

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

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)
<b>Total</b>	<b>(100)</b>

1. Simplify  $\frac{(m^5 n^{-4})^4}{m^{16}}$  and express the answer with positive indices.

(3 marks)

---

---

---

---

---

---

---

---

2. Factorize

(a)  $a^2b - 4b$ ,

(b)  $a^2 - a - 2$ ,

(c)  $a^2b - 4b + a^2 - a - 2$ .

(4 marks)

---

---

---

---

---

---

---

---

3. Make  $x$  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, (1 mark)
  - (ii) two black balls. (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)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

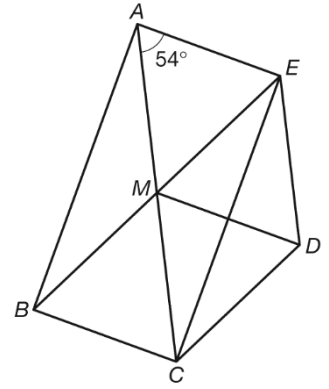
6. In the figure,  $ABCE$  is a rectangle. The diagonals  $AC$  and  $BE$  intersect at  $M$ . It is given that  $\angle EAC = 54^\circ$ .

(a) Find  $\angle EMC$ . (3 marks)

(b) It is given that  $CDEM$  is a rhombus.

(i) Find  $\angle DCM$ . (2 marks)

(ii) Prove that  $BCDM$  is a parallelogram. (2 marks)



---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

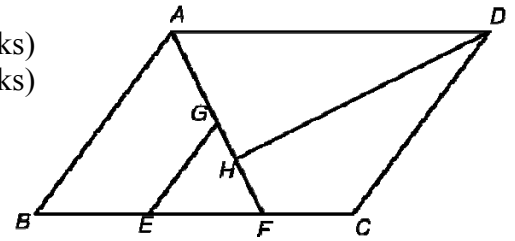
---

---

---

---

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  $AB \parallel GE$ .  $H$  is a point on  $AF$  such that  $DH$  is the angle bisector of  $\angle ADC$ .
- (a) Prove that  $EG = EF$ . (2 marks)
- (b) If  $AD = 39$  cm and  $BE = EF = FC$ , find  $AB$ . (4 marks)




---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

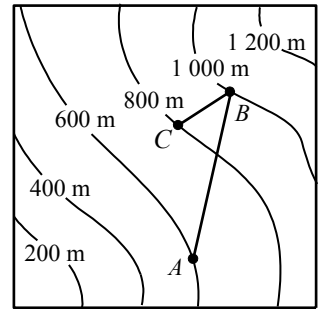
---

---

---



9. 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  $16^\circ$ .



- (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.)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---



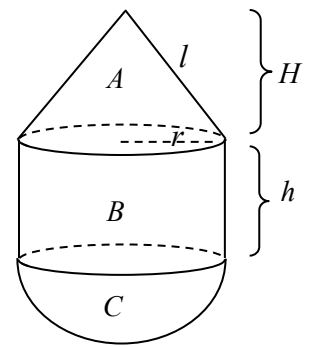




12. In the figure, a solid is made up of three parts *A*, *B* and *C*. *A*, *B* and *C* are a right circular cone, a cylinder and a hemisphere respectively. Let *r* be the radius, *l* be the slant height of the cone, *H* and *h* be the heights of the cone and the cylinder respectively.

It is given that the curved surface areas of *A*, *B* and *C* are equal.

- (a) (i) Express *h* in terms of *r*.  
(ii) Express *H* in terms of *r*. (5 marks)  
(b) Hence, find volume of *A* : volume of *B* : volume of *C*. (5 marks)  
(Leave your answers in surd form if necessary.)



---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

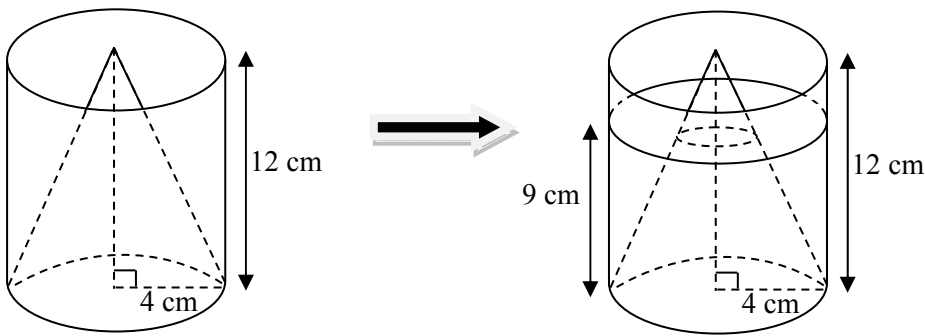
---

---

---

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  $\pi$ .) (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.  
(Give your answer in terms of  $\pi$ .) (2 marks)
  - (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.)




---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---





