Euclidean Geometry

Geometry Definitions

Notation

$\parallel$ – is parallel to

$\perp$ – is perpendicular to

$\equiv$ – is congruent to

$|||$ – is similar to

$\therefore$ – therefore

$\because$ – because

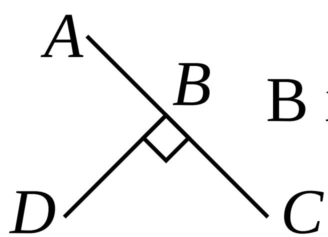
Terminology

produced – the line is extended

XY is produced to *A*

YX is produced to *B*

foot – the base or the bottom



B is the foot of the perpendicular

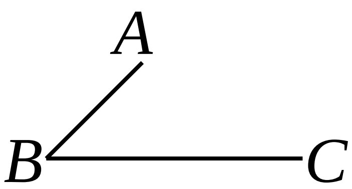
collinear – the points lie on the same line

concurrent – the lines intersect at the same point

transversal – a line that cuts two(or more) other lines

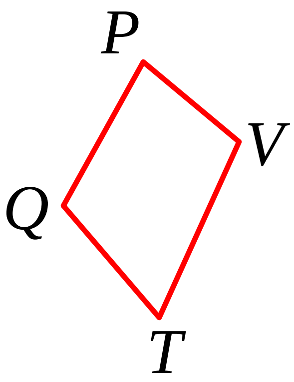
Naming Conventions

Angles and Polygons are named in cyclic order



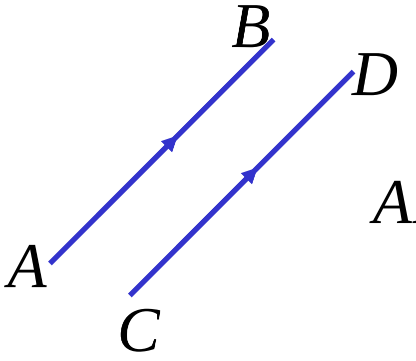
$\angle ABC$ or $A\hat{B}C$

(If no ambiguity $\angle B$ or $\hat{B}$)



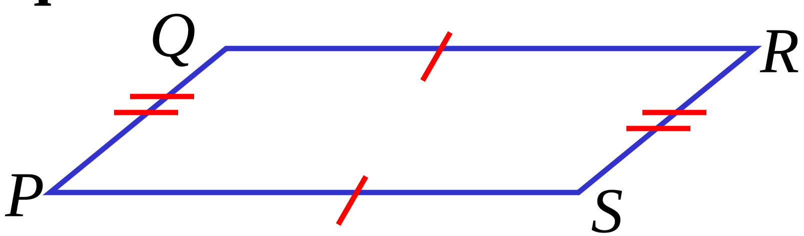
VPQT or *QPVT* or *QTVP* etc

Parallel Lines are named in corresponding order



$AB \parallel CD$

Equal Lines are marked with the same symbol



$PQ = SR$

$PS = QR$

Constructing Proofs

When constructing a proof, any line that you state must be one of the following;

1. **Given information**, do not assume information is given, e.g. if you are told two sides are of a triangle are equal don't assume it is isosceles, state that it is isosceles because two sides are equal.

2. **Construction of new lines**, state clearly your construction so that anyone reading your proof could recreate the construction.

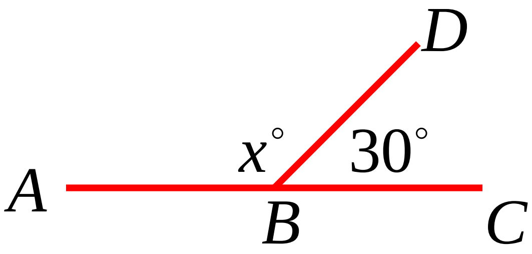
3. **A recognised geometrical theorem (or assumption)**, any theorem you are using must be explicitly stated, whether it is in the algebraic statement or the reason itself.

   e.g. $\angle A + 25 + 120 = 180$ $\qquad$ $(\angle \text{sum } \Delta = 180)$

Your reasoning should be clear and concise

4. **Any working out that follows from lines already stated.**

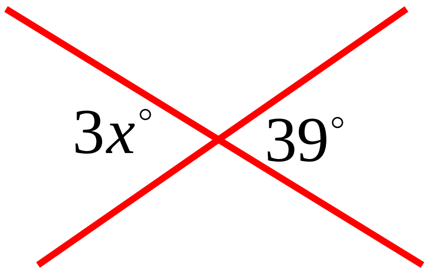
Angle Theorems



Angles in a straight line add up to 180°

$x + 30 = 180$ (straight $\angle ABC = 180^\circ$)

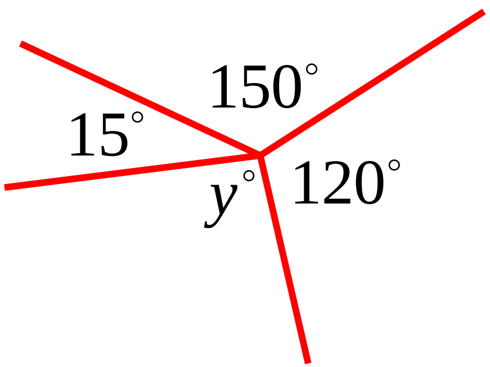
$x = 150$



Vertically opposite angles are equal

$3x = 39$ (vertically opposite $\angle$'s are $=$)

$x = 13$

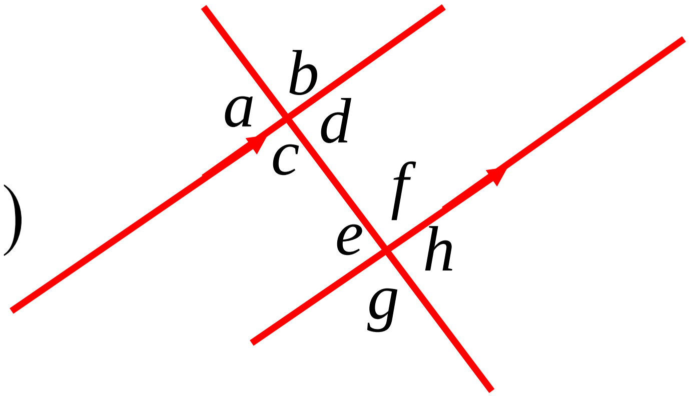


Angles about a point equal 360°

$y + 15 + 150 + 120 = 360$ (revolution $= 360^\circ$)

$y = 75$

Parallel Line Theorems



Alternate angles (Z) are equal

$$c = f \qquad d = e$$

$\left(\text{alternate} \angle\text{'s} =, \parallel \text{lines}\right)$

Corresponding angles (F) are equal

$$a = e \qquad b = f \qquad c = g \qquad d = h$$

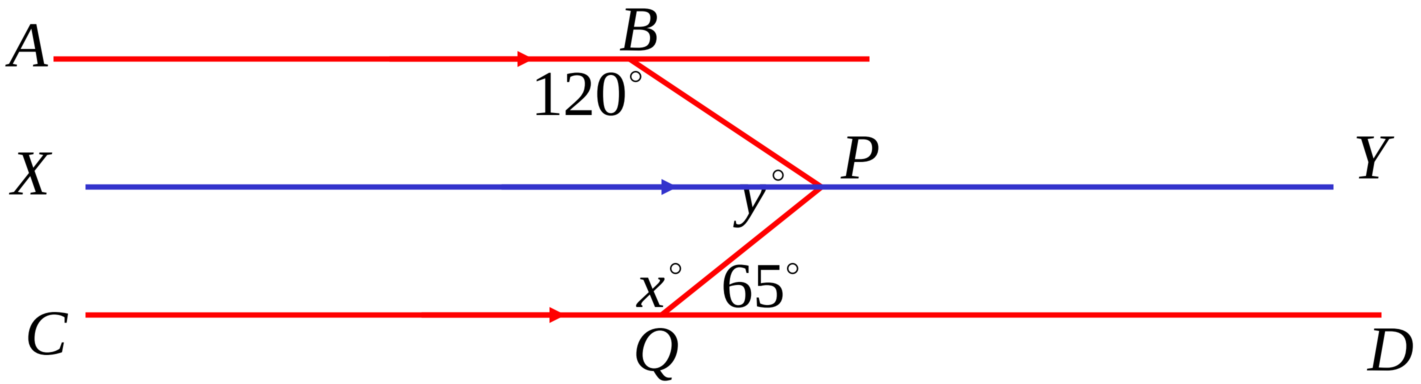
$\left(\text{corresponding} \angle\text{'s} =, \parallel \text{lines}\right)$

Cointerior angles (C) are supplementary

$$c + e = 180 \qquad d + f = 180$$

$\left(\text{cointerior} \angle\text{'s} = 180, \parallel \text{lines}\right)$

e.g.



$x + 65 = 180$ (straight $\angle CQD = 180^\circ$)

$\underline{x = 115}$

Construct $XY \parallel CD$ passing through P

$\angle XPQ = 65^\circ$ (alternate $\angle$'s $=$, $XY \parallel CQ$)

$\angle XPB + 120 = 180$ (cointerior $\angle$'s $= 180^\circ$, $AB \parallel XY$)

$\angle XPB = 60^\circ$

$\angle BPQ = \angle XPQ + \angle XPB$ (common $\angle$)

$y = 65 + 60$

$\underline{y = 125}$

Book 2
Exercise 8A; 1cfh, 2bdeh, 3bd, 5bcf, 6bef, 10bd, 11b, 12bc, 13ad, 14, 15