, $$\frac{ar(\Delta ADE)}{ar(\Delta DEC)} = \frac{\frac{1}{2} \times AE \times DG}{\frac{1}{2} \times EC \times DG} = \frac{AE}{EC} \quad \ldots(ii)$$

Since, ΔBDE and ΔDEC stand on the same base DE and between same parallel lines DE and BC.

$\therefore$ $ar(\Delta BDE) = ar(\Delta DEC)$ ...(iii)

From Eqs. (i), (ii) and (iii), we get

$$\frac{AD}{DB} = \frac{AE}{EC} \quad \ldots(iv)$$ **Hence proved.**

34)

In right Δ BAD, tan 45⁰ = AD / AB   (1+1+3)mark

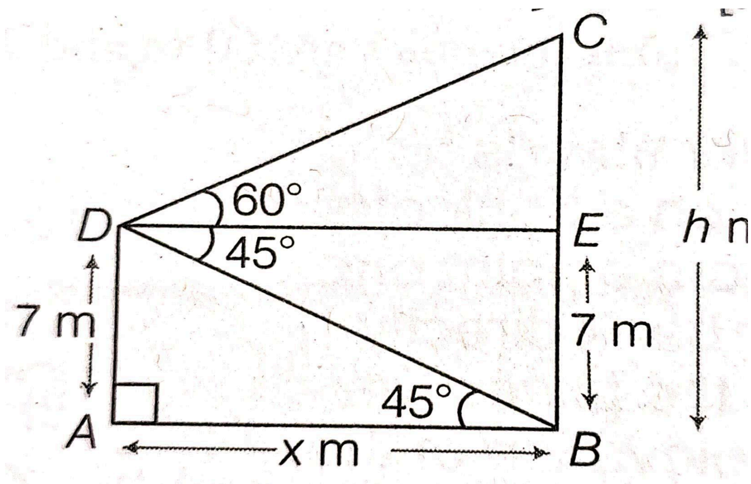
1 = 7/ x, so x= 7 m ……..(1)

And in right ΔCED, tan 60^0 = CE / DE = CB – BE / AB

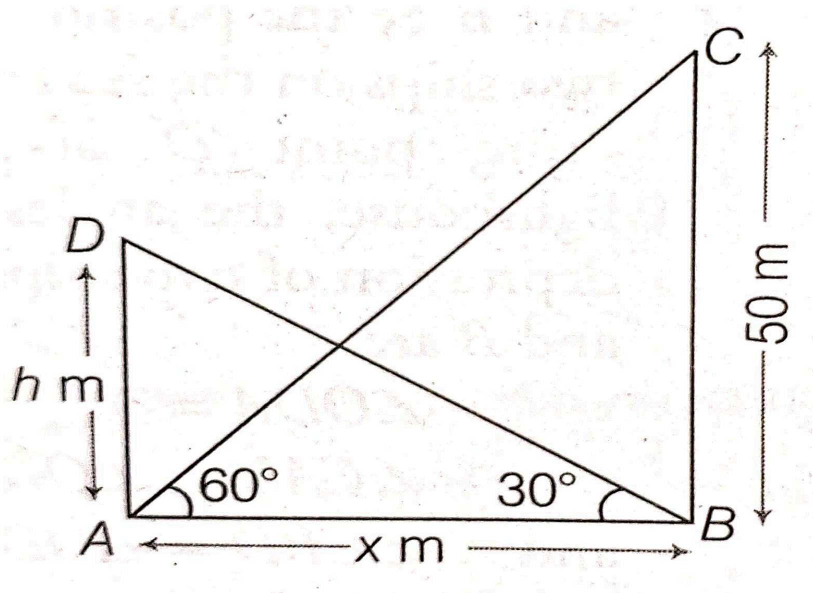
√3 =(h -7) / x.   Putting the values from equation (1), we get,

h = 7(√3 + 1) m

Hence, height of the tower is 7(√ 3 + 1) m.



OR



In right triangle BAD, tan 30^0 = AD / AB (1+1+3)mark

1/ √3 = h/ x

h = x/ √3 ………(1)

In right triangle CBA, tan 60^0 = BC / AB

√3 = 50 / x

So, x = 50/ √3

On putting x = 50/√3 in equation (1)

We get, h = 50/ √3 X 1/√ 3

h = 50/3 m

Hence, the height of the building is 16.66 m.

35) (1+2+2)mark

Given, side of a square = 15 m

∴ Area of square = $(15)^2 = 225\ m^2$

[∵ area of square = $(\text{side})^2$]

Also given, length of rope = 5 m

∴ Radius of arc = 5 m

(*i*) Area of the field graze by the horse,

$$A_1 = \frac{\theta}{360°} \times \pi r^2 = \frac{90°}{360°} \times 3.14 \times (5)^2$$

[∵ each angle of a square is 90°]

$$= \frac{3.14 \times 25}{4} = \frac{78.5}{4} = 19.625\ cm^2$$

(*ii*) If length of rope = 10 m = r_1 (say)

Then, area of the field graze by the horse,

$$A_2 = \frac{\theta}{360°} \times \pi r_1^2 = \frac{90°}{360°} \times 3.14 \times (10)^2$$

$$= \frac{3.14 \times 100}{4} = \frac{314}{4} = 78.5\ cm^2$$

∴ Required increase in the grazing area

$$= A_2 - A_1 = 78.5 - 19.625 = 58.875\ cm^2$$

Section- E

36) (1+1+2)mark

(i) Total possible outcomes = 52 -6= 46

(ii) Number of favourable outcomes = 6

P(face card) = 6/46= 3/23

iii) Number of black cards in the shuffled cards = 13 +7=20

P(black card) = 20/46 = 10/23

OR

Number of black cards and ace = 20 +2= 22 :

Number of favourable outcomes = 46-22 = 24

P(neither a black card nor an ace) = 24/46 = 12/23

37)i) The volume of hemisphere = $2/3\pi r3$ (1+1+2)mark

(ii)The volume of hemispherical dome = $2/3\pi r3$ = 2/3 x 22/78 x $(21)^3$ = 19404 m^3.

iii) The cloth required to cover the hemispherical dome = curved surface area of hemispherical dome = $2\pi r^2$

r=14 m, $=2\pi r^2$ = 2 x 14x 14 = 88 x 14= 1232 m^2

OR

Total surface area of the combined figure = surface area of hemispherical base + surface area of cuboidal top

= 2r + 2hl + 2bh+ lb = 1232 ++2 x 8 x 4 +2 x 6x 4 + 6x 8 = 1232 + 64 + 48 + 48 = 1392 m^2

Surface area of hemispherical dome = 1392 m.

38)(i) $(p-1)(4)^2 + p(4) + 1 = 0$ (1+1+2)mark

$16p - 16 + 4p + 1 = 0$

$20p = 15$

So, P = 15 / 20 = 3/4

(ii) Required quadratic polynomial is:

k[x^2 - (sum of zeroes)x + (product of zeroes)]

= k[x^2 - (-12+5)x + (-12)(5)]

= k(x^2 +7x -60), where k is any arbitrary constant.

(iii) product of zeroes = constant term/ coefficient of x^2

m = 5

OR

Required quadratic polynomial is : x^2 + 7x +10