Coordinate Geometry: Perpendicular Bisectors & Area

Practice Worksheet

Reference: Edexcel IGCSE 4MA1/Higher Tier/Paper 1H/Nov 2021/Q20

I Do

The straight line **L** passes through point *A* (-6, 2) and point *B* (5, 3)
The straight line **M** is perpendicular to **L** and passes through the midpoint of *A* and *B*.
The line **M** intersects the line $x = -1$ at point *C*.

Calculate the area of triangle *ABC*.

(Total for this question is 7 marks)

We Do

The straight line **L** passes through point *A* (-4, 1) and point *B* (4, 5)
The straight line **M** is perpendicular to **L** and passes through the midpoint of *A* and *B*.
The line **M** intersects the line $x = 2$ at point *C*.

Calculate the area of triangle *ABC*.

(Total for this question is 5 marks)

You Do

The straight line **L** passes through point *A* (-2, -3) and point *B* (6, 1)
The straight line **M** is perpendicular to **L** and passes through the midpoint of *A* and *B*.
The line **M** intersects the line $x = -1$ at point *C*.

Calculate the area of triangle *ABC*.

(Total for this question is 5 marks)

Challenge 1

The straight line **L** passes through point *A* (-5, 4) and point *B* (3, 8)
The straight line **M** is perpendicular to **L** and passes through the midpoint of *A* and *B*.
The line **M** intersects the *y*-axis at point *C*.

Calculate the area of triangle *ABC*.

(Total for this question is 5 marks)

Challenge 2

The straight line **L** passes through point *A* (1, 2) and point *B* (5, 0)
The straight line **M** is perpendicular to **L** and passes through the midpoint of *A* and *B*.
The line **M** intersects the line $y = x$ at point *C*.

Calculate the area of triangle *ABC*.

(Total for this question is 5 marks)

Challenge 3

The straight line **L** passes through point *A* (1, 1) and point *B* (3, 5)
The straight line **M** is perpendicular to **L** and passes through the midpoint of *A* and *B*.
The line **M** intersects the *x*-axis at point *C*.

Calculate the area of triangle *ABC*.

(Total for this question is 5 marks)

Answers & Worked Solutions

I Do

1. Find the midpoint of A and B: $((-6 + 5)/2 , (2 + 3)/2) = (-0.5, 2.5)$
2. Find the gradient of line L: $m = (3 - 2) / (5 - -6) = 1/11$
3. Find the gradient of perpendicular line M: Perpendicular gradient $= -11$
4. Find the equation of line M: $y - 2.5 = -11(x - -0.5) \rightarrow y = -11x - 3$
5. Find coordinates of C (intersect at $x = -1$): $y = -11(-1) - 3 = 8$. So C is (-1, 8)
6. Calculate area of triangle ABC: Using base and height or the Shoelace formula $= 0.5 \times |(-18 + 40 - 2) - (10 - 3 - 48)| = 30.5$

Answer: 30.5

We Do

1. Find the midpoint of A and B: $((-4 + 4)/2 , (1 + 5)/2) = (0, 3)$
2. Find the gradient of line L: $m = (5 - 1) / (4 - -4) = 4/8 = 1/2$
3. Find the gradient of perpendicular line M: Perpendicular gradient $= -2$
4. Find the equation of line M: $y - 3 = -2(x - 0) \rightarrow y = -2x + 3$
5. Find coordinates of C (intersect at $x = 2$): $y = -2(2) + 3 = -1$. So C is (2, -1)
6. Calculate area of triangle ABC: Using base and height or the Shoelace formula $= 0.5 \times |(-20 - 4 + 2) - (4 + 10 + 4)| = 20$

Answer: 20

Answers & Worked Solutions

You Do

1. Find the midpoint of A and B: $((-2 + 6)/2 , (-3 + 1)/2) = (2, -1)$

2. Find the gradient of line L: $m = (1 - -3) / (6 - -2) = 4/8 = 1/2$

3. Find the gradient of perpendicular line M: Perpendicular gradient $= -2$

4. Find the equation of line M: $y - -1 = -2(x - 2) \rightarrow y = -2x + 3$

5. Find coordinates of C (intersect at $x = -1$): $y = -2(-1) + 3 = 5$. So C is (-1, 5)

6. Calculate area of triangle ABC: Using base and height or the Shoelace formula $= 0.5 \times |(-2 + 30 + 3) - (-18 - 1 - 10)| = 30$

Answer: 30

Challenge 1

1. Find the midpoint of A and B: $((-5 + 3)/2 , (4 + 8)/2) = (-1, 6)$

2. Find the gradient of line L: $m = (8 - 4) / (3 - -5) = 4/8 = 1/2$

3. Find the gradient of perpendicular line M: Perpendicular gradient $= -2$

4. Find the equation of line M: $y - 6 = -2(x - -1) \rightarrow y = -2x + 4$

5. Find coordinates of C (intersect at the y-axis where $x = 0$): $y = -2(0) + 4 = 4$. So C is (0, 4)

6. Calculate area of triangle ABC: Using base and height or the Shoelace formula $= 0.5 \times |(-40 + 12 + 0) - (12 + 0 - 20)| = 10$

Answer: 10

Answers & Worked Solutions

Challenge 2

1. Find the midpoint of A and B: $((1 + 5)/2 , (2 + 0)/2) = (3, 1)$

2. Find the gradient of line L: $m = (0 - 2) / (5 - 1) = -2/4 = -1/2$

3. Find the gradient of perpendicular line M: Perpendicular gradient $= 2$

4. Find the equation of line M: $y - 1 = 2(x - 3) \rightarrow y = 2x - 5$

5. Find coordinates of C (intersect at $y = x$): $x = 2x - 5 \rightarrow x = 5$, $y = 5$. So C is (5, 5)

6. Calculate area of triangle ABC: Using base and height or the Shoelace formula $= 0.5 \times |(0 + 25 + 10) - (10 + 0 + 5)| = 10$

Answer: 10

Challenge 3

1. Find the midpoint of A and B: $((1 + 3)/2 , (1 + 5)/2) = (2, 3)$

2. Find the gradient of line L: $m = (5 - 1) / (3 - 1) = 4/2 = 2$

3. Find the gradient of perpendicular line M: Perpendicular gradient $= -1/2$

4. Find the equation of line M: $y - 3 = -0.5(x - 2) \rightarrow y = -0.5x + 4$

5. Find coordinates of C (intersect at the x-axis where $y = 0$): $0 = -0.5x + 4 \rightarrow x = 8$. So C is (8, 0)

6. Calculate area of triangle ABC: Using base and height or the Shoelace formula $= 0.5 \times |(5 + 0 + 8) - (3 + 40 + 0)| = 15$

Answer: 15