dfm Angles– Part VII – Algebraic Angles
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Prerequisites: All angle laws: angles in a triangle, on a straight line, around a point, isosceles triangles and alternate, corresponding, cointerior and vertically opposite angles.

Key Point: Sometimes angles may be **algebraic expressions**. Just **use angle laws in the usual way**. For example, if given angles in a triangle, add them together and set the sum to 180°, or equate angles you know are equal..
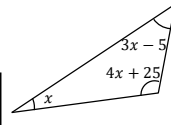
Worked Example 1: Determine x.
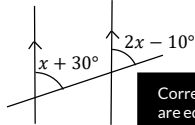
$2x - 10°$
$x + 30°$

Corresponding angles are equal. So equate the two expressions.

$2x - 10 = x + 30$
$\overset{(-x)}{x} - 10 = 30 \overset{(-x)}{}$
$\overset{(+10)}{x} = 40° \overset{(+10)}{}$

Collect x's on side with more x's, in this case the left-hand-side. Subtract x from both sides to get rid of x on RHS.

To get x on it's own, we need to get rid of -10. So +10 to both sides to get rid of it.
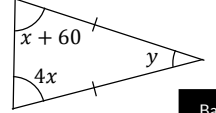
Worked Example 2: Determine x.

$3x - 5$
$4x + 25$
x

$x + 3x - 5 + 4x + 25 = 180$
$8x + 20 = 180$
$8x = 160$
$x = 20°$

Angles in triangle sum to 180°. So add expressions and set to 180°.

Tidy up LHS by collecting like terms.

Worked Example 3: Determine y.

$x + 60$
$4x$
y

Base angles of isosceles triangle are equal.

$4x = x + 60$
$3x = 60$
$x = 20°$
Angles on left:
$4 \times 20 = 80°$
$y = 180 - 80 - 80$
$= 20°$

Determine x.

Could have used $x + 60$

Angles in triangle sum to 180°.

Core Questions

1 Determine the value of x.

a
$2x$
$x + 60°$

b
x
$3x - 100°$

c
$5x - 25$
$4x$

d
$x + 60°$
$5x$

e
$4x - 75°$
$2x + 5°$

f
$2x$
$6x - 80°$

2 Determine the value of x.

a
$x + 50°$
$x + 40°$
x

b
$2x$
$3x$
x

c
$x + 5$
$3x$
x

d
$3x$
$2x$

e
$6x + 84$
$2x$

f
$7x + 27°$
$4x - 12°$
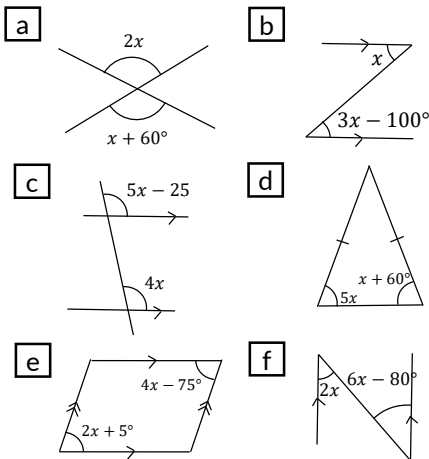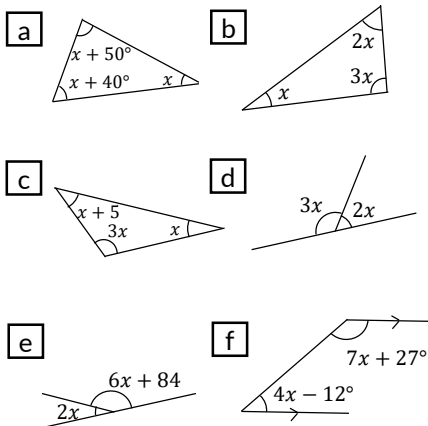
3 Determine the value of y.

a
y
$2x - 15°$
$x + 15°$

b
$2x + 6°$
$3x - 25°$
y
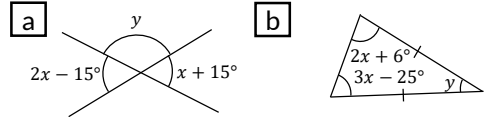
Problem Solving

4 Determine an expression for y in terms of x.

a
$2x$
y

b
$3x + 10°$
y

c
x
y

d
$2x - 5$
$x + 20$
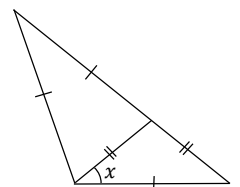y
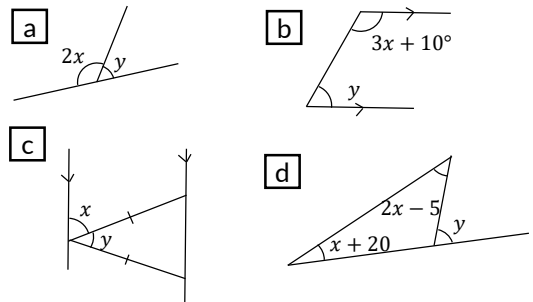
5 Determine an expression for a in terms of b and c.

a
b
c

6 Determine the value of x.

x