HIGHER

6.10 Circle Theorems: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question tests circle vocabulary.

(a) Write down the mathematical name for a fraction of the circumference of a circle. **(1)**

.....

(b) Write down the mathematical name for the region enclosed by two radii and an arc. **(1)**

.....

(c) Write down the mathematical name for the region enclosed by a chord and an arc. **(1)**

.....

(d) A straight line touches a circle at exactly one point. Write down the mathematical name for this point. **(1)**

.....

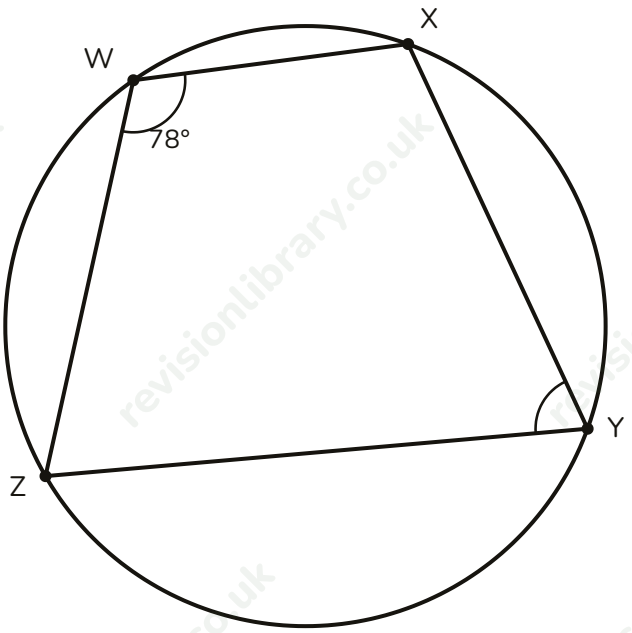
(Total for Question 1 is 4 marks)

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2 WXYZ is a cyclic quadrilateral, with all four vertices on the circumference of a circle. Angle W = 78 degrees.

Work out the size of angle Y, giving a reason for your answer.

Diagram NOT accurately drawn

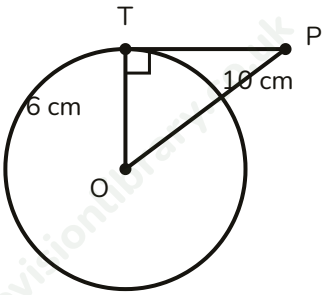


(Total for Question 2 is 3 marks)

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3 O is the centre of a circle of radius 6 cm. P is a point outside the circle with OP = 10 cm. PT is a tangent to the circle, touching it at T.
Show that PT = 8 cm.

Diagram NOT accurately drawn



(Total for Question 3 is 3 marks)

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4 PT is a tangent to a circle with centre O at the point T. P is outside the circle. Angle TPO = 40 degrees. Work out the size of angle POT. Give reasons for your working.

(Total for Question 4 is 3 marks)

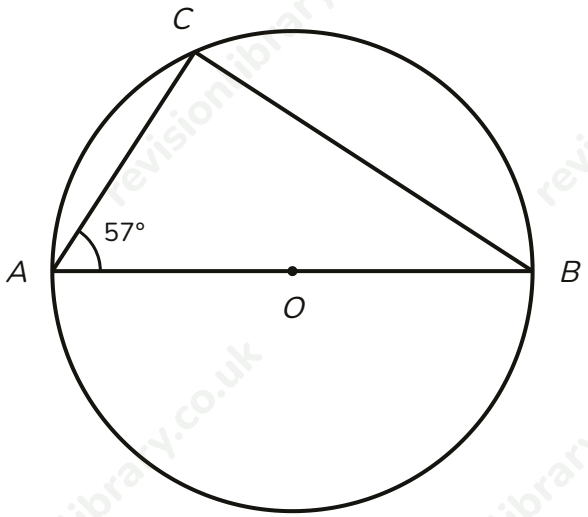
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5 A, B, C and D are points on a circle, in that order, so that ABCD is a cyclic quadrilateral. Angle ABC = 102 degrees. Work out the size of angle ADC. Give a reason for your answer.

(Total for Question 5 is 2 marks)

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6 AB is a diameter of a circle with centre O. C is a point on the circumference. Angle CAB = 57 degrees. Work out the size of angle ABC. Give reasons for your working.

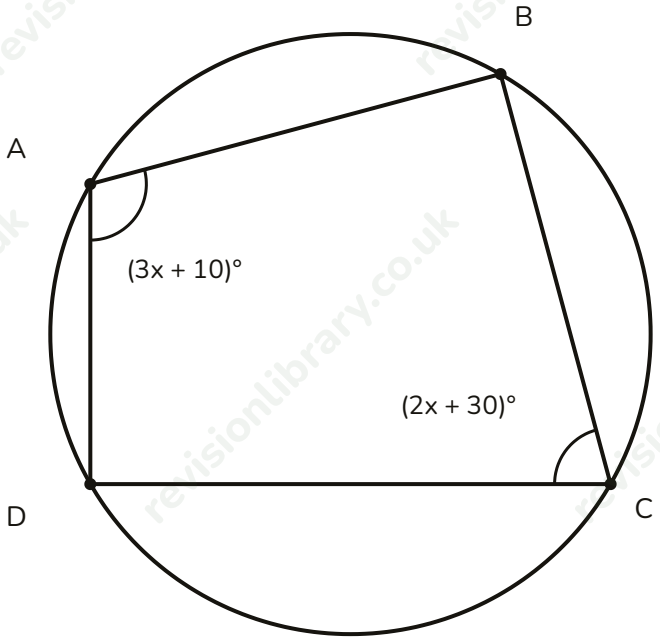


(Total for Question 6 is 3 marks)

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7 ABCD is a cyclic quadrilateral. Angle A = (3x + 10) degrees and angle C = (2x + 30) degrees.

Diagram NOT accurately drawn



(a) Explain why angle A + angle C = 180 degrees. **(1)**

(b) Work out the value of x. **(2)**

(c) Work out the size of angle A and the size of angle C. **(2)**

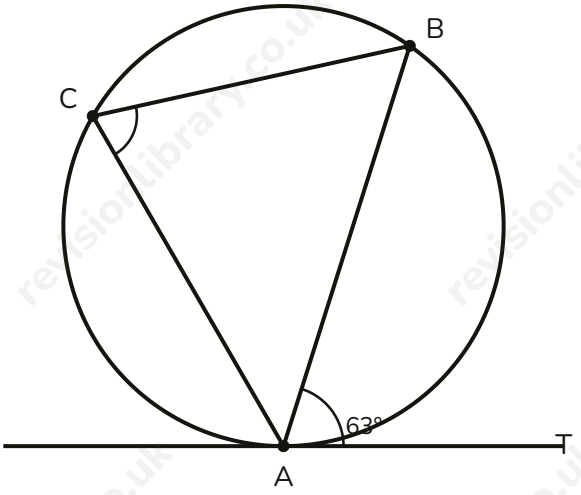
(Total for Question 7 is 5 marks)

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8 TA is a tangent to a circle at the point A. AB is a chord of the circle, and C is a point on the circle in the alternate segment. The angle between the tangent TA and the chord AB is 63 degrees.

Write down the size of angle ACB, giving a reason for your answer.

Diagram NOT accurately drawn

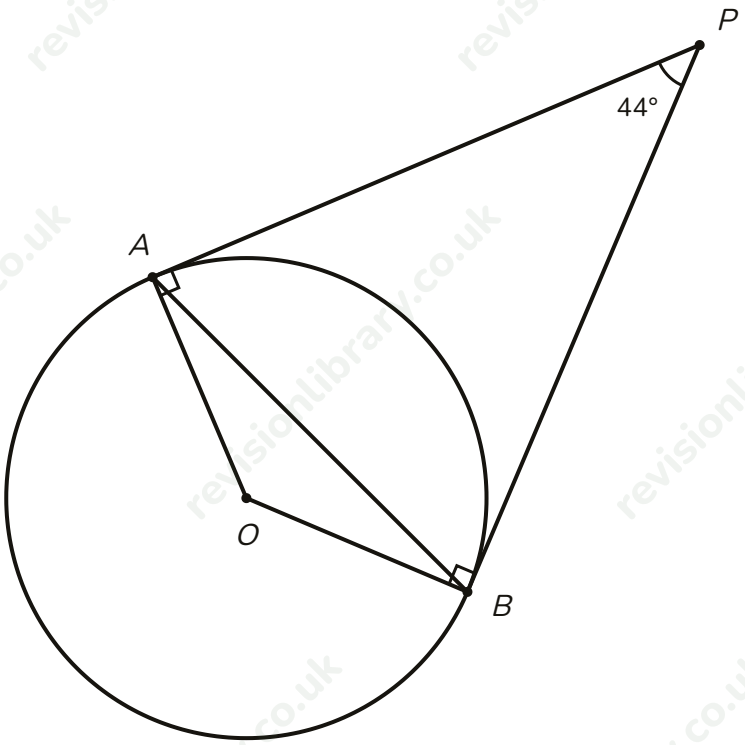


(Total for Question 8 is 2 marks)

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9 PA and PB are tangents to a circle with centre O, touching the circle at A and B respectively.
Angle APB = 44 degrees.

Diagram NOT accurately drawn



(a) Give a reason why PA = PB. **(1)**

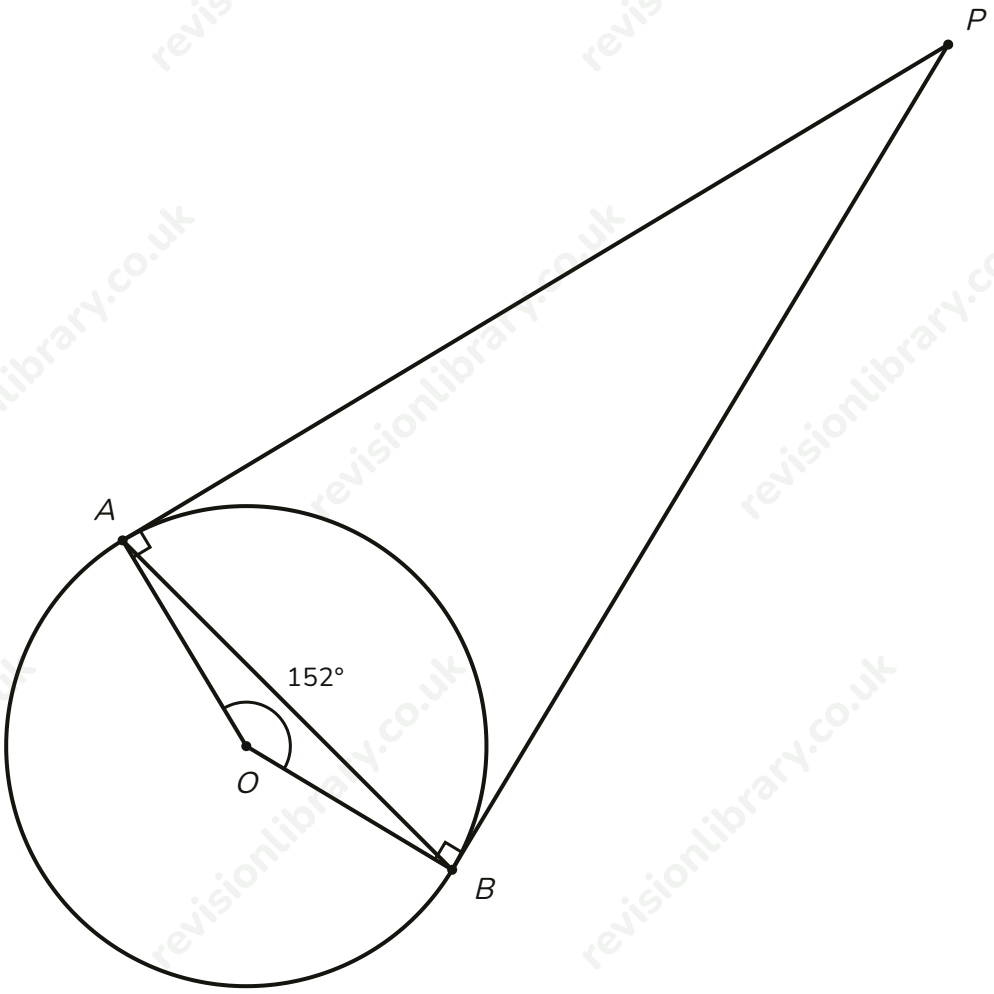
(b) Work out the size of angle PAB. **(2)**

(Total for Question 9 is 3 marks)

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10 PA and PB are tangents to a circle with centre O, touching the circle at A and B. Angle AOB = 152 degrees.

Diagram NOT accurately drawn



(a) Work out the size of angle APB. **(3)**

.....

(b) Work out the size of angle PAB. **(2)**

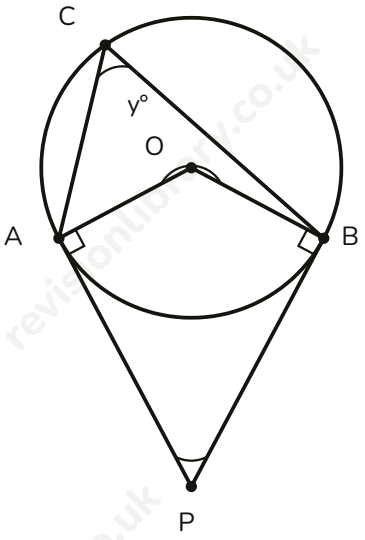
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(Total for Question 10 is 5 marks)

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11 PA and PB are tangents to a circle with centre O, touching the circle at A and B. C is a point on the major arc AB. Angle ACB = y degrees.
Prove that angle APB = 180 - 2y.

Diagram NOT accurately drawn

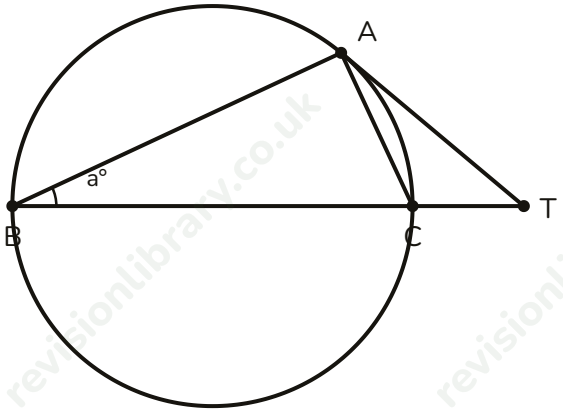


(Total for Question 11 is 5 marks)

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12 A, B and C are points on a circle, with BC a diameter. The tangent to the circle at A meets the line BC extended beyond C, at the point T. Angle ABC = a degrees.
Prove that angle ATC = (90 - 2a) degrees.

Diagram NOT accurately drawn



(Total for Question 12 is 6 marks)

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Mark scheme · 6.10 Circle Theorems: Test Pack

Question 1

(a) arc cao **B1**

(a) Answer: Arc

(b) sector cao **B1**

(b) Answer: Sector

(c) segment cao **B1**

(c) Answer: Segment

(d) point of contact oe (point of tangency) **B1**

(d) Answer: The point of contact

Question 2

reason: opposite angles in a cyclic quadrilateral sum to 180 degrees oe **B1**

180 - 78 oe **M1**

102 degrees cao **A1**

Answer: 102 degrees

Question 3

angle OTP = 90 degrees, since the tangent is perpendicular to the radius at the point of contact **B1**

$PT^2 = 10^2 - 6^2$ oe **M1**

PT = 8 cm cso **A1**

Answer: PT = 8 cm (shown)

Question 4

angle OTP = 90 degrees (tangent meets radius at 90 degrees) **B1**

180 - 90 - 40 **M1**

50 degrees cao **A1**

Answer: 50 degrees

Question 5

78 degrees **B1**

reason: opposite angles of a cyclic quadrilateral add up to 180 degrees **B1**

Answer: 78 degrees

Question 6

angle ACB = 90 degrees (angle in a semicircle) **B1**

180 - 90 - 57 **M1**

33 degrees cao **A1**

Answer: 33 degrees

Question 7

(a) opposite angles in a cyclic quadrilateral sum to 180 degrees oe **B1**

(a) Answer: Opposite angles in a cyclic quadrilateral sum to 180 degrees, and A and C are opposite angles.

(b) 3x + 10 + 2x + 30 = 180 oe **M1**

(b) x = 28 cao **A1**

(b) Answer: x = 28

(c) substitute their x into 3x + 10 and 2x + 30 (ft) **M1**

(c) angle A = 94 degrees and angle C = 86 degrees, both cao **A1**

(c) Answer: Angle A = 94 degrees, angle C = 86 degrees

Question 8

63 degrees cao **B1**

reason: alternate segment theorem, the angle between a tangent and a chord equals the angle in the alternate segment oe **B1**

Answer: 63 degrees, by the alternate segment theorem.

Question 9

(a) tangents drawn to a circle from the same external point are equal in length oe **B1**

(a) Answer: PA = PB because tangents drawn to a circle from the same external point are equal in length.

(b) (180 - 44) / 2 oe, using triangle PAB isosceles since PA = PB **M1**

(b) 68 degrees cao **A1**

(b) Answer: 68 degrees

Question 10

(a) angle OAP = angle OBP = 90 degrees (tangent perpendicular to radius) **M1**

(a) 360 - 90 - 90 - 152 oe (angle sum of quadrilateral OAPB) **M1**

(a) 28 degrees cao **A1**

(a) Answer: 28 degrees

(b) (180 - their APB) / 2 oe, using triangle PAB isosceles since PA = PB (tangents) **M1**

(b) 76 degrees cao (ft) **A1**

(b) Answer: 76 degrees

Question 11

angle OAP = 90 degrees (tangent perpendicular to radius at A) **B1**

angle OBP = 90 degrees (tangent perpendicular to radius at B) **B1**

angle AOB = 2y, using the angle at the centre is twice the angle at the circumference (angle AOB and angle ACB subtend the same arc AB) **M1**

angle sum of quadrilateral OAPB: angle APB + angle AOB + 90 + 90 = 360 **M1**

angle APB = 360 - 90 - 90 - 2y = 180 - 2y cso **A1**

Answer: Angle APB = 180 - 2y (proved)

Question 12

angle BAC = 90 degrees, since BC is a diameter (angle in a semicircle) **B1**

angle ACB = 180 - 90 - a = 90 - a degrees (angle sum of triangle ABC) **M1**

angle ACT = 180 - (90 - a) = 90 + a degrees (angles on the straight line BCT) **M1**

angle TAC = a degrees (alternate segment theorem: tangent-chord angle at A between AT and chord AC equals angle ABC in the alternate segment) **B1**

angle ATC = 180 - (90 + a) - a (angle sum of triangle ATC) **M1**

angle ATC = 90 - 2a cso **A1**

Answer: Angle ATC = 90 - 2a degrees (proved)

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