National Qualifications
MODEL PAPER 2

Mathematics
Paper 1
(Non-Calculator)

Duration — 1 hour

Total marks — 40

You may NOT use a calculator.

Attempt ALL questions.

Use **blue** or **black** ink. Pencil may be used for graphs and diagrams only.

Write your working and answers in the spaces provided. Additional space for answers is provided at the end of this booklet. If you use this space, write clearly the number of the question you are attempting.

Square-ruled paper is provided at the back of this booklet.

Full credit will be given only to solutions which contain appropriate working.

State the units for your answer where appropriate.

Before leaving the examination room you must give this booklet to the Invigilator.
If you do not, you may lose all the marks for this paper.

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: $A = \tfrac{1}{2}ab\sin C$

Volume of a sphere: $V = \tfrac{4}{3}\pi r^3$

Volume of a cone: $V = \tfrac{1}{3}\pi r^2 h$

Volume of a pyramid: $V = \tfrac{1}{3}Ah$

Standard deviation: $s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n - 1}} = \sqrt{\dfrac{\Sigma x^2 - (\Sigma x)^2/n}{n - 1}}$, where n is the sample size.

1. Evaluate $\dfrac{2}{5} \div 1\dfrac{1}{10}$.   **2**

2. Factorise fully $2m^2 - 18$.   **2**

3. Given that $f(x) = 5 - x^2$, evaluate $f(-3)$.   **2**
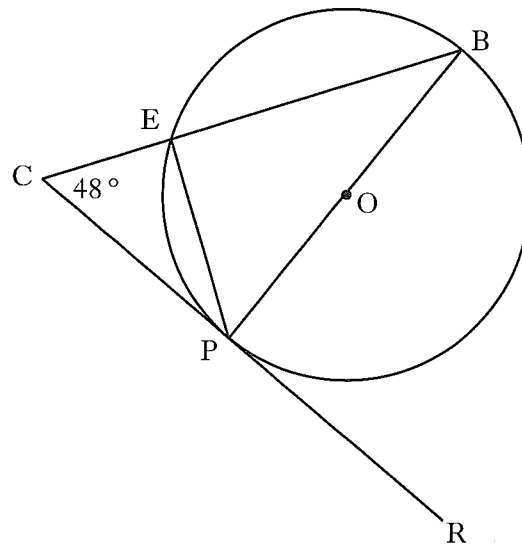
4. Solve the equation $3x + 1 = \dfrac{x-5}{2}$.   **3**

5. Express $\sqrt{63} + \sqrt{28} - \sqrt{7}$ as a surd in its simplest form.   **3**

MARKS

6. Express $x^2 + 10x + 17$ in the form $(x + p)^2 + q$.　　2

7. Alan is taking part in a quiz. He is awarded x points for each correct answer and y points for each wrong answer. During the quiz, Alan gets 24 questions correct and 6 wrong. He scores 60 points.

(a) Write down an equation in x and y which satisfies the above condition.　　1

Helen also takes part in the quiz. She gets 20 questions correct and 10 wrong. She scores 40 points.

(b) Write down a second equation in x and y which satisfies this condition.　　1

(c) Calculate the score for David who gets 17 correct and 13 wrong.　　4

Total marks　6

MARKS

8.   A circle, centre O, is shown below.

In the circle

- PB is a diameter

- CR is a tangent to the circle at point P
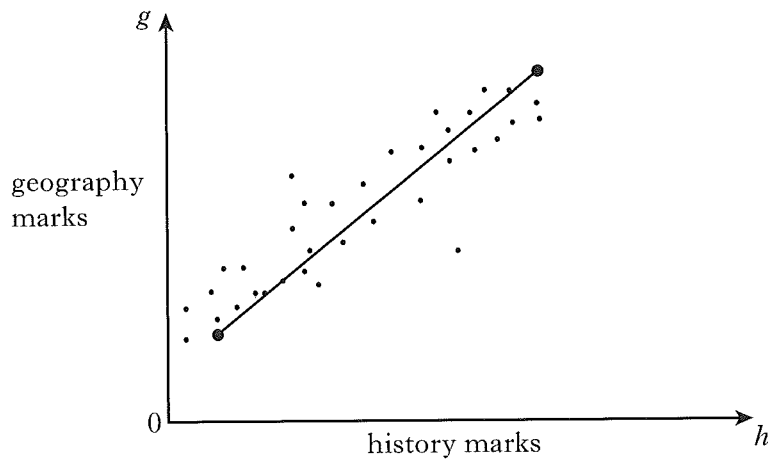
- Angle BCP is 48°.

Calculate the size of EPR.

3

9. The graph below shows the relationship between the History and Geography marks of a class of students.

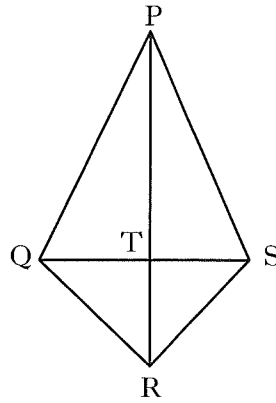A best-fitting straight line, AB has been drawn.

Point A represents 12 marks for history and 20 marks for geography.

Point B represents 92 marks for history and 80 marks for geography.

Find the equation of the straight line AB in terms of h and g.

4

MARKS

10. A kite PQRS is shown below.

The diagonals of the kite intersect at T.

PT = 2TR.

$\overrightarrow{PR}$ represents vector **a**.
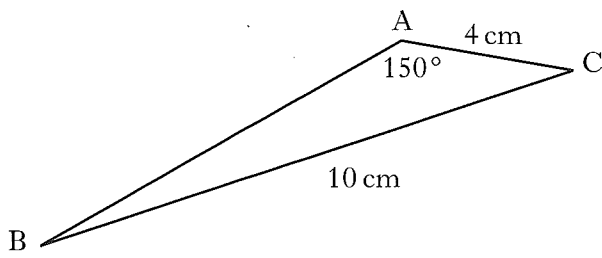
$\overrightarrow{QS}$ represents vector **b**.

Express $\overrightarrow{PS}$ in terms of **a** and **b**.

2

11. In the triangle ABC

- AC = 4 centimetres
- BC = 10 centimetres
- Angle BAC = 150°.

Given that $\sin 30^{\circ} = \dfrac{1}{2}$, show that $\sin B = \dfrac{1}{5}$.

4

12. Express $\dfrac{b^{\frac{1}{2}} \times b^{\frac{5}{2}}}{b^2}$ in its simplest form.

2

13. Express $\dfrac{5p^2}{8} \div \dfrac{p}{2}$ as a fraction in its simplest form.   **3**

14. Prove that $\dfrac{\sin^2 A}{1-\sin^2 A} = \tan^2 A$.   **2**

[END OF MODEL PRACTICE PAPER]