St. Stephen's Girls' College
Final Examination 2018-2019

Form 2 **LC, KAL, LL, WYL, MLY**
164 students

MATHEMATICS
Paper I
Time Allowed: 1 hour 30 minutes

Name: _____ No.: _____

Class: _____ Division: _____

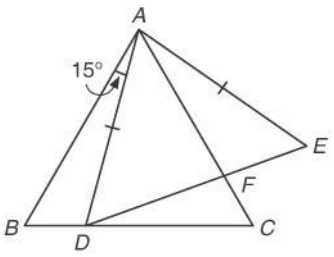
Instructions:

- *Attempt **ALL** questions.*
- *Write your answers in the spaces provided in this **Question-Answer Paper**.*
- ***ALL** working must be clearly shown.*
- *The diagrams in this paper are not necessarily drawn to scale.*
- *This paper carries 100 marks.*
- *Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.*

Question No.	Marks
1	/6
2	/5
3	/3
4	/3
5	/3
6	/4
7	/6
8	/9
9	/7

Question No.	Marks
10	/7
11	/5
12	/7
13	/7
14	/5
15	/8
16	/7
17	/8
Total:	

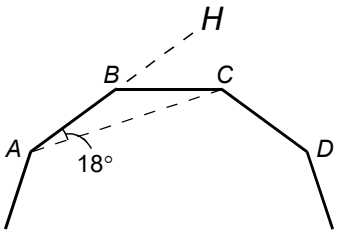
1. In the figure, $\triangle ABC$ is an equilateral triangle. D is a point on BC such that $AD = AE$. AC and DE intersect at F. If $\angle BAD = 15°$ and $\angle DAE = 70°$, find



(a) $\angle ADE$, (3 marks)

(b) $\angle CDF$. (3 marks)

2. In the figure, AB, BC and CD are three sides of a regular polygon where $\angle BAC = 18°$ and ABH is a straight line. Find the number of sides of the regular polygon. (5 marks)



3. If each interior angle of a regular polygon is larger than each exterior angle by 150°, how many sides does this polygon have? (3 marks)

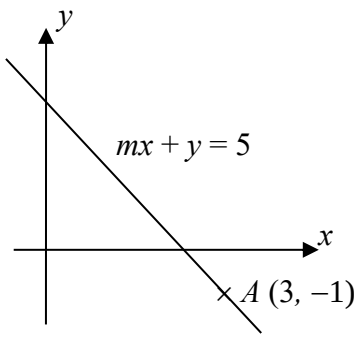
4. Sandy runs 200 m in 50 seconds. She claims that she can run 1500 m in 6 minutes at the same speed. Do you agree? Explain your answer. (3 marks)

5. If salt and water are mixed in the ratio 2 : 3 by their weight, then the weight of the salt in the mixture is 50g less than that of the water. Find the weight of the salt in the mixture.

(3 marks)

6. It is given that $a : b = 2 : 3$ and $5c = 7b$.
   (a) Find $a : b : c$. (2 marks)
   (b) Find $(a + 4b - 3c) : (2a + 3b - c)$. (2 marks)

7. The figure shows the graph of the equation $mx + y = 5$ which passes through A (3, −1).

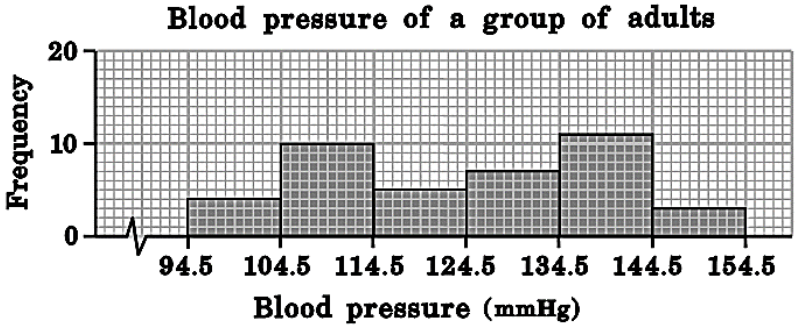


(a) Find the value of m. (2 marks)

(b) Solve $\begin{cases} mx + y = 5 \\ 4x = y - 3 \end{cases}$. (2 marks)

(c) The graph of the equation $mx + y = 5$ cuts the y-axis at point B. Find the coordinates of B. (2 marks)

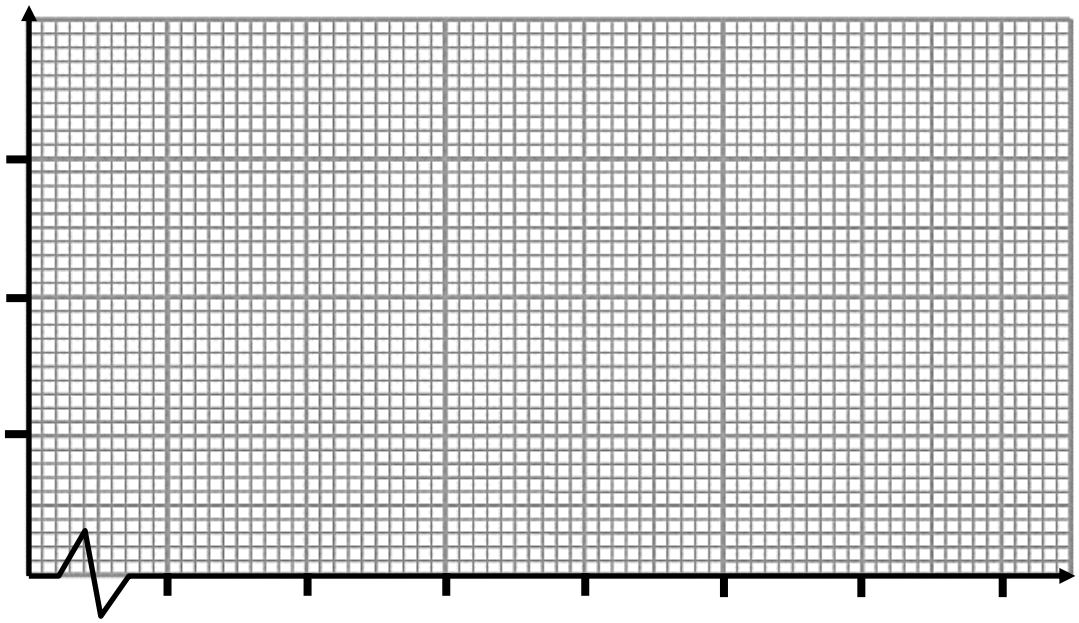
8. The following histogram shows the distribution of the blood pressure of a group of 40 adults.



(a) Referring to the diagram, complete the cumulative frequency table below. (3 marks)

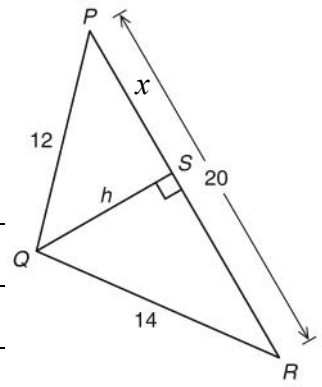
Blood pressure less than (mmHg)	Cumulative frequency

(b) Hence, construct the corresponding cumulative frequency polygon below. (4 marks)



(c) It is known that an ideal blood pressure of an adult is below 120 mmHg. Someone claims that more than 50% of the above group of adults have pre-high or high blood pressure, i.e. blood pressure more than 120 mmHg. Do you agree? Explain your answer. (2 marks)

9. In the figure, PSR is a straight line. $PS = x$.



(a) (i) By considering ΔPQS, express h^2 in terms of x. (1 mark)

(ii) By considering ΔQRS, express h^2 in terms of x. (1 mark)

(b) Hence, find the values of x and h. (5 marks)

10. (a) It is given that $a = \sqrt{2}$ and $b = \sqrt{3}$. Express $\sqrt{8} - \sqrt{75} + \sqrt{18}$ in terms of a and b. (4 marks)

(b) Simplify $\frac{10}{\sqrt{80}}$ and rationalize the denominator of the result. (3 marks)

11. Factorize the following.

(a) $xy - 1 - x + y$ (2 marks)

(b) $(3x+4y)^2 - (3x-4)^2$ (3 marks)

12. (a) Simplify $5x\left(\frac{1}{x}-\frac{1}{x+3}\right)$. (2 marks)

(b) Consider the formula $a=5x\left(\frac{1}{x}-\frac{1}{x+3}\right)$.

(i) Using the result of (a), make x the subject of the formula. (3 marks)

(ii) Hence, find the value of x when $a = -3$. (2 marks)

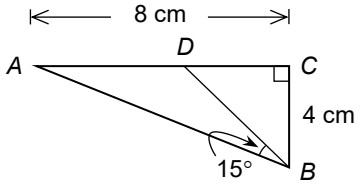
13. (a) (i) Expand $(x^2 + 5)^2$. (1 mark)

(ii) Expand $(x^2 - 5)^2$. (1 mark)

(b) Hence, prove that $(x^2 + 5)^2 - (x^2 - 5)^2 \equiv 20x^2$. (2 marks)

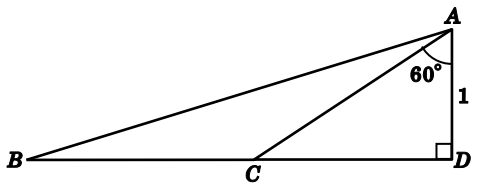
(c) Using the result of (b), show that $\dfrac{(x^2+5)^2-(x^2-5)^2}{4(y^2+5)^2-4(y^2-5)^2} = \dfrac{x^2}{4y^2}$. (3 marks)

14. In the figure, ADC is a straight line. $AC \perp BC$, $\angle ABD = 15°$, $AC = 8$ cm and $BC = 4$ cm.



(a) Find $\angle ABC$. (2 marks)
(b) Find BD. (3 marks)
(Correct your answers to 3 significant figures.)

15. In the figure, $\triangle ABD$ is a right-angled triangle with $\angle ADB = 90°$ and $AD = 1$. C is a point on BD such that $BC = CA$ and $\angle CAD = 60°$.



(a) Find CA. (2 marks)
(b) Find $\angle ABC$. (3 marks)
(c) Hence, evaluate tan 75° and express your answer in surd form. (3 marks)

16. Simplify the following expressions.

(a) $\left(\tan\theta\cos\theta\right)^2+\cos^2\theta$ (3 marks)

(b) $\dfrac{\sin(90°-\theta)}{\sin\theta}\cdot\dfrac{1}{\tan(90°-\theta)}$ (4 marks)

17. (a) Simplify $1-\cos^2\theta$. (1 mark)

(b) Factorize $\sin\theta\cos\theta+\cos\theta$. (1 mark)

(c) Using the results of (a) and (b), prove that $\dfrac{\sin\theta\cos\theta+\cos\theta}{1-\cos^2\theta+\sin\theta}\equiv\dfrac{1}{\tan\theta}$. (3 marks)

(d) Using the result of (c), solve $\dfrac{\sin\theta\cos\theta+\cos\theta}{1-\cos^2\theta+\sin\theta}=5$ and correct your answer to 2 decimal places. (3 marks)

End of paper