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CLASS X · MATHEMATICS STANDARD (041) · CBSE BOARD EXAMINATION 2027

CHAPTER 6

Triangles

Chapter Practice Booklet · Questions only · Answers in the separate Answer Booklet

59 practice questions | 4 case studies | Board question index | Original diagrams

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STUDENT DETAILS

NAME _____

CLASS & SECTION _____

ROLL NO. _____

BOOKLET STARTED ON _____

CHAPTER TEST SCORE _____ / 20

1

READ THIS FIRST

Chapter Notes

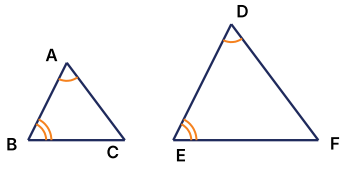
The whole chapter in short-note form: every definition, formula, method and model answer. Revise from here – you should not need the textbook again.

1 Similar figures

Two figures are **similar** if they have the same shape (not necessarily the same size). Two polygons with the same number of sides are similar if (i) their corresponding angles are equal and (ii) their corresponding sides are in the same ratio.

- Always similar: any two circles, any two squares, any two equilateral triangles.
- Congruent figures are similar, but similar figures need not be congruent.
- **Both** conditions are needed for polygons in general: a square and a 2×4 rectangle have equal angles but are not similar; a square and a rhombus of the same side have proportional sides but are not similar.

2 Similar triangles: what the statement means



$\triangle ABC \sim \triangle DEF$

$\triangle ABC \sim \triangle DEF$ means $A \leftrightarrow D$, $B \leftrightarrow E$, $C \leftrightarrow F$: $\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$ and

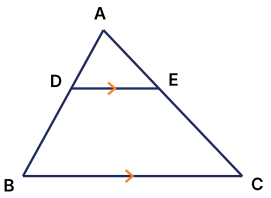
$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$$

- **The order of the letters matters.** Read the matching pairs straight from the statement.
- Perimeters, corresponding medians and corresponding altitudes are in the same ratio as the corresponding sides.

EXAMPLE

$\triangle ABC \sim \triangle PQR$, $AB = 4$ cm, $PQ = 6$ cm, perimeter of $\triangle ABC = 18$ cm. Perimeter of $\triangle PQR = 18 \times \frac{6}{4} = 27$ cm.

3 Basic Proportionality Theorem (BPT)

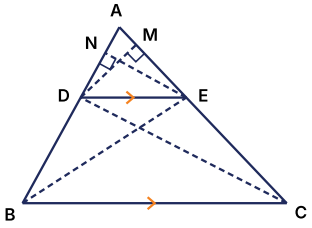


Theorem (Thales). If a line is drawn parallel to one side of a triangle to meet the other two sides in distinct points, it divides those two sides in the same ratio:

$$DE \parallel BC \Rightarrow \frac{AD}{DB} = \frac{AE}{EC}$$

- Useful forms: $\frac{AD}{AB} = \frac{AE}{AC}$ and $\frac{DB}{AB} = \frac{EC}{AC}$.
- Also $\triangle ADE \sim \triangle ABC$, so $\frac{DE}{BC} = \frac{AD}{AB}$. (BPT alone does not give DE.)

4 Model answer: proof of the BPT (3 marks of a 5-mark question)



1. **Given:** in $\triangle ABC$, $DE \parallel BC$, with D on AB and E on AC. **To prove:** $\frac{AD}{DB} = \frac{AE}{EC}$. ½
2. **Construction:** join BE and CD; draw $EN \perp AB$ and $DM \perp AC$. ½
3. $\frac{\text{ar}(ADE)}{\text{ar}(BDE)} = \frac{\frac{1}{2} AD \cdot EN}{\frac{1}{2} DB \cdot EN} = \frac{AD}{DB}$ and $\frac{\text{ar}(ADE)}{\text{ar}(DEC)} = \frac{\frac{1}{2} AE \cdot DM}{\frac{1}{2} EC \cdot DM} = \frac{AE}{EC}$ 1
4. $\triangle BDE$ and $\triangle DEC$ are on the same base DE and between the same parallels DE and BC, so $\text{ar}(BDE) = \text{ar}(DEC)$. Hence $\frac{AD}{DB} = \frac{AE}{EC}$. 1

5 Converse of the BPT · midpoint theorem

If a line divides two sides of a triangle in the same ratio, it is parallel to the third side:

$$\frac{AD}{DB} = \frac{AE}{EC} \Rightarrow DE \parallel BC$$

EXAMPLE

$AD = 3, DB = 6, AE = 2.5, EC = 5$: $\frac{3}{6} = \frac{2.5}{5} = \frac{1}{2}$, so $DE \parallel BC$.

- **Midpoint theorem:** the line joining the midpoints of two sides is parallel to the third side (both ratios are 1).
- A line through the midpoint of one side, parallel to another side, bisects the third side.

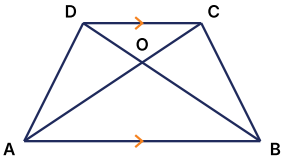
6 BPT numericals

EXAMPLE

$DE \parallel BC$, $AD = x + 1$, $DB = 3x - 1$, $AE = x + 3$, $EC = 3x + 4$. Find x.

$\frac{x+1}{3x-1} = \frac{x+3}{3x+4} \rightarrow 3x^2 + 7x + 4 = 3x^2 + 8x - 3$

$\rightarrow x = 7$. Check: $\frac{8}{20} = \frac{10}{25}$ ✓



Trapezium $ABCD$ with $AB \parallel DC$: $\triangle AOB \sim \triangle COD$, so $\frac{AO}{OC} = \frac{BO}{OD} = \frac{AB}{CD}$. A line drawn parallel to the parallel sides divides the two non-parallel sides in the same ratio.

7 Criteria for similar triangles

AA (AAA)	two angles of one triangle equal two angles of the other
SSS	all three pairs of corresponding sides in the same ratio
SAS	one angle equal, and the sides **including** it in the same ratio

ASA, RHS and SSA are not similarity criteria. RHS and ASA are congruence rules.

EXAMPLE

$AB = 2, BC = 2.5, CA = 3$ and $PQ = 4, QR = 5, RP = 6$: every ratio is $\frac{1}{2}$, so $\triangle ABC \sim \triangle PQR$ (SSS).

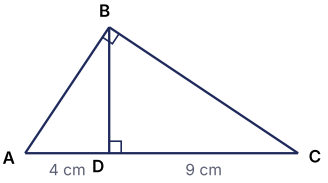
EXAMPLE

$\angle L = 50^\circ, \angle M = 70^\circ; \angle X = 50^\circ, \angle Z = 60^\circ$ so $\angle Y = 70^\circ$: $\triangle LMN \sim \triangle XYZ$ (AA).

8 Writing a similarity proof

1. Name the two triangles **in matching order**.
2. Give two pairs of equal angles with a reason each, or the side ratios.
3. Write the criterion: "$\therefore \triangle \ldots \sim \triangle \ldots$ (AA)". Then write the ratio of sides you need.

Common reasons	common angle · vertically opposite angles · alternate angles (parallel lines) · both 90° · given



Right triangle with altitude: $\angle B = 90^\circ$, $BD \perp AC$ gives $\triangle ADB \sim \triangle ABC \sim \triangle BDC$, so $BD^2 = AD \cdot DC$, $AB^2 = AD \cdot AC$, $BC^2 = CD \cdot CA$.

9 Model answer: trapezium (2 marks)

$ABCD$ is a trapezium with $AB \parallel DC$. Its diagonals meet at O. Show that $\frac{OA}{OC} = \frac{OB}{OD}$.

1. In $\triangle AOB$ and $\triangle COD$: $\angle OAB = \angle OCD$ (alternate angles, $AB \parallel DC$); $\angle AOB = \angle COD$ (vertically opposite). 1
2. $\therefore \triangle AOB \sim \triangle COD$ (AA), so $\frac{OA}{OC} = \frac{OB}{OD}$. 1

10 Model answer: shadows (3 marks)

A vertical pole 4.5 m high casts a shadow 3 m long. At the same time a tower casts a shadow 24 m long. Find the height of the tower.

1. Pole and tower are vertical, and the sun's rays make the same angle with the ground, so the two right triangles are similar (AA). 1
2. $\frac{h}{4.5} = \frac{24}{3}$ 1
3. $h = 4.5 \times 8 = 36$ m 1

11 Checks that save marks

- Write the matching order carefully: if $\triangle ABC \sim \triangle QRP$, then AB goes with QR, not PQ.
- Give a reason for every pair of equal angles and name the criterion.
- In the BPT proof, "Given, To prove, Construction" and the figure carry marks. Do not skip them.
- For a length on a whole side use $\frac{AD}{AB} = \frac{AE}{AC}$; for parts use $\frac{AD}{DB} = \frac{AE}{EC}$.
- Pythagoras ($c^2 = a^2 + b^2$) is still used in calculations, but only in right triangles.

Exam snapshot

What the board asks, and how to prepare

SYLLABUS 2026–27

- Definitions, examples and counter-examples of similar triangles.
- **Prove:** the Basic Proportionality Theorem.
- **Use (motivate):** its converse, and the AA, SSS and SAS criteria.

Not asked: the theorem on areas of similar triangles, and the proofs of Pythagoras' theorem and its converse (deleted).

BOARD WEIGHTAGE

15 / 80

Unit IV Geometry (Triangles and Circles) together. Every paper checked had a 5-mark question from this chapter (prove the BPT and apply it, or a similarity proof), a 2-mark similarity question, and most had a 1-mark question on sides or perimeters.

MOST ASKED IN BOARD PAPERS, 2024–2026 + SAMPLE PAPER 2026–27 (4 PAPERS CHECKED)

How often	Question type	Marks	Papers
★★★	5 marks: prove the BPT and apply it, or prove a result with similar triangles	5	4 of 4
★★★	2 marks: show two triangles similar (trapezium, angle bisector) or use the BPT to find x	2	4 of 4
★★★	1 mark: corresponding sides or perimeters of similar triangles	1	3 of 4

MISTAKES THAT COST MARKS

- Matching the wrong sides because the order of letters in the similarity statement was ignored.
- Writing equal angles without reasons, or not naming the criterion.
- Leaving out Given / To prove / Construction / figure in the BPT proof.
- Using $\frac{AD}{DB}$ with AC instead of EC: keep parts with parts and wholes with wholes.
- Using the BPT ratio $\frac{AD}{DB}$ to find DE. Use $\frac{DE}{BC} = \frac{AD}{AB}$.
- Quoting ASA or RHS as a similarity criterion.

HOW TO USE THIS BOOKLET

1. **Day 1:** Notes, then Part A (NCERT) and Part B (Exemplar). Do every MUST DO question first.
2. **Day 2:** Part C (board pattern) and Part D (case studies).
3. **Day 3:** Part E (challenge) and the real board questions in Part F.
4. **Wed 23 Dec: zero-period chapter test – 20 marks in 40 minutes, without the booklet.**
5. Check every answer in the Answer Booklet. Write each mistake on the My Mistakes page.

RULES AT A GLANCE

BPT	$DE \parallel BC \Rightarrow \frac{AD}{DB} = \frac{AE}{EC}$
Converse	equal ratios $\Rightarrow DE \parallel BC$
Criteria	AA · SSS · SAS
Similar triangles	sides, perimeters, medians, altitudes in one ratio
Trapezium diagonals	$\frac{AO}{OC} = \frac{BO}{OD}$
Altitude on hypotenuse	$BD^2 = AD \cdot DC$

PART A · NCERT PRACTICE

A NCERT Practice

The same skills as the NCERT examples and exercises, with new numbers. Finish every question before moving on.

Similar figures

A1. Which pair of figures is **always** similar? [1]

(a) two rectangles (b) two rhombuses

(c) two equilateral triangles (d) two isosceles triangles

A2. Give a counter-example for each statement: MUST DO [2]

(i) Two quadrilaterals with equal corresponding angles need not be similar.

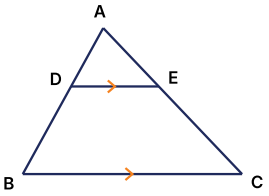
(ii) Two quadrilaterals with proportional sides need not be similar.

Basic Proportionality Theorem

A3. In $\triangle ABC$, $DE \parallel BC$ with D on AB and E on AC. Find: MUST DO [2]

(i) EC, if $AD = 2$ cm, $DB = 3$ cm, $AE = 2.4$ cm

(ii) AE, if $AD = 4$ cm, $AB = 10$ cm, $AC = 7.5$ cm

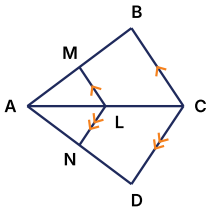


A4. E and F are points on sides PQ and PR of $\triangle PQR$. Is $EF \parallel QR$? MUST DO [2]

(i) $PE = 4$, $EQ = 5$, $PF = 3.2$, $FR = 4$ (cm)

(ii) $PE = 3$, $EQ = 4.5$, $PF = 2.4$, $FR = 3$ (cm)

A5. In the figure, $LM \parallel CB$ and $LN \parallel CD$. Prove that $\dfrac{AM}{AB} = \dfrac{AN}{AD}$. [3]



A6. Using the BPT, prove that a line drawn through the midpoint of one side of a triangle, parallel to another side, bisects the third side. [2]

A7. The diagonals of quadrilateral $ABCD$ meet at O and $\dfrac{AO}{BO} = \dfrac{CO}{DO}$. Show that $ABCD$ is a trapezium. [3]

Similarity criteria

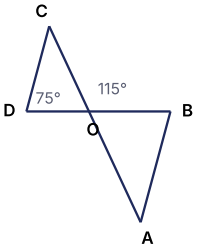
A8. State which pairs of triangles are similar, and write the criterion: MUST DO [3]

(i) $AB = 2$, $BC = 2.5$, $CA = 3$; $PQ = 4$, $QR = 5$, $RP = 6$

(ii) $\angle L = 50^\circ$, $\angle M = 70^\circ$; $\angle X = 50^\circ$, $\angle Z = 60^\circ$

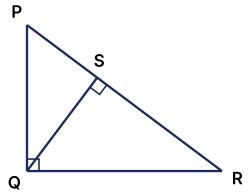
(iii) $DE = 3$, $EF = 4$, $\angle E = 40^\circ$; $ST = 6$, $TU = 10$, $\angle T = 40^\circ$

A9. In the figure, $\triangle ODC \sim \triangle OBA$, $\angle BOC = 115^\circ$ and $\angle CDO = 75^\circ$. Find $\angle DOC$, $\angle DCO$ and $\angle OAB$. [3]

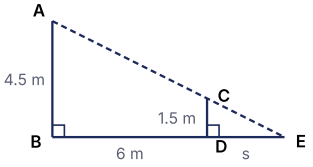


A10. In $\triangle PQR$, $\angle Q = 90^\circ$ and $QS \perp PR$. Prove that $\triangle PSQ \sim \triangle PQR$ and $PQ^2 = PS \times PR$. [3]

MUST DO



A11. A girl 1.5 m tall walks away from the foot of a lamp post at 1 m/s. The lamp is 4.5 m above the ground. How long is her shadow after 6 seconds? [3]



A12. A stick 2 m long, held upright, casts a shadow 1.6 m long. At the same time a building casts a shadow 24 m long. Find the height of the building. [2]

A13. AD and PS are medians of $\triangle ABC$ and $\triangle PQR$, and $\triangle ABC \sim \triangle PQR$. Prove that $\dfrac{AB}{PQ} = \dfrac{AD}{PS}$. [3]

Pythagoras (application)

A14. A ladder 13 m long reaches a window 12 m above the ground. How far is the foot of the ladder from the wall? [2]

B — Exemplar Practice

PART B · EXEMPLAR PRACTICE

Exemplar-style questions on the same ideas, one step harder. Give a reason for every 2-mark answer.

Multiple choice

1 mark each

B1. $\triangle PQR \sim \triangle ZYX$. Which statement is **not** true in general? [1]

(a) $PQ \cdot YX = QR \cdot ZY$ (b) $QR \cdot ZX = PR \cdot YX$

(c) $PQ \cdot ZX = PR \cdot ZY$ (d) $PQ \cdot YX = PR \cdot ZX$

B2. In $\triangle ABC$, $DE \parallel BC$ with $AD = 2$ cm and $AB = 6$ cm. Then $DE : BC$ is: [1]

(a) $1:2$ (b) $1:3$ (c) $2:3$ (d) $1:4$

B3. $\triangle ABC \sim \triangle PQR$ with $BC = 8$ cm and $QR = 6$ cm. If the perimeter of $\triangle PQR$ is 21 cm, the perimeter of $\triangle ABC$ is: [1]

(a) 28 cm (b) 24 cm (c) 15.75 cm (d) 32 cm

B4. In $\triangle ABC$, $\angle BAC = 90^\circ$ and $AD \perp BC$. Then: [1]

(a) $AB \cdot AC = BC^2$ (b) $BD \cdot CD = AD^2$

(c) $BD \cdot CD = BC^2$ (d) $AB \cdot AC = AD^2$

B5. In $\triangle KLM$ and $\triangle XYZ$, $\angle K = \angle Y$ and $\angle M = \angle X$. Which is **not** true? [1]

(a) $\dfrac{KL}{YZ} = \dfrac{KM}{YX}$ (b) $\dfrac{LM}{ZX} = \dfrac{KL}{YZ}$ (c) $\dfrac{KL}{XY} = \dfrac{LM}{ZX}$ (d) $\dfrac{KM}{XY} = \dfrac{LM}{XZ}$

B6. $\triangle ABC \sim \triangle DFE$, $\angle A = 40^\circ$, $\angle C = 60^\circ$, $AB = 4$ cm, $AC = 6$ cm and $DF = 6$ cm. Then: [1]

(a) $DE = 9$ cm, $\angle F = 60^\circ$ (b) $EF = 9$ cm, $\angle D = 80^\circ$

(c) $DE = 9$ cm, $\angle F = 80^\circ$ (d) $EF = 9$ cm, $\angle D = 40^\circ$

B7. S and T are on sides PQ and PR of $\triangle PQR$ with $PS = 2$, $SQ = 6$, $PT = 3$, $TR = 9$ (cm). Then $ST : QR$ is: [1]

(a) $1 : 3$ (b) $1 : 4$ (c) $1 : 2$ (d) $2 : 3$

Short answer with reasons

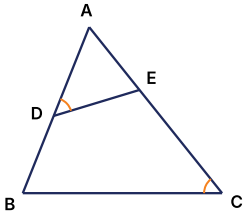
2–3 marks

B8. Is a triangle with sides 10 cm, 25 cm and 26 cm a right triangle? Justify. [2]

B9. Two sides and the perimeter of one triangle are three times the corresponding sides and perimeter of another. Are the triangles similar? Justify. [2]

B10. $\triangle ABC \sim \triangle RQP$, $\angle A = 80^\circ$ and $\angle B = 60^\circ$. Find $\angle Q$ and $\angle P$. [2]

B11. In the figure, $\angle ADE = \angle ACB$. Show that $\triangle ADE \sim \triangle ACB$. If $AD = 3$ cm, $AE = 4$ cm and $AC = 9$ cm, find AB. MUST DO [3]

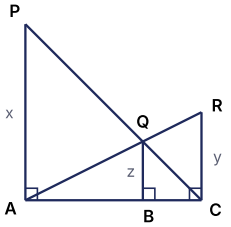


B12. $ABCD$ is a trapezium with $AB \parallel DC$ and $AB = 2\,CD$. Its diagonals meet at O and $AO = 6$ cm. Find OC and AC. [2]

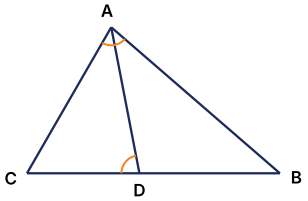
Long answer

3–4 marks

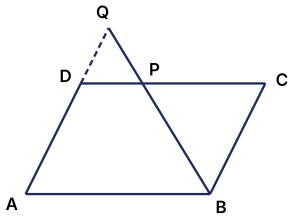
B13. Two vertical poles 6 m and 3 m high stand on level ground. The top of each pole is joined to the foot of the other. How high above the ground do the two lines cross? MUST DO [4]



B14. D is a point on side BC of $\triangle ABC$ with $\angle ADC = \angle BAC$. Show that $CA^2 = CB \times CD$. If $CB = 9$ cm and $CD = 4$ cm, find CA. [4]



B15. $ABCD$ is a parallelogram. A line through B meets DC at P and AD produced at Q. Prove that $\triangle BCP \sim \triangle QDP$ and hence $\dfrac{CP}{DP} = \dfrac{BC}{QD}$. [3]



C

PART C · BOARD PATTERN

Board Pattern Practice

Question types from real 2024–2026 board papers and the 2026–27 Sample Paper, grouped by type. ★★★ = asked in 3 or 4 of the 4 papers checked · ★★ = 2 papers · ★ = 1 paper.

ASSERTION–REASON: HOW TO ANSWER

(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.

Sides and perimeters of similar triangles

★★★ 3 of 4 papers · 1 mark

C1. $\triangle ABC \sim \triangle PQR$ with perimeters 36 cm and 48 cm. If $AB = 9$ cm, then PQ is: MUST DO [1]

(a) 6.75 cm (b) 12 cm (c) 15 cm (d) 16 cm

C2. $\triangle PQR \sim \triangle XYZ$, $XY = 3\,PQ$ and $QR = 5$ cm. Then YZ is: [1]

(a) $\frac{5}{3}$ cm (b) 8 cm (c) 15 cm (d) 10 cm

C3. In $\triangle ABC$ and $\triangle DEF$, $\angle A = \angle E = 40^\circ$ and $\dfrac{AB}{ED} = \dfrac{AC}{EF}$. Then: [1]

(a) $\triangle ABC \sim \triangle EDF$ (b) $\triangle ABC \sim \triangle DEF$
(c) $\triangle ABC \sim \triangle FED$ (d) $\triangle ABC \sim \triangle EFD$

C4. Which of these is **not** a criterion for similarity of triangles? MUST DO [1]

(a) AA (b) SAS (c) SSS (d) RHS

C5. In $\triangle ABC$ and $\triangle PQR$, $\angle A = \angle P$, $\angle B = \angle Q$ and $BC = 4\,QR$. The triangles are: [1]

(a) congruent but not similar (b) similar but not congruent
(c) neither similar nor congruent (d) both similar and congruent

C6. Two similar triangles have corresponding altitudes 6 cm and 9 cm. A side of the smaller triangle is 8 cm. The corresponding side of the larger is: [1]

(a) 10.5 cm (b) 16 cm (c) $5\frac{1}{3}$ cm (d) 12 cm

C7. ASSERTION–REASON [1]

Assertion (A): If $\triangle ABC \sim \triangle PQR$ with $AB = 4$ cm and $PQ = 6$ cm, the ratio of their perimeters is $2 : 3$.

Reason (R): The perimeters of similar triangles are in the ratio of their corresponding sides.

BPT: lengths and parallel lines

★☆☆ 1 of 4 papers · 2 marks

C8. In $\triangle ABC$, $DE \parallel BC$, $AD = 3$ cm, $DB = 4$ cm and $AE = 4.5$ cm. Then EC is: MUST DO [1]

(a) 3.375 cm (b) 5 cm (c) 7.5 cm (d) 6 cm

C9. In $\triangle ABC$, $DE \parallel BC$, $\dfrac{AD}{DB} = \dfrac{3}{5}$ and $AC = 12$ cm. Then AE is: [1]

(a) 7.2 cm (b) 4.5 cm (c) 4 cm (d) 7.5 cm

C10. In $\triangle PQR$, $ST \parallel QR$ with $PS = 4$ cm, $SQ = 6$ cm, $PT = 3x$ cm and $TR = 9$ cm. Then x is: [1]

(a) 3 (b) 1.5 (c) 2 (d) 6

C11. ASSERTION–REASON [1]

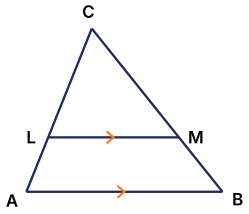
Assertion (A): In $\triangle ABC$, D and E are the midpoints of AB and AC, so $DE \parallel BC$.

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

C12. In $\triangle ABC$, $DE \parallel BC$ with $AD = x + 2$, $DB = x - 1$, $AE = x + 5$ and $EC = x + 1$ (cm). Find x. MUST DO [2]

C13. D and E are points on AB and AC of $\triangle ABC$ with $AD = 1.5$, $DB = 3$, $AE = 1$ and $EC = 2$ (cm). Show that $DE \parallel BC$. [2]

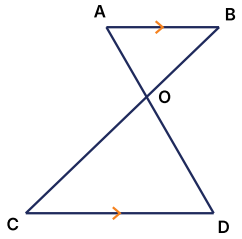
C14. In the figure, $LM \parallel AB$. If $AL = x - 3$, $AC = 2x$, $BM = x - 2$ and $BC = 2x + 3$, find x. [2]



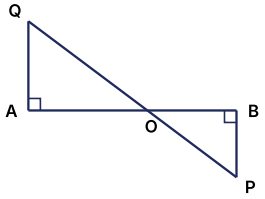
Show two triangles similar

★★★ 4 of 4 papers · 2 marks

C15. In the figure, $AB \parallel CD$ and AD, BC meet at O. Show that $\triangle OAB \sim \triangle ODC$. If $OA = 3$ cm, $OD = 5$ cm and $AB = 4.2$ cm, find CD. MUST DO [2]



C16. In the figure, $QA \perp AB$ and $PB \perp AB$. If $AO = 8$ cm, $BO = 6$ cm and $PB = 4.5$ cm, find AQ. [2]



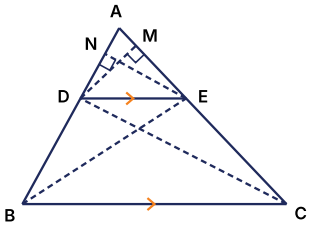
C17. In $\triangle ABC$, P and Q are on AB and AC with $PQ \parallel BC$, $AP = 3$ cm and $PB = 6$ cm. Show that $\triangle APQ \sim \triangle ABC$ and find PQ if $BC = 12$ cm. [2]

C18. $\triangle ABC \sim \triangle PQR$, and AM, PN are their altitudes. Prove that $\dfrac{AM}{PN} = \dfrac{AB}{PQ}$. [2]

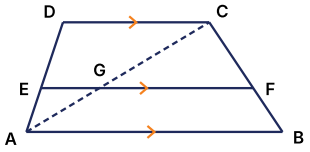
Theorem and proofs

★★★ 4 of 4 papers · 5 marks

C19. State and prove the Basic Proportionality Theorem. MUST DO [5]



C20. $ABCD$ is a trapezium with $AB \parallel DC$. E and F are points on AD and BC with $EF \parallel AB$. Show that $\dfrac{AE}{ED} = \dfrac{BF}{FC}$. MUST DO [3]



C21. In $\triangle PQR$, $PS \perp QR$ with S between Q and R, and $PS^2 = QS \times SR$. Prove that $\angle QPR = 90^\circ$. [3]

Applications: shadows and ladders

1–3 marks

C22. A ladder 17 m long reaches a window 15 m above the ground. The distance of its foot from the wall is: MUST DO [1]

(a) 7 m (b) 9 m (c) 8 m (d) 10 m

C23. A vertical stick 1.8 m long casts a shadow 1.2 m long. At the same time a tree casts a shadow 9 m long. Find the height of the tree. [2]

C24. A lamp is 6 m above the ground. A boy 1.5 m tall stands 9 m from the foot of the lamp post. Find the length of his shadow. [3]

D

PART D · SECTION E STYLE

Case-Based Questions

Each case carries 4 marks (1 + 1 + 2), as in Section E of the board paper. Read the situation carefully before answering.

D1. Case Study · Shadow and Height [4]

At 10 a.m., a student 1.6 m tall casts a shadow 2 m long on level ground. At the same moment the school flagpole casts a shadow 15 m long.

(i) Why are the triangles formed by the student and the flagpole with their shadows similar? [1]

(ii) Find the height of the flagpole. [1]

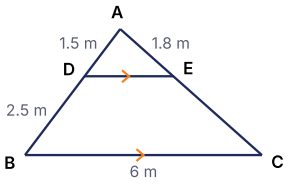
(iii) Later in the day the flagpole's shadow is 9 m long. How long is the student's shadow then? [2]

OR

(iii) A tree 8 m high stands near the flagpole. How long is its shadow at 10 a.m.? [2]

D2. Case Study · Roof Truss [4]

A roof truss is in the shape of $\triangle ABC$ with $BC = 6$ m. A horizontal beam DE is fixed parallel to BC, with $AD = 1.5$ m, $DB = 2.5$ m and $AE = 1.8$ m.



(i) Find the length EC. [1]

(ii) Find the length of the beam DE. [1]

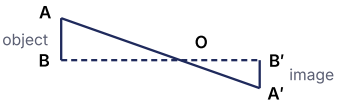
(iii) A second beam $FG \parallel BC$ is fixed with F on AB and $AF = 3$ m. Find FG and AG. [2]

OR

(iii) A builder joins a point 2 m from A on AB to a point 2.4 m from A on AC. Is this beam parallel to BC? Justify. [2]

D3. Case Study · Pinhole Camera [4]

In a pinhole camera, light from the top and bottom of an object passes through a tiny hole O and forms an upside-down image on a screen. The object AB and the image $A'B'$ are both vertical. An object 6 m from the hole forms an image 3 cm high on a screen 10 cm behind the hole.



(not to scale)

(i) Which criterion shows $\triangle OAB \sim \triangle OA'B'$? [1]

(ii) Find the height of the object. [1]

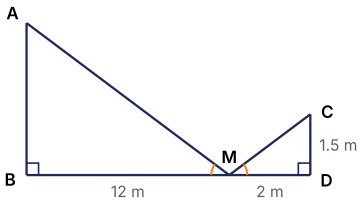
(iii) The object is moved to 9 m from the hole. Find the new height of the image. [2]

OR

(iii) The screen is moved to 15 cm behind the hole (object at 6 m). Find the height of the image. [2]

D4. Case Study · Mirror Method [4]

To find the height of a tree AB, Riya places a small mirror M on level ground 12 m from the foot of the tree. She stands 2 m from the mirror, on the other side, and sees the top of the tree in it. Her eyes C are 1.5 m above the ground. The angles that the two rays make with the ground at M are equal.



(not to scale; M is the mirror)

(i) Why is $\triangle ABM \sim \triangle CDM$? [1]

(ii) Find the height of the tree. [1]

(iii) Keeping 2 m from the mirror, how far from a pole 13.5 m high must the mirror be for Riya to see its top? [2]

OR

(iii) Her friend, whose eyes are 1.2 m above the ground, stands 1.6 m from the same mirror. Can she see the top of the tree? Justify. [2]

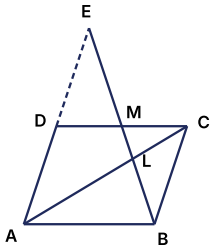
E

PART E · FOR 95+

Challenge Questions

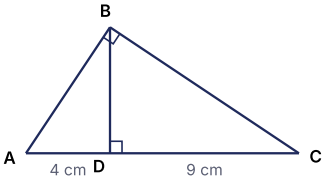
Harder than the usual board question. Try these after Parts A–D: they stretch the same methods to the toughest 3- and 5-mark questions.

E1. Through the midpoint M of side CD of parallelogram $ABCD$, the line BM is drawn, meeting AC at L and AD produced at E. Prove that $EL = 2BL$. [3]



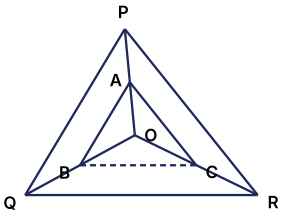
E2. In $\triangle ABC$, AD is a median and E is the midpoint of AD. BE produced meets AC at F. Prove that $AF = \frac{1}{3}AC$. [3]

E3. In $\triangle ABC$, $\angle B = 90^\circ$ and $BD \perp AC$. If $AD = 4$ cm and $CD = 9$ cm, find BD and AB. [3]



E4. Sides AB, BC and median AD of $\triangle ABC$ are proportional to sides PQ, QR and median PM of $\triangle PQR$. Show that $\triangle ABC \sim \triangle PQR$. [3]

E5. O is a point inside $\triangle PQR$. Points A, B, C on OP, OQ, OR are such that $AB \parallel PQ$ and $AC \parallel PR$. Show that $BC \parallel QR$. [3]



E6. A girl 1.6 m tall stands 3.2 m from a lamp post and casts a shadow 4.8 m long. Find the height of the lamp above the ground. [2]

F

PART F · REAL BOARD QUESTIONS

Board PYQ Index

Real questions from recent Maths Standard board papers and the 2026–27 Sample Paper, by type. Open the official paper and solve the listed questions.

Frequency	Question type	Marks	Where asked (year: paper code, question number)	Practise here
★★★	**Prove the BPT / similarity proofs**	5	**2026:** 30/1/1 Q34 · **2025:** 30/1/1 Q33 · **2024:** 30/1/1 Q34 · **SQP 2026–27:** Q33	A3–A7, A13, B2, B7, B13–B15, C8–C14, C18–C21, D2, E1–E2, E4–E5
★★★	**Similarity in a figure / BPT value of x**	2	**2026:** 30/1/1 Q22 · **2025:** 30/1/1 Q24 · **2024:** 30/1/1 Q24 · **SQP 2026–27:** Q22	A1–A13, B1–B2, B4–B5, B7, B9–B12, C3–C5, C8–C20, C23–C24, D1–D4, E2–E3, E5–E6
★★★	**Sides and perimeters of similar triangles**	1	**2026:** 30/1/1 Q7 · **2025:** 30/1/1 Q8 · **SQP 2026–27:** Q6	B3, B6, C1–C7

PAPERS CHECKED

- **2026:** 30/1/1 (Delhi, Set 1)
- **2025:** 30/1/1 (Delhi, Set 1)
- **2024:** 30/1/1 (Delhi, Set 1)
- **CBSE Sample Paper 2026–27** (Mathematics Standard)

Sets of one code family (30/1/1, 30/1/2, 30/1/3) share most questions, so each counts as one paper. Download the official papers from cbse.gov.in → Previous Year Question Papers, and solve the exact questions listed above.

PART G · YOUR RECORD

G My Mistakes

Write down each mistake from this chapter, including the chapter test.

Every wrong answer is a free lesson. Write it here, find the rule you missed, and redo the question after three days. Bring this page to class before the next test.

Date	Part & Q No.	What went wrong	Correct rule or method	Redone ✓