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

Form 3   **MWC, WYL, SCHL**
161 students

MATHEMATICS
Paper II
Time Allowed : 1 hour 15 minutes

Name: _____ **Class No.:** _____ **Class:** _____ **Marks:** _____

Please read the following <u>Instructions</u> very carefully.

- *Answer **ALL** questions in the spaces provided in this **Question-Answer Paper**.*
- *All rough work should be done on the rough work paper provided, but will not be marked.*
- *Unless otherwise specified, **numerical answers should be either exact or correct to 3 significant figures**.*
- *The diagrams in this paper are not necessarily drawn to scale.*
- ***This paper carries 100 marks.***

	Answers	**Marks**

1. Simplify the following expressions and express the answers with positive indices.

    (a) $6a^0 \times (-2a)^{-3}$

    (b) $\dfrac{ab^6}{(a^{-2}b^3)^4}$

    (c) $25^{n+1} \div 5^{1-n}$

1.

(a) _____   2

(b) _____   2

(c) _____   2

2. Factorize the following:

    (a) $x^2 - 6x - 27$

    (b) $3x^2 + 6xy + 3y^2$

    (c) $x^3 - 8 + bx - 2b$

2.

(a) _____   2

(b) _____   2

(c) _____   2

3. Calculate $0.0004 \div 35 \times 1400$ and give the answer in scientific notation.

3.

_____   2

4. Convert the decimal number $2^{56} + 78$ to a hexadecimal number.

4.

_____   2

5. Solve the inequality $\dfrac{2x}{3} > 17 - 5x$.

5.

_____   2

6. The sum of two consecutive numbers is not greater than 100, find the largest value of the smaller number.

6.

_____   2

7. The number of a certain kind of cells increases by 20% every hour. If there are 5 000 cells of that kind at present, find the number of cells of that kind after 3 hours.

7.

_____   2

8. John deposits $10 000 in a bank at an interest rate of 8% p.a. compounded quarterly. Find the amount to be obtained after 1 year, correct to the nearest dollar.

8.

_____   2

9. If the height of a parallelogram increases by 35% and its base decreases by x%, its area will decrease by 5.5%. Find the value of x.

9.

_____   2

10. The table below shows the age distribution of a group of students.

Age	13	14	15	16	17
Frequency	10	5	7	6	2

Find the mean, median and mode of the above distribution.

10.

Mean   = _____   1
Median = _____   1
Mode   = _____   1

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11. The rateable value of a flat is $204 000. If the rates percentage charge is 5% each year, find the rates payable in a quarter of a year.

11.

_____   2

12. The table shows the ratings of a broadband plan in terms of three areas. Find the weighted mean rating.

| Area	Transmission speed	Data usage	Monthly payment
Rating	5	4	3
Weight	3	3	4

12.

_____   2

13. The median of a data set is x. If each datum is multiplied by -2 and then added by 1, find the new median in terms of x.

13.

_____   2

14. How many different triangles can be constructed so that the lengths of the three sides are 15 cm, $(2x - 1)$ cm and x cm, where x is an integer?

14.

_____   2

15. In the figure, $ABCD$ is a rhombus. AC and BD intersect at F. CD is produced to E such that DB // EA. If $\angle BCD = 40°$, find $\angle AEC$ and $\angle DAE$.

15.

$\angle AEC =$ _____   2

$\angle DAE =$ _____   2
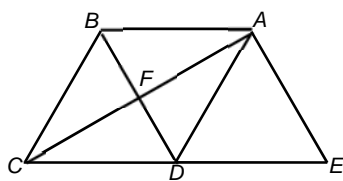
16. In the figure, OAB is a sector of radius 2 cm. If the length of $\overset{\frown}{AB}$ is 3π cm, find the area of the sector OAB.
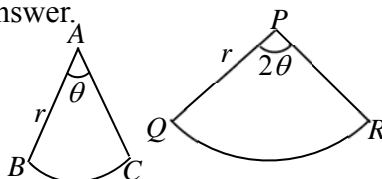(Give the answer in terms of π.)

16.

_____   3
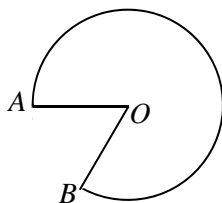
17. In the figure, O is the centre of the sector OAB. If the area of ΔOAB is 12 cm^2, find the area of the shaded region.
(Give your answer in terms of π.)

17.

_____   3
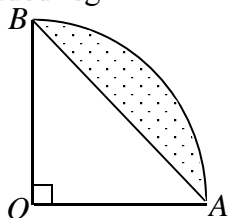
18. In the figure, two sectors ABC and PQR are folded to form two right circular cones. Find the ratio of the base radii of the two cones. Choose the correct answer.
   A. $1 : 2\sqrt{2}$ B. $1 : 2$
   C. $1 : \sqrt{2}$ D. $1 : 4$

18.

_____   3

__/21

19. The figure shows a right circular cylinder, a hemisphere and a right circular cone with equal base radius. Their curved surface areas are a cm^2, b cm^2 and c cm^2 respectively. Arrange a, b and c in ascending order.
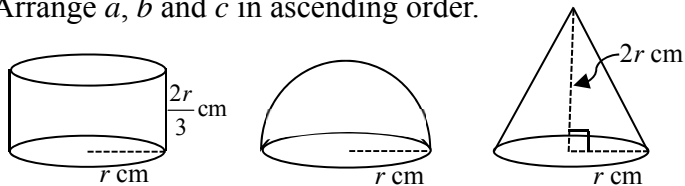
20. A metal sphere is melted and recast into a number of identical spheres. If the radius of each sphere formed is half that of the original sphere, find the number of spheres formed.

21. The figure shows two similar pyramids *VEFGH* and *VABCD* with square bases. If the volume of pyramid *VEFGH* is 72 cm^3 and $AB : EF = 2 : 1$, find the volume of frustum *ABCDHEFG*.
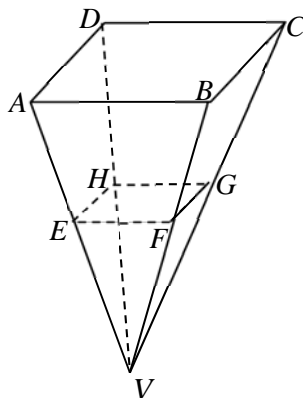
22. For each of the following expressions, where a, b and c are linear measurements, determine whether it can be a formula for volume(V). Circle the correct answer.

   I. $V = 3a^2 + bc$

   II. $V = \dfrac{b}{3}\sqrt{a^2 + c^2}$

   III. $V = ab(a + c)$

23. The figure shows a right prism *ABCDEF* with a right-angled triangle as the base. Name the angle between the line *AD* and the plane *ABFE*.
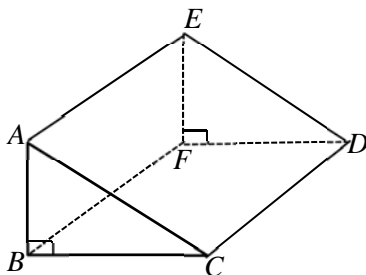
19.

   ____ < ____ < ____   3
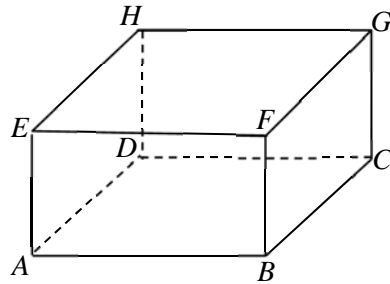
20.

   _____   2

21.

   _____   3

22.

   I.   True / False   1

   II. True / False   1

   III. True / False   1

23.

   ∠_____   2

   /13

24.   The figure shows a rectangular block.

      Write down
      (a) the projection of *D* on the plane *EFBA*,
      (b) the projection of *BH* on the plane *ABCD*,
      (c) the angle between *DF* and the plane *BCGF*.

24.

(a) _____   1
(b) _____   1
(c) ∠_____   1

25.   Mary walks along a road with gradient 1 : 10. If she rises
      vertically by 6 m, find the distance Mary walks.
   (Give your answer correct to the nearest 0.1m.)

25.

_____   2

26.   In the figure, car *A* and car *B* start their journey from a road
      junction *T*. Car *A* moves due east at 60 km/h while car *B*
      moves due north at 80 km/h. After two hours, find the
      compass bearing of *B* from *A*. (Give your answer correct to
      the nearest integer.)

26.

_____   3
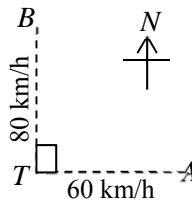
27.   In the figure, *X*, *Y*, *Z* are three towns. The bearings of *X* and *Y*
      from *Z* are 120° and 220° respectively. If *ZX = ZY*, find the
      true bearing of *Y* from *X*.

27.

_____   2
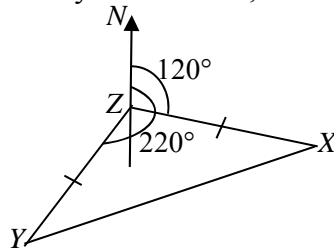
28.   A ship sails from island *A* along 020° to reach island *B*. It
      then turns its course to 110° and reaches island *C*. If island *C*
      is 50 km due east of island *A*, find the distance between *A* and
      B. (Give your answer correct to 3 significant figures.)

28.

_____   2
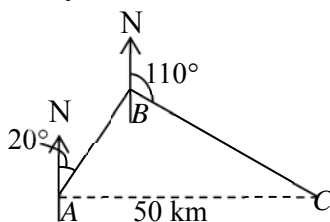
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29. Which of the following CANNOT be the probability of an event happening?

$$1, \quad 0, \quad -2, \quad \frac{2}{7}, \quad \frac{1}{\sqrt{2}}, \quad \sqrt{3}$$

29. _____ 2

30. There are a number of packs of drinks in the refrigerator, of which 12 packs are herbal tea. If a pack of drink is randomly chosen, the probability of choosing a pack of herbal tea is $\frac{6}{13}$.
How many packs of drinks are there in the refrigerator?

30. _____ 2

31. The actual volumes of 35 packs of drinks in 250 mL are checked, and the results are as follows:

Volume less than (mL)	245.5	247.5	249.5	251.5	253.5
Cumulative frequency	3	10	22	30	35

Find the experimental probability that the actual volume of a pack of drink is not less than 247.5 mL.

31. _____ 2

32. Two numbers are randomly drawn at the same time from six balls numbered 1, 2, 3, 4, 5 and 6 respectively. Find the probability that the two numbers drawn are consecutive integers.

32. _____ 3

33. In the figure, L_1, L_2 and L_3 are straight lines.
If m_1, m_2 and m_3 are the slopes of L_1, L_2 and L_3 respectively, arrange m_1, m_2 and m_3 in ascending order.

33. _____ 2
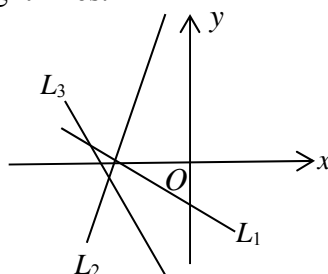
34. Find the coordinates of the point of intersection of the y-axis and the straight line passing through points $(-3 , 5)$ and $(9, 1)$.

34. _____ 2

35. $A(1 , 4)$, $B(-5 , 2)$, $C(-4 , -1)$ and D are the vertices of the rectangle $ABCD$. Find the coordinates of D.

35. _____ 2

36. The straight lines L_1 passes through $(2\sqrt{3} , k)$ and the inclination of straight line L_2 is 30°. If they both cut the x-axis at $(6\sqrt{3} , 0)$ and $L_1 \perp L_2$, find the value of k.
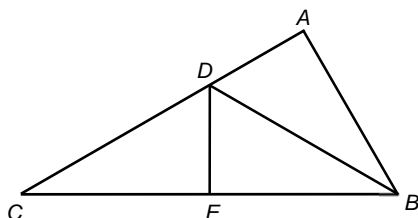
36. _____ 3

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37. The coordinates of *P* and *Q* are (2, 0) and (0, –4) respectively. Let *R* be a point lying on the *x*-axis such that the *x*-coordinate of the circumcentre of ΔPQR is – 2 . Find the *x*-coordinate of the point *R*.

    37.

    _____   3

38. In the figure, *D* and *E* are points lying on *AC* and *BC* respectively such that *BD* bisects $\angle ABC$ and *DE* is the perpendicular bisector of *BC*.

    38.

    Which of the following must be true?
    Circle the correct answers.
    (a) The in-centre of ΔABC lies on *BD*.
    (b) The centroid of ΔABC lies on *DE*.
    (c) The circumcentre of ΔABC lies on *DE*.
    (d) The centroid of ΔABC lies on *AB*.

    (a) True / False   1
    (b) True / False   1
    (c) True / False   1
    (d) True / False   1

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End of Paper