St. Stephen's Girls' College
Final Examination 2021-2022

Form 3 **JWCW, MYCC, YLN**
129 students

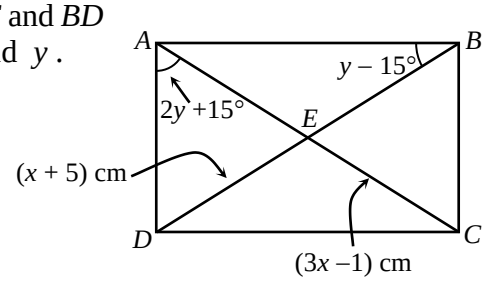
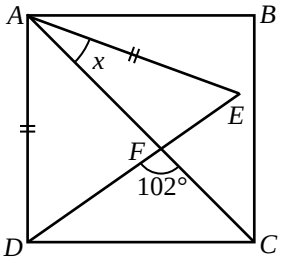
MATHEMATICS
Paper II
Time Allowed : 1 hour 15 minutes

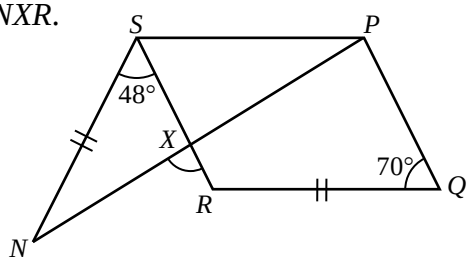
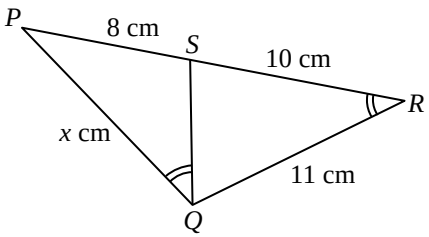
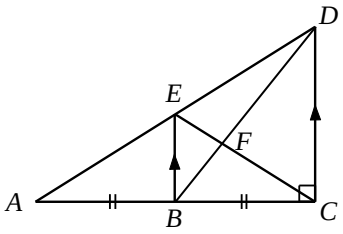
Name: _____ Class No.: _____ Class: _____ Marks: _____

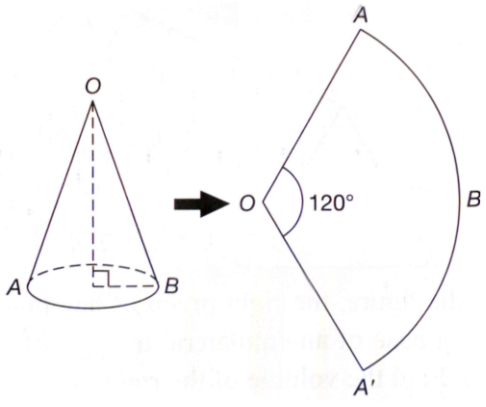
Please read the following instructions very carefully.

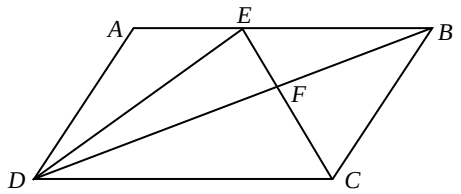
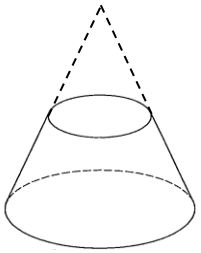
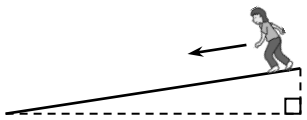
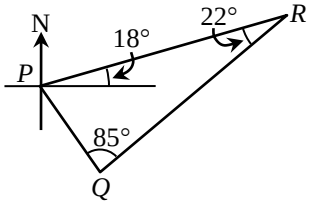
- *Answer **ALL** questions in the spaces provided in this **Question-Answer Paper**.*
- *All rough work should be done on the rough work paper provided, but will not be marked.*
- *Unless otherwise specified, **numerical answers should be either exact or correct to 3 significant figures**.*
- *The diagrams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

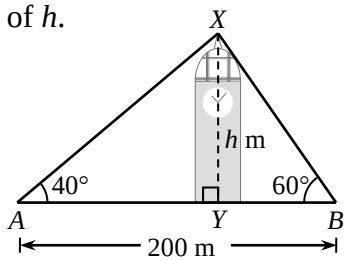
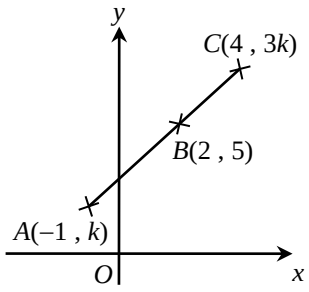
		Answers	**Marks**
1.	Factorize (a) $4x^2 - 20xy + 25y^2$, (b) $6a^3 - 48b^3$.	1. (a) _____ (b) _____	 2 2
2.	Simplify $\frac{a^2b^{-3}}{(a^{-1}b^2)^2}$ and express your answer in positive indices.	2. _____	2
3.	Represent $12\times16^9 + 30\times16^3$ as a hexadecimal number.	3. _____	3
4.	Round off the following numbers to 3 significant figures and express the results in scientific notation. (a) 45 947 775 268 (b) 0.000 368 527 401	4. (a) _____ (b) _____	 2 2
5.	Consider $x = -\frac{3}{4}(y - 1)$. If $y > 9$, find the range of values of x.	5. _____	3
6.	A sum of money is deposited in a bank. If the simple interest received after 12 years will be equal to 45% of the principal, find the interest rate per annum.	6. _____	2
7.	Alex takes out a loan of $35 000 from a bank at an interest rate of 2.1% p.a. compounded quarterly. Find the interest he will pay after 6 years. (*Give the answer correct to the nearest dollar.*)	7. _____	2
		Sub-total:	**20**

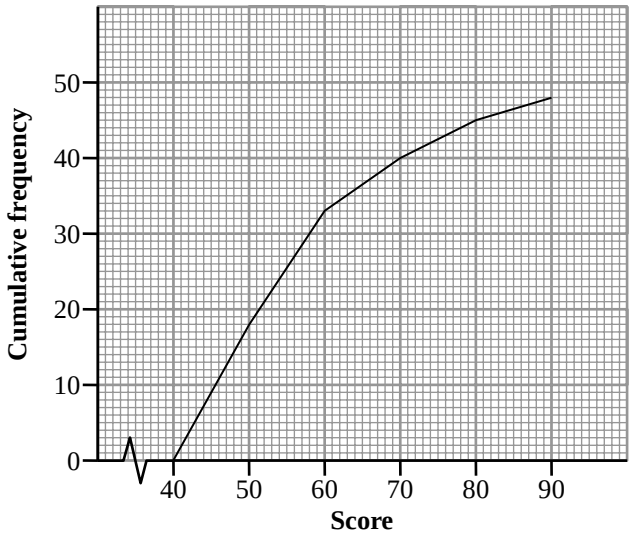
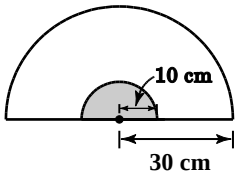
8.	The production cost of a handmade figure is the sum of the raw material cost and the labour cost. Last month, the labour cost was 1.4 times the raw material cost. This month, the raw material cost increases by 12% and the labour cost decreases by 15%. Find the percentage change in the production cost of the handmade figure.	8. _____	3
9.	The salaries tax rates are as shown in the following table: Net chargeable income — Rate On the first \$40 000 — 2% On the next \$40 000 — 7% On the next \$40 000 — 12% Remainder — 17% Mr Ng's net chargeable income is \$150 000. Find Mr Ng's salaries tax payable.	9. _____	2
10.	*ABCD* is a rectangle. *AC* and *BD* intersect at *E*. Find x and y.  	10. $x =$ _____ $y =$ _____	2 2
11.	*ABCD* is a square and $AE = AD$. *AC* and *DE* intersect at *F*. It is given that $\angle DFC = 102°$. Find x.  	11. _____	3
		Sub-total:	**12**

12.	In the figure, *PQRS* is a parallelogram. *SN* = *RQ* and *PN* intersects *SR* at *X*. Find $\angle NXR$. 	12. _____	3
13.	Which of the following quadrilaterals must be a rhombus? I. a quadrilateral with four equal sides II. a parallelogram with one pair of equal adjacent sides III. a quadrilateral with diagonals perpendicular to each other	13. _____	2
14.	In the figure, *PSR* is a straight line, $PS = 8\,\text{cm}$, $SR = 10\,\text{cm}$, $RQ = 11\,\text{cm}$ and $\angle PQS = \angle SRQ$. Find the value of *x*. 	14. _____	3
15.	In the figure , ΔACD is a right-angled triangle. *B* and *E* are points on *AC* and *AD* respectively. *EC* and *BD* intersect at *F*.  (a) Find the circumcentre of ΔACD. (b) Is *C* a centre of ΔACD? If yes, write down which centre *C* is. If no, write down "NO".	15. (a) _____ (b) _____	 2 2
		Sub-total:	**12**

16.	In ΔABC, $AB = x$, $BC = x + 3$ and $AC = 20$. It is given that x is a positive integer. Find the least possible value of x.	16. _____	2
17.	The height of a cylinder is 4 times its radius. If the total surface area of the cylinder is 360π cm^2, find its volume in terms of π.	17. _____	2
18.	The scale of a map is 1 : 2 000. If the actual area of a football field is 5 000 m^2, find the area of the football field on the map in cm^2.	18. _____	2
19.	If the volume of a solid hemisphere of radius r cm is 5 times the volume of a solid right circular cone of height h cm and base radius r cm, find r : h.	19. _____	2
20.	In the figure, OAB is a right circular cone with base radius 6 cm. If it is cut along the side OA and the curved surface is flattened, the sector $OABA'$ is obtained. Find the radius of the sector. 	20. _____	2
21.	The base of a solid right pyramid is a square of side 10 cm. If the total surface area of the pyramid is 360 cm^2, find the height of the pyramid.	21. _____	3
		Sub-total:	**13**

22.	In the figure, $ABCD$ is a parallelogram. E is a point lying on AB such that $AE:EB=2:3$. EC and BD intersect at F. It is given that the area of ΔBEF is 9 cm^2.  (a) Find the area of ΔCDF. (b) Find the area of quadrilateral $ADCE$.	22. (a) _____ (b) _____	 2 3
23.	The height and the base radius of a right circular cone are 15 cm and 8 cm respectively. The figure shows a frustum which is made by cutting off the upper part of the circular cone. The curved surface area of the frustum is 69.36π cm^2. Find the height of the frustum. 	23. _____	 3
24.	The gradient of the inclined road in the figure is $\frac{1}{8}$. If a person runs down along the road at a speed of 2 m/s, find the vertical distance travelled in 5 minutes. 	24. _____	 2
25.	Referring to the figure, (a) find the reduced bearing of Q from P, (b) find the whole circle bearing of Q from R. 	25. (a) _____ (b) _____	 2 2
		Sub-total:	**14**

26.	The figure shows a vertical clock tower *XY*. *A*, *Y* and *B* are in a straight line on the horizontal ground. The distance between *A* and *B* is 200 m. The angle of elevation of *X* from *A* and that from *B* are 40° and 60° respectively. Let *h* m be the height of the clock tower *XY*. Find the value of *h*. 	26. _____	3
27.	Given that *A*(4, 4), *B*(–5, 0) and *C*(–2, –4) are the three vertices of $\triangle ABC$. Find the perimeter of $\triangle ABC$.	27. _____	2
28.	*A*(–8 , 0), *B*(4 , *k*) and *C*(12 , –5) are collinear. Find the value of *k*.	28. _____	2
29.	In the figure, *B*(2 , 5) is a point on the line segment joining *A*(–1 , *k*) and *C*(4 , 3*k*).  (a) Find *AB* : *BC*. (b) Find the value of *k*.	29. (a) _____ (b) _____	2 2
30.	The following table shows the numbers of credit cards owned by 25 adults. **Number of credit cards**: 0, 1, 2, 3, 4, 5 **Frequency**: 2, 6, 3, 4, 9, 1 Find the mean, the median and the mode of this set of data.	30. Mean = _____ Median = _____ Mode = _____	2 2 1
31.	The table below shows the marks that Millie got in various subjects in an examination and the weight of each subject. **Chinese**: Mark 78, Weight 4 **English**: Mark 90, Weight 3 **Maths**: Mark 64, Weight 3 Find the weighted mean mark of Millie.	31. _____	2
		Sub-total:	**18**

32.	The following cumulative frequency polygon shows the scores of a group of S6 students in a mock examination. **Scores of a group of S6 students in a mock examination**  (a) How many S6 students are there in the group? (b) Find the median of the scores of the S6 students in the mock examination. (c) Find the 3rd quartile of the scores of the S6 students in the mock examination.	32. (a) _____ (b) _____ (c) _____	1 2 2
33.	A box contains 1 gold ball, 5 silver balls, 24 purple balls and 45 green balls. Alex randomly draws a ball from the box. He will be awarded a prize according to the table below. **Colour of the ball** | Gold | Silver | Purple | Green **Prize** | \$5 000 | \$800 | \$120 | \$40 Find the expected value of the prize obtained by Alex.	33. _____	3
34.	The figure shows a dartboard formed by two concentric semi-circles of radii 10 cm and 30 cm respectively. Kevin throws a dart randomly and it hits the dartboard. Find the probability that the dart hits the shaded region of the dartboard.  	34. _____	3
		Sub-total:	**11**

End of Paper