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

Form 3 161 students

MWC, WYL, SCHL

MATHEMATICS Paper I Time Allowed: 1 hour 30 minutes

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Name: _____ (

Class: _____

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.

Question No.	Marks
1	(3)
2	(4)
3	(3)
4	(4)
5	(5)
6	(7)
7	(6)

Question No.	Marks
8	(9)
9	(8)
10	(8)
11	(8)
12	(10)
13	(13)
14	(12)
Total	(100)

1. Simplify $\frac{(m^5 n^{-4})^4}{m^{16}}$ and express the answer with positive indices.	(3 marks)
2. Factorize	
(a) $a^{2}b - 4b$, (b) $a^{2} - a - 2$, (c) $a^{2}b - 4b + a^{2} - a - 2$.	
(c) $a^{-}b - 4b + a^{-} - a - 2$.	(4 marks)
3. Make <i>x</i> the subject of the formula $8(x - 4y) = 3x + 4$.	(3 marks)

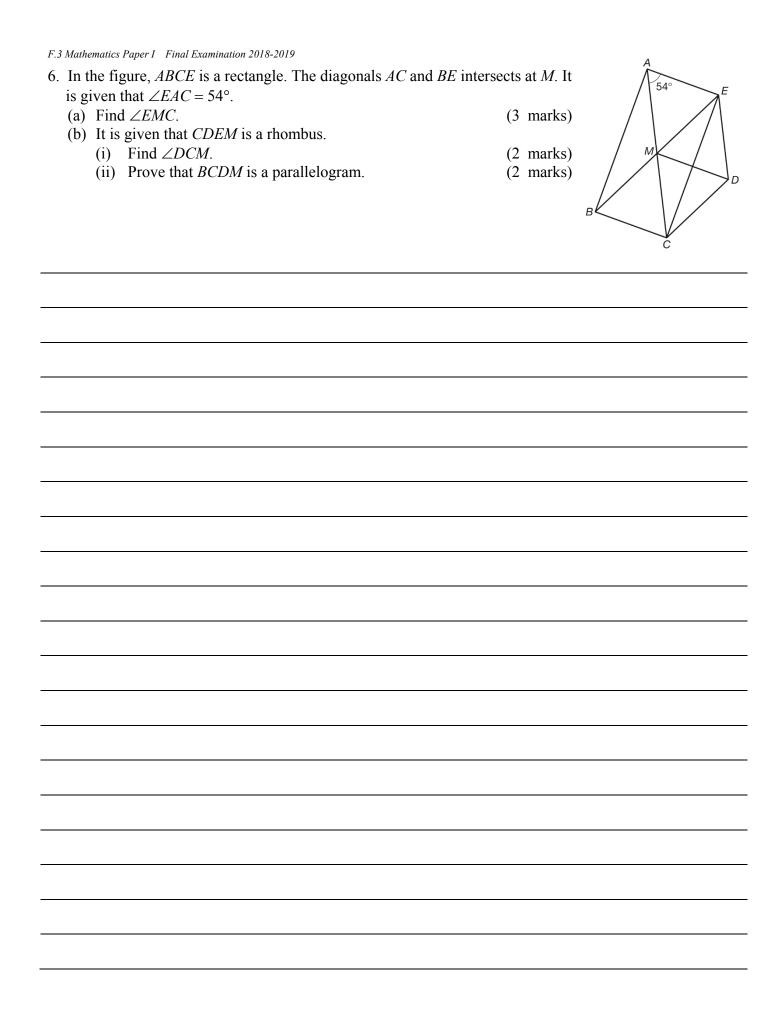
- 4. (a) Solve the inequality $\frac{2x-3}{5} > 7 \frac{x-2}{2}$. (3 marks)
 - (b) If x is an integer, write down the least possible value of x that satisfies the inequality in (a).

(1 mark)

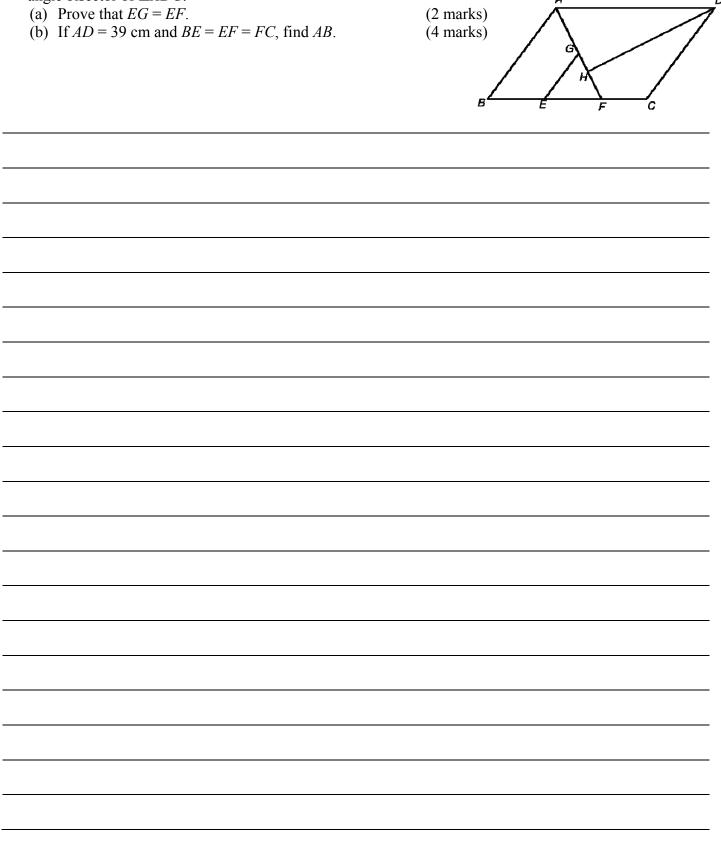
- 5. In a game, a participant needs to draw two balls from a bag one by one with replacement. The bag contains 2 white balls and 3 black balls. \$6 will be given as a prize if two white balls are drawn and \$2 will be given as a prize if two black balls are drawn.
 - (a) Write down the probabilities of drawing
 - (i) two white balls,
 - (ii) two black balls.

- (1 mark) (1 mark)
- (b) If Andy has to pay \$2 to play the game once, is the game favourable to him? Explain your answer.

(3 marks)



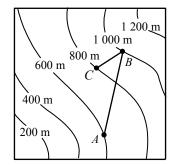
7. In the figure, *ABCD* is a parallelogram. *F* is a point on *BC* such that *AF* is the angle bisector of $\angle BAD$. *E* and *G* are points on *BF* and *AF* respectively such that *AB* // *GE*. *H* is a point on *AF* such that *DH* is the angle bisector of $\angle ADC$.



8. In the figure, A and B represent two windows of a building. PQ is a straight road with gradient $1:\sqrt{3}$. The angle of elevation of A from P is 45° , while the angle of elevation of B from Q is 60° . ABC and OQC are straight lines. PQ = 30 m and QC = 20 m. (a) Find *OP* and *OQ*. (4 marks) (5 marks) (b) Find the distance between A and B. (Give your answers correct to 3 significant figures if necessary.) В <u>4</u>5° 30 m 20 m

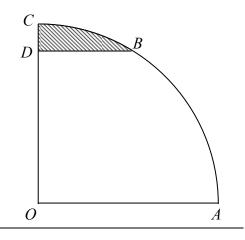
- The figure shows a contour map of scale 1 : 60 000. *AB* and *BC* represent two straight hiking trails. Paul walks along *AB* and then *BC*. It is given that the inclination of the path *AB* is 16°.
 - (a) Find the actual length of the path *AB*. (3 marks)
 - (b) If the length of *BC* on the map is measured as 0.8 cm, find
 - (i) the gradient of the path BC, (3 marks)
 - (ii) the total distance Paul walks. (2 marks)

(Give your answers correct to 3 significant figures if necessary.)



- 10. In the figure, *O* is the centre of the sector *OABC*. It is given that $BD \perp OC$, $\angle AOC = 90^\circ$, BD = 6 cm and OA = 12 cm.
 - (a) Find $\angle BOD$. (1 mark)
 - (b) Find the area of the shaded region. (4 marks)
 - (c) If a mosquito rests at a point in the sector at random without resting on the boundaries, find the probability that it rests in the shaded region. (3 marks)

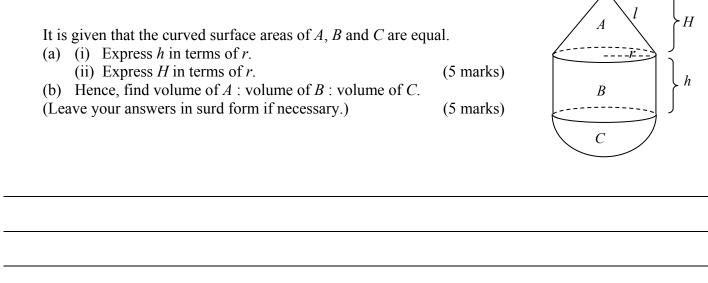
(Give the answers correct to 3 significant figures if necessary.)



- 11. Four points A(-2, 10), C(14, 2), D(-2, 6) and E(6, 2) are given. It is known that ABC is a straight line and AB : BC = 1 : 3.
 - (a) Find the coordinates of B. (2 marks)
 - (b) Prove that BC // DE. (2 marks)
 - (c) Find *DE* and *BC*. (Leave the radical sign ' $\sqrt{}$ ' in the answer if necessary.) (3 marks)
 - (d) Suppose *BE* and *DC* intersect at *F*. Write down the ratio of the area of ΔFDE to the area of ΔFBC . (1 mark)



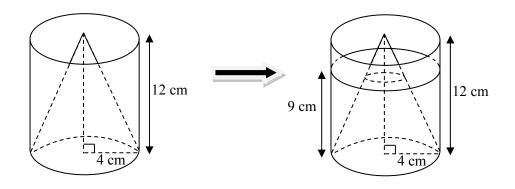
12. In the figure, a solid is made up of three parts *A*, *B* and *C*. *A*, *B* and *C* are a right circular cone, a cylinder and a hemisphere respectively. Let *r* be the radius, *l* be the slant height of the cone, *H* and *h* be the heights of the cone and the cylinder respectively.



- 13. A metal solid right circular cone of base radius 4 cm and height 12 cm is put into a cylindrical container with the same base radius and height as those of the cone. The cylindrical container is then completely filled with water.
 - (a) (i) Find the volumes of the circular cone and the cylindrical container.
 - (ii) Find the volume of water in the cylindrical container. (Give your answers in terms of π .)

(4 marks)

- (b) Later, some water is pumped out of the cylindrical container such that the depth of water becomes 9 cm.
 - (i) Find the ratio of the volume of the part of the cone that is *ABOVE* the water level to the volume of the cone. (3 marks)
 - (ii) Find the volume of the part of the cone that is above the water level. (2 marks) (Give your answer in terms of π .)
 - (iii) Find the curved surface area of the part of the cone that is **BELOW** the water level. (4 marks) (Give your answer correct to 3 significant figures.)



- 14. In the figure, the coordinates of A, B and C are (8, 0), (0, 6) and (0, 15) respectively, where AI and CI are the angle bisectors of $\Delta ABC.$
 - (a) Name the point *I*. (1 mark)(2 marks)
 - (b) Find the area of $\triangle ABC$.
 - (c) D, E and F are points on BC, AB and AC respectively where $DI \perp BC$, $EI \perp AB$ and $FI \perp AC$. Let DI be r. (1 mark)
 - Express *EI* and *FI* in terms of *r*. (i)
 - (ii) By considering the area of $\triangle ABC$, or otherwise, find r.
 - (3 marks) (iii) Suppose the *y*-coordinate of *I* is *a*. Express *CD* and *AE* in terms of a. Hence, or otherwise, find the coordinates of I.

(5 marks)

