5.14 Gradient of a Line: 1-hour Pack

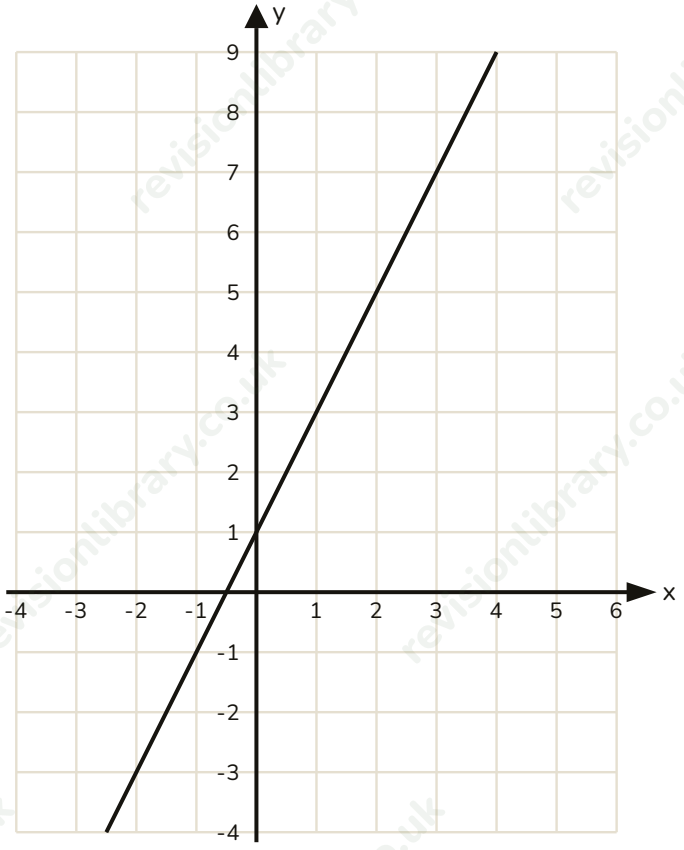
EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 The diagram shows a straight line drawn on a grid. Work out the gradient of the line.



(Total for Question 1 is 2 marks)

2 Find the gradient of the straight line joining the points (0, 7) and (4, -1).

(Total for Question 2 is 1 mark)

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3 Find the gradient of the straight line joining the points (-3, -4) and (1, -4).

(Total for Question 3 is 1 mark)

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4 Find the gradient of the straight line joining the points (5, -2) and (5, 6).

(Total for Question 4 is 1 mark)

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5 Write down the gradient of the line with equation y = -4x - 9.

(Total for Question 5 is 1 mark)

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6 Work out the gradient of the line joining the points A(2, -1) and B(5, 5).

(a) Show your working and write the gradient of AB. **(2)**

(Total for Question 6 is 2 marks)

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7 Line L1 has equation y = 4x - 3. Line L2 is parallel to L1 and passes through the point (0, 5). Find an equation for L2.

(Total for Question 7 is 3 marks)

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8 Find an equation of the straight line that passes through the points (2, 1) and (6, 9). Give your answer in the form $y = mx + c$.

(Total for Question 8 is 4 marks)

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9 The points A(-2, 1), B(1, 5) and C(7, 13) are plotted. Show whether A, B and C lie on the same straight line.

(Total for Question 9 is 3 marks)

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10 Rearrange $5x - 2y = 12$ into the form $y = mx + c$ and state the gradient.

(Total for Question 10 is 2 marks)

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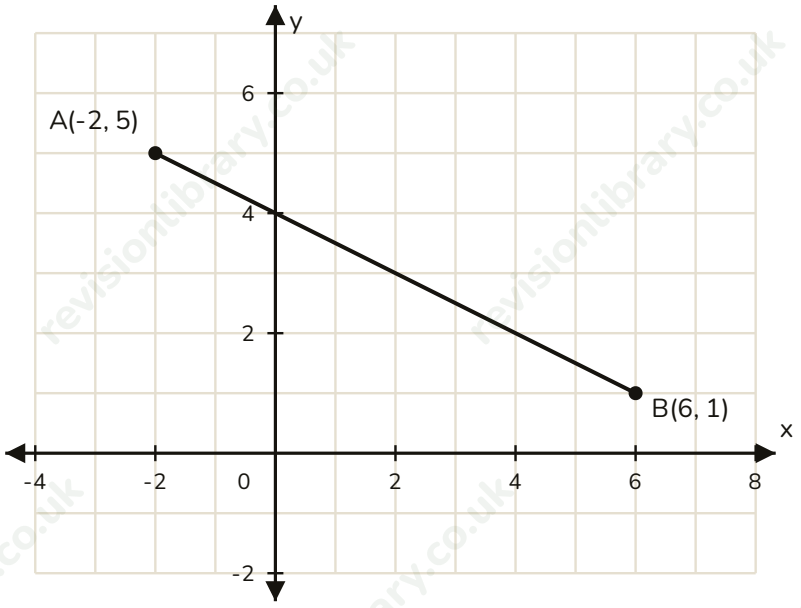
11 The graph of $y = kx + 1$ passes through the point (4, 9).

(a) Find k. **(1)**

(b) A second line $y = mx - 3$ meets the first line at (4, 9). Find m and state whether the two lines are perpendicular, parallel or neither. Give a brief reason. **(4)**

(Total for Question 11 is 5 marks)

12 The points A(-2, 5) and B(6, 1) are joined to form a line segment. Find an equation of the perpendicular bisector of AB. Give your answer in the form $y = mx + c$.



(Total for Question 12 is 5 marks)

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13 Line r has equation $2x - y = 5$. Line s passes through (1, 4) and has gradient m.

(a) Find the gradient of r and hence the gradient m of the line perpendicular to r. **(2)**

.....

(b) Find the equation of the line s that is perpendicular to r and passes through (1, 4). **(2)**

.....

(c) Another line t passes through the intersection point of r and s and has gradient 4. **(2)**
Find the coordinates of the intersection of r and t.

.....

(Total for Question 13 is 6 marks)

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14 Line L1 passes through the points (1, 3) and (3, 9). Line L2 passes through the points (2, 10) and (5, 1). Determine, showing your working, whether L1 and L2 are perpendicular.

(Total for Question 14 is 4 marks)

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15 Consider the family of lines with equation $y = mx + 2$ that meet the parabola $y = x^2$ at exactly one point (i.e. tangent lines).

(a) Write down the quadratic equation in standard form obtained by equating $mx + 2 = x^2$. **(2)**

(b) Use the discriminant to find m for which the quadratic has exactly one solution (tangent lines). Give your answers in exact form. **(4)**

(Total for Question 15 is 6 marks)

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Mark scheme · 5.14 Gradient of a Line: 1-hour Pack

Question 1

correct method to find rise and run using two points on the line, e.g. sight of 8 and 4, or 8/4 **M1**

2 cao **A1**

Answer: Gradient = 2

Question 2

-2 cao **B1**

Answer: -2

Question 3

0 cao **B1**

Answer: 0

Question 4

undefined (the line is vertical), oe **B1**

Answer: Undefined (vertical line)

Question 5

-4 cao **B1**

Answer: -4

Question 6

(a) difference in y over difference in x: (5 - (-1)) / (5 - 2) or equivalent method **M1**

(a) 2 cao **A1**

(a) Answer: 2

Question 7

gradient of L2 = 4, since parallel lines have equal gradients **B1**

uses gradient 4 with the point (0, 5), e.g. y = 4x + c, 5 = 4(0) + c **M1**

y = 4x + 5 cao **A1**

Answer: y = 4x + 5

Question 8

(9 - 1) / (6 - 2) oe **M1**

gradient = 2 **A1**

substitutes a point into y = 2x + c, e.g. 1 = 2(2) + c, or uses y - 1 = 2(x - 2) (dep) **M1**

y = 2x - 3 cao **A1**

Answer: y = 2x - 3

Question 9

gradient of AB found **M1**

gradient of BC found **M1**

Yes, both gradients are 4/3 **A1**

Answer: Yes, both gradients are 4/3

Question 10

rearranges to isolate y correctly, oe **M1**

5/2 oe (accept 2.5) cao **A1**

Answer: 5/2

Question 11

(a) k = 2 cao **B1**

(a) Answer: 2

(b) use point (4,9) in y = mx - 3 to find m (method) **M1**

(b) m = 3 cao **A1**

(b) compare gradients to test for parallel/perpendicular (method) **M1**

(b) state: neither (gradients 2 and 3 are not equal and not negative reciprocals) oe **B1**

(b) Answer: m = 3; neither

Question 12

finds midpoint of AB, e.g. ((-2 + 6)/2, (5 + 1)/2) oe **M1**

midpoint = (2, 3) **A1**

finds gradient of AB = (1 - 5) / (6 - (-2)) = -1/2 oe **M1**

uses perpendicular gradient = 2 (negative reciprocal, ft their gradient) with the midpoint (dep) **M1**

y = 2x - 1 cao **A1**

Answer: y = 2x - 1

Question 13

(a) rearrange 2x - y = 5 to y = 2x - 5 to identify gradient 2 **M1**

(a) m = -1/2 cao **A1**

(a) Answer: m = -1/2

(b) use y = mx + c with m = -1/2 and substitute (1,4) to find c **M1**

(b) y = -1/2 x + 9/2 cao **A1**

(b) Answer: y = -1/2 x + 9/2

(c) find intersection of r and s by solving their equations to get the point (method) **M1**

(c) intersection (19/5, 13/5) cao **A1**

(c) Answer: (19/5, 13/5)

Question 14

gradient of L1 = (9 - 3)/(3 - 1) = 3 **M1**

gradient of L2 = (1 - 10)/(5 - 2) = -3 **M1**

tests the product of the two gradients, ft their gradients **M1**

correct conclusion: not perpendicular, since 3 x (-3) = -9, not -1, cao **A1**

Answer: L1 and L2 are not perpendicular

Question 15

(a) form x^2 - mx - 2 = 0 or equivalent correct rearrangement **M1**

(a) x^2 - mx - 2 = 0 cao **A1**

(a) Answer: x^2 - mx - 2 = 0

(b) use discriminant b^2 - 4ac = 0 with a=1, b=-m, c=-2 leading to m^2 - 4(1)(-2) = 0 **M1**

(b) correct algebra to obtain m^2 + 8 = 0 then solve or equivalent **M1**

(b) state there are no real m (m^2 + 8 = 0 gives imaginary m) oe **A1**

(b) conclude: no real tangent lines of form y = mx + 2 to y = x^2 (cao) or state m = $\pm 2\sqrt{2}\,i$ (if complex allowed) oe **B1**

(b) Answer: No real values of m (m^2 + 8 = 0 so m = $\pm 2\sqrt{2}\,i$).

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