ExamPath

CLASS 9 MATHEMATICS · FBISE · UNIT 10 · SECTIONS B AND C PRACTICE

Unit 10: Practical Geometry: short and long questions

Write your working in the boxes. Model answers are on the last pages. These are practice questions written by ExamPath, not official FBISE questions or marking schemes.

Section B style: short questions (3 marks each)

B1 · 3 marks · Constructing triangles (SSS)

Write the steps to construct triangle ABC with AB = 6 cm, BC = 5 cm and AC = 4 cm.

B2 · 3 marks · The ambiguous case

Two sides of a triangle are 7 cm and 5 cm, and the angle opposite the 5 cm side is 40°. How many triangles can be constructed? Explain. (sin 40° ≈ 0.643)

B3 · 3 marks · Perpendicular bisector

Write the steps to construct the perpendicular bisector of a line segment PQ = 7 cm, and state one property of every point on it.

B4 · 3 marks · Centroid

In triangle ABC, AD is a median of length 12 cm and G is the centroid. Find AG and GD, and explain your answer.

B5 · 3 marks · Angle bisector

Write the steps to bisect an angle of 70°.

B6 · 3 marks · Constructing triangles (ASA)

A triangle is to be constructed with angles of 50° and 65° at the ends of a 6 cm side. Find the third angle, and say what kind of triangle it will be.

Section C style: long questions (6 marks each)

C1 · 6 marks · Medians and centroid

Construct triangle PQR with PQ = 6 cm, QR = 7 cm and PR = 5 cm.

(a) Write the steps of the construction. (2 marks)

(b) Write the steps to draw the three medians. (3 marks)

(c) What do you notice about the medians? (1 mark)

C2 · 6 marks · Circumcircle

Construct a triangle with sides 5 cm, 6 cm and 7 cm.

(a) Write the steps to draw its circumcircle. (4 marks)

(b) Will the circumcentre lie inside, on or outside the triangle? Give a reason. (2 marks)

C3 · 6 marks · Incircle

In triangle ABC, AB = 7 cm, angle A = 60° and angle B = 45°.

(a) Find angle C. (1 mark)

(b) Write the steps to construct the triangle. (2 marks)

(c) Write the steps to draw its incircle, and state what the in-centre is equidistant from. (3 marks)

Model answers

B1.

1. Draw AB = 6 cm with a ruler.
2. With centre A and radius 4 cm, draw an arc above AB.
3. With centre B and radius 5 cm, draw a second arc to cut the first arc at C.
4. Join AC and BC. ABC is the required triangle.

Answer: Triangle ABC with the three given sides

Watch out: The arcs meet only if the sides can form a triangle: $4 + 5 > 6$, so they do.

B2.

1. Draw the 40° angle and mark the 7 cm side along one arm.
2. The shortest distance from the end of the 7 cm side to the other arm is $7 \times \sin 40° \approx 4.5$ cm.
3. The 5 cm side is longer than 4.5 cm but shorter than 7 cm, so an arc of radius 5 cm cuts the other arm at two points.
4. So two different triangles can be constructed.

Answer: Two triangles

Watch out: Compare the side opposite the angle with the shortest distance (h) and with the other side: $h < 5 < 7$ gives two triangles.

B3.

1. Draw PQ = 7 cm.
2. With centre P and a radius more than half of PQ (say 5 cm), draw arcs above and below PQ.
3. With centre Q and the same radius, draw arcs to cut the first arcs at R and S.
4. Join RS. It is the perpendicular bisector of PQ.
5. Every point on RS is equidistant from P and Q.

Answer: Line RS; every point on it is equidistant from P and Q

Watch out: The radius must be more than half of PQ, or the arcs will not meet.

B4.

1. The centroid divides each median in the ratio 2 : 1, measured from the vertex.
2. $AG = 2/3 \times 12 = 8$ cm.
3. $GD = 1/3 \times 12 = 4$ cm.

Answer: AG = 8 cm, GD = 4 cm

Watch out: The longer part (2 parts) is next to the vertex.

B5.

1. Draw angle ABC = 70° with a protractor.
2. With centre B and any radius, draw an arc cutting BA at P and BC at Q.
3. With centres P and Q and equal radii, draw two arcs that cross at R inside the angle.
4. Join BR. BR bisects the angle, so angle ABR = angle RBC = 35°.

Answer: BR, making two angles of 35°

Watch out: Keep the same radius for the two arcs from P and Q.

B6.

1. Third angle = 180° − 50° − 65° = 65°.
2. Two angles are equal (65°), so the sides opposite them are equal.
3. The triangle is isosceles.

Answer: 65°; an isosceles triangle

Watch out: Equal angles are opposite equal sides.

C1.

1. (a) Draw QR = 7 cm. With centre Q and radius 6 cm draw an arc; with centre R and radius 5 cm draw an arc to cut it at P. Join PQ and PR.
2. (b) Draw the perpendicular bisector of each side to find its midpoint: L on QR, M on PR and N on PQ.
3. Join P to L, Q to M and R to N. These are the medians.
4. (c) The three medians meet at one point G, the centroid (they are concurrent). Measuring shows PG is about twice GL.

Answer: The medians are concurrent at the centroid G, which divides each median in the ratio 2 : 1

Watch out: Find each midpoint by construction (perpendicular bisector), not by guessing with a ruler.

C2.

1. (a) Construct the triangle ABC from its three sides.
2. Draw the perpendicular bisectors of any two sides, for example AB and BC. They meet at O, the circumcentre.
3. With centre O and radius OA, draw a circle. It passes through A, B and C.
4. (b) The longest side is 7 cm, and $5^2 + 6^2 = 61 > 49 = 7^2$, so the largest angle is acute and the triangle is acute-angled.
5. For an acute-angled triangle the circumcentre lies inside the triangle.

Answer: (b) Inside, because the triangle is acute-angled

Watch out: Two perpendicular bisectors are enough; the third will pass through the same point.

C3.

1. (a) Angle C = 180° − 60° − 45° = 75°.
2. (b) Draw AB = 7 cm. At A construct an angle of 60° and at B an angle of 45°. The arms meet at C.
3. (c) Bisect angle A and angle B. The bisectors meet at I, the in-centre.
4. From I draw a perpendicular to AB meeting it at D. With centre I and radius ID, draw the circle; it touches all three sides.
5. The in-centre is equidistant from the three sides of the triangle.

Answer: (a) 75° (c) The in-centre is equidistant from the three sides

Watch out: The radius of the incircle is the perpendicular distance from I to a side, not the distance from I to a vertex.

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