Answer ALL questions
All working must be clearly shown

1. (a) By first rounding each number in the expression below to **ONE** significant figure, estimate the value of:

$$\frac{\sqrt{103}}{18 + 5.124}$$

(3 marks)

(b) Work out $(2.72 - 1.58) + 0.13^2$, giving your answer

(i) exactly

(2 marks)

(ii) correct to 2 significant figures

.....

(1 mark)

(iii) correct to 2 decimal places

.....

(1 mark)

(iv) in standard form

.....

(1 mark)

(c) Evaluate $4.8 \times 10^3 + 2.29 \times 10^2$, giving your answer in standard form.

(2 marks)

(d) A sheet of paper is 0.035mm thick. A stack of paper contains 500 sheets. Calculate the thickness of the stack of papers giving your answer in standard form.

(2 marks)
TOTAL 12 MARKS

2. (a) Write as a single fraction in lowest terms possible.

(i) $\frac{5}{m} + \frac{8}{3m}$

(1 mark)

(ii) $\frac{12}{5a} - \frac{3}{2ab}$

(2 marks)

(iii) $\frac{3k-2}{4} - \frac{k-3}{3}$

(3 marks)

(b) Simplify the following.

(i) $\frac{4}{5x} \times \frac{15x}{16}$

(2 marks)

(ii) $\frac{4a^2b}{7} \div \frac{8a^2b^4}{14}$

(3 marks)

TOTAL 11 MARKS

3. (a) Evaluate $\frac{\sqrt[3]{8}}{2^5}$ giving your answer in simplest form.

(2 marks)

(b) Work out the value of the following. Do not leave your answer in index form.

(i) 5^{-2}

(1 mark)

(ii) $\frac{3^4 \times 3^5}{3^{12}}$

(2 marks)

(iii) $15^6 \div 15^4$

(1 mark)

(c) Simplify the following, giving your answer as a positive index where necessary.

(i) $y^3 \div y^{-2}$

(1 mark)

(ii) $6m^{-6} \times 3m^4$

(2 marks)

(iii) $\left(ab \times a^2b^5 \times 5bc^{11}\right)^0$

(1 mark)

(d) Solve for x in each of the following.

(i) $5^{2x-2} = 5^3$

(1 mark)

(ii) $3^{3x+2} = \frac{1}{81}$

(2 marks)

TOTAL 13 MARKS

4. (a) Expand brackets and simplify the following expressions.

(i) $6m + 7(2 - 4m)$

(2 marks)

(ii) $2(5a - c) + 3(2c + 3a)$

(2 marks)

(iii) $8x(x + 3y) - x(-5x + 5y)$

(3 marks)

(b) Factorize completely.

(i) $xy - y^3$

(1 mark)

(ii) $-12p^2 + 16p$

(2 marks)

(iii) $24a^2y^5 - 6ay^3 + 18a^3y^2$

(3 marks)

TOTAL 13 MARKS

5. (a) $3(x - 6) = 4(1 - 2x)$

(2 marks)

(b) Easy Rentals charges \$35 per day plus \$0.50 per mile to rent a midsize car.
Thrifty Rentals charges \$45.00 a day plus \$0.30 per mile to rent the same car.
Let x = number of miles

(i) Write an expression, in x, to represent the cost per day of renting a midsize car at:

(a) Easy Rentals

(1 mark)

(b) Thrifty Rentals

(1 mark)

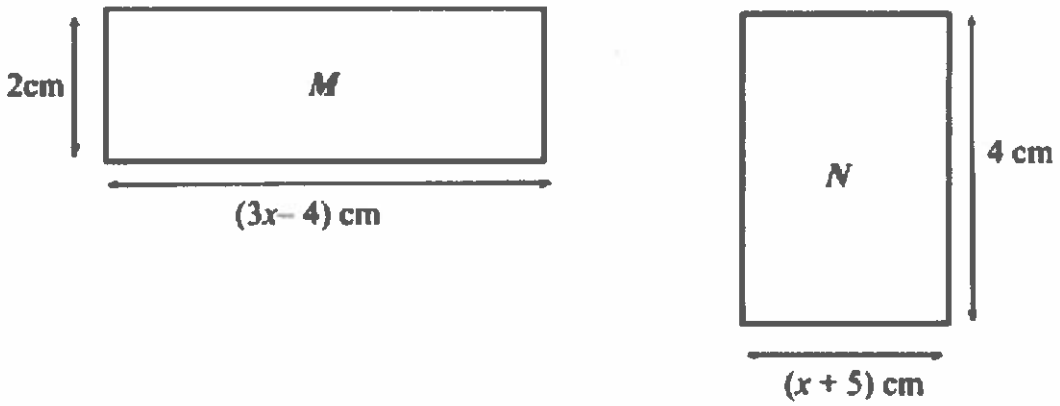
(ii) Assuming that the cost per day of renting a midsize car is the same at both companies write an equation, in x, to represent this.

(1 mark)

(iii) Hence solve the equation for x, the number of miles that would make the cost per day of renting a midsize car the same at both companies.

(2 marks)

(c) The diagram below, ***not drawn to scale***, shows two rectangles M and N with their dimensions expressed in terms of x.
(Area = length × width)



(i) Write an expression, in terms of x, for the area of rectangle M.

(1 mark)

(ii) Write an expression, in terms of x, for the area of rectangle N.

(1 mark)

The areas of the two rectangles are equal.

(iii) Write an equation, in terms of x, to represent this.

(1 mark)

(iv) Hence solve the equation for x.

(2 marks)

TOTAL 12 MARKS

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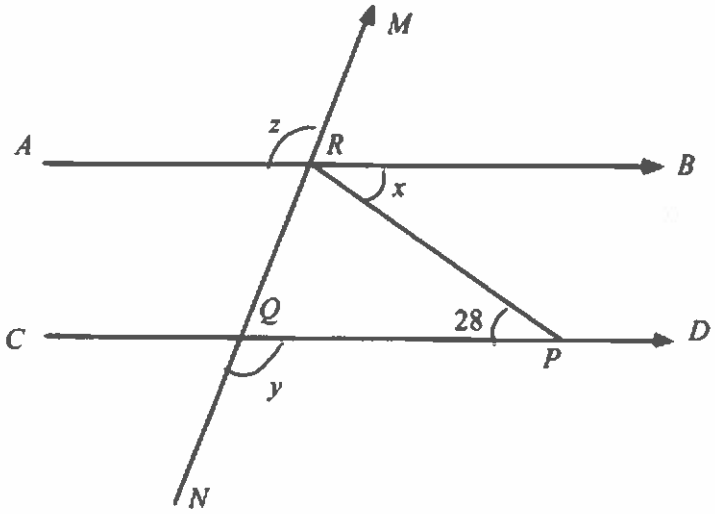
6. In the diagram below, **not drawn to scale**, the lines AQB and $CRPD$ are parallel and $MRQN$ is a transversal. $PQ = PR$ and angle $QPR = 28°$.



(a) (i) What type of triangle is PQR?

.....

(ii) State **TWO (2)** properties of the type of triangle named in (a) (i) above

.....

.....

(b) Calculate, giving reasons for your answer, the size of angles:

(i) x

(2 marks)

(ii) y

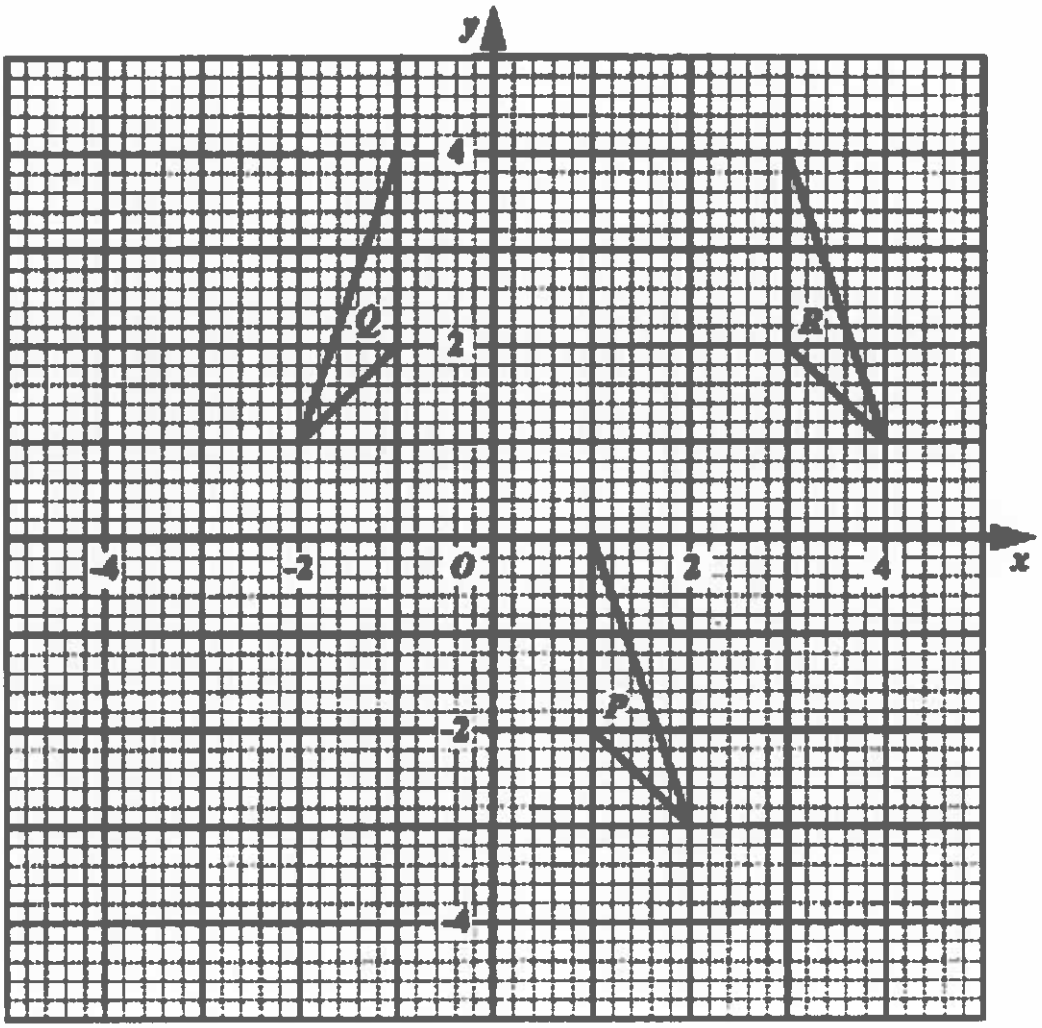
(2 marks)

(iii) z

(2 marks)

TOTAL 9 MARKS

7. (a) The diagram below shows three triangles P, Q and R. Triangles Q and R are the images of Triangle P after it undergoes a double transformation.



Describe **FULLY** the transformations that maps Triangle

(i) P unto Triangle R

.....

.....

(2 marks)

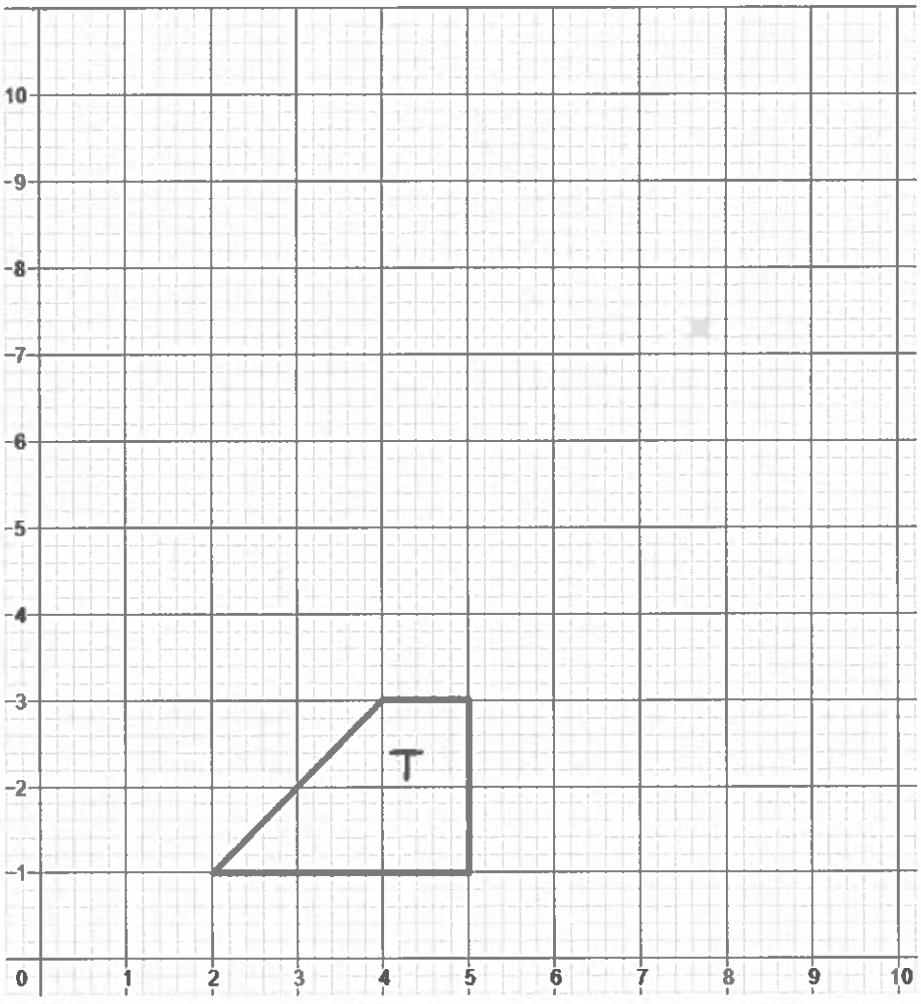
(ii) R unto Triangle Q

.....

.....

(2 marks)

(b) The diagram below shows a shape T.



(i) On the diagram above, draw the image of shape T after a reflection in the line $y = x$. Label this image M.

(3 marks)

(ii) On the diagram above, draw the image of shape T after it undergoes a translation by the vector $\begin{pmatrix} -1 \\ 6 \end{pmatrix}$. Label this image N.

(2 marks)

(iii) State **ONE (1)** geometric property of a translation.

.....

(1 mark)

TOTAL 10 MARKS

8. (a) A relation K is defined by the set of ordered pairs.

$(-3, 2), (-2, 4), (0, 5), (-2, 6), (-1, 1)$.

(i) Draw an arrow diagram to represent the relation above.

(2 marks)

(ii) List the members of the domain.

(1 mark)

.....

(ii) What type of relation is K?

(1 mark)

.....

(b) A relation L has ordered pairs $(1, 5), (2, 7), (3, 9), (4, a), (b, 23)$

(i) What is the rule of relation L?

(1 mark)

(ii) Determine the value of

(a) a

(b) b

(2 marks)

(c) (i) Complete the table below for the relation:

$y = x^2 - 4$ for $-3 \leq x \leq 3$

x	-3	-2	-1	0	1	2	3
y	5			-4		0	

(2marks)

(ii) On the graph paper provided, **using a scale of 2 cm to 1 unit the *x*-axis and 1 cm to 1 unit on the *y*-axis**, draw the graph of the relation.

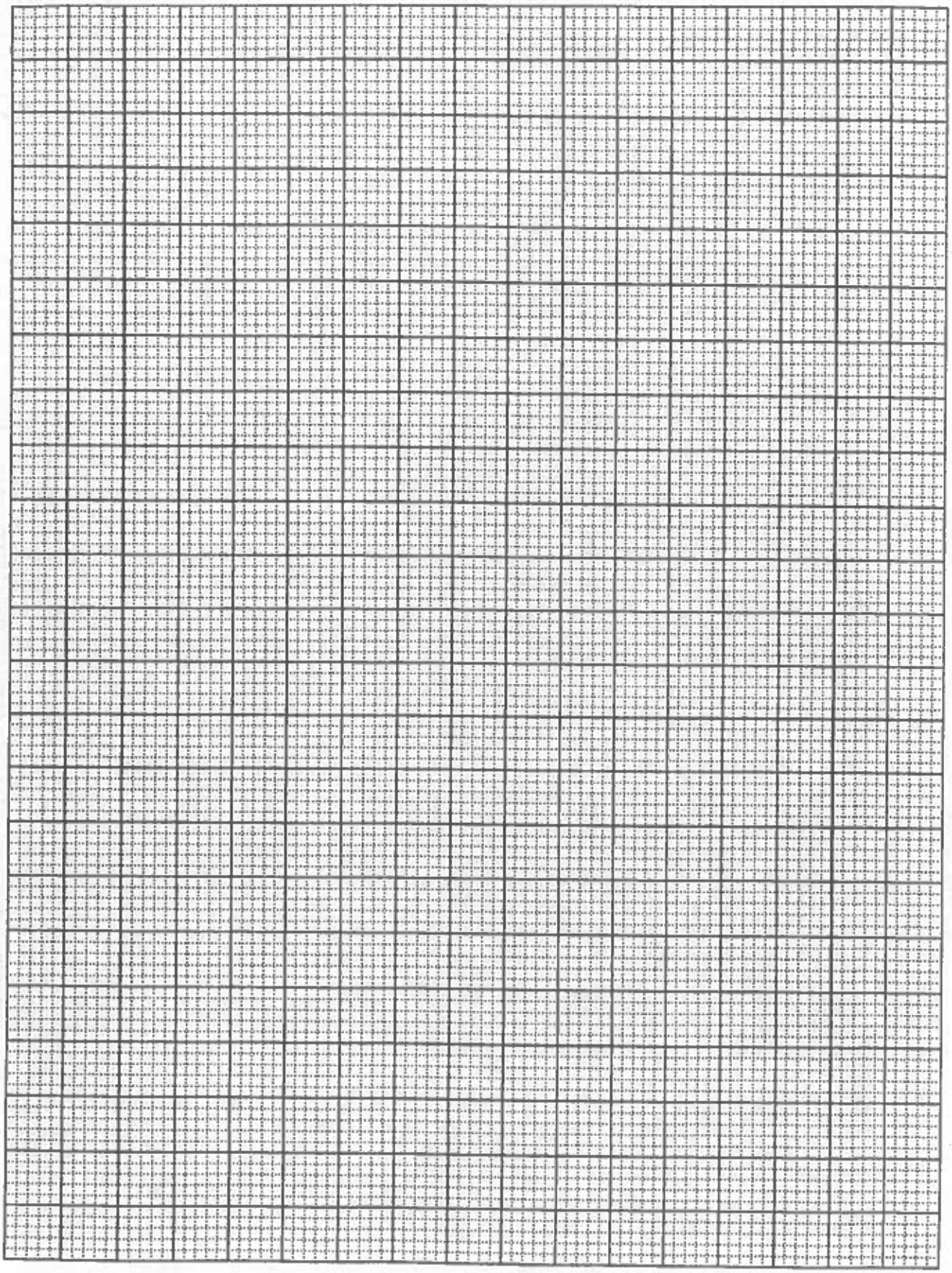
(4 marks)

(iii) Write down the coordinates of the points where the graph cuts/intercepts the *x*-axis.

.....

.....

(2 marks)

TOTAL 15 MARKS

END OF EXAM