Common Types of Coordinate Geometry Questions

Hello!

Congratulations taking the first step toward mastery of Coordinate Geometry!

This resource was created to help you save time and effort when doing your A.Math revision, so you are clear on the different types of A.math questions that commonly appear!

Our teachers have taken time and effort to curate questions, and we are certain this valuable resource will help you in your revision.

Please make sure you use it!

Should you still require some help after going through these questions, do feel free to drop us a WhatsApp! Our friendly centre manager will always be ready to help!

Here's wishing you all the very best for your O Level A.Math tests and exams.

Teachers of The Classroom

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A. Finding equation of lines (1pt & 1 gradient)

B. Finding coordinates (usually use simultaneous equation → need to form 2 equations!)

C. Formulas

Midpoint:	Area of polygon:	Length of line:
$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$	$\frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix}$ (ACW direction!)	$\sqrt{(y_1-y_2)^2+(x_1-x_2)^2}$

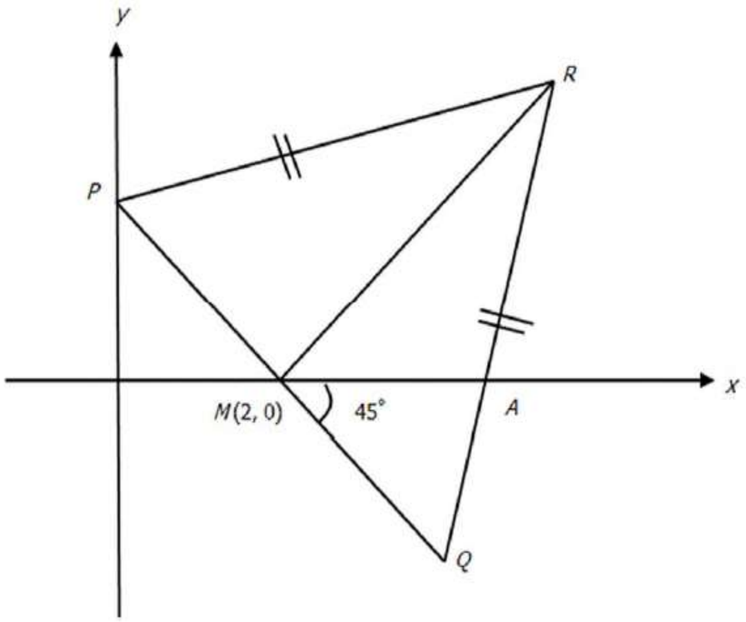
D. Parallel lines, same gradient

Perpendicular lines, $m_1m_2 = -1$

Questions

1. **Solutions to this question by accurate drawing will not be accepted.**

The following diagram shows an isosceles triangle PQR, where $PR = QR$. It is given that M (2,0) is the midpoint of PQ. The line QR intersects the x-axis at point A such that $\angle AMQ = 45°$.



i. Show that the gradient of the line MR is 1. [1]

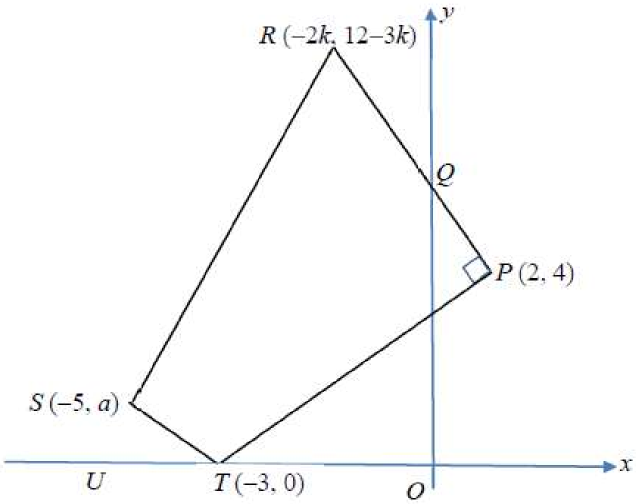
ii. Find the equation of the line PQ. [2]

iii. Find the coordinates of Q. [2]

iv. Given that the area of ΔPQR is 20unit^2, find the coordinates of R. [5]

2. **Solutions to this question by accurate drawing will not be accepted.**

The figure shows a quadrilateral *PTSR* for which *P* is (2, 4), *T* is (-3, 0), *S* is (-5, *a*), *R* is $(-2k, 12-3k)$ and angle *QPT* is a right angle. *RQP* is a straight line with point *Q* lying on the y-axis.

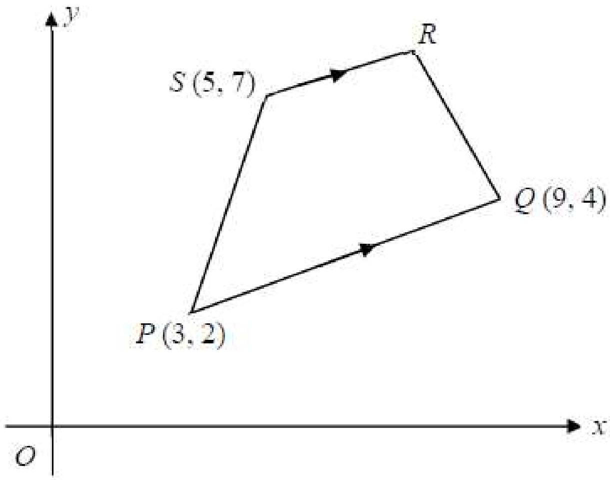


i. Find the value of *k*. [2]

ii. Given that $\angle STU = 45°$, determine the value of *a*. [2]

iii. A line passing through *Q* and is perpendicular to *TS* cuts the *x*-axis at *V*. Find the value of VR^2. [5]

3. **Solutions to this question by accurate drawing will not be accepted.**



In the diagram, PQ is parallel to SR and the coordinates of P, Q and S are (3, 2), (9, 4) and (5, 7) respectively. The gradient of line OR is 1.

Find

i. the coordinates of R, [4]

ii. the area of the quadrilateral $PQRS$, [2]

iii. the coordinates of the point H on the line $y = 1$ which is equidistant from P and Q. [4]

4. **Solutions to this question by accurate drawing will not be accepted.**

The coordinates of the points P and Q are $(-5, 2)$ and $(7, 6)$ respectively. Find

i. the equation of the line parallel to PQ and passing through the point $(-2, 3)$, [3]

ii. the equation of the perpendicular bisector of PQ. [3]

A point R is such that the shortest distance of R from the line passing through P and Q is $\sqrt{10}$ units.

iii. Find the area of triangle PQR. [3]

Suggested Solutions

1i.	$\tan 45^{o} = 1$ Hence gradient = 1.
ii	$m_1 m_2 = -1$ gradient of $PQ = -1$ $\frac{y-0}{x-2} = -1$ $y = -x + 2$
iii.	since M is midpoint of PQ, ΔPOM is similar to ΔPOQ. Hence $Q(4, \text{-}2)$
iv	$20 = \frac{1}{2}\begin{vmatrix} 4 & x & 0 & 4 \\ -2 & y & 2 & -2 \end{vmatrix}$ $40 = 4y + 2x - (-2x + 8)$ $48 = 4y + x$ $12 = y + x \quad --------(1)$ Eqn of MR, $\frac{y-0}{x-2} = 1$ $y = x - 2 \quad -----(2)$ Sub (1) into (2) $x = 7, y = 5$

2i	Gradient of $PT = \frac{4}{5}$ Gradient of PR, $\frac{12-3k-4}{-2k-2} = -\frac{5}{4}$ $-22k = -22$ $k = 1$
ii	Angle $STU = 45°$ → gradient of $ST = -1$ $\frac{a-0}{-5+3} = -1$ $a = 2$
iii.	Equation of PR $y - 4 = -\frac{5}{4}(x-2)$ $4y + 5x = 26$ At Q, $x = 0$, $4y = 26$ $y = 6.5$ $Q(0, 6.5)$ Equation of line passing through Q and perpendicular to TS is $y - 6.5 = \frac{-1}{-1}(x-0)$ $y = x + 6.5$ At V, $y = 0$, hence $x = -6.5$. $V(-6.5, 0)$ $VR^2 = (-2+6.5)^2 + 9^2$ $= 101.25$

3i.	$m_{PQ}=\frac{1}{3}$ Since $PQ // SR$, $m_{SR}=\frac{1}{3}$ Eqn of SR, $(y-7)=\frac{1}{3}(x-5)$ $==> y=\frac{x}{3}+\frac{16}{3}$ Sub. $R(a, a)$ into $y=\frac{x}{3}+\frac{16}{3}$, $a=8$ OR use eqn of OR as $y=x$ $\therefore R=(8,\ 8)$
ii	Area of $PQRS=\frac{1}{2}\begin{vmatrix}3 & 9 & 8 & 5 & 3\\ 2 & 4 & 8 & 7 & 2\end{vmatrix}$ $=\frac{1}{2}(39)=19.5$ units^2
iii.	Since the point H lies on the line $y=1$ and is equidistant from P and Q, H must lie on the $\perp$ bisector of PQ. Mid-point of $PQ=(6, 3)$ gradient of $\perp$ bisector $=-3$. Equation, $(y-3)=-3(x-6)$ $y=-3x+21$ Since $y=1$, $1=-3x+21$, $x=6\frac{2}{3}$ $\therefore H(6\frac{2}{3},\ 1)$ **OR** $PH=QH$ $\sqrt{(2-1)^2+(3-x)^2}=\sqrt{(4-1)^2+(9-x)^2}$ using length $1+9-6x+x^2=9+81-18x+x^2$ expansion $12x=80$ $x=\frac{20}{3}$ $H=(\frac{20}{3},1)$
4i.	$m_{PQ}=\frac{6-2}{7-(-5)}=\frac{1}{3}$ $y-3=\frac{1}{3}[x-(-2)]$ $y=\frac{1}{3}x+3\frac{2}{3}$
ii.	Midpoint of $PQ=\left(\frac{-5+7}{2},\frac{2+6}{2}\right)=(1,4)$ Gradient of perpendicular bisector $=-3$ $y-4=-3(x-1)$ $y=-3x+7$
iii.	$PQ=\sqrt{(7-(-5))^2+(6-2)^2}=4\sqrt{10}$ units Area $=\frac{1}{2}(4\sqrt{10})\sqrt{10}$ $=20$ units^2