CLASS – X   CBSE (SA-2) MATHEMATICS

GENERAL INSTRUCTIONS :

1. All question are compulsory.
2. The question paper consists of 34 questions divided into four sections A,B,C and D. Section – A comprises of 10 question of 1 mark each. Section – B comprises of 8 questions of 2 marks each. Section – C comprises of 10 questions of 3 marks each and Section – D comprises of 6 questions of 4 marks each.
3. Question numbers 1 to 10 in Section – 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 marks each. You have to attempt only one lf the alternatives in all such questions.
5. Use of calculator is not permitted.
6. An additional 15 minutes time has been allotted to read this question paper only.

Pre-Board Examination 2011 -12

Time : 3 to $3\frac{1}{4}$ Hours   अधिकतम समय : 3 से $3\frac{1}{4}$

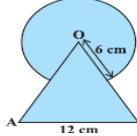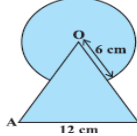Maximum Marks : 80   अधिकतम अंक : 80

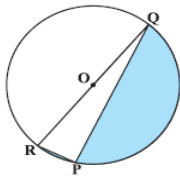Total No. Of Pages : 4   कुल पृष्ठों की संख्या : 4
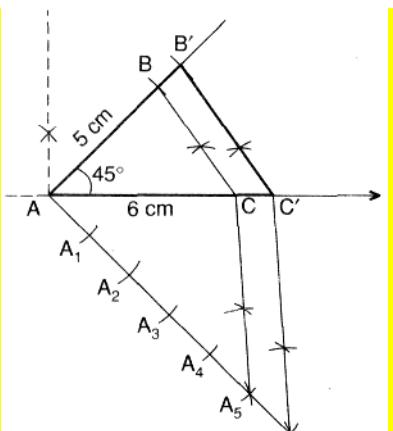
CLASS – X   CBSE (SA-2)   MATHEMATICS

SECTION A

Q.1	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
Q.2	A single letter is selected at random from the word '**PROBABILITY**' .The probability that it is a vowel is (a) $\frac{3}{11}$ (b) $\frac{4}{11}$ (c) $\frac{2}{11}$ (d) $\frac{5}{11}$ Ans (b)
Q.3	The points (-2,-5) , (2,-2) , (8,p) are collinear, then the value of p is (a) $-\frac{5}{2}$ (b) $-\frac{3}{2}$ (c) $\frac{5}{2}$ (d) $\frac{3}{2}$ Ans (c)
Q.4	9th term of an AP is 499 and 499th term is 9. the term which is equal to zero is (a) 507th (b) 508th (c) 509th (d) 510th Ans. B
Q.5	TP and TQ are two tangents to a circle with centre O, so that $\angle POQ = 120^0$, then $\angle OPT$ is equal to (a) 50^0 (b) 60^0 (c) 80^0 (d) 90^0 Ans d
Q.6	The quadratic equation whose roots are twice the roots of $2x^2 - 5x + 2 = 0$ is (a) $8x^2 - 10x + 2 = 0$ (b) $x^2 - 4x + 4 = 0$ (c) $x^2 - 5x + 4 = 0$ (d) $2x^2 - 5x + 2 = 0$ Ans. c
Q.7	The area of the shaded region in Fig. , where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as centre. (a) $\left(36\sqrt{3}\right)cm^2$ (b) $\left(660 + 36\sqrt{3}\right)cm^2$ (c) $\left(\frac{660}{7} + 36\sqrt{3}\right)cm^2$ (d) None Ans c
Q.8	The coordinates of the middle points of the sides of a triangle are (4, 2) (3, 3) and (2, 2), then the coordinates of its centroid are (a) (3, 7/3) (b) (3, 3) (c) (4,3) (d) none of these (Ans. a)
Q.9	The values of k for which the equation $2x^2 - kx + x + 8 = 0$ will have real and equal roots are (a) 9 and -7 (b) only 9 (c) only -7 (d) -9 and 7 . Ans a
Q.10	It is given that in a group of 3 students, the probability of 2 students not having the same birthday is 0.936. what is the probability that the 2 students have the same birthday ? (a) 0.624 (b) 0.064 (c) 1 (d) 0.936 Ans. B

SECTION - B

Q.11	Form a quadratic equation with rational coefficients, one of whose roots is $\frac{2-\sqrt{3}}{5}$. Ans. $s = \frac{4}{5}; p = \frac{1}{25}; 25x^2 - 20x + 1 = 0$
Q.12	The sum of three numbers in A.P. is 27 and their product is 648. Find the numbers. Ans : 6 , 9 12 **OR** If S_n denotes the sum of n terms of an AP whose common difference is d and 1st term is a. Find $S_n - 2S_{n-1} + S_{n-2}$. Ans $T_n - T_{n-1=d}$ =d
Q.13	How many spherical lead shots each 4.2cm in diameter can be obtained from a rectangular solid of lead with dimensions 66cm, 42cm, and 21cm ? *(use $\pi = 22/7$)* Ans 1500
Q.14	Find the value of x, if the distance between the points (x, -1) and (3, 2) is 5. Ans -1 , 7 .
Q.15	Find the probability of getting a number between 1 and 100 which is divisible by 1 and itself only . Ans (25/98)
Q.16	 Find the area of the shaded region in Fig. , if PQ = 24 cm, PR = 7 cm and O is the centre of the circle. Ans ($Area = 160 cm^2$)
Q.17	A metallic sphere of radius 10.5 cm is melted and thus recast into small cones, each of radius 3.5 cm and height 3 cm. find how many cones are obtained. (Ans. 126)
Q.18	Find the values of *x* for which the distance between the points P (2, - 3) and Q (x, 5) is 10 units. **Sol.** PQ = 10 units...(Given) $\therefore$ PQ^2 = 100... (Squaring both sides) $(x - 2)^2 + (5 + 3)^2 = 100$ (By distance formula) $\Rightarrow (x-2)^2 + 64 = 100 \Rightarrow (x - 2)^2 = 100 - 64 = 36 \Rightarrow$ x-2 = $\sqrt{36} = \pm 6 \Rightarrow$ x-2 = 6 or x-2=-6 $\therefore$ *x* = **8** or *x* = **- 4**

SECTION – C

Q.19	Construct a $\triangle$ABC in which CA = 6 cm, AB = 5 cm and $\angle$BAC = 45°, then construct a triangle similar to the given triangle whose sides are $\frac{6}{5}$ of the corresponding sides of the $\triangle$ABC. Sol. ... $\therefore$ $\triangle$AB'C' is the required $\triangle$.
Q.20	From your pocket money, you save Re. 1 on day 1, Rs. 2 on day 2, Rs. 3 on day 3 and so on. How much money will you save in the month of March 2008? **Sol.** Let total money saved be Rs. *x* $= \frac{31}{2}\{1 + 31\}$ $\quad \left[\because S_n = \frac{n}{2}(a+l) \right.$ $= \frac{31}{2} \times 32 = 496$ $\quad$ Ist term, $a=1$ $\therefore$ *x* = 1 +2 + 3 +.... + 31(31 days in March) last term, $l=31$, $n = 31$ Total money saved = **Rs. 496**
Q.21	If circle is inscribed in a $\triangle ABC$ having sides 8cm, 10cm and 12cm as shown in figure. Find
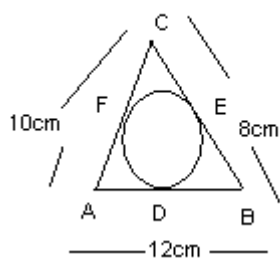
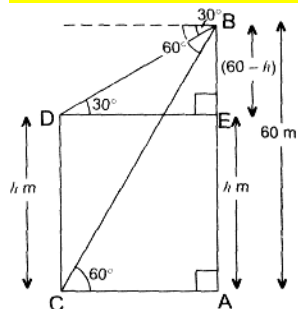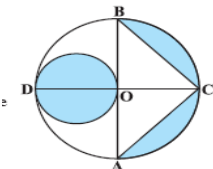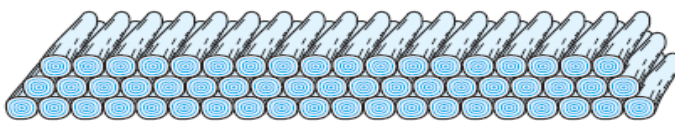|	
	AD, BE and CB. **Ans x =7,y=5,z=3**
Q.22	Given that one root of the quadratic equation $ax^2 + bx + c = 0$ is three times the other, show that $3 b^2 = 16$ ac. **OR** Solve the quadratic equation $9x^2 - 15x + 6 = 0$ by the method of completing the square . **Ans.** $x^2 - \dfrac{15x}{9} = \dfrac{-6}{9} \Rightarrow \left(\dfrac{5}{6}\right)^2 + x^2 - \dfrac{5x}{3} = \dfrac{-2}{3} + \left(\dfrac{5}{6}\right)^2$ **1 ; 2/3** . $\left[x - \left(\dfrac{5}{6}\right)\right]^2 = \dfrac{1}{36} \Rightarrow x - \dfrac{5}{6} = \pm \dfrac{1}{6}$
Q.23	If the point P (x, y) is equidistant from the points A(5, 1) and B(-1, 5), prove that $3x = 2y$.
Q.24	Prove that the angle between two tangents drawn from an external points to a circle is supplementary to the angle subtended by the line segment joining the point of contact at the center .
Q.25	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 = h m = AE BE = (60 - h) m . In rt. ΔBAC, $\dfrac{BA}{CA}$ =∴ $\dfrac{60}{CA}$ = $\sqrt{3}$ tan 60° $\Rightarrow CA = \dfrac{60}{\sqrt{3}} \Rightarrow CA = \dfrac{60}{\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{60\sqrt{3}}{3}$ ∴ Width of river, CA = 20√3 m = 20(1.73) (∵ $\sqrt{3}$ = 1.73) = 34.6 m Now, In rt. ΔBED $\dfrac{BE}{DE}$ = tan 30° ∴ $\dfrac{60-h}{20\sqrt{3}} = \dfrac{1}{\sqrt{3}}$ ⇒ $\dfrac{60-h}{20} = 1$ ⇒60- h = 20 ⇒ h = 60-20 = 40 ∴ Height of the other pole = 40 m
Q.26	Three numbers are in the ratio 3: 7: 9. If 5 is subtracted from the second, the resulting numbers are in A.P. Find the original numbers. **Ans Let nu. Is 3x , 7x 9x acc. To condition 2 (7x- 5) = 3x + 9x : x = 5 & numbers are 15 , 35 & 45 .**
Q.27	Spherical ball of diameter 21cm is melted and recasted into cubes, each of side 1 cm. find the number of cubes thus formed. **Ans 4851** **OR** In Fig. , AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle. If OA = 7 cm, find the area of the shaded region. **Ans ($Area = 66.5 cm^2$**
Q.28	Using A (4,-6), B(3,-2) and C(5,2),verify that a median of the triangle ABC divides it into two triangles of equal areas . **Ans (each $Area = 2 unit^2$** **OR**

The area of a triangle is 5. two of its vertices are (2,1) and (3,-2). The third vertex is (x,y) where y = x+3. find the co-ordinates of the third vertex.   Ans $\left(\frac{7}{2},\frac{13}{2}\right)or\left(-\frac{3}{2},\frac{3}{2}\right)$

SECTION – D

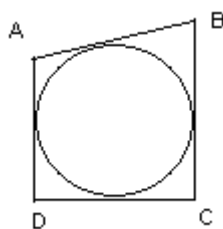| Q.29	If the angle of elevation of a cloud from a point h metres above a lake is α and the angle of depression of its reflection in the lake is β, prove that the distance of the cloud from the point of observation is $\dfrac{2h\sec\alpha}{\tan\beta-\tan\alpha}$.
Q.30	200 logs are stacked in the following manner.20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on. In how many rows are the 200 logs placed and how many logs are there in the top row? Ans : a = 20 ; d = -1 ; $S_n = 200 = \frac{n}{2}[2\times20+(n-1)(-1)] \Rightarrow n2-41n+400=0 \therefore n=16 \& 25$ But $n \neq 25 \therefore n = 16 \& T_{16} = 5$ .There are 5 logs in the top row
Q.31	In the given fig., a circle touches all the four sides of a quadrilateral ABCD with sides AB = 6cm, BC = 7cm and CD = 4cm. Find AD. Ans 3cm
Q.32	From a solid cylinder whose height is 8cm. and radius 6cm, a conical cavity of height 8cm. and base radius 6cm. is hollowed out. Find the volume of the remaining solid correct to two places of decimals. Also find the total surface area of the remaining solid. Ans 11.44 sq.cm OR Water in a canal, 30 dm wide and 12 dm deep, is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed? Ans. 30 minutes
Q.33	Some students arranged a picnic. The budget for food was Rs. 240. Because four students of the group failed to go, the cost of food to each student got increased by Rs. 5. How many students went for the picnic? **Sol.** Let the number of students who arranged the picnic be x . Then the number of students who attended the picnic = (x - 4) .Total cost of food = Rs. 240 **A.T.Q.** $\frac{240}{x-4}-\frac{240}{x}=5$ $\Rightarrow$ $\frac{240[x-(x-4)]}{(x-4)x}=5$ $\Rightarrow \frac{240\times4}{(x-4)x}=5$ $\Rightarrow$ $\frac{48\times4}{(x-4)x}=1 \Rightarrow (x-4)x=192 \Rightarrow x^2-4x-192=0 \Rightarrow x^2-16x+12x-192=0 \Rightarrow$ x(x-16) + 12(x-16) = 0 $\Rightarrow$(x-16)(x + 12) = 0 $\Rightarrow$ x - 16 = 0 or $x + 12 = 0$ x = 16 or x = - 12 (Rejecting) ($\therefore$ Number of students can not be - ve) $\therefore$Number of students who actually went for the picnic = 16-4 = **12** *Or* A plane left 30 minutes late than its scheduled time and in order to reach the destination 1500 km away in time, it had to increase its speed by 250 km/hour from the usual speed. Find its usual speed. Sol. Let the usual speed of plane = x km/hour then the increased speed of the plane $\frac{1500}{x}-\frac{1500}{x+250}=\frac{1}{2}$ $\left[\because Time = \frac{Distance}{Speed},\right.$ $\Rightarrow \frac{1500(x+250-x)}{x(x+250)}=\frac{1}{2}$ $\left. 30 \text{ mins.} = \frac{1}{2} hr.\right]$ = (x + 250) km/hour Distance = 1500 km **A.T.Q.** $\Rightarrow$x(x +250)=1500 × 250×2$\Rightarrow x^2+250x-750000=0\Rightarrow x^2 + 1000x - 750x - 750000 = 0 \Rightarrow$x(x+ 1000)- 750(x+ 1000) = 0$\Rightarrow$(x+1000)(x -750) = 0 $\Rightarrow$ x+ 1000 = 0 or x -750 = 0 $\Rightarrow$ x = -1000 or x = 750 $\therefore$ (Speed of a plane can not be negative) $\therefore$x = 750 $\therefore$Usual speed of the plane = **750 km/hr**
Q.34	Two dice are thrown simultaneously. What is the probability of obtaining a multiple of 2 on one of them and a multiple of 3 on the other . Ans 11 / 36