Unit 8 · Coordinate Geometry

ANSWER KEY · FOR TEACHERS

Full marks 31

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. parallel
2. perpendicular
3. perpendicular bisector
4. concentric
5. parabola
6. hyperbola

Each carries 0.5 mark. **K · 3**

2 Label the cone

1. Vertex
2. Axis (height)
3. Radius
4. Generator (slant height)

Each carries 0.5 mark. **K · 2**

3 Multiple choice

i. **b.** $\frac{x}{a} + \frac{y}{b} = 1$ **K · 1**

The line cuts the X-axis at a and the Y-axis at b: the double-intercept form.

ii. **d.** $-\frac{5}{2}$ **K · 1**

The line's slope is $-\frac{2}{-5} = \frac{2}{5}$; a perpendicular line's slope is its negative reciprocal, $-\frac{5}{2}$.

iii. **a.** 120° **U · 1**

The first line has slope $\sqrt{3}$, so it makes 60° with the level line $y = -10$; the other angle is 120°.

iv. **d.** hyperbola **U · 1**

$\theta < \alpha$: the plane cuts both nappes, a hyperbola.

v. **d.** center (2, 4), radius $\sqrt{65}$ units **A · 1**

$g = -2, f = -4$: center (2, 4); $r = \sqrt{4 + 16 + 45} = \sqrt{65}$.

4 Very short answers

a. **MARKING SCHEME** **K · 1**

✓ $(x - h)^2 + (y - k)^2 = r^2$ written.

b. **MARKING SCHEME** **K · 1**

✓ 14 units.

c. **MARKING SCHEME** **U · 1**

✓ Substituted, $0 = 0$: yes.

5 Short answers

a. **MARKING SCHEME** **A · 2**

✓ Slope of the join, -4.

✓ $4x + y - 13 = 0$.

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b. MARKING SCHEME U · 2

✓ Center $(3, -4)$, since the center is $(-g, -f)$.

✓ Radius 6, since $r = \sqrt{g^2 + f^2 - c}$ with $c = -11$.

c. MARKING SCHEME A · 2

✓ The slopes $-\frac{a}{10}$ and $\frac{1}{2}$, set equal.

✓ $a = -5$.

d. MARKING SCHEME A · 2

✓ $(x - 2)(x + 3) + (y + 4)(y - 7) = 0$.

✓ $x^2 + y^2 + x - 3y - 34 = 0$.

6 Long answers

a. ANSWER A · 4

i. $M = \left(\frac{2 - 6}{2}, \frac{8 + 2}{2}\right) = (-2, 5)$.

ii. $AM = \sqrt{(-4)^2 + 3^2} = 5$ units.

iii. Slope $\frac{5 - 2}{-2 - 2} = -\frac{3}{4}$; $y - 2 = -\frac{3}{4}(x - 2)$, so $4y - 8 = -3x + 6$: $\mathbf{3x + 4y = 14}$.

MARKING SCHEME

✓ $M(-2, 5)$.

✓ $AM = 5$ units.

✓ Slope of $AM = -\frac{3}{4}$.

✓ $3x + 4y = 14$.

b. ANSWER A · 4

i. $(h - 4)^2 + (k - 1)^2 = (h - 6)^2 + (k - 5)^2$, so $-8h - 2k + 17 = -12h - 10k + 61$, $4h + 8k = 44$: $h + 2k = 11$.

ii. With $4h + k = 16$: $h = 3$, $k = 4$. $r = \sqrt{(3 - 4)^2 + (4 - 1)^2} = \sqrt{10}$.

iii. $(x - 3)^2 + (y - 4)^2 = 10$: $\mathbf{x^2 + y^2 - 6x - 8y + 15 = 0}$.

MARKING SCHEME

✓ $h + 2k = 11$ shown from $CP^2 = CQ^2$.

✓ Center $(3, 4)$.

✓ Radius $\sqrt{10}$.

✓ $x^2 + y^2 - 6x - 8y + 15 = 0$.

7 Think

ANSWER HA · 2

$x^2 + y^2 = 25$ and $(x - 6)^2 + y^2 = 25$, that is $x^2 + y^2 - 12x + 36 = 25$. Subtracting, $12x - 36 = 0$: the start is on the line $x = 3$. Then $9 + y^2 = 25$, $y = \pm 4$: two places, $(3, 4)$ and $(3, -4)$. The two circles cross twice, so a third station's circle is needed to decide which one.

MARKING SCHEME

✓ The two equations subtracted to give $x = 3$, and the two places $(3, 4)$ and $(3, -4)$.

✓ Two circles meet in two points, so a third circle is needed to choose one.

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8 Activity: Points on a circle

(not marked)

WHAT STUDENTS SHOULD FIND

The circle passes exactly through 12 grid points: $(\pm5, 0)$, $(0, \pm5)$, $(\pm3, \pm4)$ and $(\pm4, \pm3)$. For each, $x^2 + y^2 = 25$: $9 + 16$, $16 + 9$ or $25 + 0$. $(2, 4)$ gives $4 + 16 = 20$, less than 25: it is inside the circle, and the drawing shows it inside.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	9	5	15	2	**31**

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