CHAPTER 8
Reasoning in geometry

Some basic ideas in geometry

QUESTION **1**   Complete the following sentences.

a   An equilateral triangle is a triangle in which _____ sides are equal.

b   An isosceles triangle is a triangle in which _____ sides are equal.

c   An scalene triangle is a triangle in which _____ sides are equal.

d   An acute-angled triangle has _____ acute angle(s).

e   An obtuse-angled triangle has _____ obtuse angle(s).

f   A right-angled triangle has _____ right angle(s).

QUESTION **2**   Complete the following statements.

a   The interior angles of an equilateral triangle are _____ .

b   The base angles of an isosceles triangle are _____ .

c   The angle sum of a triangle is _____ .

d   A triangle has all angles of equal size. The size of each angle is _____ .

e   An exterior angle of a triangle is always equal to the sum of _____ angles.

f   The angle sum of a quadrilateral is _____ .

QUESTION **3**   Complete the following.

a   A quadrilateral is a _____ plane figure.

b   A polygon is a closed figure with _____ sides.

c   A trapezium is a quadrilateral with one pair of opposite sides _____ .

d   A parallelogram is a quadrilateral with both pairs of opposite sides _____ .

e   A rhombus ia a parallelogram in which all sides are _____ .

f   A rectangle is a parallelogram in which each angle is a _____ .

QUESTION **4**   Complete the following sentences.

a   A square is a quadrilateral with all sides _____ and each angle is _____ .

b   A kite is a quadrilateral with two pairs of adjacent sides _____ and no sides _____

c   The angle sum of a kite is _____ .

d   Opposite angles of a parallelogram are _____ .

e   Each angle of a rectangle is equal to _____ .
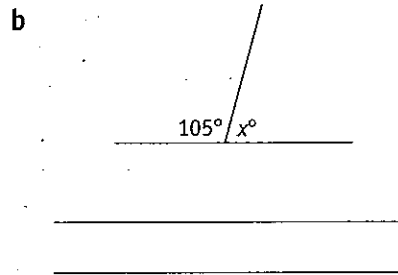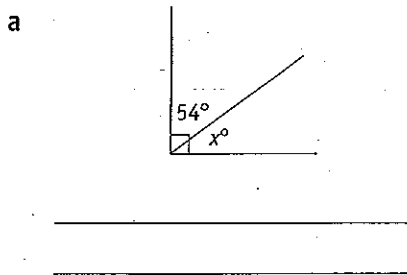
QUESTION **5**   Complete the following statements.

a   Vertically opposite angles are _____ .

b   Alternate angles are _____ .

c   Corresponding angles are _____ .
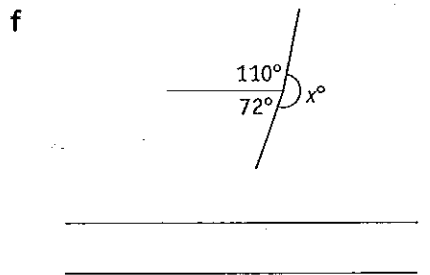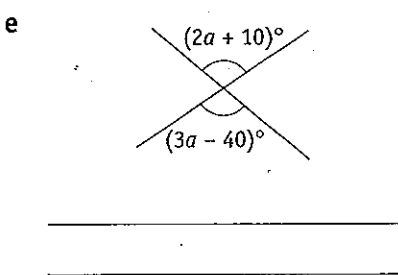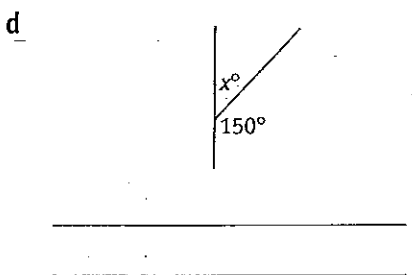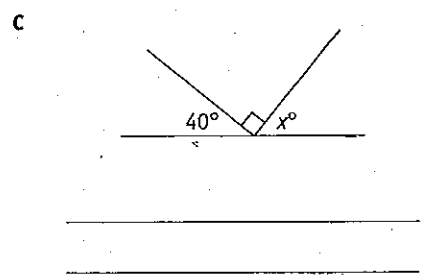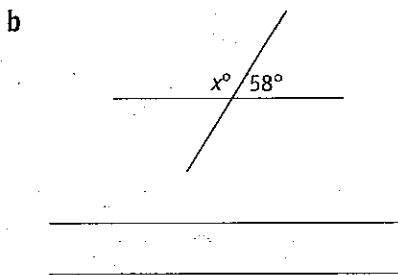
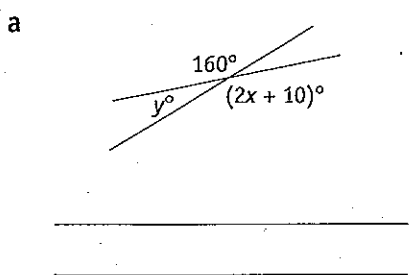d   Co-interior angles add up to _____ .

Reasoning in geometry
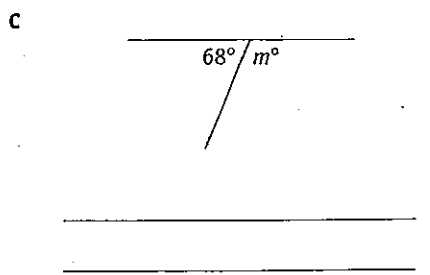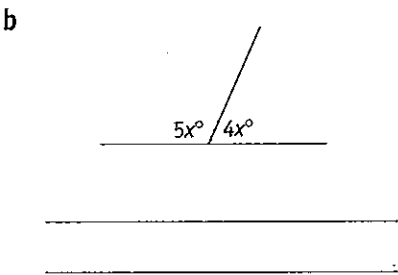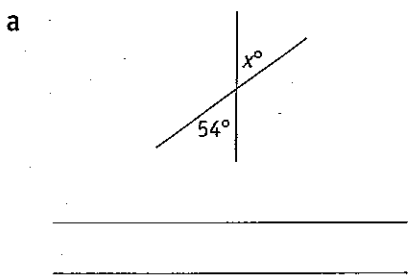
Complementary, supplementary and vertically opposite angles

QUESTION **1**   Find the value of the pronumeral in each of the following.

a

$54°$
$x°$

b

$105°$ $x°$

c

$127°$
$x°$

d

$x°$ $y°$
$120°$

e

$136°$ $m°$

f

$2t°$
$70°$
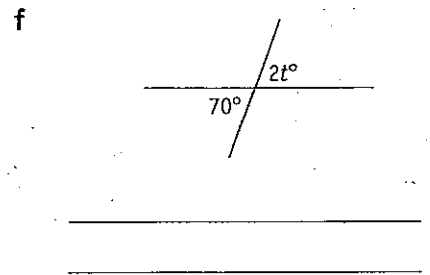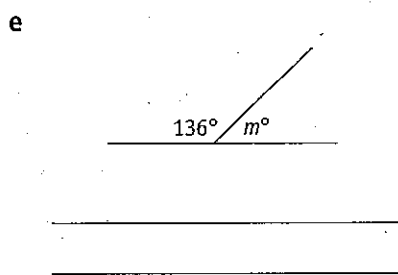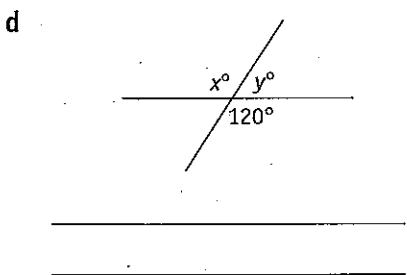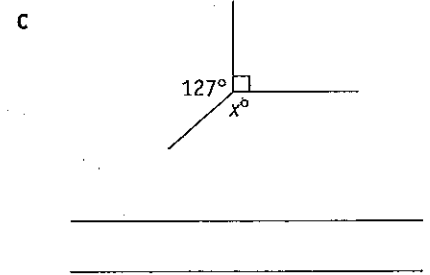
QUESTION **2**   Find the value of the pronumeral and give reasons to justify your answer.

a

$160°$
$y°$
$(2x + 10)°$

b

$x°$ $58°$

c

$40°$ $x°$

d

$x°$
$150°$

e

$(2a + 10)°$
$(3a - 40)°$

f

$110°$
$72°$ $x°$

QUESTION **3**   Find the value of the pronumeral, giving reasons.

a

$x°$
$54°$

b

$5x°$ $4x°$

c

$68°$ $m°$

Reasoning in geometry

Angles and the value of pronumerals

QUESTION 1   Find the value of the pronumeral in each of the following.

a

120°
130°
$x°$

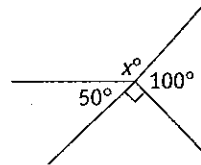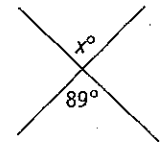**b**

20°
15°
$x°$

c

$x°$
25°

d

115° $x°$

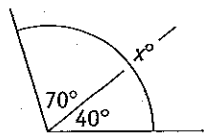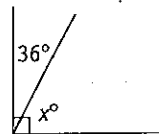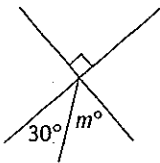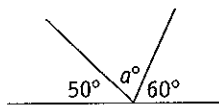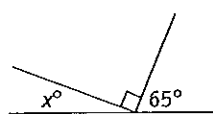**e**

$x°$ 100°
50°

f

$x°$
89°
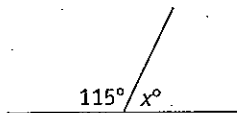
QUESTION 2   Find the value of the pronumeral and give reasons for your answer.

a

$x°$
70°
40°

b

36°
$x°$

c

30° $m°$

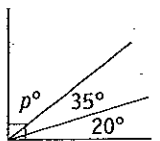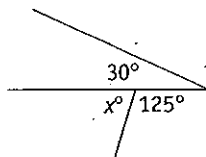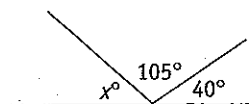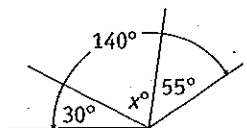**QUESTION 3**   Find the value of the pronumeral, giving reasons.

a

50° $a°$ 60°

b

$x°$ 65°

c
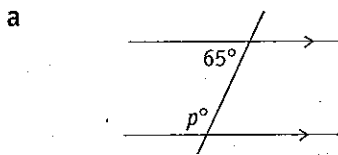
$p°$ 35°
20°

d

30°
$x°$ 125°

e

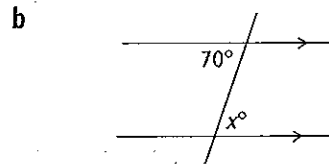$x°$ 105° 40°

f

140°
30° $x°$ 55°
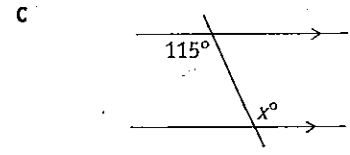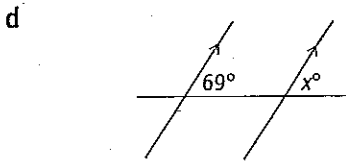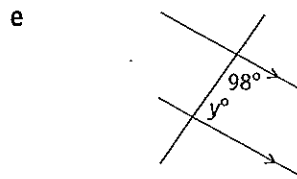
Reasoning in geometry

Parallel lines and angles

QUESTION **1**   Find the value of the pronumeral in each of the following.

a

65°

p°

b

70°

x°

c

115°

x°
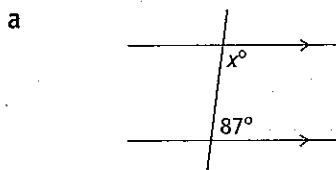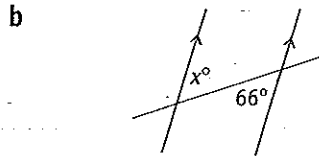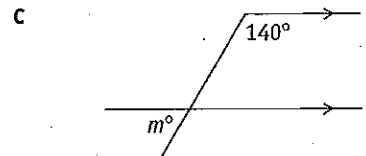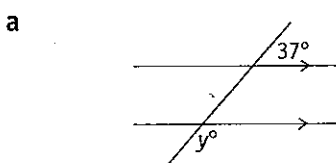
d

69°   x°

e

98°

y°

f

n°

70°

m°

QUESTION **2**   Find the value of the pronumeral, giving reasons.
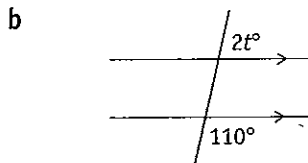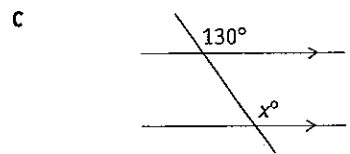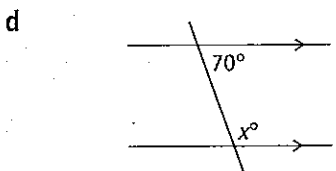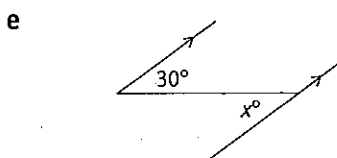
a

x°

87°

b

x°

66°

c

140°

m°

QUESTION **3**   Find the value of the pronumeral, giving reasons.

a

37°

y°

b

2t°

110°

c

130°

x°

d

70°

x°

e

30°

x°

f

65° x°

y°

Reasoning in geometry

Triangles and the value of pronumerals

QUESTION **1**   Find the value of the pronumeral.

a
50°
60° $x°$

b
68°
42° $x°$

c
$y°$
35°

d
$y°$
70°   60°

e
$2x°$
$x°$

f
$(x + 20)°$

QUESTION **2**   Find the value of the pronumeral.

a
100°
$2a°$

b
$3x°$
60° $x°$

c
$3a°$
$4a°$ $2a°$

d
$3a°$
$2a°$

e
$3x°$
$x°$ 20°

f
84°
$x°$ $x°$

QUESTION **3**   Find the value of the pronumeral.

a
85°
55°
$y°$

b
80°
120° $a°$

c
110°
$x°$

d
120°
$m°$

e
$x°$
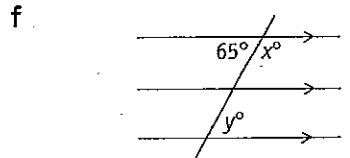115°

f
80°
$x°$

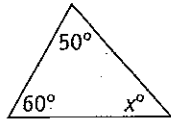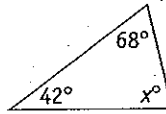# Reasoning in geometry
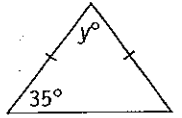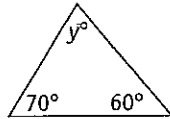
Quadrilaterals and the value of pronumerals
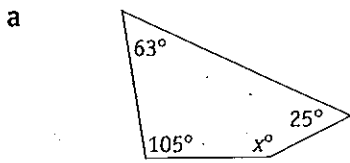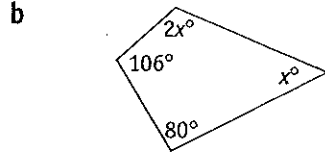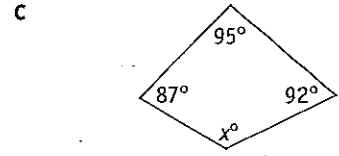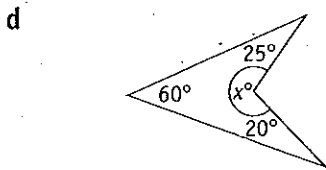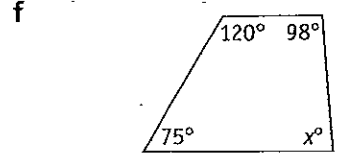
QUESTION **1**   Find the value of the pronumeral.

a

63°
105°   25°
$x°$

b

$2x°$
106°
80°
$x°$

c

95°
87°   92°
$x°$

_____

d

25°
60° $x°$
20°

e

95°
70°
130°
$y°$

f

120° 98°
75° $x°$

_____

QUESTION **2**   Find the value of the pronumeral.

a

60°
$y°$
80°

b

$3y°$ 70°
80° $2y°$

c

100°
92°
$b°$ $a°$ 70°

_____

QUESTION **3**   Find the value of the pronumeral.

a

$x°$
75°   220°
30°

b

$3x°$
230°
$x°$
$x°$

c

70°
$x°$ $x°$
50°

_____

d

120°
80°
$x°$
$y°$

e

120°
$(2x + 5)°$
$(x - 20)°$

f

80°
$x°$
135°

_____

Reasoning in geometry
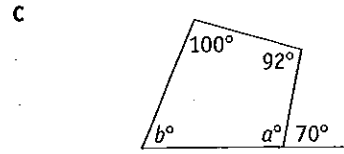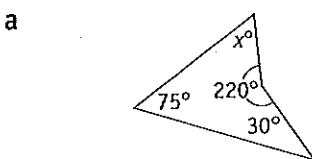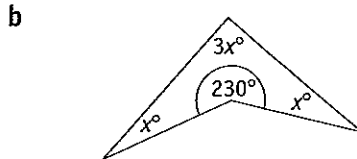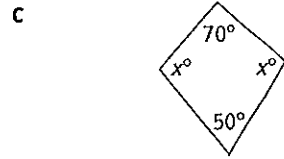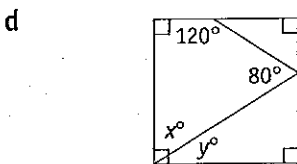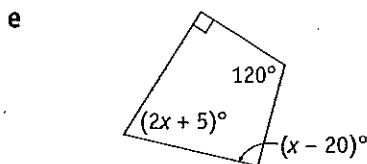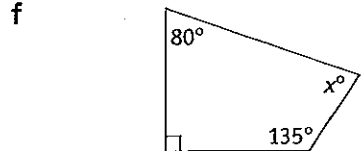
Miscellaneous questions

QUESTION **1**   Find the value of the pronumeral in each of the following.
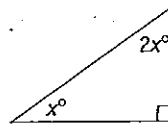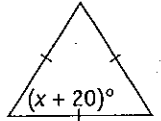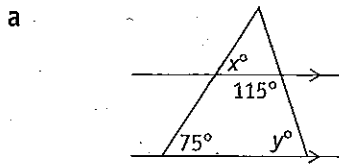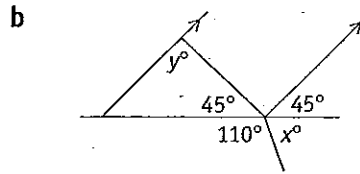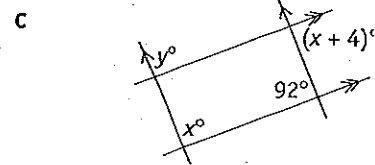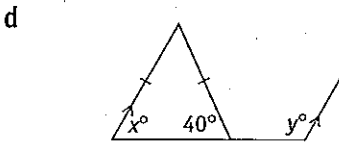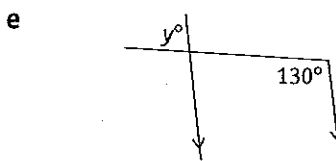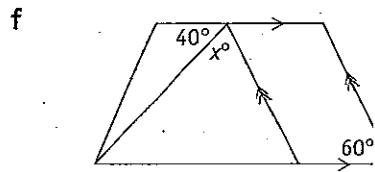
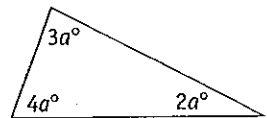a
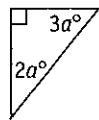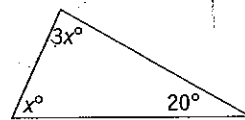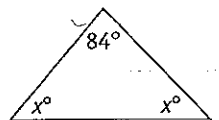

b

c

d

e

f

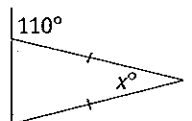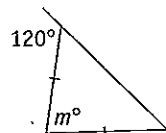QUESTION **2**   Find the value of the pronumeral in each of the following.

a

b

c

QUESTION **3**   Find the value of the pronumeral in each of the following.

a

b

c

d

e

f

Reasoning in geometry
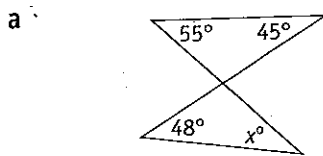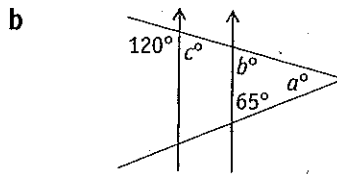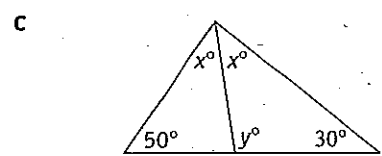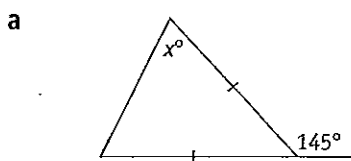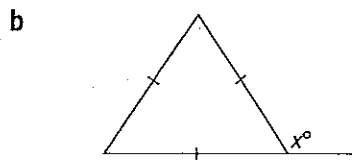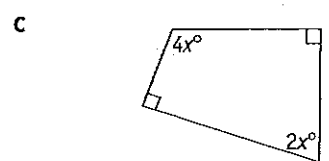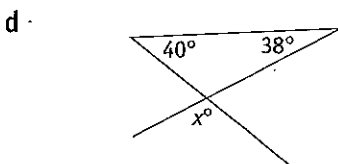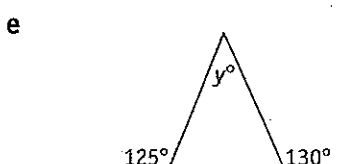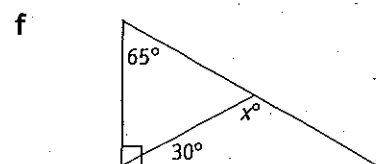
Deductive geometry

QUESTION **1**   For the parallelogram shown, prove that $a + b + c + d = 360°$

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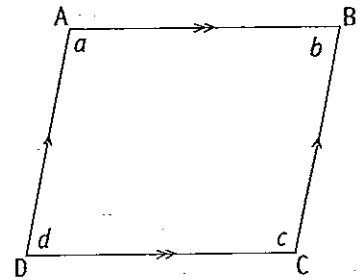
QUESTION **2**   AB and CD are two intersecting lines.
Prove that the vertically opposite angles are equal.

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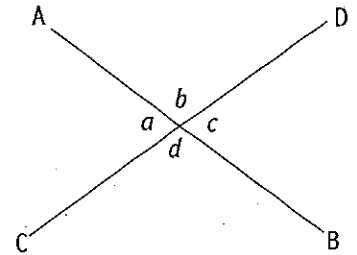
QUESTION **3**   In the triangle ABC, prove that the exterior angle ACD is
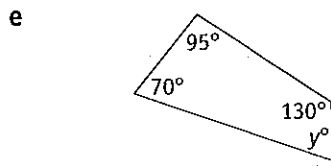equal to the sum of the opposite interior angles $a°$ and $b°$.
In other words, show that $\angle ACD = a° + b°$

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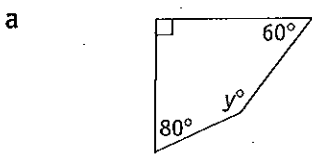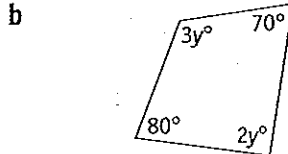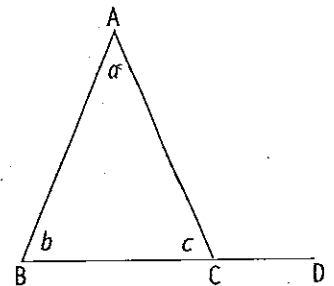QUESTION **4**   Prove that the angle sum of a triangle is equal to $180°$.
In other words, show that $a° + b° + c° = 180°$

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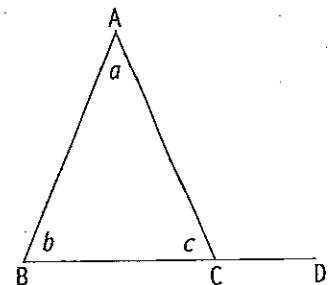
Reasoning in geometry

Problem solving and geometry

1 Two angles of a triangle are 55° and 45°. Find the third angle.

2 Three angles of a quadrilateral are 80°, 60° and 140°. Find the fourth angle.

3 If one of the base angles of an isosceles triangle is 72°, find the size of the vertical angle.

4 If the vertical angle of an isosceles triangle is 82°, find the size of each of the base angles.

5 If a triangle has all three sides equal, find the size of each angle.

6 In a right-angled triangle the two shorter sides are equal. What is the size of each acute angle?

7 In a right-angled triangle one of the angles is 50°. Find the other acute angle.

8 In a rhombus one angle is 120°. Find the size of the other angles.

9 The angles of a triangle are $x°$, $2x°$ and $3x°$. Find the size of each angle.

10 In a parallelogram one of the angles is 65°. Find the size of all other angles.

11 In a right-angled triangle one acute angle is four times the size of the other acute angle. What is the size of each angle?

12 ABCD is a rectangle. If ∠DBC = 60°, find ∠BDC.
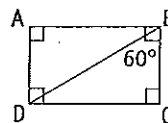
Reasoning in geometry

TOPIC TEST

PART A

Instructions
- This part consists of 15 multiple choice questions
- Fill in only ONE CIRCLE for each question
- Each question is worth 1 mark
- Calculators may be used

Time allowed: 15 minutes

Total marks = 15

Marks

1 The number of sides equal in an equilateral triangle are

Ⓐ none   Ⓑ 2   Ⓒ 3   Ⓓ none of these

☐ 1

2 The number of sides equal in an isosceles triangle are

Ⓐ none   Ⓑ 2   Ⓒ 3   Ⓓ none of these

☐ 1

3 The number of sides equal in a scalene triangle are

Ⓐ none   Ⓑ 2   Ⓒ 3   Ⓓ none of these

☐ 1

4 The angle sum of a triangle is always equal to

Ⓐ 90°   Ⓑ 180°   Ⓒ 270°   Ⓓ 360°

☐ 1

5 The angle sum of a quadrilateral is always equal to

Ⓐ 90°   Ⓑ 180°   Ⓒ 270°   Ⓓ 360°

☐ 1

6 The number of acute angles in an acute-angled triangle:

Ⓐ 1   Ⓑ 2   Ⓒ 3   Ⓓ none of these

☐ 1

7 The number of obtuse angles in an obtuse-angled triangle:

Ⓐ 1   Ⓑ 2   Ⓒ 3   Ⓓ none of these

☐ 1

8 The number of right angles in a right-angled triangle:

Ⓐ 1   Ⓑ 2   Ⓒ 3   Ⓓ none of these

☐ 1

9 If two angles of a triangle are complementary, then the third angle is

Ⓐ acute   Ⓑ right-angle   Ⓒ obtuse   Ⓓ none of these

☐ 1

10 In any right-angled triangle, the other two angles are both

Ⓐ acute   Ⓑ right angles   Ⓒ obtuse   Ⓓ none of these

☐ 1

11 In a triangle, the number of right angles can be

    (A) 1   (B) 2   (C) 3   (D) none of these

12 In a triangle, if one angle is 38° and the other is 52°, the triangle is called

    (A) scalene   (B) acute-angled   (C) right-angled   (D) obtuse-angled

13 The minimum number of sides in a polygon:

    (A) 2   (B) 3   (C) 4   (D) 5

14 The number of sides in a quadrilateral:

    (A) 2   (B) 3   (C) 4   (D) 5

15 The sum of the exterior angles of any polygon is equal to

    (A) 90°   (B) 180°   (C) 270°   (D) 360°

Total marks achieved for PART A

Reasoning in geometry

TOPIC TEST   PART B

Instructions
- This part consists of 15 questions
- Each question is worth 1 mark
- Write answers in the 'Answers only' column

Time allowed: 15 minutes   **Total marks = 15**

Questions	Answers only	Marks

Name the following angles.

1   **2**   **3**

Find the value of the pronumeral.

4   **5**   **6**

7   **8**   **9**

10   **11**   **12**

13   **14**   **15**

Total marks achieved for PART B   /15

Reasoning in geometry

TOPIC TEST

Instructions
- This part consists of 4 questions
- Each question is worth 5 marks
- Show all necessary working

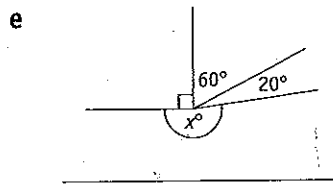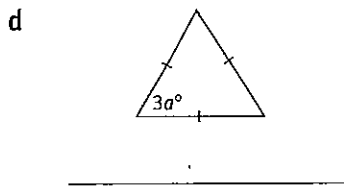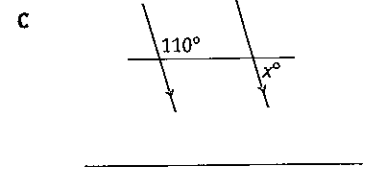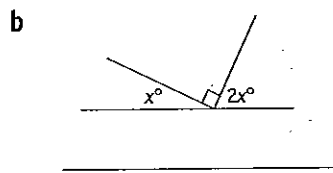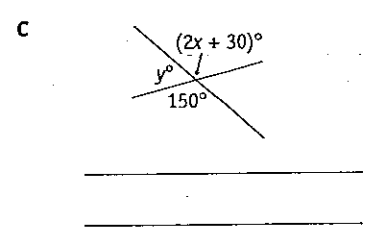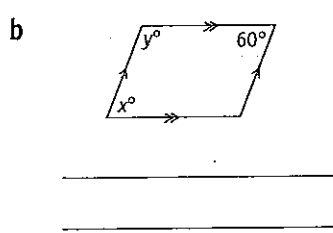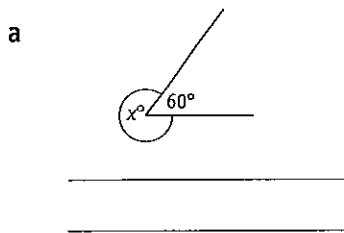**Time allowed: 20 minutes**   **Total marks = 20**

Ma

1 Comlete the following statements.

 a   The base angles of an isosceles triangle are _____ .

 b   The size of each interior angle of an equilateral triangle is _____ .

 c   A right angle is equal to _____ .

 d   A quadrilateral is a _____ sided plane figure.

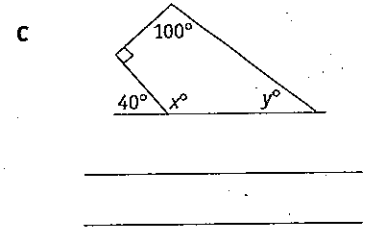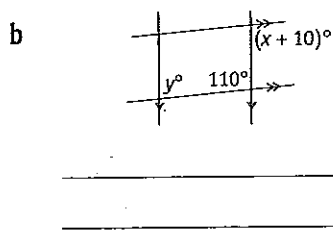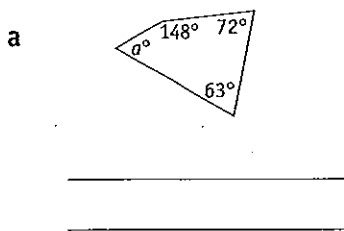 e   A trapezium is a quadrilateral in which one pair of opposite sides are _____ .

2 Find the value of the pronumeral in each of the following.

 a

 b

 c

 d

 e

3 Find the value of each pronumeral, giving reasons.

 a

 b

 c

4 Find the value of each pronumeral, giving reasons.

 a

 b

 c

Total marks achieved for PART C