OUNDLE

School

2017 Academic Scholarship

Preliminary Examination

Mathematics

Time Allowed: One hour and 30 minutes

- **Calculators may NOT be used.**
- Write your answers on **lined paper** and **show as much working as possible**. **Answers without clear logical working will gain little credit.**
- Do not spend too long on any single question. If you are having difficulty with a particular question, move on and return to it at the end if you have time. Do not be concerned if you cannot answer all of the questions.
- **At the end of the examination**, hand in both the question paper and your answers with your name clearly indicated on all sheets.

1. Work out :

(a) $56 + 29$

(b) $407 \div 11$

(c) $\sqrt[3]{125}$

(d) $\sqrt{49\,000\,000}$

(e) 24.3×0.02

(f) $2\frac{1}{4} - 1\frac{2}{3}$

(g) $3^4 - 4^3$

(h) $4\frac{1}{6} \div 1\frac{2}{3}$

(i) $84 \div (13 - 6) + \frac{2}{3}$ of $(11 - 2 \times 4)$

(j) 80% of 80% of £ 125.

(k) $\frac{8.04}{0.0002}$

2. Rewrite each of the following, inserting the correct signs (out of $+$, $-$, $\times$, $\div$) to make the statement true :

(a) $\frac{1}{2} \square \frac{1}{4} = 2$

(b) $\frac{5}{6} \square \frac{1}{7} = \frac{29}{42}$

(c) $\frac{2}{7} \square \frac{3}{4} = \frac{3}{14}$

3. Remove brackets and simplify :

(a) $3(x + 4)$

(b) $x(2x - 1) - (2 + x)$

(c) $(x + 7)(x - 3)$

4. Factorise fully :

(a) $5x - 15$

(b) $2y^3 - 6y^2 - 4y$

(c) $12x^2y^3 + 18x^3y^2$

FOR **QUESTIONS 5 AND 6**, USE A CLEAR ALGEBRAIC METHOD, **NOT** A TRIAL AND ERROR APPROACH. PLEASE NOTE THAT THE EQUATIONS TO BE SOLVED DO NOT NECESSARILY HAVE INTEGER (WHOLE NUMBER) SOLUTIONS.

5. Solve each equation for x :

(a) $\frac{1}{2}\,x = -3$

(b) $-3\,x = \frac{1}{2}$

(c) $4\,x + 7 = 18$

(d) $\frac{2x + 3}{4} = 3$

(e) $\frac{1 - x}{4} = \frac{-2\,x - 1}{5}$

6. Solve for x and y :

$$\begin{aligned} x + 4\,y &= 1 \\ 5\,x - 2\,y &= 16 \end{aligned}$$

FOR THE REMAINING QUESTIONS, YOU CAN ANSWER THEM IN ANY ORDER THAT YOU CHOOSE. YOU MUST SHOW FULL WORKING TO MAKE IT CLEAR HOW YOU OBTAINED YOUR ANSWER. (ANSWERS WITHOUT WORKING WILL BE AWARDED VERY FEW MARKS)

7. An amount of money was shared out among 3 people in the ratio 11 : 6 : 3.
The largest share was £ 120 greater than the smallest share.
Calculate the total amount of money that was shared out.

8. A bag contains *n* beads, which are black, white or red. The probability of picking a black bead at random is $\frac{3}{10}$ and the probability for a white bead is $\frac{1}{6}$.
Calculate the smallest possible value of *n*.

9. (a) Express as fractions in their simplest form :

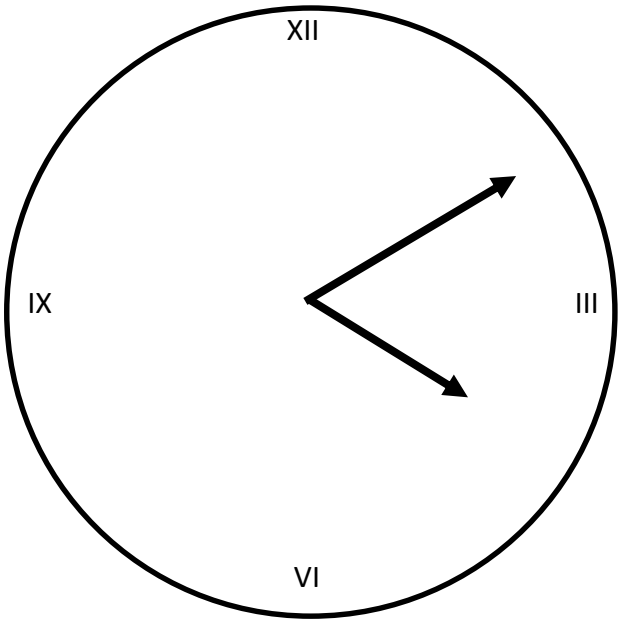
(i) $12\frac{1}{2}\ \%$

(ii) $80\ \%$

(b) Gary and Susan work in the city as investment bankers. At the start of 2016, they earned the same annual salary. However, after a poor performance in 2016 by Gary and an excellent year's work by Susan, Gary's annual salary went down by $20\ \%$ while Susan's was increased by $12\frac{1}{2}\ \%$. At this stage, Susan's annual salary was £26 000 higher than Gary's.

Work out their (original) salary at the start of 2016.

10.



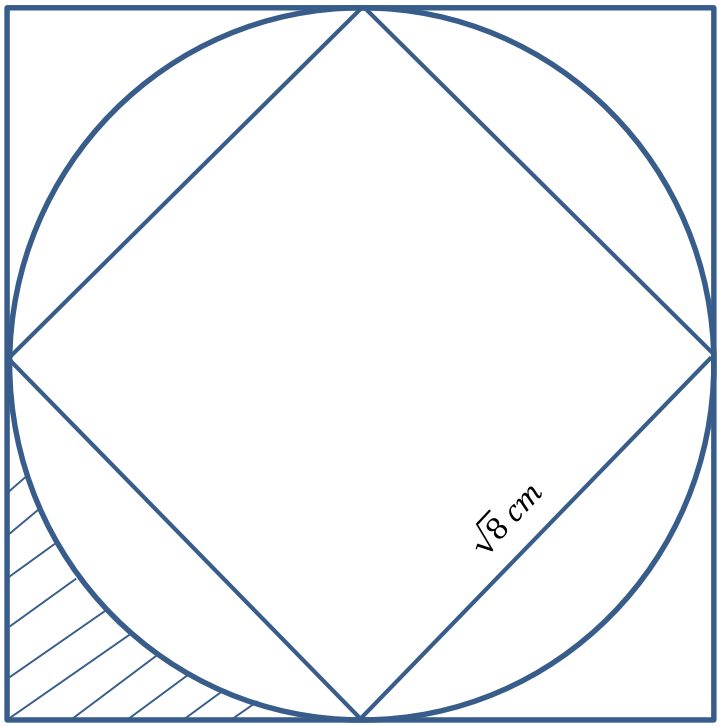
(a) Calculate the angle between the hands of a clock at 4.10 p.m.

(b) How long after 4.10pm will the minute hand 'overtake' the hour hand?
Give your answer in minutes as an exact fraction.

11. Praveen is given a numerical value for x and is asked to work out the value of $(4x)^3$. Unfortunately, as he starts to write down his solution, he forgets to copy down the brackets, and ignores them in his calculation. He makes no further errors, and produces an answer that is *n* times smaller than the correct answer. Work out the value of *n*.

12. If I take a bus to the station, travelling at 30 km per hour, I shall be 3 minutes late for my train. If I take a taxi travelling at 50 km per hour, I shall be 9 minutes early. How far is the journey to the station?

13.



The diagram shows a square contained within a circle which is contained inside another square. The length of each side of the smaller square is $\sqrt{8}$ cm.

Calculate the perimeter of the shaded area, giving your answer in terms of π.

E N D O F E X A M I N A T I O N