NBSE

NATIONAL BOARD OF SCHOOL EXAMINATION

Q.No.	01	02	03	04	05	06	07	08	09	10	TOTAL
MARKS	01	01	01	01	01	01	01	01	01	01	10

Q.No.	11	12	13	14	15	16	17	18	19	20	TOTAL
MARKS	01	01	01	01	01	01	01	01	01	01	10

Q.No.	21	22	23	24	25	26	27	28	29	30	TOTAL
MARKS	02	02	02	02	02	02	03	03	03	03	24

Q.No.	31	32	33	34	35	36	37	38	39	40	TOTAL
MARKS	03	03	03	03	04	04	04	04	04	04	36

Examiner must fill above boxes with question-wise marks obtained by student.

GRAND TOTAL	80
MARKS IN WORDS	Eighty on.

Certified that I have evaluated this answer book according to the correct set of question paper and strictly as per the NBSE marking scheme. I also certify that no question has been left un-assessed inside the answer book.

Signature of the Examiner

Certified that marks against each question in the table above have been correctly filled up in accordance with the evaluation done inside the answer book. The marks have also been transferred in the award list/web/app correctly against the roll number of the candidate.

Signature of the Co-ordinator

(To be filled by the student)

Note: Roll No. provided by NBSE to be filled here.

Roll No. 1 0 7 6 5 1 2

Student should write code no. as written on the top of the question paper in the box provided ➔

No. of supplementary answer-book(s) used (if any)

Section - A

Q1 (d) Four decimal ~~place~~ 1

Q2 (c) Midpoint of the classes 1

Q3 (a) 2 1

Q4 (c) 3 & 1 1

Q5 (c) 3/5 1

Q6 (c) $\frac{\sqrt{b^2 - a^2}}{b}$ 1

Q7 (d) $90°$ 1

Q8 (c) $\sqrt{34}$ units 1

Q9 (a) $\sqrt{61}$ units from origin 1

Q10 (b) $\sqrt{2}$ 1

Q11 Frustum 1

Q12 4 1

Q13 1/4 1

Q14 $\sqrt{3}$ 1

Q15 0.008 1

2 4

Q16 Rational → 1.5
Irrational → 1.71, 1.711, 1.7111, ... 1

Q17 90° 1
Q18 12 cm 1
Q19 p = 14/5 1

Q20 49/4 1

SECTION C

Q27 Maximum length of 165 m^2

$$Area = l \times b$$

$$l = \frac{Area}{breadth}$$

$$= \frac{\cancel{165}\ 55}{\cancel{3}}$$

$$= 55\ m^2$$

Maximum length of $195 m^2$

$Area = l \times b$

$l = \frac{Area}{breadth}$

$= \frac{\cancel{195}\ 65}{\cancel{3}}$

$= 65 m^2$

3

Maximum length of $285 m^2$

$Area = l \times b$

$l = \frac{Area}{breadth}$

$= \frac{\cancel{285}\ 95}{\cancel{3}}$

$= 95 m^2$

2

6

Q28 $S_m/S_n = \frac{m^2}{n^2}$

$$= \frac{\frac{m}{2}[2a+(m-1)d]}{\frac{n[2a+(n-1)d]}{2}} = \frac{m^2}{n^2}$$

$$\Rightarrow \frac{\{2a+(m-1)d\}}{2a+(n-1)d} = \frac{m^2}{n^2} \times \frac{n}{m} = \frac{m}{n}$$

$$\Rightarrow \frac{2a+md-d}{2a+nd-d} = \frac{m}{n}$$

3

$$\Rightarrow 2an+mnd-dn = 2am+mnd-dm$$

$$\Rightarrow 2a(n-m)-d(n-m) = 0$$

$$\Rightarrow (2a-d)(n-m) = 0$$

$$\Rightarrow 2a-d = 0$$

$$\Rightarrow 2a = d$$

Therefore,

$$\frac{a_m}{a_n} = \frac{a+(m-1)d}{a+(n-1)d}$$

$$= \frac{a+2am-2a}{a+2am-2a}$$

$$= \frac{a(2m-1)}{a(2n-1)}$$

$$= \frac{2m-1}{2n-1}$$

Q29 Let the speed of train $= x$ km/h

Time $= y$ hours

Distance = Speed × Time

$= x \times y$ —— (1)

If train 10 km/h faster ie, speed $= (x+10)$ km/h
Then it will take 2 hours less i.e, time $= (y-2)$ hours.
So,

$$xy = (x+10)(y-2)$$

$$2x - 10y + 20 = 0 \quad \text{——} \ (2)$$

If train was slow by 10 km/h ie, Speed $= (x-10)$ km/h.
Then it will take 3 hours more ie, time $= (y+3)$ hours.
So,

$$xy = (x-10)(y+3)$$

$$\Rightarrow 3x - 10y - 30 = 0 \quad \text{——} \ (3)$$

3

By solving eq. (2) and (3) :-
$y = 12$ hours and $x = 50$ km/h

Distance $= xy$ [From eq (1)]
$= 50 \times 12$
$= 600$ km.

Q30 $f(x) = 2x^2 - 5x + 7$

By comparing $f(x) = 2x^2 - 5x + 7$ with $f(x) = ax^2 + bx + c$

$a = 2,\ b = -5,\ c = 7$

Sum of zeros $= A + B = -\frac{b}{a} = \frac{5}{2}$ [When A and B are zeros of $f(x)$]

Product of zeros $= A \times B = \frac{c}{a} = \frac{7}{2}$

$2A + 3B$ and $3A + 2B$ are zeros of another polynomial.

$\therefore$ Sum of zeros $= 2A + 3B + 3A + 2B$

$= 5(A + B)$

$= 5 \times \frac{5}{2}$

$= \frac{25}{2}$.

3

Product of zeros $= (2A + 3B)(3A + 2B)$

$= 6[(A+B)^2 - 2AB] + 13AB = 6\left[\left(\frac{5}{2}\right)^2 - 2 \times \frac{7}{2}\right] + 13 \times \frac{7}{2}$

$= \frac{82}{2}$

$= 41$

Quadratic polynomial is given by :-

$k[x^2 - (\text{sum of zeros})x + (\text{product of zeros})]$

$= k[x^2 - \frac{5}{2}x + 41]$

Let $k = 2$

$= 2[x^2 - \frac{5}{2}x + 41]$

$\therefore 2x^2 - 5x + 82$ Ans

Q31 $P(x,y) = \left(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n}\right)$

$\Rightarrow AP : PQ : QB = 1:1:1$

$\Rightarrow AP : PB = 1:2$

$\Rightarrow P(x,y) = \left(\frac{1\times5 + 2\times2}{1+2}, \frac{1\times8 + 2\times1}{1+2}\right) = (3, 10/3)$

3

P is on the line $2x - y + K = 0$ [Given]

$\therefore \; 2(3) - 10/3 + K = 0$

$\Rightarrow K = \frac{10}{6} - 6 = \frac{10}{3} - \frac{18}{3} = \frac{-8}{3}$

Q32 Let $LHS = \frac{\tan x}{1 - \cot x} + \frac{\cot x}{1 - \tan x}$

$$= \frac{\frac{\sin x}{\cos x}}{1 - \left(\frac{\cos x}{\sin x}\right)} + \frac{\frac{\cos x}{\sin x}}{1 - \left(\frac{\sin x}{\cos x}\right)}$$

$$= (\sin^2 x) \frac{1}{\cos x(\sin x - \cos x)} + (\cos^2 x) \frac{1}{\sin x(\cos x - \sin x)}$$

3

$$= \frac{\sin^3 x - \cos^3 x}{(\sin x - \cos x) \sin x \cos x}$$

$$= \frac{(\sin x - \cos x)(\sin^2 x + \cos^2 x + \sin x \cos x)}{(\sin x - \cos x) \sin x \cos x}$$

$= \frac{1 + \sin x \cos x}{\sin x \cos x} = 1 + \sec x \operatorname{cosec} x = RHS$ [Hence proved]

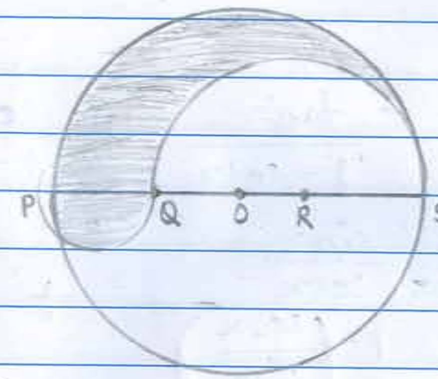
Q33 $PS = 12$ cm

$PQ = QR = RS$ [given]

$\therefore PQ = QR = RS = 1/3 \times PS = 1/3 \times 12 = 4$ cm.

$QS = 2PQ$

$QS = 2 \times 4 = 8$ cm



$= 6\pi + 2\pi + 4\pi = 12\pi$ cm

Now, area of shaded region = area of semicircle with PS diameter
+ area of semicircle with PQ diameter
− area of semicircle with QS diameter

3

$= 1/2\,[3.14 \times 6^2 + 3.14 \times 2^2 - 3.14 \times 4^2]$

$= 1/2\,[3.14 \times 36 + 3.14 \times 4 - 3.14 \times 16]$

$= 1/2\,[3.14(36 + 4 - 16)]$

$= 1/2\,(3.14 \times 24)$

$= 1/2 \times 75.36$

$\therefore$ Area of Shaded Region $= 37.68$ cm^2.

Q34

Class	Frequency	C.F
117.5 - 126.5	3	3
126.5 - 135.5	5	8
135.5 - 144.5	9	17=C
144.5 - 153.5	12 = f	29
153.5 - 162.5	5	34
162.5 - 171.5	4	38
171.5 - 180.5	2	40

$N = 40$

$\frac{N}{2} = \cancel{\frac{40}{2}}\ 20$

3

So, Median = size of 20^{th} item

Median is class $144.5 - 153.5$

$$\text{Median} = L + \left(\frac{\frac{N}{2} - c}{f}\right) h$$

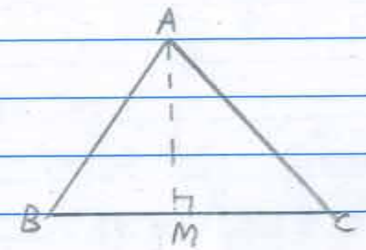
$$= 144.5 + \frac{20-17}{12} \times 8$$

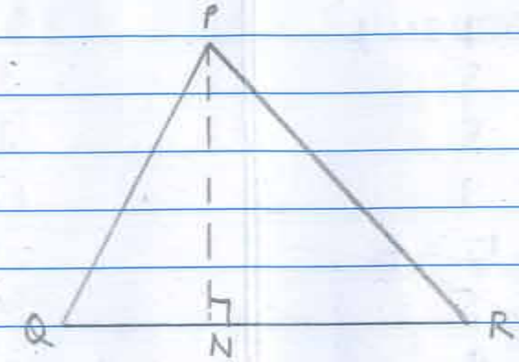
14

$= 144.5 + 2$

$= 146.5$

Q 36





Draw altitudes AM and PN of Triangles

$$ar(ABC) = \frac{1}{2} BC \times AM$$

$$ar(PQR) = \frac{1}{2} QR \times PN$$

So, $$\frac{ar(ABC)}{ar(PQR)} = \frac{\frac{1}{2} \times BC \times AM}{\frac{1}{2} \times QR \times PN} = \frac{BC \times AM}{QR \times PN} \quad \text{— (1)}$$

In ΔABM and ΔPQN,

$\angle B = \angle Q$ $(\Delta ABC \sim \Delta PQR)$

$\angle M = \angle N$ (Each is of 90°)

$\Delta ABM \sim \Delta PQN$ (AA similarity criterion)

$\therefore \quad \frac{AM}{PN} = \frac{AB}{PQ}$ —— ②

$\Delta ABC \sim \Delta PQR$ (Given)

So, $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP}$ —— ③

$\therefore \quad \frac{ar(ABC)}{ar(PQR)} = \frac{AB}{PQ} \times \frac{AM}{PN}$ [From ① and ③]

$= \frac{AB}{PQ} \times \frac{AB}{PQ}$ [From ②]

$= \left(\frac{AB}{PQ}\right)^2$ 4

Using ③ :-

$\frac{ar(ABC)}{ar(PQR)} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{QR}\right)^2 = \left(\frac{CA}{RP}\right)^2$

Q37 Let one tap fill the tank in x hours.
$\therefore$ other tap fills the tank in $(x+3)$ hours

Work done by both the taps in one hour is :-

$$\frac{1}{x} + \frac{1}{(x+3)} = \frac{13}{40}$$
$$(2x+3)40 = 13(x^2+3x)$$
$$13x^2 - 41x - 120 = 0$$
$$(13x+24)(x-5) = 0$$
$$x = 5$$

Hence, one tap takes 5 hours and another 8 hrs seperately to fill the tank.

4

Q38 Speed of water $= 2.52$ km/h $= 2520$ m/h
Length $h_1 = 2520$ m
Let the radius of pipe be r_1 and radius of tank $r_2 = 40$ cm $= 0.4$ m.
Level of water in tank half an hour $= 3.15$ m
Level of water in tank in an hour $h_2 = 6.30$ m

4

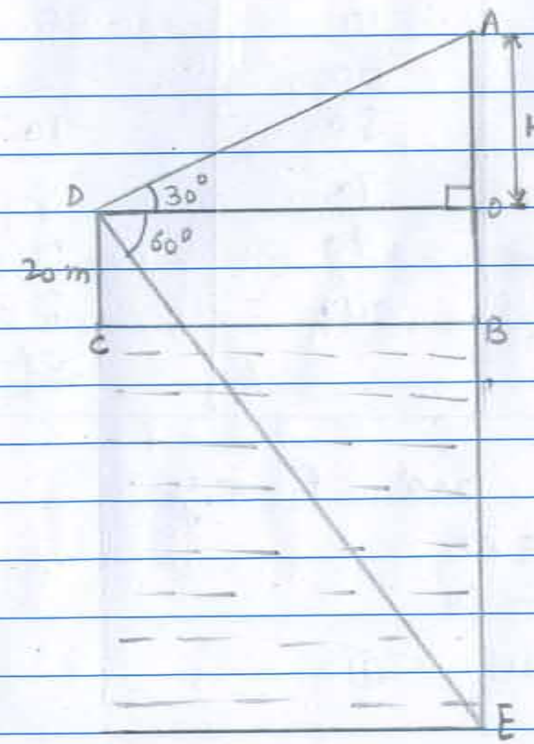
Volume of pipe = volume of tank.
$$\Rightarrow \pi r_1^2 h_1 = \pi r_2^2 h_2$$

$\Rightarrow r_1^2 (2520) = (0.4)^2 (6.3)$

$\Rightarrow r = \sqrt{\dfrac{(0.4)^2 (6.3)}{2520}} = 0.02\,m = 2\,cm$

$\therefore$ Diameter $= 2r_1 = 2 \times 2$
$= 4\,cm$

Q39 Let $AO = H$
$CD = OB = 20\,m$
$EB = AB = 20 + H$



In ΔAOD
$\tan 30^\circ = \dfrac{AO}{OD} = \dfrac{H}{OD}$

$\Rightarrow OD = \sqrt{3}H$

4

In ΔEOD
$\tan 60^\circ = \dfrac{OE}{OD} = \dfrac{(OB + BE)}{OD}$

$\Rightarrow \sqrt{3} = \dfrac{20 + 20 + H}{\sqrt{3}H} = \dfrac{40 + H}{\sqrt{3}H}$

$40 + H = 3H$

$40 = 2H$

$H = 20m$

Height of the cloud from the surface of lake $= AB + EB = 20 + 20 = 40m$.

Q40

Class Interval	x	f	fx
0 – 20	10	5	50
20 – 40	30	x	$30x$
40 – 60	50	10	500
60 – 80	70	y	$70y$
80 – 100	90	7	630
100 – 120	110	8	880
		$\Sigma f = 30 + x + y$	$\Sigma fx = 2060 + 30x + 70y$

Let $f_1 = x$ and $f_2 = y$

Frequency $= 50$

$30 + x + y = 50$

$x + y = 20$ —— ①

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$62.8 = \frac{2060 + 30x + 70y}{50}$$

$\Rightarrow 3140 = 2060 + 30x + 70y$

$\Rightarrow 3x + 7y = 108$ —— (2)

4

From eq (1) and eq (2) :-

$x = 8$, $y = 12$

So, $f_1 = 8$ and $f_2 = 12$.

SECTION - B

Q21 Two digit natural numbers which when divided by 3 yield 1 as remainder are :-

10 , 13 , 16 , 19 , ... , 97 , which forms an AP

with $a = 10$, $d = 3$, $a_n = 97$

$a_n = 97 \Rightarrow a + (n-1)d = 97$

$= 10 + (n-1)3 = 97$

$= (n-1) = \frac{87}{3} = 29$

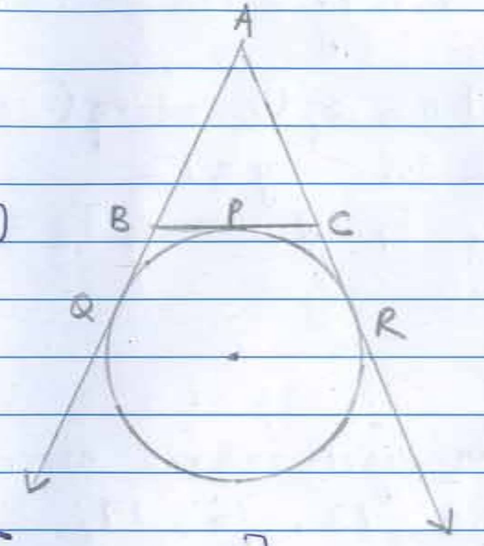
$= n = 30$

$$S_{30} = \frac{30}{2}[2 \times 10 + 29 \times 3]$$

$= 15(20+87)$
$= 15 \times 107$
$= 1605$ Ans

2

Q22 Proof :-



$AQ = AR$ [AQ and AR are tangents from A] — ①
$BQ = BP$ [BQ and BP are tangents from B] — ②
$CP = CR$ [CP and CR are tangents from C] — ③

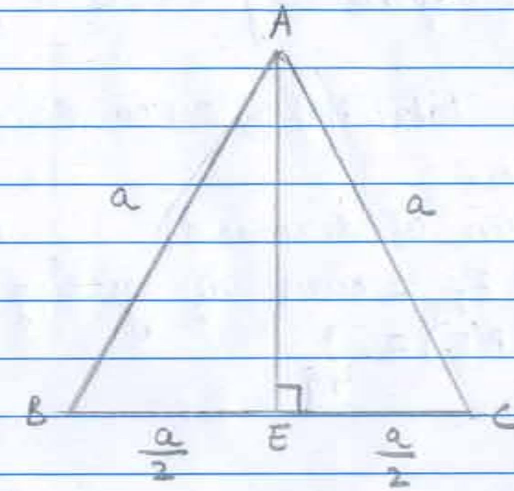
Perimeter of $\Delta ABC = AB + BC + CA$
Perimeter of $\Delta ABC = AB + (BP + PC) + (AR - CR)$
$= (AB + BQ) + (PC) + (AQ - PC)$ [Eq ①, ② and ③]
$= AQ + AQ$
$= 2AQ$
$AQ = \frac{1}{2}$ (Perimeter of ΔABC)

2

Hence, AQ is half the perimeter of ΔABC.

Q23

Let a is the length of each side of equilateral triangle and AE is the altitude.



$$BE = EC = \frac{BC}{2} = \frac{a}{2}$$

Applying Pythagoras theorem in ΔAEB.

$$AB^2 = AE^2 + BE^2$$

$$\Rightarrow a^2 = AE^2 + \left(\frac{a}{2}\right)^2$$

$$\Rightarrow AE^2 = a^2 - \frac{a^2}{4}$$

$$\Rightarrow AE^2 = \frac{3a^2}{4}$$

2

$$\Rightarrow 4AE^2 = 3a^2$$

$\Rightarrow$ 4(square of altitude) = 3(square of one side)

Hence, proved that three times the square of one side is equal to four times the square of one of its altitudes.

Q24 King, queen and jack of club removed from deck of 52 cards.

Remaining cards $= 52 - 3$

$= 49$

Total no. of outcomes $= 49$.

a) Queen of diamond.

Let E_1 = event of getting a queen of diamond

$P(E_1) = \frac{1}{49}$

b) a face card.

There are 12 face cards.

Let E_2 = Event of getting a face card.

No. of favourable outcomes $= 12 - 3$

$= 9$

∴ Required probability $P(E_2) = \frac{9}{49}$

2

Q25 Let LHS $= \dfrac{\sec^2 x - \cot^2(90^\circ - x)}{\operatorname{cosec}^2 67^\circ - \tan^2 23^\circ} + (\sin^2 40^\circ + \sin^2 50^\circ)$

$= \dfrac{\sec^2 x - \tan^2 x}{\operatorname{cosec}^2 67^\circ - \tan^2(90^\circ - 67^\circ)} + [\sin^2 40^\circ + \sin^2(90^\circ - 40^\circ)]$

$= \dfrac{1}{\operatorname{cosec}^2 67^\circ - \cot^2 67^\circ} + (\sin^2 40^\circ + \cos^2 40^\circ)$

$= \dfrac{1}{1} + 1$

$= 2 =$ RHS Hence Proved.

2

Q26 ~~Let R = radius~~, h = ~~height~~

~~$R + h = 37$ m~~

Q26 Let r = radius and h = height.

$r + h = 37\ m$

Total surface area of solid cylinder = $1628\ m^2$ [Given]

$2\pi r(h+r) = 1628$

$2\pi r(37) = 1628$

$r = \dfrac{\cancel{1628} \times 7}{\cancel{2} \times 22 \times 37}$

$r = 7\,m.$

$h = 37 - 7$

$= 30\ m$

Volume of cylinder $= \pi r^2 h$

$= \dfrac{22}{7} \times 7 \times 7 \times 30$

$= 4620\ m^3$

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Supplementary Answer-Book(s) No. ....

NBSE

Fictitious Roll No. (To be entered by Board)

Q35