

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**General Certificate of Secondary Education**

**MATHEMATICS SYLLABUS A**

**1962/6**

PAPER 6 (Higher Tier)

Wednesday

**15 JUNE 2005**

Morning

2 hours

Candidates answer on the question paper.

Additional materials:

Electronic Calculator

Geometrical instruments

Tracing paper (optional)

Candidate Name	Centre Number	Candidate Number												
	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> </tr> </table>							<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> </tr> </table>						

**TIME** 2 hours

**INSTRUCTIONS TO CANDIDATES**

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Show your working. Marks may be given for working that shows that you know how to solve the problem even if you get the answer wrong.
- You are expected to use an electronic calculator for this paper.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- Unless otherwise instructed in the question, take  $\pi$  to be 3.142 or use the  $\pi$  button on your calculator.

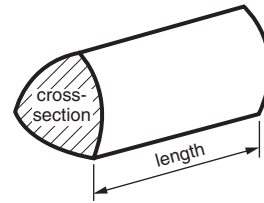
<b>FOR EXAMINER'S USE</b>

---

**This question paper consists of 19 printed pages and 1 blank page.**

## Formulae Sheet: Higher Tier

**Volume of prism** = (area of cross-section) x length

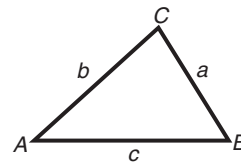


**In any triangle ABC**

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

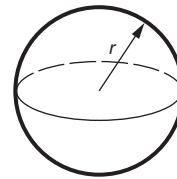
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



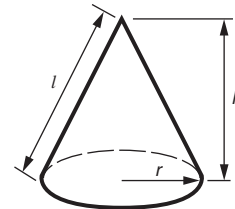
**Volume of sphere** =  $\frac{4}{3} \pi r^3$

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



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

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



**The Quadratic Equation**

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

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

1 Megan invested £2000 for 3 years at 5% Compound Interest.

Calculate the **interest** Megan received.

.....

.....

.....

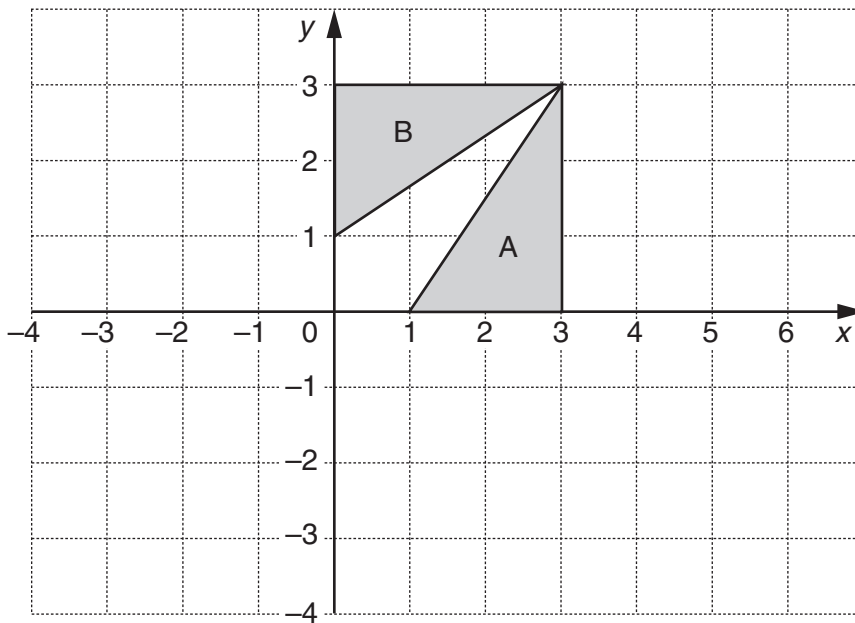
.....

.....

.....

£ \_\_\_\_\_ [3]

2



(a) Translate **shape A** by  $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ . Label the image Q. [2]

(b) Describe fully the **single** transformation which maps shape A onto shape B.

\_\_\_\_\_

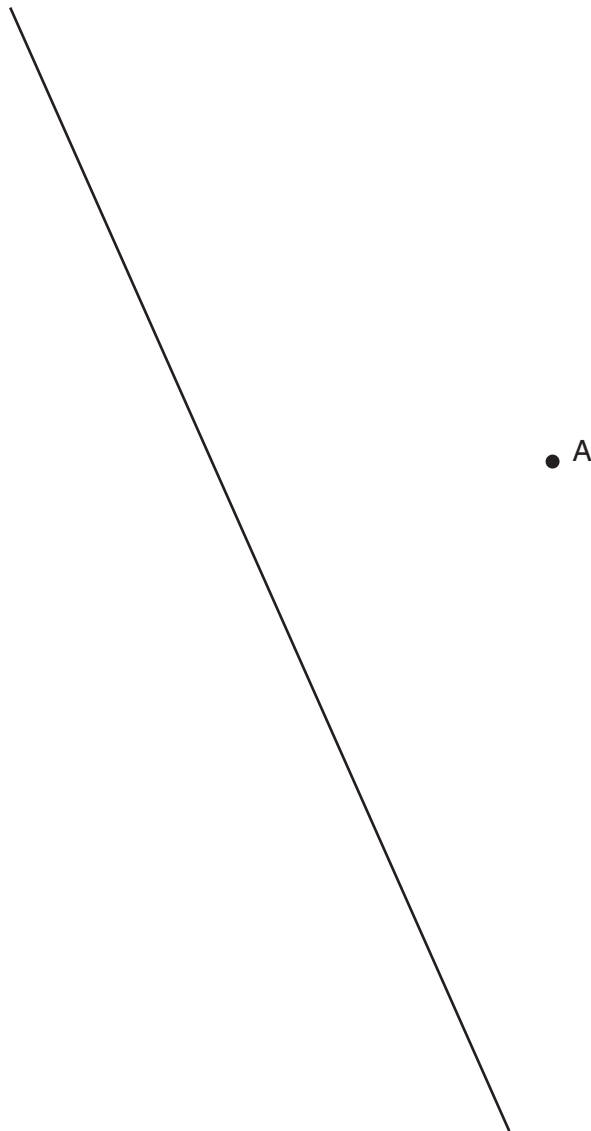
\_\_\_\_\_ [2]

- 3** Anne is standing at point A, shown in the diagram below.  
She has a walkie-talkie radio.  
The walkie-talkie can transmit signals up to a distance of 500 metres.

The line represents a power cable.

The cable blocks out all signals for a distance up to 200 metres on each side of it.

Indicate on your diagram the region that can receive the signals from Anne's walkie-talkie.  
Use a scale of 1 cm to 100 m.



[4]

4 Use your calculator to work these out.

(a)  $\sqrt{8.7^2 - 2.8^3}$

Give your answer correct to two significant figures.

.....

(a) \_\_\_\_\_ [2]

(b)  $\frac{3}{8} \div 3\frac{3}{4}$

Give your answer as a fraction.

.....

(b) \_\_\_\_\_ [2]

(c)  $5.8 \times 10^{-4} - 2.7 \times 10^{-5}$

Give your answer in standard form.

.....

(c) \_\_\_\_\_ [2]

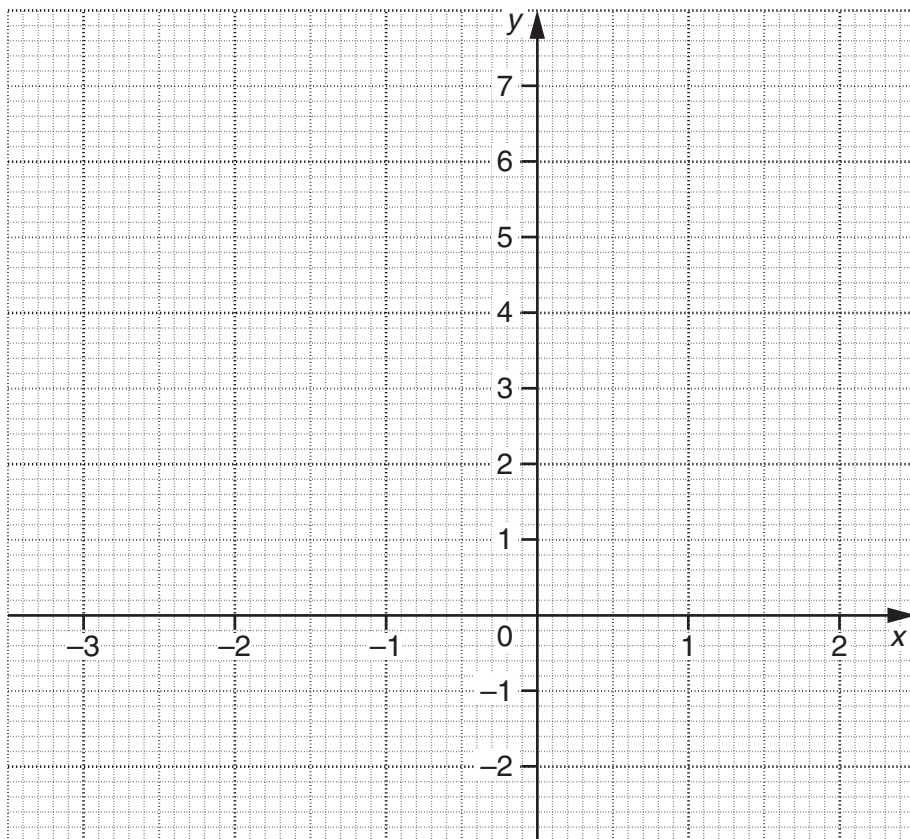
- 5 (a) Complete the table below for

$$y = x^2 + 2x - 1.$$

$x$	-3	-2	-1	0	1	2
$y$	2	-1		-1	2	

[2]

- (b) Draw the graph of  $y = x^2 + 2x - 1$ .



[2]

- (c) Use your graph to solve the equation

$$x^2 + 2x - 1 = 0.$$

(c) \_\_\_\_\_ [2]

- 6 (a) Multiply out and simplify.

$$(2x + 5y)(3x + 2y)$$

.....  
 .....

(a) \_\_\_\_\_ [3]

- (b) Factorise completely.

$$3x^2 + 9xy$$

.....

(b) \_\_\_\_\_ [2]

- (c) Solve algebraically these simultaneous equations.

$$\begin{aligned} 5x + 2y &= 9 \\ x - 4y &= 4 \end{aligned}$$

.....  
 .....  
 .....  
 .....  
 .....

(c)  $x =$  \_\_\_\_\_,  $y =$  \_\_\_\_\_ [3]

- 7 Each apple in a bag weighs 90 g, correct to the nearest 10 g.

- (a) Write down the greatest possible weight of one of these apples.

(a) \_\_\_\_\_ g [1]

- (b) Find the least possible total weight of six of these apples.

.....  
 .....

(b) \_\_\_\_\_ g [1]

- 8 (a) Majid asked 120 people, "How long did you spend listening to the radio yesterday?"

His results are summarised in the table below.

Time ( $t$ hours)	Frequency
$0 \leq t < 1$	70
$1 \leq t < 2$	26
$2 \leq t < 3$	14
$3 \leq t < 4$	10

Calculate an estimate of the mean time.

Take 0.5 as the midpoint of the first interval.

.....

.....

.....

.....

.....

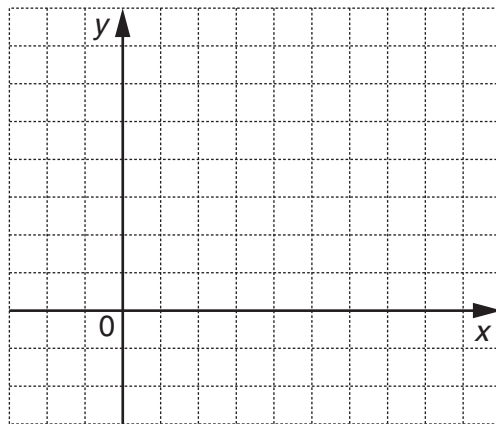
.....

(a) \_\_\_\_\_ hours [3]





- 9 You may find it helpful to use this grid.



- (a) Find the equation of the line which passes through the points  $(0, 3)$  and  $(6, 6)$ .

.....  
 .....  
 .....

(a) \_\_\_\_\_ [3]

- (b) Find the equation of the line that is parallel to the line in part (a) and passes through the point  $(0, -1)$ .

.....

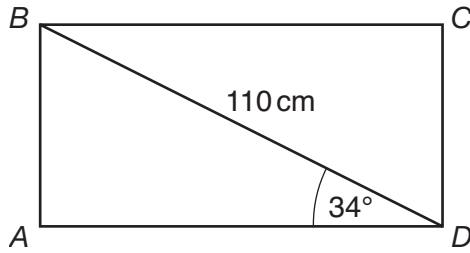
(b) \_\_\_\_\_ [2]

- (c) Find the gradient of a line perpendicular to the line in part (a).

.....

(c) \_\_\_\_\_ [1]

10



NOT TO SCALE

$ABCD$  is the base of a rectangular box.  
 $BD = 110$  cm.  
 Angle  $ADB = 34^\circ$ .

(a) Calculate the length of  $AB$ .

Give your answer to a suitable degree of accuracy.

.....

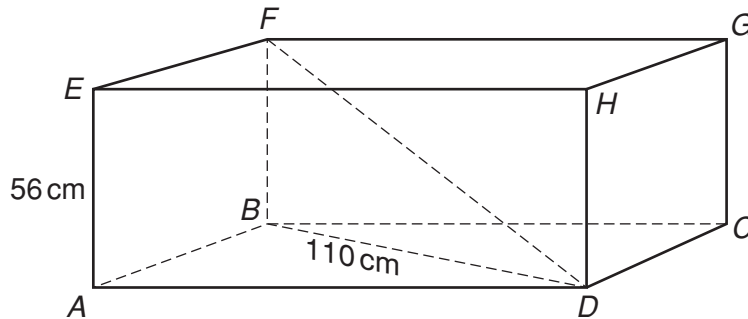
.....

.....

.....

(a) \_\_\_\_\_ cm [4]

(b)



The box has base  $ABCD$  and top  $EFGH$ .  
 The height of the box is 56 cm.

Calculate the angle between  $FD$  and the base.

.....

.....

.....

.....

(b) \_\_\_\_\_ ° [3]

- 11 The time,  $t$  seconds, that a ball takes to roll from rest down a slope is proportional to the **square root** of the distance,  $d$  metres, that it rolls.

It takes 4 seconds for the ball to roll 25 metres down the slope.

- (a) Find an expression for  $t$  in terms of  $d$ .

.....  
.....  
.....  
.....

(a) \_\_\_\_\_ [3]

- (b) Find the time it takes for the ball to roll 64 metres down the slope.

.....

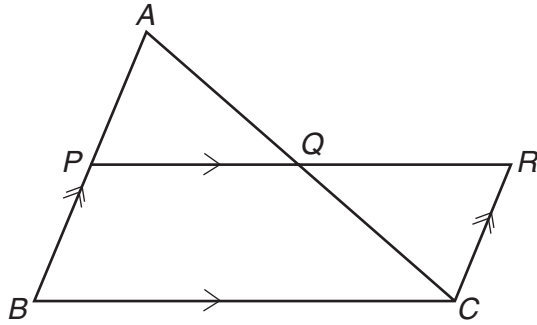
(b) \_\_\_\_\_ s [1]

- (c) Find how far down the slope the ball will roll in 8 seconds.

.....  
.....  
.....

(c) \_\_\_\_\_ m [2]

12

NOT TO  
SCALE

In the diagram  $APB$ ,  $AQC$  and  $PQR$  are straight lines.  
 $P$  is the midpoint of  $AB$ .  
 $AB$  is parallel to  $RC$ .  
 $PR$  is parallel to  $BC$ .

(a) Prove that triangle  $APQ$  is congruent to triangle  $CRQ$ .

---



---



---



---



---



---



---



---



---



---



---

[3]

(b) What do you conclude about the point  $Q$ ?

---



---

[1]

13 Sue and Peter each conducted a survey of students from years 7, 8 and 9.

(a) Sue decided to interview every tenth person on the alphabetical registers for each year.

Give one reason why Sue's method might not give a representative sample of the students in each year.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [1]

(b)

	Number of boys	Number of girls	Number of students
Year 7	78	82	160
Year 8	67	93	160
Year 9	85	75	160

The table gives the numbers of students in each of years 7, 8 and 9.

Peter wanted to interview 150 students in total from the three years. He chose a stratified sample of boys and girls.

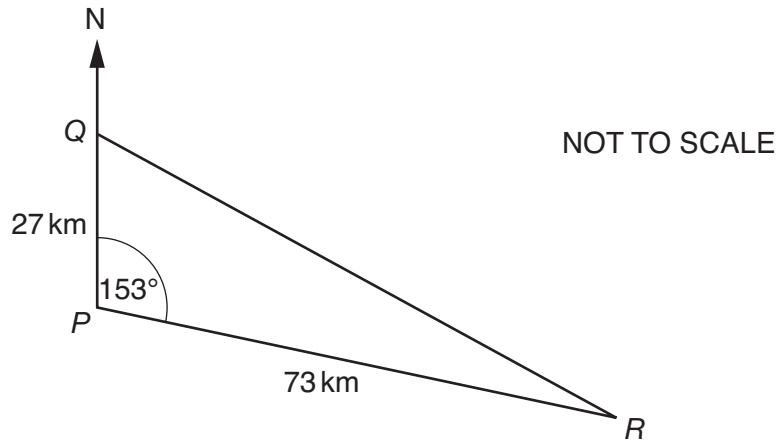
How many boys and how many girls should he choose from **year 8**?

.....  
.....  
.....  
.....  
.....

Year 8 Boys \_\_\_\_\_

Year 8 Girls \_\_\_\_\_ [3]

14



The diagram represents the positions of three towns  $P$ ,  $Q$  and  $R$ .  
 $Q$  is 27 km due north of  $P$ .  
 $R$  is 73 km from  $P$  on a bearing of  $153^\circ$ .

Calculate the distance between  $Q$  and  $R$ .

.....

.....

.....

.....

.....

.....

.....

.....

.....

\_\_\_\_\_ km [3]

15 (a) Simplify.

$$(2x^2y^3)^3$$

.....

(a) \_\_\_\_\_ [2]

(b) Factorise, and then simplify.

$$\frac{x^2 + 3x}{x^2 - x - 12}$$

.....

.....

.....

(b) \_\_\_\_\_ [3]

(c) (i) Find the values of  $a$  and  $b$  when

$$x^2 + 12x + 39 \equiv (x + a)^2 + b.$$

.....

.....

.....

(c)(i)  $a =$  \_\_\_\_\_,  $b =$  \_\_\_\_\_ [3]

(ii) Use your answer to (c)(i) to find the minimum value of

$$x^2 + 12x + 39.$$

.....

(ii) \_\_\_\_\_ [1]

(d) Which line should you draw on the graph of  $y = x^3 + 2x - 1$  to solve each of the following?

(i)  $x^3 + 2x - 4 = 0$

.....

(d)(i)  $y =$  \_\_\_\_\_ [1]

(ii)  $x^3 + x + 1 = 0$

.....

(ii)  $y =$  \_\_\_\_\_ [1]

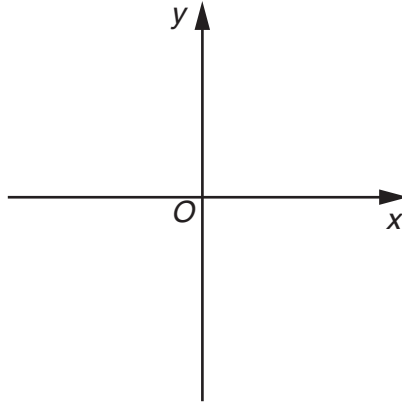


16 (a) Find the radius of the circle  $x^2 + y^2 = 45$ . Give your answer in the form  $a\sqrt{b}$  where  $a$  and  $b$  are integers and  $b$  is prime.

.....  
.....

(a) \_\_\_\_\_ [2]

(b) Sketch the circle  $x^2 + y^2 = 45$  using the given axes.



[1]

(c) Use algebra to solve these simultaneous equations.

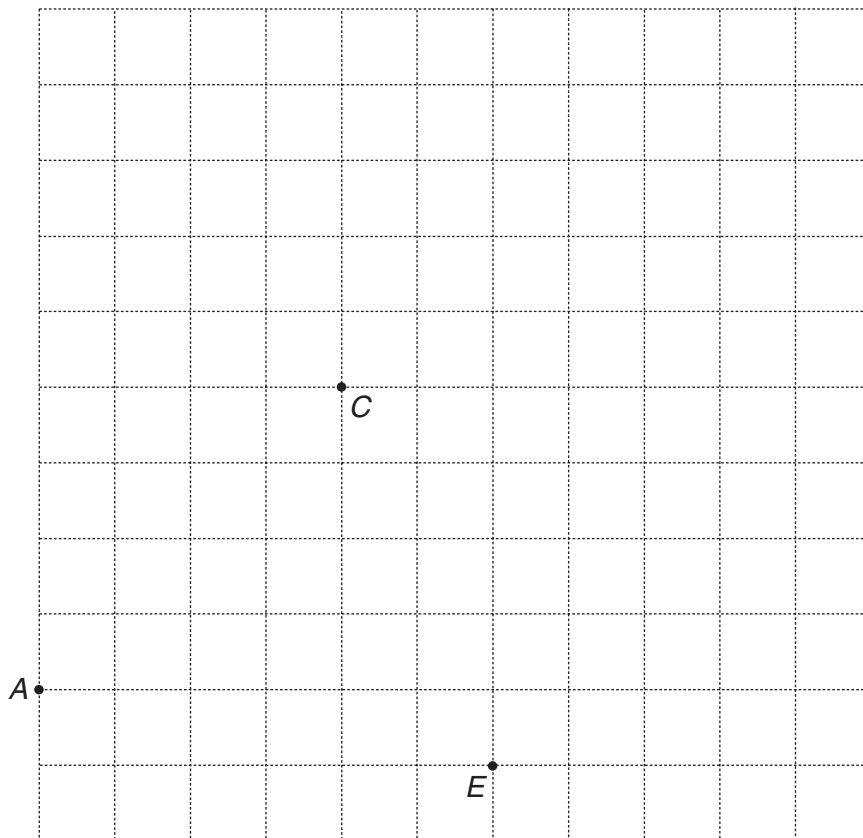
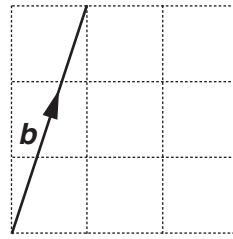
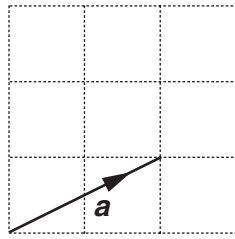
$$\begin{aligned} x^2 + y^2 &= 45 \\ y &= x - 3 \end{aligned}$$

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

(c)  $x =$  \_\_\_\_\_ and  $y =$  \_\_\_\_\_

or  $x =$  \_\_\_\_\_ and  $y =$  \_\_\_\_\_ [7]

17 The diagram shows vectors  $a$  and  $b$ .



(a) On the diagram draw and label vectors to represent

(i)  $\vec{AB} = a + 2b$ ,

(ii)  $\vec{CD} = 3a - b$ ,

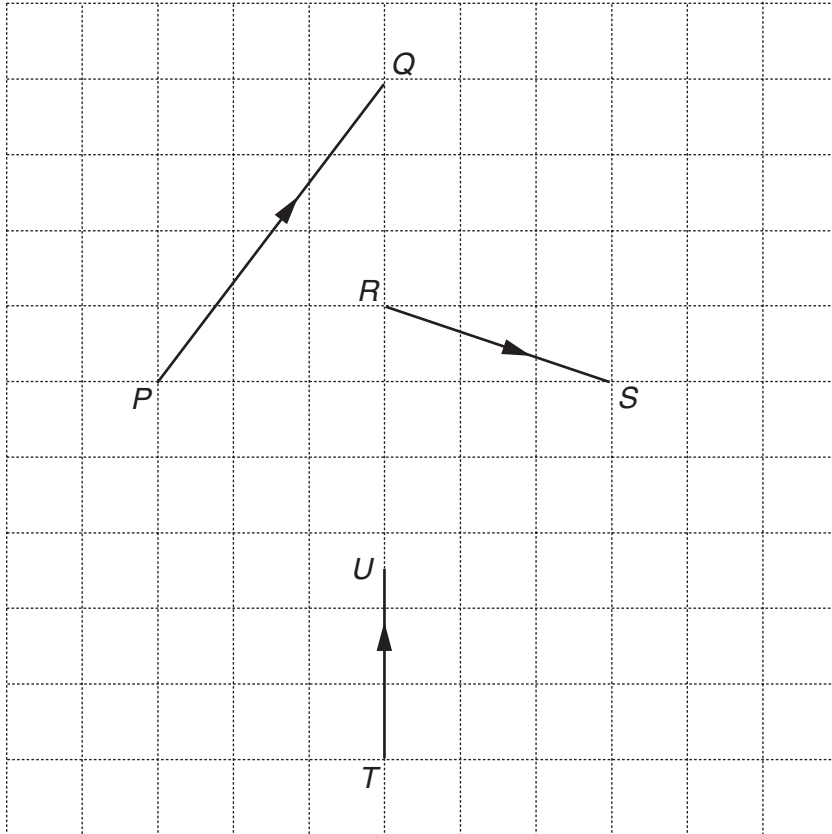
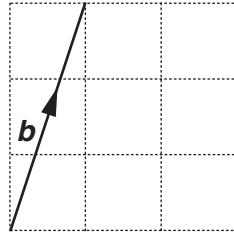
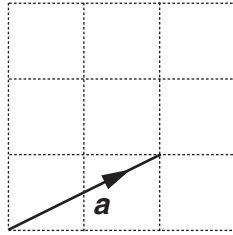
(iii)  $\vec{EF} = b + \frac{1}{2}a$ .

[3]

.....

.....

(b)



Express these vectors, as simply as possible, in terms of a and b.

(i)  $\vec{PQ}$

(ii)  $\vec{RS}$

(iii)  $\vec{TU}$

.....

.....

.....

.....

(b)(i)  $\vec{PQ} =$  \_\_\_\_\_ (ii)  $\vec{RS} =$  \_\_\_\_\_ (iii)  $\vec{TU} =$  \_\_\_\_\_ [3]

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.