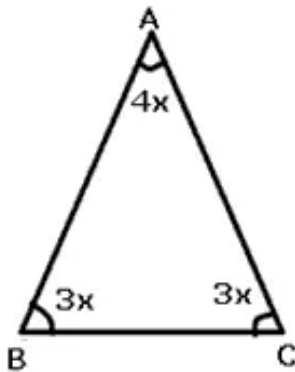


Chapter 12. Isosceles Triangle

Ex 12.1

Answer 1.



The equal angles and the non-equal angle are in the ratio 3:4.

Let equal angles be $3x$ each, therefore non-equal angle is $4x$.

Angles of a triangle $= 180^\circ$

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

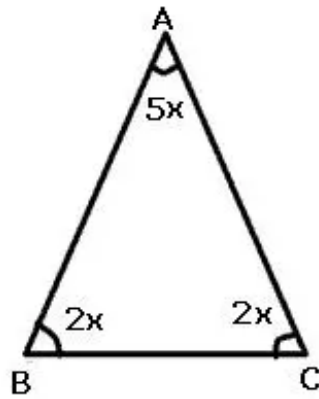
$$\Rightarrow 10x = 180^\circ$$

$$\Rightarrow x = 18^\circ$$

Therefore, $3x = 54^\circ$ and $4x = 72^\circ$

Angles $= 54^\circ, 54^\circ$ and 72°

Answer 2.



The equal angles and the non-equal angle are in the ratio 2:2:5.

Let equal angles be $2x$ each, therefore non-equal angle is $5x$.

Angles of a triangle $= 180^\circ$

$$\Rightarrow 2x + 2x + 5x = 180^\circ$$

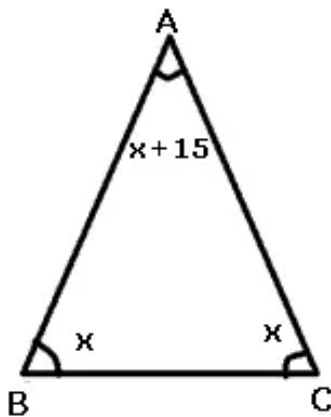
$$\Rightarrow 9x = 180^\circ$$

$$\Rightarrow x = 20^\circ$$

Therefore, $2x = 40^\circ$ and $5x = 100^\circ$

Angles $= 40^\circ, 40^\circ$ and 100°

Answer 3.



Let equal angles of the isosceles triangle be x each. Therefore, non-equal angle $= x+15^\circ$

Angles of a triangle $= 180^\circ$

$$x + x + (x+15^\circ) = 180^\circ$$

$$3x + 15^\circ = 180^\circ$$

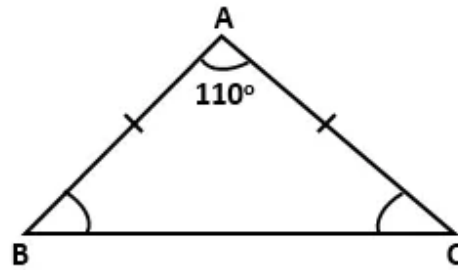
$$3x = 165^\circ$$

$$x = 55^\circ$$

$$x+15 = 70^\circ$$

Angles are $55^\circ, 55^\circ$ and 70°

Answer 4A.



In ABC,

$$\angle A = 110^\circ$$

$$AB = AC$$

$$\Rightarrow \angle C = \angle B \quad \dots(\text{angles opposite to two equal sides are equal})$$

Now, by angle sum property,

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

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

$$\Rightarrow 110^\circ + 2\angle B = 180^\circ$$

$$\Rightarrow 2\angle B = 180^\circ - 110^\circ$$

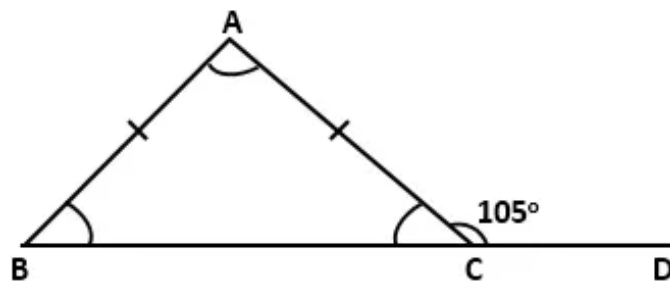
$$\Rightarrow 2\angle B = 70^\circ$$

$$\Rightarrow \angle B = 35^\circ$$

$$\Rightarrow \angle C = 35^\circ$$

Hence, $\angle B = 35^\circ$ and $\angle C = 35^\circ$

Answer 4B.



In ABC,

$$AB = AC$$

$$\Rightarrow \angle ACB = \angle ABC \quad \dots(1)(\text{angles opposite to two equal sides are equal})$$

Now, $\angle ACB + \angle ACD = 180^\circ \quad \dots(\text{linear pair})$

$$\Rightarrow \angle ACB = 180^\circ - \angle ACD$$

$$\Rightarrow \angle ACB = 180^\circ - 105^\circ$$

$$\Rightarrow \angle ACB = 75^\circ$$

$$\Rightarrow \angle ABC = 75^\circ \quad \dots[\text{From (1)}]$$

By angle sum property, in $\triangle ABC$

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

$$\Rightarrow 75^\circ + 75^\circ + \angle BAC = 180^\circ$$

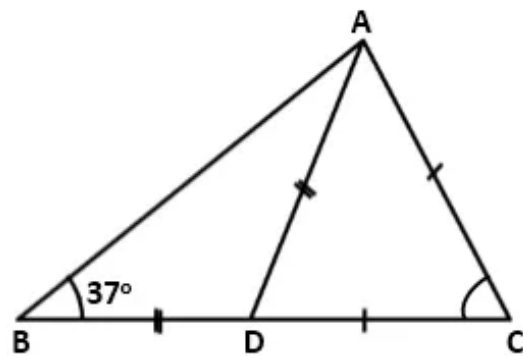
$$\Rightarrow 150^\circ + \angle BAC = 180^\circ$$

$$\Rightarrow \angle BAC = 180^\circ - 150^\circ$$

$$\Rightarrow \angle BAC = 30^\circ$$

Hence, in $\triangle ABC$, $\angle A = 30^\circ$, $\angle B = 75^\circ$ and $\angle C = 75^\circ$

Answer 4C.



In $\triangle ABD$,

$$AD = BD \quad \dots(\text{given})$$

$$\Rightarrow \angle ABD = \angle BAD \quad \dots(\text{angles opposite to two equal sides are equal})$$

$$\text{Now, } \angle ABD = 37^\circ \quad \dots(\text{given})$$

$$\Rightarrow \angle BAD = 37^\circ$$

By exterior angle property,

$$\angle ADC = \angle ABD + \angle BAD$$

$$\Rightarrow \angle ADC = 37^\circ + 37^\circ = 74^\circ$$

In $\triangle ADC$,

$$AC = DC \quad \dots(\text{given})$$

$$\Rightarrow \angle ADC = \angle DAC \quad \dots(\text{angles opposite to two equal sides are equal})$$

$$\Rightarrow \angle DAC = 74^\circ$$

$$\text{Now, } \angle BAC = \angle BAD + \angle DAC$$

$$\Rightarrow \angle BAC = 37^\circ + 74^\circ = 111^\circ$$

In $\triangle ABC$,

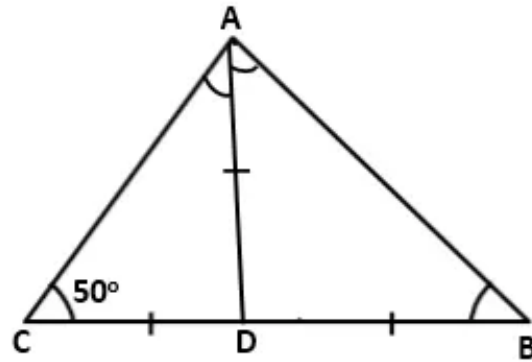
$$\angle BAC + \angle ABC + \angle ACB = 180^\circ$$

$$\Rightarrow 111^\circ + 37^\circ + \angle ACB = 180^\circ$$

$$\Rightarrow \angle ACB = 180^\circ - 111^\circ - 37^\circ = 32^\circ$$

Hence, the interior angles of $\triangle ABC$ are 37° , 111° and 32° .

Answer 4D.



In $\triangle ACD$,

$AD = CD$ (given)

$\Rightarrow \angle ACD = \angle CAD$ (angles opposite to two equal sides are equal)

Now, $\angle ACD = 50^\circ$ (given)

$\Rightarrow \angle CAD = 50^\circ$

By exterior angle property,

$$\angle ADB = \angle ACD + \angle CAD = 50^\circ + 50^\circ = 100^\circ$$

In $\triangle ADB$,

$AD = BD$ (given)

$\Rightarrow \angle DBA = \angle DAB$ (angles opposite to two equal sides are equal)

Also, $\angle ADB + \angle DBA + \angle DAB = 180^\circ$

$$\Rightarrow 100^\circ + 2\angle DBA = 180^\circ$$

$$\Rightarrow 2\angle DBA = 80^\circ$$

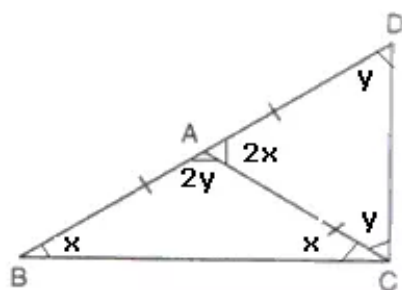
$$\Rightarrow \angle DBA = 40^\circ$$

$$\Rightarrow \angle DAB = 40^\circ$$

$$\angle BAC = \angle DAB + \angle CAD = 40^\circ + 50^\circ = 90^\circ$$

Hence, the interior angles of $\triangle ABC$ are $50^\circ, 90^\circ$ and 40° .

Answer 5.



Let $\angle ABC = x$, therefore $\angle BCA = x$ since $AB = AC$

In $\triangle ABC$,

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

$$\text{But } \angle BAC + \angle DAC = 180^\circ \dots\dots(ii)$$

From (i) and (ii)

$$\angle ABC + \angle BCA + \angle BAC = \angle BAC + \angle DAC$$

$$\angle DAC = \angle ABC + \angle BCA = x + x = 2x$$

Let $\angle ADC = y$, therefore $\angle DCA = y$ since $AD = AC$

In $\triangle ADC$,

$$\angle ADC + \angle DCA + \angle DAC = 180^\circ \dots\dots(iii)$$

$$\text{But } \angle BAC + \angle DAC = 180^\circ \dots\dots(iv)$$

From (iii) and (iv)

$$\angle ADC + \angle DCA + \angle DAC = \angle BAC + \angle DAC$$

$$\angle BAC = \angle ADC + \angle DCA = y + y = 2y$$

Substituting the value of $\angle BAC$ and $\angle DCA$ in (ii)

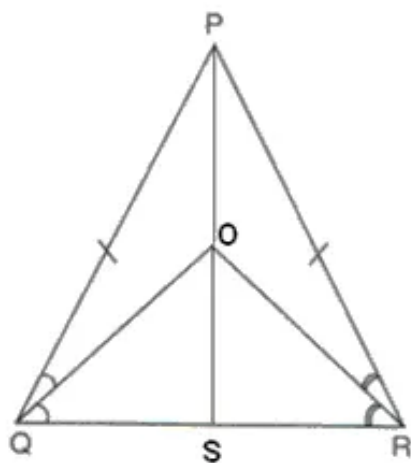
$$2x + 2y = 180^\circ$$

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

$$\Rightarrow \angle BCA + \angle DCA = 90^\circ$$

$$\Rightarrow \angle BCD \text{ is a right angle.}$$

Answer 6.



Join PO and produce to meet QR in S.

In $\triangle PQS$ and $\triangle PRS$

$PS = PS$ (common)

$PQ = PR$ (given)

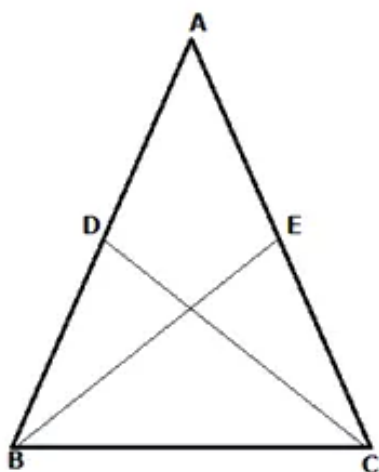
$\angle Q = \angle R$

$\therefore \triangle PQS \cong \triangle PRS$

$\therefore \angle QPS = \angle RPS$

Hence, PO bisects $\angle P$.

Answer 7.



Let ABC be an isosceles triangle with $AB = AC$.

Let D and E be the mid points of AB and AC.

Join BE and CD.

Then BE and CD are the medians of this isosceles triangle.

In $\triangle ABE$ and $\triangle ACD$

$$AB=AC \quad (\text{given})$$

$$AD=AE \quad (\text{D and E are mid points of AB and AC})$$

$$\angle A = \angle A \quad (\text{common angle})$$

Therefore, $\triangle ABE \cong \triangle ACD$ (SAS criteria)

$$\text{Hence, } BE = CD$$

Answer 8.

In $\triangle QDP$,

$$DP = DQ$$

$$\therefore \angle Q = \angle P$$

$$\angle QDR = \angle Q + \angle P$$

$$2\angle QDC = \angle Q + \angle P \quad (\text{DC bisects angle QDR})$$

$$2\angle QDC = \angle Q + \angle Q = 2\angle Q$$

$$\angle QDC = \angle Q$$

But these are alternate angles.

$$\therefore DC \parallel PQ$$

Answer 9.

In $\triangle PQS$,

$$PQ = PS$$

$$\therefore \angle PQS = \angle PSQ$$

$$\angle P + \angle PQS + \angle PSQ = 180^\circ$$

$$50^\circ + 2\angle PQS = 180^\circ$$

$$2\angle PQS = 130^\circ$$

$$\angle PQS = 65^\circ = \angle PSQ \dots\dots(i)$$

In $\triangle SRQ$,

$$SR = RQ$$

$$\therefore \angle RQS = \angle RSQ$$

$$\angle R + \angle RQS + \angle RSQ = 180^\circ$$

$$110^\circ + 2\angle RQS = 180^\circ$$

$$2\angle RQS = 70^\circ$$

$$\angle RQS = 35^\circ = \angle RSQ \dots\dots(ii)$$

Adding (i) and (ii)

$$\angle PSQ + \angle RSQ = 65^\circ + 35^\circ$$

$$\angle PSR = 100^\circ$$

Answer 10.

In $\triangle BDC$,

$$\angle BDC = 70^\circ$$

$$BD = BC$$

Therefore, $\angle BDC = \angle BCD$

$$\Rightarrow \angle BCD = 70^\circ$$

$$\text{Now } \angle BCD + \angle BDC + \angle DBC = 180^\circ$$

$$70^\circ + 70^\circ + \angle DBC = 180^\circ$$

$$\angle DBC = 40^\circ$$

$$\angle DBC = \angle ABC \text{ (BC is the angle bisector)}$$

$$\Rightarrow \angle ABC = 40^\circ$$

In $\triangle ABC$,

$$\text{Since } AB = AC, \angle ABC = \angle ACB \Rightarrow \angle ACB = 40^\circ$$

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

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

$$\angle BAC = 100^\circ$$

$$\text{Hence, } \angle BAC = 100^\circ \text{ and } \angle DBC = 40^\circ$$

Answer 11.

(i) In $\triangle PQR$,

$$PQ = PR \quad (\text{given})$$

$$\therefore \angle R = \angle Q \dots\dots\dots(i)$$

Now in $\triangle QNT$ and $\triangle RMT$

$$\angle QNT = \angle RMT \quad (90^\circ)$$

$$\angle Q = \angle R \quad (\text{from (i)})$$

$$QT = TR \quad (\text{given})$$

$$\therefore \triangle QNT \cong \triangle RMT \quad (\text{AAS criteria})$$

$$\therefore TN = TM$$

(ii) Since, $\triangle QNT \cong \triangle RMT$

$$NQ = MR \dots\dots\dots(ii)$$

$$\text{But } PQ = PR \dots\dots\dots(iii) \quad (\text{given})$$

Subtracting (ii) from (iii)

$$PQ - NQ = PR - MR$$

$$\Rightarrow PN = PM$$

(iii) In $\triangle PNT$ and $\triangle PMT$

$$TN = TM \quad (\text{proved})$$

$$PT = PT \quad (\text{common})$$

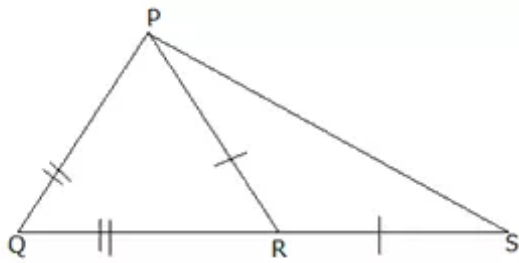
$$\angle PNT = \angle PMT \quad (90^\circ)$$

Therefore, $\triangle PNT \cong \triangle PMT$

$$\text{Hence, } \angle NPT = \angle MPT$$

Thus, PT bisects $\angle P$

Answer 12.



In $\triangle PQR$,

$$PQ = QR \quad (\text{given})$$

$$\angle PRQ = \angle QPR \quad \dots\dots(i)$$

In $\triangle PRS$,

$$PR = RS \quad (\text{given})$$

$$\angle PSR = \angle RPS \quad \dots\dots(ii)$$

Adding (i) and (ii)

$$\angle QPR + \angle RPS = \angle PRQ + \angle PSR$$

$$\angle QPS = \angle PRQ + \angle PSR \quad \dots\dots(iii)$$

Now in $\triangle PRS$,

$$\angle PRQ = \angle RPS + \angle PSR$$

$$\angle PRQ = \angle PSR + \angle PSR \quad (\text{from (ii)})$$

$$\angle PRQ = 2\angle PSR \quad \dots\dots(iv)$$

$$\text{Now, } \angle QPS = 2\angle PSR + \angle PSR \quad (\text{from (iii) and (iv)})$$

$$\angle QPS = 3\angle PSR$$

$$\frac{\angle PSR}{\angle QPS} = \frac{1}{3}$$

$$\Rightarrow \angle PSR : \angle QPS = 1 : 3$$

Answer 13.

In $\triangle KTM$,

$$KT = TM \quad (\text{given})$$

$$\text{Therefore, } \angle TKM = \angle TMK \quad \dots(i)$$

$$\text{Now, } \angle KTL = \angle TKM + \angle TMK$$

$$80^\circ = \angle TKM + \angle TKM = 2\angle TKM \quad (\text{from (i)})$$

$$\angle TKM = 40^\circ = \angle TMK = \angle LMK \quad \dots(ii)$$

But $\angle TKM = \angle TKL$ (KT is the angle bisector)

$$\text{Therefore, } \angle TKL = 40^\circ$$

In $\triangle KTL$,

$$\angle TKL + \angle KTL + \angle KLT = 180^\circ$$

$$40^\circ + 80^\circ + \angle KLT = 180^\circ$$

$$\angle KLT = 60^\circ = \angle KLM$$

$$\angle KLM = 60^\circ \text{ and } \angle LMK = 40^\circ$$

Answer 14

In $\triangle PTQ$ and $\triangle PSR$

$$PQ = PR \quad (\text{given})$$

$$PT = PS \quad (\text{given})$$

$$\angle TPQ = \angle SPR \quad (\text{vertically opposite angles})$$

$$\text{Therefore, } \triangle PTQ \cong \triangle PSR$$

$$\text{Hence, } TQ = SR$$

Answer 15.



In $\triangle ADB$ and $\triangle ADC$

$AB = AC$ (given)

$AD = AD$ (common)

$\angle BAD = \angle CAD$ (AD bisects $\angle BAC$)

Therefore, $\triangle ADB \cong \triangle ADC$

Hence, $BD = DC$ and $\angle BDA = \angle CDA$

But $\angle BDA + \angle CDA = 180^\circ$

$\Rightarrow \angle BDA = \angle CDA = 90^\circ$

Therefore, AD bisects BC perpendicularly.

Answer 16.

In $\triangle DEC$,

$$\angle DEC = \angle ADE + \angle A = 2a \quad (\text{ext. Angle to } \triangle ADE)$$

$$DE = DC$$

$$\Rightarrow \angle DEC = \angle DCE = 2a \quad \dots\dots(ii)$$

In $\triangle BDC$, let $\angle B = b$

$$DC = BC$$

$$\Rightarrow \angle BDC = \angle B = b \quad \dots\dots(iii)$$

In $\triangle ABC$,

$$\angle ADB = \angle ADE + \angle EDC + \angle BDC$$

$$180^\circ = a + \angle EDC + b \quad (\text{from (i) and (iii)})$$

$$\angle EDC = 180^\circ - a - b \quad \dots\dots(iv)$$

Now again in $\triangle DEC$

$$180^\circ = \angle EDC + \angle DCE + \angle DEC \quad (\text{from (ii)})$$

$$180^\circ = \angle EDC + 2a + 2a$$

$$\angle EDC = 180^\circ - 4a \quad \dots\dots(v)$$

Equating (iv) and (v)

Answer 17.

(i) In $\triangle ADC$,

$$AD = AC \quad (\text{given})$$

$$\text{Therefore, } \angle ADC = \angle ACD \dots\dots\dots(i)$$

$$\text{But } \angle ADB + \angle ADC = 180^\circ \dots\dots\dots(ii)$$

$$\text{And } \angle ACD + \angle DCE = 180^\circ \dots\dots\dots(iii)$$

From (i), (ii) and (iii)

$$\angle ADB = \angle DCE$$

(ii) In $\triangle ABD$ and $\triangle DCE$

$$BD = CD \quad (\text{D is mid-point of BC})$$

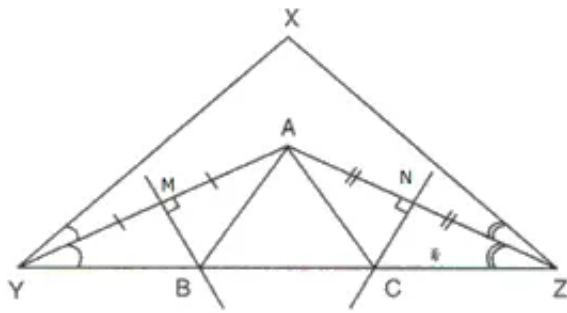
$$\angle ADB = \angle DCE \text{ (proved)}$$

$$AD = CE \quad (\text{since } AD = AC \text{ and } AC = CE)$$

Therefore, $\triangle ABD \cong \triangle DCE$

Hence, $AB = CE$.

Answer 18.



Let M and N be the points where AY and AZ are bisected.

In $\triangle ABM$ and $\triangle BMY$

$$MY = MA \quad (\text{BM bisects AY})$$

$$BM = BM \quad (\text{common})$$

$$\angle BMY = \angle BMA$$

Therefore, $\triangle ABM \cong \triangle BMY$

$$\text{Hence, } YB = AB \dots\dots\dots(i)$$

In $\triangle ACN$ and $\triangle CNZ$

$$NZ = NA \quad (\text{CN bisects AZ})$$

$$CN = CN \quad (\text{common})$$

$$\angle CAN = \angle CNZ$$

Therefore, $\triangle ACN \cong \triangle CNZ$

$$\text{Hence, } CZ = AC \dots\dots\dots(ii)$$

$$YZ = YB + BC + CZ$$

Substituting from (i) and (ii)

$$YZ = AB + BC + AC$$

Hence, YZ is equal to the perimeter of $\triangle ABC$

Answer 19.

In $\triangle PQR$, let $\angle PQR = x$

$$PQ = PR$$

$$\Rightarrow \angle PQR = \angle PRQ = x \quad \dots\dots(i)$$

In $\triangle RNS$,

$$\angle NRS = \angle PRQ = x \quad \dots\dots(\text{vertically opposite angles})$$

$$\angle RNS = 90^\circ \quad (\text{given})$$

$$\angle NSR + \angle RNS + \angle NRS = 180^\circ$$

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

$$\angle NSR = 90^\circ - x \quad \dots\dots(ii)$$

Now in Quadrilateral PTRS

$$\angle PTS = 90^\circ \quad (\text{given})$$

$$\angle TPR = \angle PQR + \angle PRQ = 2x \quad (\text{exterior angle to triangle PQR})$$

$$\angle PRS = 180^\circ - \angle PRQ = 180^\circ - x \quad (\text{QRS is a st. Line})$$

$$\angle PTS + \angle TPR + \angle PRS + \angle TSR = 360^\circ \quad (\text{angles of a quad.} = 360^\circ)$$

$$90^\circ + 2x + 180^\circ - x + \angle TSR = 360^\circ$$

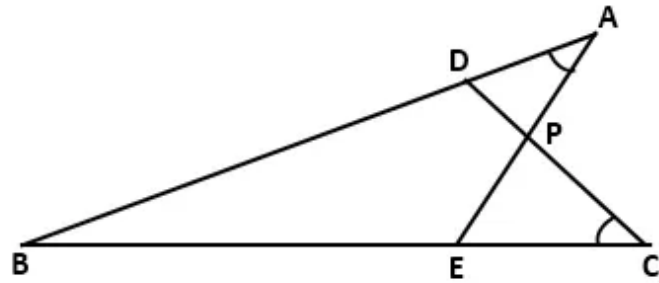
$$\angle TSR = 90^\circ - x \quad \dots\dots(iii)$$

From (ii) and (iii)

$$\angle TSR = \angle NSR$$

Therefore, QS bisects $\angle TSN$.

Answer 20.



Join DE and AC.

In $\triangle APD$ and $\triangle EPC$,

$$\angle DAP = \angle ECP \quad \dots (\because \angle BAE = \angle BCD)$$

$$AP = CP \quad \dots (\text{given})$$

$$\angle APD = \angle EPC \quad \dots (\text{vertically opposite angles})$$

$$\therefore \triangle APD \cong \triangle EPC \quad \dots (\text{By ASA Congruence criterion})$$

$$\Rightarrow AD = EC \quad \dots (\text{c.p.c.t})$$

In $\triangle APC$,

$$AP = CP \quad \dots (\text{given})$$

$$\Rightarrow \angle PAC = \angle PCA \quad \dots (\text{angles opposite to two equal sides are equal})$$

Now, $\angle BAE = \angle BCD$ and $\angle PAC = \angle PCA$

$$\Rightarrow \angle BAC = \angle BCA$$

$$\Rightarrow BC = BA \quad \dots (\text{sides opposite to two equal angles are equal})$$

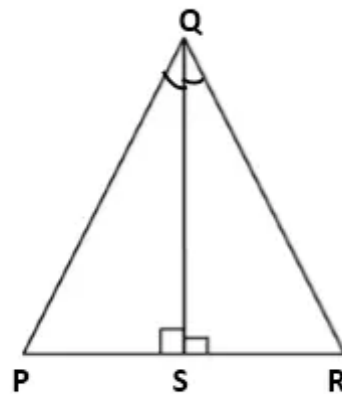
$$\Rightarrow BE + EC = BD + DA$$

$$\Rightarrow BE = BD \quad \dots (\because EC = DA)$$

$$\Rightarrow \angle BDE = \angle BED \quad \dots (\text{angles opposite to two equal sides are equal})$$

$$\Rightarrow \triangle BDE \text{ is an isosceles triangle.}$$

Answer 21.



In $\triangle PQS$ and $\triangle RQS$,

$$QS = QS \quad \dots [\text{Common}]$$

$$\angle QSP = \angle QSR \quad \dots [\text{each} = 90^\circ]$$

$$\angle PQS = \angle RQS \quad \dots [\text{given}]$$

$$\therefore \triangle PQS \cong \triangle RQS \quad \dots [\text{By ASA criterion}]$$

$$\Rightarrow PS = RS$$

$$\Rightarrow x + 1 = y + 2$$

$$\Rightarrow x = y + 1 \quad \dots (i)$$

And $PQ = SQ$

$$\Rightarrow 3x + 1 = 5y - 2$$

$$\Rightarrow 3(y + 1) + 1 = 5y - 2 \quad \dots[\text{From (i)}]$$

$$\Rightarrow 3y + 3 + 1 = 5y - 2$$

$$\Rightarrow 3y + 4 = 5y - 2$$

$$\Rightarrow 2y = 6$$

$$\Rightarrow y = 3$$

Putting $y = 3$ in (i),

$$x = y + 1 = 3 + 1 = 4$$

Answer 22A.

a.

In $\triangle PQS$,

$$PQ = QS \quad \dots(\text{given})$$

$$\Rightarrow \angle QSP = \angle QPS \quad \dots(\text{angles opposite to two equal sides are equal})$$

$$\text{Now, } \angle PQS + \angle QSP + \angle QPS = 180^\circ$$

$$\Rightarrow 60^\circ + 2\angle QSP = 180^\circ$$

$$\Rightarrow 2\angle QSP = 120^\circ$$

$$\Rightarrow \angle QSP = 60^\circ$$

$$\Rightarrow \angle QPS = 60^\circ$$

In $\triangle PRS$,

$$PS = SR \quad \dots(\text{given})$$

$$\Rightarrow \angle PRS = \angle RPS \quad \dots(\text{angles opposite to two equal sides are equal})$$

By exterior angle property,

$$\angle QSP = \angle RPS + \angle PRS$$

$$\Rightarrow 60^\circ = 2\angle RPS$$

$$\Rightarrow \angle RPS = 30^\circ$$

$$\text{Now, } \angle QPR = \angle QPS + \angle RPS = 60^\circ + 30^\circ = 90^\circ$$

b.

In $\triangle PQS$,

$$\angle PQS = 60^\circ, \angle QPS = 60^\circ \text{ and } \angle QSP = 60^\circ$$

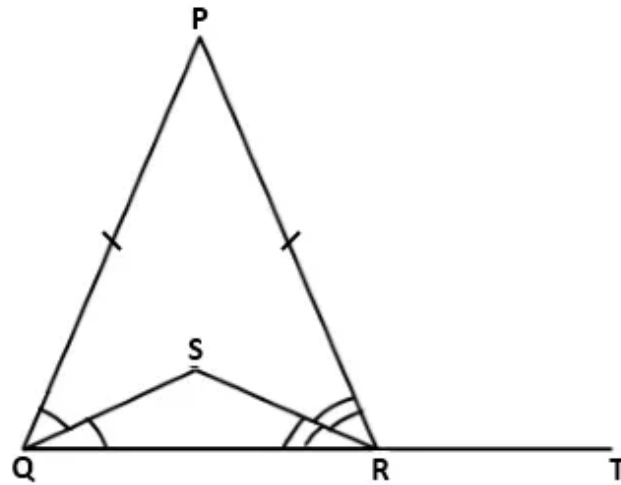
$$\Rightarrow \triangle PQS \text{ is an equilateral triangle.}$$

$$\Rightarrow PQ = QS = PS$$

And, $PS = SR$

$$\Rightarrow PQ = PS = QS = SR$$

Answer 23.



Let $\angle PQS = \angle SQR = x$ and $\angle PRS = \angle SRQ = y$

In $\triangle PQR$,

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

$$\Rightarrow \angle QPR + 2x + 2y = 180^\circ$$

$$\Rightarrow \angle QPR = 180^\circ - 2x - 2y \quad \dots(i)$$

Since $PQ = PR$,

$\angle PRQ = \angle PQR \quad \dots(\text{angles opposite to two equal sides are equal})$

$$\Rightarrow 2x = 2y$$

$$\Rightarrow x = y$$

Now, $\angle PRT = \angle PQR + \angle QPR \quad \dots(\text{by exterior angle property})$

$$\Rightarrow \angle PRT = 2x + 180^\circ - 2x - 2y \quad \dots[\text{From (i)}]$$

$$\Rightarrow \angle PRT = 180^\circ - 2y \quad \dots(ii)$$

In $\triangle SQR$,

$$\angle QSR + \angle SQR + \angle SRQ = 180^\circ$$

$$\Rightarrow \angle QSR + x + y = 180^\circ$$

$$\Rightarrow \angle QSR = 180^\circ - x - y$$

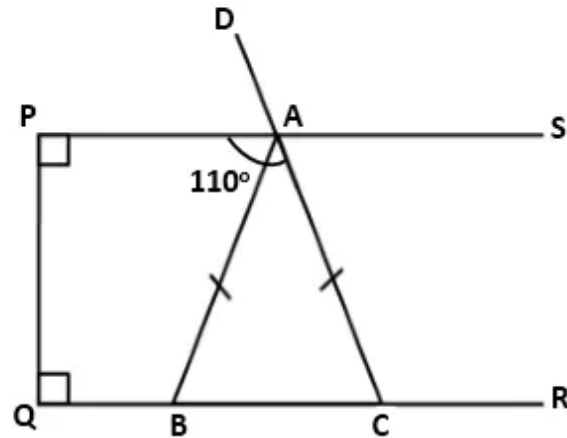
$$\Rightarrow \angle QSR = 180^\circ - y - y \quad \dots[\because x = y \text{ (proved)}]$$

$$\Rightarrow \angle QSR = 180^\circ - 2y \quad \dots(iii)$$

From (ii) and (iii),

$$\angle QSR = \angle PRT$$

Answer 24.



Given : $\angle PAC = 110^\circ$

To find:

Base angles: $\angle ABC$ and $\angle ACB$

Vertex angle: $\angle BAC$

In quadrilateral APQC,

$$\angle APQ + \angle PQC + \angle ACQ + \angle PAC = 360^\circ$$

$$\Rightarrow 90^\circ + 90^\circ + \angle QCA + 110^\circ = 360^\circ$$

$$\Rightarrow \angle ACQ = 360^\circ - 290^\circ$$

$$\Rightarrow \angle ACQ = 70^\circ$$

$$\Rightarrow \angle ACB = 70^\circ \quad \dots(i)$$

In $\triangle ABC$,

$$AB = AC \quad \dots(\text{given})$$

$$\Rightarrow \angle ACB = \angle ABC \quad \dots(\text{angles opposite to two equal sides are equal})$$

$$\Rightarrow \angle ABC = 70^\circ \quad \dots[\text{From (i)}]$$

In $\triangle ABC$,

$$\angle ABC + \angle ACB + \angle BAC = 180^\circ \quad \dots(\text{angle sum property})$$

$$\Rightarrow 70^\circ + 70^\circ + \angle BAC = 180^\circ$$

$$\Rightarrow \angle BAC = 180^\circ - 140^\circ$$

$$\Rightarrow \angle BAC = 40^\circ$$