## ANSWER KEYS

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|---|---|---|---|---|---|---|---|
| **1.** (4) | **2.** (3) | **3.** (4) | **4.** (2) | **5.** (1) | **6.** (3) | **7.** (2) | **8.** (3) |
| **9.** (8.00) | **10.** (3) | | | | | | |

**1.** **(4)**

$\begin{vmatrix} 2 & 1 & 1 \\ 3 & 2\lambda & 4 \\ 1 & 1 & -3\lambda \end{vmatrix} = 0; \begin{vmatrix} 1 & 0 & 1 \\ 3-3\lambda & 2\lambda-4 & 4 \\ 0 & 1+3\lambda & -3\lambda \end{vmatrix} = 0$

$\begin{vmatrix} 0 & 0 & 1 \\ -2\lambda-1 & 2\lambda-4 & 4 \\ 3\lambda & 1+3\lambda & -3\lambda \end{vmatrix} = 0$

$\Rightarrow (3\lambda+1)(2\lambda+1) + 3\lambda(2\lambda-4) = 0$

$\Rightarrow 6\lambda^2 + 5\lambda + 1 + 6\lambda^2 - 12\lambda = 0$

$\Rightarrow 12\lambda^2 - 7\lambda + 1 = 0$

$\Rightarrow (3\lambda-1)(4\lambda-1) = 0$

$\Rightarrow \lambda = \frac{1}{3}, \frac{1}{4} \Rightarrow \text{Sum} = \frac{7}{12}$

**2.** **(3)**

The angle bisector for the given two lines $24x + 7y - 20 = 0$ and $4x - 3y - 2 = 0$,

$\frac{24x+7y-20}{25} = \pm \frac{4x-3y-2}{5}$

Taking positive sign, we get $2x + 11y - 5 = 0$.

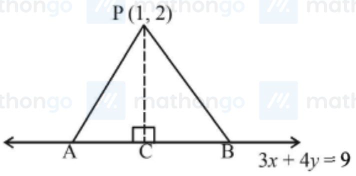
This equation of line is already given.

Therefore, the given three lines are concurrent with one line bisecting the angle between the other two.

**3.** **(4)** Point of intersection of $x + 3y - 9 = 0$ and $2x - y - 4 = 0$ is $(3, 2)$ lies on $4x + by - 2 = 0 \Rightarrow b = -5$ .

$\therefore$ req lines is $x - 4y + 5 = 0$

**4.**




**(2)**

Shortest distance of a point $(x_1, y_1)$ from line

$ax + by = c$ is $d = \left|\frac{ax_1 + by_1 - c}{\sqrt{a^2+b^2}}\right|$

Now shortest distance of $\mathrm{P}(1, 2)$ from $3x + 4y = 9$ is

$\mathrm{PC} = d = \left|\frac{3(1)+4(2)-9}{\sqrt{3^2+4^2}}\right| = \frac{2}{5}$

Given that $\Delta\mathrm{APB}$ is an equilateral triangle Let ' $a$ ' be its side

then $\mathrm{PB} = a$, $\mathrm{CB} = \frac{a}{2}$

Now, In $\Delta\mathrm{PCB}$, $(\mathrm{PB})^2 = (\mathrm{PC})^2 + (\mathrm{CB})^2$

(By Pythagoras theoresm) $a^2 = \left(\frac{2}{5}\right)^2 + \frac{a^2}{4}$

$a^2 - \frac{a^4}{4} = \frac{4}{25} \Rightarrow \frac{3a^2}{4} = \frac{4}{25}$

$a^2 = \frac{16}{75} \Rightarrow a = \sqrt{\frac{16}{75}} = \frac{4}{5\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{15}$

$\therefore$ Length of Equilateral triangle $(a) = \frac{4\sqrt{3}}{15}$

**5.** **(1)** Here, $(x_1,\ y_1)=(3,\ 4)$ and $ax+by+c=2x+y-7=0$

$\therefore a=2,\ \ b=1,\ \ c=-7$

Let, $(h,k)$ be the coordinates of the foot.

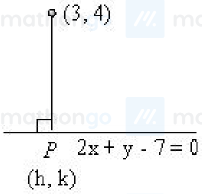
Then,

$\frac{h-3}{2}=\frac{k-4}{1}=\frac{-(2\times3+1\times4-7)}{2^2+1^2}=\frac{-3}{5}$

$\Rightarrow \frac{h-3}{2}=\frac{-3}{5}$ and $\frac{k-4}{1}=\frac{-3}{5}$

$\Rightarrow h=\frac{-6}{5}+3$ and $k=\frac{-3}{5}+4$

$\Rightarrow h=\frac{9}{5}$ and $k=\frac{17}{5}$




**6.** **(3)**

Basically, we need to find the intersection of the ray and mirror.

Let us assume $A'(x_1,\ y_1)$ is the image of $A(2,\ 3)$ with respect to $x+y=0$.

$\Rightarrow A'(-3,\ -2)$

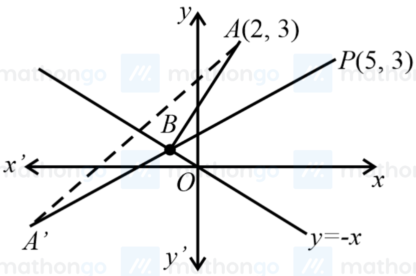
Now, we can say that $B$ is the point of intersection of $PA'$ with $x+y=0$.

The slope of $PA'$ is $\frac{5}{8}$.

Hence, the equation of the line $PA'$ is given as,

$y-3=\frac{5}{8}(x-5)$

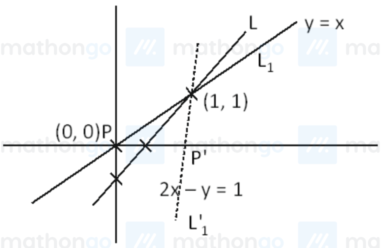
$\Rightarrow 5x-8y-1=0$




Now, on solving the equations $y+x=0$ and $5x-8y-1=0$, we will get the point $B$ as $\left(\frac{1}{13},\ -\frac{1}{13}\right)$

**7.** **(2)** Image of (0,0) w.r.t $L$ lies on $L_1$

Image of (0,0) w.r.t $L$ is




$\frac{x-0}{2}=\frac{y-0}{-1}=-2\left(\frac{-1}{5}\right)$

$P'\equiv(x,y)=\left(\frac{4}{5},\frac{-2}{5}\right)$

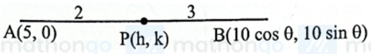
Equation of $L'_1$ which passes through (1,1) and $\left(\frac{4}{5},\frac{-2}{5}\right)$ is

$y-1=\frac{\frac{-2}{5}-1}{\frac{4}{5}-1}(x-1)=\frac{-7}{-1}(x-1)$

$y=7x-6$

**8.** **(3)**

Let $P(h,k)$ be the point dividing te line segment in the ratio 2 : 3, then




$h=\frac{2(10\cos\theta)+3(5)}{2+3}=4\cos\theta+3$ and $k=\frac{2(10\sin\theta)+3(0)}{2+3}=4\sin\theta$

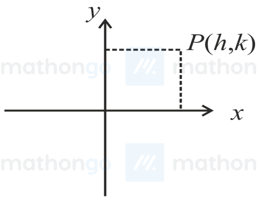
$\therefore (h-3)^2+k^2=16$

$\Rightarrow$ Locus of $P(h,k)$ is $(x-3)^2+y^2=16$, which is a circle.

Hence, the perimeter of the circle is $2\pi(4)=8\pi$ units

**9.** **(8.00)**

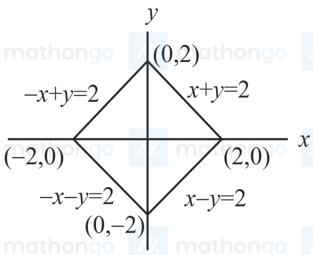
Let $x$ axis and $y$ axis be the two perpendicular lines. Let $P$ be $(h,\ k)$




then $|h|+|k|=2$

So locus of $P$ is $\Rightarrow |x|+|y|=2$

Which represents four lines forming a square



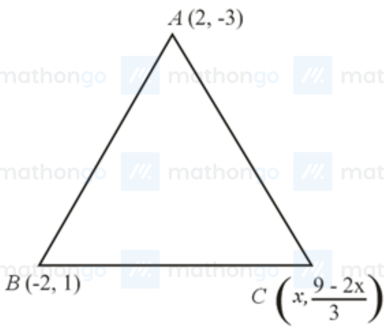

Area $=4\left(\frac{1}{2}\cdot 2\cdot 2\right)=8$

**10.** **(3)**

Given $A(2,-3)$ $B(-2,1)$

The third vertex lies on $2x+3y=9$

i.e. $C\left(x,\frac{9-2x}{3}\right)$




$\therefore$ Let $P(h,k)$ be any point on the required locus i.e $P$ is the centroid of the triangle $ABC$

$\Rightarrow\left(\frac{2-2+x}{3},\frac{-3+1+\frac{9-2x}{3}}{3}\right)=(h,k)$

$\therefore\ h=\frac{x}{3},\ k=\frac{3-2x}{9}$

Eliminating $x$ from the above equations

$\Rightarrow 9k=3-2(3h)$

$\Rightarrow 9k=3-6h$

$\Rightarrow 2h+3k=1$

Hence, the locus of $P(h,k)$ is $2x+3y=1$