Cambridge IGCSE International Mathematics (0607) - Extended Practice Paper

Candidates are allowed an electronic calculator, tracing paper and graphical instruments

Time allowed is 1 hour

1)

a) Find the LCM of 60 and 84

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b) Solve the inequality $3x + 7 \leq x - 9$

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2) A brother, Tom, and sister, Grace, share some sweets in the ratio 7:3. Tom then gives 3 sweets to Grace and the new ratio is 5:3 respectively. How many sweets did Tom and Grace each have at the start?

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3) Without using your calculator, work out $\frac{2}{5} + (1\frac{1}{5} + \frac{7}{8}) \div \frac{3}{10}$ Show all your working, giving your answer as a fraction

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4) Write the recurring decimal $0.\dot{4}1\dot{9}$ as a fraction

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5) Two friends, Harry and Lena travel from Manchester to Edinburgh. Harry travels on Monday and Lena travels on Thursday.On Monday, Harry's train leaves Manchester at 07 48 and arrives in Edinburgh at 11 33 travelling at an average speed of 92 miles per hour.On Thursday, Lena's train was diverted and the train travelled an extra 80 miles compared to Harry's train. Lena's train left Manchester at 07 48 but arrived in Edinburgh at the later time of 12 03.Work out the difference between the average speed of Harry's train compared to the average speed of Lena's train.

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6) Factorise and simplify completely

   a) $\frac{qa+qb+2a+2b}{a+b}$

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   b) $289x^2 - 5y^2$

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7)

   a) A number of mice escaped from a ship and got onto an abandoned island. The number of mice increases by a factor r every day. On day 1 there are 50 mice and on day 30 the number of mice has increased to 2000. What is the daily rate of increase of mice to 2 decimal places?

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   b) Make t the subject of the formula when $\frac{x+2}{x-3} = \frac{2t-3}{t+5}$

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8) A line has an equation given by $2y - 6x + 11 = 0$

   a) work out the equation of the line which is perpendicular to the given line and passing through the point (3,7)

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b) Does the perpendicular line found in part (a) intersect with the line $3y + x = 10$. Explain your answer.

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9) A function has the equation $f(x) = 2x^2 - 3x - 3$

a) Complete the square to find the turning point of the function.

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b) Use the quadratic formula to find the values of x when f(x)=0 to 2 decimal places

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10) The diagram shows a circle with four pints touching the circumference. The line PQ is a tangent to the circle at point A. Find the values of the angles ACB, ABC and CAB giving clear reasons for your answers.

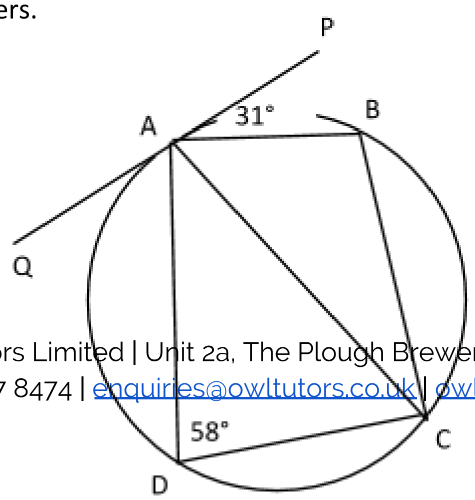

Diagram not drawn to scale

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11) Solve the following equations: $2y + x = - 4x^2 - 2y^2 = 2$

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12) Find the ratio of the areas if two similar cups have a volume ratio of small cup: big cup = 2:7
13) OST is a triangle. S has the position vector relative to O given by 6**a** and T has the position vector relative to O given by 4**b**. The point P lies on ST and is in the ratio SP:PT = 3:2.
    a) Sketch the triangle showing the vectors and ratio.

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b) Find the vector **ST** in terms of **a** and **b**.

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c) Show the vector **OP** is parallel to the vector **a** + **b**

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14) Two triangles touch each other as shown in the figure below with BC being the common side. AC is 12.7 cm, CD is 8.7 cm, angle ABC is 83° and angle ACB is 51°. Calculate to 1 decimal place:

a) length BC

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b) angle DCB

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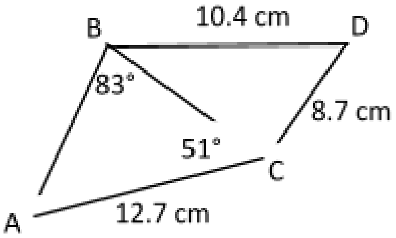

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15) Three functions are defined: $f(x) = \frac{x}{3x-2}; g(x) = 3x + 1; h(x) = x^2$

a) Find $gf(1)$

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b) Solve for x if $gh(x) = hg(x)$ clearly showing all your working

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c) Find $f^{-1}(x)$

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16) The figure below shows part of a mosaic. There are two regular hexagons, two regular triangles and two regular pentagons. Find the angles marked on the diagram clearly showing your working.

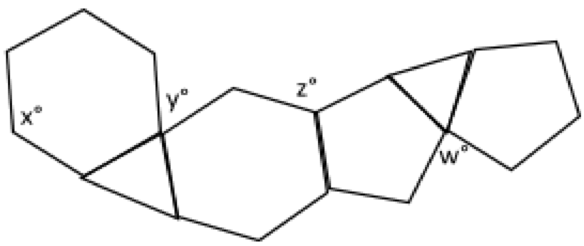

Diagram not drawn to scale

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17) A class sits an English and Mathematics test. All of the pupils pass at least one of the tests. The number of students passing the English test was 63% and the number of students passing the Mathematics test was 74%. Represent this information as a Venn diagram clearly showing the percentages in each section and fully explaining how you obtained your answers.

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18) One red die and one blue die are thrown at the same time. Both dice are unbiased and regular six-sided die. Write down the probability of the following:

a) the total of both dice add up to 4

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b) the total of both dice add up to a number greater than or equal to 6

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19) A bag contains 5 blue balls, 4 red balls and 6 yellow balls. Three balls are removed from the bag

a) what is the probability of having two red and one yellow ball if the balls are replaced

…………………………………

b) what is the probability of having one red, one blue and one yellow ball if the balls are not replaced

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20) A student asks his friends about the amount of time they watch television per week in hours and the marks they get in their mathematics tests. He records the data.

Time (hrs)	2	3	4	7	8	9
Mark	48	45	42	31	31	27

a) Sketch the graph as a scatter diagram and write down the type of correlation

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b) Another student obtains 40 marks in his mathematics test. Estimate the time spent watching television per week.

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Solutions

1. a) $60 = 2^2 \times 3 \times 5$; $84 = 2^2 \times 3 \times 7$; LCM $= 2^2 \times 3 \times 5 \times 7 = 420$

b) $3x + 7 \leq x - 9; 2x \leq -16; x \leq -8$

2. Start ratio is 7:3 therefore Tom has 7x sweets and Grace has 3x sweets. Tom gives 3 sweets to Grace so new ratio is 5:3. The equation is $\frac{Tom}{Grace} = \frac{7x-3}{3x+3} = \frac{5}{3}$. Solve to get $x = 4$. At the start Tom has 28 sweets and Grace has 12 sweets.

3. $\frac{2}{5} + \left(1\frac{1}{5} + \frac{7}{8}\right) \div \frac{3}{10} = \frac{2}{5} + 2\frac{3}{40} \div \frac{3}{10} = \frac{2}{5} + 6\frac{11}{12} = 7\frac{19}{60}$

4. $x = 0.\dot{4}1\dot{9}$; $1000x = 419.\dot{4}1\dot{9}$; $999x = 419$; $x = 0.\dot{4}1\dot{9} = \frac{419}{999}$

5. Harry: Time = 225 minutes = 3.75 hours; Distance = 3.75 x 92 = 345 miles

Lena: Distance = 345 + 80 = 425 miles; Time = 255 minutes = 4.25 hours; Speed = 100 miles per hour

Difference in speeds is 100 – 92 = 8 miles per hour (Lena is on the faster train)

6. a) $\frac{qa+qb+2a+2b}{a+b} = \frac{a(q+2)+b(q+2)}{a+b} = \frac{(a+b)(q+2)}{(a+b)} = q+2$

b) $289x^2 - 5y^2 = (17x + \sqrt{5}y)(17x - \sqrt{5}y)$

7. a) $50x^{29} = 2000; \textit{rate of increase} = x = 1.14$

b) $\frac{x+2}{x-3} = \frac{2t-3}{t+5}$; $(x+2)(t+5) = (2t-3)(x-3)$; $xt + 5x + 2t + 10 = 2xt - 6t - 3x + 9$

therefore $8x + 1 = xt - 8t = t(x-8)$; $t = \frac{8x+1}{x-8}$

8. a) $m = 3$; $m_{perp} = -\frac{1}{3}$; Passes through (3,7) gives equation $y = -\frac{1}{3}x + 8$.
b) Equation of perpendicular is $3y + x = 24$. This is parallel to $3y + x = 10$. The lines will never intersect.

9. a) $f(x) = 2x^2 - 3x - 3 = 2\left(x - \frac{3}{4}\right)^2 - \frac{33}{8}$; Turning point is $\left(\frac{3}{4}, -\frac{33}{8}\right)$
b) $2x^2 - 3x - 3 = 0$; $x = \frac{-(-3)\pm\sqrt{(-3)^2-4\times2\times(-3)}}{2\times2} = 2.19 \text{ or } -0.69\ (2dp)$

10. ACB = 31° (alternate angle theorem); ABC = 180 – 58 = 122° (opposite angles of a cyclic quadrilateral are supplementary); CAB = 180 – 31 – 122 = 27° (angles in a triangle add to 180°)

11 $2y + x = -4$; $x^2 - 2y^2 = 2$; $(-4-2y)^2 - 2y^2 = 2$; $16 + 16y + 4y^2 - 2y^2 = 2$; $2y^2 + 16y + 14 = 0$; $y = -1 \text{ or } y = -7$; $x = -2 \text{ when } y = -1$; $x = 10 \text{ when } y = -7$

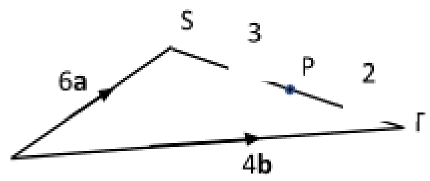
12 volume small cup: volume big cup = 2:7 = 1:3.5; length small cup: length big cup = 1:1.518; area small cup : area big cup = 1:2.305

13 b) **<u>ST</u>** = -6**a** + 4**b**

c) $OP = OS + SP = OS + \frac{3}{5}ST = \frac{12}{5}(a+b)$

OP is parallel to (**a** + **b**)

a)

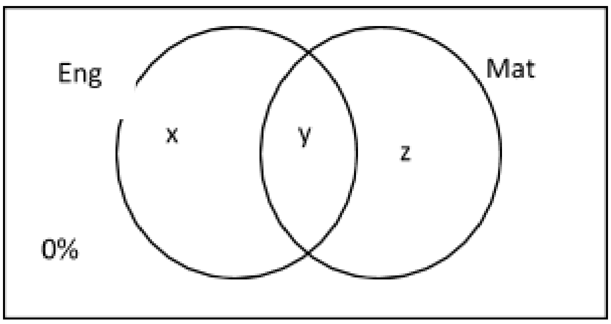


14 CAB = 46°; using sine rule for triangle ABC BC = 9.204 = 9.2 cm; using cosine rule for triangle BCD BCD = 70.959 = 71.0°

15 a) gf(1) = g(1) = 4
b) $3x^2 + 1 = (3x+1)^2; 6x^2 + 6x = 0; \textit{either } x = 0 \textit{ or } x = -1$
c) $\textit{Let } y = \frac{x}{3x-2}; x = \frac{2y}{3y-1}; f^{-1}(x) = \frac{2x}{3x-1}$

16 Regular hexagon, interior angle = x° = 120°; Regular triangle, interior angle = 60°, angle around a point = 360°, therefore y° = 360° - 120° -120° - 60° = 60°; Regular pentagon, interior angle = 108°; angle around a point = 360° therefore z° = 360° - 120° - 108° = 132°; angle around a point = 360°, therefore w° = 360° - 108° - 108° - 60° = 84°

17



$x + y = 63; y + z = 74; x + y + z = 100; \textit{therefore } x = 26\%,\ y = 37\% \textit{ and } z = 37\%$

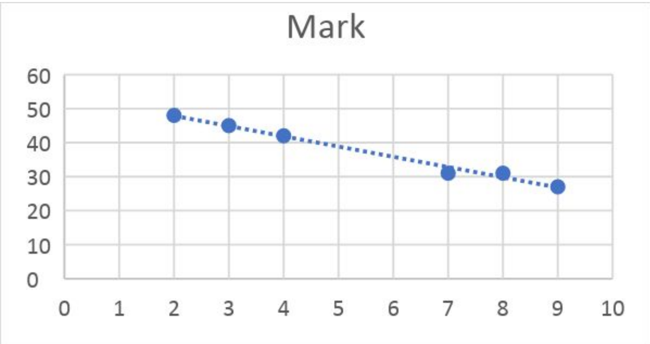
18.

		Red die					
	TOTAL	1	2	3	4	5	6
Blue die	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

a) total equalling exactly 4 = 3/36 = 1/12
b) total being equal to or greater than 6 = 26/36 = 13/18

19 a) Replaced; P(2 red, 1 yellow) = 3 x (4x4x6)/(15x15x15) = 32/375
b) Not replaced; P(1 red, 1 blue, 1 yellow) = 6 x (4x5x6)/(13x14x15) = 24/91

20 a) Negative correlation graph



b) 40 marks in mathematics test suggests about 4.5 hours per week television