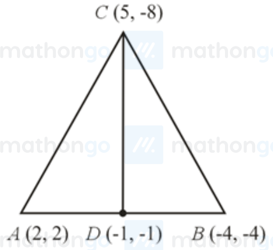
ANSWER KEYS

1. (3)	**2.** (1)	**3.** (3)	**4.** (3)	**5.** (4)	**6.** (1)	**7.** (4)	**8.** (4)
9. (2)	**10.** (3)						

1. **(3)**

Let D be the mid-point of AB, then coordinates of D are $\left(\frac{2-4}{2}, \frac{2-4}{2}\right)=(-1,-1)$.



$\therefore$ Length of median, $CD=\sqrt{(-1-5)^2+(-1+8)^2}$

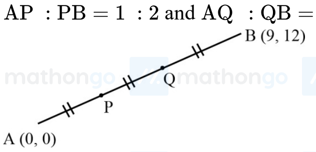
$=\sqrt{36+49}=\sqrt{85}$

2. **(1)**

Let the required points be P & Q

Thus

AP : PB = 1 : 2 and AQ : QB = 2 : 1



Now finding P by using section formula (internal division)

$\Rightarrow$ P $\equiv\left(\frac{1\times9+2\times0}{1+2}, \frac{1\times12+2\times0}{1+2}\right)$

$\Rightarrow$ P $\equiv$ (3, 4)

Now finding Q

AQ : QB = 2 : 1

$\Rightarrow$ Q $\equiv\left(\frac{2\times9+1\times0}{2+1}, \frac{2\times12+1\times0}{2+1}\right)$

$\equiv$ (6, 8)

3. **(3)** Midpoint of PR is at $\left(3, \frac{9}{2}\right)$ and midpoint of QS is a$\left(\frac{a+4}{2}, \frac{b+6}{2}\right)$.

But in parallelogram, diagonals bisect each other.

$\therefore\ \frac{a+4}{2}=3$ and $\frac{b+6}{2}=\frac{9}{2}\Rightarrow a=2,\ b=3$

4. **(3)** $A\equiv\left(\frac{3k-5}{k+1}, \frac{5k+1}{k+1}\right)$

Area of $\Delta ABC=2$ sq.units

$\Rightarrow\frac{1}{2}\left[\frac{3k-5}{k+1}(5+2)+1\left(-2-\frac{5k+1}{k+1}\right)+7\left(\frac{5k+1}{k+1}-5\right)\right]=\pm2$

$\Rightarrow 14k-66=\pm4(k+1)\Rightarrow k=7$ or $\frac{31}{9}$

5. **(4)** Let the third vertex be $(h,\ k)$

Since it lies on line $y=x+3$

$\therefore\ k=h+3$ ....(1)

Also area of triangle is 5

$\therefore\frac{1}{2}[2(-2-k)+3(k-1)+h\ (1+2)]=\pm5$

$\Rightarrow k+3h-\ 7=\pm10$ ....(2)

Solving (1) & (2) we get

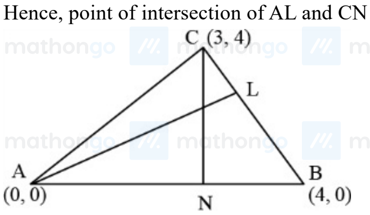
$h=\frac{7}{2},\ k\ =\frac{13}{2}\Rightarrow\ \left(\frac{7}{2}, \frac{13}{2}\right)$

and $h=\frac{-3}{2},\ k=\frac{3}{2}\Rightarrow\ \left(-\frac{3}{2}, \frac{3}{2}\right)$

6. **(1)**
Let the third vertex be $(\mathrm{x},\ \mathrm{y})$
then the centroid of the triangle is
$G\equiv\left(\frac{x_1+x_2+x_3}{3},\ \frac{y_1+y_2+y_3}{3}\right)$
$\Rightarrow G\equiv\left(\frac{5-2+\mathrm{x}}{3},\ \frac{4+4+\mathrm{y}}{3}\right)=(5,\ 6)$
$\Rightarrow\ \frac{3+\mathrm{x}}{3}=5$ and $\frac{8+\mathrm{y}}{3}=6$
$\Rightarrow \mathrm{x}=12\ \ and\ \ \mathrm{y}=10$
$\therefore G\equiv(12,\ 10)$

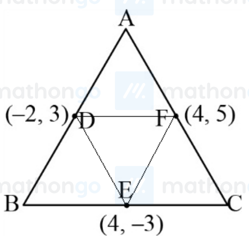
7. **(4)** As two lines are perpendicular, so triangle is right angle Δ where right angle is made at point of intersection of these two lines.
Also in right angle triangle, orthocentre is point of intersection of perpendicular lines.
$\Rightarrow$ orthocentre is point of intersection of lines $x-y+1=0$ and $x+y+3=0$
i.e. $(-2,-1)$

8. **(4)**
We know that orthocentre of triangle is point of intersection of any two altitudes of triangle.
Like in this figure,
Slope of BC $\Rightarrow \frac{(y_2-y_1)}{(x_2-x_1)}=\frac{0-4}{4-3}=-4$
We know that if two lines are perpendicular then $m_1m_2=-1$
Here BC is perpendicular to AL
$\Rightarrow$Slope of AL is $\frac{1}{4}$
Where AL is the altitude from A to BC,
$\Rightarrow(y-y_1)=m(x-x_1)$
$\Rightarrow(y-0)=\frac{1}{4}(x-0)$
Similarly, altitude of CN is $\mathrm{x}=3$
Hence, point of intersection of AL and CN is $(3,\ {}^{3}/_{4})$



9. **(2)**
Given $A(0,0),\ B(0,2)\ C(2,0)$,
$\overline{AC}$ is a horizontal line and
$\overline{AB}$ is a vertical line.
Given, vertices of ΔABC are the vertices of right-angled triangle, right-angled at A.
In a right-angled triangle, A is orthocentre and mid-point of BC is $D\left(\frac{2+0}{2},\ \frac{0+2}{2}\right)=(1,1)$, which is the circumcentre.
$\therefore$ Required distance $=AD=\sqrt{(1-0)^2+(1-0)^2}=\sqrt{2}$ units.

10. **(3)**



Centroid of Δ DEF = Centroid of Δ ABC
$G\left(\frac{x_1+x_2+x_3}{3},\ \frac{y_1+y_2+y_3}{3}\right)$
$\Rightarrow G\equiv\left(\frac{-2+4+4}{3},\ \frac{3-3+5}{3}\right)=\ \left(2,\ \frac{5}{3}\right)$