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Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | Candidate Number

Mathematics A

Paper 1 (Non-Calculator)

Higher Tier

Thursday 26 May 2016 – Morning
Time: 1 hour 45 minutes

Paper Reference
1MA0/1H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators must not be used.**

Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 9 3 0 2 A 0 1 2 8

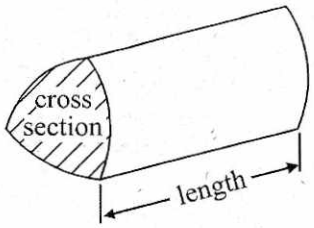
PEARSON

GCSE Mathematics 1MA0

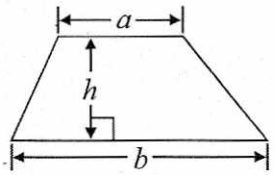
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

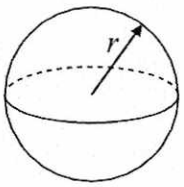


Area of trapezium = $\frac{1}{2}(a + b)h$



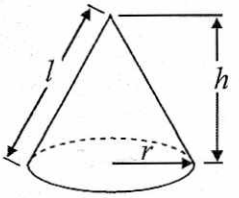
Volume of sphere = $\frac{4}{3}\pi r^3$

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

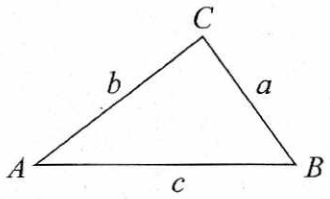


Volume of cone = $\frac{1}{3}\pi r^2 h$

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



In any triangle *ABC*



The Quadratic Equation

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

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

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 = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 The diagram shows a prism.

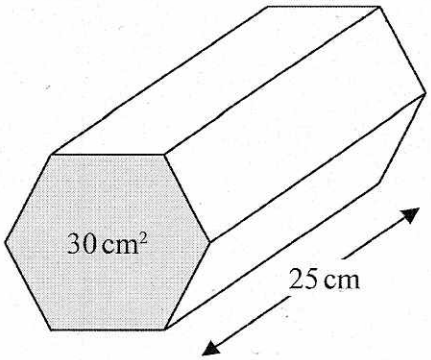

Diagram **NOT** accurately drawn

The area of the cross section of the prism is 30 cm².
The length of the prism is 25 cm.

Work out the volume of the prism.

30 × 25

	30
20	600
5	150

750 cm³

(Total for Question 1 is 3 marks)

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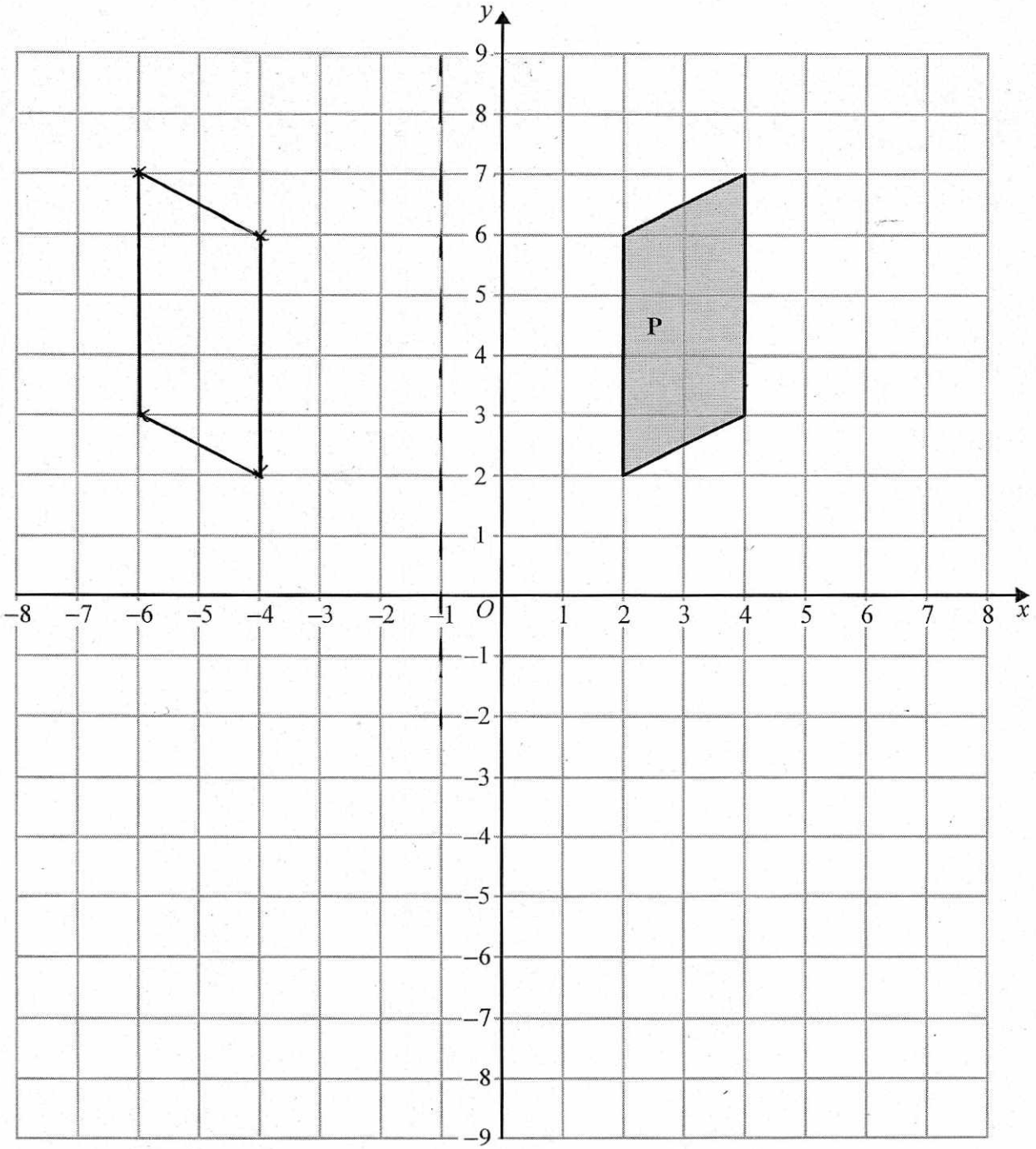
2



(a) Reflect shape **P** in the line $x = -1$

(2)

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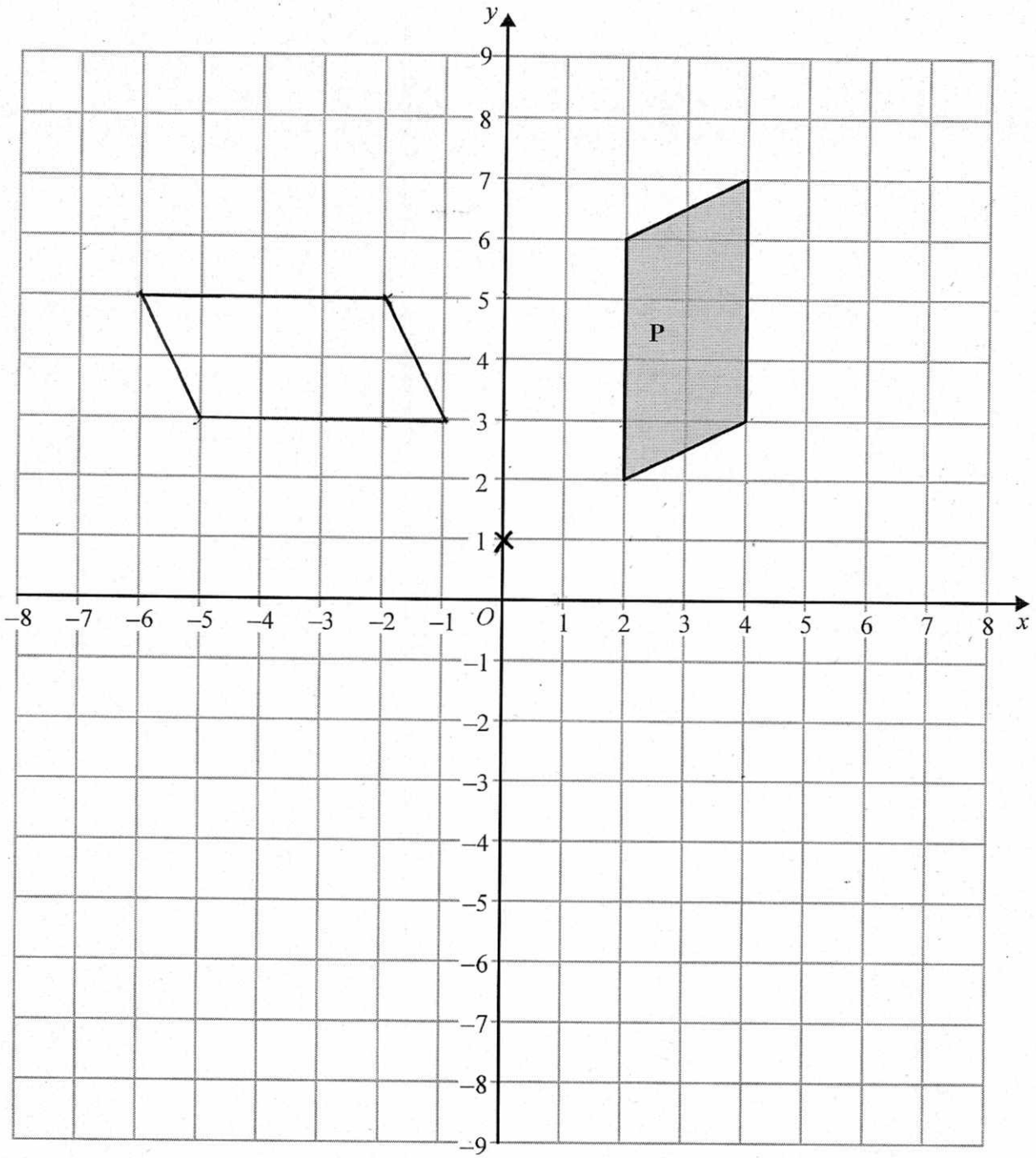

(b) Rotate shape **P** 90° anticlockwise about (0, 1).

(2)

(Total for Question 2 is 4 marks)

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3 Richard wants to find out how often people buy crisps.
He uses this question on a questionnaire.

How often do you buy crisps?

Often ☐ Sometimes ☐ Never ☐

(a) Write down **two** things that are wrong with this question.

1 There is no time scale

2 It is not clear what 'often', 'sometimes' and 'never' mean.

(2)

(b) Design a better question for Richard to use on his questionnaire to find out how often people buy crisps.

How many times do you buy crisps a week?

☐ 0 ☐ 1-2 ☐ 3-4 ☐ ~~5~~ 5 or more

(2)

Richard is going to ask the students in his maths class to answer his questionnaire.

(c) This may **not** be a good sample to use.
Give one reason why.

They will all be the same age.

(1)

(Total for Question 3 is 5 marks)

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4 (a) Simplify $p^2 \times p^5$

p^7

(1)

(b) Simplify $g^6 \div g^4$

g^2

(1)

(c) Simplify $(k^3)^2$

$k^3 \times k^3$

k^6

(1)

(d) Expand and simplify $3(m + 4) - 2(4m + 1)$

$3m + 12 - 8m - 2$

$-5m + 10$

$-5m + 10$ [OR $10 - 5m$]

(2)

(e) Factorise $n^2 - 7n$

$n(n - 7)$

(1)

(Total for Question 4 is 6 marks)

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5 There are 892 litres of oil in Mr Aston's oil tank.
He uses 18.7 litres of oil each day.

Estimate the number of days it will take him to use all the oil in the tank.

900
20

45
[44 - 56]

(Total for Question 5 is 2 marks)

6 One of the teachers at a school is chosen at random.

The probability that this teacher is female is $\frac{3}{5}$

There are 36 **male** teachers at the school.

Work out the total number of teachers at the school.

$\frac{2}{5}$ are male

Male | Female
18 18 | 18 18 18
36

$\frac{2}{5} = 36$

$\frac{1}{5} = 18$

$18 \times 5 = 90$

90

(Total for Question 6 is 3 marks)

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*7 The diagram shows the plan of a floor.

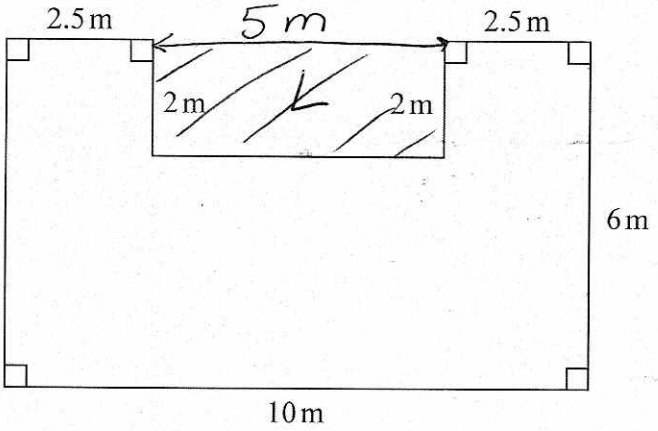

Diagram **NOT** accurately drawn

Angie is going to varnish the floor.

She needs 1 litre of varnish for 5 m^2 of floor.
There are 2.5 litres of varnish in each tin of varnish.

Angie has 3 tins of varnish.

Does she have enough varnish for all the floor?
You must show all your working.

Big Rectangle $6 \times 10 = 60 m^2$

(L) Little Rectangle $= 2 \times 5 = 10 m^2$

Floor Area $= 60 - 10 = \underline{50 m^2}$

x10 (1 litre for $5 m^2$) x10

$\underline{10 \text{ litres}}$ for $50 m^2$

$3 \times 2.5 = 7.5$ litres

She does not have enough, she needs 10 litres. She has 7.5 litres.

(Total for Question 7 is 5 marks)

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8 Carol spins a spinner 80 times.

The table shows information about her results.

Outcome	Frequency
J	39
K	25
L	16

Dan spins this spinner 300 times.

Work out an estimate for the number of times that Dan will get an L.

$\frac{16}{80} = \frac{8}{40} = \frac{4}{20} = \frac{2}{10} = \frac{1}{5}$

$\frac{1}{5}$ of 300 = 60

60

(Total for Question 8 is 3 marks)

9 A shop sells packets of envelopes.

There are 5 envelopes in a small packet.
There are 20 envelopes in a large packet.

There is a total of T envelopes in x small packets and y large packets.

Write down a formula for T in terms of x and y.

$T = 5x + 20y$

$T = 5x + 20y$

(Total for Question 9 is 3 marks)

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10

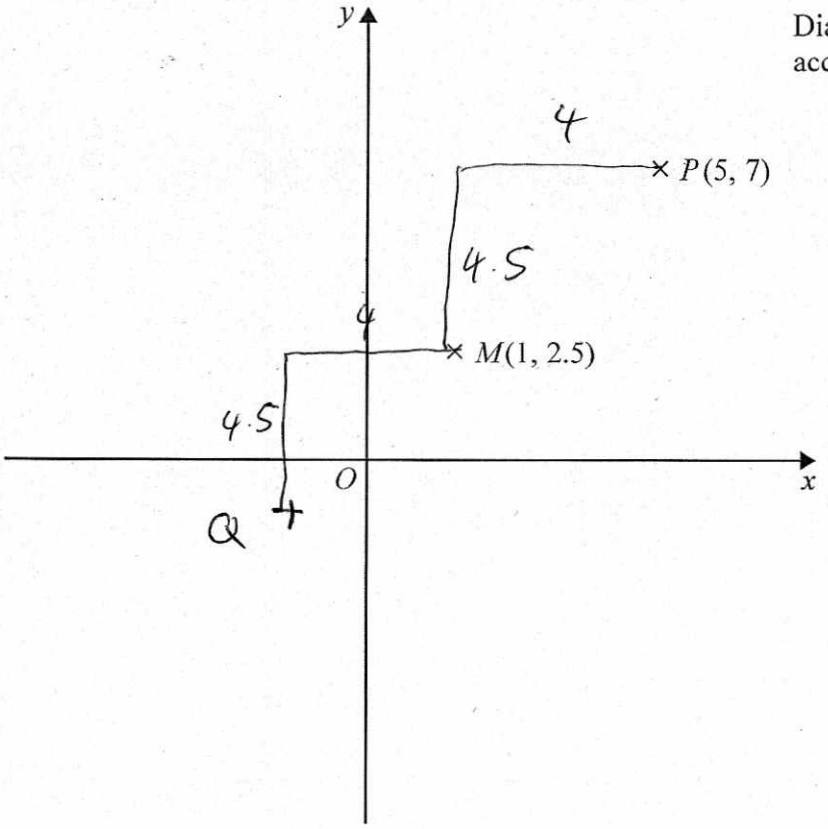

Diagram **NOT** accurately drawn

Point P has coordinates (5, 7).
Point M has coordinates (1, 2.5).

Point M is the midpoint of the line PQ.

Find the coordinates of point Q.

(-3 , -2)

(Total for Question 10 is 2 marks)

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11 66 people went on a day trip.
Each person did only one activity on the trip.

Each person went skating or went to an art gallery or went bowling.

43 of the people are female.
4 of the 10 people who went skating are male.
20 of the people went to the art gallery.
10 males went bowling.

Work out the number of females who went to the art gallery.

	Skating	Art G.	Bowling	Total
Male	4	9	10	23
Female	6	11	26	43
Total	10	20	36	66

11

(Total for Question 11 is 4 marks)

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12 The diagram shows a circle inside a square.

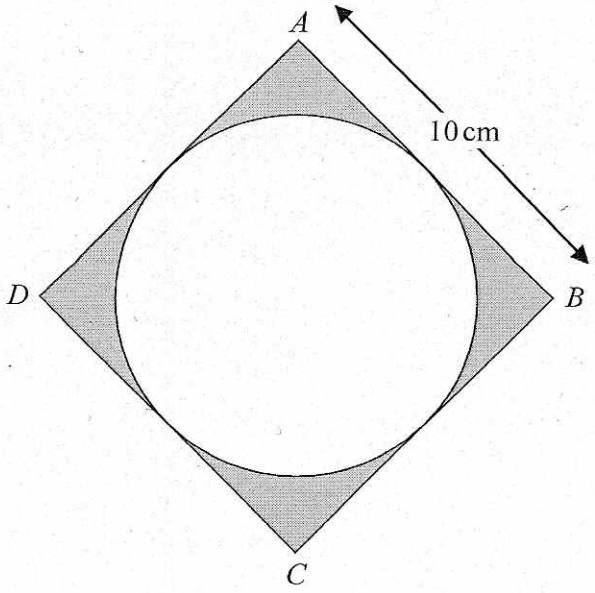

Diagram **NOT** accurately drawn

ABCD is a square of side 10 cm.
Each side of the square is a tangent to the circle.

Work out the total area of the shaded regions in terms of π.
Give your answer in its simplest form.

Area of Square = $10 \times 10 = 100\ cm^2$

Area of circle = $\pi \times r^2$
= $\pi \times 5^2$
= 25π

Shaded Area = $100 - 25\pi$

$100 - 25\pi$ cm^2

(Total for Question 12 is 3 marks)

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13 The table gives information about Ali's spending last month.

Item	Percentage of total spending
rent	30%
food	15%
transport	12%
other	43%

Ali's total spending last month was £800

Next month Ali's rent, in pounds, is going to rise by 20%.
His total spending will still be the same.

Express the amount of money Ali will spend on rent next month as a percentage of £800

Rent Last Month: 30% of 800

10% = 80

30% = £240

New rent = 240 + 20%

10% = 24

20% = 48

= £288

$\frac{288}{800} = \frac{144}{400} = \frac{72}{200} = \frac{36}{100}$ 36 %

(Total for Question 13 is 3 marks)

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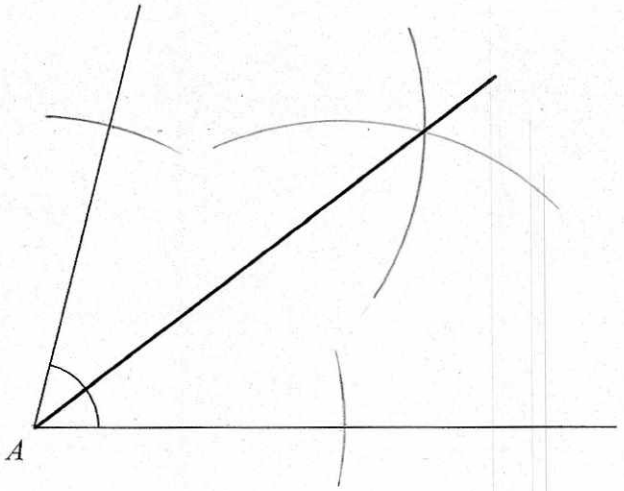
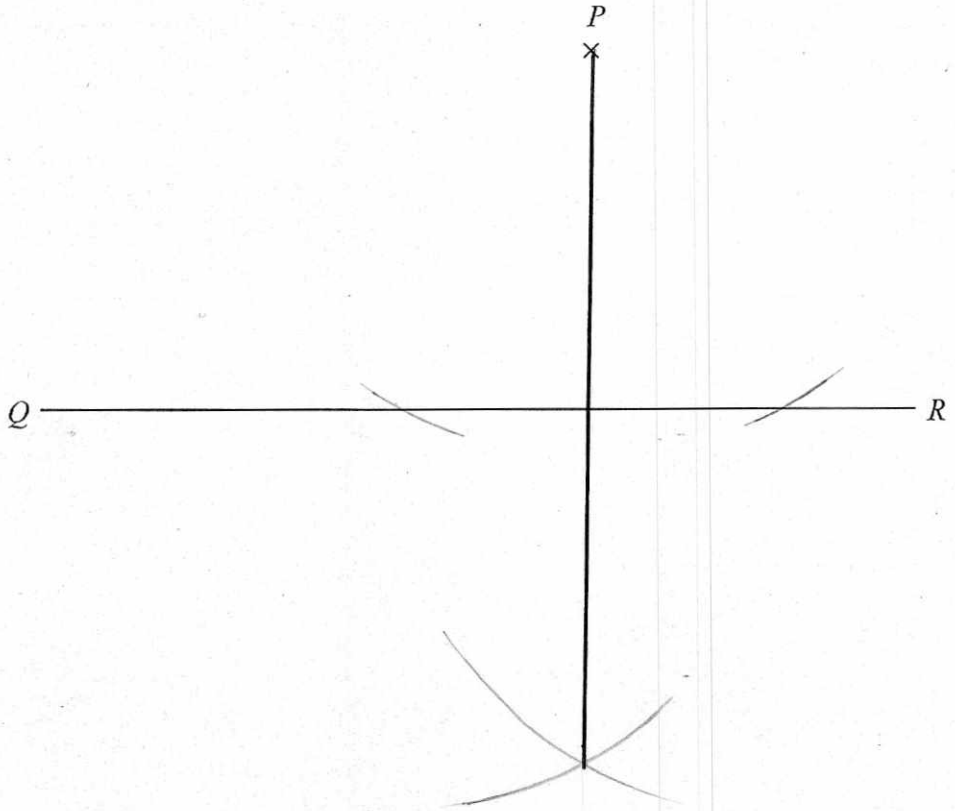
14 (a) Use ruler and compasses to bisect the angle at A.
You must show all your construction lines.



(2)

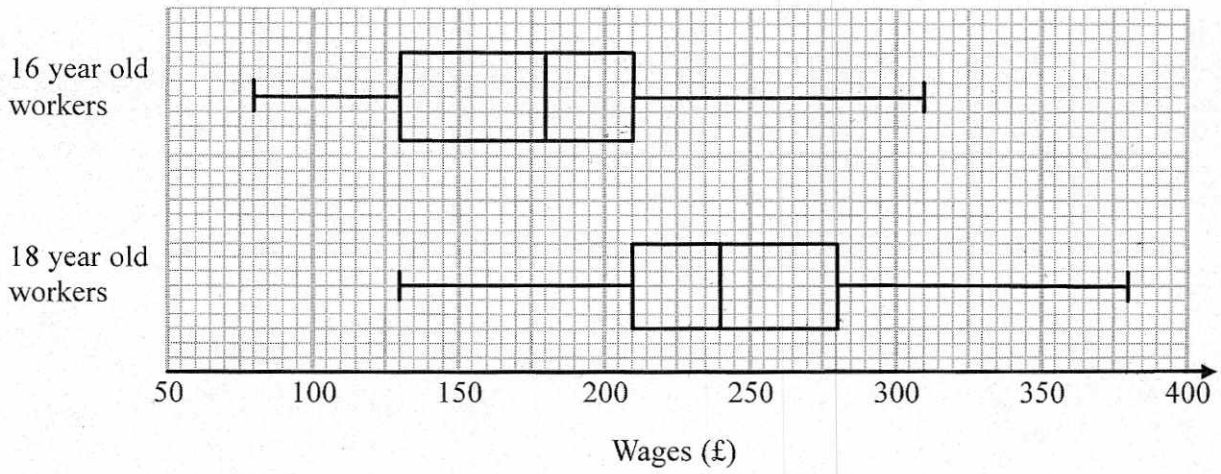
(b) Use ruler and compasses to construct the perpendicular from the point P to the line QR.
You must show all your construction lines.



(2)

(Total for Question 14 is 4 marks)

15 The box plots give information about the wages of a group of 16 year old workers and a group of 18 year old workers.



*(a) Compare the distribution of the wages of the 16 year old workers with the distribution of the wages of the 18 year old workers.

The median wage of the 18 year olds is greater. (£240 compared to £180). On average they earn more.

The interquartile range of 18 year olds is bigger - their wages are more spread out.

(3)

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There are 200 workers who are 16 years old.

(b) Work out an estimate for the number of these workers whose wages are £130 or more.

130 is the lower quartile

3/4 above the lower quartile

3/4 of 200 150

(2)

(Total for Question 15 is 5 marks)

16 Work out the value of $(3.5 \times 10^6) \div (5 \times 10^{-3})$
Give your answer in standard form.

$\frac{3.5}{5} \times \frac{10^6}{10^{-3}}$

$\frac{7}{10} \times 10^9$

0.7×10^9

7×10^8

7×10^8

(Total for Question 16 is 2 marks)

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17 (a) Solve $3x - 5 < 16$

$+5 \quad +5$

$3x < 21$

$x < 7$

$x < 7$

(2)

(b) Solve $\frac{11 - w}{4} = 1 + w$

$11 - w = 4(1 + w)$

$11 - w = 4 + 4w$

$+w \qquad +w$

$11 = 4 + 5w$

$-4 \quad -4$

$7 = 5w$

$w = \frac{7}{5}$

$w = \frac{7}{5}$

[OR 1.4]

(3)

(Total for Question 17 is 5 marks)

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18 (a) Work out $1\frac{1}{5} \times 2\frac{1}{3}$

Give your answer as a mixed number in its simplest form.

$\frac{6}{5} \times \frac{7}{3} = \frac{42}{15} = \frac{14}{5} = 2\frac{4}{5}$

$2\frac{4}{5}$

(3)

(b) Work out $2\frac{7}{15} - 1\frac{2}{3}$

$\frac{37}{15} - \frac{5}{3} \times 5$

$\frac{37}{15} - \frac{25}{15} = \frac{12}{15} = \frac{4}{5}$

$\frac{4}{5}$

(3)

(Total for Question 18 is 6 marks)

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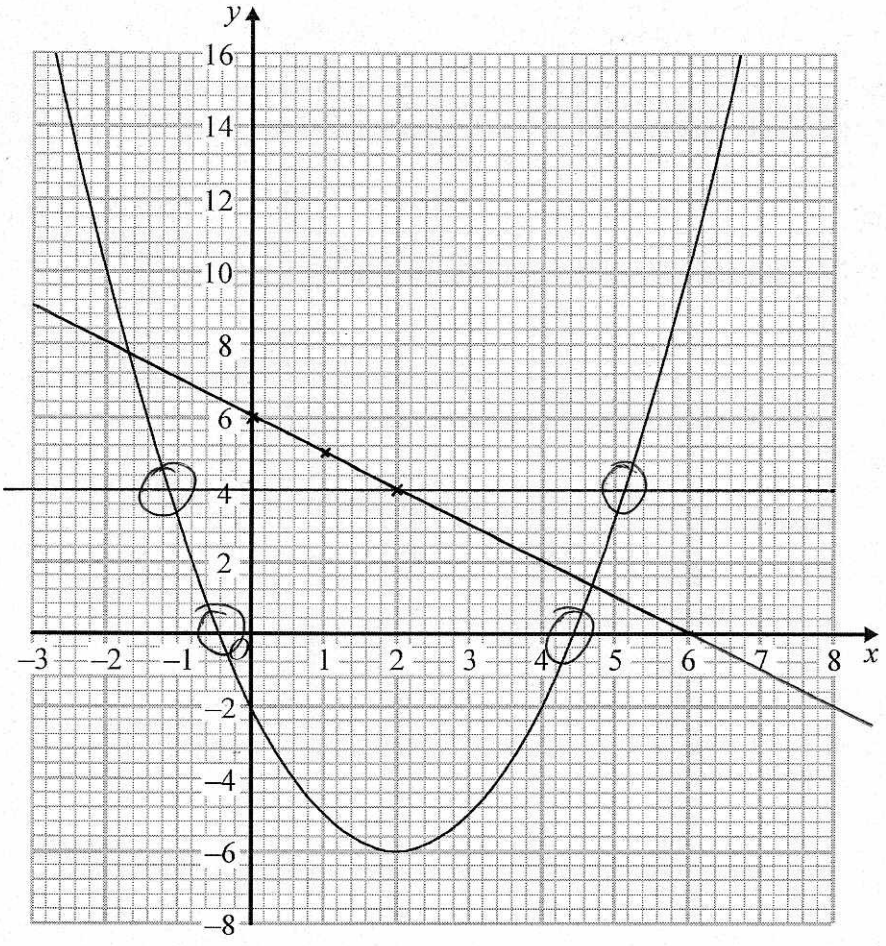
19 The diagram shows the graph of $y = x^2 - 4x - 2$



(a) Use the graph to find estimates for the solutions of

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

$x = -0.4$ $x = 4.4$

(ii) $x^2 - 4x - 6 = 0$ $x^2 - 4x - 2 = 4$

$x = -1.1$ $x = 5.1$

(3)

(b) Use the graph to find estimates for the values of x that satisfy the simultaneous equations

$y = x^2 - 4x - 2$

$x + y = 6$

x	0	1	2
y	6	5	4

$x = -1.7$ $y = 7.7$

$x = 4.7$ $y = 1.4$

(3)

(Total for Question 19 is 6 marks)

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*20

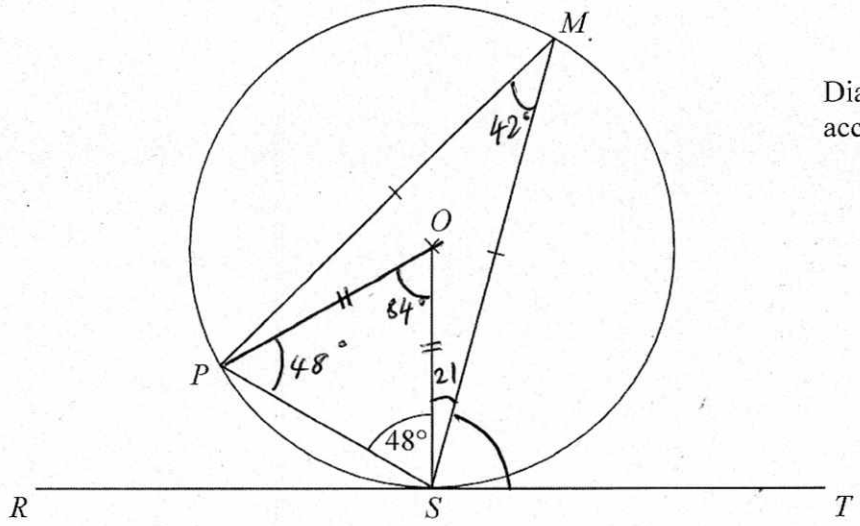

Diagram **NOT** accurately drawn

P, *M* and *S* are points on a circle, centre *O*.
RST is a tangent to the circle.

Angle *PSO* = 48°
MP = *MS*

Work out the size of angle *MST*.
Give reasons for each stage of your working.

OPS = 48° Angles at the base of an isosceles triangle are equal (1)

POS = 84° Angles in a triangle sum to 180°

PMS = 42° Angle at circumference is half angle at centre

MPS or MSP = $\frac{180-42}{2} = \frac{138}{2} = 69°$ [As (1)]

MSO = 21° $69° - 48° = 21°$

OST = 90° Tangent meets radius at 90°

MST $90 - 21 = \underline{69°}$

[or alternate segment theorem]

(Total for Question 20 is 5 marks)

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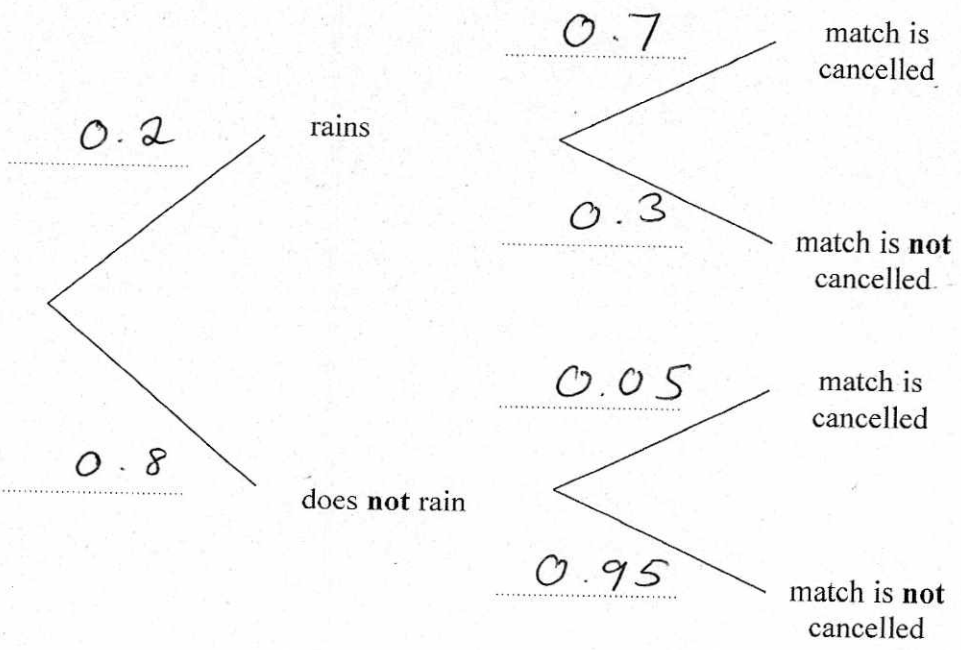
21 The probability that it will rain on a day in June is 0.2

When it rains the probability that my tennis match is cancelled is 0.7

When it does **not** rain, the probability that my tennis match is **not** cancelled is 0.95

(a) Complete the probability tree diagram for this information.



(3)

(b) Work out the probability that, on a day in June, it does **not** rain and my tennis match is cancelled.

$0.8 \times 0.05 =$

$5 \times 8 = 40$

$0.040 = 0.04$

0.04

(2)

(Total for Question 21 is 5 marks)

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22 Solve $x^2 = 4(x-3)^2$

$x^2 = 4((x-3)(x-3))$

$x^2 = 4(x^2 - 3x - 3x + 9)$

$x^2 = 4(x^2 - 6x + 9)$

$x^2 = 4x^2 - 24x + 36$

$0 = 3x^2 - 24x + 36$

$0 = x^2 - 8x + 12$

$0 = (x-6)(x-2)$

$x = 6 \quad x = 2$

$x = 6 \quad x = 2$

(Total for Question 22 is 3 marks)

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23

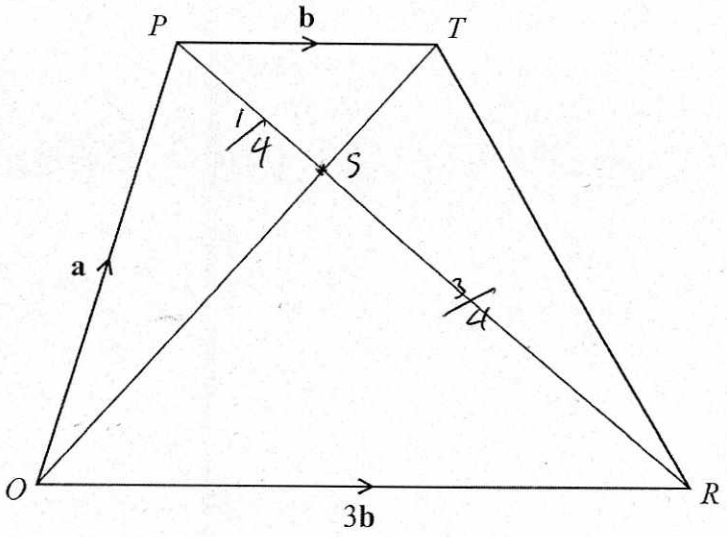

Diagram **NOT** accurately drawn

OPTR is a trapezium.

$\overrightarrow{OP} = \mathbf{a}$
$\overrightarrow{PT} = \mathbf{b}$
$\overrightarrow{OR} = 3\mathbf{b}$

(a) (i) Find $\overrightarrow{OT}$ in terms of **a** and **b**

a + b

(ii) Find $\overrightarrow{PR}$ in terms of **a** and **b**
Give your answer in its simplest form.

−a + 3b

(2)

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S is the point on PR such that $PS : SR = 1 : 3$

(b) Find $\overrightarrow{OS}$ in terms of **a** and **b**
Give your answer in its simplest form.

$$\overrightarrow{OS} = \overrightarrow{OP} + \frac{1}{4}\overrightarrow{PR}$$
$$= a + \frac{1}{4}(-a + 3b)$$
$$= a - \frac{1}{4}a + \frac{3}{4}b$$
$$= \frac{3}{4}a + \frac{3}{4}b$$

$\frac{3}{4}a + \frac{3}{4}b$

(2)

*(c) What does your answer to part (b) tell you about the position of point S?

It is 3/4 of the way from $\overrightarrow{OT}$

(2)

(Total for Question 23 is 6 marks)

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24 Given that $y \propto \frac{1}{x^2}$, complete this table of values.

x	1	2	5	10
y	100	25	4	1

$$y = \frac{k}{x^2}$$

$$1 = \frac{k}{(10)^2}$$

$$1 = \frac{k}{100}$$

$$k = 100$$

$$y = \frac{100}{x^2}$$

$$\frac{100}{5^2} = 4 \qquad \frac{100}{2^2} = 25 \qquad \frac{100}{1^2} = 100$$

(Total for Question 24 is 4 marks)

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25 ABD is a right angled triangle.

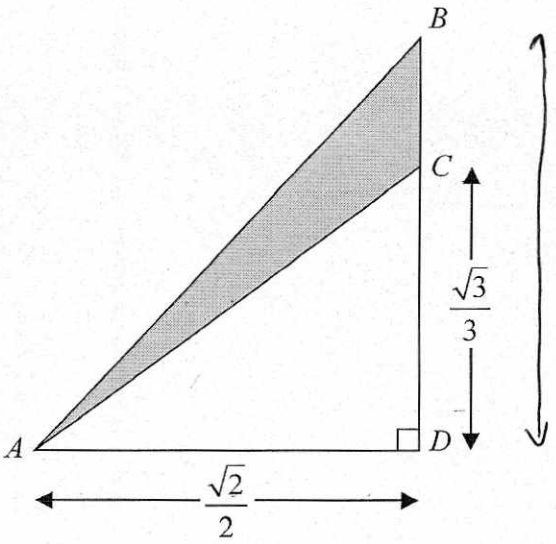

Diagram **NOT** accurately drawn

$\sqrt{2}/2$

All measurements are given in centimetres.

Area of triangle $= \frac{1}{2} \times$ base $\times$ height

C is the point on BD such that $CD = \frac{\sqrt{3}}{3}$

$AD = BD = \frac{\sqrt{2}}{2}$

Work out the exact area, in cm^2, of the shaded region.

Big triangle $= \frac{1}{2} \times \frac{\sqrt{2}}{2} \times \frac{\sqrt{2}}{2} = \frac{2}{8} = \frac{1}{4}$

Little triangle $= \frac{1}{2} \times \frac{\sqrt{2}}{2} \times \frac{\sqrt{3}}{3} = \frac{\sqrt{6}}{12}$

Shaded Area $= \frac{1}{4} - \frac{\sqrt{6}}{12}$

$\frac{1}{4} - \frac{\sqrt{6}}{12}$ cm^2

(Total for Question 25 is 3 marks)

TOTAL FOR PAPER IS 100 MARKS

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