Grade 09
Unit 04

Maths

Course Outline

- ◎ **Triangles**
- ◎ **Herror's formula**

MAT

(Monthly Achievement Tests)

Guide Lines

1. Each set consists of:

   50 | Warm-up/Foundation Questions

   30 | Regular Questions

   20 | Thinking Ability Questions

2. The time allocation and instructions regarding the questions are printed clearly in the beginning of each question types. The answers should be written or tick marked as per the instructions given. It is suggested to use pencil initially, so as to enable you to reuse the practice papers.

3. **According to the new pattern of CBSE these practice papers will be very useful especially for syllabus related Quiz, Debates, Visuals related checking and Orals etc.,**

4. After marking the answers, the scores of students can be checked and for marks obtained guidelines are given along with the question solving instructions. Follow those instructions and if, you are fully satisfied with your performance then check for your expected grades as per the CBSE guidelines as given on the back of each set.

5. Remember that this is only a guideline not the finally worked out result. You can further improve your performance by increase your practice.

6. For your convenience please follow following essential examiner's advices:

   a. Answer all the questions
   b. Read all the Options carefully
   c. Understand and use correct scientific language in your responses.

We from ⬤ wish skillful learning for your bright future.

Before going for the test, look at least :

1. First of all go through the syllabus of the test according to the **Course Outline** provided at the front page of each MAT.

2. After going through the syllabus once or twice or even more time as per your satisfaction, first of all do the Warm-up questions. If you score A+ grade in those 50 questions go to the next level otherwise go through the chapter again.

3. The box for **Specific Information** is very useful as it adds to your concept building. Try to fill specific information in the proper way so that you will get the maximum benefit of it.

4. **Let's Chat** portion will help you to prepare for oral assessment. Through this you can increase your capacity to interact on a particular topic related to your syllabus.

5. The **Extra Diet** portion is also there to enhance you knowledge through visulization of concept. This portion provides you added knowledge on various related concepts.

6. The information related to time factor is there to enhance your time management skills.

7. From the examiners point of view it is always advised to use Pencil for initial efforts. The use of pen is fruitful only when the final effort comes.

Examiner's Tips:

☞ Read the question carefully. Make sure you understand exactly what is required.

☞ If you find that you are unable to do a part of a question, do not give up. The next part may be easier and may provide a clue to what you might have done in the part you found difficult.

☞ Note the number of marks per question as guide to the depth of response needed.

☞ Underline or note the key words that tell you what is required.

☞ Underline or note data as you read the question.

☞ Structure your answer carefully.

☞ Show all steps in calculations. Include equations you use and show the substitution of data. remember to work according to units given.

☞ Make sure that your answers contain suitable significant figures (wherever necessary) and must include units in numericals.

☞ Draw diagrams and graphs carefully.

☞ Read data from graphs carefully; note scales and prefixes on axes.

☞ Keep your eye on the clock but don't panic.

☞ If you have time at the end, use it. Check that your descriptions and explanations make sense. Consider whether there is anything you could add to an explanation or description. Repeat calculations to ensure that you have not made a mistake.

To enlighten your fundamental/basic topic knowledge.

A+. If you score 45 or above marks, move to the next section confidently.

A. If you score between 40 and 45 marks, it is satisfactory. Bit more knowledge will bring excellent result.

B. If you score below 40, kindly go through the topic more seriously.

Section A (50 marks)   **Time given – 50 minutes + 5 minutes for revision**

Questions 1 to 50 carry 1 mark each.

For questions 1 to 20 four options are given one of them is the correct answer make your choice and write its name (a, b, c or d) in the answer box provided.

1. If three sides of one triangle are equal to the corresponding three sides of the other triangle then the congruence criterion is triangle then the congruence criterion is

    (a) SAS   (b) ASA

    (c) RHS   (d) SSS

    | T | – 1 min |
    | S | – Triangles |

    Ans.

2. If the hypotenuse and one side of a triangle are respectively equal to the hypoten use and one side of the other triangle, then the congruence criterion is

    (a) ASA   (b) RHS

    (c) SAS   (d) SSS

    | T | – 1 min |
    | S | – Triangles |

    Ans.

3. Sides of a triangle in the ratio of 12 : 17 : 25 and its perimeter is 540 cm. Find its area

    (a) 5000 cm^2 (b) 9000 cm^2

    (c) 7000 cm^2 (d) 6000 cm^2

    | T | – 1 min |
    | S | – Heron's formula |

    Ans.

4. In a triangle ABC, if AD is a perpendicular bisector of BC, then the two triangles so formed are congruent by

    (a) *SAS* criterion   (b) *ASA* criterion
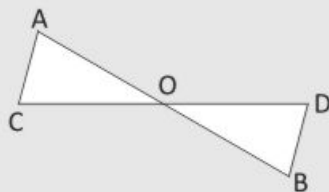
    (c) *RHS* criterion   (d) *SSS* criterion

    | T | – 1 min |
    | S | – Triangles |

    Ans.

5. In the figure O is the mid point of AB and CD, $\triangle AOC \cong \triangle BOD$ can be proven by

(a) ASA

(b) AAS

(c) SSS

(d) SAS

| T | – 1 min |
| S | – Triangles |

| Ans. |

6. A triangle whose sides are 42 cm, 34 cm and 20 cm in length, find the area.

(a) 336 cm^2 (b) 335 cm^2

(c) 396 cm^2 (d) 346 cm^2

| T | – 1 min |
| S | – Area of triangles |

| Ans. |

7. Find the base of a triangle whose area is 3.9 m^2 and whose height is 260 cm

(A) 1 m   (b) 2 cm

(c) 2 m   (d) 1 cm

| T | – 1 min |
| S | – Area of triangles |

| Ans. |

8. Find the area of the triangle two sides of which are 16 cm and 22 cm and perimeter is 64 cm.

(a) $32\sqrt{30}$ cm^2 (b) $37\sqrt{7}$ cm^2

(c) $36\sqrt{10}$ cm^2 (d) $46\sqrt{5}$ cm^2

| T | – 1 min |
| S | – Area of triangles |

| Ans. |

9. Find the third side of a triangle whose other two sides are 18 cm, and 24 cm and perimeter is 65 cm

(a) 24 cm   (b) 23 cm

(c) 22 cm   (d) 21 cm

| T | – 1 min |
| S | – Perimeter |

| Ans. |

10. If two sides and the included angle of one are equal to the corresponding sides and the included angle of other triangle, then the congruence criterion is

(a) AAS   (b) ASA

(c) SAS   (d) SSS

| T | – 1 min |
| S | – SAS congruence |

| Ans. |

11. In which of the following condition $\triangle ABC$ is not an isosceles triangle can not be proved

(a) medium AD is perpendicular on BC

(b) bisect of $\angle BAC$ is perpendicular to BC

(c) altitude AD bisects $\angle BAC$

(d) none of the above

| T | – 1 min |
| S | – Isosceles triangle |

| Ans. |

12. Perimeter of a triangle is _____ than sum of its three altitudes.
    (a) equal   (b) depends on type of triangle
    (c) smaller   (d) greater

T	– 1 min
S	– Perimeter of a triangle

    | Ans. | |

13. Surface area of a box whose length is 40 cm, breadth 27 cm & height 10 cm is
    (a) 2500 cm^2 (b) 3500 cm^2
    (c) 1600 cm^2 (d) 1500 cm^2

T	– 1 min
S	– Surface area

    | Ans. | |

14. If three sides of one triangle are equal to the corresponding three sides of the other triangle then the congruence criterion is
    (a) SAS   (b) ASA
    (c) RHS   (d) SSS

T	– 1 min
S	– Triangles

    | Ans. | |

15. If the hypotenuse and one side of a triangle are respectively equal to the hypotenuse and one side of the other triangle, then the congruence criterion is
    (a) ASA   (b) RHS
    (c) SAS   (d) SSS

T	– 1 min
S	– Triangles

    | Ans. | |

16. In a triangle ABC, if AD is a perpendicular bisector of BC, then the two triangles so formed are congruent by
    (a) SAS criterion   (b) ASA criterion
    (c) RHS criterion   (d) SSS criterion

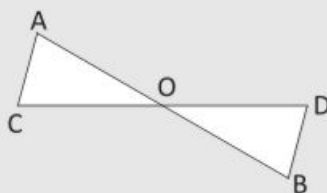 | T | – 1 min |
    |---|---|
    | S | – Triangles |

    | Ans. | |

17. In the figure, O is the mid point of AB and CD, $\triangle AOC \cong \triangle BOD$ can be proven by
    (a) ASA   (b) AAS
    (c) SSS   (d) SAS

T	– 1 min
S	– Triangles

    | Ans. | |

18. If two sides and the included angle of one triangle are equal to the corresponding sides and the included angle of other triangle, then the congruence criterion is

(a) AAS   (b) ASA

(c) SAS   (d) SSS

| T | – 1 min |
| S | – Triangles |

| Ans. |

19. Which of the following condition does not prove that $\triangle ABC$ is not an isosceles triangle ?

(a) median AD is perpendicular on BC

(b) bisector of $\angle BAC$ is perpendicular to BC

(c) altitude AD bisects $\angle BAC$

(d) none of these

| T | – 1 min |
| S | – Triangles |

| Ans. |

20. If $AB \cong CD$ and $CD \cong EF$ then

(a) $AB \cong CD + EF$

(b) $AB + CD \cong EF$

(c) $AB - CD \cong EF$

(d) $AB \cong EF$

| T | – 1 min |
| S | – Triangles |

| Ans. |

Fill in the Blanks

21. The sum of any two sides of a triangle is _____ third side.

| T | – 1 min |
| S | – Triangles |

| Ans. |

22. $S =$ _____ .

| T | – 1 min |
| S | – Heron's formula |

| Ans. |

23. Each angle of an equilateral triangle is _____ .

| T | – 1 min |
| S | – Equilateral triangle |

| Ans. |

24. $\sqrt{s(s-a(s-b)(s-c)}$ is called _____ .

| T | – 1 min |
| S | – Heron's formula |

| Ans. |

25. In any triangle, the side opposite to the greater angle is
   (a) smaller   (b) depends on angle

T	– 1 min
S	– Triangles

   (c) cannot be determined   (d) longer

Ans.	

26. If two angles and non included side of one triangle are equal to the corresponding angles and side of another triangle, then the congruence criterion is _____ .

T	– 1 min
S	– AAS congruence rule

Ans.	

27. Area of an equilateral triangle, with each side a is _____ .

T	– 1 min
S	– Area

Ans.	

28. The line segment joining the mid-points of any two sides of triangle is parallel to the _____ and equal to half of it.

T	– 1 min
S	– Triangles

Ans.	

29. Triangles on the same base and between the same parallels are equal in _____ .

T	– 1 min
S	– Triangles

Ans.	

30. In any triangle, the side opposite to the greater angle is _____ .

T	– 1 min
S	– Triangles

Ans.	

True or False

31. Surface area of a triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

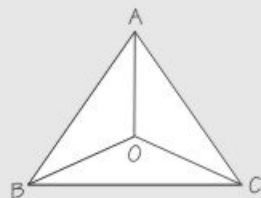| T	– 1 min
S	– Heron's formula

Ans.	

32. The sides of a triangle plot are in the ratio of 3 : 5 : 7 and its perimeter is 300 m. Find its area.

T	– 1 min
S	– Heron's formula

Ans.

33. Area of a triangle $= \sqrt{(s-a)(s-b)(s-c)}$ is called heron's formula.

T	– 1 min
S	– Heron's formula

Ans.

34. Three altitudes of an equilateral triangle are equal in length.

T	– 1 min
S	– Triangles

Ans.

35. If two angles are congruent then they have equal arms.

T	– 1 min
S	– Similarity

Ans.

36. Three altitudes of an equilateral triangle are equal in length.

T	– 1 min
S	– Triangles

Ans.

37. Two figures having equal areas are congruent.

T	– 1 min
S	– Triangles

Ans.

38. In isosceles triangle, angles opposite to equal sides are equal.

T	– 1 min
S	– Triangles

Ans.

39. In congruent triangles, the corresponding parts are equal.

T	– 1 min
S	– Triangles

Ans.

40. Each angle of an equilateral triangle is 60°.

T	– 1 min
S	– Triangles

Ans.

Solve these questions

41. The sides of a triangle plot are in the ratio of 3 : 5 : 7 and its perimeter is 300 m. Find its area
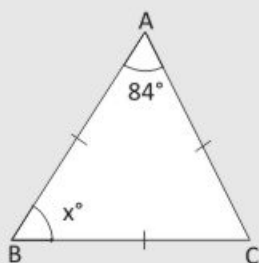
T	– 1 min
S	– Heron's formula

Ans.

42. In $\triangle ABC$, $AB = AC$ and the bisectors of angles B and C intersect at point O. Prove that $BO = CO$ and the ray AO is the bisector of angle BAC.
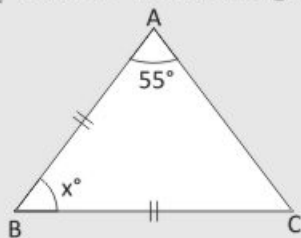
T	– 1 min
S	– Triangles

Ans.

43. Find the area of an equilateral triangle of sides 8 dm each.

T	– 1 min
S	– Area of equilateral triangles

Ans.

44. Find the area of an isosceles triangle whose equal sides measure 5cm each and the third side is 4cm.

T – 1 min
S – Area of triangle

Ans.

45. Find the area.
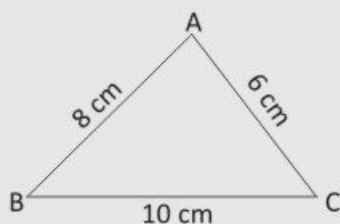
T – 1 min
S – Area of triangle

Ans.

46. Three altitudes AD, BE and CF of $\triangle ABC$ are equal. Prove that $\triangle ABC$ is an equilateral triangle.

T – 1 min
S – Triangles

Ans.

47. Prove that if the bisector of the vertical angle of a triangle bisects the base of the triangle, then the triangle is isosceles.

T – 1 min
S – Triangles

Ans.

48. In $\triangle ABC$, $AB = AC$ and the bisectors of angles B and C intersect at point O. Prove that $BO = CO$ and the ray AO is the bisector of angle BAC.

T	– 1 min
S	– Triangles

Ans.

49. Find $x°$ from the given figure.

T	– 1 min
S	– Triangles

Ans.

50. Find $x°$ from the given figure

T	– 1 min
S	– Triangles

Ans.

To enlighten your regular knowledge of topic. If you score more than 55 marks here, you have achieved this level brilliantly. Move to the next level of test papers.

Section B (60 marks)   **Time given – 45 minutes + 5 minutes for revision**
Questions 51 to 80 carry 2 marks each.

51. Find the area of a triangle whose sides are 40 m, 24 m and 32 m.

T – 1 min
S – Heron's formula

Ans.

52. Find the area of triangular plot using heron's formula. The sides are 12 m, 5 m and 13 m.

T – 1 min
S – Heron's formula

Ans.

53. Which of the following expressions are polynomials in one variable and which are not

$4x^2 + 7x + 5$

T – 1 min
S – Heron's formula
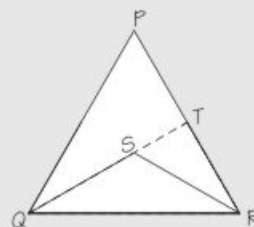
Ans.

54. Find the area of rhombus.
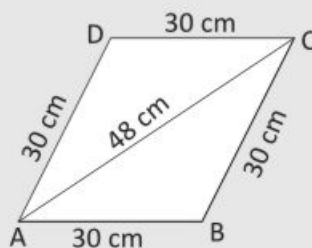
T	– 1 min
S	– Area

Ans.

55. Find the area of a triangle with base 18 cm and corresponding height 7 cm.

T	– 1 min
S	– Area

Ans.

56. Find the area of the triangle 15 m, 11 m and 6 m.

T	– 1 min
S	– Heron's formula

Ans.

57. Sides of a triangles are 5 cm, 5 cm and 1 cm, find the area.

T	– 1 min
S	– Area of triangle

Ans.

58. Find the area of the quadrilateral ABCD
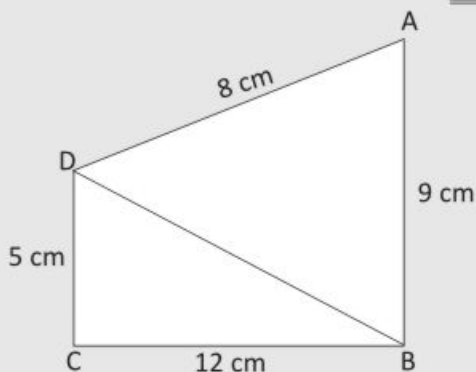
Ans.

59. If two parallel lines are intersected by a transversal, prove that the bisector of the interior angles on the same side of transversal intersect each other at right angles.

Ans.

60. In figure, it is given that $LM = MN, QM = MR, ML \perp PQ$ and $MN \perp PR$. Prove that $PQ = PR$.
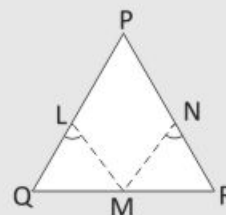
Ans.

61. In the figure, $PS \perp PQ$, $PQ \parallel SR$, $\angle SQR = 28°$ and $\angle QRT = 65°$, then find the values of x and y.
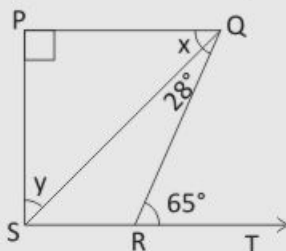
T	– 1 min
S	– Triangles

Ans.

62. Prove that if the side BC of a $\triangle ABC$ is increased on both the sides then the sum of the exterior angles so formed will be greater than $\angle A$ by two right angles.

T	– 1 min
S	– Triangles

Ans.

63. In figure, T is a point on side QR of $\triangle PQR$ and S is a point such that $RT = ST$. Prove that $PQ + PR > QS$.

T	– 1 min
S	– Triangles
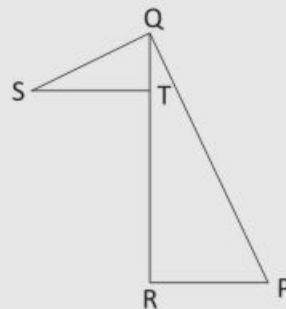
Ans.

64. In $\triangle PQR$, S is any point on side QR. Show that $PQ + QR + RP > 2PS$.

T – 1 min
S – Triangles

Ans.

65. BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule, prove that the triangle ABC is isosceles.

T – 1 min
S – Triangles

Ans.

66. $ABCD$ is a rectangle and P, Q, R and S are mid points of the sides AB, BC, CD and DA respectively. Show that the quadrilateral $PQRS$ is a rhombus.

T – 2 min
S – Triangles

Ans.

67. If diagonals of a cyclic quadrilateral are diameters of the circle through vertices of the quadrilateral. Prove that it is a rectangle.

T – 2 min
S – Triangles

Ans.

68. Construct a triangle *XYZ* in which $\angle Y = 30°$, $\angle Z = 90°$ and $XY + YZ + ZX = 11$ cm.

T – 2 min
S – Triangles

Ans.

69. In a $\triangle ABC$ $\angle B = 100°$, $\angle C = 30°$, find $\angle A$.

T – 2 min
S – Triangles

Ans.

70. Line segment *PQ* is parallel to another line segment *RS*. 0 is the midpoint of *PS* show that $\triangle PQR \cong \triangle SOR$.

T – 2 min
S – Triangles

Ans.

71. In the figure it is given that $AB = CF$, $EF = BD$ and $\angle AFE \cong \angle CBD$. Prove that $\triangle AFE \cong \triangle CBD$.

T – 2 min
S – Triangles
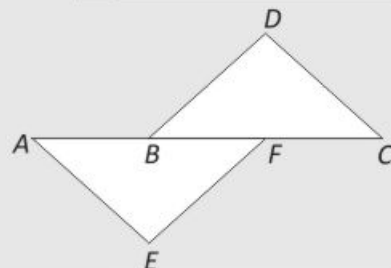
Ans.

72. In the figure $\angle BCD = \angle ADC$ and $\angle ACB = \angle BDA$. Prove that $AD = BC$ and $\angle A = \angle B$.

T	– 2 min
S	– Triangles
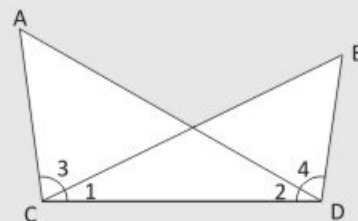
Ans.

73. In the figure $PQ = PR$ and S is any point at QR. Prove that $PQ > PS$.
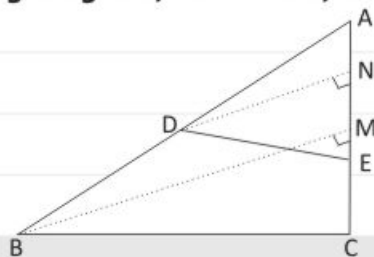
T	– 2 min
S	– Triangles
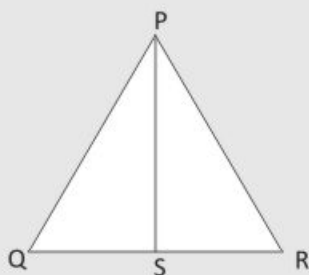
Ans.

Questions 74–76. In the adjoining diagram, $AD = 4$ cm, $BD = 11$ cm, $AE = 6$ cm and $EC = 4$ cm.

T	– 6 min
S	– Triangles

74. Prove that $\triangle ADE \sim \triangle ACB$.

Ans.

75. If $\angle ABC = 40°$, find $\angle AED$.

Ans. [   ]

76. If $DE = 7$ cm, find BC.

Questions 77-78. In the following figure, $\dfrac{OC}{OA} = \dfrac{OD}{OB} = \dfrac{1}{2}$.
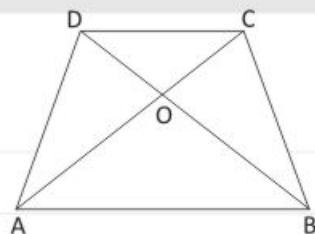
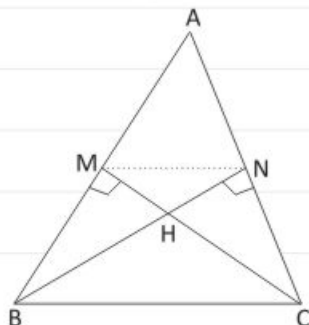77. Prove that, $\triangle OAB \sim \triangle OCD$.

T — 4 min
S — Triangles

Ans. [   ]

78. ABCD is trapezium, further, if $AB = 6$ cm, compute the length of CD.

Ans. [   ]

Questions 79–80. The altitudes BN and CM of △ABC meet at H.

T	– 4 min
S	– Triangle

79. Prove that $CN \times HM = BM \times HN$

Ans. [   ]

80. Prove that $\dfrac{HC}{HB} = \sqrt{\dfrac{CN \times HN}{BM \times HM}}$
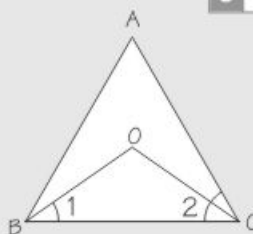
Ans. [   ]

To enlighten your regular knowledge of topic. If you score more than 50 marks here, you have achieved this level brilliantly. Move to the next level of test papers.

Section C (60 marks)   **Time given – 45 minutes + 5 minutes for revision**

81. If the bisectors of angles $\angle ABC$ and $\angle ACB$ meet at a point O. Then Prove that $\angle BOC = 90° + \dfrac{1}{2} \angle A.$

| T | – 2 min |
| S | – Triangles |

Ans.

82. A, B, C are three angles of triangle, if $A - B = 15\ B - C = 30°$, find $\angle A, \angle B$ and $\angle C$.

| T | – 2 min |
| S | – Triangles |

Ans.

83. In the figure $AC = AE$, $AB = AD$ and $\angle BAD = \angle EAC$ Prove that $BC = DE$
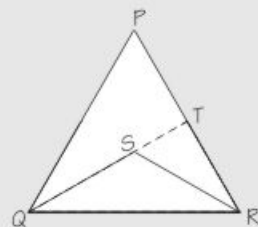
| T | – 2 min |
| S | – Congruent triangles |

Ans.

84. *l* and *m* are two parallel lines intersected by another pair of parallel lines *p* and *q* as shown in the figure. Show that $\triangle ABC = \triangle CDA$.

T	– 2 min
S	– Triangles

Ans. [   ]

85. In figure *PQR* is a triangle and *S* is any point in its interior, show $SQ + SR < PQ + PR$.

T	– 2 min
S	– Triangles

Ans. [   ]

86. In figure *TQ* and *TR* are the bisectors of $\angle Q$ and $\angle R$ respectively. If $\angle QPR = 80°$ and $\angle PRT = 30°$ determine $\angle TQR$ and $\angle QTR$.

T	– 2 min
S	– Triangles
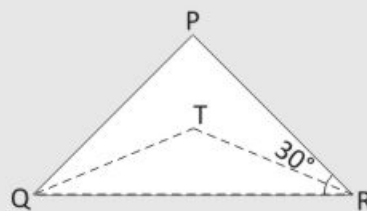
Ans. [   ]

87. *l* and *m* are two parallel lines intersected by another pair of parallel lines p and q show that $\triangle ABC = \triangle CDA$.

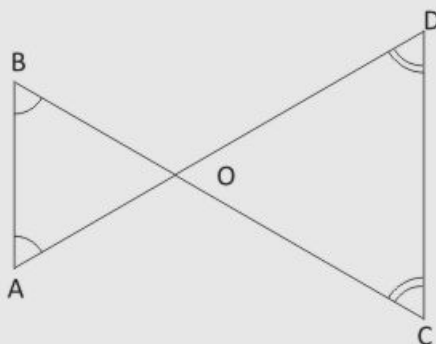| T	– 2 min
S	– Triangles

Ans.

88. *ABC* is a triangle in which altitudes *BE* and *CT* to sides *AC* and *AB* are equal, show that (i) $\triangle ABE = \triangle ACF$, (ii) $AB = AC$ i.e., $\triangle ABC$ is an isosceles triangle.

T	– 2 min
S	– Triangles

Ans.

89. In figure, $\angle B < \angle A$ and $\angle C < \angle D$ show that $AD < BC$.

T	– 2 min
S	– Triangles

Ans.

90. Find the area of a triangle whose sides are 26 cm, 28 cm and 30 cm.

T − 2 min
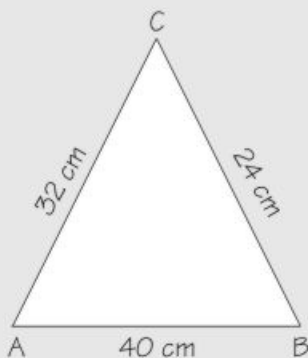S − Heron's formula

Ans.

91. The sides of a triangular plot are in the ratio of 3 : 5 : 7 and its perimeter is 300 m, find its area.

T − 2 min
S − Heron's formula

Ans.

92. Find area of triangle given in the figure below:

T − 2 min
S − Triangles

Ans.

93. *E* and *F* are respectively the mid-points of equal sides *AB* and *AC* of $\triangle ABC$ show that *BF* = *CE*.

T	– 2 min
S	– Triangles

Ans.

94. Prove that angles opposite to the equal sides of an isosceles triangles are equal.

T	– 2 min
S	– Triangles

Ans.

95. In figure, line segment *PQ* is parallel to another line segment *RS*. *O* is the midpoint of *PS*, show that $\triangle PQR \cong \triangle SOR$.
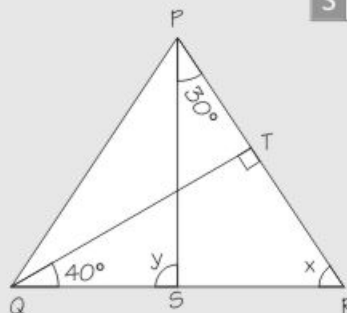
T	– 3 min
S	– Triangles
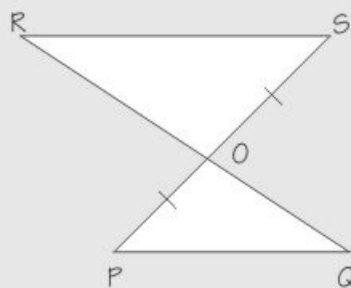
Ans.

96. In figure, if $QT \perp PR$, $\angle TQR = 40°$ and $\angle SPR = 30°$ find x and y.

T	– 3 min
S	– Triangles

Ans.

97. In the figure find $\angle PRQ$.

T	– 3 min
S	– Triangles
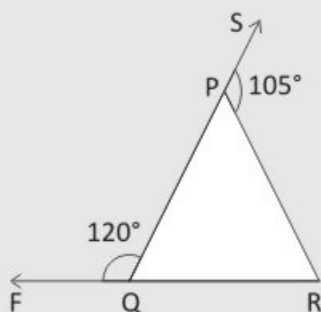
Ans.

98. Find x in the figure.

T	– 3 min
S	– Triangles
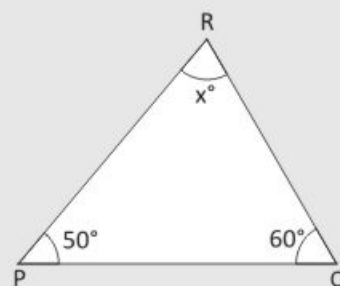
Ans.

99. Show that the median of a triangle divides it into two triangles of equal areas.

> T – 3 min
> S – Triangles

Ans.

100. Write a short note on *SAS* congruence rule and *AAS* congruence rule.

> T – 3 min
> S – Triangles

Ans.

Tools at a glance

Opening Window with instructions for your potential analysis and guideline to improve your performance.

Opening Window

Let's Chat, the feature with suggestive topics for discussion so as to improve your capacity to debate on various topics.

Let's Chat

| T | — .... |
| S | — .... |

Box with time break-up of questions **(T)** and its concept (**S**, i.e., subject)

Brain Teasers

Brain Teasers i.e., Questions with difference to make the concepts of students crystal clear. These are the questions with higher difficulty levels to check the grip of the students over the concepts.

Extra Diet, the web link, the notation: www._____ to provide additional information regarding the concept for more clarity of thoughts.

Extra Diet

CBSE GRADING PATTERN

As the new pattern includes **CCE** (Continuous and Comprehensive Evaluation) which will be run in two terms i.e., from April to September and October to March. Thus the school will conduct four **Formative** and two **Summative** Assessments.

However, the most generalised version of grades is given below:

MARKS PERCENTAGE	GRADE	GRADE POINT	CATEGORY
91 to 100	A1	10	Exceptional
81 to 90	A2	9	Excellent
71 to 80	B1	8	Very Good
61 to 70	B2	7	Good
51 to 60	C1	6	Ordinary (Fair)
41 to 50	C2	5	Average
33 to 40	D	4	Below Average
21 to 32	E1	3	Improvement Needed
Below 20	E2	Below 2	Unsatisfactory