Triangles

Standard difficulty · 20 questions · 40 marks · Time: 40 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer 8 × 1 = 8 marks

1. In △ABC, DE ∥ BC with D on AB and E on AC. If AD = 1 cm, DB = 3 cm and AE = 2 cm, then EC is:
(a) 6 cm **(b)** 2/3 cm **(c)** 8 cm **(d)** 7 cm

2. △ABC ~ △PQR with AB = 8 cm, BC = 20 cm and PQ = 10 cm. Then QR is:
(a) 16 cm **(b)** 20 cm **(c)** 29 cm **(d)** 25 cm

3. △ABC ~ △DEF. AB = 8 cm, DE = 2 cm and the perimeter of △ABC is 84 cm. The perimeter of △DEF is:
(a) 23 cm **(b)** 84 cm **(c)** 21 cm **(d)** 105 cm

4. In △ABC and △DEF, AB = 6, BC = 8, CA = 9 and DE = 30, EF = 40, FD = 46 (in cm). Then:
(a) the triangles are congruent **(b)** the triangles are similar by SSS
(c) the triangles are similar by AA **(d)** the triangles are not similar

5. Two triangles are similar when their corresponding angles are equal and their corresponding sides are:
(a) perpendicular **(b)** in the same ratio
(c) equal **(d)** parallel

6. △ABC ~ △DEF. If ∠A = 71° and ∠B = 61°, then ∠F is:
(a) 132° **(b)** 109° **(c)** 48° **(d)** 119°

7. D and E are points on AB and AC of △ABC with AD = 12 cm, DB = 16 cm, AE = 3 cm and EC = 4 cm. Is DE ∥ BC?
(a) Yes, because AD = AE **(b)** No, because AD/DB ≠ AE/EC
(c) Yes, because AD/DB = AE/EC **(d)** It cannot be decided from lengths

8. Assertion (A): In △ABC, DE ∥ BC with AD = 20 cm, DB = 28 cm and AE = 20 cm, so EC = 30 cm.
Reason (R): A line drawn parallel to one side of a triangle divides the other two sides 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.
(d) A is false, but R is true.

Section B — Short answer 8 × 2 = 16 marks

9. In △ABC, DE ∥ BC. If AD = x + 2, DB = x + 4, AE = x − 1 and EC = x (in cm), find x.

10. △ABC ~ △PQR. AB = 15 cm, BC = 20 cm, CA = 30 cm and PQ = 12 cm. Find QR and RP.

11. In △ABC, ∠A = 61° and ∠B = 42°. In △DEF, ∠D = 61° and ∠E = 77°. Are the triangles similar? If so, write the similarity in the right order.

12. D and E lie on AB and AC of △ABC with DE ∥ BC. If AD : DB = 5 : 3 and AC = 40 cm, find AE and EC.

13. The sides of △ABC are 35 cm, 40 cm and 50 cm, and the sides of △DEF are 14 cm, 16 cm and 20 cm. Are the triangles similar? Give the criterion and the scale factor.

14. △ABC ~ △DEF. The perimeters of △ABC and △DEF are 34 cm and 102 cm. If DE = 27 cm, find AB.

15. In △ABC, AB = 11 cm, AC = 12 cm and ∠A = 105°. In △PQR, PQ = 22 cm, PR = 24 cm and ∠P = 125°. Are the triangles similar?

16. ABCD is a trapezium with AB ∥ DC, and its diagonals meet at O. If AB = 6 cm, DC = 12 cm and AC = 54 cm, find AO and OC.

Section C — Word problems — 4 × 4 = 16 marks

17. A vertical pole 3 m tall casts a shadow 10 m long. At the same time, a tower casts a shadow 90 m long. How tall is the tower?

18. A girl 150 cm tall walks away from the base of a lamp post in a straight line at 1 m/s. The lamp is 275 cm above the ground. How long is the shadow after 5 seconds?

19. Isha's eyes are 1.6 m above the ground. A mirror lies flat on the ground 1 m from Isha's feet, and in it Isha sees the top of a tree that is 5 m from the mirror. How tall is the tree?

20. To find the width AB of a river, Meera stands at B, opposite a tree A on the far bank. Meera walks 66 m along the bank to C, then 11 m further to D, then turns at a right angle and walks away from the river until C and A are in line, at E, 9 m from D. How wide is the river?

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Answer key

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Q	Answer	Working
1	**(a) 6 cm**	AD/DB = AE/EC: 1/3 = 2/EC, so EC = 6
2	**(d) 25 cm**	QR/BC = PQ/AB = 5/4, so QR = 20 × 5/4 = 25
3	**(c) 21 cm**	perimeters are in the ratio of corresponding sides: 84 × 1/4 = 21
4	**(d) the triangles are not similar**	DE/AB = 5, EF/BC = 5, FD/CA = 46/9
5	**(b) in the same ratio**	—
6	**(c) 48°**	∠F = ∠C = 180° − 71° − 61° = 48°
7	**(c) Yes, because AD/DB = AE/EC**	AD/DB = 3/4, AE/EC = 3/4
8	**(d) A is false, but R is true.**	A is false: EC = AE × DB/AD = 28, not 30. R is true.
9	**x = 4**	AD/DB = AE/EC: (x + 2)(x) = (x + 4)(x − 1), which gives x = 4
10	**QR = 16 cm, RP = 24 cm**	scale factor PQ/AB = 4/5
11	**Yes, by AA: △ABC ~ △DFE**	∠F = 180° − 61° − 77° = 42° = ∠B, and ∠E = 77° = ∠C, so A ↔ D, B ↔ F, C ↔ E
12	**AE = 25 cm, EC = 15 cm**	AE : EC = AD : DB = 5 : 3; AE = 40 × 5/8
13	**Yes, by SSS; scale factor 2/5**	14/35 = 16/40 = 20/50 = 2/5
14	**9 cm**	AB/DE = 34/102, so AB = 27 × 1/3 = 9
15	**No: the sides are in proportion but the angles between them are not equal**	PQ/AB = PR/AC = 2; ∠P ≠ ∠A
16	**AO = 18 cm, OC = 36 cm**	△AOB ~ △COD (AA), so AO/OC = AB/DC = 6/12
17	**27 m**	the sun's rays make similar triangles: height/90 = 3/10
18	**6 m**	distance walked 5 m; similar triangles: L/150 = (L + 5)/275, so L = 6
19	**8 m**	the angles at the mirror are equal, so the triangles are similar: height/5 = 1.6/1
20	**54 m**	△ABC ~ △EDC (AA): AB/DE = BC/CD, so AB = 9 × 66/11 = 54

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