


$\angle a$ and $\angle e$ are alternate angles.

$$\therefore \angle a = \angle e.$$

$\angle c$ and $\angle f$ are alternate angles

$$\therefore \angle c = \angle f.$$

Note: for alternate angles, look out for the  shape.

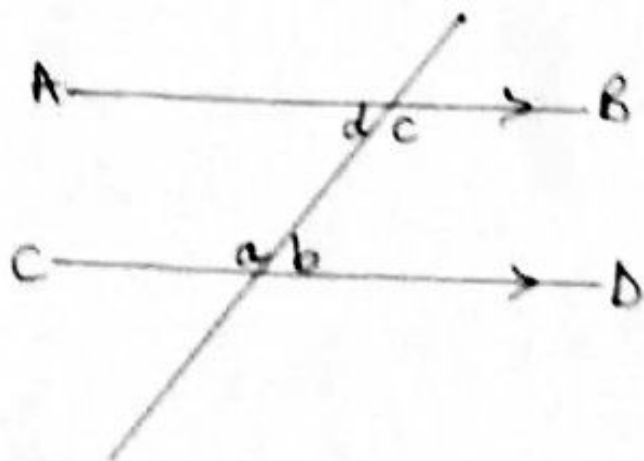


x and y are alternate angles.



v and w are alternate angles.

Interior angles on the same side of the transversal



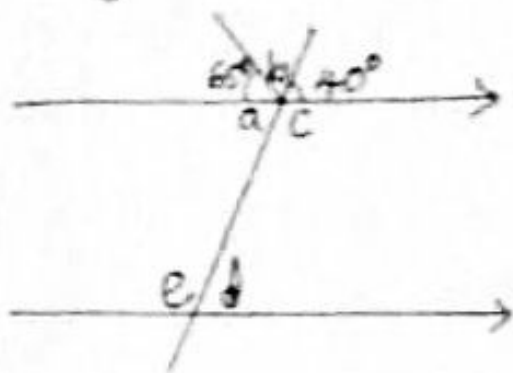
* Interior angles on the same side of the transversal are supplementary angles. (add up to 180°).

$$a + d = 180^\circ$$

$$b + c = 180^\circ$$

Example

Calculate the angles marked with letters:



Solution

$$a = 40^\circ \text{ (vertically opposite angles)}$$

$$65^\circ + b + 40^\circ = 180^\circ \text{ (angles on a straight line)}$$

$$b + 105^\circ = 180^\circ$$

$$b = 180^\circ - 105^\circ$$

$$\therefore \underline{b = 75^\circ}$$

$$c + 40^\circ = 180^\circ \text{ or } a + c = 180^\circ$$

$$c = 180^\circ - 40^\circ$$

$$\underline{c = 140^\circ}$$

$$d = 40^\circ \text{ (corresponding angles)}$$

$$\text{or } c + d = 180^\circ \text{ (interior angles on the same side of the transversal).}$$

$$140^\circ + d = 180^\circ$$

$$d = 180^\circ - 140^\circ$$

$$\underline{d = 40^\circ}$$

$$\text{or } a = d \text{ (alternate angles)}$$

$$e = c \text{ (alternate angles)}$$

$$\therefore e = 140^\circ$$

$$\text{or } a + e = 180^\circ \text{ (interior angles on the same side of the transversal).}$$

$$40^\circ + e = 180^\circ$$

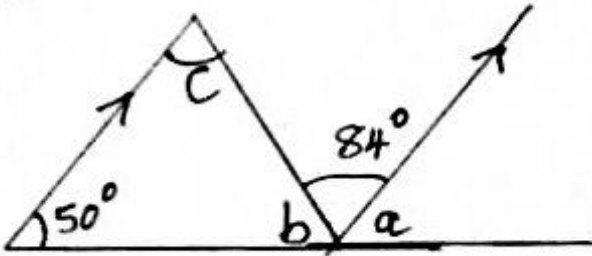
$$e = 180^\circ - 40^\circ$$

$$\underline{e = 140^\circ}$$

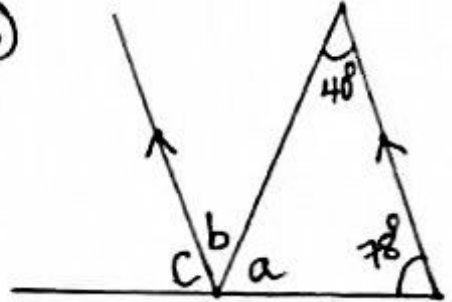
Exercise

Calculate the angles marked with letters in each of the following:

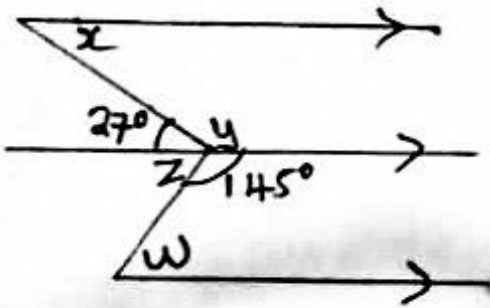
(a)



(b)

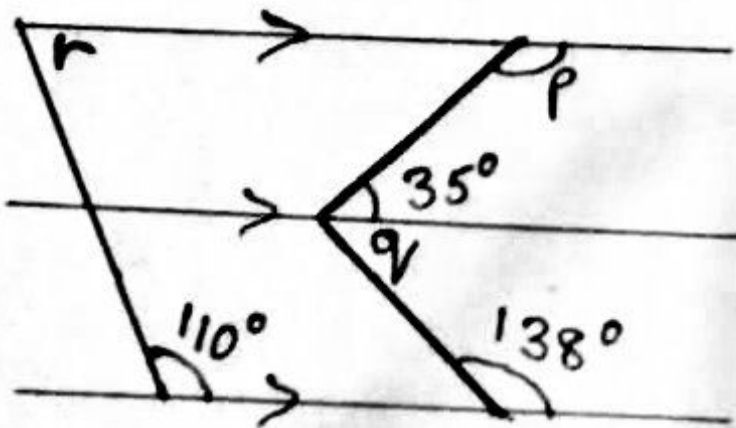


(c)



Prep Work

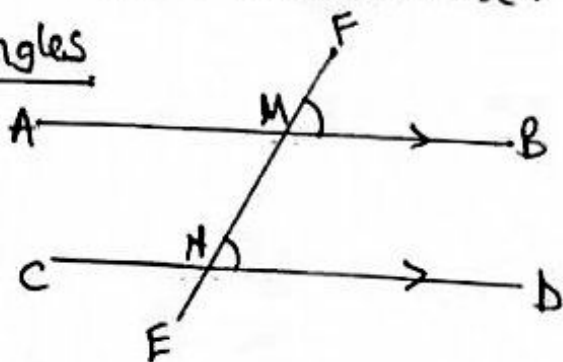
Calculate the angles marked with letters:



Angles associated with parallel lines.

In the diagram below, AB is parallel to CB. The line EF which cuts AB and CB at M and N respectively, is called a transversal.

Corresponding angles



* If two parallel lines are cut by a transversal, the corresponding angles are equal.

$\angle FMB$ and $\angle MNB$ are corresponding angles.

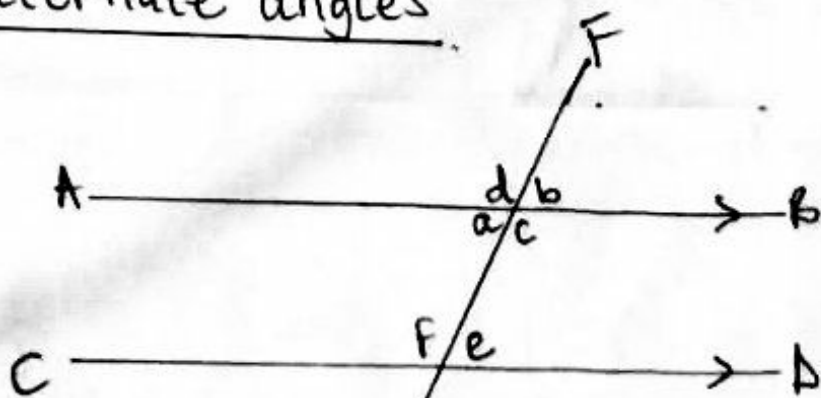
$\angle ENB$ and $\angle MNB$ are corresponding angles.

$\angle CNM$ and $\angle AME$ are also corresponding angles.

$\angle ENC$ and $\angle NMA$ are also corresponding angles.

- $\therefore \angle FMB = \angle MNB$
- $\angle ENB = \angle MNB$
- $\angle CNM = \angle AME$
- $\angle ENC = \angle NMA$

Alternate angles



* If two parallel lines are cut by a transversal, the alternate angles are equal.