WITH GRAPH PAPER

केन्द्रीय माध्यमिक शिक्षा बोर्ड, दिल्ली

सैकण्डरी स्कूल परीक्षा (कक्षा दसवीं)

परीक्षार्थी प्रवेश–पत्र के अनुसार भरें

य Subject : MATHEMATICS

ा कोड Subject Code : 041

क्षा का दिन एवं तिथि
/ & Date of the Examination : THURSDAY, 07.03.2019

र देने का माध्यम
dium of answering the paper : ENGLISH

। पत्र के ऊपर लिखे
ड को दर्शाएँ :
te code No. as written on
top of the question paper :

Code Number	Set Number
30/1/3	① ② ● ④

रिक्त उत्तर–पुस्तिका (ओं) की संख्या
. of supplementary answer-book(s) used : 1

मार्क विकलांग व्यक्ति
rson with Benchmark Disabilities — हाँ / नहीं Yes / No : NO

कलांगता का कोड
श पत्र के अनुसार)
ıde of Disabilities
given on Admit Card) : NA

या लेखन – लिपिक उपलब्ध करवाया गया : हाँ / नहीं
/hether writer provided : Yes / No : NO

दृष्टिहीन हैं तो उपयोग में लाए गये
फ्टवेयर का नाम :
/isually challenged, name of software used :

खाने में एक अक्षर लिखें। नाम के प्रत्येक भाग के बीच एक खाना रिक्त छोड़ दें। यदि परीक्षार्थी का 24 अक्षरों से अधिक है, तो केवल नाम के प्रथम 24 अक्षर ही लिखें।

h letter be written in one box and one box be left blank between each part of the ıe. In case Candidate's Name exceeds 24 letters, write first 24 letters.

र्यालय उपयोग के लिए
ıce for office use

1184493

041 / 11465

Instructions to Candidates

1. Make sure that the answer-book contains 48 pages and are properly seria in number (including title pages) as soon as you receive it.
2. DO NOT make any special sign or mark in or outside the answer-bo supplementary answer-book, graph-paper, map etc.
3. DO NOT write your roll no., name of your school or place of examination in a of your answers.
4. You must write the supplementary answer-book serial no. in the attendan sheet.
5. Write on each ruled line on both sides and do not waste pages by leaving wider margin.
6. DO NOT tear out or fold the pages of the answer-book and do not leave a page blank unnecessarily. No supplementary anwer-book(s) should be ask for unless this answer-book / the previous supplementary answer-book finished.
7. Number your answers according to their numbers in the question paper.
8. Draw a line when a question (or a part thereof) is finished.
9. Securely tag your answer-book with supplementary answer-book(s graph-paper, map etc. if used by you, but DO NOT write your Roll No. on th supplementary answer-book, graph-paper, map etc.
10. Use only blue-black or royal-blue ink/gel/ball point pen. Using of any other writin instrument/ink/pencil etc will be on your own risk and responsibility.
11. For rough calculation etc., appropriate margin on the right-hand side the page may be drawn. The rough calculations etc. should be crossed o afterwards.
12. DO NOT leave the examination hall without handing over the answer-book t the Asstt. Supdt.
13. If during the course of examination, a candidate is found indulging in any of th following, he/she shall be deemed to have used unfair means at th examinations, and as such his/her result shall not be declared but shall b marked as UNFAIR MEANS (U.F.M.) :-
    (a) having in possession papers, books, notes or any other material o information relevant to the examination in the paper concerned;
    (b) giving or receiving assistance directly or indirectly of any kind o attempting to do so;
    (c) writing questions or answers on any material other than the answer bool given by the Centre Superintendent for writing answers;
    (d) tearing of any page of the answer-book or supplementary answer-book etc
    (e) contacting or communicating or trying to do so with any person, other tha the Examination Staff, during the examination time in the examination centr
    (f) taking away the answer-book out of the examination hall/room;
    (g) using or attempting to use any other undesirable method or mean in connection with the examination;
    (h) smuggling out Question Paper or its part or smuggling out answer-book supplementary answer-sheet or part thereof; and
    (i) threatening any of the officials connected with the conduct of the exam ination or threatening of any of the candidates.

केन्द्रीय माध्यमिक शिक्षा बोर्ड, दिल्ली

Central Board of Secondary Education, Delhi

WITH GRAPH PAPER

SECONDARY SCHOOL EXAMINATION (CLASS X)

सैकण्डरी स्कूल परीक्षा (कक्षा दसवीं)

Q. No.	01	02	03	04	05	06	07	08	09	10	TOTAL
MARKS	1	1	1	1	1	1	2	2	2	2	14

Q. No.	11	12	13	14	15	16	17	18	19	20	TOTAL
MARKS	2	2	3	3	3	2	3	3	3	3	28

Q. No.	21	22	23	24	25	26	27	28	29	30	TOTAL
MARKS	3	3	4	4	4	4	4	4	4	4	38

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

GRAND TOTAL	80
MARKS IN WORDS	Seventy Eighty only.

प्रमाणित किया जाता है कि मैंने इस उत्तर पुस्तिका का मूल्यांकन उचित प्रक्रमण के मैट्रिक और अंकन योजना के अनुसार किया है। यह भी प्रमाणित किया जाता है कि उत्तर पुस्तिका के अन्दर कोई

SECTION - A

Ans 1. $a = x^3y^2$

$b = xy^3$

1

L.C.M $(a, b) = x^3y^3$ [highest degree of common factors]

Ans 2. Required A.P = 12, 15 ..... 99.

$a_n = 99$

$a + (n-1)d = 99$ $[a = 12, d = 3]$

$12 + (n-1)3 = 99$

$12 + 3n - 3 = 99$

$3n = 99 + 3 - 12$

1

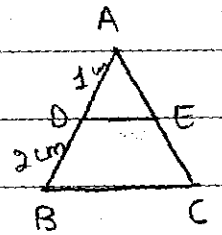
$3n = 99 - 9$

$3n = 90$

$n = \frac{90}{3} = 30$

30, two digit number are divisible by 3.

Ans 3



Given: $DE \parallel BC$, $AD = 1cm$, $BD = 2cm$

To find: $\frac{ar\,ABC}{ar\,ADE}$

In ΔABC and ΔADE

$\angle A = \angle A$ (common)

$\angle ABC = \angle ADE$ ($DE \parallel BC$, corresponding angles)

$\Delta ABC \sim \Delta ADC$

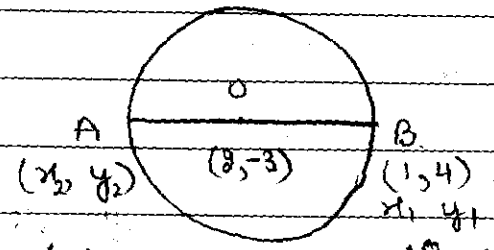
$$\frac{ar\,ABC}{ar\,ADE} = \left(\frac{AB}{AD}\right)^2 = \left(\frac{AD+DB}{AD}\right)^2 = \left(\frac{1+2}{1}\right)^2 = \left(\frac{3}{1}\right)^2 = \frac{9}{1}$$

1

$$\frac{ar\,ABC}{ar\,ADE} = \frac{9}{1}$$

$ar\,ABC : ar\,ADE = 9 : 1.$

Ans 4.



Since, AB is diameter and O is centre, O is midpoint of AB.

Let the co-ordinates of A be (x_2, y_2).

$m_1 : m_2 = 1:1$

$O(2,-3) = \left(\frac{m_1x_2 + m_2x_1}{m_1+m_2}, \frac{m_1y_2 + m_2y_1}{m_1+m_2}\right)$ [Section formula]

$(2,-3) =$

$\frac{x_1+x_2}{2} = 2$ $\qquad$ $\frac{y_1+y_2}{2} = -3$

$1 + x_2 = 4$ $\qquad$ $4 + y_2 = -6$

$x_2 = 4-1$ $\qquad$ $y_2 = -6-4$

$x_2 = 3$ $\qquad$ $y_2 = -10$

Co-ordinates of A $= (3, -10)$

ans 5. ~~Ga~~ Let α and β be the zeroes of equation $3x^2-10x+k=0$

Then, Given that

$$\alpha = \frac{1}{\beta} \quad \text{and} \quad \beta = \frac{1}{\alpha}$$

$$3x^2-10x+k=0.$$

~~Sa~~ Product of zeroes = $\frac{\text{constant term}}{\text{coefficient of } x^2}$

$$\alpha \times \beta = \frac{c}{a}$$

$$\frac{1}{\cancel{\beta}} \times \cancel{\beta} = \frac{k}{3}$$

$$1 = \frac{k}{3}$$

$$\boxed{3 = k}$$

Value of $k = 3$, for which the roots are reciprocal of each other.

Ans 6. To find: $\sin^2 33^\circ + \sin^2 57^\circ$ (1)

$\sin\theta = \cos(90^\circ - \theta)$

$\sin 33^\circ = \cos(90^\circ - 33^\circ)$

$\sin 33^\circ = \cos 57^\circ$

$\boxed{\sin^2 33^\circ = \cos^2 57^\circ}$ (II)

putting the value of $\sin^2 33^\circ$ in (1)

1

Ans. $\boxed{\cos^2 57^\circ + \sin^2 57^\circ = 1}$ [Identity: $\cos^2\theta + \sin^2\theta = 1$]

So, $\sin^2 33^\circ + \sin^2 57^\circ = 1$. [SECTION – B]

Ans 7. Let 'n' ~~nota~~ two digit numbers are divisible by 7.

The required A.P = 14, 21 ..... 98.

14
7)98
28

$a_n = 98$

$a + (n-1)d = 98$ [$a = 14$, $d = 7$]

$14 + (n-1)7 = 98$

$14 + 7n - 7 = 98$

$7 + 7n = 98$

$7n = 98 - 7$

$7n = 91$

$n = \frac{91}{7}$

$\boxed{n = 13}$

$\therefore$ 13, two digit natural numbers are divisible by 7.

Ans. 8. Coin is tossed 3 times.

Total ~~pos~~ outcome = HHH, HHT, HTT, TTT, THH, TTH, THT, HTH
= 8.

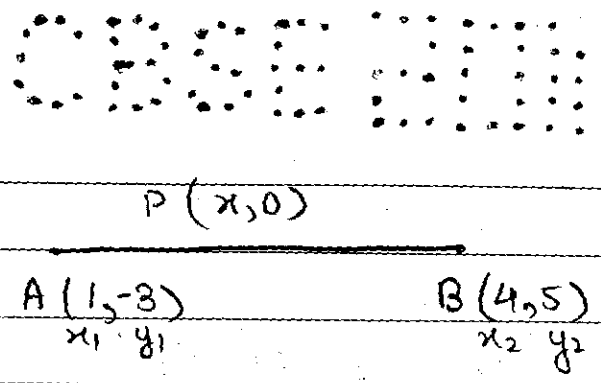
One can win game if the result is same i.e. HHH or TTT

Chances to lose game = HHT, HTT, THH, TTH, THT, HTH
Favourable outcome = 6.

Probability (Losing the game) $= \frac{6}{8} = \frac{3}{4}$

$\boxed{PE = \frac{3}{4}}$

Ans 9.



Let the joining points be A (1,-3) and B (4,5).

Since, AB is divided by X-axis, The point is of the form P (x,0)
By section formula, Let AB is divided in the ratio $m_1 : m_2$

$$0 = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \qquad [\ y_2 = 5,\ y_1 = -3$$

$$0 = \frac{5m_1 + (-3m_2)}{m_1 + m_2}$$

$$0 = 5m_1 - 3m_2$$

$$3m_2 = 5m_1$$

$$\frac{3}{5} = \frac{m_1}{m_2}$$

So, $m_1 : m_2 = 3 : 5$

So, Co-ordinates of x axis =

$m_1 : m_2 = 3 : 5$

$$P(x, 0) = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2} \qquad [x_1 = 1,\ x_2 = 4]$$

$$= \frac{3 \times 4 + 5 \times 1}{8}$$

$$= \frac{12 + 5}{8} = \frac{17}{8}$$

Co-ordinates are $= \left(\frac{17}{8}, 0\right)$.

Ans 10 A dice is thrown once.

Total outcome = 6

(i) Prime number = 2, 3, 5

Probability (Getting prime number) $= \frac{3}{6} = \frac{1}{2} = 0.5$.

(ii) number lies between 2 and 6 = 3, 4, 5.

So, Probability (of getting number lie between 2 and 6) = $\frac{3}{6} = \frac{1}{2} = 0.5$.

2

Ans 11. Condition for Infinitely many Solution.

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}.$$

$$cx + 3y + (3-c) = 0 \quad (I)$$
$$12x + cy - c = 0 \quad (II)$$

$a_1 = c$, $b_1 = 3$, $c_1 = 3-c$

$a_2 = 12$, $b_2 = c$, $c_2 = -c$.

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\frac{c}{12} = \frac{3}{c} = \frac{(3-c)}{-c}$$

$$\frac{c}{12} = \frac{3}{c}$$

$$c^2 = 36$$

$$c = \pm 6.$$

$$\frac{3}{c} = \frac{3-c}{-c}$$

$$-3c = 3c - c^2$$

$$-3c - 3c = -c^2$$

$$+6c = +c^2$$

$$c^2 - 6c = 0$$

$$c(c-6) = 0$$

$$c = 0 \text{ or } c = 6.$$

2

$\therefore$ $c = 6$ fulfils the condition.

Hence, the value $c = 6$ gives infinitely many solutions.

Ans 12. To find: HCF of 1260, 7344 by Euclids algorithm.

~~Let a = 12~~

Let $a = 7344$ and $b = 1260$.

Then by Euclids division algorithm

$a = bq + r \quad (0 \le r < b)$

$7344 = 1260 \times 5 + 1044$

$1260 = 1044 \times 1 + 216$

$1044 = 216 \times 4 + 180$

$216 = 180 \times 1 + 36$

$180 = 36 \times 5 + 0$

Hence, Now, Remainder is zero.

and at this stage divisor = 36.

$\therefore$ H.C.F $(1260, 7344) = 36$.

```
1260) 7344 (5
      6300
      1044) 1260 (1
            1044
             216) 1044 (4
                  ~~1080~~
                   864
                   180) 216 (1
                        180
                         36) 180 (5
                             180
                               0
```

$1260 \times 6 = 7560$

$1260 \times 5 = 6300$

$216 \times 4 = 864$

$216 \times 5 = 1080$

$180 \times 2 = 360$

$36 \times 5 = 180$

SECTION - C.

Ans 13. Given: One zero of polynomial $3x^3+10x^2-9x-4$ is 1

To find: All the zeroes of given polynomial.

Since 1 is a zero of given polynomial,
$(x-1)$ must be the factor of given polynomial.

$$
\begin{array}{r|l}
 & 3x^2+13x+4 \\
\hline
x-1 & 3x^3+10x^2-9x-4 \\
 & 3x^3-3x^2 \\
 & - \quad + \\
\hline
 & 13x^2-9x-4 \\
 & 13x^2-13x \\
 & - \quad + \\
\hline
 & 4x-4 \\
 & 4x-4 \\
 & - \quad + \\
\hline
 & 0
\end{array}
$$

$3x^2 + 13x + 4.$ (a factor of given polynomial)

$3x^2 + 12x + x + 4$ (Splitting the middle term)

$3x(x+4) + 1(x+4)$

$(3x+1)(x+4)$

Equating both factor to zero, we get

$3x + 1 = 0$ $\qquad$ $x + 4 = 0$

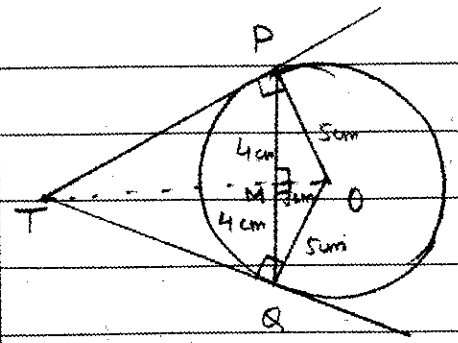
$3x = -1$ $\qquad$ $\boxed{x = -4}$

3 $\boxed{x = \frac{-1}{3}}$

So, $1, \frac{-1}{3}$ and -4 are the zeroes of polynomial

$3x^3 + 10x^2 - 9x - 4.$

Ans 14.



Given: PQ (chord) = 8 cm

OP = OQ (radius) = 5cm

PT and TQ are tangents

Let OT intersect PQ at M.

To find: Length of TP.

In Δ ~~POT~~ POT and Δ QOT.

PO = OQ (Radius)

PT = QT (Tangent)

$\angle OPT = \angle OQT$ [each 90°. Angle made by radius on tangent at point of contact is 90°].

$\Delta POT \cong \Delta QOT$ (SAS congruence)

$\angle TOP = \angle TOQ$ (C.P.C.T)

Now,

In Δ POM and Δ QOM

PO = QO (Radius)

OM = OM (common)

$\angle MOP = \angle MOQ$ [as prove above $\angle TOP = \angle TOQ$)

$\Delta POM \cong \Delta QOM$

$\angle OMP = \angle OMQ$ (C.P.C.T)

$\angle OMP + \angle OMQ = 180^\circ$ (Linear pair)

$2\angle OMP = 180^\circ$

$\angle OMP = 90^\circ$ (1)

In ΔPOM (Pythagoras theorem)

$OM = \sqrt{PO^2 - PM^2}$

$OM = \sqrt{(5)^2 - (4)^2} = \cancel{\sqrt{3}}\ \sqrt{9} = \cancel{3\text{ cm}}$ (2)

Now, In ΔPOT and ΔMOP

$\angle OPT = \angle OMP$ (each 90°).

$\angle POT = \angle MOP$ (common)

3

$\Delta POT \sim \Delta MOP$ (AA similarity)

$\frac{PO}{MO} = \frac{OT}{OP} = \frac{PT}{MP}$ (corresponding parts of similar triangle are proportional).

$\frac{PO}{MO} = \frac{PT}{MP}$ [$OM = 3$ cm as proved above in 2]

$\frac{5}{\cancel{3}} = \frac{PT}{4}$

$\frac{20}{3} = PT$

$\boxed{PT = 6.67\text{ cm}}$

3)20(6.67
18

Ans 15 Given: $\sqrt{3}$ is an irrational number.

To prove: ~~$2+\sqrt{5}$~~ $\frac{2+\sqrt{3}}{5}$ is an irrational number.

Proof: Let $\frac{2+\sqrt{3}}{5}$ be a rational number which can be expressed in the form $\frac{p}{q}$ where ~~and~~ p and q are co-prime integer and $q \neq 0$

$$\frac{2+\sqrt{3}}{5} = \frac{p}{q}$$

$$2+\sqrt{3} = \frac{5p}{q}$$

$$\sqrt{3} = \frac{5p}{q} - 2$$

$$\sqrt{3} = \frac{5p-2q}{q}$$

Since, p and q are integers, $\frac{5p-2q}{q}$ should be rational and so, $\sqrt{3}$ should also be rational.

But, this contradicts the fact that $\sqrt{3}$ is irrational.

This contradiction has arisen because of our wrong assumption.

So, we conclude that $\frac{2+\sqrt{3}}{5}$ is irrational.

Ans 16. To prove : $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$.

Solving L.H.S., $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2$

$[(a+b)^2 = a^2 + b^2 + 2ab]$

$\sin^2\theta + \operatorname{cosec}^2\theta + 2\sin\theta\operatorname{cosec}\theta + \cos^2\theta + \sec^2\theta + 2\cos\theta\sec\theta$

$\sin^2\theta + \cos^2\theta + \operatorname{cosec}^2\theta + \sec^2\theta + 2\sin\theta\operatorname{cosec}\theta + 2\cos\theta\sec\theta$

$[\sin^2\theta + \cos^2\theta = 1]$

$1 + \operatorname{cosec}^2\theta + \sec^2\theta + 2\sin\theta \times \frac{1}{\sin\theta} + 2\cos\theta \times \frac{1}{\cos\theta}$

Identity

$1 + \operatorname{cosec}^2\theta + \sec^2\theta + 2 + 2.$ $\quad [1 + \cot^2\theta = \operatorname{cosec}^2\theta]$

$[1 + \tan^2\theta = \sec^2\theta]$

$1 + 1 + \cot^2\theta + 1 + \tan^2\theta + 4.$

$3 + 4 + \cot^2\theta + \tan^2\theta$

$7 + \tan^2\theta + \cot^2\theta = R.H.S.$

5

$L.H.S = R.H.S.$

Hence proved.

Ans 17. Let the numerator be x

Let the denominator be y

So, the fraction is $\frac{x}{y}$

A.T.Q. Ist case.

$$\frac{x-2}{y} = \frac{1}{3}$$

$3x - 6 = y.$

$3x - y = 6$ (1)

IInd case.

$$\frac{x}{y-1} = \frac{1}{2}.$$

$2x = y - 1.$

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

subtracting eq. (1) from (2).

$2x - y - (3x - y) = -1 - 6$

$2x - \cancel{y} - 3x + \cancel{y} = -7$

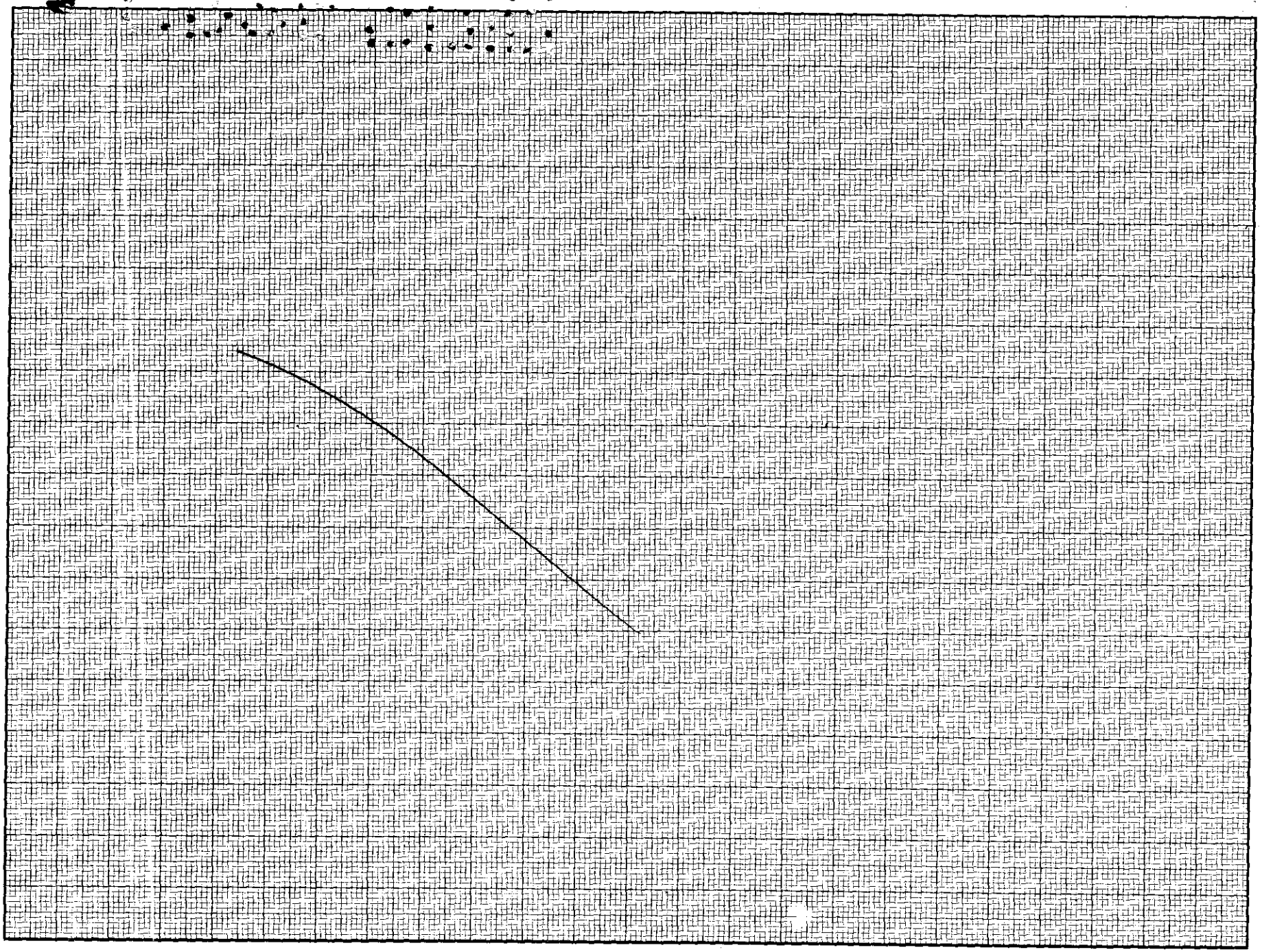
$$2x - 3x = -7$$
$$+x = +7$$
$$\boxed{x = 7}$$

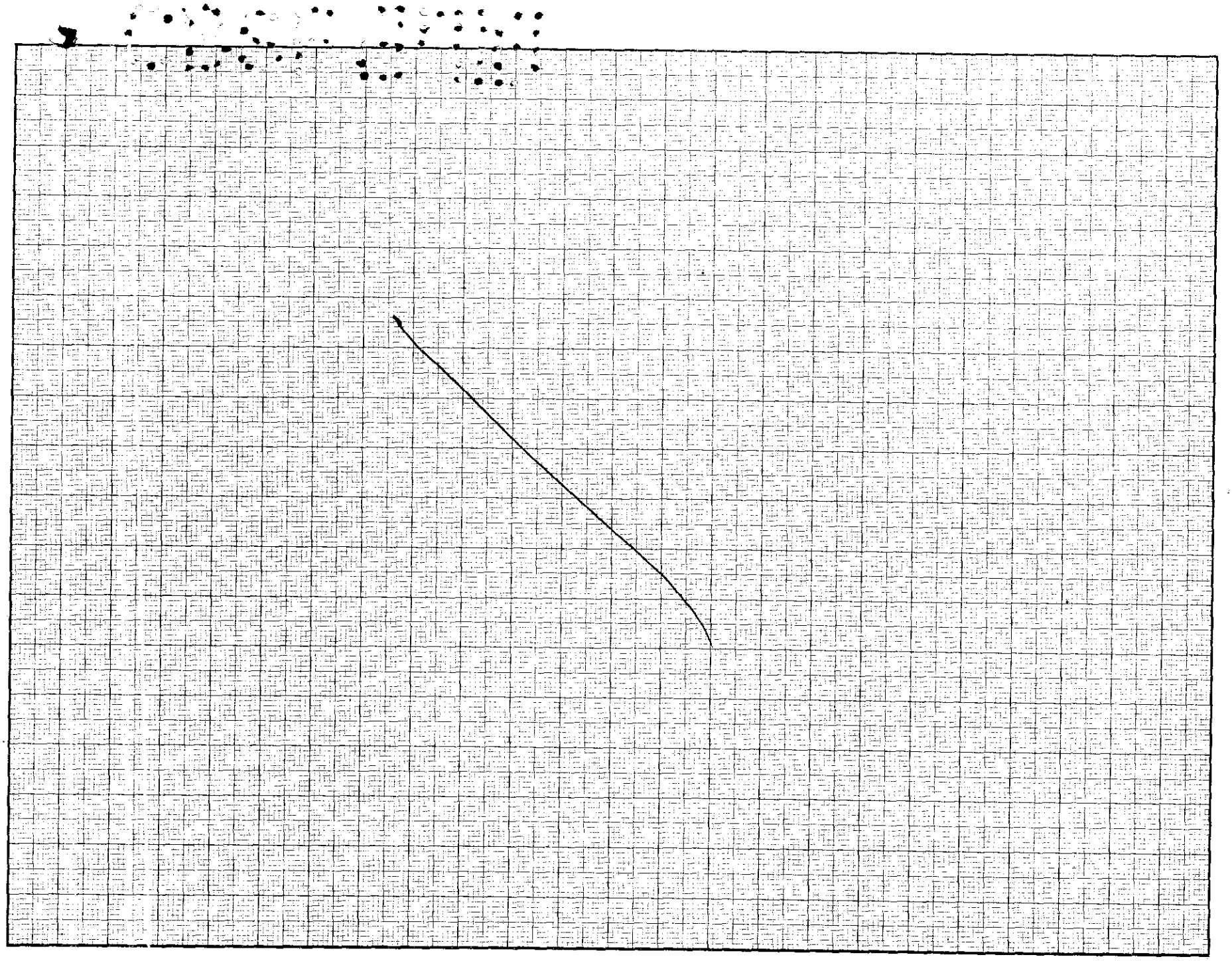
Putting the value of x in eq (1)

$$3x - y = 6$$
$$3 \times 7 - y = 6$$
$$21 - y = 6$$
$$-y = 6 - 21$$
$$+y = +15$$
$$y = 15.$$

3

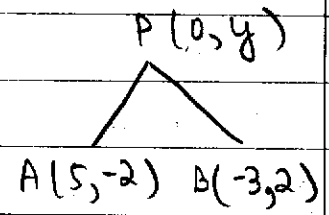
The fraction is $\frac{7}{15}$.





Ans 18. Let the point 'P', since it is on Y axis, it is of form $P(0, y)$.

Given: $P(0, y)$ is equidistant from $A(5, -2)$ and $B(-3, 2)$.



$$PA = PB$$

squaring both sides.

$$PA^2 = PB^2$$

$$(x_1 - x_2)^2 + (y_1 - y_2)^2 = (x_1 - x_2)^2 + (y_1 - y_2)^2$$

$$(5-0)^2 + (-2-y)^2 = (-3-0)^2 + (2-y)^2$$

3

$$25 + [4 + 4y + y^2] = 9 + 4 - 4y + y^2$$

$$25 + \cancel{4} + 4y + \cancel{y^2} = 9 + \cancel{4} - 4y + \cancel{y^2}$$

$$25 - 9 = -4y - 4y$$

$$16 = -8y$$

$$\frac{-16}{8} = y \quad \text{or} \quad \boxed{y = -2}$$

Point on Y-axis is $(0, -2)$.

Ans 9.

C.I		f
0 - 10		8
10 - 20		10
20 - 30	F_0	10
30 - 40	f_1	16
40 - 50	F_2	12
50 - 60		6
60 - 70		7

modal class

$l = 30$
$h = 10$
$f_1 = 16$
$F_0 = 10$
$F_2 = 12$

$$\text{mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$30 + \left[\frac{16-10}{2\times16-10-12}\right] \times 10$$

$$30 + \frac{6}{32-22} \times 10$$

$$30 + \frac{6 \times 10}{10}$$

$$\boxed{\text{Mode} = 36}$$

Ans 20. Dimension of canal.

Wide = 6m

Deep = 1.5m.

Rate of flow of water = 10km/hr.

1 hr = 10km.

i.e. 60min = 10,000 m.

1 min = $\frac{10,000}{60}$ m

30min = $\frac{10,000 \times \cancel{30}^{1}}{\cancel{60}_{2}} = \frac{10,000}{2} = 5000$ m.

$$\begin{array}{r} 1250 \\ 4\overline{)5000} \\ \underline{4} \\ 10 \\ \underline{8} \\ 20 \end{array}$$

$$\begin{array}{r} 1250 \\ \times\ 45 \\ \hline 6250 \\ 5000\times \\ \hline 56,250 \end{array}$$

So, length of ~~water~~ ~~to~~ canal in 30 ~~min~~ is 5000m.

l = 5000 m (1).

Volume of water in canal = vol of water in field

$l \times b \times h$ = Area $\times$ h.

$5000 \times 6 \times 1.5$ = Area $\times \frac{8}{100}$.

$\frac{5000 \times \cancel{6}^{3} \times 1.5 \times 100}{\cancel{8}_{4} \times 10}$ = Area.

$\frac{\cancel{5000}^{1250} \times 3 \times 150}{\cancel{4}}$ = Area

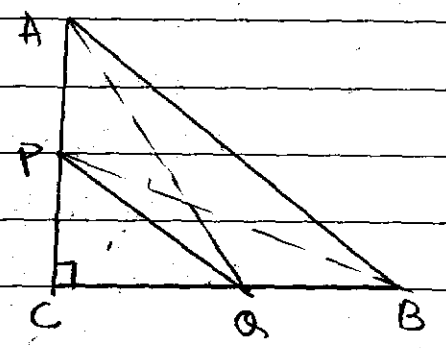
$1250 \times 3 \times 150$ = Area

$56,250 m^2$ = Area.

It will irrigate $56,250 m^2$ area in 30 minutes.

3

Ans 21.



Given: ΔABC in which $\angle C = 90°$. P and Q are points of CA and CB.

To prove: $AQ^2 + BP^2 = AB^2 + PQ^2$.

Construction: Join AQ and BP.

Proof: In ΔACQ

$$AQ^2 = AC^2 + CQ^2 \quad (1) \quad \text{(Pythagorus theorem)}$$

In ΔBCP.

$$BP^2 = PC^2 + BC^2 \quad (2) \quad \text{(Pythagorus theorem)}$$

Adding (1) and (2)

3

$$AQ^2 + BP^2 = AC^2 + CQ^2 + PC^2 + BC^2$$

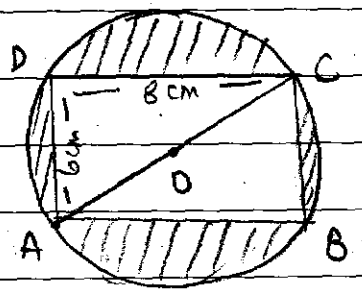
$$AQ^2 + BP^2 = AC^2 + BC^2 + CQ^2 + PC^2$$

In ΔABC
$AB^2 = AC^2 + BC^2$
In ΔPQC
$PQ^2 = CQ^2 + PC^2$

$$AQ^2 + BP^2 = AB^2 + PQ^2$$

Hence prove.

Ans 22:



Given: ABCD is a rectangle
$BC = AD = 6\,cm$, $DC = AB = 8\,cm$.
O is the centre of circle.

To find: Area of shaded region.

In ΔADC
$\angle D = 90^\circ$ [Angle in rectangle].

$AC^2 = AD^2 + DC^2$ [Pythagorus Theorem]

$AC^2 = (6)^2 + (8)^2$

$AC = \sqrt{36+64}$

$= \sqrt{100}$

$AC = 10\,cm$

Since O is centre on AC, O is the midpoint of AC.
$AO = OC = 5\,cm$. (Radius)

Area of circle = πr^2

$= 3.14 \times 5 \times 5$

$= 3.14 \times 25$

$= \frac{314}{\cancel{100}_4} \times \cancel{25}^1$

$= \frac{314}{4} = 78.5 \text{ cm}^2$.

$$\begin{array}{r} 78.5 \\ 4\overline{)314} \\ \underline{28} \\ 34 \\ \underline{32} \\ 20 \end{array}$$

Area of Rectangle = $l \times b$

$= 6 \times 8 = 48 \text{ cm}^2$.

$$\begin{array}{r} 78.5 \\ 48.0 \\ \hline 30.5 \end{array}$$

Area of shaded region = Area of circle − area of Rectangle

$= 78.5 - 48$

$= 30.5 \text{ cm}^2$

3

Required area = 30.5 cm^2.

SECTION – D.

Ans 23. Given : $\sec\theta = x + \frac{1}{4x}$.

To find : $\sec\theta + \tan\theta$.

$1 + \tan^2\theta = \sec^2\theta$ [Identity]

$1 + \tan^2\theta = \left(x + \frac{1}{4x}\right)^2$

$1 + \tan^2\theta = x^2 + \frac{1}{16x^2} + 2 \times x \times \frac{1}{4x}$

$1 + \tan^2\theta = x^2 + \frac{1}{16x^2} + \frac{1}{2}$.

$\tan^2\theta = x^2 + \frac{1}{16x^2} + \frac{1}{2} - 1$

$\tan^2\theta = \cancel{x^2} + \frac{1}{16x^2} - \frac{1}{2}$.

$\tan^2\theta = \left(x - \frac{1}{4x}\right)^2$

$$\tan\theta = \pm\left(x - \frac{1}{4x}\right)$$

Case I, when $\tan\theta = x - \frac{1}{4x}$.

$$\sec\theta + \tan\theta = x + \cancel{\frac{1}{4x}} + x - \cancel{\frac{1}{4x}}$$

$$= 2x.$$

Case II when $\tan\theta = -\left(x - \frac{1}{4x}\right)$

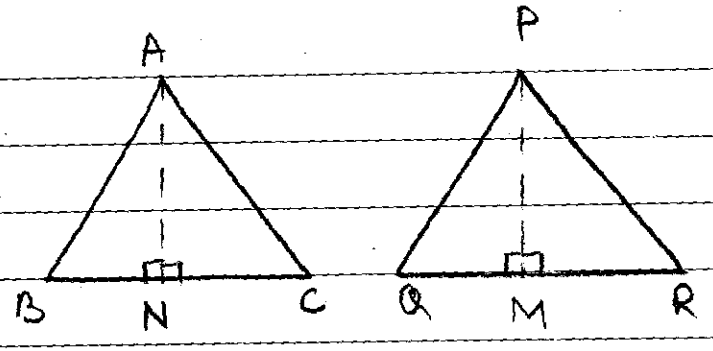
$$\sec\theta + \tan\theta = x + \frac{1}{4x} - x + \frac{1}{4x}$$

$$= \frac{1}{4x} + \frac{1}{4x}$$

$$= \frac{2}{4x} = \frac{1}{2x}.$$

$$\boxed{\sec\theta + \tan\theta = 2x \text{ or } \frac{1}{2x}}$$

Ans 24.



Given: $\Delta ABC \sim \Delta PQR$.

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

$\angle A = \angle P$, $\angle B = \angle Q$, $\angle C = \angle R$.

To prove: $\frac{ar\ ABC}{ar\ PQR} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{QR}\right)^2 = \left(\frac{AC}{PR}\right)^2$

Construction: Draw $AN \perp BC$, and $PM \perp QR$.

Proof: $ar\ ABC = \frac{1}{2} \times b \times h$

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

ar PQR = $\frac{1}{2} \times b \times h$

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

From (1) and (2)

$$\frac{\text{ar } ABC}{\text{ar } PQR} = \frac{\cancel{\frac{1}{2}} \times BC \times AN}{\cancel{\frac{1}{2}} \times QR \times PM} = \frac{BC \times AN}{QR \times PM} \quad (3)$$

Now, In Δ ABN and PQM

$\angle ABN = \angle PQM$ [$\Delta ABC \sim \Delta PQR$]

$\angle ANB = \angle PMQ$ (each 90°) [By construction]

$\Delta ABN \sim \Delta PQM$

$$\frac{AB}{PQ} = \frac{AN}{PM}$$

But $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$

$$\therefore \frac{BC}{QR} = \frac{AN}{PM} \quad (4)$$

Substituting the value of $\frac{AN}{PM}$ from 4 in 3.

$$\frac{ar\ ABC}{ar\ PQR} = \frac{BC}{QR} \times \frac{BC}{QR} \qquad \left[\frac{AN}{PM} = \frac{BC}{QR}\right].$$

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

But $\frac{BC}{QR} = \frac{AB}{PQ} = \frac{AC}{PR}$.

$$\therefore \frac{ar\ ABC}{ar\ PQR} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{QR}\right)^2 = \left(\frac{AC}{PR}\right)^2$$

Hence proved.

Ans 25.

C.I.	f_i	x_i	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
100 - 150	4	125	-2	-8
150 - 200	5	175	-1	-5
200 - 250	12	225 = a	0	0
250 - 300	2	275	1	2
300 - 350	2	325	2	4
	$\Sigma f_i = 25$			$\Sigma f_i u_i = -7$

$\frac{250}{2}$ 125 $\frac{350}{2}$ $\frac{175}{50}$ $-\frac{13}{6}$

Mean $= a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$ [Step deviation method]

$= 225 + \frac{(-7)}{25} \times \frac{50}{2}$ [$h = 150 - 100 = 50$]

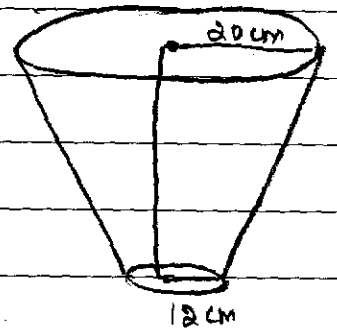
$= 225 - 14$

$= 211$

$\frac{225}{14}$ 211

Mean expenditure = ₹ 211.

Ans 27.



Given : Capacity = 12308.8 cm^3

$r_1 = 20$

$r_2 = 12$.

To find : Height of bucket and area of metal sheet used in making it,

Volume = 12308.8 cm^3

$$\frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right] = 12308.8 \text{ cm}^3$$

$$\frac{1}{3} \times 3.14 \times h \left((20)^2 + (12)^2 + 20 \times 12\right) \quad 12308.8$$

$$\frac{1}{3} \times 3.14 \times h \left(400 + 144 + 240\right) = 12308.8$$

$$\frac{1}{3} \times 3.14 \times h \times 784 = 12308.8$$

$$h = \frac{12308.8 \times 3 \times 100}{3.14 \times 784 \times 10}$$

400
144
240
784

2512

~~17584~~

$$\frac{\cancel{123088} \times 3 \times 10}{314 \times \cancel{784}}$$

~~112~~.

16.

~~628~~ 157

$$= \frac{\cancel{2512} \times 3 \times 10}{314 \times \cancel{16}}$$

~~4~~ 1

1

$$= \frac{\cancel{157} \times 3 \times 10}{\cancel{314}} = \frac{30}{2} = 15$$

2

$$\boxed{h = 15\text{cm}}$$

Height of bucket = 15 cm.

784

7) 123088 | 17584

7

59

49

40

35

58

56

28

2512

7) 17584

14

35

35

8

7

14

628

4) 2512

24

11

8

32

157

4) 628

4

22

20

28

11

157

× 2

314

Area of metal sheet = C.S.A of frustum + πr_2^2

$= \pi (r_1 + r_2) l + \pi r_2^2$

$l = \sqrt{h^2 + (r_1 - r_2)^2} = \sqrt{(15)^2 + (20-12)^2}$

$= \sqrt{225 + 64} = \sqrt{289} = 17$ cm

$l = 17$ cm.

Area $= \pi (r_1 + r_2) l + \pi r_2^2$

$= 3.14 (32) \times 17 + 3.14 \times 144$

4 $= 3.14 [32 \times 17 + 144]$

$= 3.14 \times [544 + 144]$

$= 3.14 \times 688$

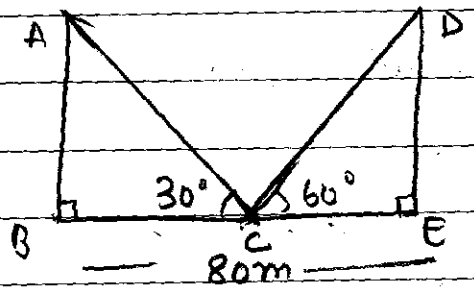
$= 2160.32$

Area of metal sheet = 2160.32 cm^2

$$\begin{array}{r} 32 \\ 17 \\ \hline 224 \\ 32\times \\ \hline 544 \\ 144 \\ \hline 688 \end{array}$$

$$\begin{array}{r} 314 \\ 688 \\ \hline 2512 \\ 2512\times \\ 1884\times\times \\ \hline 216032 \end{array}$$

Ans 28.



Given: $AB = DE =$ Height of pole.
C is observer.

To find: AB and BC and CE.

In Δ ABC

$$\tan 30° = \frac{AB}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{AB}{BC}$$

$$BC = \sqrt{3}\,AB. \quad (1)$$

In Δ CED

$$\tan 60° = \frac{ED}{CE}$$

$$\sqrt{3} = \frac{ED}{CE}$$

$$CE\sqrt{3} = ED.$$

$$CE = \frac{ED}{\sqrt{3}}$$

But $ED = AB$.

$$CE = \frac{AB}{\sqrt{3}}$$

$BC + CE = 80\,m$ (Given)

$$\sqrt{3}\,AB + \frac{AB}{\sqrt{3}} = 80$$

$$3AB + AB = 80\sqrt{3}$$

$$4AB = 80\sqrt{3}$$

$$AB = \frac{80\sqrt{3}}{4}$$

4

$$AB = 20\sqrt{3}$$

Height of the poles is $20\sqrt{3}\,m$.

$$BC = \sqrt{3}\,AB$$
$$= \sqrt{3} \times 20\sqrt{3}$$
$$= 3 \times 20 = 60\,m.$$

$$CE = 80 - 60 = 20\,m.$$

Distance of point from pole AB is 80m and ED is 20m.

Ans. 29. Let the speed of boat be x.
Speed of stream be y

Speed in upstream $= (x-y)$ km/hr
Speed in downstream $= (x+y)$ km/hr.

Speed $= \frac{\text{Distance}}{\text{time}}$

time $= \frac{\text{Distance}}{\text{speed}}$

A.T.Q.

$$\frac{30}{x-y} + \frac{4y}{x+y} = 10. \quad (1)$$

$$\frac{40}{x-y} + \frac{55}{x+y} = 13. \quad (2)$$

1

Let $x-y$ be m

and $\frac{1}{x+y} = n$.

Then.

$$30m + 44n = 10 \quad (3)$$
$$40m + 55n = 13. \quad (4)$$

Multiplying eq (3) by 4 and eq (4) by 3.

$$120m + 176n = 40 \quad 5$$
$$120m + 165n = 39 \quad 6$$

Solving 5 and 6

$$\cancel{120m} + 176n = 40$$
$$\cancel{120m} + 165n = 39$$
$$- \qquad -$$

$$11n = 1$$
$$n = \frac{1}{11}$$

Putting the value of n in (3)

$30m + 44n = 10$

$30m + \cancel{44} \times \frac{1}{\cancel{11}} = 10$

$30m + 4 = 10$

$30m = 6$

$m = \frac{\cancel{6}}{\cancel{30}} = \frac{1}{5}$.

2019

$\frac{1}{x-y} = m = \frac{1}{5}$, $\frac{1}{x+y} = n = \frac{1}{11}$

$x - y = 5$. (7) $x + y = 11$. (8)

Solving (7) and 8

4

$x - y = 5$

$x + y = 11$

$2x = 16$

$x = 8$.

Putting the value in (7)

$x - y = 5$

$8 - 5 = y$

$3 = y$.

Speed of stream = 3 km/hr , Speed of boat = 8 km/hr

0901

Fictitious Roll No.
(To be entered by Board)

अपना अनुक्रमाँक इस उत्तर-पुस्तिका पर न लिखें
Please do not write your Roll Number on this Answer-Book

अतिरिक्त उत्तर-पुस्तिका(ओं) की संख्या.....
Supplementary Answer-Book(S) No. .....

Ans 30. Given : $S_4 = 40$.

$S_{14} = 280$

To find : S_n

$S_4 = 40$

$\frac{n}{2}(2a + (n-1)d) = 40$

$2 \cdot \frac{4}{2}(2a + 3d) = 40$.

$2a + 3d = 20$. (1).

$S_{14} = 280$

$\frac{n}{2}(2a + (n-1)d = 280$

$$\frac{7\cancel{14}}{\cancel{2}}(2a + 13d) = 280.$$

$$2a + 13d = \frac{280}{7}$$

$$2a + 13d = 40 \quad (2)$$

Solving (1) and (2)

$$\cancel{2a} + 3d = 20$$
$$\cancel{2a} + 13d = 40.$$
$$- \qquad - \qquad -$$

$$-10d = +20$$

$$d = \frac{20}{10} = 2$$

$$\boxed{d = 2}$$

Putting the value of d in (1)

$2a + 3d = 20.$

$2a + 3 \times 2 = 20$

$2a = 20 - 6$

$2a = 14$

$a = \frac{14}{2} = 7$

$\boxed{a = 7}$

$S_n = \frac{n}{2}\left(2a + (n-1)d\right.$

$= \frac{n}{2}\left(2 \times 7 + (n-1)2\right)$

$= \frac{n}{2}\left(14 + 2n - 2\right)$

4

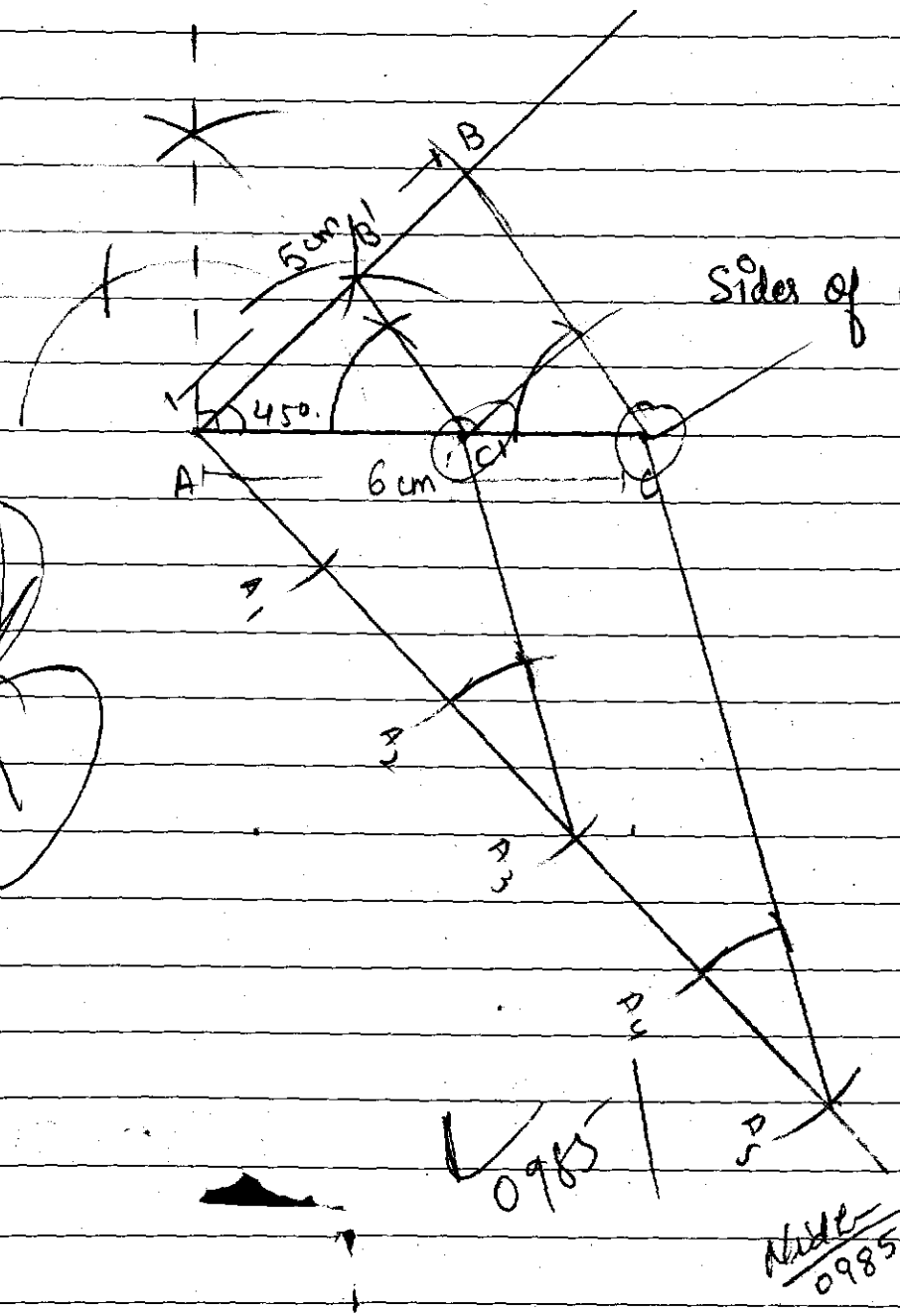
$= \frac{n}{2}\left(12 + 2n\right)$

$= \frac{n}{\cancel{2}} \times \cancel{2}\left(6 + n\right)$

$= n\left(6 + n\right).$

$\boxed{S_n = n(n+6)}$

Ans 26.



AB'C' is the required triangle drawn.

Sides of AB'C' = $\frac{3}{5}$ of sides of ABC

4

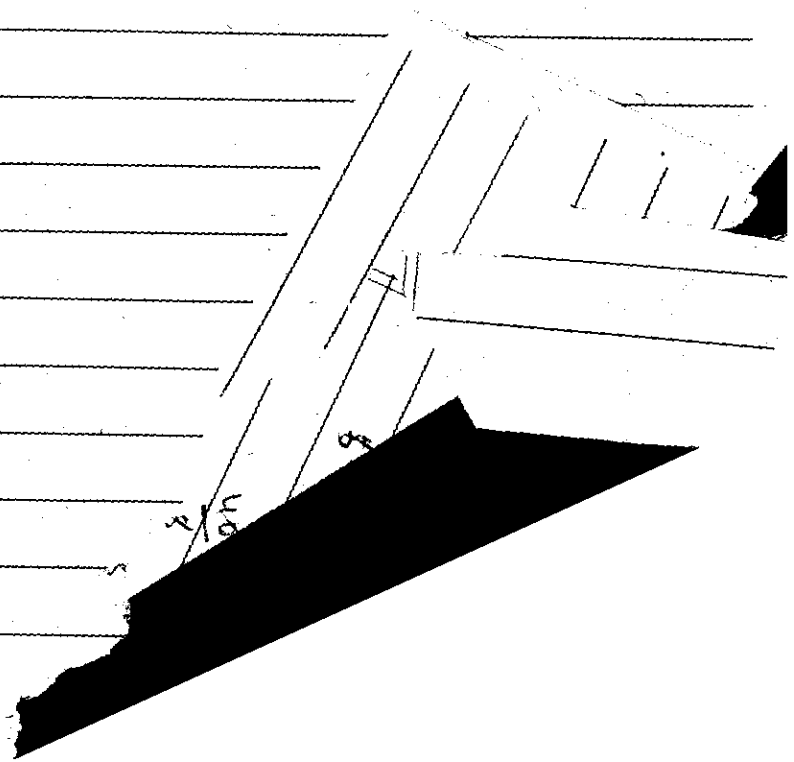
80/80

Right angle only

9867 9866

0985

Nide 09854 - Sandy 09873



Rough

$S_4 = 40$

$\frac{4}{2}(2a + 3d) = 40$

$2a + 3d = \frac{40 \times 2}{4}$

$2a + 3d = 20$

$2a + 13d = 40$

$10d = 120$

$d = 2$

$2a + 6 = 20$

$2a = 14$

$a = 7$

$S_{14} = 280$

$\frac{14}{2}(2a + 13d) = 280$

$2a + 13d = \frac{280 \times 2}{14}$

$2a + 13d = 40$

$\frac{30}{8-3} + \frac{44}{8+3}$

$6 \quad \frac{30}{5} + \frac{44}{11}$

$3.14(32 \times 17 + 144)$

$= \frac{n}{2}(2 \times 7 + (n-1)2)$

$= \frac{n}{2}(14 - 2 + 2n)$

$= \frac{n}{2}(12 + 2n)$

$= \frac{n}{2} \times 2(6+n)$

$= n(n+6)$