50 multiple-choice questions

Question 1 (Level 1) — *Reading coordinates*
What are the coordinates of a point that is 3 units to the right and 4 units up from the origin?

(A) $(3, 4)$

(B) $(4, 3)$

(C) $(-3, 4)$

(D) $(3, -4)$

Question 2 (Level 1) — *Identifying the origin*
What are the coordinates of the origin?

(A) $(0, 0)$

(B) $(1, 1)$

(C) $(0, 1)$

(D) $(1, 0)$

Question 3 (Level 1) — *Quadrant identification*
In which quadrant does the point $(-2, 5)$ lie?

(A) Quadrant II

(B) Quadrant I

(C) Quadrant III

(D) Quadrant IV

Question 4 (Level 1) — *Plotting on the x-axis*
A point lies on the x-axis at $x = 5$. What are its coordinates?

(A) $(5, 0)$

(B) $(0, 5)$

(C) $(5, 5)$

(D) $(5, 1)$

Question 5 (Level 1) — *Horizontal or vertical line*
What is the equation of a horizontal line passing through $(0, 3)$?

(A) $y = 3$

(B) $x = 3$

(C) $y = 3x$

(D) $x + y = 3$

Question 6 (Level 1) — *Reading a y-intercept*
The line $y = 2x + 5$ crosses the y-axis at which point?

(A) $(0, 5)$

(B) $(5, 0)$

(C) $(0, 2)$

(D) $(2, 5)$

Question 7 (Level 1) — *Identifying gradient from equation*
What is the gradient (slope) of $y = 3x + 1$?

(A) 3

(B) 1

(C) $\frac{1}{3}$

(D) -3

Question 8 (Level 1) — *Substituting into a linear equation*
Does the point $(2, 7)$ lie on the line $y = 3x + 1$?

(A) Yes

(B) No

(C) Only if $x > 0$

(D) Cannot be determined

Question 9 (Level 1) — *Vertical line equation*
What is the equation of a vertical line passing through $(4, 0)$?

(A) $x = 4$

(B) $y = 4$

(C) $y = 4x$

(D) $x + y = 4$

Question 10 (Level 1) — *Positive or negative gradient*
A line goes downhill from left to right. Is its gradient positive or negative?

(A) Negative

(B) Positive

(C) Zero

(D) Undefined

Question 11 (Level 2) — *Gradient from two points*
Find the gradient of the line through $(1, 2)$ and $(4, 8)$.

(A) 2

(B) 3

(C) $\frac{3}{2}$

(D) 6

Question 12 (Level 2) — *Finding the x-intercept*
Find the x-intercept of the line $y = 2x - 6$.

(A) $(3, 0)$

(B) $(0, -6)$

(C) $(-3, 0)$

(D) $(6, 0)$

Question 13 (Level 2) — *Midpoint of a segment*
Find the midpoint of $(2, 4)$ and $(6, 10)$.

(A) $(4, 7)$

(B) $(4, 6)$

(C) $(3, 7)$

(D) $(8, 14)$

Question 14 (Level 2) — *Distance between two points*
Find the distance between $(1, 1)$ and $(4, 5)$.

(A) 5

(B) 7

(C) $\sqrt{7}$

(D) 25

Question 15 (Level 2) — *Equation from gradient and y-intercept*
Write the equation of a line with gradient -2 and y-intercept 4.

(A) $y = -2x + 4$

(B) $y = 2x + 4$

(C) $y = -2x - 4$

(D) $y = 4x - 2$

Question 16 (Level 2) — *Parallel line gradient*
A line is parallel to $y = 5x - 3$. What is its gradient?

(A) 5

(B) -5

(C) $\frac{1}{5}$

(D) $-\frac{1}{5}$

Question 17 (Level 2) — *Table of values*
For $y = x + 3$, when $x = -1$, what is y?

(A) 2

(B) 4

(C) -4

(D) 3

Question 18 (Level 2) — *Gradient of a horizontal line*
What is the gradient of the line $y = 7$?

(A) 0

(B) 7

(C) Undefined

(D) 1

Question 19 (Level 2) — *Rearranging to gradient-intercept form*
Write $2x + y = 8$ in the form $y = mx + c$.

(A) $y = -2x + 8$

(B) $y = 2x + 8$

(C) $y = 2x - 8$

(D) $y = -2x - 8$

Question 20 (Level 2) — *Interpreting gradient*
A line has gradient $\frac{3}{4}$. For every 4 units moved to the right, how many units does the line rise?

(A) 3

(B) 4

(C) $\frac{3}{4}$

(D) 7

Question 21 (Level 3) — *Perpendicular gradient*
A line has gradient 2. What is the gradient of a line perpendicular to it?

(A) $-\frac{1}{2}$

(B) $\frac{1}{2}$

(C) -2

(D) 2

Question 22 (Level 3) — *Point-gradient form*
Find the equation of the line through $(3, 1)$ with gradient 2.

(A) $y = 2x - 5$

(B) $y = 2x + 5$

(C) $y = 2x - 1$

(D) $y = 2x + 1$

Question 23 (Level 3) — *Equation through two points*
Find the equation of the line through $(0, 4)$ and $(2, 0)$.

(A) $y = -2x + 4$

(B) $y = 2x + 4$

(C) $y = -2x - 4$

(D) $y = -\frac{1}{2}x + 4$

Question 24 (Level 3) — *Distance formula with surds*
Find the distance between $(-1, 3)$ and $(2, -1)$.

(A) 5

(B) $\sqrt{7}$

(C) 7

(D) $\sqrt{13}$

Question 25 (Level 3) — *Intercept form*
A line has x-intercept $(6, 0)$ and y-intercept $(0, 3)$. Write its equation in the form $\frac{x}{a} + \frac{y}{b} = 1$.

(A) $x + 2y = 6$

(B) $2x + y = 6$

(C) $x + 2y = 3$

(D) $3x + 6y = 1$

Question 26 (Level 3) — *Intersection of two lines*
Find the point of intersection of $y = x + 1$ and $y = -x + 5$.

(A) $(2, 3)$

(B) $(3, 2)$

(C) $(1, 4)$

(D) $(4, 1)$

Question 27 (Level 3) — *Collinear points*
Are the points $(1, 2)$, $(3, 6)$, and $(5, 10)$ collinear?

(A) Yes, the gradients are equal

(B) No, the gradients are different

(C) Yes, but only if they are on the x-axis

(D) Cannot be determined

Question 28 (Level 3) — *General form of a line*
Write $y = \frac{2}{3}x - 4$ in general form $ax + by + c = 0$ with integer coefficients.

(A) $2x - 3y - 12 = 0$

(B) $2x + 3y - 12 = 0$

(C) $3x - 2y - 12 = 0$

(D) $2x - 3y + 12 = 0$

Question 29 (Level 3) — *Midpoint application*
If $M(3, 5)$ is the midpoint of $A(1, 2)$ and B, find B.

(A) $(5, 8)$

(B) $(2, 3.5)$

(C) $(4, 7)$

(D) $(6, 10)$

Question 30 (Level 3) — *Parallel line through a point*
Find the equation of the line through $(1, 4)$ parallel to $y = 3x - 2$.

(A) $y = 3x + 1$

(B) $y = 3x - 2$

(C) $y = 3x + 4$

(D) $y = -\dfrac{1}{3}x + 1$

Question 31 (Level 4) — *Perpendicular bisector*
Find the equation of the perpendicular bisector of the segment from $(0, 0)$ to $(4, 2)$.

(A) $y = -2x + 5$

(B) $y = 2x + 5$

(C) $y = -\dfrac{1}{2}x + 2$

(D) $y = -2x + 1$

Question 32 (Level 4) — *Distance from a point to a line*
Find the distance from the point $(3, 4)$ to the line $3x + 4y - 5 = 0$.

(A) 4

(B) $\dfrac{20}{7}$

(C) 5

(D) $\dfrac{4}{5}$

Question 33 (Level 4) — *Angle of inclination*
A line has gradient 1. What angle does it make with the positive x-axis?

(A) 45ř

(B) 30ř

(C) 60ř

(D) 90ř

Question 34 (Level 4) — *Dividing a segment in a ratio*
Find the point that divides the segment from $A(1, 2)$ to $B(7, 8)$ in the ratio $1 : 2$.

(A) $(3, 4)$

(B) $(4, 5)$

(C) $(5, 6)$

(D) $(3, 5)$

Question 35 (Level 4) — *Line through intersection*
Find the equation of the line through the intersection of $x + y = 4$ and $x - y = 2$ that passes through the origin.

(A) $y = \frac{1}{3}x$

(B) $y = 3x$

(C) $y = x - 2$

(D) $y = \frac{x}{2}$

Question 36 (Level 4) — *Area of a triangle from vertices*
Find the area of the triangle with vertices $(0, 0)$, $(6, 0)$, and $(3, 4)$.

(A) 12

(B) 24

(C) 8

(D) 6

Question 37 (Level 4) — *Perpendicular line through a point*
Find the equation of the line perpendicular to $2x + 3y = 6$ passing through $(0, 0)$.

(A) $y = \frac{3}{2}x$

(B) $y = -\frac{3}{2}x$

(C) $y = \frac{2}{3}x$

(D) $y = -\frac{2}{3}x$

Question 38 (Level 4) — *Gradient as rate of change*
Water flows into a tank at a constant rate. After 2 hours, the tank has 50 L; after 5 hours, 110 L. What is the rate of flow in L/hr?

(A) 20 L/hr

(B) 25 L/hr

(C) 22 L/hr

(D) 30 L/hr

Question 39 (Level 4) — *Equation of a median*
Triangle ABC has $A(0,0)$, $B(6,0)$, $C(2,4)$. Find the equation of the median from A to the midpoint of BC.

(A) $y = \frac{1}{2}x$

(B) $y = 2x$

(C) $y = \frac{2}{3}x$

(D) $y = x$

Question 40 (Level 4) — *Concurrent lines*
Do the lines $x + y = 4$, $2x - y = 2$, and $x - 2y = -2$ all pass through the same point?

(A) Yes, at $(2, 2)$

(B) No

(C) Yes, at $(4, 0)$

(D) Yes, at $(1, 3)$

Question 41 (Level 5) — *Shortest distance from point to line*
Find the shortest distance from $(1, 2)$ to the line $y = 3x + 1$.

(A) $\frac{\sqrt{10}}{5}$

(B) $\frac{2}{\sqrt{10}}$

(C) $\sqrt{10}$

(D) $\frac{2}{3}$

Question 42 (Level 5) — *Locus — equidistant from two points*
Find the equation of the locus of points equidistant from $(0, 0)$ and $(4, 6)$.

(A) $2x + 3y = 13$

(B) $4x + 6y = 13$

(C) $2x + 3y = 26$

(D) $x + y = 5$

Question 43 (Level 5) — *Angle between two lines*
Find the acute angle between $y = 2x + 1$ and $y = -3x + 4$.

(A) 45ř

(B) 90ř

(C) 60ř

(D) 30ř

Question 44 (Level 5) — *Family of lines*
For what value of k does the line $(k + 1)x + ky = 2k + 3$ pass through $(1, 1)$?

(A) No value of k

(B) $k = 1$

(C) $k = 2$

(D) $k = -1$

Question 45 (Level 5) — *Reflection of a point in a line*
Find the reflection of the point $(4, 0)$ in the line $y = x$.

(A) $(0, 4)$

(B) $(-4, 0)$

(C) $(4, 4)$

(D) $(0, -4)$

Question 46 (Level 5) — *Area enclosed by lines*
Find the area of the region enclosed by $y = 0$, $x = 0$, and $2x + 3y = 12$.

(A) 12

(B) 24

(C) 6

(D) 10

Question 47 (Level 5) — *Parameterised line*
A line is given by $x = 1 + 2t$, $y = 3 - t$. Find its gradient.

(A) $-\dfrac{1}{2}$

(B) 2

(C) -2

(D) $\dfrac{1}{2}$

Question 48 (Level 5) — *Foot of perpendicular*
Find the foot of the perpendicular from $(5, 7)$ to the line $y = x + 2$.

(A) $(5, 7)$ (the point is on the line)

(B) $(3, 5)$

(C) $(4, 6)$

(D) $(6, 8)$

Question 49 (Level 5) — *Circle and tangent line*
The circle $x^2 + y^2 = 25$ has a tangent at $(3, 4)$. Find the equation of this tangent.

(A) $3x + 4y = 25$

(B) $4x + 3y = 25$

(C) $3x - 4y = 25$

(D) $4x - 3y = 0$

Question 50 (Level 5) — *Circumcentre of a triangle*
Find the circumcentre of the triangle with vertices $A(0, 0)$, $B(6, 0)$, $C(0, 8)$.

(A) $(3, 4)$

(B) $(2, 3)$

(C) $(3, 3)$

(D) $(0, 0)$

Solutions

Q1: (A)
The point is $(3, 4)$.
Q2: (A)
The origin is $(0, 0)$.
Q3: (A)
$x < 0$ and $y > 0$, so the point lies in Quadrant II.
Q4: (A)
The point is $(5, 0)$.
Q5: (A)
The equation is $y = 3$.
Q6: (A)
When $x = 0$: $y = 5$. The y-intercept is $(0, 5)$.
Q7: (A)
The gradient is $m = 3$.
Q8: (A)
$y = 3(2) + 1 = 7$. Yes, the point lies on the line.
Q9: (A)
The equation is $x = 4$.
Q10: (A)
The gradient is negative.
Q11: (A)
$m = \dfrac{8-2}{4-1} = \dfrac{6}{3} = 2$.
Q12: (A)
$0 = 2x - 6 \Rightarrow x = 3$. The x-intercept is $(3, 0)$.
Q13: (A)
Midpoint $= \left(\dfrac{2+6}{2}, \dfrac{4+10}{2}\right) = (4, 7)$.
Q14: (A)
$d = \sqrt{(4-1)^2 + (5-1)^2} = \sqrt{9+16} = \sqrt{25} = 5$.
Q15: (A)
$y = -2x + 4$.
Q16: (A)
The gradient is 5.
Q17: (A)
$y = -1 + 3 = 2$.
Q18: (A)
The gradient is 0.
Q19: (A)
$y = -2x + 8$.
Q20: (A)
Rise $= 3$ units.
Q21: (A)
$m_2 = -\dfrac{1}{2}$.
Q22: (A)
$y - 1 = 2(x - 3) \Rightarrow y = 2x - 5$.
Q23: (A)
$m = \dfrac{0-4}{2-0} = -2$. y-intercept is 4. So $y = -2x + 4$.

Q24: (A)
$d = \sqrt{9+16} = \sqrt{25} = 5$.
Q25: (A)
$\frac{x}{6} + \frac{y}{3} = 1$, which simplifies to $x + 2y = 6$.
Q26: (A)
$2x = 4 \Rightarrow x = 2$, $y = 3$. Intersection: $(2, 3)$.
Q27: (A)
$m_{12} = \frac{6-2}{3-1} = 2$. $m_{23} = \frac{10-6}{5-3} = 2$. Same gradient, so yes, they are collinear.
Q28: (A)
$3y = 2x - 12 \Rightarrow 2x - 3y - 12 = 0$.
Q29: (A)
$x_B = 5$ and $y_B = 8$. So $B = (5, 8)$.
Q30: (A)
$y - 4 = 3(x - 1) \Rightarrow y = 3x + 1$.
Q31: (A)
Midpoint $= (2, 1)$. Gradient of segment $= \frac{1}{2}$. Perp gradient $= -2$. Equation: $y - 1 = -2(x - 2) \Rightarrow y = -2x + 5$.
Q32: (A)
$d = \frac{|3(3) + 4(4) - 5|}{\sqrt{9+16}} = \frac{|9 + 16 - 5|}{5} = \frac{20}{5} = 4$.
Q33: (A)
$\tan\theta = 1 \Rightarrow \theta = 45$ř.
Q34: (A)
$P = \left(\frac{7+2}{3}, \frac{8+4}{3}\right) = (3, 4)$.
Q35: (A)
Adding: $2x = 6 \Rightarrow x = 3, y = 1$. Intersection: $(3, 1)$. Line through origin and $(3, 1)$: $y = \frac{1}{3}x$.
Q36: (A)
Area $= \frac{1}{2}|0(0-4) + 6(4-0) + 3(0-0)| = \frac{1}{2}|24| = 12$.
Q37: (A)
Perpendicular gradient $= \frac{3}{2}$. Through origin: $y = \frac{3}{2}x$.
Q38: (A)
Rate $= \frac{110 - 50}{5 - 2} = \frac{60}{3} = 20$ L/hr.
Q39: (A)
Midpoint of $BC = (4, 2)$. Gradient from $A(0, 0)$ to $(4, 2)$ is $\frac{1}{2}$. Equation: $y = \frac{1}{2}x$.
Q40: (A)
From $x + y = 4$ and $2x - y = 2$: $3x = 6 \Rightarrow x = 2, y = 2$. Check: $2 - 4 = -2$ ✓. Yes, they are concurrent at $(2, 2)$.
Q41: (A)
$d = \frac{|3(1) - 2 + 1|}{\sqrt{9+1}} = \frac{2}{\sqrt{10}} = \frac{2\sqrt{10}}{10} = \frac{\sqrt{10}}{5}$.
Q42: (A)
$x^2 + y^2 = x^2 - 8x + 16 + y^2 - 12y + 36 \Rightarrow 8x + 12y = 52 \Rightarrow 2x + 3y = 13$.
Q43: (A)

$\tan\alpha = \left|\dfrac{2-(-3)}{1+2(-3)}\right| = \left|\dfrac{5}{-5}\right| = 1$. So $\alpha = 45$ř.

Q44: (A)

$(k+1)(1)+k(1) = 2k+3 \Rightarrow 2k+1 = 2k+3 \Rightarrow 1 = 3$, which is false. So no value of k works.

Q45: (A)

The reflection of $(4,0)$ in $y = x$ is $(0,4)$.

Q46: (A)

x-intercept: $(6,0)$. y-intercept: $(0,4)$. Area $= \dfrac{1}{2}(6)(4) = 12$.

Q47: (A)

$\dfrac{dx}{dt} = 2$, $\dfrac{dy}{dt} = -1$. Gradient $= \dfrac{-1}{2} = -\dfrac{1}{2}$.

Q48: (A)

Perpendicular: $y-7 = -1(x-5) \Rightarrow y = -x+12$. Intersection with $y = x+2$: $x+2 = -x+12 \Rightarrow x = 5, y = 7$. Wait — let me recompute: $2x = 10 \Rightarrow x = 5, y = 7$. The point $(5,7)$ lies on $y = x+2$ since $7 = 5+2$. The foot is $(5,7)$ itself.

Q49: (A)

Radius gradient $= \dfrac{4}{3}$. Tangent gradient $= -\dfrac{3}{4}$. $y-4 = -\dfrac{3}{4}(x-3) \Rightarrow 3x+4y = 25$.

Q50: (A)

Since $\angle A = 90$ř, the circumcentre is the midpoint of $BC = \left(\dfrac{6+0}{2}, \dfrac{0+8}{2}\right) = (3,4)$.