TARGET MATHEMATICS
THE EXCELLENCE KEY
AGYAT GUPTA (M.Sc., M.Phil.)

21st YEAR OF QUALITY EDUCATION

GENERAL INSTRUCTIONS :-

CODE:- AG-TS-1

1. All questions are compulsory.
2. The question paper consists of 34 questions divided into four sections A,B,C and D. Section – A comprises of 8 question of 1 mark each. Section – B comprises of 6 questions of 2 marks each. Section – C comprises of 10 questions of 3 marks each and Section – D comprises of 10 questions of 4 marks each.
3. Question numbers 1 to 8 in Sections – A are multiple choice questions where you are to select one correct option out of the given four.
4. There is no overall choice. However, internal choice has been provided in 1 question of two marks, 3 questions of three marks each and 2 questions of four mark each. You have to attempt only one lf the alternatives in all such questions.
5. Use of calculator is not permitted.
6. Please check that this question paper contains 6 printed pages.

सामान्य निर्देश :

1. सभी प्रश्न अनिवार्य हैं।
2. इस प्रश्न पत्र में 34 प्रश्न है, जो चार खण्डों में अ, ब, स व द में विभाजित है। खण्ड – अ में 8 प्रश्न हैं और प्रत्येक प्रश्न 1 अंक का है। खण्ड – ब में 6 प्रश्न हैं और प्रत्येक प्रश्न 2 अंको के हैं। खण्ड – स में 10 प्रश्न हैं और प्रत्येक प्रश्न 3 अंको का है। खण्ड – द में 10 प्रश्न हैं और प्रत्येक प्रश्न 4 अंको का है।
3. प्रश्न संख्या 1 से 8 बहुविकल्पीय प्रश्न हैं। दिए गए चार विकल्पों में से एक सही विकल्प चुनें।
4. इसमें कोई भी सर्वोपरि विकल्प नहीं है, लेकिन आंतरिक विकल्प 1 प्रश्न 2 अंको में, 3 प्रश्न 3 अंको में और 2 प्रश्न 4 अंको में दिए गए हैं। आप दिए गए विकल्पों में से एक विकल्प का चयन करें।
5. कैलकुलेटर का प्रयोग वर्जित है।
6. इस प्रश्न–पत्र को पढ़ने के लिऐ 15 मिनिट का समय दिया गया है। इस अवधि के दौरान छात्र केवल प्रश्न–पत्र को पढेंगे और वे उत्तर–पुस्तिका पर कोई उत्तर नहीं लिखेंगें।

Pre-Board Examination 2012 -13

MATHEMATICS CLASS X (SA-2)

Time : 3 to $3\frac{1}{4}$ Hours Maximum Marks : 90

QUADRATIC EQUATION ; AIRTHMETIC PROGRESSION; HIGHTS AND DISTANCE & AREA RELATED TO CIRCLE

SECTION A

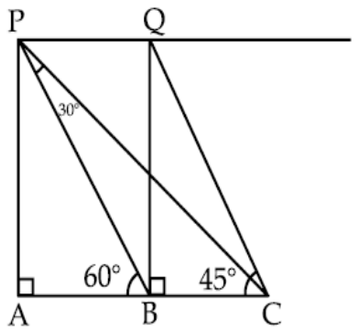
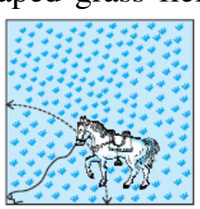
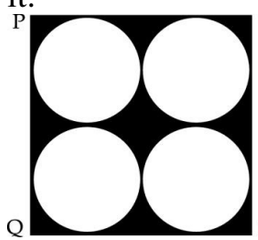
Q.1 The difference between the circumference and the radius of a circle is 37 cm. The area of circle is
(a) $149cm^2$ (b) $154cm^2$ (c) $121cm^2$ (d) $169cm^2$ Ans b

Q.2 The circumference of a circle is 100 cm. the side of a square inscribed in the circle is
(a) $50\sqrt{2}$ cm. (b) $\frac{100}{\pi}$ cm. (c) $\left(\frac{50\sqrt{2}}{\pi}\right)$ cm. (d) $\left(\frac{100\sqrt{2}}{\pi}\right)$ cm. . Ans c

Q.3 If the numbers a, b, c, d, e form an AP , then the value of $a-4b+6c-4d+e$ is
(a) 1 (b) 2 (c) 0 (d) none of these Ans : c

Q.4 The radius of circle is 50 cm. If the radius is decreased by 50 %, its area will be decreased by
(a) 50% (b) 75% (c) 80 % (d) 25% Ans b

Q.5 The value of p so that $x^2+5px+16=0$ has no real roots

	(a) $p > \frac{8}{5}$ (b) $p < -\frac{8}{5}$ (c) $-\frac{8}{5} < p < \frac{8}{5}$ (d) none of these . Ans c
Q.6	From the figure, the angle of depression of point C from the point P is :  (A) 90° (B) 60° (C) 30° (D) 45° Ans. C
Q.7	The discriminant of the quadratic equation $ax^2 - 4ax + (2a+1) = 0$ (a) 4a (2a + 1) (b) 2a (2a + 1) (c) 4a (2a – 1)(d) 2a (4a – 1) Ans c
Q.8	From the top of a lighthouse 60 metres high with its base at the sea level, the angle of depression of a boat is 30^0 . The distance of the boat from the foot of the lighthouse is (a) $10\sqrt{3}$ m (b) $15\sqrt{3}$ m (c) $20\sqrt{3}$ m (d) none of these Ans.d
	SECTION B
Q.9	Shaped grass field of side 15 m by means of a 5 m long rope in given fig  .. Find (i) the area of that part of the field in which the horse can graze. (ii) the increase in the grazing area if the rope were 10 m long instead of 5 m. (Use $\pi = 3.14$) . Ans (i) $19.6m^2$ (ii) 78.5 cm
Q.10	Write the nature of roots of the quadratic equation $\sqrt{5}x^2 - 3\sqrt{6}x - \sqrt{20} = 0$. . Ans D = 94 ; Real , un equal , irrational
Q.11	Find the middle term of the A.P. : 1, 8, 15, …….. 505. . $a = 1, d = 8-1 = 7, a_n = 505$ $a_n = a + (n-1)\,d$ $\therefore\ 505 = 1 + (n-1)\,(7)$ $\therefore\ n = 73$ Middle term is 37^{th} term. ANS: $\therefore\ a_{37} = a + 36\,d = 1 + 36\,(7) = 253$
Q.12	Find the area of the shaded region in the given figure, where PQRS is a square and its side is 28cm, and four circles of equal radii are inscribed in it.  ANS: $d = \frac{S}{2} = \frac{28}{2} = 14$ Area of shaded part = S × S – [4× πr²] $r = \frac{14}{2} = 7$ cm Area of shaded part $= 28 \times 28 - \left[4 \times \frac{22}{7} \times 7 \times 7\right]$ = 784 – [616] = 168 cm²
Q.13	The length of a string between a kite and a point on the ground is 90 metres. If the string makes an angle θ with the ground level such that tan θ = 15/8, how high is the kite? Assume that there is no slack in the string.

Target Mathematics by- Agyat Gupta ; Resi.: D-79 Vasant Vihar ; Office : 89-Laxmi bai colony
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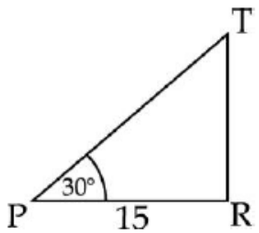
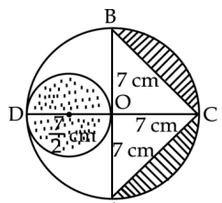
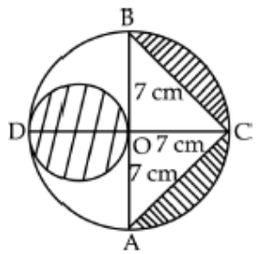
	Ans $h = \frac{1350}{17} = 192.85$ OR From a point on the ground, 15 m away from the base of a tree, the angle of elevation of the top of the tree is 30°. Find the height of the tree. ANS:  In rt. Δ TPR, $\tan 30° = \frac{TR}{15} \Rightarrow TR = \frac{15}{\sqrt{3}} = 5\sqrt{3} = 5 \times 1.732$ $\Rightarrow \frac{1}{\sqrt{3}} = \frac{TR}{15}$ $= 8.660$ $= 8.66$ m
Q.14	Determine p and q such that the equation $3y^2 - 8qy + 4py + 6y + 4q + 2p + 1 = 0$ shall have both roots equal to zero Ans p = -1 q = 1 / 4 ; 4q – 2p = 3 & 4q + 2p = -1
	SECTION C
Q.15	Two ships are sailing in the sea on the either side of the light house, the angle of depression of two ships as observed from the top of the light house are 60° and 45° respectively. If the distance between the ships is $200\left(\frac{\sqrt{3}+1}{\sqrt{3}}\right)$. find the height of the light house. Ans. 200 m
Q.16	If α, β are the roots of the equation $x^2 - 3x + 2 = 0$, then the equation whose roots are $(\alpha + 1)$ and $(\beta + 1)$. ANS : $x^2 - 5x + 6 = 0$.
Q.17	The short and long hands of a clock are 4 cm and 6cm long respectively. Find the sum of the distances traveled by their tips in two days. Take $(\pi = 3.14)$ Ans.Total distance traveled by their tips in two days = $608\pi = 608 \times 3.14 = 1909.12cm$ 910.86cm
Q.18	AB and CD are two diameters of a circle perpendicular to each other and OD is the diameter of the smallest circle. If OA= 7 cm. Find the area of the shaded region.   ANS: Area of circle on DO as diameter $= \pi r^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{2}$ sq. cm Area of semicircle on AB as diameter $= \frac{\pi R^2}{2} = \frac{22 \times 7 \times 7}{7 \times 2} = 77$ sq. cm Area of $\Delta ABC = \frac{1}{2} \times 14 \times 7 = 49$ sq. cm Area of shaded region = a. of circle on DO + A. of semi circle on BA – a. of ΔABC $= \frac{77}{2} + 77 - 49 = 66.5$ sq. cm
Q.19	From the top of a 7m high building, the angle of elevation of the top of a tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower. ANS:

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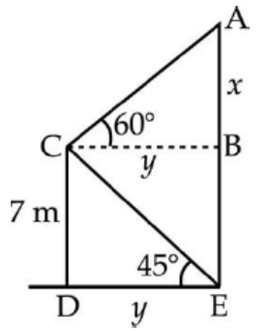


$\frac{7}{y} = \tan 45 = 1$

$\Rightarrow y = 7\text{m}$

$\frac{x}{7} = \tan 60^\circ = \sqrt{3} \Rightarrow x = 7\sqrt{3}\text{m}$

$\Rightarrow AE = 7\sqrt{3}+7 = 7(\sqrt{3}+1)$

$= 7(2.732) = 19.124\text{m}$

Q.20 Solve using quadratic formula : $9x^2 - 9(a+b)x + (2a^2 + 5ab + 2b^2) = 0$

Ans $\left\{\frac{2a+b}{3}, \frac{a+2b}{3}\right\}$

OR

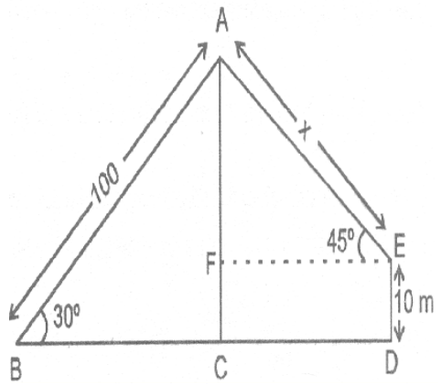
Solve : $\frac{a}{x-b} + \frac{b}{x-a} = 2, x \neq b \text{ and } x \neq a$. **Ans** $\left\{(a+b), \left(\frac{a+b}{2}\right)\right\}$

Q.21 The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is traveling at a speed of 66 km per hour? Ans (Number of revoluation = $\frac{1100000}{2\times\pi\times 40} = \frac{1100000\times 7}{2\times 22\times 40} = 4375$

OR

The wheel of a motor cycle, 70 cm in diameter, makes 40 revolutions in every 10 seconds. What is the speed of the motorcycle in km/hr? Ans : speed of motar cycle = $\frac{8800\times 3600}{10} cm/h = 3168000 cm/h = 31.68 km/h$

Q.22 A boy is standing on the ground and flying a kite with 100 m of string at an elevation of 30^0. Another boy is standing on the roof of a 10 m high building and is flying his kite at an elevation of 45^0. Both the boys are on opposite sides of both the kites. Find the length of the string that the second boy must have so that the two kites meet. **Sol.** Let the length of second string b x m.



In ΔABC ; Sin 30^0 $= \frac{AC}{AB}$ $\frac{1}{2} = \frac{AC}{100} \Rightarrow AC = 50\,\text{m}$ **In ΔAEF Sin 30^0** $= \frac{AF}{AE}$ **;** $\frac{1}{\sqrt{2}} = \frac{AC-FC}{x}$ $\frac{1}{\sqrt{2}} = \frac{50-10}{x}$ **[$\therefore$ AC = 50 m, FC = ED = 10 m]** $\frac{1}{\sqrt{2}} = \frac{40}{x}$ $x = 40\sqrt{2}\text{m}$ **(So the length of string that the second boy must have so that the two kites meet =** $40\sqrt{2}$ **m.)**

Q.23 For what value (s) of k will the quadratic equation $(2k+1)x^2 + 2(k+3)x + (k+5) = 0$ have real and equal

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For real and equal roots $D = b^2 - 4ac = 0$

$\Rightarrow [2(k+3)]^2 = 4.(2k+1)(k+5)$ ½

½

$4(k^2+6k+9) = 8k^2+44k+20$

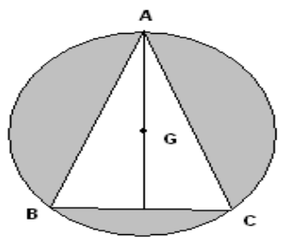
$4k^2+24k+36-8k^2-44k-20=0$

$-4k^2-20k+16=0$ 1

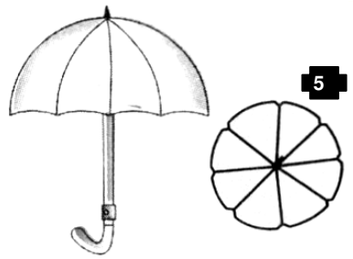
$k^2+5k-4=0$ 1

roots?ANS: $k = \frac{-5 \pm \sqrt{41}}{2}$

Q.24 In figure, ΔABC is an equilateral triangle inscribed in a circle of radius 4 cm. Find the area of shaded portion. Ans 29.48 sqcm



OR



An umbrella has 8 ribs which are equally spaced (see Fig.). Assuming umbrella to be a flat circle of radius 28 cm find the area between the two consecutive ribs of the umbrella. Ans 308 sq cm

SECTION D

Q.25 A bird was sitting on the top of a tree, which is 80m high. The angle of elevation of the bird, from a point of the ground was 45^0. The bird few away horizontally and remained at a constant height. After 2 second the angle of elevation of the bird from the point of observation became 30^0. Find the speed with which the bird flew. Ans speed of the bird

$= \frac{80\sqrt{3}-80}{2} = \frac{58.56}{2} = 29.28 m/s$

Q.26 A contract on construction job specifies a penalty for delay of completion beyond a certain date as follows. Rs. 200 for the first day, Rs. 250 for the second day, Rs. 300 for the third day etc. the penalty for each succeeding day being Rs. 50 more than for the preceding day. How much money the contractor has to pay as penalty, if he has delayed the work for 30 days ? ANS:

Fine for the delay for first day = Rs. 200
Fine for the delay for 2nd day = Rs. 250
Fine for the delay for 3rd day = Rs. 300

Taking n = 30

We know $a_n = a + (n-1)d$

$a_{30} = 200 + (30-1)50$

$= 200 + 29 \times 50$

$= 200 + 1450 = 1650$

Now we get AP as 200, 250, 300 1650

We know $S_n = \frac{n}{2}(a+l)$

$= \frac{30}{2}(200+1650) = 27750$ Rs.

Q.27 The area of an equilateral triangle ABC is 17320.5 cm2. With each vertex of the triangle as centre, a circle is drawn with radius equal to half the length of the side of the triangle in given Fig. Find the area of the shaded region. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73205$) . Ans (side =200 cm ; radius = 100 ; $Area = 17320.5 - 15699.99 = 1620.51 cm^2$

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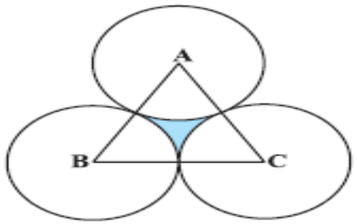
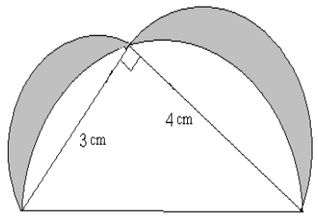
	 **OR**  Find the area of the shaded region. . ans : Area of the design = $D_1 = 5cm; A_1 = \frac{25\pi}{8}; D_2 = 4cm; A_2 = 2\pi$ & $D_3 = 3cm; A_3 = \frac{9\pi}{8} \therefore A(\Delta ABC) = 6unit^2$ $A = \left(\frac{9\pi}{8} + 2\pi + 6\right) - \frac{25\pi}{8} = \frac{886}{56} - \frac{550}{56} = 6unit^2$
Q.28	If the 8th term of the A.P is 37 and the 15th term is 15 more than the 12th term, find the A.P. Hence find the sum of first 15 terms of the A.P. ANS: $a_8 = 37 \Rightarrow a + 7d = 37$ -------(1) $a_{15} = a + 14d = a + 11d + 15$

	$= 14d - 11d = 15$ $3d = 15$ $d = 5$ Putting the value of d in (1) we get $a + 7d = 37$ $a + 7(5) = 37$ $a + 35 = 37$ $a = 37 - 35 = 2$ $\therefore$ AP is 2, 7, 12, ---------- $S_{15} = \frac{n}{2}[2a + (n-1)d] = \frac{15}{2}[2(2)+(15-1)5]$ $= \frac{15}{2} \times 74$ $= 555$
Q.29	If -5 are a root of quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of -5 satisfies $2x^2 + px - 15 = 0$ $\therefore 50 - 5p - 15 = 0$ $5p = 35$ $P = 7$ **1** $px^2 + px + k = 0$ has equal roots $b^2 = 4ac$ is condition of equal roots. $p^2 = 4$ p.k. sub value of p from 1 $p[p - 4k] = 0$ **1** Either $p = 0$ or $p = 4k$ $\Rightarrow k = \frac{p}{4} = +\frac{7}{4} = 1.75$ k. **ANS:** **1**
Q.30	Find the area of the shaded design in Fig. 12.17, where ABCD is a

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square of side 10 cm and semicircles are drawn with each side of the square as diameter. (Use π = 3.14) .

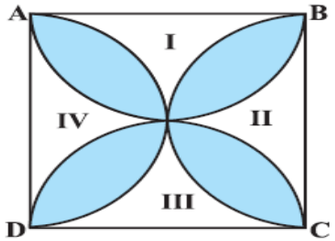


Fig. 12.18

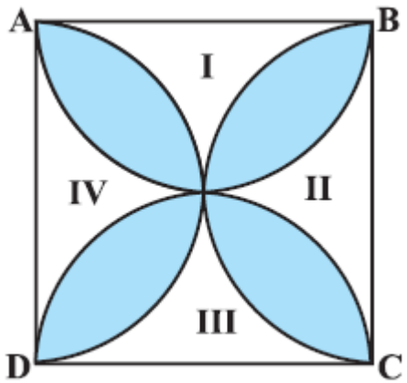


Fig. 12.18

Solution : Let us mark the four unshaded regions as I, II, III and IV (see Fig. 12.18).

Area of I + Area of III = Area of ABCD – Areas of two semicircles of each of radius 5 cm

$$= \left(10 \times 10 - 2 \times \frac{1}{2} \times \pi \times 5^2\right) \text{cm}^2 = (100 - 3.14 \times 25)\ \text{cm}^2$$

$$= (100 - 78.5)\ \text{cm}^2 = 21.5\ \text{cm}^2$$

Similarly, Area of II + Area of IV = 21.5 cm²

So, area of the shaded design = Area of ABCD – Area of (I + II + III + IV)

$$= (100 - 2 \times 21.5)\ \text{cm}^2 = (100 - 43)\ \text{cm}^2 = 57\ \text{cm}^2$$

Q.31 If S_1, S_2, S_3 be the sum of n, 2n and 3n terms respectively of an A.P. prove that $S_3 = 3(S_2 - S_1)$.

OR

How many three digit numbers are such that when divided by 7, leave a remainder 3, in each case. ANS:

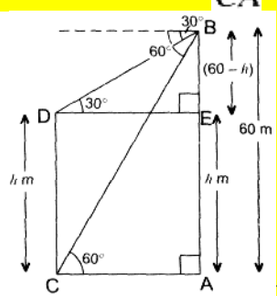
Here $a = 101,\ d = 7,\ a_n = 997$

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

$997 = 101 + (n-1)7$

Getting $n = 129$

Q.32 There are two poles, one each on either bank of a river, just opposite to each other. One pole is 60 m high. From the top of this pole, the angles of depression of the top and the foot of the other pole are 30° and 60° respectively. Find the width of the river and the height of the other pole.**Sol.** Let AB be the first pole and CD be the other one .CA is the river .Draw DE ⊥ AB .Let CD = *hm* = AE BE = (60 - *h*) m . In rt. ΔBAC, $\frac{BA}{CA} = \therefore \frac{60}{CA} = \sqrt{3} \tan 60°$



$\Rightarrow CA = \frac{60}{\sqrt{3}} \Rightarrow CA = \frac{60}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{60\sqrt{3}}{3} \therefore$ Width of river, CA = 20√3 m = 20(1.73) (∵ 3 = 1.73) = 34.6 m Now, In rt. ΔBED

$\frac{BE}{DE} = \tan 30° \therefore \frac{60 - h}{20\sqrt{3}} = \frac{1}{\sqrt{3}} \Rightarrow \frac{60 - h}{20} = 1 \Rightarrow 60 - h = 20 \Rightarrow h = 60 - 20 = 40 \therefore$ Height of the other pole = 40 m

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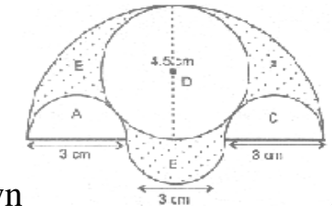
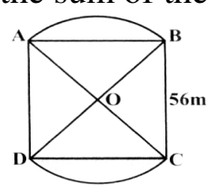
Q.33	In **figure** there are three semicircles, A,B and C having diameter 3 cm each, and another semicircle E having a circle D with diameter 4.5 cm  are shown . Calculate. (i) the area of the shaded region (ii) the cost of painting the shaded region of the 25 paisa per cm^2, to the nearest rupee. Ans: (i) 12.375 cm^2 ,(ii) Rs. 3
Q.34	In Fig., two circular flower beds have been shown on two sides of a square lawn ABCD of side 56 m. If the centre of each circular flower bed is the point of intersection O of the diagonals of the square lawn, find the sum of the areas of the lawn and the flower beds.  Ans 4032 m
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	TO FOLLOW, WITHOUT HALT, ONE AIM : **THERE'S THE SECRET OF SUCCESS .**

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