CBSE Class 10 Maths (Standard) Question Paper Solution 2020 Set 2

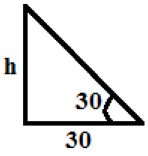
CLASS: X

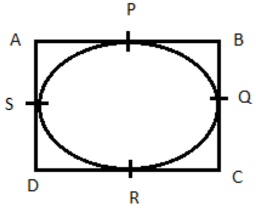
MATHEMATICS STANDARD SOLVED

SET 2 (CODE: 30/5/2) SERIES: JBB/5

Q. NO	SOLUTION	MARKS
	SECTION – A	
1.	(B) ± 4	1
2.	(C) $\frac{4}{3}, \frac{7}{3}, \frac{9}{3}, \frac{12}{3}, \ldots$	1
3.	(B) 4 cm	1
4.	(C) $2\sqrt{m^2+n^2}$	1
5.	(A) 2	1
6.	(A) $AB^2 = 2AC^2$	1
7.	(D) (3, 0) OR (C) $\left(0, \frac{7}{2}\right)$	1 1
8.	(B) inconsistent	1
9.	(A) 50°	1
10.	(C) $3^{\frac{2}{3}}$	1
11.	5 units	1

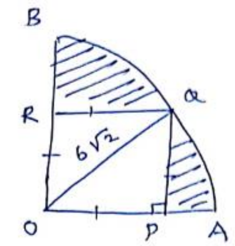
12.	$u_i = \frac{x_i - a}{h}$ $x_i -$ class mark a – assumed mean h – class size	1
13.	Similar	1
14.	1	1
15.	$\left(1-\cos^2 A\right)\left(1+\cot^2 A\right)=\sin^2 A\times \cos ec^2 A=1$	1
16.	LCM × HCF = Product 182 × 13 = 2 6 × x $x=\frac{182\times\cancel{13}}{\cancel{26}\,2}$ x = 91 Other number = 91	½ ½
17.	$k\left[x^2+3x+2\right]$ **OR**	1

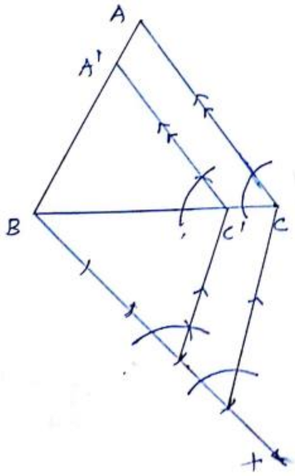
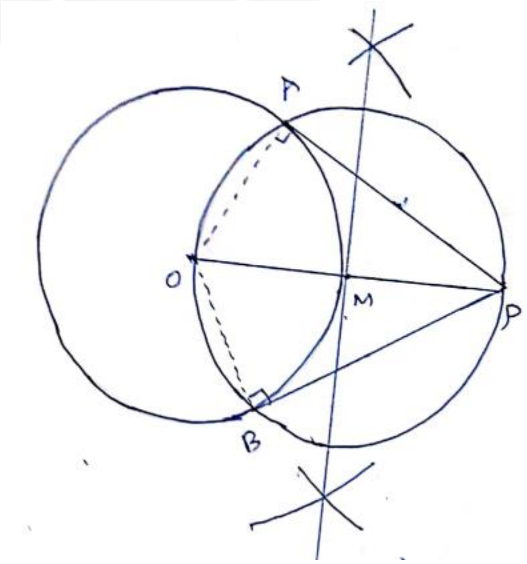
	No. $x^2 - 1$ can't be remainder. Because degree of the remainder should be less than the degree of the divisor.	1
18.	$S_n = \frac{n(n+1)}{2}$ $S_{100} = \frac{100 \times 101}{2} = 5050$	½ ½
19.	2 sec 30 × tan 60 $= 2 \times \frac{2}{\sqrt{3}} \times \sqrt{3} = 4$	½ + ½
20.	 $\tan 30 = \frac{1}{\sqrt{3}} = \frac{h}{30}$ $h = \frac{30}{\sqrt{3}} = 10\sqrt{3}m$	½ ½
SECTION – B		
21.	Modal class : 30 – 40 $\ell = 30, \quad f_1 = 12, \quad f_0 = 7, \quad f_2 = 5, \quad h = 10$ $mod\ e = \ell + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$ $= 30 + \left[\frac{12 - 7}{24 - 7 - 5} \times 10\right]$	½ ½

	$= 30 + \left[\frac{5}{12} \times 10\right]$ $= 30 + \frac{50}{12} = 30 + 4.16..$ $= 34.17$	1
22.	Let P, Q, R and S be point of contact.  $\left.\begin{matrix} AP = AS \\ BP = BQ \\ CQ = CR \\ DS = DR \end{matrix}\right]$ Tangents drawn from external point of circle AB + CD = AP + BP + CR + RD = AS + BQ + CQ + DS = AS + DS + BQ + CQ = AD + BC Hence proved. **(OR)** Perimeter of ΔABC = AB + BC + AC = AB + BD + CD + AC = AB + BP + CQ + AC [Since BD = BP and CD = CQ]	½ ½ 1 ½ ½

	= AP + AQ = 2AP [AP = AQ, Tangents drawn from external point] = 2 × 12 = 24 cm.	½ ½
23.	Number of small cubes made $= \frac{\text{Volume of cube of side 10 cm}}{\text{Volume of cube of side 2 cm}}$ $= \frac{10 \times 10 \times 10}{2 \times 2 \times 2} = 125$ 125 cubes can be made.	1 1
24.	Given DE || AC $BPT \Rightarrow \frac{BE}{EC} = \frac{BD}{AD}$ ......1 $and, DF \parallel AC$ $By\ BPT \Rightarrow \frac{BF}{FE} = \frac{BD}{AD}$ ......2 $From 1 and 2$ $\frac{BE}{EC} = \frac{BF}{FE}$ Hence proved.	½ ½ 1
25.	Let $5 + 2\sqrt{7}$ be rational. So $5 + 2\sqrt{7} = \frac{a}{b}, where'a'and'b'are\ integersb \neq 0$	½

	$2\sqrt{7}=\frac{a}{b}-5$ $2\sqrt{7}=\frac{a-5b}{5}$ $\sqrt{7}=\frac{a-5b}{2b}$ Since ‘a’ and ‘b’ are integers a – 5b is also an integer. $\frac{a-5b}{2b}$ is rational. So RHS is rational. LHS should be rational. but it is given that $\sqrt{7}$ is irrational .Our assumption is wrong. So $5+2\sqrt{7}$ is an irrational number. **(OR)** $12^n = (2 \times 2 \times 3)^n$ If a number has to and with digit 0. It should have prime factors 2 and 5. By fundamental theorem of arithmetic, $12^n = (2 \times 2 \times 3)^n$ It doesn’t have 5 as prime factor. So 12^n cannot end with digit 0.	½ 1 1 1
26.	Given A, B and C are interior angles of ΔABC So $A + B + C = 180$ $B + C = 180 – A$ $\frac{B+C}{2}=\frac{180-A}{2}=90-\frac{A}{2}$ $\frac{B+C}{2}=90-\frac{A}{2}$	1

	$\cot\left(\frac{B+C}{2}\right)=\cot\left(90-\frac{A}{2}\right)$ $\cot\left(\frac{B+C}{2}\right)=\tan\frac{A}{2}$	1
	SECTION – C	
27.	Given,  Radius of circle r = $6\sqrt{2}$ OA = OB = OQ = $6\sqrt{2}$ cm In Δ OPQ, $(OP)^2 + (PQ)^2 = (OQ)^2$ $2(OP)^2 = \left(6\sqrt{2}\right)^2$ a = op = 6 cm Area of the shaded region = ar (quadrant, with r = $6\sqrt{2}$) – ar (square with side 6 cm) $= [\frac{1}{4}\pi \times r^2] - a^2$ $= [\frac{1}{4} \times 3.14 \times \left(6\sqrt{2}\right)^2] - 6^2$ $= [18\ x\ 3.14] - 36 = 56.52 - 36$ $= 20.52cm^2(app)$	1 1 1

28.	For correct construction of Δ ABC AB = 5 cm, BC= 6 cm , $\angle B = 60°$ A’B C’ is required similar Δ. A’ B C’ is similar to ABC $\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{3}{4}$  For correct construction of similar triangle with scale factor ¾ OR 	1 2

	For correct construction of given circle OP = 7cm , OA = OB = 3.5 cm. PA and PB are required tangents to the circle with centre O. For correct construction of tangents	1 2
29.	LHS : $\frac{2\cos^3\theta-\cos\theta}{\sin\theta-2\sin^3\theta}=\frac{\cos\theta\left[2\cos^2\theta-1\right]}{\sin\theta\left[1-2\sin^2\theta\right]}$ $=\frac{\cot\theta\left[2\left(1-\sin^2\theta\right)-1\right]}{1-2\sin^2\theta}$ $=\frac{\cot\theta\left[2-2\sin^2\theta-1\right]}{\left(1-2\sin^2\theta\right)}=\frac{\cot\theta\left[1-2\sin^2\theta\right]}{1-2\sin^2\theta}$ $=\cot\theta$	1 1 1
30.	Let the fraction be $\frac{x}{y}$ as per the question, $\frac{x-1}{y}=\frac{1}{3}$ 3x – 3 = y 3x – y = 3 ……………. 1 and, $\frac{x}{y+8}=\frac{1}{4}$ 4x = 8 + y 4x – y = 8 …………… 2 By elimination,	1 ½

$$\Theta \begin{array}{r} 3x - y = 3 \\ \underline{4x - y = 8} \\ -x = -5 \\ x = 5 \end{array}$$

$Put\ x = 5\ in 1$

$15 - y = 3$

$y = 12$

1 + ½

$\therefore The\ required\ fraction\ is\ \frac{5}{12}$

OR

Let the present age of son be ‘x’ years

	Father	Son
Present age	3x + 3	X
Three years hence	3x + 6	x + 3

1

As per question,

$3x + 6 = 10 + 2 (x + 3)$

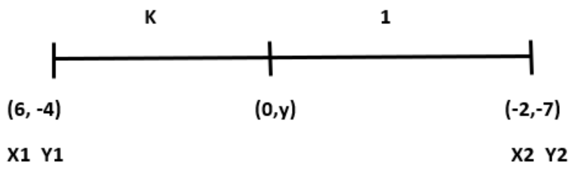
$3x + 6 = 10 + 2x + 6$

1

$x = 10$

Father’s present age = $3x + 3$

$= 3 \times 10 + 3 = 33$

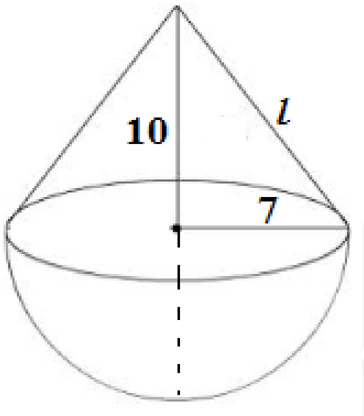
	∴ Present age of son = 10 years Present age of father = 33 years	1
31.	Required number = HCF [870 – 3, 258 - 3] = HCF [867, 255] 867 = 255 × 3 + 102 (by EDL) 255 = 102 × 2 + 51 102 = 51 × 2 HCF = 51 ∴ Required number = 51	1 2
32.	Y axis divides the line segment . Any point on y – axis is of the form (o, y) As per the question  As per section formula, $P(x,y) = \left(\frac{kx_2+x_1}{k+1}, \frac{ky_2+y_1}{k+1}\right)$	½ ½

	$= \left(\frac{-2k+6}{k+1}, \frac{-7k-4}{k+1}\right)$ $\frac{-2k+6}{k+1} = 0$ $-2k+6=0$ $2k=6$ $k=3$ $\therefore Ratio 3:1$ $y = \frac{-7k-4}{k+1} = \frac{-21-4}{4} = \frac{-25}{4}$ $\therefore Point\ of\ intersection \left(0, \frac{-25}{4}\right)$ **(OR)** Distance between 2 points $= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $(x_1,y_1)\ (x_2,y_2)$ $AB = \sqrt{9^2+5^2} = \sqrt{81+25} = \sqrt{106}$ $BC = \sqrt{5^2+9^2} = \sqrt{25+81} = \sqrt{106}$ $CA = \sqrt{4^2+14^2} = \sqrt{16+196} = \sqrt{212}$ (by Pythagoras theorem) $AB^2 + BC^2 = AC^2$ $(\sqrt{106})^2 + (\sqrt{106})^2 = (\sqrt{212})^2$ 106 + 106 = 212 $\therefore$ ABC is an isosceles right angled Δ.	1 1 ½ 1 + ½ 1
33.	Given: a = 54	

	d = -3 $n = ?$ $a_n = 0$ $S_n = ?$ $a_n = a + (n-1)d = 0$ $54 + (n-1)(-3) = 0$ $(n-1)(-3) = -54$ $(n-1) = 18$ $n = 19$ $S_n = \frac{n}{2}[a + a_n]$ $S_{19} = \frac{19}{2}[54+0] = 19 \times 27 = 513$ $n = 19, \quad S_n = 513$	½ 1 ½ 1
34.	(i) P(to pick a marble from the bag) = P(spinner stops an even number) A = {2, 4, 6, 8, 10} n (A) = 5 n (S) = 6 $\Rightarrow P(A) = \frac{n(A)}{n(S)} = \frac{5}{6}$	½ 1

	(ii) P(getting a prize) = P(bag contains 20 balls out of which 6 are black) $= \frac{6}{20} = \frac{3}{10}$	½ 1
SECTION – D		
35.	Let the sides of the two squares be x and y (x > Y) difference of perimeter is = 32 $4x - 4y = 32$ $X - y = 8 \Rightarrow y = x - 8$ Sum of area of two squares = 544 $x^2 + y^2 = 544$ $x^2 + (x - 8)^2 = 544$ $x^2 + x^2 + 64 - 16x = 544$ $2x^2 - 16x = 480$ $\div 2$, $x^2 - 8x = 240$ $x^2 - 8x - 240 = 0$ $(x - 20)(x + 12) = 0$ $X = 20, -12$	1 2

	Side can’t be negative.	
	So x = 20	
	y = x – 8 = 20 – 8 = 12	
	∴ Sides of squares are 20 cm,12cm	1
	(OR)	
	Speed of boat = 18 km/hr	
	Let speed of the stream be =x km/hr	
	Speed of upstream $=(18-x)km/hr$	
	Speed of downstream $=(18+x)km/hr$	
	Distance = 24 km	
	Time $=\frac{Distance}{Speed}$	1
	As per question,	
	$\frac{24}{18-x}-\frac{24}{18+x}=1$	1
	$24\left[\frac{1}{18-x}-\frac{1}{18+x}\right]=1$	
	$\frac{18+x-18+x}{(18-x)(18+x)}=\frac{1}{24}$	
	$\frac{2x}{324-x^2}=\frac{1}{24}$	
	$324-x^2=48x$	

	$x^2+48x-324=0$ $(x+54)(x-6)=0$ $x=6,\ -54$ $\therefore \quad x=6\ km/hr$ Speed of stream $=6\ km/hr$	2
36.	Volume of the toy = Volume of cone + Volume of hemisphere  Cone: r = 7 cm h = 10 cm Hemisphere: r = 7 cm Volume of toy $=\frac{1}{3}\pi r^2 h+\frac{2}{3}\pi r^3$	1

$$=\frac{1}{3}\pi r^2\left[h+2r\right]$$

$$=\frac{1}{3}\times\frac{22}{7}\times7\times7\left[10+14\right]$$

$$=\frac{1}{3}\times22\times7\times24$$

Volume of toy $=1232\,cm^3$ 1

Area of coloured sheet required to cover the toy = CSA of cone + CSA of hemisphere ½

$$=\pi rl+2\pi r^2$$

$$=\pi r\left[l+2r\right]$$

$$=\frac{22}{7}\times7\left[12.2+14\right]$$

$$l^2=10^2+7^2$$

$$l^2=100+49$$

$$l=\sqrt{149}$$

$$l=12.2$$ ½

$$=22\times26.2$$ 1

$$=576.4\,cm^2$$

37.

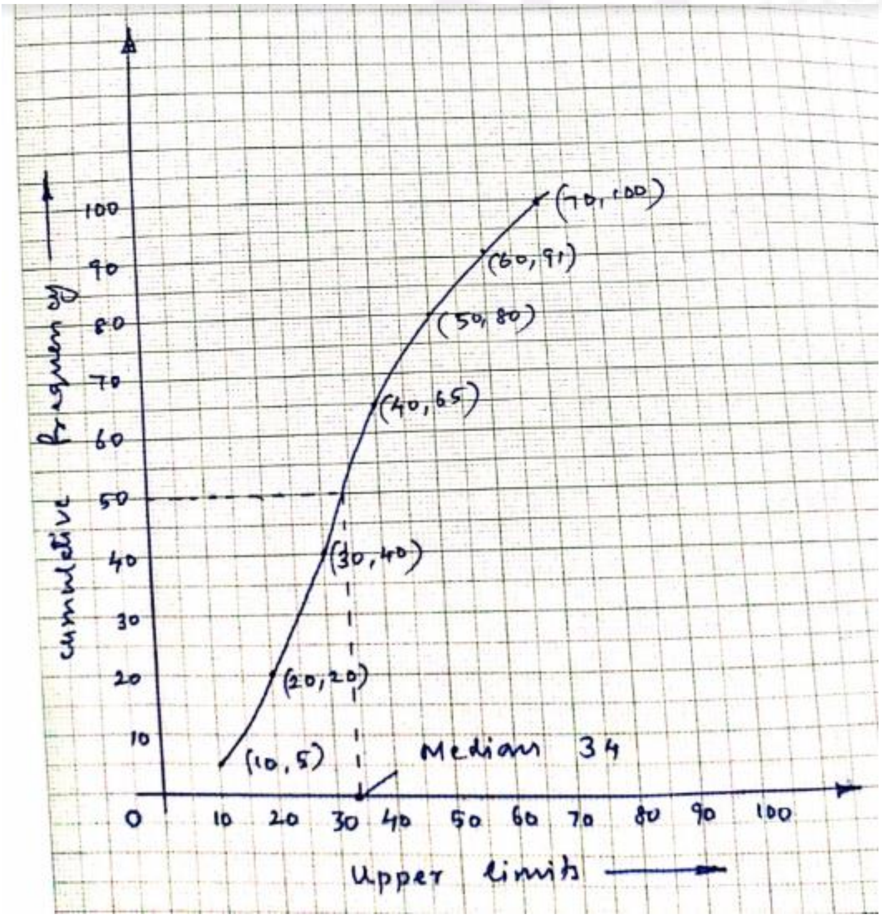
Age	No. of persons	Class	CF
0 – 10	5	Less than 10	5
10 – 20	15	Less than 20	20

20 – 30	20	Less than 30	40
30 – 40	25	Less than 40	65
40 – 50	15	Less than 50	80
50 – 60	11	Less than 60	91
60 – 70	9	Less than 70	100

Coordinates to plot less than ogive: (10, 5) (20, 20) (30, 40) (40, 65) (50, 80) (60, 91)(70, 100)

2

N = 100 , N/2 = 50 Median = 34



2

(OR)

To find mean

Number of wickets	**Number of bowlers (f)**	**xi**	$u_i = \frac{x_i - a}{h}$	**u_i f_i**
20 – 60	7	40	-3	-21
60 – 100	5	80	-2	-10
100 – 140	16	120	-1	-16
140 – 180	12	160	0	0
180 – 220	2	200	1	2
220 – 260	3	240	2	6
	45			**-39**

1

Assumed mean a = 160

Class size h = 40

$$Mean\ \bar{x} = a + \left(\frac{\sum f_i u_i}{\sum f_i} \times h\right)$$

$$= 160 + \left(\frac{\cancel{-39}\ -13}{\cancel{45}\ \cancel{9}\ 3} \times \cancel{40}\right)$$

$$= 160 + \left(\frac{-104}{3}\right)$$

$$= 160 - 34.66\ ...$$

$$= 160 - 34.67$$

$$\bar{x} = 125.33$$

1

To find median,

Number of workers CI	No. of bowlers (f)	CF
20 – 60	7	7
60 – 100	5	12
100 – 140	16	28
140 – 180	12	40
180 – 220	2	42
220 – 260	3	45

1

N = 45, > N/2 ➔ > 22.5

Median class: 100 – 140

F = 16 h = 40

CF = 12 l = 100

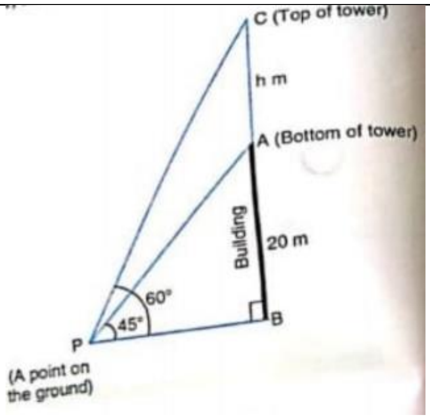
$$Median = \ell + \left(\frac{{}^{N}\!/_{2} - CF}{f} \times h \right)$$

$$= 100 + \left(\frac{\frac{45}{2} - 12}{\cancel{16}\,4} \times \cancel{40}\,10 \right)$$

$$= 100 + \frac{105}{4} = 100 + 26.25$$

$$= 126.25$$

1

38.	 Let the height of the tower be *h* m. Then, in right triangle CBP, $\tan 60^o = \frac{BC}{BP}$ $\Rightarrow \quad \sqrt{3} = \frac{AB + AC}{BP}$ $\sqrt{3} = \frac{20 + h}{BP}$ ….. (i) In right triangle ABP, $\tan 45^o = \frac{AB}{BP}$ $\Rightarrow \quad 1 = \frac{20}{BP}$ …… (ii) Dividing (1) by (2), we get	1 1

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

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

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

$$\Rightarrow \quad h = 20\left(\sqrt{3} - 1\right)$$

Hence, the height of the tower $20\left(\sqrt{3}-1\right)m$ =20(1.73-1)=20 x 0.73= 14.6 m

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For correct Given, to prove, Construction and figure

For Correct proof

Pythagoras theorem proof: Refer NCERT text book Pg: No. 145

</td><td>½ x 4 =
2
2</td></tr>
<tr><td>40.</td><td>

$p(x) = 2x^4 – x^3 -11 x^2 + 5x + 5$

Two zeros are $\sqrt{5}$ *and* $-\sqrt{5}$

$\therefore x = \sqrt{5} \quad x = -\sqrt{5}$

$\left(x-\sqrt{5}\right)\left(x+\sqrt{5}\right) = x^2 - 5$ is a factor of p(*x)*

To find other zeroes

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

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<td>$\therefore 2x^2 - x - 1 \, is \, a \;\, factor$
$2x^2 - 2x + x - 1 = 0$
$2x (x - 1) + 1 (x - 1) = 0$
$(2x + 1) \qquad\qquad (x - 1) = 0$
$x = -1/2 \qquad\qquad x = 1$
$\therefore$ Other zeroes are -1/2, 1

(OR)

$\begin{array}{r|l} & 2x + 5 \\ \hline x^2 - 4x + 8 & 2x^3 - 3x^2 + 6x + 7 \\ & - \quad + \quad - \\ & 2x^3 - 8x^2 + 16x \\ \hline & 5x^2 - 10x + 7 \\ & - \quad + \quad - \\ & 5x^2 - 20x + 40 \\ \hline & 10x - 33 \\ \hline \end{array}$

So -10x + 33 has to be added</td>
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3

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