New Century Maths 8
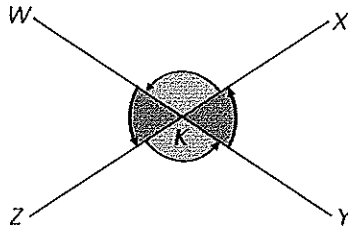
Angles and parallel lines

Angles are formed when two lines intersect. Special pairs of these angles are *vertically opposite* angles.
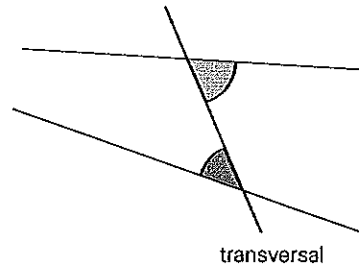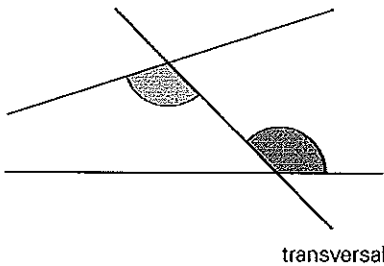

$\angle WKZ$ and $\angle XKY$ are vertically opposite angles and are equal.

$\angle ZKY$ and $\angle XKW$ are vertically opposite angles and are equal.

Angles are also formed when two lines are each cut by a third line, called a *transversal*. These angles have special names.
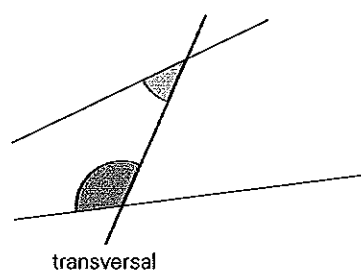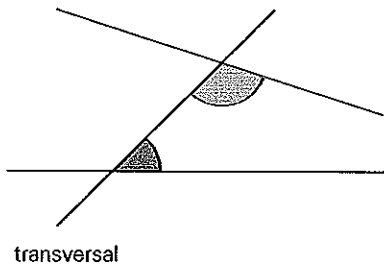
■ *Alternate* angles are on opposite sides of the transversal between the lines.

transversal   transversal

■ *Corresponding* angles are on the same side of the transversal and either both above or both below the lines.

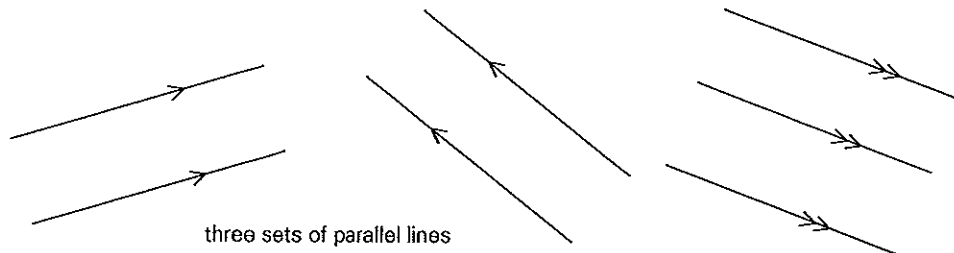transversal   transversal
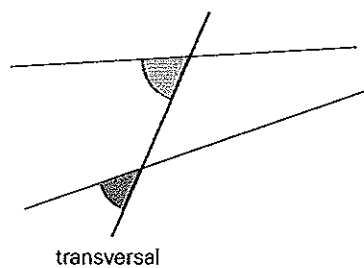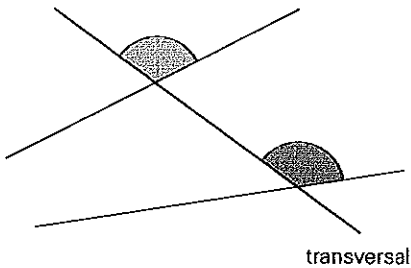
■ *Co-interior* angles are on the same side of the transversal but between the lines.

transversal   transversal

1

Skillsheet 3-02   Angles and parallel lines *continued*

Two lines the same distance apart that do not intersect are called *parallel* lines. Parallel lines are shown by drawing arrowheads on each line.
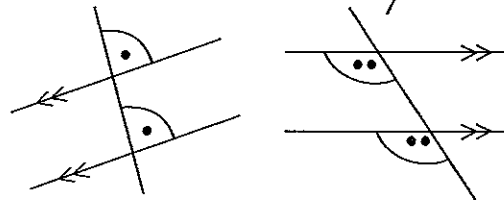
three sets of parallel lines

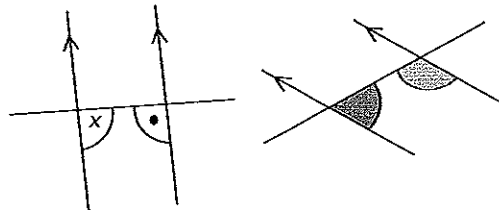When two *parallel* lines are cut by a transversal the special pairs of angles formed have the following properties.

■ Alternate angles are equal.
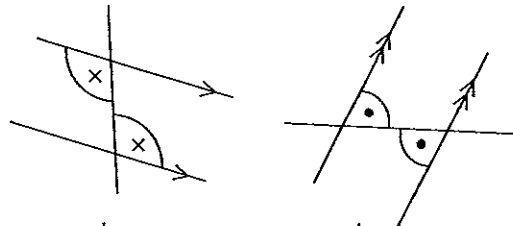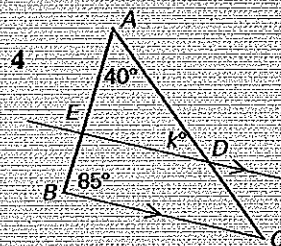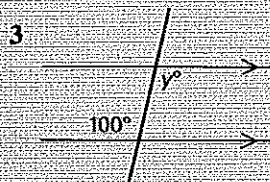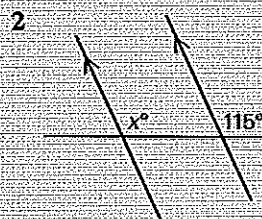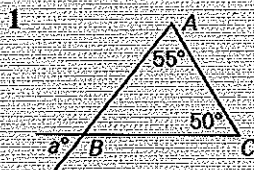
■ Corresponding angles are equal.

■ Co-interior angles are supplementary. They add to 180°.

Examples

Find the value of the pronumeral in each diagram. Give a brief reason for your answer.

1

2

3

4

Solutions

1 $\angle ABC = 180° - (55° + 50°) = 75°$ sum of angles in $\triangle = 180°$

   $a° = 75°$ vertically opposite angles are equal

2 $x° = 115°$ parallel lines, so corresponding angles are equal

3 $y° = 100°$ parallel lines, so alternate angles are equal

4 $\angle BCA = 180° - (40° + 85°) = 55°$ sum of angles in $\triangle = 180°$

   $k° = 55°$ lines ED and BC are parallel, so corresponding angles are equal

2

Skillsheet 3-02   Angles and parallel lines *continued*

Exercises

**1** Look at the diagram. Name an angle that is:

a vertically opposite to ∠AWV

b corresponding to ∠VWA

c alternate to ∠QXW

d co-interior with ∠PWX

e vertically opposite to ∠WXS

f supplementary with ∠AWX

g alternate to ∠SXV

h corresponding to ∠ZXS
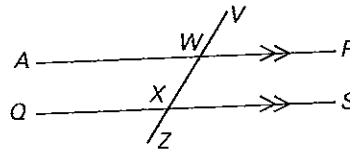
2 To show two lines are parallel you must show that *one* of the following is true:

 • a pair of alternate angles are equal.

 • a pair of corresponding angles are equal
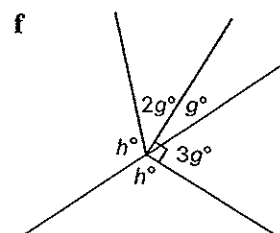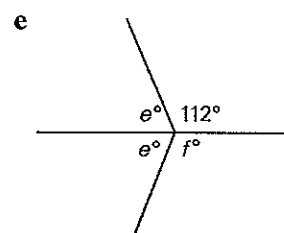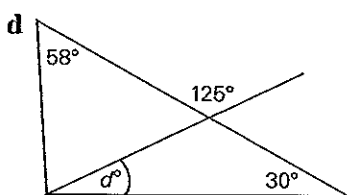
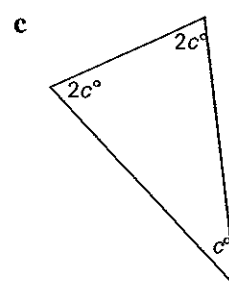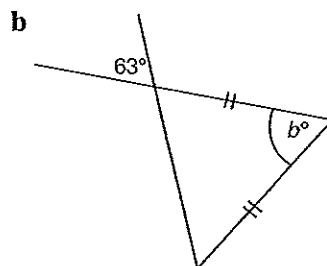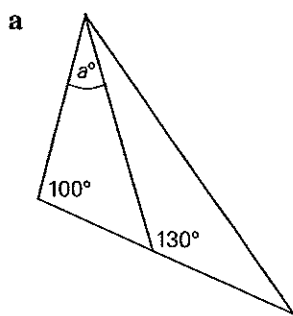 • a pair of co-interior angles are supplementary.

In each diagram say whether line *PQ* is parallel to line *MN*. Give reasons for your answer.

a

b

c
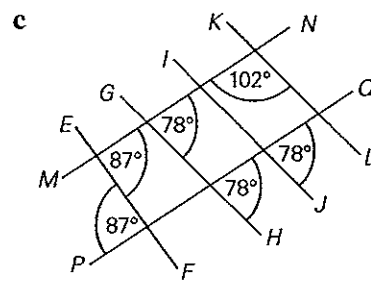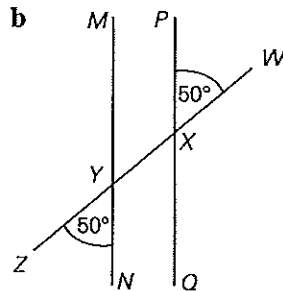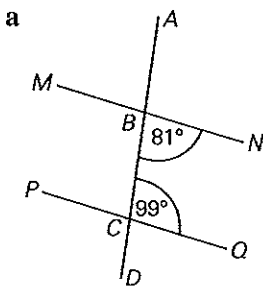
3 Recall these angle facts.

 • straight angle = 180°

 • vertically opposite angles are equal

 • angles in a △ add to 180°

 • complementary angles add to 90°

Use the above facts to find the value of the letter in each diagram below.

a

b

c

d

e

f

Skillsheet 3-02   Angles and parallel lines *continued*

4 Find the size of the angles marked with a letter. Give reasons for your answers.

a

42°
$y°$
$z°$

b

75°
$p°$
$q°$

c

$k°$
130°

d

$m°$
95°
$l°$

e

$t°$
$w°$
$n°$
62°   55°

f

$x°$
$b°$
$a°$
85°

g

$m°$
51°

h

62°
$x°$
$y°$

i

$a°$
125°
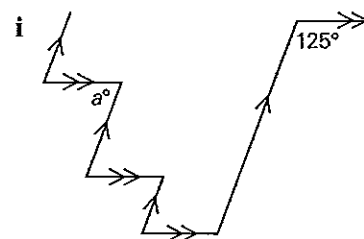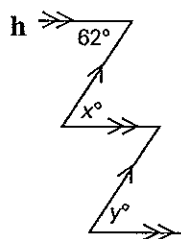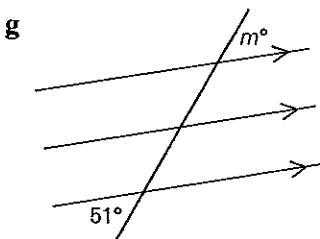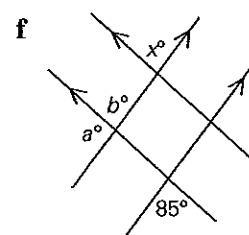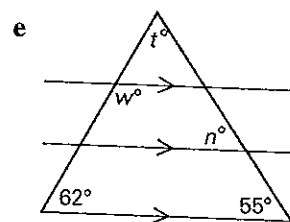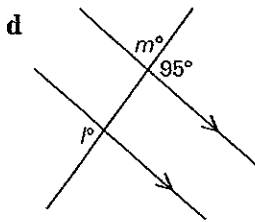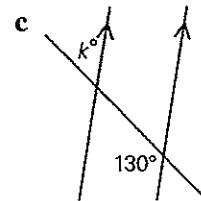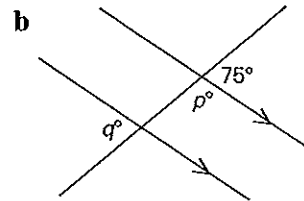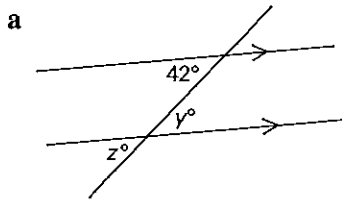
Skillsheet 3-02 Angles and parallel lines *continued*

Answers

1 a $\angle PWX$ **b** $\angle VXQ$ **c** $\angle PWX$ **d** $\angle SXW$

  e $\angle QXZ$ **f** $\angle AWV, \angle PWX$ or $\angle WXQ$

  g $\angle AWX$ **h** $\angle ZWP$

2 a $\angle NBC = 81°$ and $\angle BCQ = 99°$ (given)

  $\angle NBC$ and $\angle BCQ$ are supplementary ($81° + 99° = 180°$)

  $\angle NBC$ and $\angle BCQ$ are supplementary (definition of co-interior angles)

  PQ is parallel to MN since two co-interior angles are supplementary.

  b $\angle NYZ = 50°$ and $\angle PXW = 50°$ (given)

  $\angle MYX$ is vertically opposite to $\angle NYZ$ (definition of opposite angles)

  $\angle PYW = \angle MYX = 50°$ (opposite angles are equal)

  $\angle MYX$ and $\angle PXW$ are corresponding angles (definition of corresponding angles)

  PQ is parallel to MN since a pair of corresponding angles are equal.

  c PQ is parallel to MN since a pair of alternate angles are equal (the pair of 87° angles) or a pair of corresponding angles are equal (the pair of 78° angles)

3 a $a° = 30°$ **b** $b° = 54°$ **c** $c° = 36°$ **d** $d° = 25°$

  e $e° = 68°, f° = 112°$ **f** $g° = 22.5°, h° = 112.5°$

4 a $y° = 42°, z° = 42°$ **b** $p° = 105°, q° = 75°$

  c $k° = 50°$ **d** $m° = 85°, l° = 95°$

  e $n° = 55°, t° = 63°, w° = 118°$ **f** $a° = 95°, b° = 85°, x° = 85°$

  g $m° = 51°$ **h** $x° = 62°, y° = 62°$

  i $a° = 55°$

5