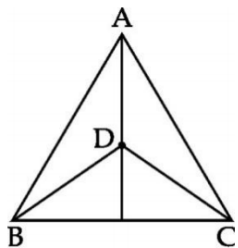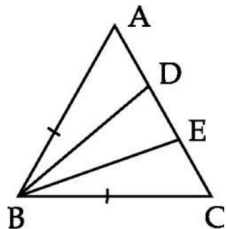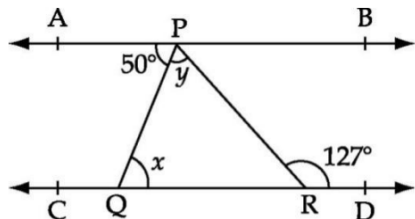21. In the given figure, AB = AC, D is the point in the interior of ΔABC such that ∠DBC = ∠DCB. Prove that AD bisects ∠BAC of ΔABC.

22. In the given figure, AB = BC and AD = EC. Prove that ΔABE ≅ ΔCBD.

23. In the given figure, if AB∥CD, ∠APQ = 50° and ∠PRD = 127°, find x and y.

24. The perimeter of a triangular field is 300 cm and its sides are in the ratio 5 : 12 : 13. Find the length of the perpendicular from the opposite vertex to the side whose length is 130 cm.

Section D

25. Find the values of a and b if $\dfrac{7+3\sqrt{5}}{3+\sqrt{5}} - \dfrac{7-3\sqrt{5}}{3-\sqrt{5}} = a + b\sqrt{5}$.

Or

Evaluate after rationalizing the denominator of $\left(\dfrac{25}{\sqrt{40}-\sqrt{80}}\right)$. It is being given that √5 = 2.236, √10 = 3.162.

26. Simplify: $\dfrac{1}{2+\sqrt{5}} + \dfrac{1}{\sqrt{5}+\sqrt{6}} + \dfrac{1}{\sqrt{6}+\sqrt{7}} + \dfrac{1}{\sqrt{7}+\sqrt{8}}$.

27. Prove that: $(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3 = 3(a + b)(b + c)(c + a)(a - b)(b - c)(c - a)$.

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Mathematics
(Test 1 for SA – 1, Sep' 2012)

**Time allowed: 3 hours**   **Maximum Marks: 90**

General Instructions:
(i) All questions are compulsory.
(ii) The question paper consists of 34 questions divided into four sections A, B, C and D. Section A comprises of 8 questions 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 10 questions of 4 marks each.
(iii) Question numbers 1 to 8 in section - A are multiple choice questions where you are to select one correct option out of the given four.
(iv) There is no overall choice. However, internal choice have 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 of the alternatives in all such questions.
(v) Use of calculator is not permitted.

Section A

Question numbers 1 to 8 carry one mark each. For each question, four alternative choices have been provided of which only one is correct. You have to select the correct choice.

1. $\dfrac{p}{q}$ form of the number $0.\overline{3}$ is:

(a) $\dfrac{3}{10}$ (b) $\dfrac{3}{100}$ (c) $\dfrac{1}{3}$ (d) $\dfrac{1}{2}$

2. Which of the following is a cubic polynomial?
(a) $x^3 + 3x^2 – 4x + 3$ (b) $x^2 + 4x – 7$ (c) $3x^2 + 4$ (d) $3(x^2 + x + 1)$

3. If a polynomial $f(x)$ is divided by x – a, then remainder is
(a) $f(0)$ (b) $f(a)$ (c) $f(-a)$ (d) $f(a) – f(0)$

4. What is the remainder when $x^3 – 2x^2 + x + 1$ is divided by (x – 1)?
(a) 0 (b) -1   (c) 1   (d) 2

5. In the figure below if AB = AC, the value of x is:
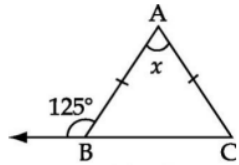
(a) 55°　　(b) 110 °　　(c) 50°　　(d) 70°

6. If ΔABC is congruent to ΔDEF by SSS congruence rule, then:
   (a) $\angle C < \angle F$　　　(b) $\angle B < \angle E$
   (c) $\angle A < \angle D$　　　(d) $\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$

7. The area of an equilateral triangle is $16\sqrt{3}$ m². Its perimeter (in metres) is:
   (a) 12　　(b) 48　　(c) 24　　(d) 306

8. The base of a right triangle is 15 cm and its hypotenuse is 25 cm. Then its area is :
   (a) 187.5 cm²　　(b) 375 cm²　　(c) 150 cm²　　(d) 300 cm²

Section B

9. Simplify: $\left(\dfrac{64}{125}\right)^{-2/3}$

10. If $(x - 1)$ is a factor of the polynomial $p(x) = 3x^4 - 4x^3 - ax + 2$ then find the value of 'a'.

11. Simplify: $(\sqrt{3} + 2)(\sqrt{3} - 2)$.

12. In the given figure, find the value of x.
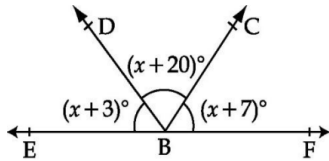
13. In the figure, OA = OB and OD = OC. Show that
    (i) $\Delta AOD \cong \Delta BOC$　　　(ii) AD ∥ BC.
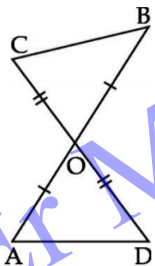
Or

An exterior angle of a triangle is 120° and one of the interior opposite angles is 40°. Find the other two angles of a triangle.

14. A point lies on x–axis at a distance of 9 units from y–axis. What are its coordinates? What will be the coordinates of a point if it lies on y axis at a distance of - 9 units from x–axis?

Section C

15. Find the value of $\left(\dfrac{64}{125}\right)^{-2/3} + \dfrac{1}{\left(\dfrac{256}{625}\right)^{1/4}} + \dfrac{\sqrt{25}}{\sqrt[3]{64}}$

Or

Represent √3 on number line.

16. Prove that $\dfrac{1}{2+\sqrt{3}} + \dfrac{2}{\sqrt{5}-\sqrt{3}} + \dfrac{1}{2-\sqrt{5}} = 0$

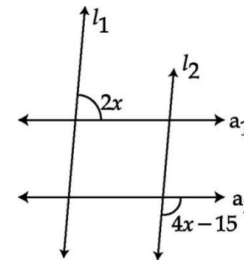17. Factorise: $x^2 + \dfrac{x}{4} - \dfrac{1}{8}$

Or

What are the possible expressions for the dimensions of a cuboid whose volume is given below?
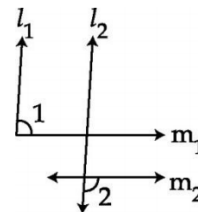Volume = $12ky^2 + 8ky - 20k$.

18. If $x = 2y + 6$ then find the value of $x^3 - 8y^3 - 36xy - 216$.

19. In ΔABC, $\angle B = 45°$, $\angle C = 55°$ and bisector of $\angle A$ meets BC at a point D. Find $\angle ADB$ and $\angle ADC$.

Or

In the figure below, $l_1 \parallel l_2$ and $a_1 \parallel a_2$. Find the value of x.

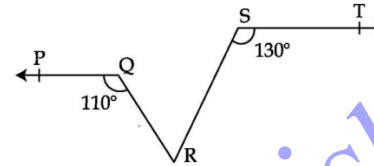20. In the figure below, $l_1 \parallel l_2$ and $m_1 \parallel m_2$. Prove that $\angle 1 + \angle 2 = 180°$.

28. If remainder is same when polynomial p(x) = x³ + 8x² + 17x + ax is divided by (x + 2) and (x + 1), find the value of *a*.

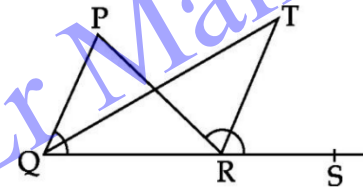**29.** Find α and β, if (x + 1) and (x + 2) are factors of x³ + 3x² – 2αx + β.

Or

Factorize: x³ – 3x² – 9x – 5.

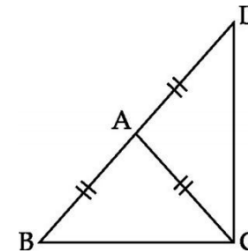**30.** Plot the points A (4, 0) and B (0, 4). Join AB to the origin O. Find the area of ΔAOB.

31. In the given figure, if PQ ∥ ST, ∠PQR = 110° and ∠RST = 130° find ∠QRS.

32. In the given figure, the side QR of ΔPQR is produced to a point S. If the bisectors of ∠PQR and ∠PRS meet at point T, then prove that ∠QTR = ½ ∠QPR.

33. ABCD is a parallelogram. If the two diagonals are equal. Find the measure of ∠ABC.

34. In figure, ABC is an isosceles triangle in which AB = AC. Side BA is produced to D such that AD = AB. Show that BCD is a right angle.

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