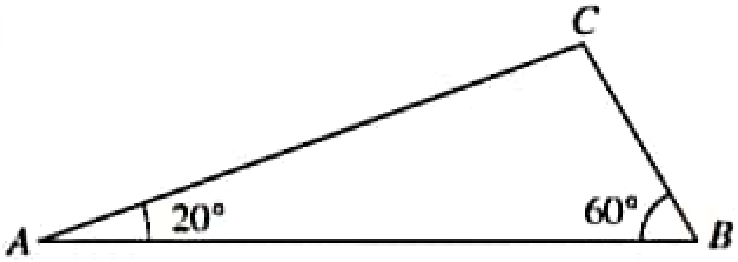
Exercise 11A

1. **(a)**

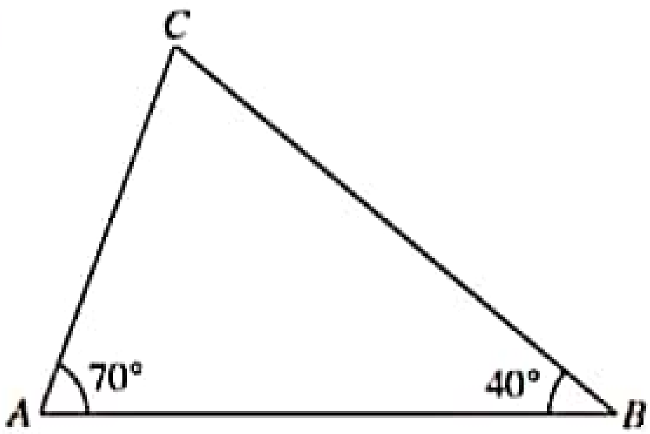


$\angle C = 180° - 20° - 60°$ ($\angle$ sum of $\triangle$)

$= 100°$

It is a scalene triangle and an obtuse-angled triangle.

(b)

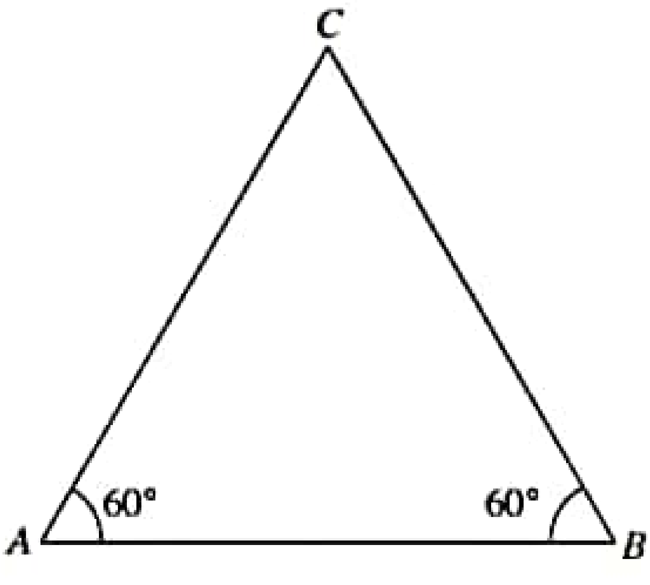


$\angle C = 180° - 70° - 40°$ ($\angle$ sum of $\triangle$)

$= 70°$

It is an isosceles triangle and acute-angled triangle.

(c)

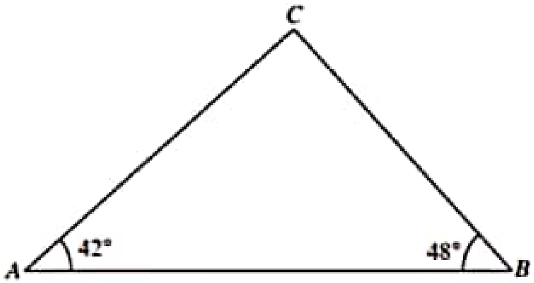


$\angle C = 180° - 60° - 60°$ ($\angle$ sum of $\triangle$)

$= 60°$

It is an equilateral triangle and acute-angled triangle.

(d)



$\angle C = 180° - 42° - 48°$ ($\angle$ sum of $\triangle$)

$= 90°$

It is a scalene triangle and right-angled triangle.

2. (a) Third angle of the triangle

$= 180° - 40° - 40°$ ($\angle$ sum of $\triangle$)

$= 100°$

(b) Third angle of the triangle

$= 180° - 87° - 87°$ ($\angle$ sum of $\triangle$)

$= 6°$

(c) Third angle of the triangle

$= 180° - 15° - 15°$ ($\angle$ sum of $\triangle$)

$= 150°$

(d) Third angle of the triangle

$= 180° - 79° - 79°$ ($\angle$ sum of $\triangle$)

$= 22°$

3. (a) $39° + 90° + a° = 180°$ ($\angle$ sum of $\triangle$)

$a° = 180° - 39° - 90°$

$= 51°$

$\therefore a = 51$

(b) $68° + 2b° + 64° = 180°$ ($\angle$ sum of $\triangle$)

$2b° = 180° - 68° - 64°$

$= 48°$

$b° = \frac{48°}{2}$

$= 24°$

$\therefore b = 24$

(c) $4c° + 3c° + 40° = 180°$ ($\angle$ sum of $\triangle$)

$4c° + 3c° = 180° - 40°$

$7c° = 140°$

$c = \frac{140°}{7}$

$= 20°$

$\therefore c = 20$

(d) $3d° + 4d° + d° = 180°$ ($\angle$ sum of $\triangle$)

$8d° = 180°$

$d° = \frac{180°}{8}$

$= 22.5°$

$\therefore d = 22.5$

(e) Since $BA = BC$, $\therefore B\hat{C}A = B\hat{A}C = 62°$

$62° + e° + 62° = 180°$ ($\angle$ sum of $\triangle$)

$e° = 180° - 62° - 62°$

$= 56°$

$\therefore e = 56$

(f) Since $AC = BC = AB$, $\therefore\ C\hat{A}B = C\hat{B}A = A\hat{C}B = f°$

$f° + f° + f° = 180°$ (∠ sum of △)

$3f° = 180°$

$f° = \frac{180°}{3}$

$= 60°$

$\therefore f = 60$

4. (a) $a° = 47° + 55°$ (ext. ∠ of △)

$= 102°$

$\therefore a = 102$

(b) $90° + b° + 50° = 180°$ (∠ sum of △)

$b° = 180° - 90° - 50°$

$= 40°$

$\therefore b = 40$

$90° + c° + 35° = 180°$ (∠ sum of △)

$c° = 180° - 90° - 35°$

$= 55°$

$\therefore c = 55$

(c) $d° + 110° = 180°$ (adj. ∠s on a str. line)

$d° = 180° - 110°$

$= 70°$

$\therefore d = 70$

$2e° + 3e° = 110°$ (ext. ∠ of △)

$5e° = 110°$

$e° = \frac{110°}{5}$

$= 22°$

$\therefore e = 22$

5. $3x° + 4x° + 5x° = 180°$ (∠ sum of △)

$12x° = 180°$

$x° = \frac{180°}{12}$

$= 15°$

$\therefore x = 15$

Smallest angle of the triangle

$= 3(15°)$

$= 45°$

6. (i) Let $A\hat{D}B = B\hat{D}C = x°$

$90° + 20° + 2x° = 180°$ (∠ sum of △)

$2x° = 180° - 90° - 20°$

$= 70°$

$x° = \frac{70°}{2}$

$= 35°$

$\therefore B\hat{D}C = 35°$

(ii) $C\hat{B}D + 20° + 35° = 180°$ (∠ sum of △)

$C\hat{B}D = 180° - 20° - 35°$

$= 125°$

Exercise 11B

1. (a) $a^\circ + 54^\circ = 90^\circ$ ($B\hat{C}D$ is a right angle)

$$a^\circ = 90^\circ - 54^\circ$$
$$= 36^\circ$$
$$\therefore a = 36$$
$$b^\circ = 36^\circ \text{ (alt. } \angle\text{s, } AB \parallel DC)$$
$$\therefore b = 36$$

(b) $E\hat{B}C = 90^\circ$ (right angle)

$$90^\circ + 39^\circ + c^\circ = 180^\circ \text{ (}\angle \text{ sum of } \triangle BCE)$$
$$c^\circ = 180^\circ - 90^\circ - 39^\circ$$
$$= 51^\circ$$
$$\therefore c = 51$$
$$D\hat{C}E + 39^\circ = 90^\circ \text{ (} B\hat{C}D \text{ is a right angle)}$$
$$D\hat{C}E = 90^\circ - 39^\circ$$
$$= 51^\circ$$
$$51^\circ + d^\circ + 78^\circ = 180^\circ \text{ (}\angle \text{ sum of } \triangle CDE)$$
$$d^\circ = 180^\circ - 51^\circ - 78^\circ$$
$$= 51^\circ$$
$$\therefore d = 51$$

2. (a) $a^\circ = 106^\circ$ (opp. $\angle$s of // gram)

$$\therefore a = 106$$
$$b^\circ = 48^\circ \text{ (alt. } \angle\text{s, } AD \parallel BC)$$
$$\therefore b = 48$$

(b) $4c^\circ + 5c^\circ = 180^\circ$ (int. $\angle$s, $AB \parallel DC$)

$$9c^\circ = 180^\circ$$
$$c^\circ = \frac{180^\circ}{9}$$
$$= 20^\circ$$
$$\therefore c = 20$$
$$2d^\circ = 4(20^\circ) \text{ (opp. } \angle \text{ s of // gram)}$$
$$d^\circ = \frac{80^\circ}{2}$$
$$= 40^\circ$$
$$\therefore d = 40$$

3. (a) Since $ABCD$ is a kite, $\therefore AD = CD$ and so $A\hat{C}D = C\hat{A}D = a^\circ$

$$a^\circ + 100^\circ + a^\circ = 180^\circ \text{ (}\angle \text{ sum of } \triangle ACD)$$
$$2a^\circ = 180^\circ - 100^\circ$$
$$= 80^\circ$$
$$a^\circ = \frac{80^\circ}{2}$$
$$= 40^\circ$$
$$\therefore a = 40$$

Since $ABCD$ is a kite, $\therefore AB = CB$ and so $C\hat{A}B = A\hat{C}B = 61^\circ$.

$$61^\circ + b^\circ + 61^\circ = 180^\circ \text{ (}\angle\text{sum of } \triangle ABC)$$
$$b^\circ = 180^\circ - 61^\circ - 61^\circ$$
$$= 58^\circ$$
$$\therefore b = 58$$

(b) Since $ABCD$ is a kite, $\therefore D\hat{A}C = B\hat{A}C = 40^\circ$.

(One diagonal bisects the interior angles)

$$40^\circ + 26^\circ + c^\circ = 180^\circ \text{ (}\angle \text{ sum of } \triangle ACD)$$
$$c^\circ = 180^\circ - 40^\circ - 26^\circ$$
$$= 114^\circ$$
$$\therefore c = 114$$

Practise Now 1

1. $90° + 65° + a° = 180°$ ($\angle$ sum of $\triangle$)

$a° = 180° - 90° - 65°$

$= 25°$

$\therefore a = 25$

2. Since $AC = BC$, $\therefore C\hat{A}B = C\hat{B}A = b°$

$b° + 52° + b° = 180°$ ($\angle$ sum of $\triangle$)

$2b° = 180° - 52°$

$= 128°$

$b° = \frac{128°}{2}$

$= 64°$

$\therefore b = 64$

Practise Now 2

(a) $a° = 53° + 48°$ (ext. $\angle$ of $\triangle$)

$= 101°$

$\therefore a = 101$

(b) $F\hat{D}E = 93°$ (vert. opp. $\angle$s)

$b° + 33° + 93° = 180°$ ($\angle$ sum of $\triangle$)

$b° = 180° - 33° - 93°$

$= 54°$

$\therefore b = 54$

$c° = 41° + 93°$ (ext. $\angle$ of $\triangle ABD$)

$= 134°$

$\therefore c = 134$

Practise Now 3

1. (i) $D\hat{A}E = 90°$ (right angle)

$51° + 90° + A\hat{E}D = 180°$ ($\angle$ sum of $\triangle AED$)

$A\hat{E}D = 180° - 51° - 90°$

$= 39°$

(ii) $C\hat{D}E + 51° = 90°$ ($\angle ADC$ is a right angle)

$C\hat{D}E = 90° - 51°$

$= 39°$

$68° + 39° + C\hat{E}D = 180°$ ($\angle$ sum of $\triangle CDE$)

$C\hat{E}D = 180° - 68° - 39°$

$= 73°$

2. (i) Since $EB = EC$ (diagonals bisect each other), $\therefore E\hat{B}C = 63°$

$63° + B\hat{E}C + 63° = 180°$ ($\angle$ sum of $\triangle BEC$)

$B\hat{E}C = 180° - 63° - 63°$

$= 54°$

(ii) $D\hat{E}C + 54° = 180°$ (adj. $\angle$s on a str. line)

$D\hat{E}C = 180° - 54°$

$= 126°$

Since $ED = EC$ (diagonals bisect each other),

$\therefore C\hat{D}E = D\hat{C}E = x°$.

$x° + 126° + x° = 180°$ ($\angle$ sum of $\triangle CDE$)

$2x° = 180° - 126°$

$= 54°$

$$x° = \frac{54°}{2}$$
$$= 27°$$
$$\therefore C\hat{D}E = 27°$$

Practise Now 4

1. (i) $A\hat{B}C = 108°$ (opp. $\angle$s of // gram)
$9x° = 108°$
$$x = \frac{108°}{9}$$
$= 12°$
$\therefore x = 12$
(ii) $(D\hat{C}E + 38°) + 108° = 180°$ (int. $\angle$s, AD // BC)
$D\hat{C}E = 180° - 38° - 108°$
$= 34°$
2. $(5x + 6)° + (2x + 13)° = 180°$ (int. $\angle$s, AB // DC)
$7x° + 19° = 180°$
$7x° = 180° - 19°$
$= 161°$
$$x° = \frac{161°}{7}$$
$= 23°$
$\therefore x = 23$
$[5(23) + 6]° + (y + 17°) = 180°$ (int. $\angle$s, AB // DC)
$y° = 180° - 121° - 17°$
$= 42°$
$\therefore y = 42$

Practise Now 5

1. (i) $C\hat{A}B = 32°$ (alt. $\angle$s, AB // DC)
Since $BA = BC$, $\therefore A\hat{C}B = C\hat{A}B = 32°$
$32° + A\hat{B}C + 32° = 180°$ ($\angle$sum of $\triangle ABC$)
$A\hat{B}C = 180° - 32° - 32°$
$= 116°$
(ii) Since $AC = CE$, $\therefore C\hat{E}A = C\hat{A}E = 32°$
$32° + (32° + B\hat{C}E) + 32° = 180°$ ($\angle$ sum of $\triangle ABC$)
$B\hat{C}E = 180° - 32° - 32° - 32°$
$= 84°$
2. $B\hat{D}C = (3x + 13)°$ (diagonals bisect interior angles of a rhombus)
$D\hat{A}C = (x + 45)°$ (diagonals bisect interior angles of a rhombus)
$2(3x + 13)° + 2(x + 45)° = 180°$ (int. $\angle$ s, AB // DC)
$6x° + 26° + 2x° + 90° = 180°$
$8x° = 180° - 26° - 90°$
$8x° = 64°$
$$x° = \frac{64°}{8}$$
$= 8°$
$\therefore x = 8$