EXERCISE 15A

PAGE: 176

1. State, if the triangles are possible with the following angles :
(i) 20°, 70° and 90°
(ii) 40°, 130° and 20°
(iii) 60°, 60° and 50°
(iv) 125°, 40° and 15°
Solution:

In a triangle, the sum of three angles is 180^0

(i) 20°, 70° and 90°
Sum = $20^0 + 70^0 + 90^0 = 180^0$
Here the sum is 180^0 and therefore it is possible.

(ii) 40°, 130° and 20°
Sum = 40° + 130° + 20° = 290^0
Here the sum is not 180^0 and therefore it is not possible.

(iii) 60°, 60° and 50°
Sum = 60° + 60° + 50° = 170^0
Here the sum is not 180^0 and therefore it is not possible.

(iv) 125°, 40° and 15°
Sum = 125° + 40° + 15° = 180^0
Here the sum is 180^0 and therefore it is possible.

2. If the angles of a triangle are equal, find its angles.
Solution:

In a triangle, the sum of three angles is 180^0
So each angle = $180^0/3 = 60^0$

3. In a triangle ABC, ∠A = 45° and ∠B = 75°, find ∠C.
Solution:

In a triangle, the sum of three angles is 180^0
$\angle A + \angle B + \angle C = 180^0$
Substituting the values
$45^0 + 75^0 + \angle C = 180^0$
By further calculation
$120^0 + \angle C = 180^0$
So we get
$\angle C = 180^0 - 120^0 = 60^0$

4. In a triangle PQR, ∠P = 60° and ∠Q = ∠R, find ∠R.
Solution:

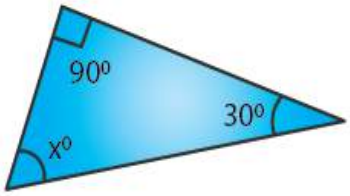
Consider ∠Q = ∠R = x
∠P = 60°

We can write it as
$\angle P + \angle Q + \angle R = 180^0$
Substituting the values
$60^0 + x + x = 180^0$
By further calculation
$60^0 + 2x = 180^0$
$2x = 180^0 – 60^0 = 120^0$
So we get
$x = 120^0/2 = 60^0$

$\angle Q = \angle R = 60^0$
Therefore, $\angle R = 60^0$.

5. Calculate the unknown marked angles in each figure:

(i)



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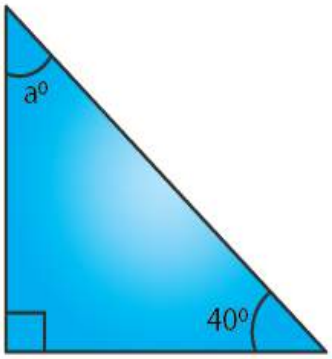

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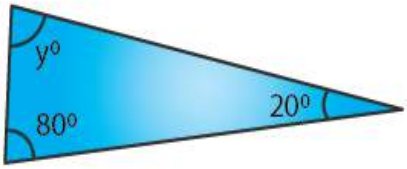


Solution:

In a triangle, the sum of three angles is 180^0

(i) From figure (i)
$90^0 + 30^0 + x = 180^0$
By further calculation
$120^0 + x = 180^0$
So we get
$x = 180^0 – 120^0 = 60^0$
Therefore, $x = 60^0$.

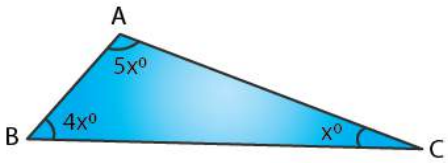
(ii) From figure (ii)
$y + 80^0 + 20^0 = 180^0$
By further calculation
$y + 100^0 = 180^0$
So we get
$y = 180^0 – 100^0 = 80^0$
Therefore, $y = 80^0$.

(iii) From figure (iii)

$a + 90^0 + 40^0 = 180^0$
By further calculation
$a + 130^0 = 180^0$
So we get
$a = 180^0 – 130^0 = 50^0$
Therefore, $a = 50^0$.

6. Find the value of each angle in the given figures:

(i)



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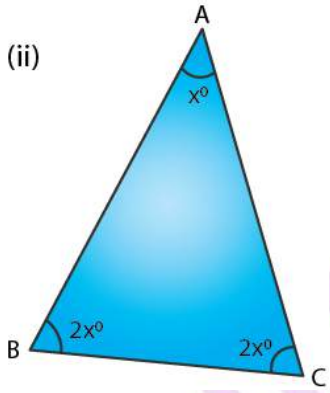


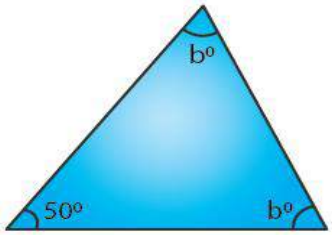
Solution:

(i) From the figure (i)
$\angle A + \angle B + \angle C = 180^0$
Substituting the values
$5x^0 + 4x^0 + x^0 = 180^0$
By further calculation
$10x^0 = 180^0$
$x = 180/10 = 18^0$
So we get
$\angle A = 5x^0 = 5 \times 18^0 = 90^0$
$\angle B = 4x^0 = 4 \times 18^0 = 72^0$
$\angle C = x = 18^0$

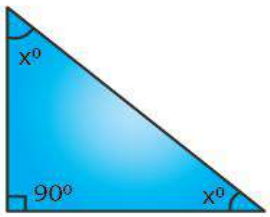
(ii) From the figure (ii)
$\angle A + \angle B + \angle C = 180^0$
Substituting the values
$x^0 + 2x^0 + 2x^0 = 180^0$
By further calculation
$5x^0 = 180^0$
$x^0 = 180^0/5 = 36^0$
So we get
$\angle A = x^0 = 36^0$
$\angle B = 2x^0 = 2 \times 36^0 = 72^0$
$\angle C = 2x^0 = 2 \times 36^0 = 72^0$

7. Find the unknown marked angles in the given figure:

(i)



(ii)



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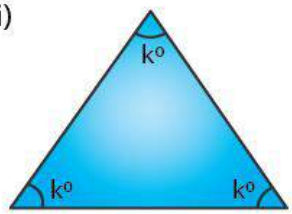

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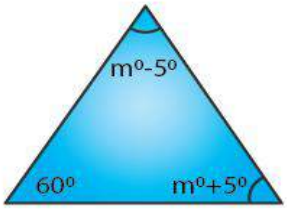


Solution:

(i) From the figure (i)
$\angle A + \angle B + \angle C = 180^0$
Substituting the values
$b^0 + 50^0 + b^0 = 180^0$
By further calculation
$2b^0 = 180^0 – 50^0 = 130^0$
$b^0 = 130^0/2 = 65^0$
Therefore, $\angle A = \angle C = b^0 = 65^0$.

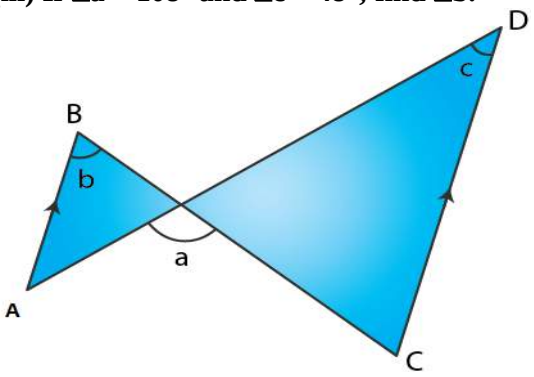
(ii) From the figure (ii)
$\angle A + \angle B + \angle C = 180^0$
Substituting the values
$x^0 + 90^0 + x^0 = 180^0$
By further calculation
$2x^0 = 180^0 – 90^0 = 90^0$
$x^0 = 90^0/2 = 45^0$
Therefore, $\angle A = \angle C = x^0 = 45^0$.

(iii) From the figure (iii)
$\angle A + \angle B + \angle C = 180^0$
Substituting the values
$k^0 + k^0 + k^0 = 180^0$
By further calculation
$3k^0 = 180^0$
$k^0 = 180^0/3 = 60^0$
Therefore, $\angle A = \angle B = \angle C = 60^0$.

(iv) From the figure (iv)
$\angle A + \angle B + \angle C = 180^0$
Substituting the values
$(m^0 – 5^0) + 60^0 + (m^0 + 5^0) = 180^0$
By further calculation

$m^0 – 5^0 + 60^0 + m^0 + 5^0 = 180^0$
$2m^0 = 180^0 – 60^0 + 5^0 = 120^0$
$m^0 = 120^0/2 = 60^0$
Therefore, $\angle A = m^0 – 5^0 = 60^0 – 5^0 = 55^0$
$\angle C = m^0 + 5^0 = 60^0 + 5^0 = 65^0$

8. In the given figure, show that: ∠a = ∠b + ∠c
(i) If ∠b = 60° and ∠c = 50°; find ∠a.
(ii) If ∠a = 100° and ∠b = 55°; find ∠c.
(iii) If ∠a = 108° and ∠c = 48°; find ∠b.



Solution:

From the figure
AB || CD
b = c and ∠A = ∠C are alternate angles
In triangle PCD
Exterior ∠APC = ∠C + ∠D
a = b + c

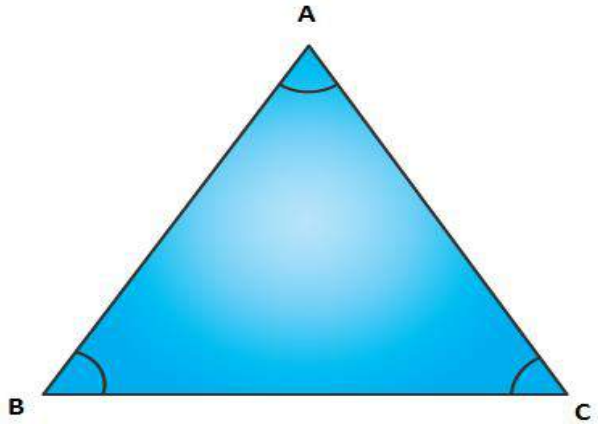
(i) If ∠b = 60° and ∠c = 50°
∠a = ∠b + ∠c
Substituting the values
$\angle a = 60 + 50 = 110^0$

(ii) If ∠a = 100° and ∠b = 55°
∠a = ∠b + ∠c
Substituting the values
$\angle c = 100 – 55 = 45^0$

(iii) If ∠a = 108° and ∠c = 48°
∠a = ∠b + ∠c
Substituting the values
$\angle b = 108 – 48 = 60^0$

9. Calculate the angles of a triangle if they are in the ratio 4 : 5 : 6.
Solution:

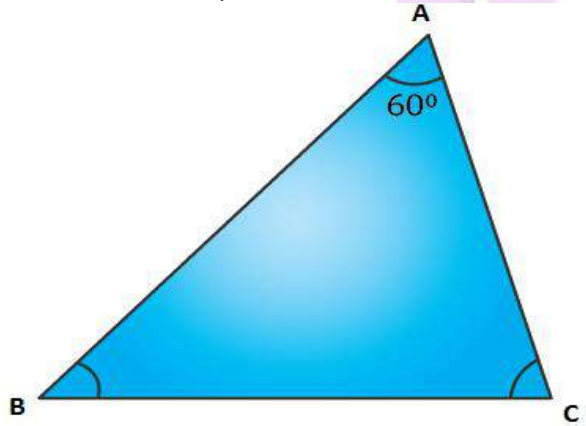
In a triangle, the sum of angles of a triangle is 180^0
$\angle A + \angle B + \angle C = 180^0$



It is given that
$\angle A: \angle B: \angle C = 4: 5: 6$
Consider $\angle A = 4x$, $\angle B = 5x$ and $\angle C = 6x$
Substituting the values
$4x + 5x + 6x = 180^0$
By further calculation
$15x = 180^0$
$x = 180^0/15 = 12^0$
So we get
$\angle A = 4x = 4 \times 12^0 = 48^0$
$\angle B = 5x = 5 \times 12^0 = 60^0$
$\angle C = 6x = 6 \times 12^0 = 72^0$

10. One angle of a triangle is 60°. The, other two angles are in the ratio of 5 : 7. Find the two angles.
Solution:

From the triangle ABC
Consider $\angle A = 60^0$, $\angle B: \angle C = 5:7$



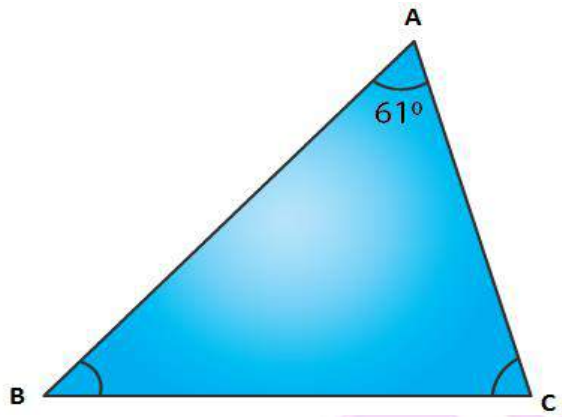
In a triangle
$\angle A + \angle B + \angle C = 180^0$
Substituting the values
$60^0 + \angle B + \angle C = 180^0$
By further calculation
$\angle B + \angle C = 180^0 - 60^0 = 120^0$

Take ∠B = 5x and ∠C = 7x
Substituting the values
$5x + 7x = 120^0$
$12x = 120^0$
$x = 120^0/12 = 10^0$

So we get
$\angle B = 5x = 5 \times 10^0 = 50^0$
$\angle C = 7x = 7 \times 10^0 = 70^0$

11. One angle of a triangle is 61° and the other two angles are in the ratio 1 ½ : 1 1/3. Find these angles.
Solution:

From the triangle ABC
Consider $\angle A = 61^0$



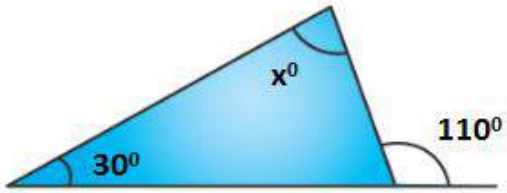
In a triangle
$\angle A + \angle B + \angle C = 180^0$
Substituting the values
$61^0 + \angle B + \angle C = 180^0$
By further calculation
$\angle B + \angle C = 180^0 - 61^0 = 119^0$

∠B: ∠C = 1 ½: 1 1/3 = 3/2: 4/3
Taking LCM
∠B: ∠C = 9: 8/ 6
∠B: ∠C = 9: 8

Consider ∠B = 9x and ∠C = 8x
Substituting the values
$9x + 8x = 119^0$
$17x = 119^0$
$x = 119^0/ 17 = 7^0$
So we get
$\angle B = 9x = 9 \times 7^0 = 63^0$
$\angle C = 8x = 8 \times 7^0 = 56^0$

12. Find the unknown marked angles in the given figures:

(i)



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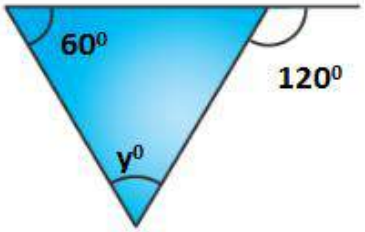

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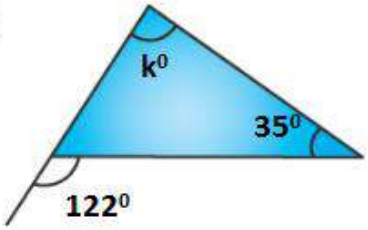

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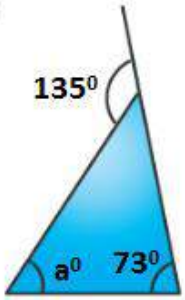

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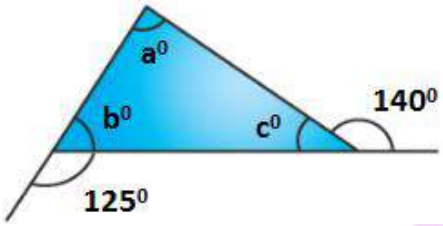

Solution:

In a triangle, if one side is produced
Exterior angle is the sum of opposite interior angles

(i) From the figure (i)
$110^0 = x^0 + 30^0$
By further calculation
$x^0 = 110^0 – 30^0 = 80^0$

(ii) From the figure (ii)
$120^0 = y^0 + 60^0$
By further calculation
$y^0 = 120^0 – 60^0 = 60^0$

(iii) From the figure (iii)
$122^0 = k^0 + 35^0$
By further calculation
$k^0 = 122^0 – 35^0 = 87^0$

(iv) From the figure (iv)
$135^0 = a^0 + 73^0$
By further calculation
$a^0 = 135^0 – 73^0 = 62^0$

(v) From the figure (v)
$125^0 = a + c$ …… (1)
$140^0 = a + b$ …… (2)
By adding both the equations
$a + c + a + b = 125^0 + 140^0$
On further calculation
$a + a + b + c = 265^0$

We know that $a + b + c = 180^0$
Substituting it in the equation
$a + 180^0 = 265^0$
So we get
$a = 265 – 180 = 85^0$

If $a + b = 140^0$
Substituting it in the equation
$85^0 + b = 140^0$
So we get
$b = 140 – 85 = 55^0$

If $a + c = 125^0$
Substituting it in the equation
$85^0 + c = 125^0$
So we get
$c = 125 – 85 = 40^0$

Therefore, $a = 85^0$, $b = 55^0$ and $c = 40^0$.