

SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

TRIANGLES

Class 10 - Mathematics

Time Allowed: 3 hours

Maximum Marks: 178

Section A

- D and E are respectively the points on the sides AB and AC of a triangle ABC such that AD = 2 cm, BD = 3 cm, [1] BC = 7.5 cm and DE || BC. Then, length of DE (in cm) is
 a) 6
 b) 5
 c) 2.5
 d) 3
- 2. The perimeters of two similar triangles ABC and PQR are 56 cm and 48 cm respectively. $\frac{PQ}{AB}$ is equal to [1]
 - a) $\frac{7}{6}$
 - c) $\frac{6}{7}$
- 3. \triangle ABC is such that AB = 3 cm, BC = 2 cm and CA = 2.5 cm. If \triangle DEF ~ \triangle ABC and EF = 4 cm, then perimeter [1] of \triangle DEF is

b) 7.5 cm

d) 15 cm

- a) 30 cm
- c) 22.5 cm
- 4. Which of the following statements is correct?
 - i. The ratio of the areas of two similar triangles is equal to the ratio of their corresponding sides.
 - ii. If a line is drawn parallel to one side of the triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.
 - iii. All similar figures are congruent.
 - iv. If in two triangles, two angles of one triangle is equal to the two corresponding angles of the other triangle, then two triangles may or may not be similar.
 - a) Statements (iv) is correct. b) Statements (ii) is correct.
 - c) Statements (i) is correct. d) Statements (iii) is correct.
- 5. In two triangles \triangle PQR and \triangle ABC, it is given that $\frac{AB}{BC} = \frac{PQ}{PR}$. For these two triangles to be similar, which of **[1]** the following should be true?
 - a) $\angle A = \angle P$ b) CA = QRc) $\angle B = \angle Q$ d) $\angle B = \angle P$
- 6. A vertical stick 1.8 m long casts a shadow 45 cm long on the ground. At the same time, what is the length of the **[1]** shadow of a pole 6 m high?

a) 13.5 m	b) 1.35 m
c) 1.5 m	d) 2.4 m

[1]

7.	$ riangle ext{ABC}$ is a right triangle right-angled at A and AD .	$\perp BC$, Then $rac{BD}{DC}=$	[1]
	a) <u>AB</u> AD	b) $\frac{AB}{AC}$	
	c) $\left(\frac{AB}{AD}\right)^2$	d) $\left(\frac{AB}{AC}\right)^2$	
8.	A street light is fixed on a pole 6 m above the ground	l. If a woman of height 1.5 m casts a shadow of 3, then	[1]
	distance between her and the base of the pole is	_	
	a) 12 m	b) 9 m	
	c) 8 m	d) 10 m	
9.	$\bigtriangleup PQR \sim \bigtriangleup XYZ$ and the perimeters of $\bigtriangleup PQR$ and	riangle XYZ are 30 cm and 18 cm respectively. If QR = 9 cm,	[1]
	then, YZ is equal to	~	
	a) 4.5 cm.	b) 5.4 cm.	
	c) 12.5 cm.	d) 9.5 cm.	
10.	In the given figure, $\angle A = \angle C$, $AB = 6$ cm, $AP = 12$ c	cm, $CP = 4$ cm. Then length of CD is:	[1]
	E total		
	a) 18 cm	b) 2 cm	
	c) 8 cm	d) 6 cm	
11.	In a \land ABC. AD is the bisector of \checkmark BAC. It AB = 6	cm. AC = 5 cm and BD = 3 cm. then DC =	[1]
	a) 11.2 am	b) 4 5 cm	[-]
		b) 4.5 cm	
10	c) 3.5 cm	a) 2.5 cm Γ	[4]
12.	It is given that $\triangle ABC \sim \triangle DEF$. If $\angle A = 55$, \angle .	$E = 45$, then $\angle C$ is:	[1]
	a) 80°	b) 55°	
	c) ₄₅ °	d) 90°	
13.	If $\Delta ABC \sim \Delta PQR$ such that AB = 9.1 cm and PC	Q = 6.5 cm. If the perimeter of ΔPQR is 25 cm, then the	[1]
	perimeter of ΔABC is		
	a) 36 cm	b) 30 cm	
	c) 35 cm	d) 34 cm	
14.	In \triangle ABC and \triangle DEF, $\frac{AB}{DE} = \frac{BC}{FD}$. Which of the following	lowing makes the two triangles similar?	[1]
	a) $\angle B = \angle D$	b) $\angle B = \angle E$	
	c) $\angle A = \angle F$	d) $\angle A = \angle D$	
15.	\triangle ABC ~ \triangle DEF and the perimeters of \triangle ABC and then EF = ?	\triangle DEF are 30 cm and 18 cm respectively. If BC = 9 cm	[1]

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a) 4.5 cm	b) 6.3 cm

- 16. In \triangle ABC, a line XY parallel to BC cuts AB at X and AC at Y. If BY bisects \angle XYC, then
 - a) BC = CYb) BC = BYc) $BC \neq BY$ d) $BC \neq CY$
- 17. A construction company wants to connect two parks on opposite sides of town with a road. Surveyors have laid [1] out a map as shown. The road can be built through the town or around town through point R. The roads intersect at a right angle at point R. The line joining Park A to Park B is parallel to the line joining C and D.

d) 5.4 cm



i. What is the distance between the parks through town?

- ii. What is the distance from Park A to Park B through point R?
 - a) (i) 9 m, (ii) 13 m
 - c) (i) 8 m, (ii) 12.5 m

b) (i) 8.75 m, (ii) 12 m d) (i) 9 m, (ii) 14 m

- 18. In \triangle ABC, D and E are points on side AB and AC respectively such that DE || BC and AD : DB = 3 : 1. If EA = [1] 3.3 cm, then AC =
 - a) 1.1 cm

c) 7.2 cm

c) 4 cm

d) 4.4 cm

b) 5.5 cm

19. In the given figure, ABCD is a trapezium whose diagonals AC and BD intersect at O such that OA = (3x - 1) [1] cm, OB = (2x + 1) cm, OC = (5x - 3) cm and OD = (6x - 5) cm. Then, x = ?



Assertion (A): If two triangles are similar then they are congruent also.
 Reason (R): Ratio of perimeters of two triangles is always equal to ratio of their corresponding sides, medians, altitudes and angle bisectors.

a) Both A and R are true and R is the correctb) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

21. **Assertion (A):** If a line intersects sides AB and AC of a \triangle ABC at D and E respectively and is parallel to BC, [1] then $\frac{AD}{AB} = \frac{AE}{AC}$

d) A is false but R is true.

Reason (R): If a line is parallel to one side of a triangle then it divides the other two sides in the same ratio.

a) Both A and R are true and R is the correct b) Both A and R are true but R is not the

[1]

[1]

	explanation of A.	correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	
22.	Assertion (A): If ratio of perimeters of two similar t is also 6 : 11.	triangles is 6 : 11, then ratio of their corresponding medians	[1]
	Reason (R): Converse of B.P.T. states that if two side line is parallel to the third side.	les of a triangle are divided by a line in equal ratio then the	
	a) Both A and R are true and R is the correct explanation of A.	b) Both A and R are true but R is not the correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	
23.	Assertion (A): In \triangle ABC, DE BC such that AD = and EC = 3x cm than x equal to 5.	(7x - 4) cm, AE = $(5x - 2)$ cm, DB = $(3x + 4)$ cm	[1]
	Reason (B): If a line is drawn parallel to one side of than the other two sides are divided in the same ratio	f a triangle to intersect the other two sides in distant point, o.	
	a) Both A and R are true and R is the correct	b) Both A and R are true but R is not the	
	explanation of A.	correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	
24.	Assertion (A): D and E are points on the sides AB a	and AC respectively of a \triangle ABC such that AB = 10.8 cm,	[1]
	AD = 6.3 cm, $AC = 9.6$ cm and $EC = 4$ cm then DE	is parallel to BC.	
	Reason (R): If a line is parallel to one side of a triar	ngle then it divides the other two sides in the same ratio.	
	a) Both A and R are true and R is the correct	b) Both A and R are true but R is not the	
	explanation of A.	correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	
25.	Assertion (A): If two triangles are similar and have	an equal area, then they are congruent.	[1]
	Reason (R): Corresponding sides of two triangles a	re equal, then triangles are congruent.	
	a) Both A and R are true and R is the correct	b) Both A and R are true but R is not the	
	explanation of A.	correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	
26.	Assertion (A): D and E are points on the sides AB a	and AC respectively of a \triangle ABC such that AD = 5.7 cm, DB	[1]
	= 9.5 cm, AE = 4.8 cm and EC = 8 cm then DE is not $E = 1000$	ot parallel to BC.	
	Reason (R): If a line divides any two sides of a trian	ngle in the same ratio then it is parallel to the third side.	
	a) Both A and K are true and K is the correct	D) BOTH A and K are true but K is not the	

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

27. **Assertion (A):** A line drawn parallel to any one side of a triangle intersects the other two sides in the same ratio. **[1]**

Reason (R): Parallel lines cannot be drawn to any side of a triangle.

a) Both A and R are true and R is the correctb) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

d) A is false but R is true.

28. **Assertion (A):** If in a \triangle ABC, a line DE || BC, intersects AB in D and AC in E, then $\frac{AB}{AD} = \frac{AC}{AE}$ [1] **Reason (R):** If a line is drawn parallel to one side of a triangle intersecting the other two sides, then the other two sides are divided in the same ratio.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

29. **Assertion (A):** D and E are points on the sides AB and AC respectively of a \triangle ABC such that DE||BC then the **[1]** value of x is 11, when AD = 4cm, DB = (x - 4)cm, AE = 8cm and EC = (3x - 19)cm.

Reason (R): If a line divides any two sides of a triangle in the same ratio then it is parallel to the third side.



a) Both A and R are true and R is the correct explanation of A.

n

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c) A is true but R is false.

E√55°

b) Both A and R are true but R is not the correct explanation of A.

d) A is false but R is true.

Section B

30. In the given figure, BAD || EF, $\angle AEF = 55^{\circ}$ and $\angle ACB = 25^{\circ}$, find $\angle ABC$.



32. D and E are points on the sides AB and AC respectively of a $\triangle ABC$ such that DE||BC. If $\frac{AD}{AB} = \frac{8}{15}$ and EC = [2] 3.5 cm, find AE.



33. In the given figure XY || BC, Find the length of XY. (In cm)

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[2]

[2]



34. In Fig. AE is the bisector of the exterior \angle CAD meeting BC produced in E. If AB =10 cm, AC = 6 cm and BC = [2] 12 cm, find CE. (In cm)



35. In Fig. DE || BC such that AE = $(\frac{1}{4})$ AC. If AB = 6 cm, find AD. (In cm)



36. In Fig. AD is the bisector of $\angle A$. If BD = 4 cm, DC = 3 cm and AB = 6 cm, determine AC. (In cm)



37. The perimeters of two similar triangles ABC and PQR are 32 cm and 24 cm respectively. If PQ = 12 cm, find [2] AB.

38. In the given figure,
$$LM \| CB$$
 and $LN \| CD$. Prove that $\frac{AM}{AB} = \frac{AN}{AD}$. [2]



- 39. In a \triangle ABC, D and E are points on the sides AB and AC respectively such that DE ||BC. If $\frac{AD}{DB} = \frac{2}{3}$ and AC [2] =18 cm, find AE.
- 40. In \triangle ABC, AL and CM are the perpendiculars from the vertices A and C to BC and AB respectively. If AL and [2] CM intersect at O, prove that:

i.
$$\Delta OMA \sim \Delta OLC$$

ii. $\frac{OA}{OC} = \frac{OM}{OL}$

41. In $\triangle ABC$, $AD \perp BC$, such that $AD^2 = BD \times CD$. Prove that $\triangle ABC$ is right angled at A. [2]

[2]

[2]

42. In the given figure, PQR and QST are two right-angled traingles, right angled at R and T, respectively. Prove [2] that $QR \times QS = QP \times QT$



43. In the given figure, ABC and AMP are two right triangles, right angled at B and M, respectively. Prove that [2] $\triangle ABC \sim \triangle AMP$.



- 44. E and F are points on the sides PQ and PR respectively of a \triangle PQR. For PQ = 1.28 cm, PR = 2.56 cm, PE = 0.18 [2] cm and PF = 0.36 cm, state whether EF || QR.
- 45. In the given pairs of triangles, find whether the triangles are similar or not. State the similarity criterion and [2] write the similarity relation in symbolic form.



46. The diagonals of a quadrilateral ABCD intersect each other at the point O such that $\frac{AO}{BO} = \frac{CO}{DO}$. Show that [2] ABCD is a trapezium.

Section C

- 47. In the given figure, $\triangle OAB \sim \triangle OCD$. If AB = 8 cm, BO = 6.4 cm, OC = 3.5 cm and CD = 5 cm, find [3] i. OA
 - ii. DO.



48. D and E are points on the sides AB and AC respectively of a $\triangle ABC$ such that DE ||BC. AD = (7x - 4) cm, AE [3] = (5x - 2) cm, DB = (3x + 4) cm and EC = 3x cm.



Find the value of x.

49. S and T are points on sides PR and QR of \triangle PQR such that \angle P = \angle RTS. Show that \triangle RPQ $\sim \triangle$ RTS.



- 50. In a $\triangle ABC$, let D be a point on BC such that $\frac{BD}{DC} = \frac{AB}{AC}$ Prove that AD is the bisector of $\angle A$. [3]
- 51. Two right triangles ABC and DBC are drawn on the same hypotenuse BC and on the same side of BC. If AC **[3]** and BD intersect at P, Prove that $AP \times PC = BP \times DP$.
- 52. The diagonal BD of a quadrilateral ABCD bisects both $\angle B$ and $\angle D$, show that $\frac{AB}{BC} = \frac{AD}{CD}$. [3]
- 53. A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow [3]28 m long. Find the height of the tower.
- 54. In Fig. if DE ||AQ| and DF ||AR. Prove that EF ||QR|.

[3]

[3]



55. In Fig. P is the mid-point of BC and Q is the mid-point of AP. If BQ, when produced meets AC at R, prove that **[3]** RA = $\frac{1}{3}$ CA.



56. In the given figure, the line segment XY is parallel to side AC of $\triangle ABC$ and it divides the triangle into two [3] parts of equal area. Prove that



Section D

57. Read the following text carefully and answer the questions that follow:

Observe the figures given below carefully and answer the questions:



- ii. Name the figure(s) wherein the figures are congruent. (1)
- iii. Prove that congruent triangles are also similar but not the converse. (2)

OR

What more is least needed for two similar triangles to be congruent? (2)

58. Read the following text carefully and answer the questions that follow:

Ashok wanted to determine the height of a tree on the corner of his block. He knew that a certain fence by the tree was 4 feet tall. At 3 PM, he measured the shadow of the fence to be 2.5 feet tall. Then he measured the tree's shadow to be 11.3 feet.



- i. What is the height of the tree? (1)
- ii. What will be length of shadow of tree at 12:00 pm? (1)
- iii. Write the name triangle formed for this situation. (2)

OR

What will be the length of wall at 12:00 pm? (2)

59. Read the following text carefully and answer the questions that follow:

[4]

[4]

[4]

Swimmer in Distress: A lifeguard located 20 metre from the water spots a swimmer in distress. The swimmer is 30 metre from shore and 100 metre east of the lifeguard. Suppose the lifeguard runs and then swims to the swimmer in a direct line, as shown in the figure.



i. How far east from his original position will he enter the water? (Hint: Find the value of x in the sketch.) (1)

ii. Which similarity criterion of triangle is used? (1)

iii. What is the distance of swimmer from the shore? (2)

OR

What is the length of AD? (2)

60. Read the following text carefully and answer the questions that follow:

Priyanshu is very intelligent in maths. He always try to relate the concept of maths in daily life. One day he is walking away from the base of a lamp post at a speed of 1 m/s. Lamp is 4.5 m above the ground.



- ii. What is the minimum time after which his shadow will become larger than his original height? (1)
- iii. What is the distance of Priyanshu from pole at this point? (2)

OR

What will be the length of his shadow after 4 seconds? (2)

61. Read the following text carefully and answer the questions that follow:

The discus throw is an event in which an athlete attempts to throw a discus. The athlete spins anti-clockwise around one and a half times through a circle, then releases the throw. When released, the discus travels along tangent to the circular spin orbit.



In the given figure, AB is one such tangent to a circle of radius 75 cm. Point O is centre of the circle and \angle ABO

= 30^o. PQ is parallel to OA.



[4]

[4]

- i. find the length of AB. (1)
- ii. find the length of OB. (1)
- iii. find the length of AP. (2)

OR

find the length of PQ. (2)

62. **Read the following text carefully and answer the questions that follow:**

Statue of a Pineapple: The Big Pineapple is a heritage-listed tourist attraction at Nambour Connection Road, Woombye, Sunshine Coast Region, Queensland, Australia. It was designed by Peddle Thorp and Harvey, Paul Luff, and Gary Smallcombe and Associates. It is also known as Sunshine Plantation. It was added to the Queensland Heritage Register on 6 March 2009.

Kavita last year visited Nambour and wanted to find the height of a statue of a pineapple. She measured the pineapple's shadow and her own shadow. Her height is 156 cm and casts a shadow of 39 cm. The length of shadow of pineapple is 4 m.



- i. What is the height of the pineapple? (1)
- ii. What is the height Kavita in metres? (1)
- iii. Write the type of triangles used to solve this problem. (2)

OR

Which similarity criterion of triangle is used? (2)

63. Read the following text carefully and answer the questions that follow:

In the figure given below, a folding table is shown:



The legs of the table are represented by line segments AB and CD intersecting at O. Join AC and BD. Considering table top is parallel to the ground, and OB = x, OD = x + 3, OC = 3x + 19 and OA = 3x + 4, answer the following questions:

- i. Prove that $\triangle OAC$ is similar to $\triangle OBD$.
- ii. Prove that $\frac{OA}{AC} = \frac{OB}{BD}$
- iii. a. Observe the figure and find the value of x. Hence, find the length of OC.

OR

b. Observe the figure and find $\frac{BD}{AC}$.

64. **Read the following text carefully and answer the questions that follow:**

Veena wants to make the curtains for her window as shown in the figure. The window is in the shape of a

[4]

[4]

rectangle, whose width and height are in the ratio 2 : 3. The area of the window is 9600 square cm.



- i. What is the shape of the window that is uncovered? (1)
- ii. What will be the ratio of two sides of each curtain (other than hypotenuse)? (1)
- iii. What are the dimensions of the window? (2)

OR

What will be the perimeter of the window? (2)

65. Read the following text carefully and answer the questions that follow:

The centroid is the centre point of the object. It is also defined as the point of intersection of all the three medians. The median is a line that joins the midpoint of a side and the opposite vertex of the triangle. The centroid of the triangle separates the median in the ratio of 2 : 1. It can be found by taking the average of x-coordinate points and y-coordinate points of all the vertices of the triangle. See the figure given below



Here D, E and F are mid points of sides BC, AC and AB in same order. G is centroid, the centroid divides the median in the ratio 2 : 1 with the larger part towards the vertex. Thus AG : GD = 2 : 1 On the basis of above information read the question below. If G is Centroid of \triangle ABC with height h and J is Centroid of \triangle ADE. Line DE parallel to BC, cuts the \triangle ABC at a height $\frac{h}{4}$ from BC. HF = $\frac{h}{4}$



- i. What is the length of AH? (1)
- ii. What is the distance of point A from point G? (1)
- iii. What is the distance of point A from point J? (2)

OR

What is the distance GJ? (2)

66. **Read the following text carefully and answer the questions that follow:**

[4]

[4]

The law of reflection states that when a ray of light reflects off a surface, the angle of incidence is equal to the angle of reflection.



Suresh places a mirror on level ground to determine the height of a pole (with traffic light fired on it). He stands at a certain distance so that he can see the top of the pole reflected from the mirror. Suresh's eye level is 1.5 m above the ground. The distance of Suresh and the pole from the mirror are 1.8 m and 6 m respectively.



- i. Which criterion of similarity is applicable to similar triangles? (1)
- ii. What is the height of the pole? (1)
- iii. If angle of incidence is i, find tan i. (2)

OR

Now Suresh move behind such that distance between pole and Suresh is 13 meters. He place mirror between him and pole to see the reflection of light in right position. What is the distance between mirror and Suresh? (2)

Section E

67. In the following figure, $\triangle FEC \cong \triangle GBD$ and $\angle 1 = \angle 2$ Prove that $\triangle ADE \cong \triangle ABC$.



68. In the figure, OB is the perpendicular bisector of the line segment DE, FA \perp OB and F E intersect OB at point [5] C. Prove that $\frac{1}{OA} + \frac{1}{OB} = \frac{2}{OC}$.



- 69. ABCD is a quadrilateral. P, Q, R and S are the points of trisection of sides AB, BC, CD and DA respectively and [5] are adjacent to A and C. Prove that PQRS is a parallelogram.
- 70.CD and GH are respectively the bisectors of $\angle ACB$ and $\angle EGF$ such that D and H lie on sides AB and FE of[5] $\triangle ABC$ and $\triangle FEG$ respectively. If $\triangle ABC \sim \triangle FEG$, show that:

i.
$$\frac{CD}{GH} = \frac{AC}{FG}$$

ii. $\triangle DCB \sim \triangle HGE$

71. In the given figure, PA, QB, RC and SD are all perpendiculars to a line '*l*', AB = 6 cm, BC = 9 cm, CD = 12 cm [5] and SP = 36 cm. Find PQ, QR and RS.

[5]



- 72. In Fig., DEFG is a square in a triangle ABC right angled at A. Prove that

i.
$$\triangle AGF \sim \triangle DBG$$

ii. $\triangle AGF \sim \triangle EFC$



PA, QB and RC are each perpendicular to AC. If AP = x, QB = z, RC = y, AB = a and BC = b, then prove that 73. [5]



In the given figure, $\angle ADC = \angle BCA$; prove that $\triangle ACB \sim \triangle ADC$. Hence find BD if AC = 8 cm and AD = 3 [5] 74. cm.



In the given figure, $\triangle FEC \cong \triangle GDB$ and $\angle 1 = \angle 2$. Prove that $\triangle ADE \sim \triangle ABC$. 75.

[5]

[5]

