

St Paul's School Entrance Scholarship

Mathematics Paper 1: Specimen Paper B

Time: 90 minutes

Calculators are allowed.

- 1 (a) What is the next prime number after 83?
(b) What is the lowest common multiple (LCM) of 24 and 28?
(c) What is the LCM of $5x^2y$ and $6xy^3$?
- 2 By working to 1 significant figure, estimate the values of the following.
(i) $\frac{493 \times 0.103}{9.2^2 + 0.78}$
(ii) $\sqrt{48.1} \times (-29.3)^2$
- 3 (a) Write the equation $x + \frac{2}{x} = 3 + 4x$
in a form without fractions, simplifying your answer where possible.
(b) Solve the equation $\frac{x}{3} = 1 - \frac{x}{5}$, giving your answer as an exact fraction.
- 4 Simplify as far as possible:
(i) $(3x^2 + 7x - 2) - x(3x - 5)$
(ii) $\frac{a + a + a + a}{a}$
(iii) $\frac{b \times b \times b \times b \times b}{b}$
(iv) $\frac{(2p^2)^5}{(4p^3)^3}$
- 5 Carice had an operation costing £500. She was in hospital for n days, and the cost of nursing care is £170 for each day in hospital.
(i) Write down, in terms of n , an expression for the total cost of her operation and nursing care.
(ii) The total cost of her operation and nursing care was £2370.
Work out how many days Carice was in hospital.

6 The numbers 0, 1, 1, 1, 2, k , m , 6, 9, 9, are in increasing order, and k and m are different. The median of the numbers is 2.5 and their mean is 3.6.

- (i) Write down the mode.
- (ii) Find the value of k and the value of m .
- (iii) Maria chooses a number from the list. The probability of choosing this number is $\frac{1}{5}$. Which number did Maria choose?

7 Magazines cost $\pounds x$ each and newspapers cost $\pounds y$ each. One magazine costs $\pounds 2.60$ more than one newspaper. Three magazines cost $\pounds 0.60$ less than ten newspapers.

- (i) Write down two equations in x and y to show this information.
- (ii) Find the values of x and y .

8 Marcus, Carl and Pedram receive $\pounds 800$ from their grandmother in the ratio

$$\text{Marcus} : \text{Carl} : \text{Pedram} = 7 : 5 : 4.$$

- (i) Calculate how much money each receives.
- (ii) Marcus spends $\frac{2}{7}$ of her money and then invests the rest. After 2 years it has increased by 10%. How much money does Marcus have at the end of the two years?
- (iii) Carl spends all his money on a hi-fi set and two years later sells it at a loss of 20%. How much money does Carl have at the end of the two years?
- (iv) Pedram spends some of his money at once and invests the rest. At the end of the two years the amount he invested has grown by 10% and it is now worth $\pounds 132$. How much did he spend?

9 The surface area A of a shape of length r and height h is given by the formula

$$A = 6rh + 6r^2.$$

- (i) Calculate the value of A when $r = 5$ cm and $h = 9$ cm.
- (ii) A shape for which $r = 7$ cm has $A = 353$ cm². Calculate the value of h .
- (iii) A shape for which r and h are equal has $A = 192$ cm². Find the value of r .

10 A box contains red, yellow, green and purple sweets. Abdul picks a sweet at random. The probability that the sweet is red is $\frac{1}{4}$. The probability that it is green is $\frac{1}{5}$. The probability that it is yellow is $\frac{1}{6}$.

- (i) What is the probability that it is purple? Give your answer as an exact fraction.
- (ii) What is the smallest possible number of sweets in the box?

- 11 A swimming pool has a cross-section in the shape of a trapezium with vertical sides. The depth of the swimming pool is 3 m at the deep end and 1 m at the shallow end. The pool is 25 m long and 10 m wide. The sides of the pool are all vertical and the top is horizontal.
- Find the area of the cross-section of the pool (that is, the area of the trapezium).
 - The volume of the pool is equal to its width multiplied by the area of the cross-section. Calculate the volume of the pool in litres.
 - To empty the pool, water is removed at a rate of 20 litres per second. Find out how long it takes to empty the pool, in hours and minutes correct to the nearest minute.

