Angle Properties

Exercise 1 (A)

Work out the sizes of the angles marked with a letter in each of the following diagrams:

- \(a\degree\) \(50\degree\)
- \(80\degree\) \(b\degree\)
- \(120\degree\) \(c\degree\)
- \(90\degree\) \(d\degree\)
- \(70\degree\) \(e\degree\)
- \(130\degree\) \(h\degree\)
- \(f\degree\) \(60\degree\)
- \(20\degree\) \(g\degree\)
- \(110\degree\) \(20\degree\) \(i\degree\)
- \(30\degree\) \(j\degree\) \(40\degree\)
Exercise 1 (B)
Work out the sizes of the angles marked with a letter in each of the following diagrams:

Exercise 1 (C)
Work out the sizes of the angles marked with a letter in each of the following diagrams.
Exercise 2 (A)

Work out the sizes of the angles marked with a letter.

Exercise 2 (B)

Work out the sizes of the angles marked with a letter.
Exercise 2 (C)
Work out the sizes of the angles marked with a letter.

Exercise 3 (A)
Work out the sizes of the angles marked with a letter in each of the following triangles:-
Exercise 3(B)

Work out the sizes of the angles marked with a letter in each of the following triangles:-
Exercise 3 (C)
Work out the sizes of the angles marked with a letter in each of the following triangles:

Exercise 4 (A)
Copy the following ISOSCELES triangles into your jotter and fill in the sizes of all the angles. The first one has been done for you:
**Exercise 4 (B)**
Copy the following ISOSCELES triangles into your jotter and fill in the sizes of all the angles. The first one has been done for you:-

Exercise 4 (C)
Copy the following diagrams into your jotter and fill in the sizes of all the angles.

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**Exercise 4 (B)**

Copy the following ISOSCELES triangles into your jotter and fill in the sizes of all the angles. The first one has been done for you:-

- a
  - $40^\circ$
  - $70^\circ$
  - $70^\circ$

- b
  - $76^\circ$

- c
  - $52^\circ$

- d
  - $34^\circ$

- e
  - $73^\circ$

- f
  - $64^\circ$

- g
  - $15^\circ$

- h
  - $64^\circ$

- i
  - $50^\circ$

- j
  - $72^\circ$

- k
  - $32^\circ$

- l

**Exercise 4 (C)**

Copy the following diagrams into your jotter and fill in the sizes of all the angles.

- a
  - $x^\circ$
  - $(x - 15)^\circ$

- b
  - $x^\circ$
  - $2x^\circ$

- c
  - $64^\circ$
  - $\frac{1}{2}x^\circ$
**Exercise 5 (A)**

Copy the following diagrams into your jotter and fill in the sizes of all the angles. The first one has been done for you.

![Diagram A](image1.png)

**Exercise 5 (B)**

Copy the following diagrams into your jotter and fill in the sizes of all the angles. The first one has been done for you.

![Diagram B](image2.png)
Exercise 5 (C)
Copy the following diagrams into your jotter and fill in the sizes of all the angles.

Exercise 6 (A)
Copy the following diagrams into your jotter and fill in the sizes of all the angles. The first one has been done for you.
Exercise 6 (B)
Copy the following diagrams into your jotter and fill in the sizes of all the angles. The first one has been done for you.

Exercise 6 (C)
Copy the following diagrams into your jotter and fill in the sizes of all the angles.
Exercise 7 (B)
Copy the following diagrams into your jotter and fill in the sizes of all the angles. The first one has been done for you:-

a
\[50^\circ\]
\[50^\circ\]

b
\[65^\circ\]

c
\[70^\circ\]

d
\[110^\circ\]

e
\[45^\circ\]

f

\[150^\circ\]

g

h
\[161^\circ\]
Exercise 8 (B)

Copy the following diagrams into your jotter and fill in the sizes of all the angles:

- a: 50°, 60°
- b: 50°
- c: 85°
- d: 90°
- e: 90°
- f: 72°
- g: 54°, 72°
- h: 56°
- i: 70°
Exercise 8 (C)
Make a copy of each diagram and fill in the sizes of all the angles:

- 102°
- 143°
- 42°
- 148°
- 133°
- 75°
- 204°
- 85°
- 112°
- 80°
Quadrilaterals

Exercise 1 (A) – Squares and Rectangles.
Copy each diagram into your jotter and fill in ALL the angles you can.

1. a)
   b)
   c)
   d) What do you notice about the angles in all of the diagrams above?

2. a)
   b)
   c)
   d)
   e)
   f)
   g)
Exercise 1 (B) – Squares and Rectangles.
Copy each diagram into your jotter and fill in ALL the angles you can.

1. a) \[ \triangle ABE \]
   b) \[ \triangle JIH \]
   c) \[ \triangle KNM \]
   d) \[ \square PQRS \]
   e) \[ \triangle UVX \]

2. From the above diagrams in Exercise 1 (B) state the following angle sizes:
   a) angle CED.
   b) angle GHJ.
   c) angle KNL.
   d) angle QTR.
   e) angle WVX.
   f) angle ACD.
   g) angle FJG.
   h) angle LOM.
   i) angle PST.
   j) angle WYX.

3. Draw a rectangle ABCD with diagonals AC and CD intersecting (crossing over) at the point E. Now fill in angle BAC as 59° and then fill in all the other possible angles.
Exercise 1 (C) – Squares and Rectangles.

1. The rectangle ABCD below has angle BAC = 27°. State the size of the following angles:
   a) angle DAB.          e) angle AEB.
   b) angle DAC.          f) angle BEC.
   c) angle BED.          g) angle BCE.
   d) angle ABD.          h) the reflex angle BCE.

   ![Diagram of ABCD]

2. The rectangle PQRS below has angle STR = 143°. State the size of the following angles:
   a) angle QTR.          e) angle SPT.
   b) angle TRS.          f) angle PRQ.
   c) angle RPQ.          g) the reflex angle PRQ.
   d) angle TPQ.          h) the reflex angle PTS

   ![Diagram of PQRS]
3. The diagram below shows two identical ("CONGRUENT") squares. State the size of the following angles:

   a) angle ADF.
   b) angle DAF.
   c) angle CAF.
   d) angle ACF.
   e) angle AFC.
   f) the reflex angle ACB.
   g) the mathematical name for quadrilateral ABCD.

![Diagram](image)

4. This diagram shows two squares ABCD and PQRS with a common centre Z. State:

   a) the size of angle APQ.
   b) the size of angle DPS.
   c) the size of angle QPS.
   d) the size of angle APS.
Exercise 2 (A) – The Rhombus
Copy each diagram into your jotter and fill in ALL the angles you can.

1. a)  
   ![Diagram a)

   b)  
   ![Diagram b)

   c)  
   ![Diagram c)

   d)  
   ![Diagram d)

   e)  
   ![Diagram e)

   f)  
   ![Diagram f)

2. What do you notice about all the “middle” angles?

3. a)  
   ![Diagram a)

   b)  
   ![Diagram b)

   c)  
   ![Diagram c)

   d)  
   ![Diagram d)

4. Write down any other things you notice about the angles in a rhombus.
Exercise 2 (B) – The Rhombus
Copy each diagram into your jotter and fill in ALL the angles you can.

1. a)  
   ![Diagram](image1)
   b)  
   ![Diagram](image2)
   c)  
   ![Diagram](image3)
   d)  
   ![Diagram](image4)
   e)  
   ![Diagram](image5)
   f)  
   ![Diagram](image6)
   g)  
   ![Diagram](image7)
   h)  
   ![Diagram](image8)

2. Discuss with your partner and write down 3 things you notice about the angles in a rhombus.

3. From the above diagrams in Exercise 2 (B) state the following angle sizes:
   a) angle ADB.  
   b) angle GFH.  
   c) angle ILJ.  
   d) angle MPN.  
   e) angle MPO.  
   f) angle QRT.  
   g) angle QRS.  
   h) angle VUX.  
   i) angle YZB.  
   j) angle BAY.

3. Draw a rhombus AEKN with diagonals AK and EN. If angle AEK = 62° fill in all the other possible angles.
Exercise 2 (C) – The Rhombus
Copy each diagram into your jotter and fill in ALL the angles you can first, then answer the questions.

1. The rhombus ABCD below has angle BAZ = 34°. State the size of the following angles:
   a) angle BCZ.
   b) angle BZC.
   c) angle ABZ.
   d) angle BAD.
   e) angle ABC.
   f) angle ADC.
   g) the reflex angle ABC.

2. The rhombus KLMN below has angle KNL = 23°. State the size of the following angles:
   a) angle MZL.
   b) angle NKZ.
   c) angle ZLM.
   d) angle KLM.
   e) angle NML.
   f) angle reflex angle KNM.
3. The rhombus RSTU below has angle QTU = 55°. State the size of the following angles:
   a) angle UQT.
   b) angle QTS.
   c) angle UTS.
   d) angle RUQ.
   e) angle RUT.
   f) angle RUS.
   g) the angle SQU.

4. The rhombus PQRS below has angle QPS = 28°. State the size of the following angles:
   a) angle QZR.
   b) angle OPZ.
   c) angle PQZ.
   d) angle PQR.
   e) angle PSZ.
   f) angle PSR.
   g) angle ZRS.

5. The rhombus ABCD below has angle BCD = 68°. State the size of the following angles:
   a) angle BAZ.
   b) angle BZA.
   c) angle BAD.
   d) angle ZBC.
   e) angle ADC.
6. ABCD is a rhombus. PQ is parallel to C. Angle BAD = 82°.

(a) $\hat{B}AZ =$
(b) $\hat{A}ZB =$
(c) $\hat{A}DZ =$
(d) $\hat{D}CB =$
(e) $\hat{A}BC =$
(f) $\hat{D}PQ =$
(g) $\hat{A}PQ =$
Exercise 3 (A) – The Kite
Copy each diagram into your jotter and fill in ALL the angles you can.

1. a)  
   ![Diagram a)
   
   b)  
   ![Diagram b)
   
   c)  
   ![Diagram c)
   
   d)  
   ![Diagram d)
   
   e)  
   ![Diagram e)

2. a)  
   ![Diagram a)
   
   b)  
   ![Diagram b)
   
   c)  
   ![Diagram c)

3. What do you notice about some of the angles across from each other?
Exercise 3 (B) – The Kite
Copy each diagram into your jotter and fill in ALL the angles you can.

1. a)  
   ![Diagram A]
   b)  
   ![Diagram B]
   c)  
   ![Diagram C]
   d)  
   ![Diagram D]
   e)  
   ![Diagram E]

2. Discuss with your partner and write down 3 things you notice about the angles in a kite.

3. From the above diagrams in Exercise 3 (B) state the following angle sizes:
   a) angle BAC.  
   b) angle GFH.  
   c) angle LKN.  
   d) angle KNM.  
   e) angle QPS.  
   f) angle VUX.  
   g) angle UXW.  
   h) angle VUX.  
   i) angle ADC.  
   j) angle BCD.

4. Draw a kite ABCD with diagonals AC and BD. If angle DCA = 57° and DAC = 41° fill in all the other possible angles.
Exercise 3 (C) – The Kite
Copy each diagram into your jotter and fill in ALL the angles you can.

1. The kite ABCD below has angle BCA = 53° and DAZ = 23°. State the size of the following angles:
   a) angle AZB.
   b) angle ACD.
   c) angle BAD.
   d) angle ADZ.
   e) angle ADB.
   f) angle ADC.
   g) angle ABC.

2. The kite ABCD below has angle BAC = 40° and DAZ = 70°. State the size of the following angles:
   a) angle AZB.
   b) angle ABZ.
   c) angle ABC.
   d) angle ZDC.
   e) angle ADC.
   f) angle BCD.
   g) the reflex angle BAD.
   h) the reflex angle ABC.
3. The kite PQRS below has angle SPQ = 64°. Notice carefully what you are told about triangle QZR! 
State the size of the following angles:

a) angle PZS.
b) angle SPZ.
c) angle PQZ.
d) angle ZRS.
e) angle ZRQ.
f) angle PQR.
g) the reflex angle PQR.
h) the reflex angle QPS.

4. The kite KLMN below has angle LKZ = 74° and KNM = 70°. 
State the size of the following angles:

a) angle KZN.
b) angle ZKN.
c) angle LNK.
d) angle NML.
e) angle KLM.
f) the reflex angle KLM.
g) the reflex angle LNK.
Exercise 4 (A) – The Parallelogram
Copy each diagram into your jotter and fill in ALL the angles you can.

1. a) b) c)
Exercise 4 (B) – The Parallelogram
Copy each diagram into your jotter and fill in ALL the angles you can.

1. a) b) c) d) 

2. From the above diagrams in Exercise 4 (B) state the following angle sizes:
   a) angle ABC. 
   b) angle ADC. 
   c) angle GFI. 
   d) angle GHI. 
   e) angle LOM. 
   f) the reflex angle LOM. 
   g) angle RQS. 
   h) angle TQR. 
   i) angle QUT. 
   j) the reflex angle RUQ.

3. Discuss with your partner and write down 3 things you notice about the angles in a parallelogram.
Exercise 4 (C) – The Parallelogram
Copy each diagram into your jotter and fill in ALL the angles you can.

1. ABCD shown below is a parallelogram.

   [Diagram of a parallelogram with angles 43°, 25°, 35°, and 74° indicated]

   State the following angle sizes:

   a) angle ABC.  
   b) angle DAB.  
   c) angle ABD.  
   d) angle DBC.  
   e) angle BAZ.  
   f) angle AZB.  
   g) angle BZC.  
   h) angle DZC.

2. (HINT: Look carefully at triangle AZD) ABCD is a parallelogram.

   [Diagram of a parallelogram with angles 30° and 74° indicated, and an additional angle labeled Z]

   State the following angle sizes:

   a) angle AZD.  
   b) angle ADZ.  
   c) angle DAZ.  
   d) angle ABC.  
   e) angle ZAB.  
   f) angle DAB.  
   g) angle DZC.  
   h) angle ZCD.
3. The diagrams below all show a parallelogram. Copy each diagram into your jotter and then fill in the sizes of all angles.
Exercise 5 (A) – The Trapezium
Copy each diagram into your jotter and fill in ALL the angles you can.

1. a) 
   b) 
   c) 
   d) 
   e) 
   f) 
   g) 
   h)
Exercise 5 (B) – The Trapezium
Copy each diagram into your jotter and fill in ALL the angles you can.

1. a) 
   b) 
   c) 
   d) 

2. From the above diagrams in Exercise 5 (B) state the following angle sizes:
   a) angle ABC.  
   b) angle EHF.  
   c) angle LKM.  
   d) angle NPQ.  
   e) angle JLM.  
   f) the reflex angle ABC. 
   g) angle EFG.  
   h) angle JKL.  
   i) angle OPQ.  
   j) the reflex angle NQP.

3. Discuss with your partner and write down 3 things you notice about the angles in a trapezium.
Exercise 5 (C) – The Trapezium
Copy each diagram into your jotter and fill in ALL the angles you can.

1. **State the sizes of the following angles:**
   a) angle DCE =
   b) angle DCB =
   c) angle ADC =
   d) angle ABF =
   g) angle EDC =

2. **ABCD is a RECTANGLE.** DE is parallel to FB.
   a) angle DEB =
   b) angle EBF =
   c) angle CBF =
   d) angle CFB =

3. **angle AEB = 48°, angle BDC = 37°.**
   a) ABDE is a TRAPEZIUM. Name the other TRAPEZIUM.
   b) angle ABE =
   c) angle CBD =
   d) angle EBD =
   e) angle BED =