



1 AB and CD are parallel straight lines.

A straight line crosses AB at E and crosses CD at F. On line AB, A is to the left of E and B is to the right of E. On line CD, C is to the left of F and D is to the right of F.

Angle AEF = 62° .

Work out the size of angle CFE.

Give a reason for each stage of your working.

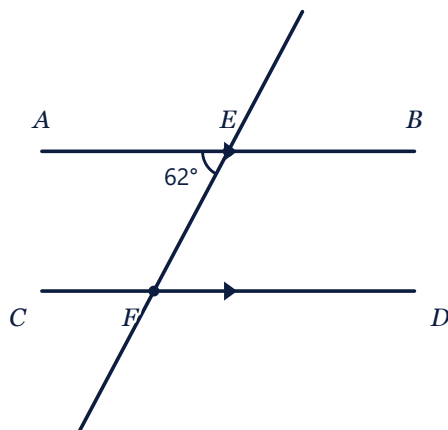


Diagram NOT accurately drawn

(4 marks)

Alternate angles lie between parallel lines on opposite sides of the crossing line. Co-interior angles lie between the parallel lines on the same side of the crossing line

Angle $EFD = 62^\circ$ because angle AEF and angle EFD are alternate angles, and alternate angles are equal

Angle $CFE = 180^\circ - 62^\circ = 118^\circ$ because angles on a straight line add up to 180

(Alternatively

angle AEF and angle CFE are co-interior angles, so angle $CFE = 180^\circ$

$$\begin{aligned} &- \\ &62^\circ \\ &= \\ &118^\circ \end{aligned}$$

118°

- 2 Two straight lines are parallel. A third line crosses them. Two angles lie between the parallel lines, on opposite sides of the crossing line, in a Z shape. One of these angles is 72° .

Write down the size of the other angle and the name of this type of angle.

(2 marks)

Z shape = alternate angles

Alternate angles are equal

72° , alternate

- 3 Two straight lines are parallel. A third line crosses them. Two angles are in matching positions, one at each crossing, in an F shape. One of these angles is 115° .

Write down the size of the other angle and the name of this type of angle.

(2 marks)

F shape = corresponding angles

Corresponding angles are equal

115° , corresponding

- 4 PQ and RS are parallel straight lines.

A straight line crosses PQ at E and crosses RS at F. On line PQ, P is to the left of E and Q is to the right of E. On line RS, R is to the left of F and S is to the right of F.

Angle QEF = 74° .

- Work out the size of angle RFE. Give a reason for your answer.
- Work out the size of angle EFS. Give a reason for your answer.

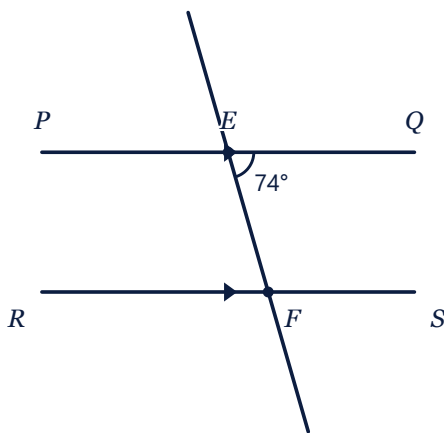


Diagram NOT accurately drawn

(4 marks)

a) Angle RFE = 74° because angle QEF and angle RFE are alternate angles, and alternate angles are equal

b) Angle EFS = $180^\circ - 74^\circ = 106^\circ$ because angles on a straight line add up to 180°

(For part b you could also say angle QEF and angle EFS are co-interior angles, which add up to 180°)

- 5 Two straight lines are parallel. A third line crosses them. Two angles lie between the parallel lines, on the same side of the crossing line, in a C shape. One of these angles is 108° .

Work out the size of the other angle. Give the name of this type of angle.

(2 marks)

C shape = co-interior angles

Co-interior angles add to 180°

$$180 - 108 = 72$$

72° , co-interior

- 6 Two straight lines are parallel and are crossed by a third line. Write down the name of each pair of angles, and say what you know about their sizes.

- Two angles in a Z shape, between the parallel lines.
- Two angles in an F shape, in matching positions.
- Two angles in a C shape, between the parallel lines.

(3 marks)

a)

Z shape: alternate, equal

b)

F shape: corresponding, equal

c)

C shape: co-interior, add to 180°

7 AB and CD are parallel straight lines.

A straight line GEFH crosses AB at E and crosses CD at F, where G is above the line AB and H is below the line CD. On line AB, A is to the left of E and B is to the right of E. On line CD, C is to the left of F and D is to the right of F. Angle GEB = 63° .

- Work out the size of angle EFD. Give a reason for your answer.
- Work out the size of angle CFH. Give a reason for your answer.

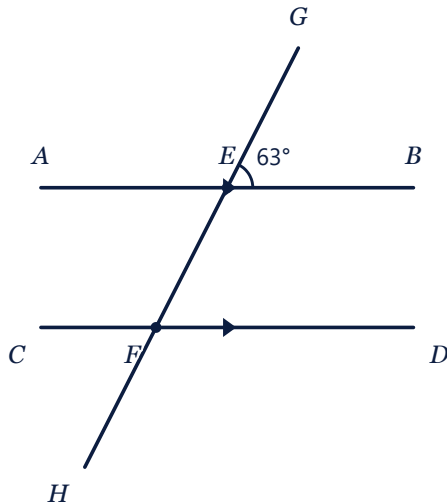


Diagram NOT accurately drawn

(4 marks)

- a) Angle $EFD = 63^\circ$ because angle GEB and angle EFD are corresponding angles, and corresponding angles are equal
- b) Angle $CFH = 63^\circ$ because angle CFH and angle EFD are vertically opposite angles, and vertically opposite angles are equal

8 Two straight lines are parallel and are crossed by a third line. Two alternate angles are $(3x + 10)^\circ$ and $(5x - 30)^\circ$. Work out the value of x .

(3 marks)

Alternate angles are equal

$$\begin{array}{rclcl} 3x + 10 & = & 5x - 30 & & \\ -3x & & & -3x & \\ \hline 10 & = & 2x - 30 & & \\ +30 & & & +30 & \\ \hline 40 & = & 2x & & \\ \div 2 & & & \div 2 & \\ \hline 20 & = & x & & \end{array}$$

$x = 20$

9

Two straight lines are parallel and are crossed by a third line. Two corresponding angles are $(4x - 12)^\circ$ and $(x + 30)^\circ$.

Work out the value of x , and the size of each angle.

(3 marks)

Corresponding angles are equal

$$\begin{array}{rcl}
 4x - 12 & = & x + 30 \\
 -x & & -x \\
 \hline
 3x - 12 & = & 30 \\
 +12 & & +12 \\
 \hline
 3x & = & 42 \\
 \div 3 & & \div 3 \\
 \hline
 x & = & 14
 \end{array}$$

$$\text{Angle} = 14 + 30 = 44^\circ$$

$$x = 14, \text{ angles } 44^\circ$$

10

DE and FG are parallel straight lines.

Triangle ABC is drawn so that A lies on DE, and B and C both lie on FG.

D is to the left of A and E is to the right of A.

Angle DAB = 48° and angle ACB = 63° .

Work out the size of angle BAC.

Give a reason for each stage of your working.

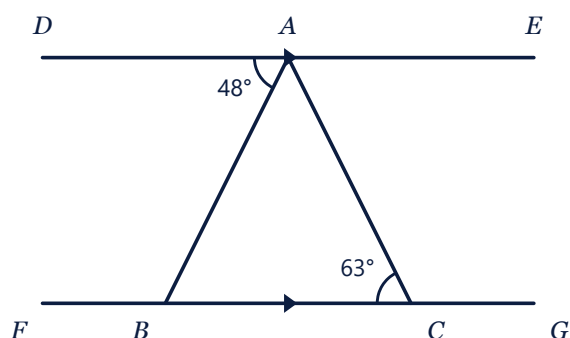


Diagram NOT accurately drawn

(4 marks)

Angle ABC = 48° because angle DAB and angle ABC are alternate angles (DE is parallel to FG), and alternate angles are equal

Angle BAC = $180^\circ - 48^\circ - 63^\circ = 69^\circ$ because angles in a triangle add up to 180°

$$69^\circ$$

- 11 Two straight lines are parallel and are crossed by a third line. Two co-interior angles are $(2x + 15)^\circ$ and $(3x - 5)^\circ$.
Work out the value of x , and the size of the larger angle.

(3 marks)

Co-interior angles add to 180°

$$\begin{array}{rcl} 2x + 15 + 3x - 5 & = & 180 \\ 5x + 10 & = & 180 \\ -10 & & -10 \\ 5x & = & 170 \\ \div 5 & & \div 5 \\ x & = & 34 \end{array}$$

$$3 \times 34 - 5 = 97$$

$$2 \times 34 + 15 = 83 \quad (83 + 97 = 180)$$

$$x = 34, \text{ larger angle } 97^\circ$$

- 12 A straight line crosses line AB at the point P and crosses line CD at the point Q, where P is above Q. On line AB, B is to the right of P. On line CD, D is to the right of Q.

Angle QPB, between PQ and PB and inside the region between the two lines, is 104° .

Angle PQD, between QP and QD and inside the region between the two lines, is 76° .

Show that AB is parallel to CD.

Give reasons for your answer.

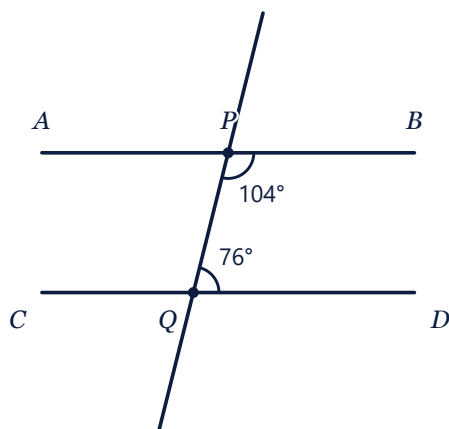


Diagram NOT accurately drawn

(4 marks)

Angle QPB and angle PQD are co-interior (allied) angles between the lines AB and CD

$$104^\circ + 76^\circ = 180^\circ$$

Co-interior angles add up to 180° only when the two lines are parallel, so AB is parallel to CD

13

AB and CD are parallel straight lines.

E lies on AB. F and G both lie on CD, with F to the left of G.

A is to the left of E and B is to the right of E.

$EF = EG$ and angle $AEF = 64^\circ$.

Work out the size of angle FEG.

Give a reason for each stage of your working.

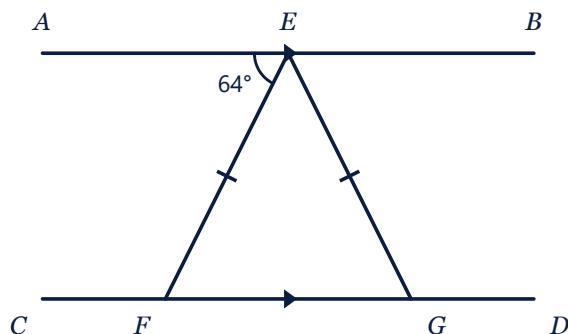


Diagram NOT accurately drawn

(5 marks)

Angle $EFG = 64^\circ$ because angle AEF and angle EFG are alternate angles (AB is parallel to CD), and alternate angles are equal

Angle $EGF = \text{angle } EFG = 64^\circ$ because triangle EFG is isosceles ($EF = EG$), and base angles of an isosceles triangle are equal

Angle $FEG = 180^\circ - 64^\circ - 64^\circ = 52^\circ$ because angles in a triangle add up to 180°

52°

14

ABCD is a trapezium in which AB is parallel to DC.

The diagonal BD is drawn.

Angle DAB = 74° and angle ADB = 68° .

- Work out the size of angle ABD. Give a reason for your answer.
- Work out the size of angle BDC. Give a reason for your answer.

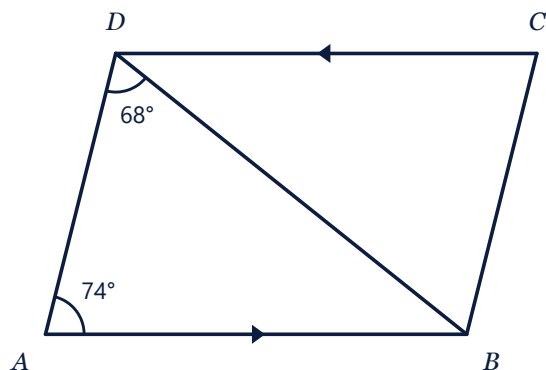


Diagram NOT accurately drawn

(5 marks)

a) Angle ABD = $180^\circ - 74^\circ - 68^\circ = 38^\circ$ because angles in a triangle add up to 180°

b) Angle BDC = angle ABD = 38° because they are alternate angles (AB is parallel to DC, with BD as the transversal), and alternate angles are equal

15

AB and CD are parallel straight lines.

E lies on AB. F and G both lie on CD, with F to the left of G.

A is to the left of E and B is to the right of E.

Angle AEF = 67° and angle BEG = 67° .

Show that triangle EFG is an isosceles triangle.

Give a reason for each stage of your working.

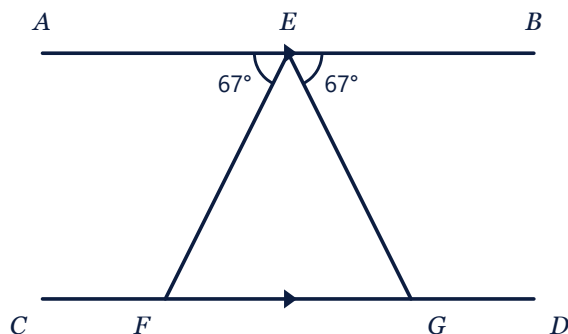


Diagram NOT accurately drawn

(5 marks)

Angle EFG = 67° because angle AEF and angle EFG are alternate angles (AB is parallel to CD), and alternate angles are equal

Angle EGF = 67° because angle BEG and angle EGF are alternate angles, and alternate angles are equal

Angle EFG = angle EGF, so triangle EFG has two equal base angles
A triangle with two equal angles is isosceles, so triangle EFG is isosceles (with $EF = EG$)

16

AB and CD are parallel straight lines. A straight line crosses them both.

Two co-interior angles between the parallel lines are $(3x + 20)^\circ$ and $(2x - 15)^\circ$.

Work out the size of the smaller of these two angles.

You must show all your working.

(5 marks)

Co-interior angles between parallel lines add up to 180° , so $(3x + 20) + (2x - 15) = 180$

$5x + 5 = 180$, so $5x = 175$ and $x = 35$

The two angles are $3(35) + 20 = 125^\circ$ and $2(35) - 15 = 55^\circ$

Check

$125^\circ + 55^\circ = 180^\circ$. The smaller angle is 55°

55°

17

AB and CD are parallel straight lines, with AB above CD.

E lies on AB and G lies on CD. F is a point between the two lines, to the right of both E and G, so that EFG forms a zigzag.

Angle BEF = 38° and angle DGF = 44° , where B is to the right of E and D is to the right of G.

Work out the size of angle EFG.

Give a reason for each stage of your working.

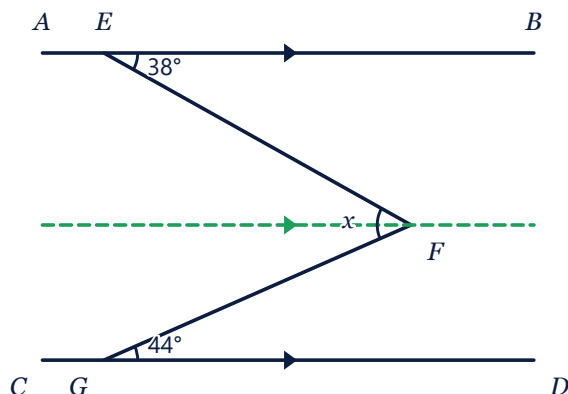


Diagram NOT accurately drawn

(5 marks)

Draw a line through F parallel to AB and CD, splitting angle EFG into an upper part and a lower part

The upper part of angle EFG = 38° because it is alternate to angle BEF, and alternate angles are equal

The lower part of angle EFG = 44° because it is alternate to angle DGF, and alternate angles are equal

$$\text{Angle EFG} = 38^\circ + 44^\circ = 82^\circ$$

82°