Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16	
TOTAL	

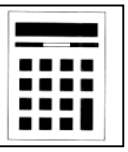
General Certificate of Secondary Education
Higher Tier

Methods in Mathematics (Linked Pair Pilot) 93652H

Unit 2 Geometry and Algebra

Practice Paper 2

H

For this paper you must have:	
• a calculator • mathematical instruments.	

Time allowed
- 1 hour 30 minutes

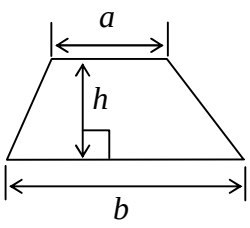
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- The quality of your written communication is specifically assessed in Questions 8, 12 and 13.
  These questions are indicated with an asterisk (✳)
- You may ask for more answer paper, graph paper and tracing paper.
  These must be tagged securely to this answer booklet.
- You are expected to use a calculator where appropriate.

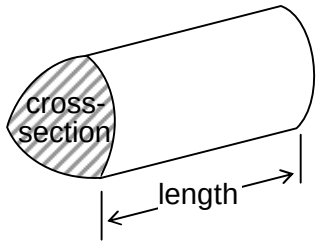
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a + b)h$

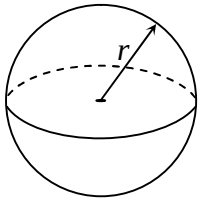


Volume of prism = area of cross-section × length



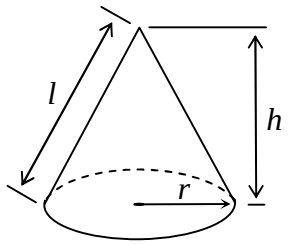
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

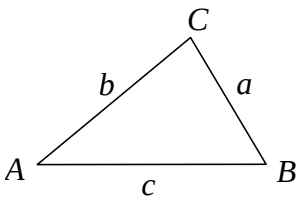


In any triangle ABC

Area of triangle = $\frac{1}{2}ab \sin C$

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Do not write outside the box

Answer **all** questions in the spaces provided.

1 Solve the equation $5x - 7 = 2x + 5$

.....

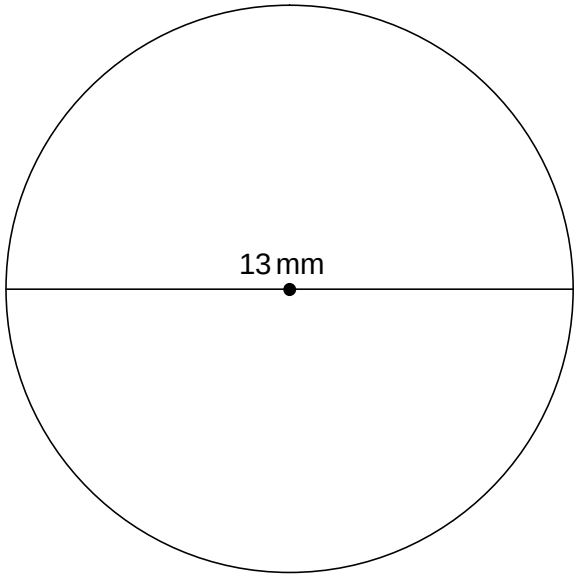
.....

.....

.....

Answer x = ... *(3 marks)*

2 Calculate the area of a circle of diameter 13 mm.



Not drawn accurately

State the units of your answer.

.....

.....

.....

.....

Answer ..... *(3 marks)*

6

3 These are the sizes in centimetres of three cuboids.

Cuboid	Length	Width	Height
A	8	4	4.5
B	9	4	6
C	9	5.5	6

3 (a) What is the ratio of the height of cuboid A to the height of cuboid B?
Write your answer in its simplest form.

.....

.....

Answer ..... : ..... *(2 marks)*

3 (b) What is the ratio of the volume of cuboid B to the volume of cuboid C?
Write your answer in its simplest form.

.....

.....

Answer ..... : ..... *(3 marks)*

4 (a) The nth term of a sequence is given by $n^2 - 1$.

Write down the first 3 terms of the sequence..

.....

.....

Answer ....., ..., ... *(2 marks)*

4 (b) Work out the nth term of the sequence.

5 11 17 23 29 ……

.....

.....

.....

Answer ..... *(2 marks)*

4 (c) n is a positive whole number.

Is the expression $5n - 1$ always odd, always even or it could be either odd or even?
Tick the correct box.

☐ Always odd ☐ Always even ☐ Could be either odd or even

Give examples to support your choice.

.....

.....

.....

.....

(2 marks)

Turn over for the next question

11

5 This is the calendar for the first 3 months of 2012.

January 2012

Mon	Tue	Wed	Thu	Fri	Sat	Sun
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

February 2012

Mon	Tues	Wed	Thu	Fri	Sat	Sun
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	1	2	3	4

March 2012

Mon	Tue	Wed	Thu	Fri	Sat	Sun
27	28	29	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1

Abe, Baz and Clara have birthdays in these months.
Their birthdays are all on the same day of the week.

Baz is the oldest.
His birthday is on the only even prime number.
Abe's birthday is exactly 11 weeks before Clara's.

What are the dates of their birthdays?

.....

.....

.....

Answer Abe .....

Baz .....

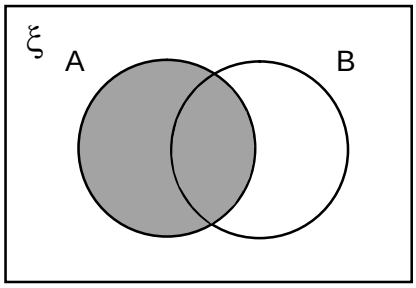
Clara ..... *(3 marks)*

6 In a group of 30 students there are 17 boys and 13 girls.

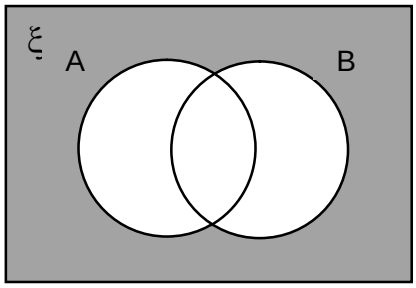
In the group 7 girls and 9 boys take A level mathematics.

In the Venn Diagrams below the set B represents the boys and the set A represents the students who take A level mathematics.

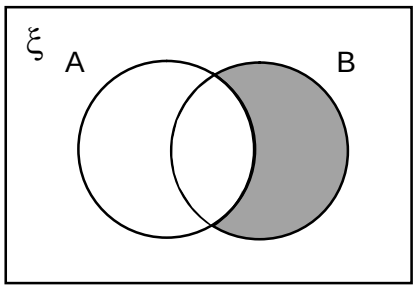
Venn Diagram P



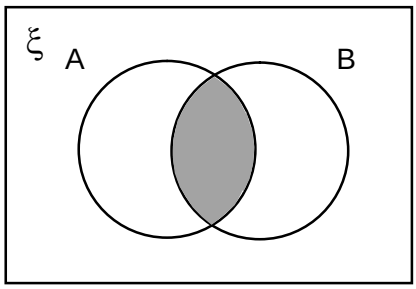
Venn Diagram Q



Venn Diagram R



Venn Diagram S



Complete the statements below.

The first one has been completed for you.

The shaded part of Venn diagram ….*S*…… represents the ……*9*…… students who are boys taking A level mathematics.

The shaded part of Venn diagram ……. represents the ……. students who are taking A level mathematics.

The shaded part of Venn diagram ……. represents the ……. students who are girls who do **not** take A level mathematics.

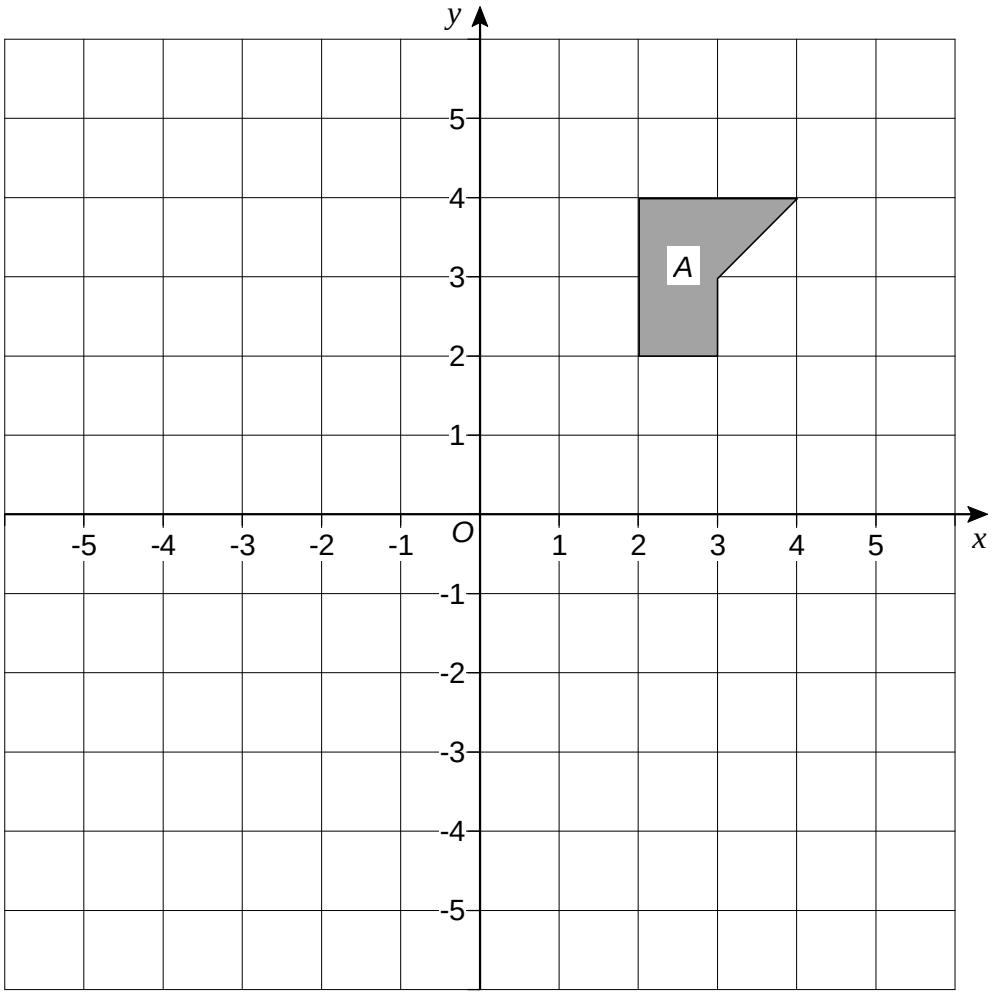
The shaded part of Venn diagram ……. represents the ……. students who are boys who do **not** take A level mathematics.

(4 marks)

Turn over for the next question

7

7 Shape *A* is shown on the grid.



7 (a) Reflect shape *A* in the line $x = 1$

Label the new shape *B*.

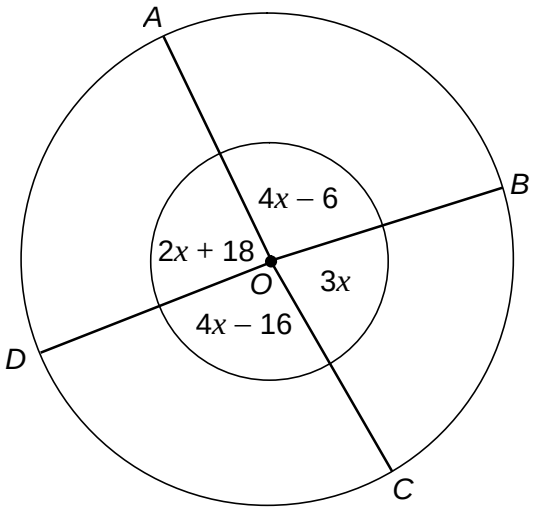
(2 marks)

7 (b) Rotate shape *A* 90° clockwise about centre (0, 0)

Label the new shape *C*.

(2 marks)

***8** *A*, *B*, *C* and *D* are four points on a circle, centre *O*.



Not drawn accurately

Which of the following is a diameter of the circle?

Circle the correct answer.

AC *BD*

Show working to justify your choice.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

10

9 During the Klondike gold rush in 1898, Dawson City had a population of 40 000.
In 1902, after the gold rush was over, the population was 5000.

What was the percentage decrease in the population between 1898 and 1902?

.....

.....

.....

.....

Answer ..... % *(3 marks)*

10 (a) Expand $2(x - 5)$

.....

Answer ..... *(1 mark)*

10 (b) Expand and simplify $(x + 3)^2$

.....

.....

Answer ..... *(2 marks)*

10 (c) Solve the equation $x^2 - 3x = 10$

.....

.....

.....

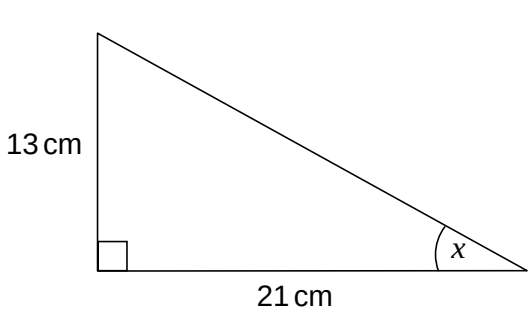
.....

.....

.....

Answer ..... *(4 marks)*

11 Work out the value of the angle x.



.....

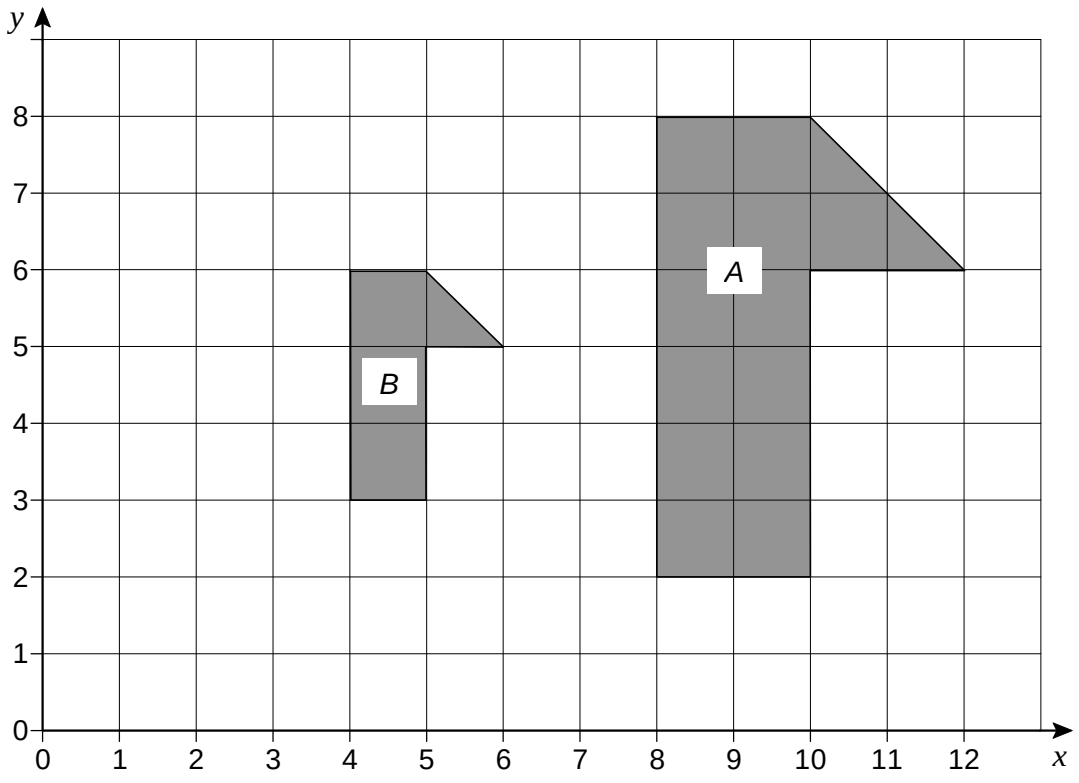
.....

.....

.....

Answer ..... degrees *(3 marks)*

***12** Describe the transformation that takes shape *A* to shape *B*.



.....

.....

.....

(3 marks)

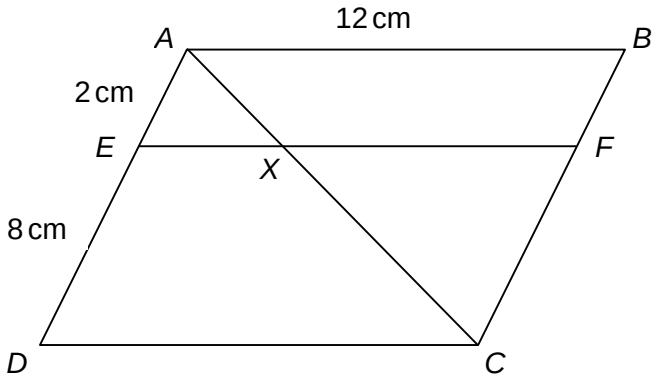
16

***13** *ABCD* is a parallelogram.

EF is parallel to *AB.*

AB = 12 cm, *AE* = 2 cm, *ED* = 8 cm.

Not drawn accurately



Calculate the length *XF*.

You **must** show your working.

.....

.....

.....

.....

.....

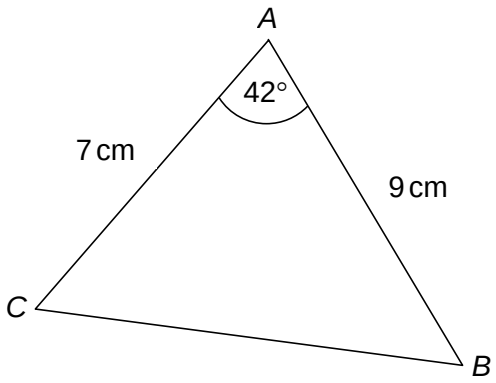
.....

.....

Answer ..... cm *(5 marks)*

14 *ABC* is a triangle.

AB = 9 cm, *AC* = 7 cm, angle *BAC* = 42°.



Not drawn accurately

Work out *BC*.

.....

.....

.....

.....

.....

Answer ..... cm *(3 marks)*

15 The square number sequence is

1 4 9 16 25 36 49 64 81 ….. n^2

For any three consecutive square numbers the sum of the first and the third is always twice the second plus two.

For example, taking 16, 25 and 36

16 + 36 = 52

2 × 25 + 2 = 52

Prove this result algebraically.

.....

.....

.....

.....

.....

.....

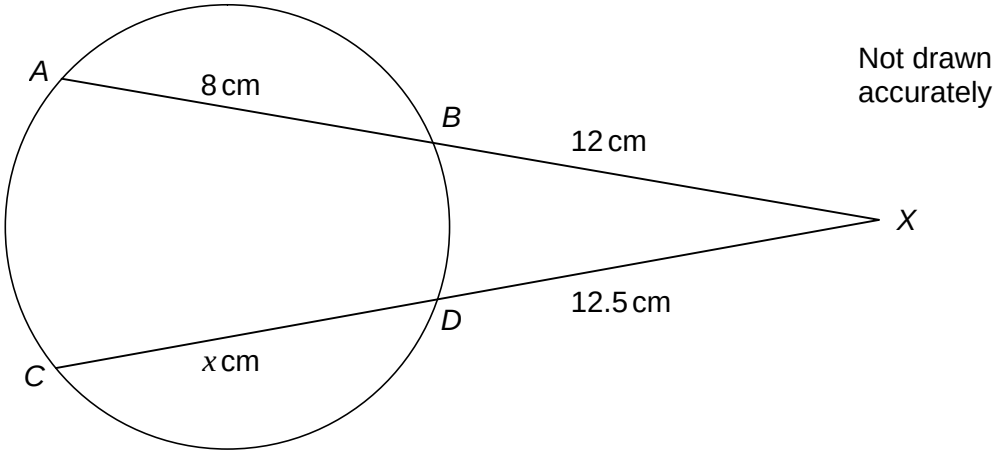
(4 marks)

12

16 *AB* and *CD* are two chords of a circle.

They intersect at a point *X* outside the circle.

AB = 8 cm, *BX* = 12 cm, *DX* = 12.5 cm.



Find the length *CD*, marked *x* in the diagram.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

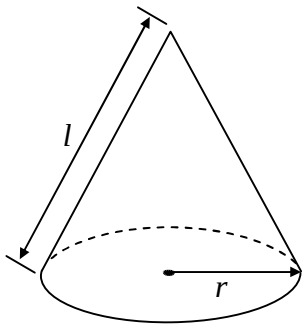
Answer ..... cm *(4 marks)*

Do not write outside the box

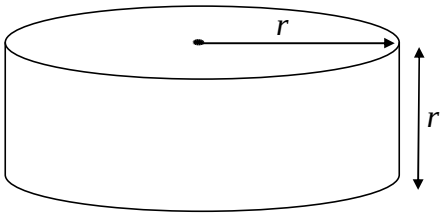
17 A cone has radius r and slant height l.

A cylinder has radius r and height r.

The **total** surface area of the cone is equal to the **total** surface area of the cylinder.



Not drawn accurately



Find an expression for l in terms of r.

.....

.....

.....

.....

.....

.....

Answer ..... *(4 marks)*

18 Simplify fully $\dfrac{12x^2 - 36x + 15}{12x^2 - 3}$

.....

.....

.....

.....

.....

.....

.....

.....

Answer ..... *(4 marks)*

12

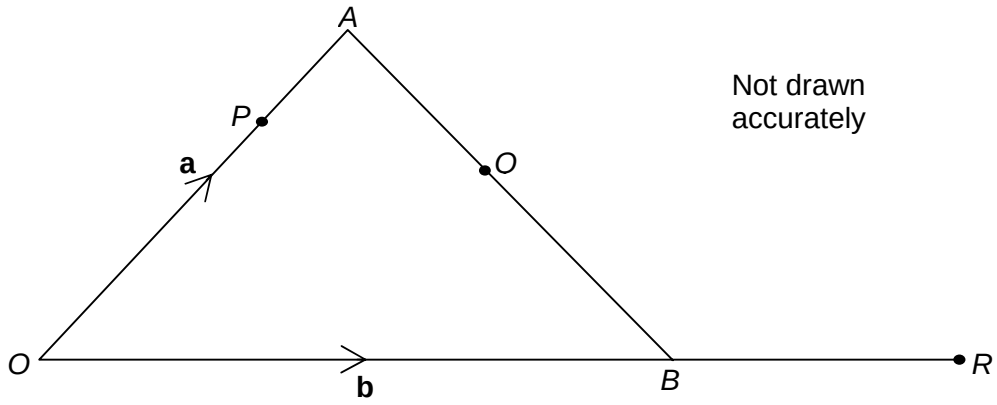
Do not write outside the box

19 In the diagram $\overrightarrow{OA}$ = **a** and $\overrightarrow{OB}$ = **b**.

The point *P* divides *OA* in the ratio *OP* : *PA* = 4 : 1

The point *Q* divides *AB* in the ratio *AQ* : *QB* = 2 : 3

The point *R* on *OB* produced is such that *OB* : *BR* = 5 : 3



19 (a) Show that $\overrightarrow{PQ} = \frac{2}{5}\mathbf{b} - \frac{1}{5}\mathbf{a}$

.....

.....

.....

.....

.....

(3 marks)

19 (b) Show that *P*, *Q* and *R* lie on a straight line.

.....

.....

.....

.....

.....

.....

.....

.....

.....

(3 marks)

END OF QUESTIONS

6

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE

ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED