# **Topic 5**

# **Straight Line Graphs**

# Bronze, Silver, Gold

# Worksheets for

# AS Level Mathematics

# Teacher Notes

These Bronze, Silver and Gold worksheets are designed to be used either straight after the content has been taught or as part of a skills gap analysis, especially as students move into year 13.

They are drawn from the latest specification questions and legacy questions. The papers are between 25 and 35 marks.

The topic number on this worksheet relates to the corresponding chapter number in the ‘Pearson Edexcel AS and A Level Mathematics: Pure Mathematics Year 1/AS’ textbook.

# Non-Calculator Questions

The new specification allows calculators to be used in all papers. **We have, however, put these questions together with the intention that students can complete them without a calculator.** It’s important for pupils to be able to maintain their non-calculator skills, especially on topics such as surds or indices, to support question that use the keywords “show that” or “prove”. If you wish to ease the difficulty slightly then you can, of course, allow students to attempt them with the support of a calculator.

# Quick Links

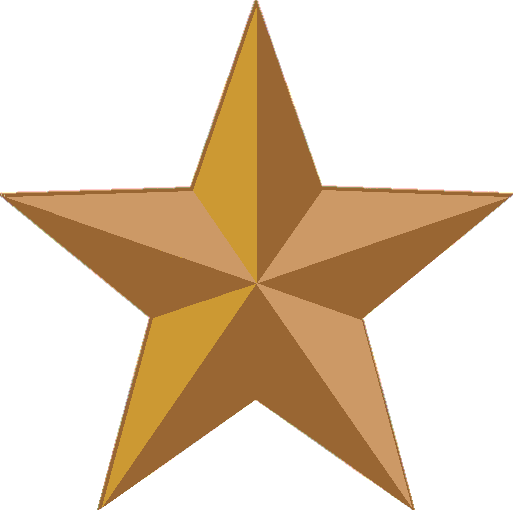
(Press Ctrl, as you click with your mouse to follow these links)

* [Bronze Questions](#BrQue)
* [Bronze Mark Scheme](#BrMS)
* [Silver Questions](#SiQue)
* [Silver Mark Scheme](#SiMS)
* [Gold Questions](#GoQu)
* [Gold Mark Scheme](#GoMS)

# Extension and Enrichment

If you have students that have enjoyed the challenge of the Gold questions, then they should have a go at the more challenging question from our Advanced Extension Award (AEA) papers. The Mathematics AEA is a single, 3 hour non-calculator paper, taken at the end of year 13. It helps students to develop high level problem solving and proof skills. It is entirely based on the content of the A Level Mathematics Course. No extra material needs to be covered to take the AEA in Mathematics. A second important difference is that marks are awarded for the clarity and quality of their solution. Developing this key skill, alongside the extra problem-solving experience, can pay dividends in the way they approach A Level Mathematics and Further Mathematics problems.

More information about the Advanced Extension Award can be found [here](https://qualifications.pearson.com/en/qualifications/edexcel-a-levels/advanced-extension-award-mathematics-2018.html) on the Pearson Edexcel Website, or [here](https://www.mathsemporium.com/category/advanced-extension-award-mathematics/) on the Maths Emporium

******Bronze Questions**

**Calculators may not be used**

The total mark for this section is 34

**Q1**

The line *l* passes through the points *A* (3, 1) and *B* (4, – 2).

Find an equation for *l*

**(Total for Question 1 is 6 marks)**

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**Q2**

The line *L*1 has equation 4*x* + 2*y* − 3 = 0

(a)  Find the gradient of *L*1

**(2)**

The line *L*2 is perpendicular to *L*1 and passes through the point (2, 5)

(b)  Find the equation of *L*2 in the form *y* = *mx* + *c*, where *m* and *c* are constants.

**(3)**

**(Total for Question 2 is 5 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Q3**

The line *l*1 has equation 4*y* – 3*x* = 10

The line *l*2 passes through the points (5, –1) and (–1, 8)

Determine, giving full reasons for your answer, whether lines *l*1 and *l*2 are parallel, perpendicular or neither.

**(Total for Question 3 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Q4**

The line *l*1 has equation *y* = − 2*x* + 3

The line *l*2 is perpendicular to *l*1 and passes through the point (5, 6).

(a)  Find an equation for *l*2 in the form *ax* + *by* + *c* = 0, where *a* , *b* and *c* are integers.

**(3)**

The line *l*2 crosses the *x*-axis at the point *A* and the *y*-axis at the point *B*.

(b)  Find the *x*-coordinate of *A* and the *y*-coordinate of *B*.

**(2)**

Given that *O* is the origin,

(c)  find the area of the triangle *OAB*.

**(2)**

**(Total for Question 4 is 7 marks)**

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**Q5**

The point *A* (–6, 4) and the point *B* (8, –3) lie on the line *L*.

(a) Find an equation for *L* in the form *ax* + *by* + *c* = 0, where *a*, *b* and *c* are integers.

**(4)**

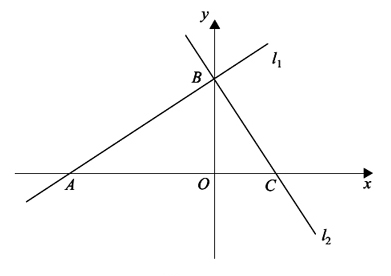
(b) Find the distance *AB*, giving your answer in the form *k*√5, where *k* is an integer.

**(3)**

**(Total for Question 5 is 7 marks)**

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**Q6**



**Figure 1**

The line *l*1 has equation 2*x* − 3*y* + 12 = 0

(a) find the gradient of *l*1.

**(1)**

The line *l*1 crosses the *x*-axis at the point *A* and the *y*-axis at the point *B*, as shown in Figure 1.

The line *l*2 is perpendicular to *l*1 and passes through *B*.

(b) Find an equation of *l*2.

**(3)**

The line *l*2 crosses the *x*-axis at the point *C*.

(c) Find the area of triangle *ABC*.

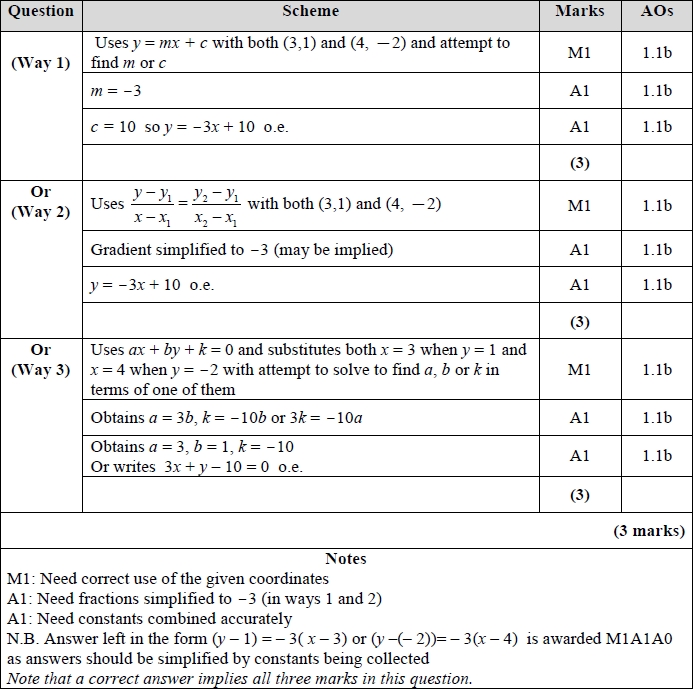
**(4)**

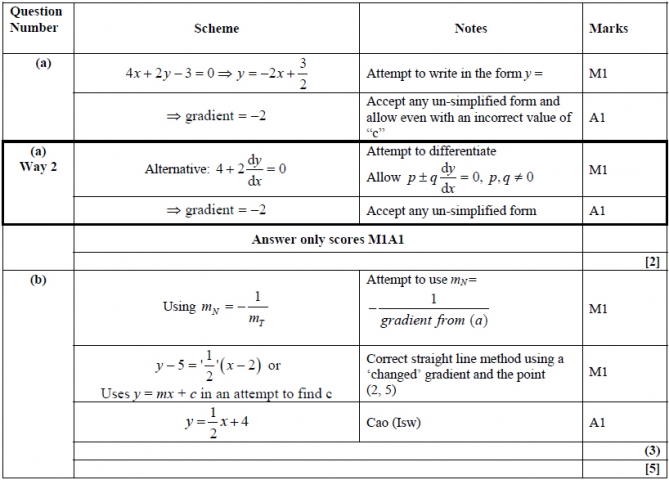
**(Total for Question 6 is 8 marks)**

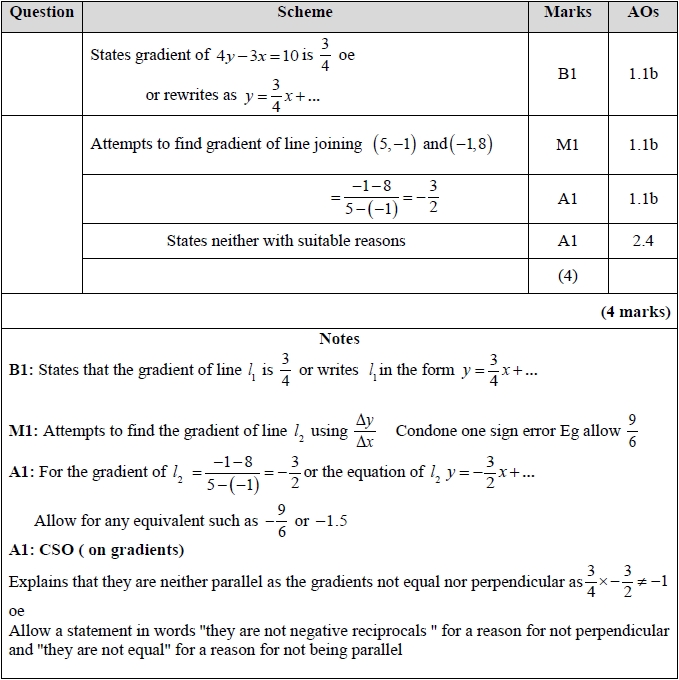
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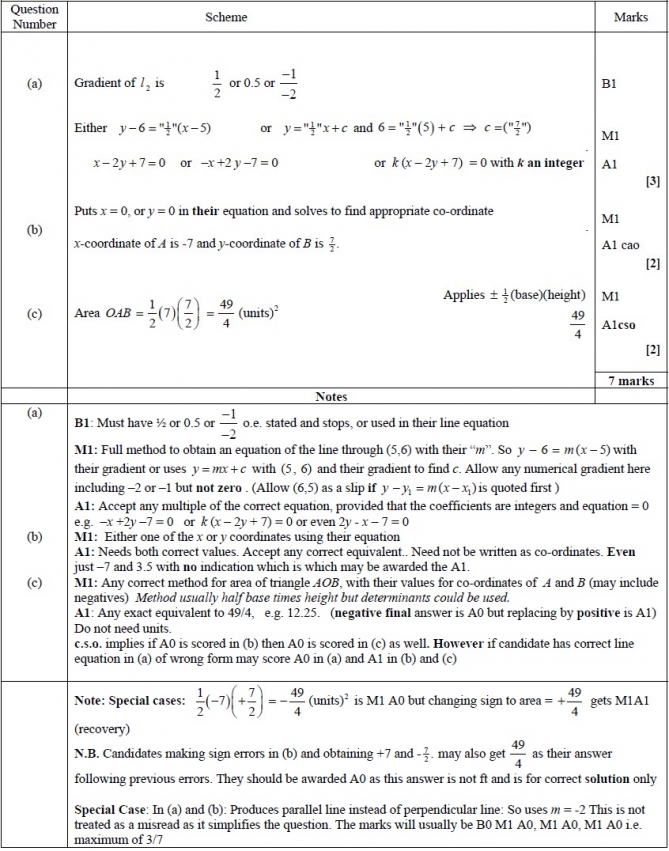
**End of Questions**

**Bronze Mark Scheme**

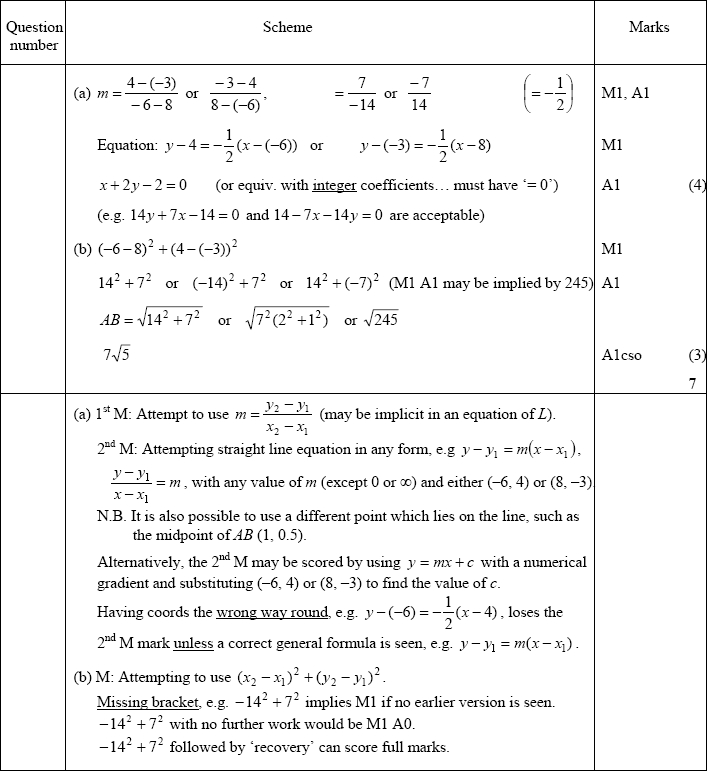
 **Q1**

**Q2**

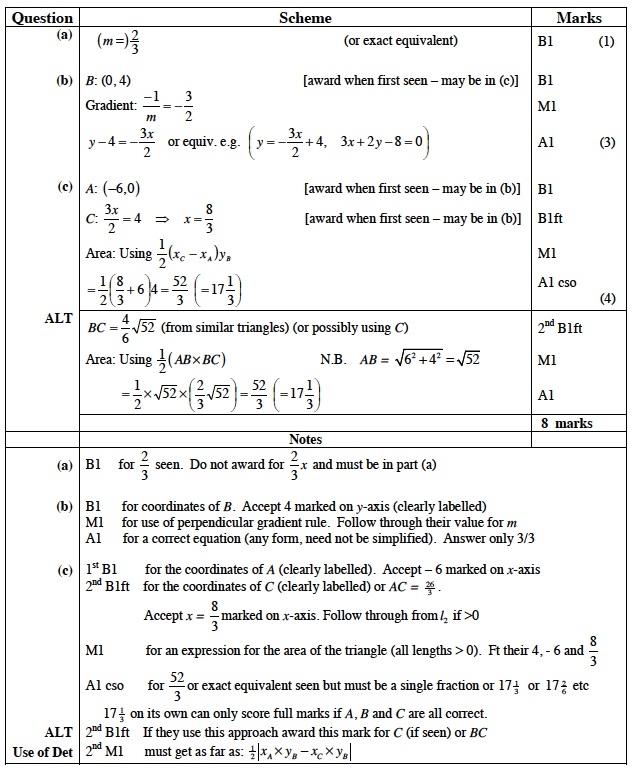
**Q3**

**Q4**

**Q5**



**Q6**



**Silver Questions **

**Calculators may not be used**

The total mark for this section is 31

**Q1**

The points *P* and *Q* have coordinates (−1, 6) and (9, 0) respectively.

The line *l* is perpendicular to *PQ* and passes through the mid-point of *PQ*.

Find an equation for *l*, giving your answer in the form *ax* + *by* + *c* = 0, where *a*, *b* and *c* are integers.

**(5)**

**(Total for Question 1 is 5 marks)**

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**Q2**

The straight line *L*1 passes through the points (−1, 3) and (11, 12).

(a)  Find an equation for *L*1 in the form *ax* + *by* + *c* = 0,

where *a*, *b* and *c* are integers.

**(4)**

The line *L*2 has equation 3*y* + 4*x* − 30 = 0.

(b)  Find the coordinates of the point of intersection of *L*1 and *L*2.

**(3)**

**(Total for Question 2 is 7 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Q3**

The line *L*1 has equation 2*y* − 3*x* − *k* = 0, where k is a constant.

Given that the point *A* (1, 4) lies on *L*1, find

(a) the value of *k*,

**(1)**

(b) the gradient of *L*1.

**(2)**

The line *L*2 passes through *A* and is perpendicular to *L*1

(c) Find an equation of *L*2 giving your answer in the form *ax* + *by* + *c* = 0, where *a*, *b* and *c* are integers.

**(4)**

The line *L*2 crosses the *x*-axis at the point *B*.

(d) Find the coordinates of *B*.

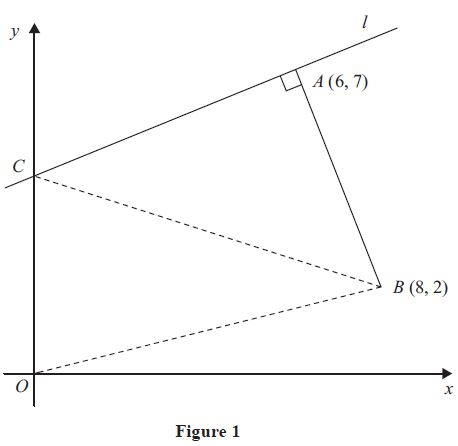
**(2)**

(e) Find the exact length of *AB*.

**(2)**

**(Total for Question 3 is 11 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Q4**

The points *A* and *B* have coordinates (6, 7) and (8, 2) respectively.

The line *l* passes through the point *A* and is perpendicular to the line *AB*, as shown in  
 Figure 1.

(a)   Find an equation for *l* in the form *ax* + *by* + *c* = 0, where *a*, *b* and *c* are integers.

**(4)**

Given that *l* intersects the *y*-axis at the point *C*, find

(b)   the coordinates of *C*,

**(2)**

(c)   the area of Δ*OCB*, where *O* is the origin.

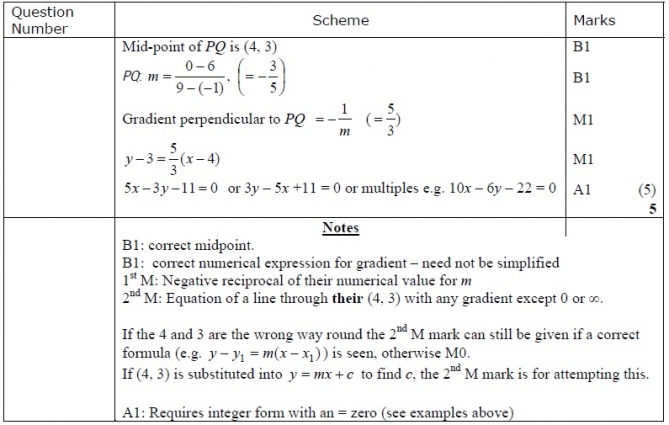
**(2)**

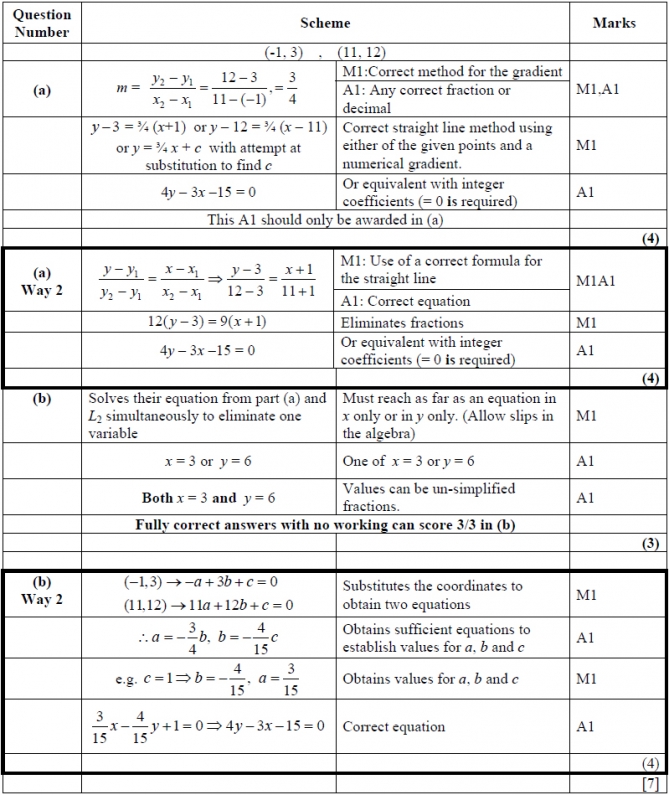
**(Total for Question 4 is 8 marks)**

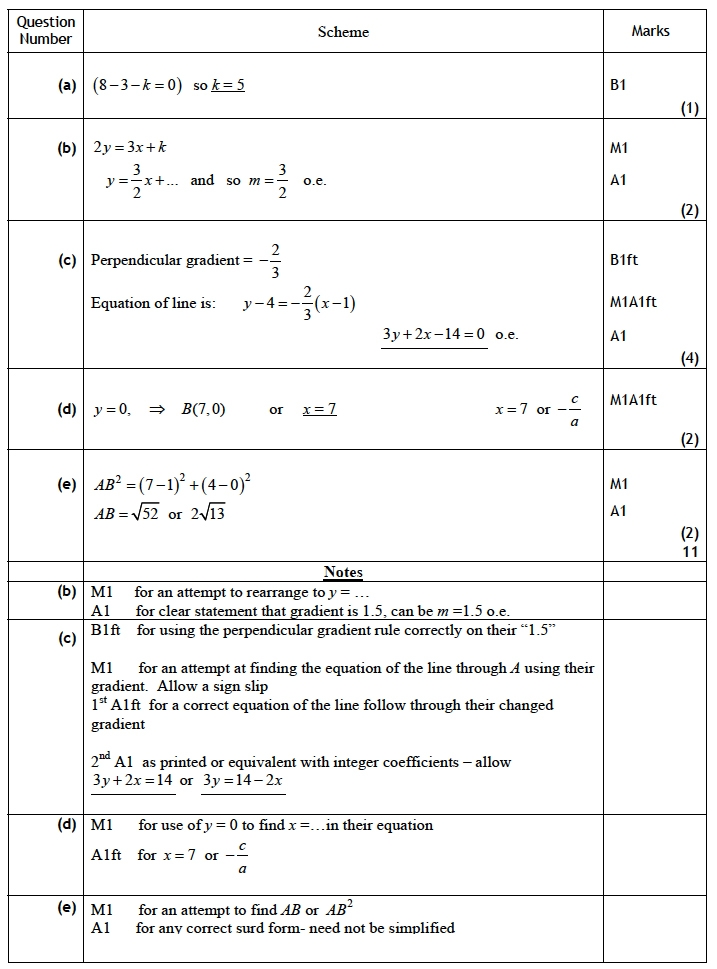
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**End of Questions**

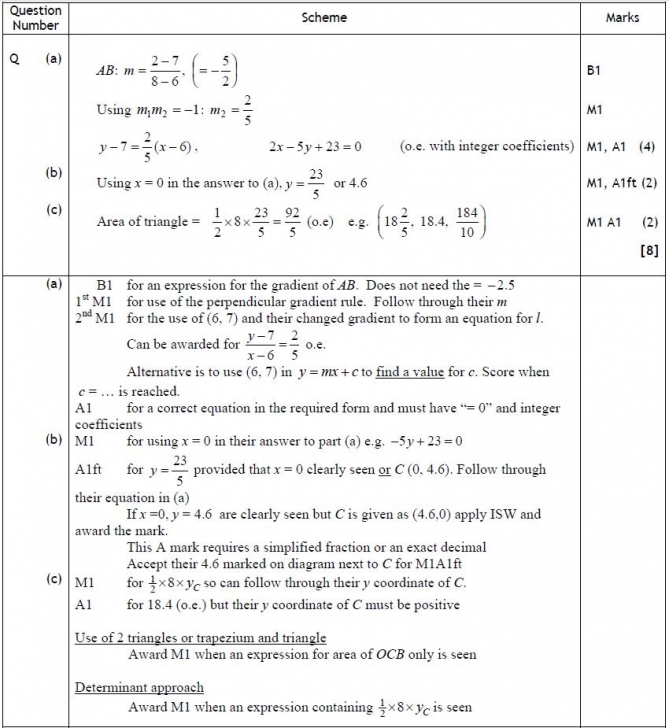
**Silver Mark Scheme**

**Q1**

**Q2** 

**Q3**

**Q4**



**Gold Questions **

**Calculators may not be used**

The total mark for this section is 27

**Q1**

(a)   Find an equation of the line joining *A*(7, 4) and *B*(2, 0), giving your answer in the  
        form *ax*+*by*+*c* = 0, where *a*, *b* and *c* are integers.

**(3)**

(b)   Find the length of *AB*, leaving your answer in surd form.

**(2)**

The point *C* has coordinates (2, *t*), where *t* > 0, and *AC* = *AB*.

(c)   Find the value of *t*.

**(1)**

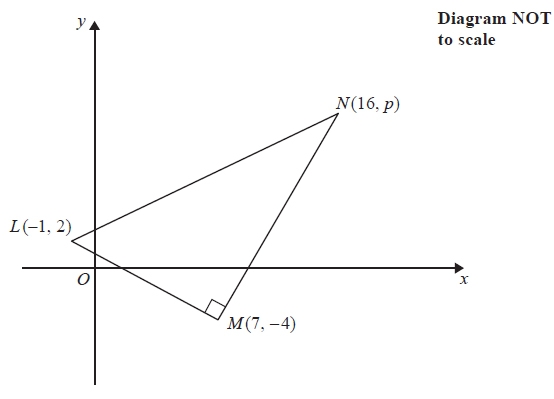
(d)   Find the area of triangle *ABC*.

**(2)**

**(Total for Question 1 is 8 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Q2**



**Figure 2**

Figure 2 shows a right angled triangle *LMN*.

The points *L* and *M* have coordinates (−1, 2) and (7, −4) respectively.

(a) Find an equation for the straight line passing through the points *L* and *M*.

Give your answer in the form *ax* + *by* + *c* = 0, where *a*, *b* and *c* are integers.

**(4)**

Given that the coordinates of point *N* are (16, *p*), where *p* is a constant, and angle

LMN = 90°,

(b) find the value of *p*.

**(3)**

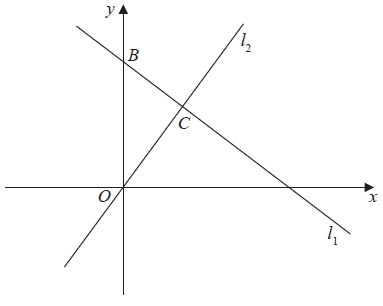
Given that there is a point *K* such that the points *L, M, N*, and *K* form a rectangle,

(c) find the *y* coordinate of *K*.

**(2)**  
  
**(Total for Question 2 is 9 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Q3**



**Figure 2**

The line *l*1, shown in Figure 2 has equation 2*x* + 3*y* = 26

The line *l*2 passes through the origin *O* and is perpendicular to *l*1

(a) Find an equation for the line *l*2

**(4)**

The line *l*2 intersects the line *l*1 at the point *C*

Line *l*1 crosses the *y*-axis at the point *B* as shown in Figure 2.

(b) Find the area of triangle *OBC*

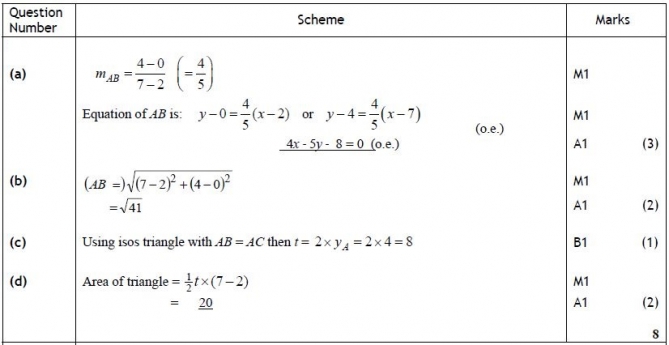
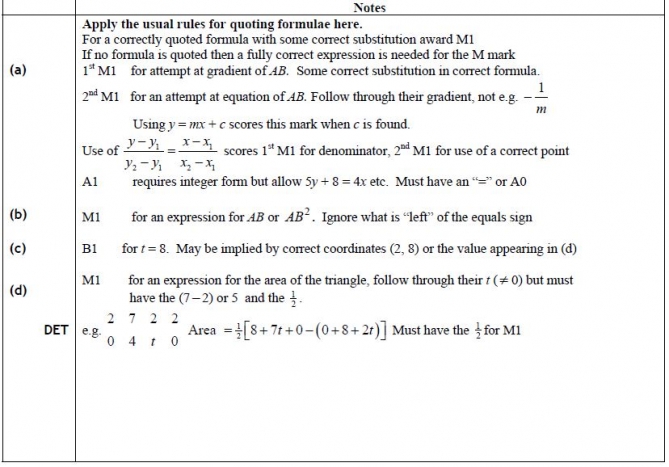
Give your answer in the form , where *a* and *b* are integers to be determined.

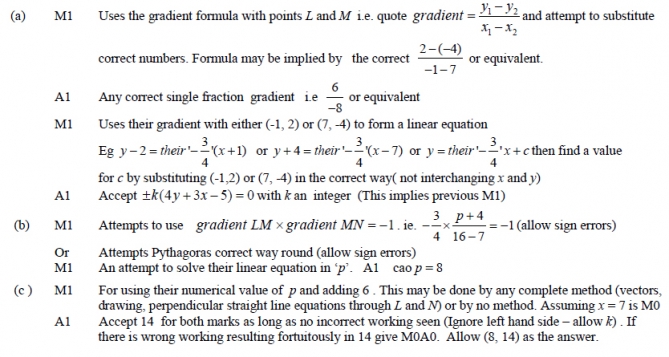
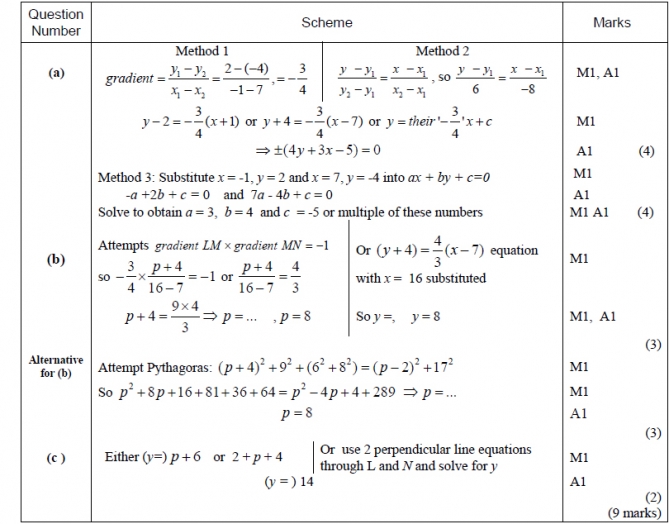
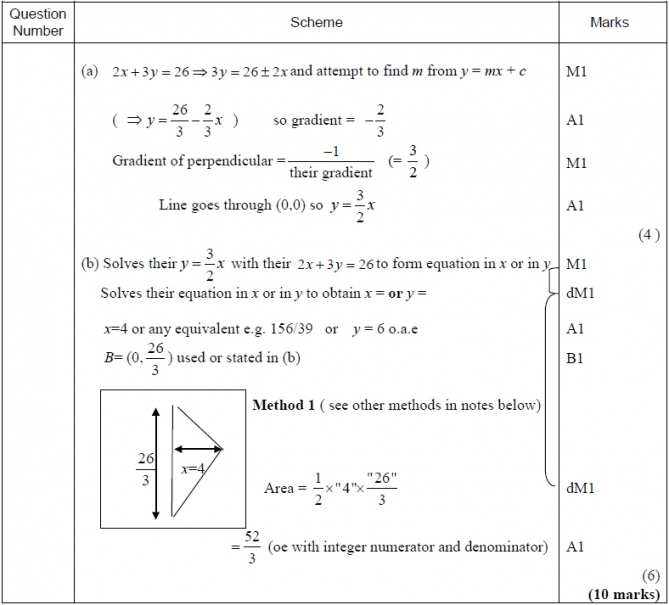
**(6)**  
  
**(Total for Question 3 is 10 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**End of Questions**

**Gold Mark Scheme**

**Q1**

**Q2****Q3**

**Notes**

(a)   M1       Complete method for finding gradient. (This may be implied by later correct answers.) e.g. Rearranges 2*x* + 3*y* = 26 ⇒ *y* = *mx* + *c* so *m* =

Or finds coordinates of two points on line and finds gradient e.g. (13, 0) *and* (1, 8) *so m* = 

A1 States or implies that gradient = − 2⁄3   condone − 2⁄3*x* if they continue correctly. Ignore errors in constant term in straight line equation

M1       Uses *m*1×*m*2= − 1 to find the gradient of *l*2. This can be implied by the use of 

A1       *y* = 3⁄2*x* or 2*y* − 3*x* = 0 Allow *y* = 3⁄2*x* + 0 Also accept 2*y* = 3*x*, *y* = 39/26*x* or even *y* − 0 = 3⁄2 (*x* − 0) and isw

(b)   M1       Eliminates variable between their *y* = 3⁄2*x* and their (possibly rearranged) 2*x* + 3*y* = 26 to form an equation in *x* or *y*. (They may have made errors in their rearrangement)

dM1       (Depends on previous M mark) Attempts to solve their equation to find the value of *x* or *y*

A1       *x* = 4 or equivalent or *y* = 6 or equivalent

B1       *y* coordinate of *B* is  (stated or implied)   –   isw if written as (, 0). **Must be used or stated in (b)**

dM1       (Depends on previous M mark) Complete method to find area of triangle *OBC* (using their values of *x* and/or *y* at point *C* and their 26/3)

A1       Cao  o.e.

**Method 1:**  
Uses the area of a triangle formula ½×*OB* ×(*x* coordinate of *C*)

**Alternative methods:**  
Several Methods are shown below. The only mark which differs from Method 1 is the last M mark and its use in each case is described below:

**Method 2** in (b) using 1⁄2× *BC* × *OC*

dM1 Uses the area of a triangle formula ½× *BC* × *OC*   Also finds *OC* (=√52 ) and *BC* = 

**Method 3** in (b) using 

dM1 States the area of a triangle formula  or equivalent with their values

**Method 4** in (b) using area of triangle *OBX* – area of triangle *OCX* where *X* is point (13, 0)

dM1   Uses the correct subtraction 

**Method 5** in (b) using area = ½ (6 × 4) + ½ (4 × 8/3) drawing a line from *C* parallel to the *x* axis and dividing triangle into two right angled triangles

dM1 for correct method area = ½ ("6" × "4") + ½ ("4" × ["26/3" − "6"])

**Method 6 Uses calculus**

dM1 