

Name _____

Class	Registration Number

**SECONDARY FOUR NORMAL ACADEMIC
PRELIMINARY EXAMINATION 2013
MATHEMATICS 4042/01
PAPER 1**

Duration: 2 hours

Candidates answer on the Question Paper

READ THESE INSTRUCTIONS FIRST

Write your name, class and registration number on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagram or graphs.
Do not use staples, paper clips, highlighters, and glue or correction fluid.

Answer **all** questions.

The number of marks is given in brackets [] at the end of each question or part question.

If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The total number of marks for this paper is 80.

You are expected to use a scientific calculator to evaluate explicit numerical expressions.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142.

For Examiner's Use
80

Mathematical Formulae

Compound interest

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

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

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

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

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

Answer all the questions.

- 1** Jason bought a sofa-set for \$2500. After 3 years, he decided to sell it at a loss of 20%. Find the selling price of the sofa-set.

Answer \$ [2]

- 2** Solve $3(x - 2)(x + 4) = 0$

Answer [2]

- 3** Nigel leaves home at 6.30 am and reaches school which is 36 km away at 7.15 am every morning. Find his average travelling speed to school.

Answer km/h [2]

4 Find the distance between two points $A(1, 4)$ and $B(3, -2)$.

Answer units [2]

5 (a) Express 150 as a product of prime factors.

Answer [1]

(b) Write down the smallest positive integer, k , such that $150k$ is a perfect square.

Answer $k =$ [1]

6 The ages of three siblings are x , $2x - 3$ and $\frac{x}{2} + 6$.

(a) Write down, in its simplest form, an expression for the sum of their ages.

Answer (a) [2]

(b) Given that the sum of their ages is 38, find the age of the youngest sibling.

Answer (b) [2]

- 7 (a) Evaluate $\frac{0.9563}{8.473+11.83}$ as a decimal. Write down all the figures shown on your calculator.

Answer (a) [1]

- (b) Give your answer to part (a) correct to

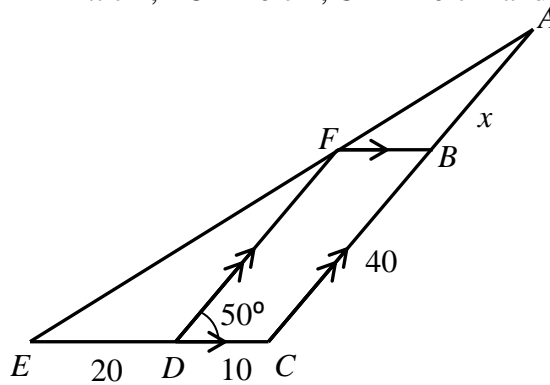
- (i) 3 significant figures,

Answer (b) (i) [1]

- (ii) 5 decimal places.

Answer (b) (ii) [1]

- 8 In the diagram, triangle ABF is a reduction of triangle FDE and $BCDF$ is a parallelogram. $\angle FDC = 50^\circ$, $AB = x$ cm, $BC = 40$ cm, $CD = 10$ cm and $DE = 20$ cm.



Find

- (a) the scale factor,

Answer (a) [1]

- (b) the value of x ,

Answer (b) $x =$ cm [1]

- (c) angle DFB ,

Answer (c) $\angle DFB =$ [1]

- (d) area of triangle FDE .

Answer (d) cm^2 [2]

9 (a) Simplify $\frac{2x}{3} - \frac{3(x-2)}{5}$.

Answer (a) [2]

(b) Solve $2x^2 + 9y - 5 = 0$.

Answer (b) [3]

10 A class of 24 students took an English test. Their scores are represented in the stem and leaf diagram as shown below.

Stem	Leaf
0	7 9
1	1 4 8
2	0 1 3 5 7 7 7 8 9 9
3	0 2 4 5 7 8 9
4	0 2

Key: 1 | 4 means 14 marks

(a) (i) State the modal score for the whole class.

Answer (a) (i)marks [1]

(ii) Find the median score for the whole class.

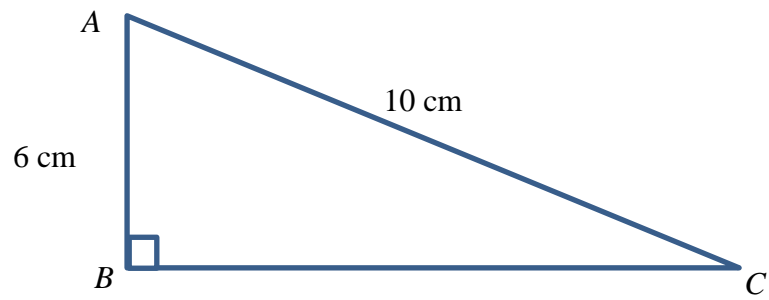
Answer (a) (ii)marks [1]

(b) A new student joined the class and sat for the same test. If the mean score of the class became 27, find the score of the new student.

Answer (b)marks [2]

11 Triangle ABC is a right-angled triangle. $AC = 10$ cm and $AB = 6$ cm.

Find



(a) $\angle ACB$,

Answer (a) $^{\circ}$ [2]

(b) length of BC

Answer (b) cm [2]

12 (a) By completing the square, express $x^2 - 4x - 5$ in the form $(x + a)^2 + b$.

Answer (a)..... [2]

(b) Hence, solve $x^2 - 4x - 5 = 1$, correcting answers to 2 decimal places.

Answer (b) x =..... or [2]

- 13 (a)** The first 4 terms of a sequence is 5, 9, 13, 17, ...
Find
(i) the next 2 terms,

Answer (a) (i), [1]

- (ii)** the n th term,

Answer (a) (ii) [1]

- (iii)** the 100th term.

Answer (a) (iii) [1]

- (b)** 4 men took 10 days to paint a house. How many more men are needed to paint the same house in 5 days.

Answer (b)..... [2]

14 (a) Write the value of n if

(i) $3^n = 243,$

Answer (b) (i) $n = \dots\dots\dots$ [1]

(ii) $0.00234 = 2.34 \times 10^n,$

Answer (b) (ii) $n = \dots\dots\dots$ [1]

(iii) $\frac{1}{36} = 6^n$

Answer (b) (iii) $n = \dots\dots\dots$ [1]

(b) (i) Express 43 billion in standard form.

Answer (b) (i) $\dots\dots\dots$ [1]

(ii) The thickness of a pack of 1400 sheets of paper is 16.8 cm. Find the thickness of 1 sheet of paper in millimeters.

Answer (b) (ii) $\dots\dots\dots$ [1]

- 15 (a) Calculate the sum of the interior angles of a 7-sided heptagon.

Answer (a)° [1]

- (b) Four of the angles of a 7-sided heptagon are 120° , and the others are x° , $(x + 92)^\circ$ and $(2x - 20)^\circ$.
Find the largest angle.

Answer (b)° [3]

- 16 (a) For the equation $x = y + \frac{v^2}{y}$, when $y = 8$ and $v = 2$, find the value of x .

Answer (a) [2]

- (b) For the equation $x = y + \frac{wv^2}{y}$, make v the subject of the formula.

Answer (b) [2]

17 (a) Find the integer values of x for which $x - 3 \leq 7$ and $x - 5 > 2$.

Answer (a) $x = \dots\dots\dots$ [3]

(b) Given that x and y are integers such that $-8 \leq x \leq 4$ and $-2 \leq y \leq 3$,
Calculate

(i) the greatest value of $y - x$,

Answer (b) (i)..... [1]

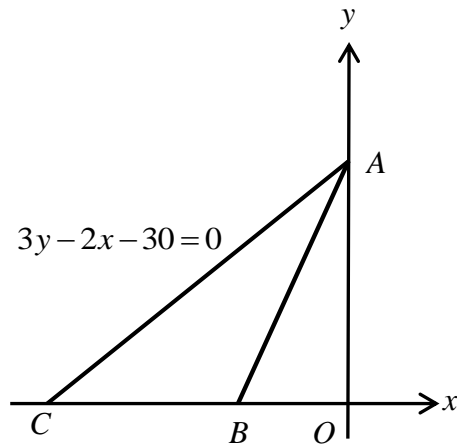
(ii) the least value of $3x + 2$,

Answer (b) (ii) [1]

(iii) the greatest value of x^2 .

Answer (b) (iii) [1]

- 18** In the diagram, the equation of the line AC is $3y - 2x - 30 = 0$.
The length of the line BC is 10 units.



- (a) Find the coordinates of the points A and C .

Answer (a) A (.....,) [1]

C (.....,) [1]

- (b) Write down the gradient of the line AC .

Answer (b) gradient = [1]

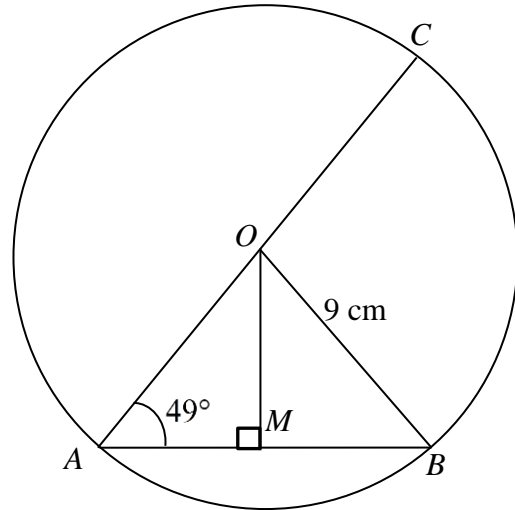
- (c) Write down the coordinates of the point B .

Answer (c) B (.....,) [1]

- (d) If the length of AC is 18 cm, find the perpendicular distance from B to AC .

Answer (d) units [2]

- 19** In the diagram below, A , B and C are three points on the circumference of a circle with center O , radius 9 cm and $\angle OAM = 49^\circ$. Given that OM is perpendicular to chord AB , calculate



- (a) (i) the length of OM ,

Answer (a) (i) [1]

- (ii) the length of AB ,

Answer (a) (ii) [1]

- (iii) the area of triangle ABO

Answer (a) (iii) [2]

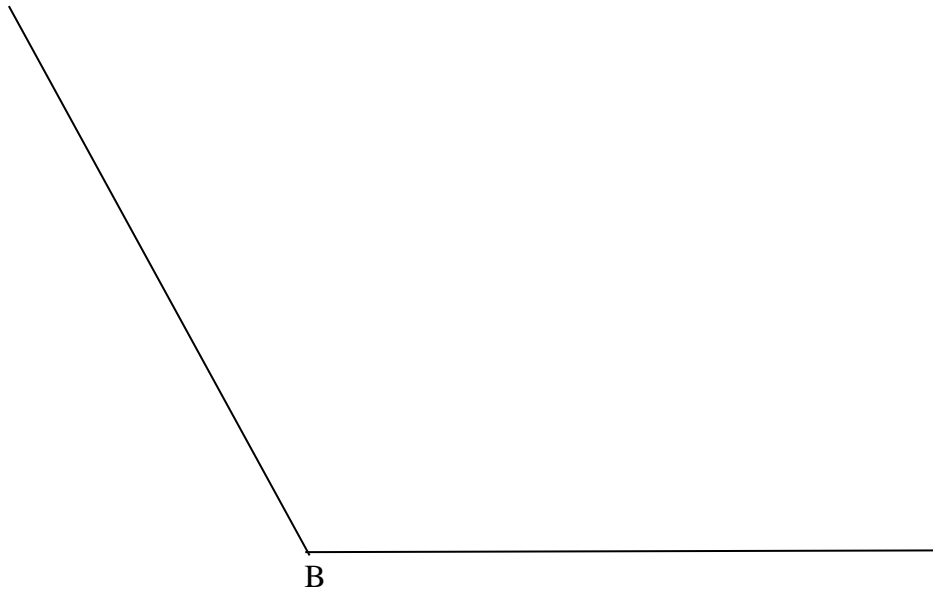
- (b) the area of the sector OAB .

Answer (c) cm^2 [2]

20 The quadrilateral ABCD has $AB = 7$ cm, $BC = 7$ cm, $CD = 6$ cm and $DA = 10$ cm.

$\angle B$ is drawn below.

Answer (a) (b) (c)



- (a) In the answer space above, complete the quadrilateral using only a pair of compasses and ruler. Mark and label A , D and C clearly. [3]
- (b) Construct the angle bisector of $\angle ABC$. [1]
- (c) Construct the perpendicular bisector of the line AB . [1]

END OF PAPER

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Section A (44 marks)

Answer **all** the questions in this section.

1 In December 2012 the rate of exchange between Singapore dollars (\$) and Malaysian Ringgit (RM) was \$1 = RM 2.52

(a) What was the value of RM 250 in Singapore dollars? [1]

(b) Sally bought a bag which cost \$3000. The shop charged 1.85% commission because she paid in Malaysian Ringgit. What was the total price in Malaysian Ringgit? [2]

2 (a) Simplify

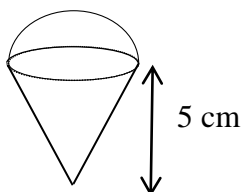
(i) x^0 [1]

(ii) $\frac{x^{-1}}{x^{-7}}$ [1]

(b) Evaluate $13.4 \times (6.2 \times 10^6)$, giving your answer in standard form. [2]

3 Mrs Lim deposited \$5000 in a bank account. The money is left in the account for 3 years earning compound interest of 4.8% a year. Calculate the total amount in her account at the end of 3 years. [3]

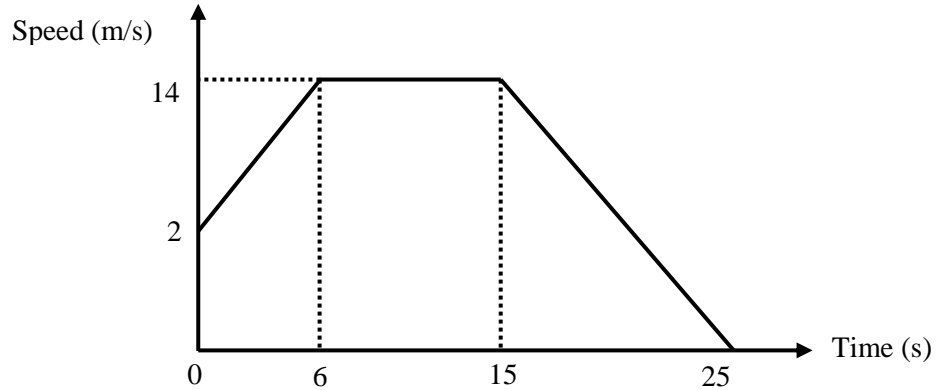
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The diagram shows an ice-cream cone with vanilla ice-cream, which is in the shape of a hemisphere, on top. Both have a radius of 3 cm.

Find the **total** volume of the ice-cream. [4]

- 5 The speed-time graph shows the first 25 seconds of a bus journey.



Find

- (a) the acceleration during the first 5 seconds. [1]
- (b) the total distance travelled. [2]
- (c) the speed when $t = 20$. [2]
-
- 6 (a) Factorise $3p^2 - 48$. [2]
- (b) Solve $2(2x - 1) - 3(x + 2) = 14$ [3]
- (c) Solve the equation $2x^2 + 3x - 7 = 0$. [3]
- Give your answers correct to three significant figures.

- 7 It was found that when the brakes of a vehicle were applied, the breaking distance, d metres,

is proportional to the square of its speed, v km/h.

The minimum breaking distance for a car travelling at 80 km/h is 38.4 m.

- (a) Find the formula connecting d and v . [2]
- (b) Find the minimum breaking distance of this car when travelling at 120 km/h. [1]
- (c) Find the time taken by this car to reach its destination if the minimum breaking distance is 25.35 m. [3]

- 8 (a) Each week, Hanis works partly at home and partly in the office. He divides his time so that the ratio of home hours to office hours is 2 : 3. If he works a total of 55 hours in a week,

calculate how many hours he worked at home and how many hours he worked in the office.

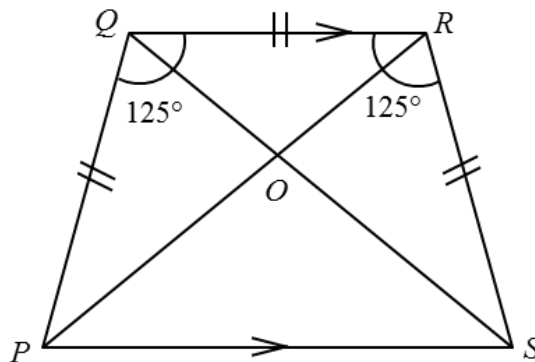
- (b) Solve these simultaneous equations.

$$4x - 5y = 10$$

$$2x + 7y = -3$$

[3]

- 9 $PQRS$ is a quadrilateral with sides $PQ = QR = RS$. $\angle PQR = \angle SRQ = 125^\circ$.
 QR is parallel to PS .



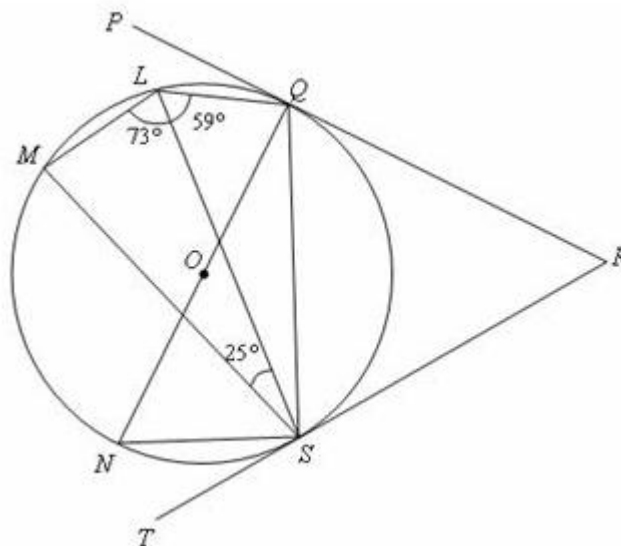
(a) Name a pair of congruent triangles. State the reasons for congruency. [2]

(b) Find angle POS . [3]

Section B (16 marks)

Answer any **two** questions from this section. Each question carries 8 marks.

- 10 In the diagram, O is the centre of the circle $MLQSN$. PR is the tangent to the circle at Q and RT is the tangent to the circle at S .



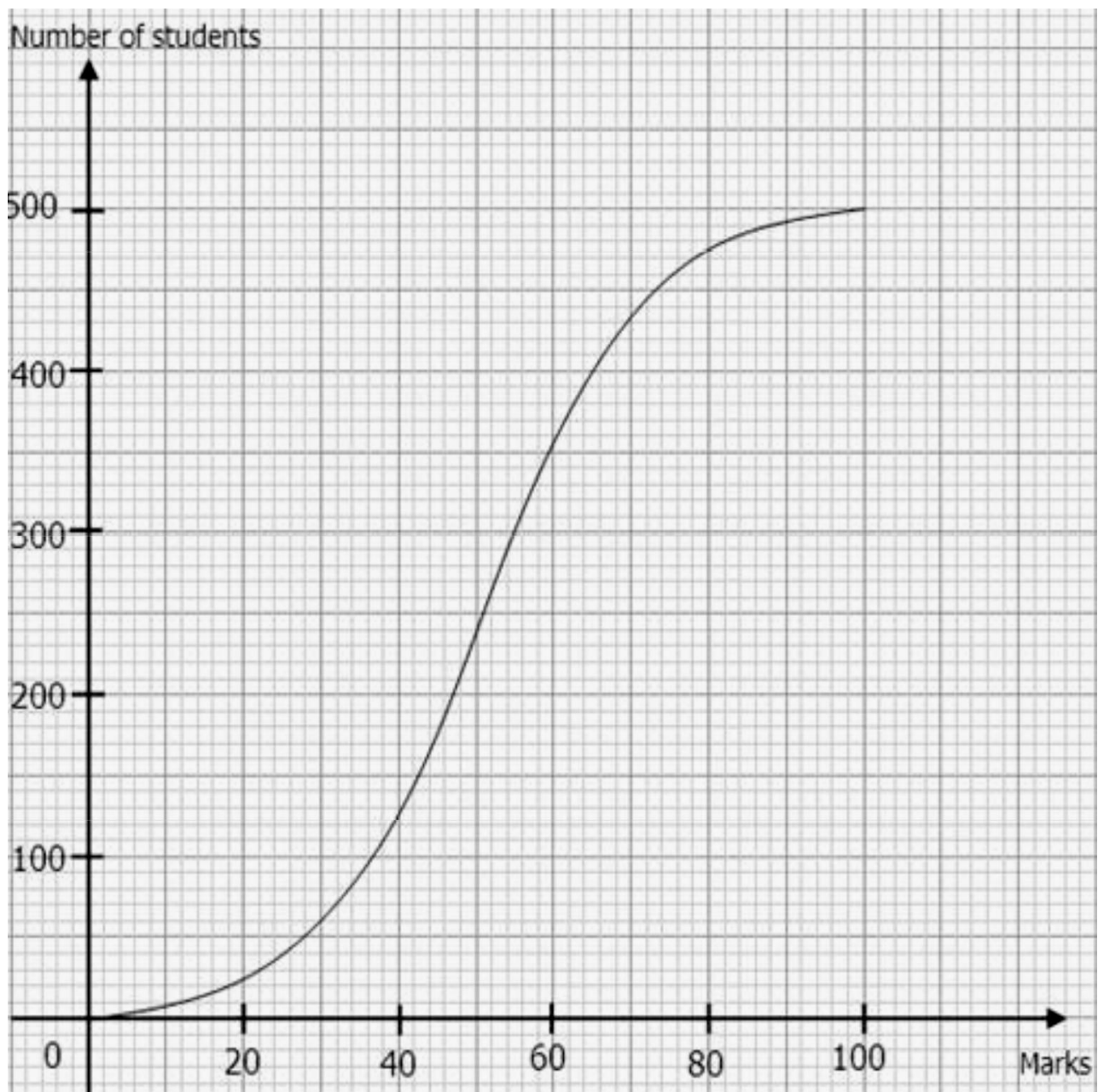
Find

- (a) angle QNS , [1]
- (b) angle MSQ , [1]
- (c) angle NQS , [1]
- (d) reflex angle QRS , [3]
- (e) angle QMS , [1]
- (f) angle LOM . [1]

11 (a) The cumulative frequency graph represents the Chemistry preliminary examination marks of

of a group of 500 students. Use the graph to estimate

- (i) the median mark, [1]
- (ii) the interquartile range, [2]
- (iii) the number of students who score between 40 and 50 marks. [2]



- 11 (b) 40 boys and 20 girls are chosen to represent the school for an Inter-school Science Competition. Two of these 60 are chosen at random.

What is the probability that one was a girl and one was a boy?

[3]

- 12 Answer the whole of this question on a single sheet of graph paper.

The table of values is for $y = x^3 - 18x + 30$

x	-4	-3	-2	-1	0	1	2	3	4
y	38	57	q	47	30	p	2	3	22

- (a) Calculate the value of p and q .

[2]

- (b) Using a scale of 2 cm to 1 unit on the horizontal axis and a scale of 2 cm to 10 units

on the vertical axis, draw the graph of $y = x^3 - 18x + 30$.

[3]

- (c) Use your graph to find the values of x when $y = 15$.

[1]

- (d) By drawing a tangent, find the gradient of the curve when $x = 2$.

[2]

--- END OF PAPER ---
