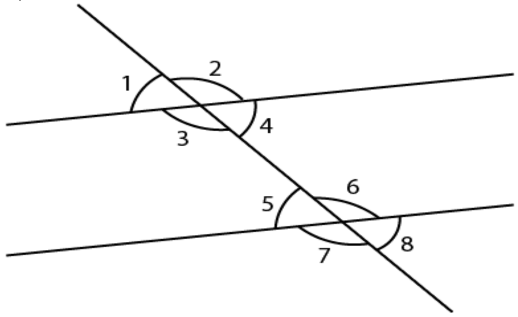
EXERCISE 14B PAGE: 166

1. In questions 1 and 2, given below, identify the given pairs of angles as corresponding angles, interior alternate angles, exterior alternate angles, adjacent angles, vertically opposite angles or allied angles:
(i) ∠3 and ∠6
(ii) ∠2 and ∠4
(iii) ∠3 and ∠7
(iv) ∠2 and ∠7
(v) ∠4 and∠6
(vi) ∠1 and ∠8
(vii) ∠1 and ∠5
(viii) ∠1 and ∠4
(ix) ∠5 and ∠7



Solution:

(i) ∠3 and ∠6 are interior alternate angles.

(ii) ∠2 and ∠4 are adjacent angles.

(iii) ∠3 and ∠7 are corresponding angles.

(iv) ∠2 and ∠7 are exterior alternate angles.

(v) ∠4 and∠6 are allied or co-interior angles.

(vi) ∠1 and ∠8 are exterior alternate angles.

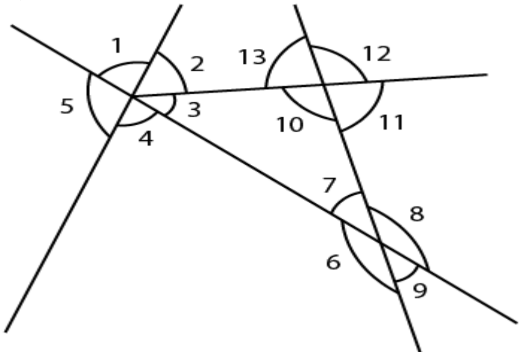
(vii) ∠1 and ∠5 are corresponding angles.

(viii) ∠1 and ∠4 are vertically opposite angles.

(ix) ∠5 and ∠7 are adjacent angles.

2. (i) ∠1 and ∠4
(ii) ∠4 and ∠7
(iii) ∠10 and ∠12
(iv) ∠7 and ∠13
(v) ∠6 and ∠8
(vi) ∠11 and ∠8
(vii) ∠7 and ∠9
(viii) ∠4 and ∠5

(ix) ∠4 and ∠6
(x) ∠6 and ∠7
(xi) ∠2 and ∠13



Solution:

(i) ∠1 and ∠4 are vertically opposite angles.

(ii) ∠4 and ∠7 are interior alternate angles.

(iii) ∠10 and ∠12 are vertically opposite angles.

(iv) ∠7 and ∠13 are corresponding angles.

(v) ∠6 and ∠8 are vertically opposite angles.

(vi) ∠11 and ∠8 are allied or co-interior angles.

(vii) ∠7 and ∠9 are vertically opposite angles.

(viii) ∠4 and ∠5 are adjacent angles.

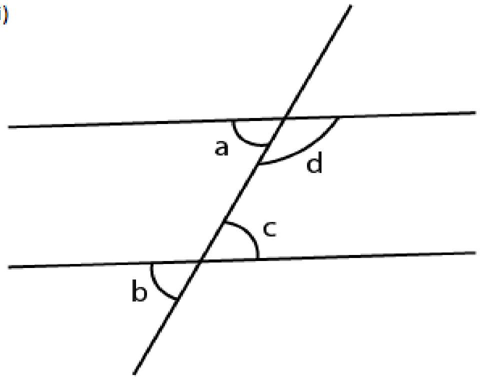
(ix) ∠4 and ∠6 are allied or co-interior angles.

(x) ∠6 and ∠7 are adjacent angles.

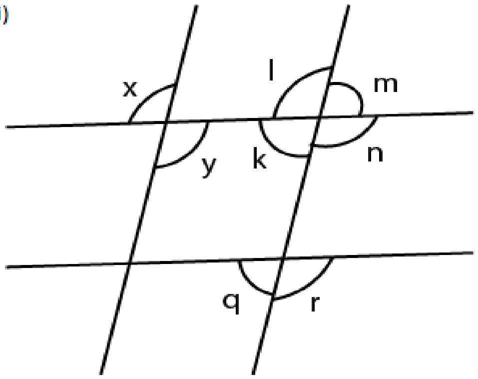
(xi) ∠2 and ∠13 are allied or co-interior angles.

3. In the following figures, the arrows indicate parallel lines. State which angles are equal. Give reasons.

(i)



(ii)

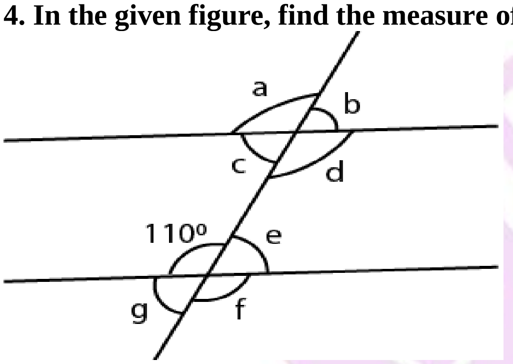


Solution:

(i) From the figure (i)
a = b are corresponding angles
b = c are vertically opposite angles
a = c are alternate angles
So we get
a = b = c

(ii) From the figure (ii)
x = y are vertically opposite angles
y = l are alternate angles
x = l are corresponding angles
1 = n are vertically opposite angles
n = r are corresponding angles
So we get
x = y = l = n = r
Similarly
m = k are vertically opposite angles
k = q are corresponding angles
Hence, m = k = q.

4. In the given figure, find the measure of the unknown angles:



Solution:

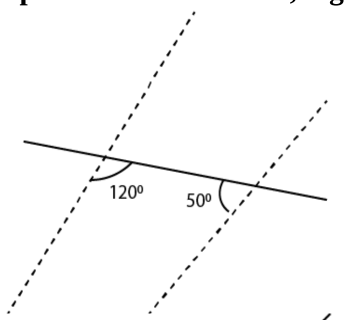
From the figure
a = d are vertically opposite angles
d = f are corresponding angles
$f = 110^0$ are vertically opposite angles
So we get
$a = d = f = 110^0$
We know that
$e + 110^0 = 180^0$ are co-interior angles
$e = 180 – 110 = 70^0$

b = c are vertically opposite angles
b = e are corresponding angles
e = g are vertically opposite angles
So we get
$b = c = e = g = 70^0$

Therefore, a = 110^0, b = 70^0, c = 70^0, d = 110^0, e = 110^0, f = 110^0 and g = 70^0.

5. Which pair of the dotted line, segments, in the following figures, are parallel. Give reason:

i)



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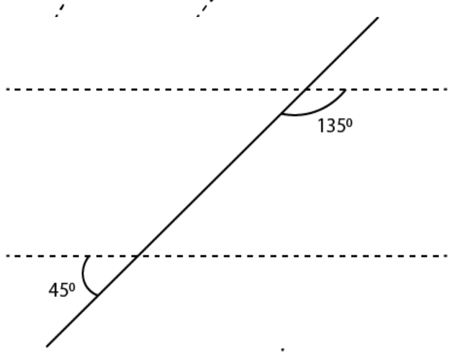
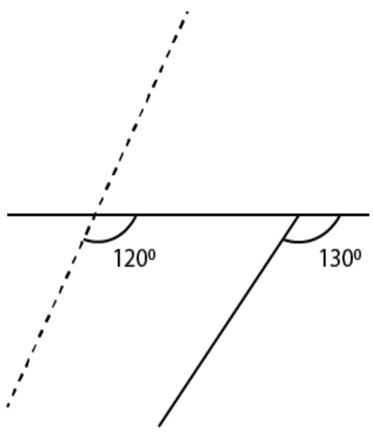
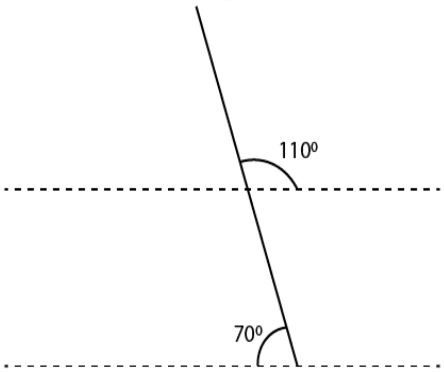


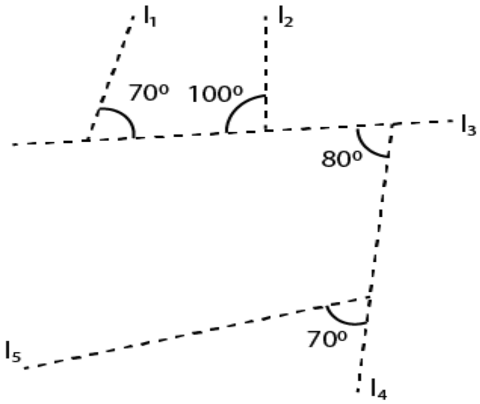
iii)



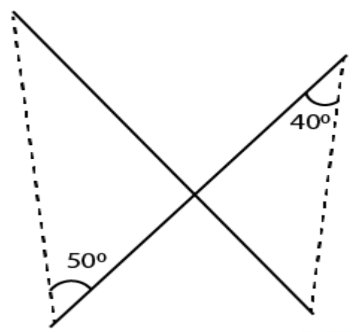
iv)



v)



vi)



Solution:

(i) From the figure (i)
If the lines are parallel we get $120 + 50 = 180^0$
There are co-interior angles where $170^0 = 180^0$
It is not true.
Therefore, they are not parallel lines.

(ii) From the figure (ii)
$\angle 1 = 45^0$ are vertically opposite angles
We know that the lines are parallel if
$\angle 1 + 135^0 = 180^0$ are co-interior angles
Substituting the values
$45^0 + 135^0 = 180^0$
$180^0 = 180^0$ which is true
Therefore, the lines are parallel.

(iii) From the figure (iii)
The lines are parallel if corresponding angles are equal
Here $120^0 = 130^0$ is not correct
Hence, lines are not parallel.

(iv) $\angle 1 = 110^0$ are vertically opposite angles
We know that if lines are parallel
$\angle 1 + 70^0 = 180^0$ are co-interior angles
Substituting the values
$110^0 + 70^0 = 180^0$
$180^0 = 180^0$ which is correct

Therefore, the lines are parallel.

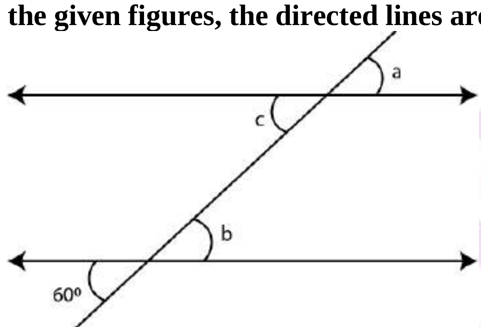
(v) $\angle 1 + 100^0 = 180^0$
So we get
$\angle 1 = 180^0 – 100^0 = 80^0$ which is a linear pair
Here the lines 1 and 2 are parallel if $\angle 1 = 70^0$
$80^0 = 70^0$ is not true
So the $\angle 1$ and $\angle 2$ are not parallel
$\angle 3$ and $\angle 5$ will be parallel if $80^0 = 70^0$ are corresponding angle which is not true.
Hence, $\angle 3$ and $\angle 5$ are not parallel.

We know that
$\angle 1 = 80^0$ are alternate angles
$80^0 = 80^0$ which is true
Hence, $\angle 2$ and $\angle 4$ are parallel.

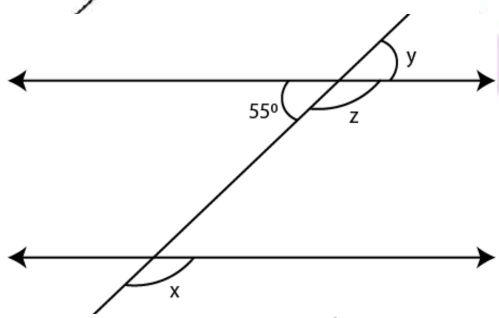
(vi) Two lines are parallel if alternate angles are equal
$50^0 = 40^0$ which is not true
Hence, the lines are not parallel.

6. In the given figures, the directed lines are parallel to each other. Find the unknown angles.

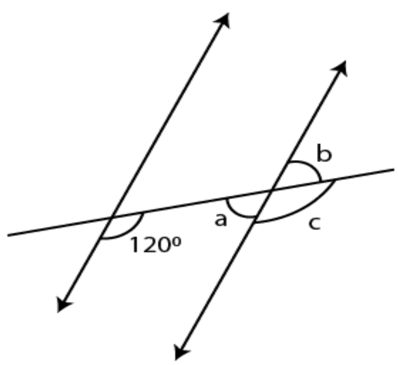
i)



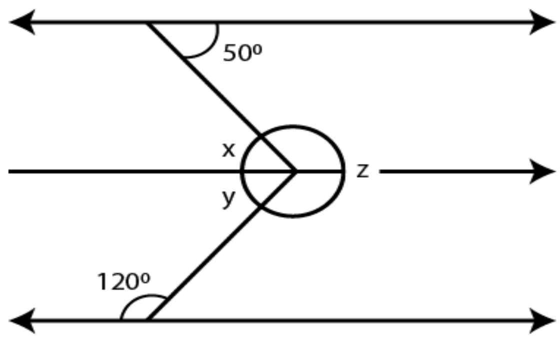
ii)



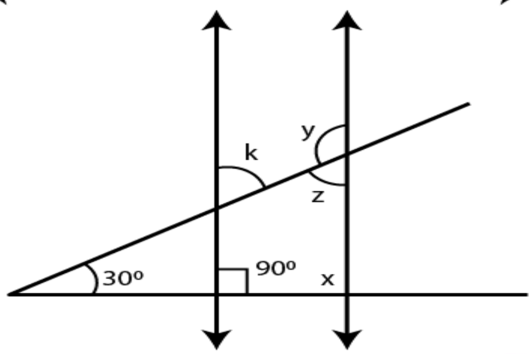
iii)



iv)



v)



Solution:

(i) If the lines are parallel
a = b are corresponding angles
a = c are vertically opposite angles
a = b = c
Here b = 60^0 are vertically opposite angles
Therefore, a = b = c = 60^0

(ii) If the lines are parallel
x = z are corresponding angles
z + y = 180^0 is a linear pair
y = 55^0 are vertically opposite angles
Substituting the values
z + 55^0 = 180^0
z = 180 – 55 = 125^0
If x = z we get x = 125^0
Therefore, x = 125^0, y = 55^0 and z = 125^0.

(iii) If the lines are parallel
c = 120^0
a + 120^0 = 180^0 are co-interior angles
a = 180 – 120 = 60^0
We know that a = b are vertically opposite angles
So b = 60^0
Therefore, a = b = 60^0 and c = 120^0.

(iv) If the lines are parallel
x = 50^0 are alternate angles
y + 120^0 = 180^0 are co-interior angles

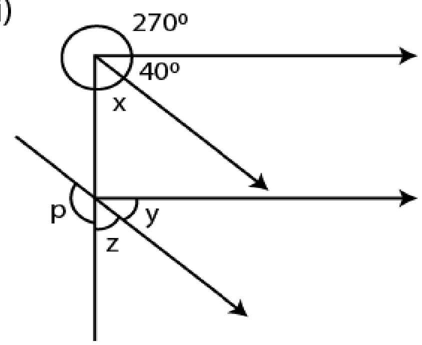
$y = 180 – 120 = 60^0$
We know that
$x + y + z = 360^0$ are angles at a point
Substituting the values
$50 + 60 + z = 360$
By further calculation
$110 + z = 360$
$z = 360 – 110 = 250^0$
Therefore, $x = 50^0$, $y = 60^0$ and $z = 250^0$.

(v) If the lines are parallel
$x + 90^0 = 180^0$ are co-interior angles
$x = 180^0 – 90^0 = 90^0$
$\angle 2 = x$
$\angle 2 = 90^0$
We know that the sum of angles of a triangle
$\angle 1 + \angle 2 + 30^0 = 180^0$
Substituting the values
$\angle 1 + 90^0 + 30^0 = 180^0$
By further calculation
$\angle 1 + 120^0 = 180^0$
$\angle 1 = 180 – 120 = 60^0$

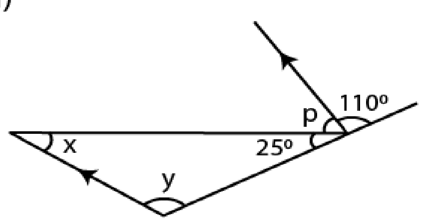
Here $\angle 1 = k$ are vertically opposite angles
$k = 60^0$
Here $\angle 1 = z$ are alternate angles
$z = 60^0$
Here $k + y = 180^0$ are co-interior angles
Substituting the values
$60^0 + y = 180^0$
$y = 180 – 60 = 120^0$
Therefore, $x = 90^0$, $y = 120^0$, $z = 60^0$, $k = 60^0$.

7. Find x, y and p is the given figures:

(i)



(ii)



Solution:

(i) From the figure (i)
The lines are parallel
x = z are corresponding angles

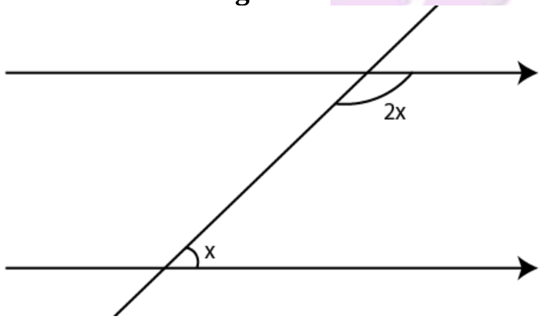
$y = 40^0$ are corresponding angles
We know that
$x + 40^0 + 270^0 = 360^0$ are the angles at a point
So we get
$x + 310^0 = 360^0$
$x = 360 - 310 = 50^0$
So $z = x = 50^0$
Here $p + z = 180^0$ is a linear pair
By substituting the values
$p + 50^0 = 180^0$
$p = 180 - 50 = 130^0$

Therefore, $x = 50^0$, $y = 40^0$, $z = 50^0$ and $p = 130^0$.

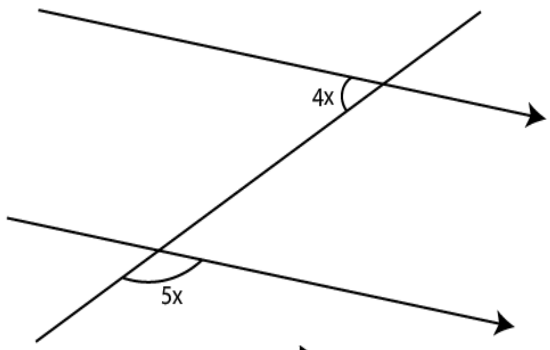
(ii) From the figure (ii)
The lines are parallel
$y = 110^0$ are corresponding angles
We know that
$25^0 + p + 110^0 = 180^0$ are angles on a line
$p + 135^0 = 180^0$
$p = 180 - 135 = 45^0$

We know that the sum of angles of a triangle
$x + y + 25^0 = 180^0$
$x + 110^0 + 25^0 = 180^0$
By further calculation
$x + 135^0 = 180^0$
$x = 180 - 135 = 45^0$

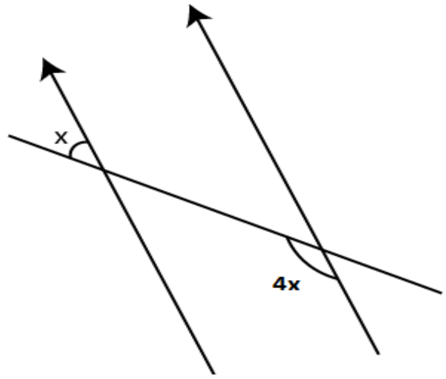
Therefore, $x = 45^0$, $y = 110^0$ and $p = 45^0$.

8. Find x in the following cases:
(i)


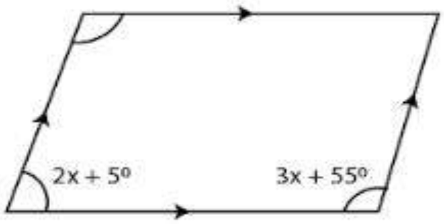
(ii)



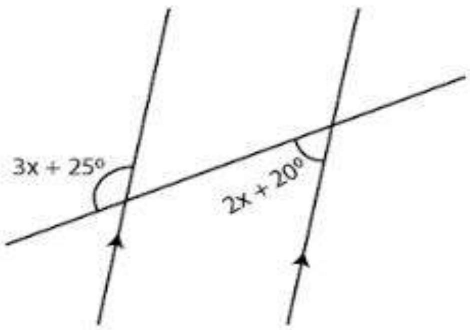
(iii)



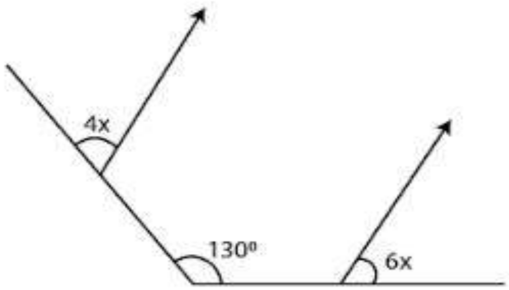
(iv)



(v)



(vi)



Solution:

(i) From the figure (i)
The lines are parallel
$2x + x = 180^0$ are co-interior angles
$3x = 180^0$
$x = 180/3 = 60^0$

(ii) From the figure (ii)
The lines are parallel
$4x + 1 = 180^0$ are co-interior angles
$\angle 1 = 5x$ are vertically opposite angles
Substituting the values
$4x + 5x = 180^0$
So we get
$9x = 180^0$
$x = 180/9 = 20^0$

(iii) From the figure (iii)
The lines are parallel
$\angle 1 + 4x = 180^0$ are co-interior angles
$\angle 1 = x$ are vertically opposite angles
Substituting the values
$x + 4x = 180^0$
$5x = 180^0$
So we get
$x = 180/5 = 36^0$

(iv) From the figure (iv)
The lines are parallel
$2x + 5 + 3x + 55 = 180^0$ are co-interior angles
$5x + 60^0 = 180^0$
By further calculation
$5x = 180 – 60 = 120^0$
So we get
$x = 120/5 = 24^0$

(v) From the figure (v)
The lines are parallel
$\angle 1 = 2x + 20^0$ are alternate angles
$\angle 1 + 3x + 25^0 = 180^0$ is a linear pair
Substituting the values
$2x + 20^0 + 3x + 25^0 = 180^0$
$5x + 45^0 = 180^0$
So we get
$5x = 180 – 45 = 135^0$
$x = 135/5 = 27^0$

(vi) From the figure (vi)
Construct a line parallel to the given parallel lines
$\angle 1 = 4x$ and $\angle 2 = 6x$ are corresponding angles
$\angle 1 + \angle 2 = 130^0$

Substituting the values
$4x + 6x = 130^0$
$10x = 130^0$
So we get
$x = 130/10 = 13^0$