परीक्षार्थी प्रवेश–पत्र के अनुसार भरें

विषय Subject : MATHEMATICS STANDARD

विषय कोड Subject Code : 041

परीक्षा का दिन एवं तिथि
Day & Date of the Examination : THURSDAY 12.3.2020

उत्तर देने का माध्यम
Medium of answering the paper : ENGLISH

प्रश्न पत्र के ऊपर लिखे कोड को दर्शाएं Write code No. as written on the top of the question paper	Code Number: 30/5/2	Set Number: ① ● ③ ④

अतिरिक्त उत्तर–पुस्तिका (ओं) की संख्या
No. of supplementary answer-book(s) used: –

बेंचमार्क विकलांग व्यक्ति हाँ / नहीं
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यदि दृष्टिहीन हैं तो उपयोग में लाए गये सॉफ्टवेयर का नाम :
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*एक खाने में एक अक्षर लिखें। नाम के प्रत्येक भाग के बीच एक खाना रिक्त छोड़ दें। यदि परीक्षार्थी का नाम 24 अक्षरों से अधिक है, तो केवल नाम के प्रथम 24 अक्षर ही लिखें।
Each letter be written in one box and one box be left blank between each part of the name. In case Candidate's Name exceeds 24 letters, write first 24 letters.

कार्यालय उपयोग के लिए
Space for office use

SECTION – D

(40) choice – (1)

$P(x) = 2x^4 - x^3 - 11x^2 + 5x + 5.$

Given zeroes: $\sqrt{5}, -\sqrt{5}.$

Sum of zeroes $= \sqrt{5} - \sqrt{5} = 0$

Product of zeroes $= \sqrt{5} \times -\sqrt{5} = -5.$

$g(x) = x^2 + 0x - 5$

$$\begin{array}{r|l} & 2x^2 - 1x - 1 \\ \hline x^2+0x-5 & 2x^4 - x^3 - 11x^2 + 5x + 5 \\ & -2x^4 + 0x^3 + 10x^2 \\ \hline & 0 \quad -x^3 - 1x^2 + 5x + 5 \\ & +x^3 + 0x^2 \mp 5x \\ \hline & 0 \quad -1x^2 \pm 0x + 5 \\ & +1x^2 + 0x \mp 5 \\ \hline & 0 \quad 0 \quad 0 \end{array}$$

$g(x) = 2x^2 - 1x - 1$

$g(x) = 0$

$2x^2 - 1x - 1 = 0$

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

$2x(x-1) + 1(x-1) = 0$

$x = 1$

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

$\frac{1}{8} + \frac{1}{8} - \frac{11}{4} - \frac{5}{2} + 5$ -2 $-2\ x+1$

$2 - 1 - 11 + 5 + 5$

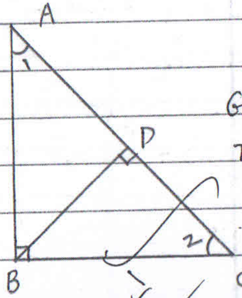
$\frac{1+1-22-20+40}{8}$ $\frac{1}{2} - \frac{1}{8} - \frac{11}{4} - \frac{5}{2} + 5$

$\frac{4-1-22-20+40}{8}$

Ans: The other zeroes of $P(x)$ are: $1, \frac{-1}{2}$

Zeroes of $P(x)$: $\sqrt{5}, -\sqrt{5}, 1, \frac{-1}{2}$

(39)



Given: Right ΔABC, $\angle B = 90°$

To Prove: $AC^2 = AB^2 + BC^2$

Construction:

Draw $BD \perp AC$.

Proof:

In $\triangle ABC$ and $\triangle ADB$,

$\angle ABC = \angle ADB = 90^\circ$

$\angle 1 = \angle 1$ (common)

$\therefore \triangle ABC \sim \triangle ADB$ (AA)

by CPST, $\frac{AB}{AD} = \frac{BC}{DB} = \frac{AC}{AB}$

$\Rightarrow \frac{AB}{AD} = \frac{AC}{AB}$

$AB^2 = AC \cdot AD \rightarrow (1)$

In $\triangle ABC$ and $\triangle BDC$

$\angle ABC = \angle BDC = 90^\circ$

$\angle 2 = \angle 2$ (common)

$\therefore \triangle ABC \sim \triangle BDC$ (AA)

by CPST, $\frac{AB}{BD} = \frac{BC}{DC} = \frac{AC}{BC}$

$\frac{BC}{DC} = \frac{AC}{BC} \Rightarrow BC^2 = AC \cdot DC \rightarrow (2)$

Adding ① and ②,

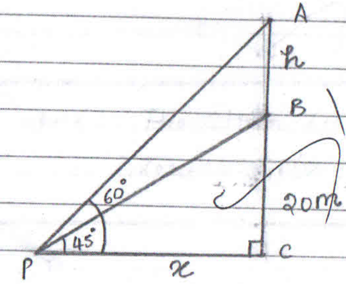
$$AB^2 + BC^2 = AC.AD + AC.DC$$

$$AB^2 + BC^2 = AC(AD + DC)$$

$$AB^2 + BC^2 = AC^2$$ //

Hence Proved.

(38)



Let AB → Transmission tower

BC → Building - 20m

P → Point on the ground.

In ΔPBC, $\angle C = 90°$

$\tan 45° = \frac{20}{x} \Rightarrow 1 = \frac{20}{x}$

$x = 20\text{m}$.

In ΔPAC, $\angle C = 90°$

$\tan 60° = \frac{h+20}{x}$

$$\frac{20+h}{20} = \sqrt{3}$$

$$h = 20\sqrt{3} - 20$$

1.73
1.00
0.73

7.3

0.73×20
7.3
2
14.6

$\frac{h+20}{20} = \sqrt{3}$

$h+20 = 20\sqrt{3}$

$h = 20(\sqrt{3}-1)$

1.73

0.73×10

7.3

14.6

$h = 20(\sqrt{3}-1)$

$h = 14.64m.$

Ans :- Height of transmission tower = 14.64m

choice-1

(37)

Age (in yrs) (C.I)	No. of persons (f)	less than	cf
0 - 10	5	< 10	5
10 - 20	15	< 20	20
20 - 30	20	< 30	40
30 - 40	25	< 40	65
40 - 50	15	< 50	80
50 - 60	11	< 60	91
60 - 70	9	< 70	100
	100		

$65 + 15 = 80$

Median Age :

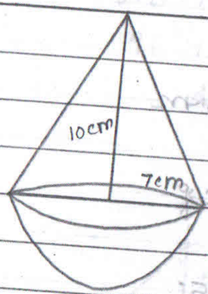
$L + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h \Rightarrow 30 + \frac{50-40}{25} \times 10$

$\Rightarrow 30 + \frac{100}{25}$ (4) $\Rightarrow 34$ years

2020

Median of the distribution: 34 years (by graph and calculation)

(36)



For Hemisphere:

$r = 7cm.$

For cone:

$h = 10cm$

$r = 7cm.$

$l = \sqrt{100+49} = 12.2\ cm$

Volume of the toy: Volume of cone + Volume of hemisphere

$\frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$

$\frac{1}{3}\pi r^2 (h + 2r)$

$\frac{1}{3} \times \frac{22}{7} \times 7 \times 7 (10 + 14)$

$\frac{1}{\cancel{3}} \times \frac{22}{\cancel{7}} \times \cancel{7} \times 7 \times \cancel{24}^{8}$

$\Rightarrow 1232\ cm^3$

$56 \times 22 = 112 + 1120 = 1232$

Area of coloured sheet required : CSA of cone + CSA of hemisphere

$\Rightarrow \pi r l + 2\pi r^2$

$\Rightarrow \pi r(l+2r)$

$\Rightarrow \frac{22}{7} \times 7 (12.2 + 14)$

$\Rightarrow \frac{22}{\cancel{7}} \times \cancel{7} \times 26.2$

$\Rightarrow 576.4\ cm^2$

Ans: Volume of the toy $= 1232\ cm^3$

Area of coloured sheet required $= 576.4\ cm^2$.

35 For motorboat:

Speed in still water = 18 km/hr

let speed of stream = x km/hr

upstream speed = $18 - x$ km/hr

downstream speed = $18 + x$ km/hr.

$t = \frac{d}{s}$

$\frac{24}{18-x} - \frac{24}{18+x} = 1$

$24\left(\frac{1}{18-x} - \frac{1}{18+x}\right) = 1$

$\frac{18+x - 18+x}{(18-x)(18+x)} = \frac{1}{24}$

$\frac{2x}{324-x^2} = \frac{1}{24}$

$48x = 324 - x^2$

$x^2 + 48x - 324 = 0.$

$(x+54)(x-6) = 0.$

$x = -54$ (invalid - speed cannot be negative)

$x = 6$

Ans: Speed of the stream = 6 km/hr.

UP = 12

DN = 24

$18 \times 18 = 144$, $144 + 180 = 324$

$324 = 2 \times 2 \times 3 \times 3 \times 3 \times 3$

4×14, 6, 48

SECTION - C

(34) (i) Total number of 'Numbers' on spinner = 6

'Even numbers' = 5

P(Shweta being allowed to pick a marble) = $\dfrac{\text{No. of favourable outcomes}}{\text{Total number of outcomes}}$

Ans: Probability of being allowed to pick a marble $\Rightarrow \dfrac{5}{6}$

(ii) Total number of marbles = 20

black marbles = 6.

P(Shweta winning a prize) = $\dfrac{6}{20} \Rightarrow \dfrac{3}{10} \Rightarrow 0.3$ $\left\{\dfrac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}\right\}$

Ans: Probability of getting a prize = $\dfrac{3}{10}$

(33) $a = 54$

$d = -3$

$a_n = 0$

$a_n = 0$

$a + (n-1)d = 0$

$54 - 3(n-1) = 0$

$\cancel{-}\cancel{3}(n-1) = \cancel{-}\cancel{54}\ 18$

$n = 19$

Ans: $n = 19$

$a_{19} = 0$

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

$S_n = \frac{n}{2}[108 - 3(n-1)]$

$S_n = \frac{n}{2}[108 - 3n + 3] \Rightarrow \frac{n}{2}(111 - 3n)$

$54 - 3(18) = 0$

$54 - 54 = 0$

$\frac{19}{2}[108 - 3(18)]$

$a = 54$

$d = -3$

$54 - 3(n-1) = 0$

$\cancel{-}\cancel{3}(n-1) = \cancel{-}54\ 18$

$n = 19$

$S_{19} = \frac{19}{2}(27)$

Here, $n = 19$

$S_{19} = \frac{19}{2}[111 - 57]$

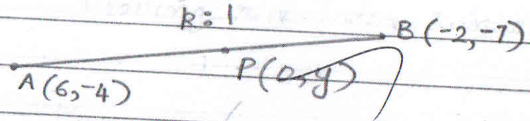
$S_{19} = \frac{19}{\cancel{2}} \times \cancel{54}^{27}$

Ans: $S_{19} = 513$

Ans: $n = 19$

$S_n = S_{19} = 513$.

(32) choice - (1)



Let the y axis meet the line segment joining points A(6, −4) and B(−2, −7) be P(0, y).

Let P divide AB in the ratio k : 1.

14 A P(0, y)

coordinates of P : $P\left(\frac{-2k+6}{k+1}, \frac{-7k-4}{k+1}\right)$

$\frac{-2k+6}{k+1} = 0$

$-2k+6=0$

$2k=6$

$k=3$

Ans: Ratio in which y axis divides AB = 3 : 1

$y = \frac{-7(3)-4}{(3)+1}$

$y = \frac{-21-4}{4}$

$y = \frac{-25}{4}$

Ans: Point of intersection = $P\left(0, \frac{-25}{4}\right)$.
of y axis and line segment.

(31) $870 - 3 = 867$

$258 - 3 = 255$

HCF(867, 255) by Euclid's Division Algorithm:

$867 = 255 \times 3 + 102$

$255 = 102 \times 2 + 51$

$102 = 51 \times 2 + 0$

HCF(867, 255) = 51.

Ans: The largest number which divides 870 and 258 leaving remainder 3 in each case is 51.

Choice - (2)

(30) Let the Present age of

Father = x years

Son = y years.

$x = 3y + 3$

$\cancel{x/}$ $x - 3y - 3 = 0 \rightarrow (1)$

$\cancel{x + 3 = 2y + 10}$

$x + 3 = 2(y + 3) + 10$

$x + 3 = 2y + 6 + 10$

$x - 2y = 16 - 3$

$x - 2y - 13 = 0 \rightarrow (2)$

$x + 3 = 2y + 16$

$x - 2y = 13$

$x - 2y - 13 = 0$

Solving (1) and (2),

$$\begin{array}{r} x - 3y - 3 = 0 \\ -x + 2y + 13 = 0 \\ \hline -y + 10 = 0 \end{array}$$

$y = 10$

$x = 33$

Ans: Present age of father = 33 years

son = 10 years

(29) $\frac{2\cos^3\theta - \cos\theta}{\sin\theta - 2\sin^3\theta} = \cot\theta$

LHS:

$\frac{\cos\theta\,(2\cos^2\theta - 1)}{\sin\theta\,(1 - 2\sin^2\theta)}$

$\frac{\cos\theta\,[2(1-\sin^2\theta) - 1]}{\sin\theta\,(1 - 2\sin^2\theta)}$

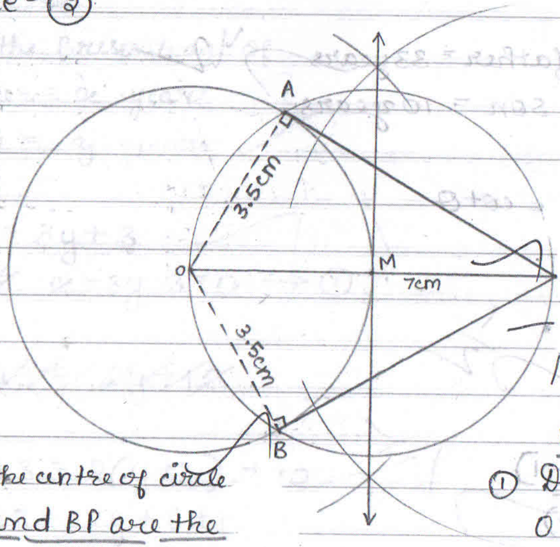
$\frac{\cos\theta\,[2 - 2\sin^2\theta - 1]}{\sin\theta\,(1 - 2\sin^2\theta)} \Rightarrow \frac{\cos\theta}{\sin\theta} \times \frac{\cancel{(1-2\sin^2\theta)}}{\cancel{(1-2\sin^2\theta)}} \Rightarrow \cot\theta$

LHS = RHS = $\cot\theta$ //

Proved.

choice - 2

28



- O is the centre of circle
- AP and BP are the required Tangents from P.
- OA = OB = radius = 3.5cm
- OP = 7cm.

STEPS OF CONSTRUCTION:

1. Draw a circle with centre O and radius 3.5 cm
2. Take a point P outside the circle so that OP = 7cm.
3. Join OP.
4. construct perpendicular bisector for OP and let it meet OP at M
5. With M as centre and r = OM draw a circle, passing through O and P to meet the previous circle at A and B.
6. Join AP, BP. AP and BP are the required tangents.

27 For ... $r = 6$
For S...
diagon...
Area of ...

Ans- Area of shade...

$\frac{22}{7} \times 36 \times 2$

20.571

$36.00 - 20.57$

Area of Quadrant - Area of square.

$\frac{22}{7} \times 6 \times 6 \times 2 - 6 \times 6$

$6 \times 6 \left[\frac{11}{7} - 1\right]$

$6 \times 6 \times \frac{4}{7} \Rightarrow 20.57\ cm^2$ (approx)

20.57 cm² (approx)

SECTION - B

26 Since A, B, C are interior angles of ΔABC,

$\angle A + \angle B + \angle C = 180^\circ$ (ASP).

$\frac{\angle A + \angle B + \angle C}{2} = 90^\circ$

$\frac{\angle B + \angle C}{2} = 90^\circ - \frac{\angle A}{2} \rightarrow (1)$

$\cot\left(\frac{B+C}{2}\right) = \tan\left(\frac{A}{2}\right) \rightarrow$ To Prove:

LHS:

$\cot\left(\frac{B+C}{2}\right)$

sub (1),

$\cot\left(90^\circ - \frac{\angle A}{2}\right)$ $\left\{\because \cot(90^\circ - \theta) = \tan\theta\right\}$

$\tan\left(\frac{\angle A}{2}\right) = RHS$

// Proved.

25 Let us assume to the contrary that $5+2\sqrt{7}$ is rational.
Then $5+2\sqrt{7}$ is of the form $\frac{p}{q}$ where p and q are co-primes and $q \neq 0$.

$$\frac{p}{q} = 5+2\sqrt{7}$$

$$\frac{p}{q} - 5 = 2\sqrt{7}$$

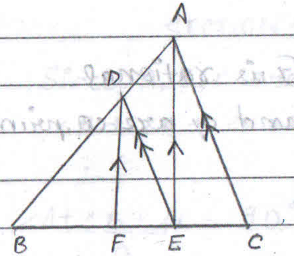
$$\frac{p-5q}{2q} = \sqrt{7}$$

$\frac{p-5q}{2q}$ is rational as p and q are integers

This contradicts the given fact that $\sqrt{7}$ is irrational.
$\therefore$ Our assumption is wrong.
$5+2\sqrt{7}$ is irrational //

Proved.

24



Given: $\triangle ABC$

$DE \parallel AC$

$DF \parallel AE$

To Prove: $\frac{BF}{FE} = \frac{BE}{EC}$

Proof: In $\triangle ABE$, $DF \parallel AE$

by BPT, $\frac{BF}{FE} = \frac{BD}{DA} \rightarrow (1)$

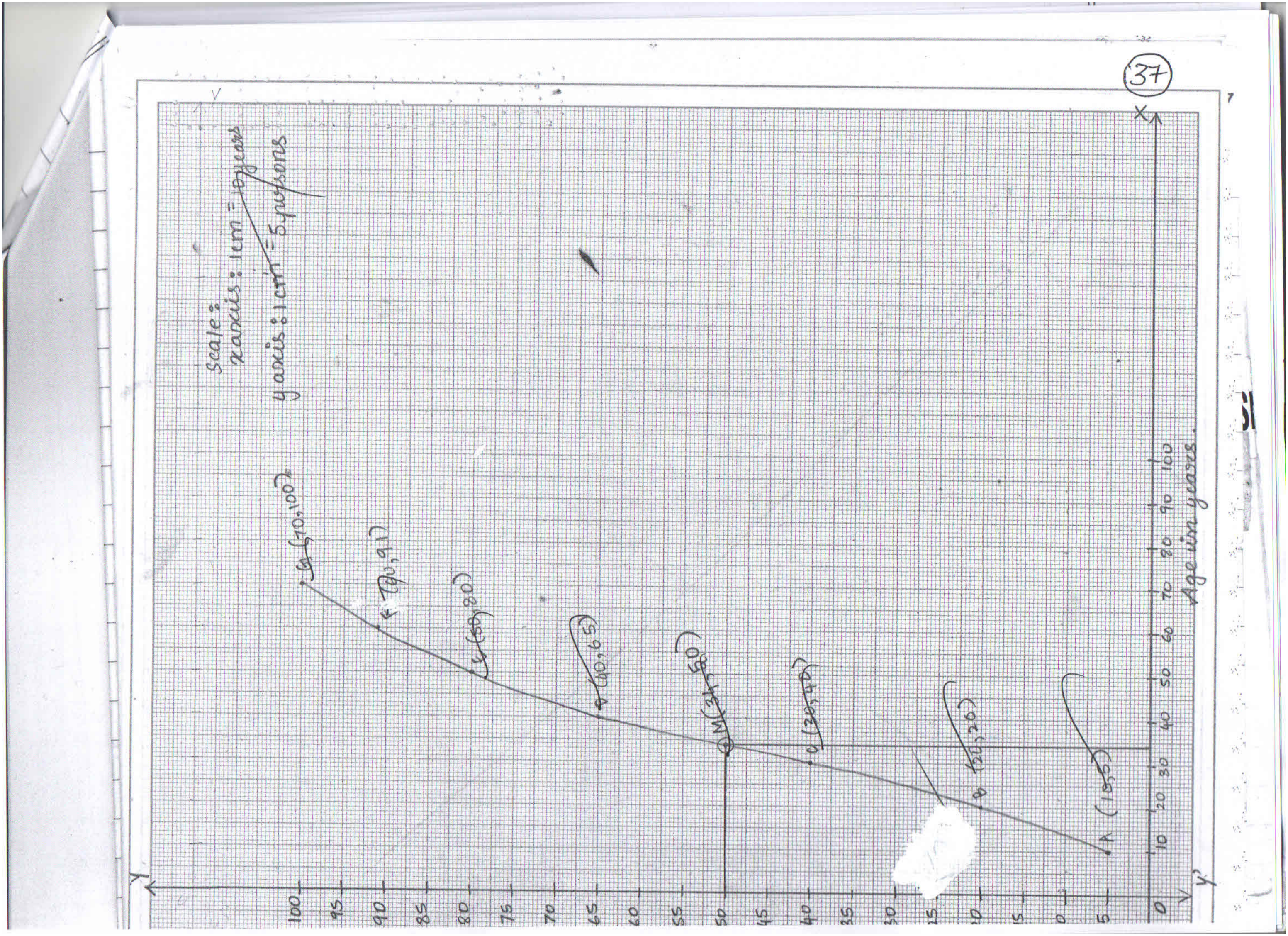
In $\triangle ABC$, $DE \parallel AC$

by BPT, $\frac{BE}{EC} = \frac{BD}{DA} \rightarrow (2)$

From (1) and (2),

$\frac{BF}{FE} = \frac{BE}{EC}$

// Proved


37
Scale:
x axis: 1cm = 10 years
y axis: 1cm = 5 persons
G(70,100)
F(60,91)
E(50,80)
D(40,65)
M(34,50)
C(30,40)
B(20,20)
A(10,5)
Age in years
X
Y
Y'
O

(23) For Small cube : $a = 2cm$

large cube : $A = 10cm$

Let number of cubes $= n$.

$125 \times 2 \times 2 \times 2 =$

$\frac{10 \times 10 \times 10}{2 \times 2 \times 2}$

$$A^3 = n \times a^3$$

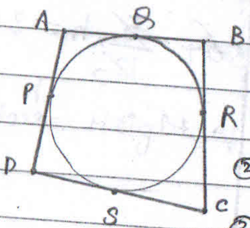
$$n = \frac{A^3}{a^3}$$

$$\cancel{n = \frac{1000}{8}} \quad n = \frac{1000}{8} = 125$$

Ans: Number of cubes that can be made $= 125$ cubes

(22) choice-(1)

Let the circle and ~~square~~ quadrilateral meet at P, Q, R, S.



(1) $AP = AQ$
(2) $DP = DS$
(3) $BR = BQ$
(4) $CR = CS$

} lengths of Tangents from external points A, B, C, D to the circle are equal

Adding ①, ②, ③, ④,

$AP + DP + BR + CR = AQ + BQ + DS + CS$

$AD + BC = AB + DC$ //

Proved.

21

Marks	No. of students (f)
0 – 10	4
10 – 20	6
20 – 30	7
$\boxed{30 - 40}$	$\boxed{12}$ modal class
40 – 50	5
50 – 60	6

Mode : $L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$

$\cancel{30 + \frac{12-7}{14-7-5} \times 10}$

$\cancel{30 + \frac{5}{2} \times 10^5} \Rightarrow$ ~~55 marks~~

$30 + \frac{12-7}{24-7-1^6}$

$30 + \frac{12-7}{24-12} \times 10$

$30 + \frac{50^{25}}{12_6}$

$30 + \frac{5}{12_2} \times h = 30 + \frac{25}{6}$

$h = 10$

Mode: $30 + \frac{12-7}{24-\cancel{7-5}} \cancel{\times 10}$

$30 + \frac{5}{\cancel{12}\,6} \times \cancel{10}\,5 \Rightarrow 34.17$ ~~marks~~ (approx)

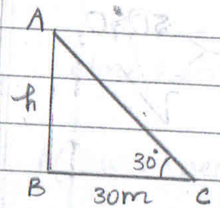
Ans: Modal marks = 34.17 marks. (approx)

4.166
$6\,)\,25$
24
10
6
40
36
40

4.17

SECTION-A

(20)



Let ht of tower = AB = h m.

In right ΔABC,

$\tan 30^\circ = \frac{h}{30}$

$\frac{1}{\sqrt{3}} = \frac{h}{30} \Rightarrow h = \frac{\cancel{30}^{10}\sqrt{3}}{\cancel{3}}$

$h = 10\sqrt{3} \Rightarrow 17.32\text{ m}.$

Ans- Height of tower = 17.32m (approx).

(19) $2\sec 30^\circ \times \tan 60^\circ$

$2 \times \frac{2}{\cancel{\sqrt{3}}} \times \cancel{\sqrt{3}} = 4$

(18) $n = 100$

Sum of first 100 natural numbers $= \frac{n(n+1)}{2}$

Ans: Sum of 1^{st} 100 natural nos. $\Rightarrow \frac{\cancel{100}^{50} \times 101}{\cancel{2}} = 5050$.

(17) Sum of zeroes $= -3$

Product of zeroes $= 2$.

Ans: The required Polynomial:

$P(x) = k(x^2 + 3x + 2)$

(16)

Product of 2 nos. = LCM × HCF

Let other number be x

$x \times \cancel{26}^{2} = \cancel{182}^{91} \times \cancel{13}$

$x = 91$

Ans: other number is 91

$(1-\frac{1}{2})$ (2)

(15) $(1-\cos^2 A)(1+\cot^2 A)$

$(1-\cos^2 A)\left(1+\frac{\cos^2 A}{\sin^2 A}\right)$

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

$\frac{(1-\cos^2 A)}{\sin^2 A} \Rightarrow \frac{\cancel{\sin^2 A}}{\cancel{\sin^2 A}} =$

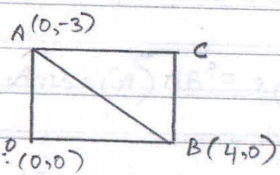
Ans : 1

(14) P(Sure event) = 1

(13) Similar

(12) $u_i = \frac{x_i - a}{h}$

(11)



Length of diagonal $AB = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(0-4)^2+(-3-0)^2} = \sqrt{16+9} = 5$ units

Ans: length of diagonal of rectangle AOBC is 5 units.

(10) Volume = 12π

$\frac{4}{3}\pi r^3 = 12\pi$

$\frac{4}{3}\cancel{\pi} r^3 = \cancel{12}^{3}\cancel{\pi}$

$r^3 = 9$

$r^3 = 9$

$r = 3^{\frac{2}{3}}$ cm.

$\sqrt[3]{9}$

$(3^{\frac{2}{3}})^3$

Ans: (c) $3^{\frac{2}{3}}$ cm

(9) (A) 50°

(8) $\frac{3}{2}x + \frac{5}{3}y = 7$

$9x + 10y = 14$

$\frac{a_1}{a_2} = \frac{\cancel{3}}{2} \times \frac{1}{\cancel{9}3} = \frac{1}{6}$

$\frac{b_1}{b_2} = \frac{\cancel{5}}{3} \times \frac{1}{\cancel{10}2} = \frac{1}{6}$

$$\frac{c_1}{c_2} = \frac{+7}{+14} = \frac{1}{2}$$

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

Ans (B) Inconsistent

(7) $A(-6, 3)$
$B(6, 4)$

$$O = \left(\frac{-6+6}{2}, \frac{3+4}{2}\right)$$

$$O = \left(0, \frac{7}{2}\right)$$

Ans - (c) $\left[0, \frac{7}{2}\right]$

(6) $AB^2 = AC^2 + BC^2$
$AB^2 = 2AC^2$

Ans - (A) $AB^2 = 2AC^2$

(5) (A) 2

(4) $A(m, -n)$
$B(-m, n)$

$$AB = \sqrt{(m+m)^2 + (-n-n)^2}$$
$$AB = \sqrt{4m^2 + 4n^2}$$

$$AB = 2\sqrt{m^2+n^2}$$

Ans- (C) $2\sqrt{m^2+n^2}$

(3) (B) 4cm

(2) (C) $\frac{4}{3}, \frac{7}{3}, \frac{9}{3}, \frac{12}{3}$

$$\begin{array}{r} 0.8 \\ 1.2 \\ \hline 2.0 \end{array} \qquad \begin{array}{r} 2.8 \\ 0.8 \\ \hline 2.0 \end{array}$$

$3+\sqrt{2}-3 = \sqrt{2}$

$\cancel{3}+2\sqrt{2}-\cancel{3}-\sqrt{2} = \sqrt{2}$

$\frac{7}{3}-\frac{4}{3} =$ $\frac{9}{3}-\frac{7}{3} = \frac{2}{3}$

$-\frac{2}{5}+\frac{1}{5} = \frac{-1}{5}$ $\quad -\frac{3}{5}+\frac{2}{5} = \frac{-1}{5}$

$2x^2+kx+2=0$

For Equal roots;

$b^2-4ac=0$

$k^2-16=0$

$k^2=16$

$k=\pm 4$

Ans (B) ± 4