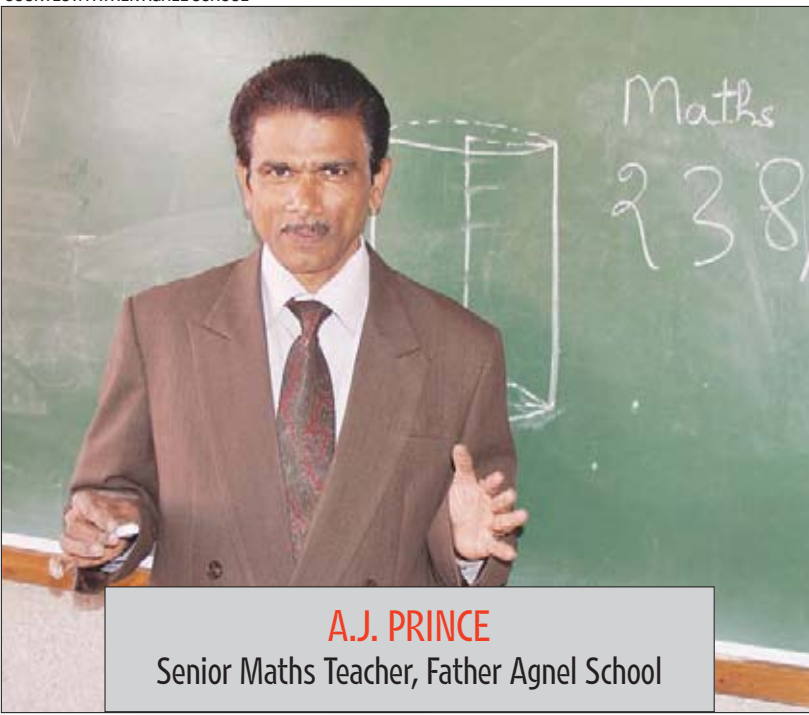




COURTESY: FATHER AGNEL SCHOOL



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## FIGURE IT OUT

# Maths made easy

If the Maths paper in the Class X Board exam has been sending jitters down your spine, read these solutions, says A.J. PRINCE

**Though** it is imperative to complete the syllabus of Class X Maths to fair well, average students may choose to study selectively during these last few weeks and focus on a few important topics, according to the mark distribution given below:

1. Algebra: (Linear Equation, Polynomials, Rational Expression, Quadratic Equation, Arithmetic Progression): 20 marks
2. Geometry: (Similar Triangles, Circles, Tangents to a Circle, Geometrical Constructions): 18 marks
3. Commercial Maths: (Installments, Income Tax): 10 marks
4. Statistics: 10 marks
5. Trigonometry: 8 marks
6. Mensuration: 8 marks
7. Coordinate Geometry: 6 marks

### Graph

It is found that for the problem on finding a graphical solution of linear equation, students forget to write the solution which carries one mark. Remember to write the graphical solution on the graph paper itself. Also note that the graph to a linear equation will always be a straight line.

**Question:** Solve the following system of linear equation graphically. Also find the coordinates of the point where these lines meet the x-axis

$$2x + y - 6 = 0$$

$$2x - y + 2 = 0$$

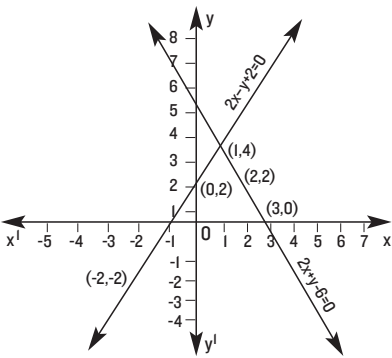
**Solution:**

$$2x + y - 6 = 0 \quad 2x - y + 2 = 0$$

$$y = 6 - 2x \quad y = 2x + 2$$

x	1	3	2
y	4	0	2

x	2	-2	0
y	6	-2	2



The points where the lines meet the x-axis are A (3,0) and B (-1,10)

### Polynomials

Students go wrong in the factorisation of Polynomials using the factor theorem.

**Question:** Find 'a' and 'b' so that the polynomials  
 $P(x) = (x^2 - ux - 21)(x^2 - 4x + a)$  and  
 $Q(x) = (x^2 - 5x + 6)(x^2 - 4x + b)$  have  
 $(x+3)(x-2)$  as their HCF

**Solution:**  
 $P(x) = (x-7)(x+3)(x^2 - 4x + a)$   
 $Q(x) = (x-2)(x-3)(x^2 - 4x + b)$   
 HCF =  $(x+3)(x-2)$   
 $P(+2) = 0$  (factor theorem)  
 $\Rightarrow 4 - 4x + a = 0$   
 $\therefore a = 4$   
 $Q(-3) = 0$  (factor Theorem)  
 $\Rightarrow 9 + 12 + b = 0$   
 $\therefore b = -21$   
 Hence  $a = 4, b = -21$

While expressing a rational expression in the lowest form, you have to follow the 'BODMAS' rule. Algebraic identities such as  $a^2 - b^2 = (a+b)(a-b)$  ( $a^2 - ab + b^2$ );  $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$  etc. have to be used for the factorisation of polynomials wherever possible.

Qn.  $\frac{x^3 - 125}{x^3 - 4x - 5} \times \frac{x^2 - 1}{x^2 + x - 2} + \frac{x^2 + 5x + 25}{x^2 + 4x + 4}$

Sol.  $\frac{x^3 - 5^3}{x^3 - 4x - 5} \times \frac{x^2 - 1}{x^2 + x - 2} + \frac{x^2 + 4x + 4}{x^2 + 5x + 25}$

$$\frac{(x-5)(x^2+5x+25)}{(x-5)(x-1)} \times \frac{(x-1)(x+1)}{(x+2)(x-1)} + \frac{(x+2)(x+2)}{(x^2+5x+25)}$$

After cancellation, get the final answer (x+2)

### Quadratic Equation

For the general quadratic equation  $ax^2 + bx + c = 0$ , the discriminant is  $D = b^2 - 4ac$   
 If  $D > 0$ , one root is  $\alpha = \frac{-b + \sqrt{D}}{2a}$

$\angle OBC = 60^\circ$   
 $\Rightarrow \triangle OBC$  is equiangular and hence equilateral  
 $\therefore OB = OC = BC = r$

### Installments

Expect two questions from this chapter in the Board examination based on the calculation of equal monthly/yearly installments, rate of interest and sum borrowed. The simple interest formula should definitely be mastered. In the computation of income tax, be familiar with the three slabs namely, (i) salaried man (ii) salaried woman and (iii) senior citizen. Practice at least one sum from income tax daily using the latest slab (year-2006-07).

**Question:** Mr. Anil's (age 52 years) salary is Rs. 50,000 per month. He contributes Rs. 5,000 per month towards PF and pays Rs. 15,000 as annual LIC premium. He invests Rs. 20,000 in NSC. In addition to this he donates Rs. 10,000 towards the PM's National Relief Fund and donates Rs. 10,000 to a charity earning a deductions of 100 per cent and 50 per cent respectively on the amount donated. Calculate the income tax payable by him at the end of the financial year if his earlier deduction from salary towards income tax was Rs. 7,600 per month for 11 months.

**Solution:** Mr. Anil's annual income =  $50,000 \times 12 = \text{Rs } 6,00,000$   
 Deduction on donation:  
 PM Relief's Fund =  $(100/100) \times 10,000 = \text{Rs. } 10,000$   
 50% deduction of charity =  $(50/100) \times 10,000 = \text{Rs. } 5,000$   
 Thus, total deduction on donation = Rs. 15,000

Annual income - admissible donation = Rs. 5,85,000  
 Saving: PF =  $5000 \times 12 = \text{Rs. } 60,000$   
 LIC = Rs. 15,000  
 NSC = Rs. 20,000  
 Thus, total savings = Rs. 95,000

Taxable income =  $\text{Rs. } (5,85,000 - 95,000) = \text{Rs. } 4,90,000$   
 Income tax =  $\text{Rs. } 25,000 + (30/100) \times 2,40,000 = \text{Rs. } 97,000$   
 Educational cess =  $(2/100) \times 97,000 = \text{Rs. } 1,940$   
 Income tax + Education cess =  $97,000 + 1,940 = \text{Rs. } 98,940$   
 Advance Tax paid =  $7600 \times 11 = \text{Rs. } 83,600$   
 Tax payable in the last month =  $\text{Rs. } (98,940 - 83,600) = \text{Rs. } 15,340$

### Statistics and co-ordinate geometry

Students often go wrong in calculation in questions from statistics such as multiplication, addition etc. Learn the necessary formula for the calculation of arithmetic mean of raw data, ungrouped data and grouped data

**Question:** The mean of the following frequency distribution is 57.6 and the sum of the frequency is 50. Find the missing frequencies  $f_1$  and  $f_2$

**Solution:**  $7f_1 + 12f_2 + 8 + 5 = 50$   
 $f_1 + f_2 = 18$  — (1)

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	7	$f_1$	12	$f_2$	8	5

Class	freq. ( $f_i$ )	$X_i$	$f_i X_i$
0-20	7	10	70
20-40	$f_1$	30	$30f_1$
40-60	12	50	600
60-80	$f_2$	70	$70f_2$
80-100	8	90	720
100-120	6	110	550
Total	50		$1940 + 30f_1 + 70f_2$

Also  $57.6 = (1940 + 30f_1 + 70f_2) / 50$   
 $\Rightarrow 3f_1 + 7f_2 = 94$  — (2)  
 Solving equation (1) and (2), we get  $f_1 = 8$  and  $f_2 = 10$   
 $\therefore$  the missing frequencies are  $f_1 = 8$  and  $f_2 = 10$

### Pie-charts

Regarding pie-charts, one of the following two types will be asked in the Board:

- (i) Draw a pie-chart for the given data
- (ii) Answer on the basis of a given pie-chart

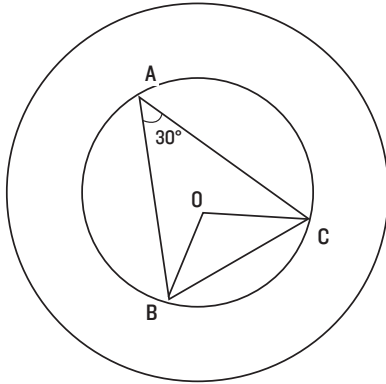
Usually students take more time in drawing a pie-chart and are advised to practice a pie-chart daily within time limit of five minutes.

Be prepared to get two questions from coordinate geometry: one on distance formula and the other on section formula. Students are advised to do the examples and exercise from the NCERT text book.

If you study selectively, focusing on these areas, you can easily secure 70-85 per cent. Practise at least five to six model test papers to learn time management. ■

If you are abreast with these 11 theorems and the geometrical constructions, you will be able to score very well. Students confuse Pythagora's theorem with its converse and the degree measure theorem with alternate segment theorem. So learn the statements of the theorems carefully and give the proofs of these.

**Question:** In the following figure, O is the centre of the circumcircle of  $\triangle ABC$ . Show that BC is a measure of the radius of the circle.



**Solution:**  
 $\angle BAC = 30^\circ$  (given)  
 $\therefore \angle BOC = 60^\circ$  (because of degree measure theorem)  
 In  $\triangle OBC$ ,  $OB = OC$  (radii)  
 $\therefore \angle OBC = \angle OCB$  (as angle opp. to equal sides of a  $\triangle$ )  
 $\angle OBC + \angle BOC + \angle OCB = 180^\circ$  (according to angle sum property of a  $\triangle$ )  
 $\angle OBC + 60^\circ + \angle OBC = 180^\circ$  (as  $\angle OBC = \angle OCB$ )  
 $2\angle OBC = 120^\circ$

