St. Stephen's Girls' College

Mid-Year Examination 2016-2017

Form 3 MWC, SCHL, WYL

152 students **MATHEMATICS**

Time Allowed: 1 hour 30 minutes

Name: _____

Class : _____Class No. _____

For Markers only					
1-17		(40)	**24-25**	(6)	(6)
18-19	(3)	(4)	**26-27**	(3)	(6)
20-21	(4)	(4)	**28-29**	(6)	(6)
22-23	(6)	(6)	**Total**		

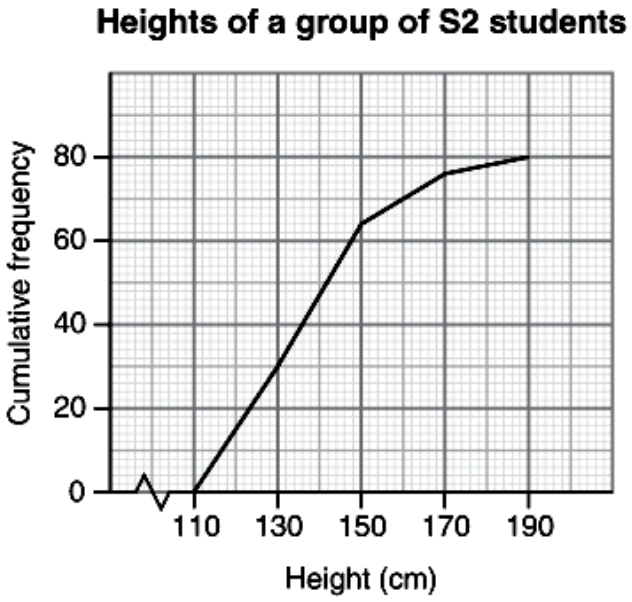
Instructions for Candidates:

1. This paper consists of TWO sections, A and B.

2. Answer **ALL** questions in the spaces provided in this **Question-Answer Paper.**

Section A (40%)

All rough work should be done on the rough work paper provided, but will not be marked.

		Answer	**Marks**
1.	The following shows the marks of Billy in 10 subjects in the mid-term examination. 42, 44, 62, 64, 65, 70, 72, 80, 80, 82 Find the mean, the median and the mode.	1. Mean : _____ Median : _____ Mode : _____	 1 1 1
2.	The following cumulative frequency polygon shows the heights (in cm) of a group of S2 students.  Using the above figure, find the (a) median, (b) 3rd quartile, (c) 80th percentile.	2. (a) _____ (b) _____ (c) _____	 1 1 1

3. Express the following numbers in scientific notation.
   (a) 340 000 000
   (b) $-0.000\,026$

   3. (a) _____ 1
   (b) _____ 1

4. Factorize $16x^2 - 24xy + 9y^2$.

   4. _____ 2

5. (a) Factorize $a^2 - b^2$.
   (b) Factorize $2x^4 - 32y^4$.

   5. (a) _____ 1
   (b) _____ 2

6. Convert 111010101_2 into a hexadecimal number.

   6. _____ 2

7. Convert the decimal number $12 \times 16^8 + 296$ into a hexadecimal number.

   7. _____ 2

8. Simplify $2^{2017} \times (0.5)^{2014}$.

   8. _____ 2

9. A sum of \$30 000 is deposited at an interest rate of 12% p.a. for 4 years compounded monthly. Find the amount received correct to the nearest dollar.

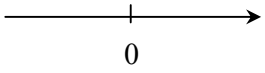
   9. _____ 2

10. Amy is 30% younger than Ben, and Ben is 15% younger than Candy. By what percentage is Candy older than Amy? Correct your answer to 1 decimal place.

    10. _____ 2

11. Given that $x \le -3$ and $y = \dfrac{4-x}{21}$, find the range of values of y and represent its solutions graphically on a number line.

    11. _____ 2

    1

12. If John has to pay \$56 000 of rates quarterly and the rates percentage charge is 5%. Find the rateable value of the building.

    12. _____ 2

13. The annual income of Mr. Ng is \$520 000 and he is eligible for a salaries tax allowance of \$370 000. With reference to the table below, how much salaries tax should he pay?

    13. _____ 2

Net chargeable income	Tax rate
On the first \$30 000	2%
On the next \$30 000	7%
On the next \$30 000	12%
Remainder	18%

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14. A coin is tossed 1000 times. The results are recorded as follows:

	Frequency
Head	x
Tail	528

Find the experimental probability of getting a head.

14. _____ 2

15. Phoenix has bought some roses, tulips and carnations. She put them into three vases *A*, *B* and *C*. The number of flowers in each vase is as follows:

	Rose	**Tulip**	**Carnation**
Vase *A*	7	2	3
Vase *B*	5	4	4
Vase *C*	1	8	2

If a flower is randomly picked, find the probabilities that

(a) it is in vase *A*,

(b) it is a rose,

(c) it is not a tulip and it is not in vase *C*.

15.

(a) _____ 1

(b) _____ 1

(c) _____ 1

16. The perimeter of sector *AOB* is 40 cm and $\angle AOB = 140°$, where *O* is the centre. Find the radius of sector *AOB*.

$\left(\text{Take } \pi = \frac{22}{7}.\right)$

16. _____ 2

17. The base area of a cylinder is $16\pi\ \text{cm}^2$ and its total surface area is $104\pi\ \text{cm}^2$. Find the volume of the cylinder in terms of π.

17. _____ 3

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Section B (60%)

All working must be clearly shown in the spaces provided.

18. Simplify $\dfrac{ab^4\left(2a^{-2}b^3\right)^{-1}}{\left(b^5\right)^2}$ and express the answer with positive indices. (3 marks)

19. It is given that a factory produces 205 000 bottles of drink of 500 mL every day on average.

(a) How much drink in mL does the factory produce every day on average?
(Express your answer in scientific notation.) (2 marks)

(b) Can the factory produce drink of one million litres within 10 days? Explain your answer.
(2 marks)

20. Find the greatest integer satisfying the inequality $\frac{3(x+1)}{4} - \frac{x-4}{5} < 2$. (4 marks)

21. David has some \$2 coins and \$5 coins in his pocket where 80% of the coins are \$2 coins. After spending 10 \$2 coins, at least 25% of the coins are \$5 coins in his pocket. Find the maximum number of coins in his pocket originally. (4 marks)

22. The length, width and height of a cuboid are 15 cm, 12 cm and h cm respectively. Suppose its length is increased by 20%, its width is decreased by 25% and its volume is then increased by 8%.

    (a) Let y cm be the height of the cuboid after the change. Express y in terms of h. (4 marks)
    (b) Hence, find the percentage change in the height of the cuboid. (2 marks)

23. The marks of Cherie in 6 mathematics tests are recorded as follows:

62, 70, 80, 57, 85, 48

(a) Find the mean mark and the median mark of Cherie in these 6 tests. (2 marks)

(b) It is found that the mark 84 is wrongly recorded as 48.

(i) Find the mean mark and the median mark after correction.

(ii) The teacher decides to ignore the worst result of each student among these 6 tests. Find the new mean mark and new median mark of Cherie in these tests.

(4 marks)

24. A cylindrical metal of base radius 30 cm and height 20 cm is melted and recast to form a new cylindrical metal. It is known that the height of the new metal is increased by 20%.
(a) Find the base radius of the new metal. (3 marks)
(b) Find the percentage change in the curved surface area. (3 marks)
(Give your answers correct to 3 significant figures.)

25. The interest rate offered by bank *A* is 6% p.a. and the interest is compounded quarterly. The interest rate offered by bank *B* is *r*% p.a. and the interest is compounded yearly. Mr. Wong wants to deposit $ 100 000 into a bank for 3 years.

(a) Find the interest, correct to the nearest dollar, Mr. Wong will receive after 3 years if he chooses bank *A*. (2 marks)

(b) In order to attract Mr. Wong to deposit his money in bank *B*, find the least possible interest rate that bank *B* should offer. Correct your answer to 1 decimal place. (4 marks)

26. Simplify $\dfrac{2^{5n+2}-2\cdot 32^{n+1}}{16^n\cdot 2^n}$. (3 marks)

27. In a lucky draw, a participant needs to draw a ball from each of bags *A* and *B*. Bag *A* contains 2 white balls, 1 blue ball and 1 red ball. Bag *B* contains 1 white ball, 1 blue ball and 1 red ball. The prizes given to the participants are shown below.

Balls drawn	Prize	Value of the prize
2 white	a pack of candies	$5
2 blue	a comic book	$15
2 red	a pair of socks	$10
Others	no prize	—

(a) Find the probabilities of drawing

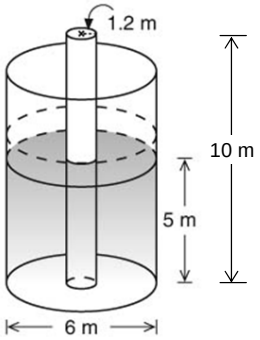
(i) 2 white balls, (1 mark)

(ii) 2 blue balls, (1 mark)

(iii) 2 red balls. (1 mark)

(b) If David has to pay $5 to enter the lucky draw once, is the lucky draw favourable to him? Explain your answer. (3 marks)

28. A cylindrical tank of base diameter 6 m is filled with water to a depth of 5 m. A cylindrical metal pillar of length 10 m is then lowered until it stands upright on the base of the tank as shown in the figure. The base radius of the pillar is 1.2 m.



(a) Find the rise in water level. (3 marks)

(b) Find the total area of the wet surfaces of the pillar (including the base). (3 marks)

(Give your answers correct to 3 significant figures.)

29. (a) Factorize $m^3 + 27$. (1 mark)

(b) Factorize $m^2 + 38m + 105$. (1 mark)

(c) Using (a) and (b), or otherwise, factorize $3m^3 - m^2 - 38m - 24$. (4 marks)

End of Paper