Higher Check In - 8.04 Properties of polygons

1. Triangle PQR is isosceles with PR  QR. Angle PQR  57°. Find angle QRP.
2. ABCD is a rhombus. If ADB  18°, calculate the size of ACB.

A

**Not to scale**

D

B

C

1. Find the size of angle *x* in the diagram below.

A

B

E

*x*

**Not to scale**

52°

D

C

1. In a triangle, the first angle is a right angle and the second angle is 5 times the size of the third angle. Find the size of all three angles.

3(*x* – 4)*°*

4(*x* – 1)*°*

1. Work out the size of each angle in the quadrilateral below.

**Not to scale**

1. Show that triangle MPQ is isosceles.

P

**Not to scale**

35°

N

M

Q

1. A, B and C are points on the circumference of a circle, centre O.

Given that the BAO BCO, prove that AB  BC.

B

**Not to scale**

O

A

C

1. Points A, B and C are on the circumference of the circle, centre O.

By considering the triangles OAB and OAC, prove that the obtuse angle

BOC  2(*x* + *y*).

A

*x*

*y*

**Not to scale**

O

B

C

1. Points A, B and C are on the circumference of the circle, centre O.

Given that AB  OC, find the value of angle OAC.

B

A

C

**Not to scale**

O

1. Points A, B and C are on the circumference of the circle, centre O.

None of the chords AB, AC or BC go through the centre of the circle.

DE is a tangent and touches the circle at point B.

Find the length of the radius of the circle.

B

E

D

38°

6 cm

O

**Not to scale**

A

C

Extension

Cut out and arrange the decision boxes to form a flow chart for distinguishing between quadrilaterals (square, parallelogram, trapezium, rectangle, kite, rhombus and non-specific general quadrilateral).

|  |  |
| --- | --- |
| Are all the angles equal?YESNO | Is there exactly one line of symmetry?YESNO |
| Are the opposite angles equal?YESNO | Are there parallel sides?YESNO |
| Are all the sides equal?YESNO | Are there equal adjacent sides?YESNO |

Answers

1. 66°
2. 72°
3. *x*  64**°**
4. 90°, 15° and 75°
5. 72°, 108°, 72°, 108°
6. Given that NQ  QP, QNP QPN  35° NQP  180 – (35 + 35) 110° (sum of angles in a triangle is 180°).

Given that NPM  90°, QPM  90 – 35  55° and

NMP  180 – (90 + 35)  55° (sum of angles in a triangle is 180°).

QPM  NMP triangle MPQ is isosceles.

1. OA  OB  OC as they are radii of the circle

$∴$ triangles OAB and OBC are isosceles

$∴$ triangles OAB and OBC are congruent, SAS so AB  BC.

1. OA  OB  OC as they are all radii of the circle

$∴$ triangles OAB and OAC are isosceles

$∴$ angle ABO  *x* because base angles of an isosceles triangle are equal.

Similarly angle ACO  *y*, because base angles of an isosceles triangle are equal.

Angle AOB  180 – 2*x* because sum of angles in a triangle is 180°.

Similarly angle AOC  180 – 2*y*

$∴$ angle BOC  360 – (180 – 2*x*) – (180 – 2*y*)

  2*x* + 2*y*

  2(*x* + *y*)

1. Given AB  OC and OC  OA  OB (radii) then triangles AOB and BOC are equilateral triangles and ABCO is a rhombus.

$∴$ OAB  60° so CAB  30°.

1. 4.87 cm

**Extension**

One possible arrangement:

Are all the angles equal?

YES

Are all the sides equal?

YES

NO

square

NO

Is there exactly one line of symmetry?

YES

Are there equal adjacent sides?

YES

rectangle

kite

NO

NO

rhombus

Are the opposite angles equal?

YES

Are there parallel sides?

YES

parallelogram

NO

NO

trapezium

non-specific quadrilateral

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| **Assessment Objective** | **Qu.** | **Topic** | **R** | **A** | **G** |  | **Assessment Objective** | **Qu.** | **Topic** | **R** | **A** | **G** |
| AO1 | 1 | Use the properties of an isosceles triangle to find an angle |  |  |  |  | AO1 | 1 | Use the properties of an isosceles triangle to find an angle |  |  |  |
| AO1 | 2 | Use the properties of a rhombus to find an angle |  |  |  |  | AO1 | 2 | Use the properties of a rhombus to find an angle |  |  |  |
| AO1 | 3 | Use the properties of a trapezium and an isosceles triangle to find an angle |  |  |  |  | AO1 | 3 | Use the properties of a trapezium and an isosceles triangle to find an angle |  |  |  |
| AO1 | 4 | Use the properties of a right-angled triangle to find an angle |  |  |  |  | AO1 | 4 | Use the properties of a right-angled triangle to find an angle |  |  |  |
| AO1 | 5 | Use the properties of a parallelogram to find an angle |  |  |  |  | AO1 | 5 | Use the properties of a parallelogram to find an angle |  |  |  |
| AO2 | 6 | Use the properties of an isosceles triangle in a simple proof |  |  |  |  | AO2 | 6 | Use the properties of an isosceles triangle in a simple proof |  |  |  |
| AO2 | 7 | Use the properties of triangles in a proof involving circle theorems |  |  |  |  | AO2 | 7 | Use the properties of triangles in a proof involving circle theorems |  |  |  |
| AO2 | 8 | Use the properties of triangles in a proof involving circle theorems |  |  |  |  | AO2 | 8 | Use the properties of triangles in a proof involving circle theorems |  |  |  |
| AO3 | 9 | Use the properties of triangles and quadrilaterals in circle theorems to find an angle |  |  |  |  | AO3 | 9 | Use the properties of triangles and quadrilaterals in circle theorems to find an angle |  |  |  |
| AO3 | 10 | Use the properties of triangles in circle theorems to find a length |  |  |  |  | AO3 | 10 | Use the properties of triangles in circle theorems to find a length |  |  |  |
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| AO2 | 6 | Use the properties of an isosceles triangle in a simple proof |  |  |  |  | AO2 | 6 | Use the properties of an isosceles triangle in a simple proof |  |  |  |
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