

EXERCISE 15.2

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1. Two angles of a triangle are of measures 105° and 30° . Find the measure of the third angle.

Solution:

Given two angles of a triangle are of measures 105° and 30°

Let the required third angle be x

We know that sum of all the angles of a triangle = 180°

$$105^\circ + 30^\circ + x = 180^\circ$$

$$135^\circ + x = 180^\circ$$

$$x = 180^\circ - 135^\circ$$

$$x = 45^\circ$$

Therefore the third angle is 45°

2. One of the angles of a triangle is 130° , and the other two angles are equal. What is the measure of each of these equal angles?

Solution:

Given one of the angles of a triangle is 130°

Also given that remaining two angles are equal

So let the second and third angle be x

We know that sum of all the angles of a triangle = 180°

$$130^\circ + x + x = 180^\circ$$

$$130^\circ + 2x = 180^\circ$$

$$2x = 180^\circ - 130^\circ$$

$$2x = 50^\circ$$

$$x = 50/2$$

$$x = 25^\circ$$

Therefore the two other angles are 25° each

3. The three angles of a triangle are equal to one another. What is the measure of each of the angles?

Solution:

Given that three angles of a triangle are equal to one another

So let the each angle be x

We know that sum of all the angles of a triangle = 180°

$$x + x + x = 180^\circ$$

$$3x = 180^\circ$$

$$x = 180/3$$

$$x = 60^\circ$$

Therefore angle is 60° each

4. If the angles of a triangle are in the ratio 1: 2: 3, determine three angles.

Solution:

Given angles of the triangle are in the ratio 1: 2: 3

So take first angle as x , second angle as $2x$ and third angle as $3x$

We know that sum of all the angles of a triangle = 180°

$$x + 2x + 3x = 180^\circ$$

$$6x = 180^\circ$$

$$x = 180/6$$

$$x = 30^\circ$$

$$2x = 30^\circ \times 2 = 60^\circ$$

$$3x = 30^\circ \times 3 = 90^\circ$$

Therefore the first angle is 30° , second angle is 60° and third angle is 90° .

5. The angles of a triangle are $(x - 40)^\circ$, $(x - 20)^\circ$ and $(1/2 - 10)^\circ$. Find the value of x .

Solution:

Given the angles of a triangle are $(x - 40)^\circ$, $(x - 20)^\circ$ and $(1/2 - 10)^\circ$.

We know that sum of all the angles of a triangle = 180°

$$(x - 40)^\circ + (x - 20)^\circ + (1/2 - 10)^\circ = 180^\circ$$

$$x + x + (1/2) - 40^\circ - 20^\circ - 10^\circ = 180^\circ$$

$$x + x + (1/2) - 70^\circ = 180^\circ$$

$$(5x/2) = 180^\circ + 70^\circ$$

$$(5x/2) = 250^\circ$$

$$x = (2/5) \times 250^\circ$$

$$x = 100^\circ$$

Hence the value of x is 100°

6. The angles of a triangle are arranged in ascending order of magnitude. If the

difference between two consecutive angles is 10° . Find the three angles.

Solution:

Given that angles of a triangle are arranged in ascending order of magnitude

Also given that difference between two consecutive angles is 10°

Let the first angle be x

Second angle be $x + 10^\circ$

Third angle be $x + 10^\circ + 10^\circ$

We know that sum of all the angles of a triangle = 180°

$$x + x + 10^\circ + x + 10^\circ + 10^\circ = 180^\circ$$

$$3x + 30 = 180$$

$$3x = 180 - 30$$

$$3x = 150$$

$$x = 150/3$$

$$x = 50^\circ$$

First angle is 50°

Second angle $x + 10^\circ = 50 + 10 = 60^\circ$

Third angle $x + 10^\circ + 10^\circ = 50 + 10 + 10 = 70^\circ$

7. Two angles of a triangle are equal and the third angle is greater than each of those angles by 30° . Determine all the angles of the triangle

Solution:

Given that two angles of a triangle are equal

Let the first and second angle be x

Also given that third angle is greater than each of those angles by 30°

Therefore the third angle is greater than the first and second by $30^\circ = x + 30^\circ$

The first and the second angles are equal

We know that sum of all the angles of a triangle = 180°

$$x + x + x + 30^\circ = 180^\circ$$

$$3x + 30 = 180$$

$$3x = 180 - 30$$

$$3x = 150$$

$$x = 150/3$$

$$x = 50^\circ$$

Third angle = $x + 30^\circ = 50^\circ + 30^\circ = 80^\circ$

The first and the second angle is 50° and the third angle is 80° .

8. If one angle of a triangle is equal to the sum of the other two, show that the triangle is a right triangle.

Solution:

Given that one angle of a triangle is equal to the sum of the other two

Let the measure of angles be x, y, z

Therefore we can write above statement as $x = y + z$

$$x + y + z = 180^\circ$$

Substituting the above value we get

$$x + x = 180^\circ$$

$$2x = 180^\circ$$

$$x = 180/2$$

$$x = 90^\circ$$

If one angle is 90° then the given triangle is a right angled triangle

9. If each angle of a triangle is less than the sum of the other two, show that the triangle is acute angled.

Solution:

Given that each angle of a triangle is less than the sum of the other two

Let the measure of angles be x, y and z

From the above statement we can write as

$$x > y + z$$

$$y < x + z$$

$$z < x + y$$

Therefore triangle is an acute triangle

10. In each of the following, the measures of three angles are given. State in which cases the angles can possibly be those of a triangle:

(i) $63^\circ, 37^\circ, 80^\circ$

(ii) $45^\circ, 61^\circ, 73^\circ$

(iii) $59^\circ, 72^\circ, 61^\circ$

(iv) $45^\circ, 45^\circ, 90^\circ$

(v) $30^\circ, 20^\circ, 125^\circ$

Solution:

(i) $63^\circ + 37^\circ + 80^\circ = 180^\circ$

Angles form a triangle

(ii) $45^\circ, 61^\circ, 73^\circ$ is not equal to 180°

Therefore not a triangle

(iii) $59^\circ, 72^\circ, 61^\circ$ is not equal to 180°

Therefore not a triangle

(iv) $45^\circ + 45^\circ + 90^\circ = 180^\circ$

Angles form a triangle

(v) $30^\circ, 20^\circ, 125^\circ$ is not equal to 180°

Therefore not a triangle

11. The angles of a triangle are in the ratio 3: 4: 5. Find the smallest angle

Solution:

Given that angles of a triangle are in the ratio: 3: 4: 5

Therefore let the measure of the angles be $3x, 4x, 5x$

We know that sum of the angles of a triangle = 180°

$$3x + 4x + 5x = 180^\circ$$

$$12x = 180^\circ$$

$$x = 180/12$$

$$x = 15^\circ$$

$$\text{Smallest angle} = 3x$$

$$= 3 \times 15^\circ$$

$$= 45^\circ$$

Therefore smallest angle = 45°

12. Two acute angles of a right triangle are equal. Find the two angles.

Solution:

Given that acute angles of a right angled triangle are equal

We know that Right triangle: whose one of the angle is a right angle

Let the measure of angle be $x, x, 90^\circ$

$$x + x + 90^\circ = 180^\circ$$

$$2x = 90^\circ$$

$$x = 90/2$$

$$x = 45^\circ$$

The two angles are 45° and 45°

13. One angle of a triangle is greater than the sum of the other two. What can you say about the measure of this angle? What type of a triangle is this?

Solution:

Given one angle of a triangle is greater than the sum of the other two

Let the measure of the angles be x, y, z

From the question we can write as

$$x > y + z \text{ or}$$

$$y > x + z \text{ or}$$

$$z > x + y$$

x or y or $z > 90^\circ$ which is obtuse

Therefore triangle is an obtuse angle

14. In the six cornered figure, (fig. 20), AC, AD and AE are joined. Find $\angle FAB + \angle ABC + \angle BCD + \angle CDE + \angle DEF + \angle EFA$.

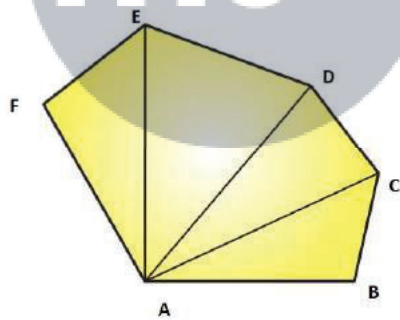


Fig. 20

Solution:

We know that sum of the angles of a triangle is 180°

Therefore in $\triangle ABC$, we have

$$\angle CAB + \angle ABC + \angle BCA = 180^\circ \dots\dots (i)$$

In $\triangle ACD$, we have

$$\angle DAC + \angle ACD + \angle CDA = 180^\circ \dots\dots (ii)$$

In $\triangle ADE$, we have

$$\angle EAD + \angle ADE + \angle DEA = 180^\circ \dots\dots (iii)$$

In $\triangle AEF$, we have

$$\angle FAE + \angle AEF + \angle EFA = 180^\circ \dots\dots\dots (iv)$$

Adding (i), (ii), (iii), (iv) we get

$$\angle CAB + \angle ABC + \angle BCA + \angle DAC + \angle ACD + \angle CDA + \angle EAD + \angle ADE + \angle DEA + \angle FAE + \angle AEF + \angle EFA = 720^\circ$$

$$\text{Therefore } \angle FAB + \angle ABC + \angle BCD + \angle CDE + \angle DEF + \angle EFA = 720^\circ$$

15. Find x, y, z (whichever is required) from the figures (Fig. 21) given below:

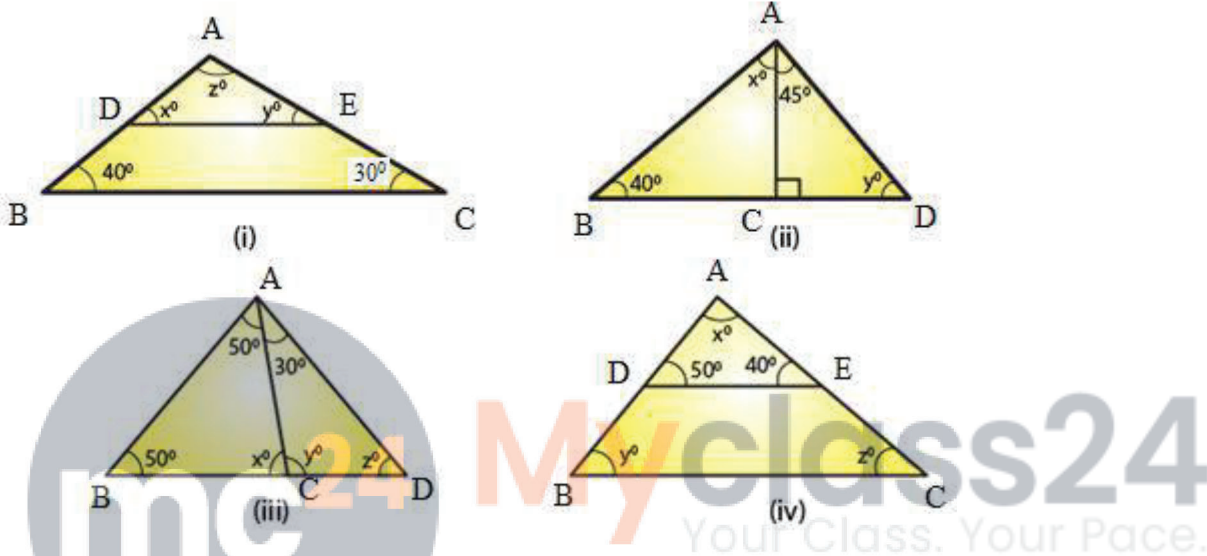


Fig.21

Solution:

(i) In $\triangle ABC$ and $\triangle ADE$ we have,
 $\angle ADE = \angle ABC$ [corresponding angles]

$$x = 40^\circ$$

$\angle AED = \angle ACB$ (corresponding angles)

$$y = 30^\circ$$

We know that the sum of all the three angles of a triangle is equal to 180°

$$x + y + z = 180^\circ \text{ (Angles of } \triangle ADE)$$

$$\text{Which means: } 40^\circ + 30^\circ + z = 180^\circ$$

$$z = 180^\circ - 70^\circ$$

$$z = 110^\circ$$

Therefore, we can conclude that the three angles of the given triangle are $40^\circ, 30^\circ$ and 110°

(ii) We can see that in $\triangle ADC$, $\angle ADC$ is equal to 90° .

($\triangle ADC$ is a right triangle)

We also know that the sum of all the angles of a triangle is equal to 180° .

Which means: $45^\circ + 90^\circ + y = 180^\circ$ (Sum of the angles of $\triangle ADC$)

$$135^\circ + y = 180^\circ$$

$$y = 180^\circ - 135^\circ.$$

$$y = 45^\circ.$$

We can also say that in $\triangle ABC$, $\angle ABC + \angle ACB + \angle BAC$ is equal to 180° .

(Sum of the angles of $\triangle ABC$)

$$40^\circ + y + (x + 45^\circ) = 180^\circ$$

$$40^\circ + 45^\circ + x + 45^\circ = 180^\circ \quad (y = 45^\circ)$$

$$x = 180^\circ - 130^\circ$$

$$x = 50^\circ$$

Therefore, we can say that the required angles are 45° and 50° .

(iii) We know that the sum of all the angles of a triangle is equal to 180° .

Therefore, for $\triangle ABD$:

$\angle ABD + \angle ADB + \angle BAD = 180^\circ$ (Sum of the angles of $\triangle ABD$)

$$50^\circ + x + 50^\circ = 180^\circ$$

$$100^\circ + x = 180^\circ$$

$$x = 180^\circ - 100^\circ$$

$$x = 80^\circ$$

For $\triangle ABC$:

$\angle ABC + \angle ACB + \angle BAC = 180^\circ$ (Sum of the angles of $\triangle ABC$)

$$50^\circ + z + (50^\circ + 30^\circ) = 180^\circ$$

$$50^\circ + z + 50^\circ + 30^\circ = 180^\circ$$

$$z = 180^\circ - 130^\circ$$

$$z = 50^\circ$$

Using the same argument for $\triangle ADC$:

$\angle ADC + \angle ACD + \angle DAC = 180^\circ$ (Sum of the angles of $\triangle ADC$)

$$y + z + 30^\circ = 180^\circ$$

$$y + 50^\circ + 30^\circ = 180^\circ \quad (z = 50^\circ)$$

$$y = 180^\circ - 80^\circ$$

$$y = 100^\circ$$

Therefore, we can conclude that the required angles are 80° , 50° and 100° .

(iv) In $\triangle ABC$ and $\triangle ADE$ we have:

$\angle ADE = \angle ABC$ (Corresponding angles)

$$y = 50^\circ$$

Also, $\angle AED = \angle ACB$ (Corresponding angles)

$$z = 40^\circ$$

We know that the sum of all the three angles of a triangle is equal to 180° .

We can write as $x + 50^\circ + 40^\circ = 180^\circ$ (Angles of $\triangle ADE$)

$$x = 180^\circ - 90^\circ$$

$$x = 90^\circ$$

Therefore, we can conclude that the required angles are 50° , 40° and 90° .

16. If one angle of a triangle is 60° and the other two angles are in the ratio 1: 2, find the angles.

Solution:

Given that one of the angles of the given triangle is 60° .

Also given that the other two angles of the triangle are in the ratio 1: 2.

Let one of the other two angles be x .

Therefore, the second one will be $2x$.

We know that the sum of all the three angles of a triangle is equal to 180° .

$$60^\circ + x + 2x = 180^\circ$$

$$3x = 180^\circ - 60^\circ$$

$$3x = 120^\circ$$

$$x = 120^\circ/3$$

$$x = 40^\circ$$

$$2x = 2 \times 40^\circ$$

$$2x = 80^\circ$$

Hence, we can conclude that the required angles are 40° and 80° .

17. If one angle of a triangle is 100° and the other two angles are in the ratio 2: 3. Find the angles.

Solution:

Given that one of the angles of the given triangle is 100° .

Also given that the other two angles are in the ratio 2: 3.

Let one of the other two angle be $2x$.

Therefore, the second angle will be $3x$.

We know that the sum of all three angles of a triangle is 180° .

$$100^\circ + 2x + 3x = 180^\circ$$

$$5x = 180^\circ - 100^\circ$$

$$5x = 80^\circ$$

$$x = 80/5$$

$$x = 16$$

$$2x = 2 \times 16$$

$$2x = 32^\circ$$

$$3x = 3 \times 16$$

$$3x = 48^\circ$$

Thus, the required angles are 32° and 48° .

18. In $\triangle ABC$, if $3\angle A = 4\angle B = 6\angle C$, calculate the angles.

Solution:

We know that for the given triangle, $3\angle A = 6\angle C$

$$\angle A = 2\angle C \dots\dots (i)$$

We also know that for the same triangle, $4\angle B = 6\angle C$

$$\angle B = (6/4)\angle C \dots\dots (ii)$$

We know that the sum of all three angles of a triangle is 180° .

Therefore, we can say that:

$$\angle A + \angle B + \angle C = 180^\circ \text{ (Angles of } \triangle ABC)\dots\dots (iii)$$

On putting the values of $\angle A$ and $\angle B$ in equation (iii), we get:

$$2\angle C + (6/4)\angle C + \angle C = 180^\circ$$

$$(18/4)\angle C = 180^\circ$$

$$\angle C = 40^\circ$$

From equation (i), we have:

$$\angle A = 2\angle C = 2 \times 40$$

$$\angle A = 80^\circ$$

From equation (ii), we have:

$$\angle B = (6/4)\angle C = (6/4) \times 40^\circ$$

$$\angle B = 60^\circ$$

$$\angle A = 80^\circ, \angle B = 60^\circ, \angle C = 40^\circ$$

Therefore, the three angles of the given triangle are 80° , 60° , and 40° .

19. Is it possible to have a triangle, in which

(i) Two of the angles are right?

(ii) Two of the angles are obtuse?

(iii) Two of the angles are acute?

- (iv) Each angle is less than 60° ?
- (v) Each angle is greater than 60° ?
- (vi) Each angle is equal to 60° ?

Solution:

(i) No, because if there are two right angles in a triangle, then the third angle of the triangle must be zero, which is not possible.

(ii) No, because as we know that the sum of all three angles of a triangle is always 180° . If there are two obtuse angles, then their sum will be more than 180° , which is not possible in case of a triangle.

(iii) Yes, in right triangles and acute triangles, it is possible to have two acute angles.

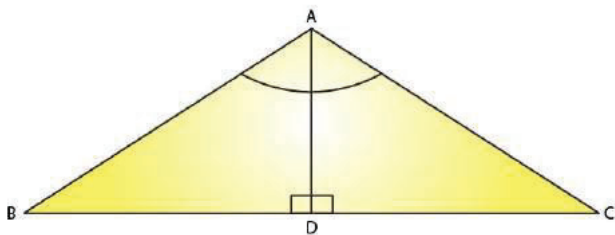
(iv) No, because if each angle is less than 60° , then the sum of all three angles will be less than 180° , which is not possible in case of a triangle.

(v) No, because if each angle is greater than 60° , then the sum of all three angles will be greater than 180° , which is not possible.

(vi) Yes, if each angle of the triangle is equal to 60° , then the sum of all three angles will be 180° , which is possible in case of a triangle.

20. In $\triangle ABC$, $\angle A = 100^\circ$, AD bisects $\angle A$ and $AD \perp BC$. Find $\angle B$

Solution:



Given that in $\triangle ABC$, $\angle A = 100^\circ$

Also given that $AD \perp BC$

Consider $\triangle ABD$

$\angle BAD = 100/2$ (AD bisects $\angle A$)

$\angle BAD = 50^\circ$

$\angle ADB = 90^\circ$ (AD perpendicular to BC)

We know that the sum of all three angles of a triangle is 180° .

Thus,

$$\angle ABD + \angle BAD + \angle ADB = 180^\circ \text{ (Sum of angles of } \triangle ABD)$$

Or,

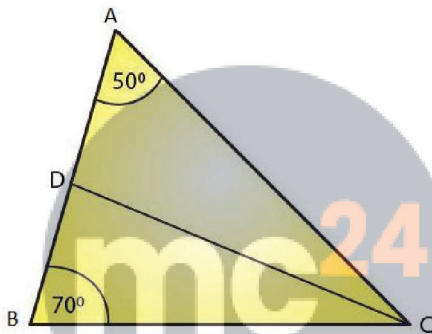
$$\angle ABD + 50^\circ + 90^\circ = 180^\circ$$

$$\angle ABD = 180^\circ - 140^\circ$$

$$\angle ABD = 40^\circ$$

21. In $\triangle ABC$, $\angle A = 50^\circ$, $\angle B = 70^\circ$ and bisector of $\angle C$ meets AB in D. Find the angles of the triangles ADC and BDC

Solution:



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We know that the sum of all three angles of a triangle is equal to 180° .

Therefore, for the given $\triangle ABC$, we can say that:

$$\angle A + \angle B + \angle C = 180^\circ \text{ (Sum of angles of } \triangle ABC)$$

$$50^\circ + 70^\circ + \angle C = 180^\circ$$

$$\angle C = 180^\circ - 120^\circ$$

$$\angle C = 60^\circ$$

$\angle ACD = \angle BCD = \frac{1}{2}\angle C$ (CD bisects $\angle C$ and meets AB in D.)

$$\angle ACD = \angle BCD = \frac{60^\circ}{2} = 30^\circ$$

Using the same logic for the given $\triangle ACD$, we can say that:

$$\angle DAC + \angle ACD + \angle ADC = 180^\circ$$

$$50^\circ + 30^\circ + \angle ADC = 180^\circ$$

$$\angle ADC = 180^\circ - 80^\circ$$

$$\angle ADC = 100^\circ$$

If we use the same logic for the given $\triangle BCD$, we can say that

$$\angle DBC + \angle BCD + \angle BDC = 180^\circ$$

$$70^\circ + 30^\circ + \angle BDC = 180^\circ$$

$$\angle BDC = 180^\circ - 100^\circ$$

$$\angle BDC = 80^\circ$$

Thus,

$$\text{For } \triangle ADC: \angle A = 50^\circ, \angle D = 100^\circ \angle C = 30^\circ$$

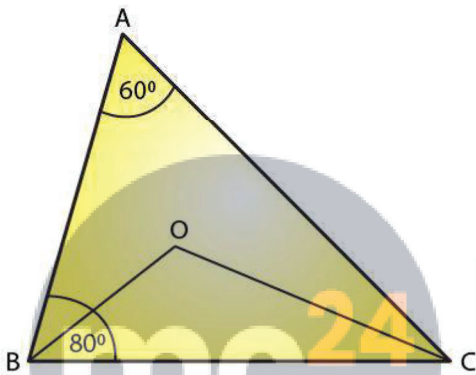
$$\triangle BDC: \angle B = 70^\circ, \angle D = 80^\circ \angle C = 30^\circ$$

22. In $\triangle ABC$, $\angle A = 60^\circ$, $\angle B = 80^\circ$, and the bisectors of $\angle B$ and $\angle C$, meet at O. Find

(i) $\angle C$

(ii) $\angle BOC$

Solution:



(i) We know that the sum of all three angles of a triangle is 180° .

Hence, for $\triangle ABC$, we can say that:

$$\angle A + \angle B + \angle C = 180^\circ \text{ (Sum of angles of } \triangle ABC)$$

$$60^\circ + 80^\circ + \angle C = 180^\circ.$$

$$\angle C = 180^\circ - 140^\circ$$

$$\angle C = 40^\circ.$$

(ii) For $\triangle OBC$,

$$\angle OBC = \angle B/2 = 80/2 \text{ (OB bisects } \angle B)$$

$$\angle OBC = 40^\circ$$

$$\angle OCB = \angle C/2 = 40/2 \text{ (OC bisects } \angle C)$$

$$\angle OCB = 20^\circ$$

If we apply the above logic to this triangle, we can say that:

$$\angle OCB + \angle OBC + \angle BOC = 180^\circ \text{ (Sum of angles of } \triangle OBC)$$

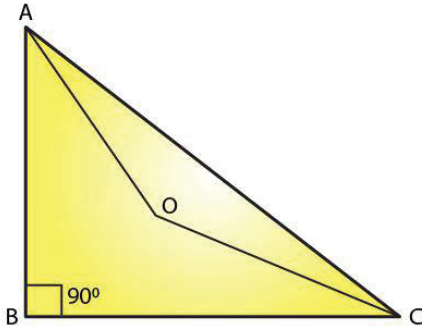
$$20^\circ + 40^\circ + \angle BOC = 180^\circ$$

$$\angle BOC = 180^\circ - 60^\circ$$

$$\angle BOC = 120^\circ$$

23. The bisectors of the acute angles of a right triangle meet at O. Find the angle at O between the two bisectors.

Solution:



Given bisectors of the acute angles of a right triangle meet at O

We know that the sum of all three angles of a triangle is 180° .

Hence, for $\triangle ABC$, we can say that:

$$\angle A + \angle B + \angle C = 180^\circ$$

$$\angle A + 90^\circ + \angle C = 180^\circ$$

$$\angle A + \angle C = 180^\circ - 90^\circ$$

$$\angle A + \angle C = 90^\circ$$

For $\triangle OAC$:

$$\angle OAC = \angle A/2 \text{ (OA bisects } \angle A)$$

$$\angle OCA = \angle C/2 \text{ (OC bisects } \angle C)$$

On applying the above logic to $\triangle OAC$, we get

$$\angle AOC + \angle OAC + \angle OCA = 180^\circ \text{ (Sum of angles of } \triangle AOC)$$

$$\angle AOC + \angle A/2 + \angle C/2 = 180^\circ$$

$$\angle AOC + (\angle A + \angle C)/2 = 180^\circ$$

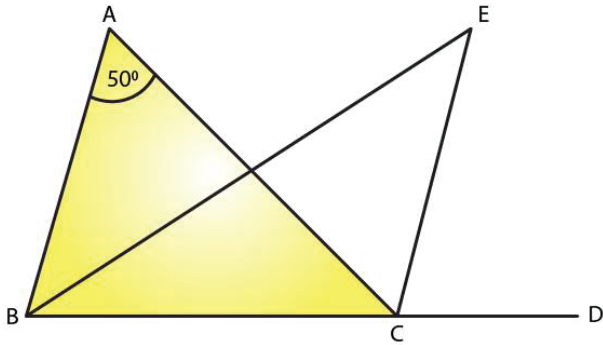
$$\angle AOC + 90/2 = 180^\circ$$

$$\angle AOC = 180^\circ - 45^\circ$$

$$\angle AOC = 135^\circ$$

24. In $\triangle ABC$, $\angle A = 50^\circ$ and BC is produced to a point D. The bisectors of $\angle ABC$ and $\angle ACD$ meet at E. Find $\angle E$.

Solution:



In the given triangle,

$\angle ACD = \angle A + \angle B$. (Exterior angle is equal to the sum of two opposite interior angles.)

We know that the sum of all three angles of a triangle is 180° .

Therefore, for the given triangle, we know that the sum of the angles = 180°

$$\angle ABC + \angle BCA + \angle CAB = 180^\circ$$

$$\angle A + \angle B + \angle BCA = 180^\circ$$

$$\angle BCA = 180^\circ - (\angle A + \angle B)$$

But we know that EC bisects $\angle ACD$

Therefore $\angle ECA = \angle ACD/2$

$$\angle ECA = (\angle A + \angle B)/2 \quad [\angle ACD = (\angle A + \angle B)]$$

But EB bisects $\angle ABC$

$$\angle EBC = \angle ABC/2 = \angle B/2$$

$$\angle EBC = \angle ECA + \angle BCA$$

$$\angle EBC = (\angle A + \angle B)/2 + 180^\circ - (\angle A + \angle B)$$

If we use same steps for $\triangle EBC$, then we get,

$$\angle B/2 + (\angle A + \angle B)/2 + 180^\circ - (\angle A + \angle B) + \angle BEC = 180^\circ$$

$$\angle BEC = \angle A + \angle B - (\angle A + \angle B)/2 - \angle B/2$$

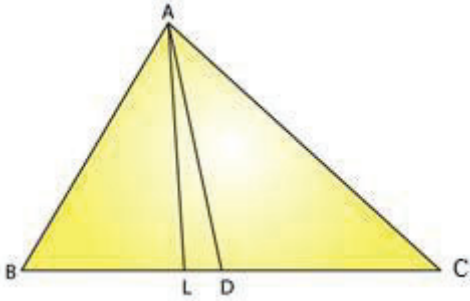
$$\angle BEC = \angle A/2$$

$$\angle BEC = 50^\circ/2$$

$$= 25^\circ$$

25. In $\triangle ABC$, $\angle B = 60^\circ$, $\angle C = 40^\circ$, $AL \perp BC$ and AD bisects $\angle A$ such that L and D lie on side BC . Find $\angle LAD$

Solution:



We know that the sum of all angles of a triangle is 180°

Consider $\triangle ABC$, we can write as

$$\angle A + \angle B + \angle C = 180^\circ$$

$$\angle A + 60^\circ + 40^\circ = 180^\circ$$

$$\angle A = 80^\circ$$

But we know that $\angle DAC$ bisects $\angle A$

$$\angle DAC = \angle A/2$$

$$\angle DAC = 80^\circ/2$$

If we apply same steps for the $\triangle ADC$, we get

We know that the sum of all angles of a triangle is 180°

$$\angle ADC + \angle DCA + \angle DAC = 180^\circ$$

$$\angle ADC + 40^\circ + 40^\circ = 180^\circ$$

$$\angle ADC = 180^\circ - 80^\circ = 100^\circ$$

We know that exterior angle is equal to the sum of two interior opposite angles

Therefore we have

$$\angle ADC = \angle ALD + \angle LAD$$

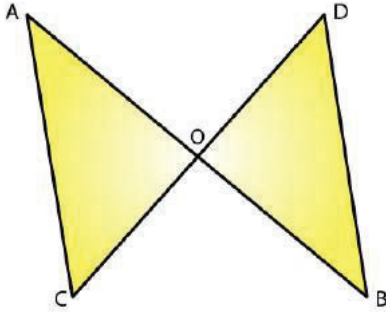
But here AL perpendicular to BC

$$100^\circ = 90^\circ + \angle LAD$$

$$\angle LAD = 10^\circ$$

26. Line segments AB and CD intersect at O such that $AC \parallel DB$. If $\angle CAB = 35^\circ$ and $\angle CDB = 55^\circ$. Find $\angle BOD$.

Solution:



We know that AC parallel to BD and AB cuts AC and BD at A and B, respectively.

$\angle CAB = \angle DBA$ (Alternate interior angles)

$$\angle DBA = 35^\circ$$

We also know that the sum of all three angles of a triangle is 180° .

Hence, for $\triangle OBD$, we can say that:

$$\angle DBO + \angle ODB + \angle BOD = 180^\circ$$

$$35^\circ + 55^\circ + \angle BOD = 180^\circ \quad (\angle DBO = \angle DBA \text{ and } \angle ODB = \angle CDB)$$

$$\angle BOD = 180^\circ - 90^\circ$$

$$\angle BOD = 90^\circ$$

27. In Fig. 22, $\triangle ABC$ is right angled at A, Q and R are points on line BC and P is a point such that $QP \parallel AC$ and $RP \parallel AB$. Find $\angle P$

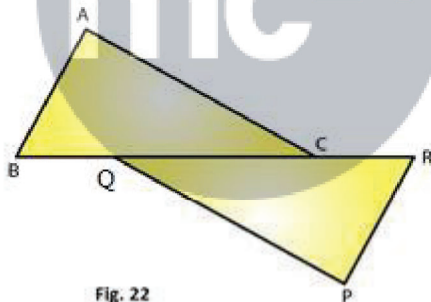


Fig. 22

Solution:

In the given triangle, AC parallel to QP and BR cuts AC and QP at C and Q, respectively.

$\angle QCA = \angle CQP$ (Alternate interior angles)

Because RP parallel to AB and BR cuts AB and RP at B and R, respectively,

$\angle ABC = \angle PRQ$ (alternate interior angles).

We know that the sum of all three angles of a triangle is 180° .

Hence, for $\triangle ABC$, we can say that:

$$\angle ABC + \angle ACB + \angle BAC = 180^\circ$$

$$\angle ABC + \angle ACB + 90^\circ = 180^\circ \quad (\text{Right angled at A})$$

$$\angle ABC + \angle ACB = 90^\circ$$

Using the same logic for $\triangle PQR$, we can say that:

$$\angle PQR + \angle PRQ + \angle QPR = 180^\circ$$

$$\angle ABC + \angle ACB + \angle QPR = 180^\circ \quad (\angle ACB = \angle PQR \text{ and } \angle ABC = \angle PRQ)$$

Or,

$$90^\circ + \angle QPR = 180^\circ \quad (\angle ABC + \angle ACB = 90^\circ)$$

$$\angle QPR = 90^\circ$$



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