ST PAUL'S SCHOOL
Est. 1509

JUNIOR SCHOLARSHIP EXAMINATION

MAY 2017

MATHEMATICS

2 hours

Answer as many questions as you can in any order you wish. If you cannot do a question, move on to the next one and come back later.

Credit will be given for reasoning and working where appropriate.

Give formulae for areas and volumes. When the answer is a fraction it should be given in mixed form, e.g. $3\frac{4}{5}$

The total number of marks for this paper is 100.

The mark allocation is shown in brackets at the end of each part of each question.

CALCULATORS MAY NOT BE USED.

Name:.....

1 Work out the values of:

(i) $12-8\times5\div10$

Answer ..... [1]

(ii) 7^4

Answer ..... [1]

(iii) $0.087\div0.6$

Answer ..... [2]

---

2 Given that $ab=1\frac{3}{5}$, $bc=\frac{2}{9}$ and $cd=-3\frac{1}{3}$, find the values of:

(i) $b(c-a)$

Answer ..... [2]

(ii) ad

Answer ..... [3]

---

3 The price of a pair of shoes has already been reduced by 30% in a shop. Everything in the shop is now reduced by a further 20% of their current price. What is the total percentage reduction on the price of the shoes?

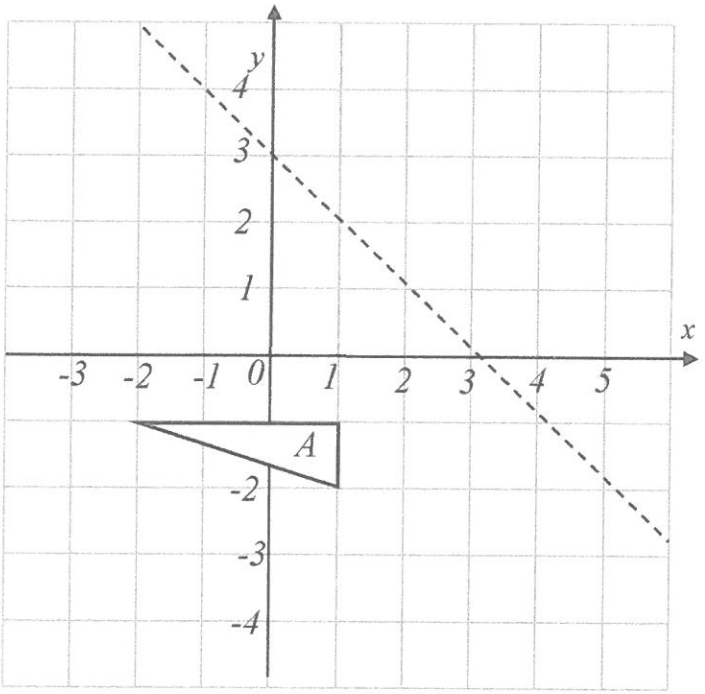
Answer ..... [3]

---

4 The triangle A is reflected in dotted line (which has equation $y = 3 - x$) to produce the triangle B. The triangle B is rotated 90° clockwise about the origin to produce the triangle C. The triangle C is reflected in the x-axis to produce triangle D.

(i) Draw and label triangles B, C and D on the diagram. [4]

0



(ii) Describe the single transformation that maps A onto D.

Answer ..... [2]

---

5 Five whole numbers have a mode of 1, a mean of 4 and a median of 5. What are the five numbers?

Answer ..... [2]

---

6 Solve the following equations for y, giving answers as exact fractions where appropriate:

(i) $7-9y=5(y-3)$

Answer ..... [2]

(ii) $y=\sqrt{5y^2-9}$

Answer ..... [3]

(iii) $\frac{5}{2y}-\frac{7}{2}=\frac{4}{3y}$

Answer ..... [3]

---

7 (i) What must $\frac{x}{7}$ be divided by to get 7 ?

Answer ..... [2]

(ii) What must $119x^2-7xy+28x$ be divided by to get $7x$?

Answer ..... [2]

(iii) What must $\frac{4}{p^3q^2}$ be divided by to get $\frac{8p}{q^5}$?

Answer ..... [2]

---

8 (i) Sketch the net of a cylinder.

[1]

(ii) The volume of a solid cylinder of length 8 cm is 18π cm^3. Find the total surface area of the cylinder.

Answer ..... [4]

---

9 (i) For which regular polygon is each external angle one half of each internal angle?

Answer ..... [1]

(ii) Each external angle of a regular polygon is one ninth of each internal angle. How many sides does the polygon have?

Answer ..... [2]

---

10 (i) The first two terms of a sequence are 3 and 1. The rule for finding each subsequent term is to subtract 2 from the previous term.

(a) Write down a formula for the n^{th} term of this sequence.

Answer ..... [2]

(b) Find the 76^{th} term of this sequence.

Answer ..... [1]

(ii) The first two terms of a different sequence are also 3 and 1. To find the next term, divide the previous term by the term before that. For example, the third term is 1 divided by 3.

(a) Write down the first eight terms of this sequence.

Answer ..... [2]

(b) Find the 76^{th} term of this sequence.

Answer ..... [2]

(c) If the first term was $-\frac{5}{8}$ instead of 3 (but the second term is still 1) what would the 76^{th} term now be?

Answer ..... [1]

---

11 A rectangular region of land measures 3 km by 5 km. On a map this same region of land has a perimeter of 40 mm. What is the scale of the map? Give your answer as a ratio 1 : n where n needs to be found.

Answer ..... [4]

---

12 In a toy shop I can buy 2 buffaloes for 90p. I can buy 5 crocodiles, 2 leopards and 3 buffaloes for £4.45. I can also buy 3 leopards and 2 crocodiles for £2.45. How much is one leopard?

Answer ..... [5]

---

13 (i) Make x the subject of the formula $w = \dfrac{5v - 3x}{4}$.

Answer ..... [2]

(ii) Make y the subject of the formula $w = \dfrac{3y}{2y - 5}$.

Answer ..... [4]

---

14 Two numbers X and Y multiply together to give 6000.

(i) Find the greatest possible HCF of X and Y.

Answer ..... [2]

(ii) Find the smallest possible LCM of X and Y.

Answer ..... [2]

(iii) Find the smallest possible value of $X + Y$.

Answer ..... [4]

15 (i) The probability of getting exactly one Head when you toss two coins is $\frac{r}{4}$.
State the value of r.

Answer ..... [1]

(ii) What is the probability of getting exactly one Head when you toss three coins?

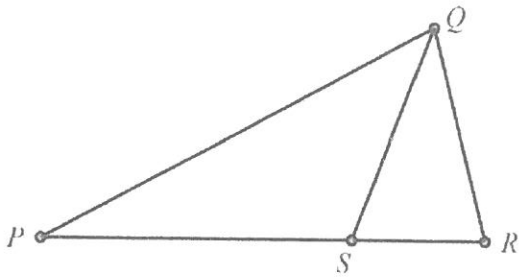
Answer ..... [2]

(iii) By considering the pattern of your answers to parts (i) and (ii), or otherwise, find the probability of getting exactly one Head when you toss n coins.

Answer ..... [2]

16 In the diagram, QS bisects angle PQR, $PQ = PR$ and $QR = QS$.
Find the size of angle QPR.

(Diagram not drawn to scale)



Answer ..... [4]

17 At 3 pm, the angle between the minute hand and the hour hand on a clock face is 90 degrees. When is the next time that the angle between them is 90 degrees? Give your answer as an exact fraction.

Answer ..... [5]

18 (i) Find three positive prime numbers whose product is eleven times their sum.

Answer ... [3]

(ii) (a) Multiply out $(a - 1)(b - 1)$.

Answer ... [1]

(b) Find all the pairs of positive numbers that multiply together to give 12.

Answer ... [1]

(c) Using your answers to part (ii)(a) and (b), find all the possible solutions to part (i), justifying your answer.

Answer ... [4]

19 How many years from 1000 to 2017 inclusive have four different digits?

Answer ..... [4]

END OF PAPER

BLANK PAGE