Name:	()	Class: Sec



St. Gabriel's Secondary School

2016 Second Semestral Examination

Subject

Mathematics

Paper

Level/Stream : Sec 2 Express

Duration Date

: 1 hour 15 minutes : 5 October 2016

Setter(s)

: Ms Fina Zhu

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

Answer all the questions.

If working is needed for any question, it must be shown with the answer.

Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to 3 significant figures. Give answers in degrees to 1 decimal place. For , use either your calculator value or 3.142, unless the question requires the answer in terms of.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 50.

50

This question paper consists of 9 printed pages including this cover page.

Answer all the questions.

1	State	the 'True' or 'False' for the following statements	
	(a)	If p and \overline{q} are two different prime numbers, pq has only 2 factors.	
		Answer[1]]
	(b)	The diagonals of a parallelogram are perpendicular to each other.	
		Answer[1]	
2	(a)	Round 0.099801 correct to 2 significant figures.	
		Answer[1]	
	(b)	The first four terms of a sequence are 2, 8, 18 and 32. Write down the 6th term of the sequence.	
		Answer[1]]
	(c)	Convert 31 m/s to km/h.	
		Answerkm/h [1]	
3	(a)	An unbiased die is thrown. Find the probability that the number shown is a prime number.	
		Answer[1]	
	(b)	Ryan picks a number from 9 to 15. Find the probability that the number he picks	
		(i) is odd,	
		(ii) is a perfect cube.	



	1700001700
Answer	 [1]

Given that $42^2 - 8^2 = 5k$, use algebraic rule to find the value of k. (Note: You are not allowed to use the calculator for this question.)

5 Solve $2x^2 - 9x - 5 = 0$.

Answer
$$x = \dots$$
 or \dots [3]

Find the ratio of the curved surface area of the cone in **Figure 1** to the curved surface area of the hemisphere in **Figure 2**.

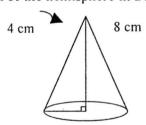


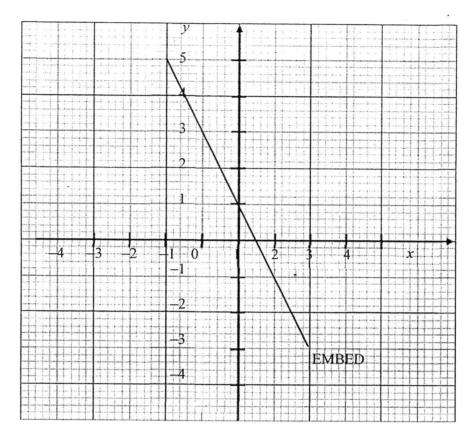


Figure 1



Figure 2

7 The graph of y = 3 - 2x is drawn on the grid below.



(a) State the gradient of the line y = 3 - 2x.

Answer[1]

(b) Draw the line y=2 on the same grid.

(c) Hence, solve the simultaneous equations of y=3-2x and y=2.

Answer $x = \dots$

 $y = \dots$ [1]

[1]

8	The school organises an overseas trip for a group of 40 pupils and the amount of fund available allows them to travel for 15 days. If the number of pupils increases to 50, find the difference in the number of days they could travel with the same amount of fund provided.	
	Answerdays	[3]
9	The highest common factor (HCF) and lowest common multiple (LCM) of two numbers are 12 and 360 respectively.	
	(a) Express the HCF as the product of prime factors.	
	Answer	[1]
	(b) Express the LCM as the product of prime factors.	
	Answer	[1]

(c) One possible set of the two numbers is 12 and 360. Write down another set of two numbers that will have the same HCF and LCM.

Answer		[1]
THISWET	,	[1]

10 (a) Daniel has a total of 19 dollar notes of which x are \$5 notes and y are \$2 notes. The total value of the dollar notes is \$71. Form two equations in terms of x and y to represent the information.

(b) Given $9m-2n=m+\frac{1}{4}n$, find the value of $\frac{m}{n}$.

Answer
$$\frac{m}{n}$$
 [2]

11 Factorise completely

(a)
$$-3pq+2p^2+3q-2p$$



			-							Ai	nsw	er		[2]
	(b)	a^4-8	81.											
										Ai	nsu	er		[2]
12													Mathematics class test is given in	
	the st	tem an	d leaf diagram b	elo	W.	Th	e t	tot	al ı	na	arks	is	80.	
	Section		. 1	l٥	R	9	Q							
	Key 3 3	repres	sents 33 mark⁄s	$\begin{vmatrix} 0 \\ 3 \end{vmatrix}$	4	4	5	7						
		•	3						5	7	8	9		
			4											
			5	2	3	4	7	9						
				2										
				2	6	9								
			8	0										
	(a)	Find												
		(i)	the total number	r of	fst	ude	ent	ts '	wh	0 :	sat	for	the test,	
										A	nsv	ver	students	[1]
		(ii)	the modal mark	foi	r th	ne t	es	t,						
						u,	ā			A	nsv	ver	AST SEE	[1]
		(iii)	the median mar	k fo	or i			st.		OSCIE KOMEN WZ - A	otizalia. Harazza			

If remedial lesson is given to students who scored less than 25 marks, find the

(b)

percentage of students who have to attend remedial.

Answer % [2]

13 If x + y = -3 and xy = -10, find the value of

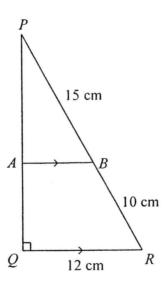
(a) (y+1)(x+1),

Answer [2]

(b) $x^2 + y^2$



14



PAB and PQR are two similar right-angled triangles. A and B are points on PQ and PR respectively such that AB is parallel to QR. BR = 10 cm, PB = 15 cm and QR = 12 cm. Find

(a) AB,



Answer	AB =		cm	[2]
--------	------	--	----	-----

(b) *PQ*,

Answer $PQ = \dots$ cm [2]

(c) angle QPR.

Answer angle $QPR = \dots ^{\circ}$ [2]

End of Paper



Qn	Solution		Remarks
la	False	B1	Generally ok.
lb	False	BI	0 mark for those who wrote T or F.
2a	0.10	BI	Generally ok.
2b	72	BI	• Common mistake: 0.010 or 0.100
2c	111.6 km/h	BI	
3a	0.5 or ½	BI	Generally ok.
3b	(i) 4/7	B1	Common Mistake: not reducing to lowest
	(ii) 0	B1	0
			term or leaving answer as 7
4	$42^2 - 8^2 = 5k$		Generally ok.
	(42+8)(42-8) = 5k	MI	
	(50)(34) = 5k	MI	
	$\therefore k = 340$	Al	
5	$2x^2 - 9x - 5 = 0$		Generally ok.
	(2x+1)(x-5)=0	M1	0 mark for those who attain solution from
	x = -0.5 or $x = 5$	A2	expression $(2x+1)(x-5)$, not equation.
6	$\pi(4)(8) \cdot 2\pi(6)^2$	M2	Common Mistakes:
	4:9	Al	Applied wrong formulas OR used rounded
		120	off figure when comparing ratio.

.

		T	
			• [-Im] wrong side of ratio
			• [-1m] no brackets $\rightarrow \frac{2}{16}6^{-2} \text{ or} 2\pi 36$
7a	-2	BI	Badly done. Some forgot about –ve sign.
7b	See drawing	BI	Ok but many did not label the graph.
7c	x = 0.5, y = 2	BI	Generally ok.
8	$50 d = 40 \times 15$	MI	• [-1m] 40 pupils = 15 days
	d = 12 days	MI	
	Difference = $15 - 12 = 3$ days	Al	 Most students did not find the difference.
9a	$HCF = 2^2 \times 3$	ВІ	Some did not give product form
9b	$LCM = 2^3 \times 3^2 \times 5$	BI	e.g. 2. 2. 3
9c	[60, 72] & [24,180] & [36, 120]	BI	Part c is quite badly done.
10a	x + y = 19	BI	• 50-50
	5x + 2y = 71	B1	
10b	$9m - 2n = m + \frac{1}{4}n$		• Quite badly done. Many only get M1. 32
	$8m = \frac{9}{4}n$	MI	Many has answer 9
	4		A few with the same weird mistake:
	$\frac{m}{n} = \frac{9}{4} \div 8$		$32 \times \frac{m}{}=9$
			n
	$=\frac{9}{32}$	Al	$\frac{32}{9} \times \frac{m}{n} = 0$
Ha	$-3pq + 2p^2 + 3q - 2p$		Majority can do.
	= p(2p-3q)-(2p-3q)	MI	
	= p(2p-3q)-(2p-3q) = (p-1)(2p-3q)	A1	
	•		
116	$a^4 - 81$		Badly done.
	$=(a^2)^2-(9)^2$		Some left answer in index form as
	= (a2)2 - (9)2 = (a ² + 9)(a ² - 9)	MI	$(a^2+3^2)(a^2-3^2) \rightarrow \text{No M1}$
	$= (a^2 + 9)(a + 3)(a - 3)$	AI	Many missed out A1
12a	(i) 36	B1	Well done for part (i) and (ii)
	(ii) 35	B1	• 50-50 for part (iii)
	(iii) 39.5	BI	
	2		
12b	$\frac{7}{26} \times 100\%$	MI	• [-1m] for not writing % after 100
	36		
	$=19\frac{4}{9}\%$	Al	, , , , , , , , , , , , , , , , , , ,
	9		
	3		

1.2	1 / 12/ 1:	,	
13a	(y+1)(x+1) = xy + y + x + 1	MI	Generally ok.
	= -10 - 3 + 1		Common mistake:
	= -12	A1	• $(y+1)(x+1) = xy + y + x + 2$
13b	$x^2 + y^2 = (x + y)^2 - 2xy$	MI	Badly done.
	$=(-3)^2-2(-10)$	MI	Common mistake:
	= 29	.A1	• $x^2 + y^2 = (x + y)(x - y)$
			$x^2 + y^2 = (x + y)(x + y)$
			• $-3^2 = 9$
14a	$\frac{AB}{12} = \frac{15}{15 + 10}$	141	Generally ok.
	12 15+10	MI	-
	AB = 7.2cm	Al	Common mistake:
			• [-1m] no unit for all 3 parts
14b	$PQ = \sqrt{25^2 - 12^2}$	MI	• [-Im] for wrong unit
	$=\sqrt{481}$		Several did not write ∠
	= 21.9cm		
	- 21.9cm	Al	$PQ^2 = 25^2 - 12^2$
			• = 21.9cm
14c	$\sin \angle QPR = \frac{12}{25}$	M1	$\sin^{-1} = \frac{12}{25} \operatorname{or} \sin^{-1} QPR = \frac{12}{25}$
			• 25 or 25
	$\angle QPR = 28.685$		
	=28.7°	Al	

St Gabriel's Sec Sch Mathematics Department 2016 Sec 2E SA2 Paper 2 Answer Key & Marking Scheme

Qı	n No.	Solutions	Marks	Remarks
1		$8a^2 - 18b^2 = 2(4a^2 - 9b^2)$	MI	Generally well done.
		$=2[(2a)^2-(3b)^2]$		
1		= 2(2a+3b)(2a-3b)	A1	
1				
2		$(x+1)^2 - 14(x+1) + 49$		$(x+1)^2-14(x+1)+49$
		$= (x+1)^2 - 2(7)(x+1) + 7^2$		$= x^2 + 2x + 1 - 14x$
		$=(x+1-7)^2$		-14+49
		$=(x-6)^2$	MI	$=x^2-12x+36$
				$=(x-6)^2$
		Since length of one side of square is 6 cm,		
		x - 6 = 6	MI	
		x = 12	Al	
		A CONTRACT OF THE CONTRACT OF	1 25 mm	Parties and the Santa
3		Surface Area of shaded portion .		
		$=2(\frac{1}{2}\pi r^2)$		Many used
				calculator's π instead
		$=\pi r^2$		of 3.142 (as stated on
		$=3.142\times26.6\times26.6$	MI	cover pg).
		$= 2223.15352 \mathrm{cm}^2$		Marks awarded accordingly.
		[or $707.56 \pi \text{ cm}^2$]		accordingly.
		[or 2222.865298 cm ² (using calculator π)]		Many had longwinded
		Surface area of white portion/curved surface		methods – finding
				total surface area of
		$=\frac{7}{8}(4\pi r^2)$	MI	sphere first, and minus 1/8 of it to find
		o o		the 7/8 th of surface
		$=\frac{7}{8} \times 4 \times 3.142 \times 26.6 \times 26.6$		area of sphere.
	18.	$= 7781.03732 \mathrm{cm}^2$		Many used rounded
- 1		$[or\ 2476.46\ \pi\ cm^2]$		off answers to find
	, ,	[or 7780.028543 cm ² (using calculator π)]		final answer, resulting
		Total surface area of non-sister as-1:-1	A1	in inaccuracy.
		Total surface area of remaining solid		
		= 2223.15352 + 7781.03732		
		$= 10004.2 \text{ cm}^2 \text{ (to 1 d.p.)}$		
		[or 10002.89384 cm ² (using calculator π)]		

4	(a)	Percentage of mala mass	1	
	(4)	Percentage of male prefects		
		$= \frac{25}{100} \times (100\% - 60\%)$		
		= 10%		Many left answers in
	-		MI	the form of
		10		percentage.
		$P(a \text{ male prefect}) = \frac{10}{100}$		Many did not give proper headings for
		P(a male prefect) 100		probability.
		$=\frac{1}{10}$, and the second of the second
	(1)	10	Al	
	(b)	Percentage of girls in the class		Generally well done
		who are not prefects = 60% - 15% = 45%		
		(Since 25% of the class are prefects and 10% of the class are male prefects, percentage of female prefects in the class is 15%.)	MI	
		P(a girl who is not a prefect) = $\frac{45}{100}$	A1	
		P(a girl who is not a prefect) $\frac{100}{100}$		
		= 9		
		$=\frac{20}{20}$		
5	(a)	Since y and \sqrt{x} -are in inverse proportion,		
		Since y and $\frac{1}{2}$ are in inverse proportion,		٠.
		$v\sqrt{x} = k$, where k is a constant.		
		Which $\lambda = 0$,		
		$y\sqrt{9} = k$		
		$y = \frac{k}{\sqrt{Q}}$		
		When $x = 100$,		
		$y\sqrt{100} = k$		Many equate the value
				of k instead of y.
		$y = \frac{k}{\sqrt{100}}$		Wrote
		V100		10y - 3y = 2.8
		Since the difference in the values of y when		Need to read qs
		x = 9 and $x = 100$ is 2.8,		carefully.
	-	$\frac{k}{\sqrt{9}} - \frac{k}{\sqrt{100}} = 2.8$	MI	
		$\frac{k}{3} - \frac{k}{10} = 2.8$		
		$\frac{10k - 3k}{30} = 2.8$	MI	
		$\frac{7k}{30} = 2.8$		
		k = 12	A1	

	(b)	When $x = 16$.		
		$v\sqrt{16} = 12$		Well done if (a) is
		v = 3	Bi	done correctly
	(c)	When $y = 5$.	ρ1	
	(C)	$5\sqrt{x} = 12$		Prone to careless
		$\sqrt{x} = 2.4$		mistakes when
		3 000		"moving around" the terms in the equation.
		x = 5.76	B1	
6	(a)	A stem-and-leaf diagram is the most suitable		Many simply stated
		because all the marks can be shown and at	BI	that it was "easier". which is too vague.
		most only 6 rows are required (simplest form).	БІ	Student must be
		101111).		specific in their
				explanation.
	Key: 1 0 me	eans 10 marks.		
		Stem Leaf		
		1 0 3 6 7 8		Many constructed a back-to-back stem and
		2 1 2 8 8 8 8 3 0 1 3 9	D.	leaf diagram, instead
		4 0 2 3 5 8 8	BI	of separate diagrams
-	*			at stated in question.
				Many students split
		Marks for second test		the page and
		Stem Leaf		constructed the
		0 7		diagrams side-by-side.
		1 6 6 7 8 8 2 2 5 6 6 6 6		(which is incorrect)
		3 0		DO NOT SPLIT THE
		4 0 1 2 2 4 5 0 0	B1	PAGE INTO
		3 0 0		COLUMNS.
	()			
	(c)	Number of students who failed the first test = 7. Number of students who failed the second test	BI	A handful added the 2 tests together although
		= 7	ВІ	question asked for
		eri pet seede eeu ja ja eeu j		separate answers
34.55	. Was a second			("each test")
7	(a)	48	10 to	5 1
		In right-angled $\triangle QAB$, $\sin \angle BAQ = \overline{60}$		Some mistook angle
		4		BAQ for angle ABP.
		= + + + + + + + + + + + + + + + + + + +		
		. <u>. 1</u>	B1	Otherwise mostly
	1	<u></u>		correct.
		In right-angled $\triangle PBA$, $\sin \angle ABP = 60$		

for the state of the same state of

٦	1			
		$=\frac{11}{12}$		
	(b)	$\sin \angle BAQ = \frac{4}{5}$		
}	-	$\sin \angle BAQ$ 5		
		$\angle BAQ \approx 53.13^{\circ}$		
		11		No reasoning (-1m)
		$\sin \angle ABP = \frac{11}{12}$		$(\angle sum of \Delta)$
		$SIII \angle ABP = 12$ $\angle ABP \approx 66.44^{\circ}$		Many was districted
		∠ABF ~ 00.44		Many used rounded off answers to calculate.
		$\therefore \angle PCQ = 180^{\circ} - \angle BAQ - \angle ABP (\angle sum)$		resulting in inaccuracy
		of Δ)	MI	(incorrect final answer)
		= 180° - 53.13° - 66.44°	A 1	,
		= 60.43°	Al	
	-	= 60.4° (correct to 1 d.p.)	2	
	(c)	In $\triangle ACP$, $\angle PCQ = \angle PCA = 60.43^{\circ}$		Many longwinded
		$\sin \angle PCA = \frac{55}{AC}$		ways of doing –
				finding AQ and QC separately and adding
		$AC = \frac{55}{\sin 60.43^{\circ}}$	MI	them up to get AC.
				(more time taken)
		$\approx 63.2 \mathrm{cm} \mathrm{(to3s.f.)}$	A1	(inaccuracy occurs
				when rounded off
				answers were used to calculate)
3	(a)	Scale of map $A = 2 \text{ cm} : 5 \text{ km}$	objects or against	
		$= 2 \text{ cm} : 5 \times 1000 \times 100 \text{ cm}$		
		= 2 cm : 500 000 cm	MI	Well done.
		= 1 cm : 250 000		
	(1)	= 1 : 250 000	A1	
	(b)	Scale of map $A = 2 \text{ cm} : 5 \text{ km}$		
		= 1 cm : 2.5 km		
		Area on map A: actual area		
		$= 1 \text{ cm}^2 : 2.5 \times 2.5 \text{ km}^2$		Some forgot to
		$= 1 \text{ cm}^2 : 6.25 \text{ km}^2$	MI	convert to new scale
٠.				for area.
		actual area of the park = 6.25 × 2.5		
		$= 15.625 \text{ km}^2$	A1	
1	(c)	Scale of map $B = 1:50000$		
	` '	= 1 cm : 0.5 km		
		1 CH . 0.5 KH		
		nem () materials a later of the		Comment
		Area on map B: actual area		Some used the wrong
		nem () materials a later of the		Some used the wrong scale to calculate.

		15.625		
		\therefore area of park on map $B = 0.25$		
		$= 62.5 \text{ cm}^2$		
-		-	A1	
9	(a)	$\frac{2p+q+p+3q}{2} = 14.5$	MI	Many didn't reduce or
		3p + 4q = 29	.41	simplify
	(b)	$\frac{p-q+3p-2q+2p+q+p+3q+2p+3q+5p+2q}{6} = 12$	МІ	•
		$\frac{14p+6q}{6}=12$		Many didn't reduce or simplify
		2(7p + 3q) = 72		
		2(7p+3q) = 72 $7p+3q = 36$	A1	

	(c)	3p + 4q = 29 (1)		
		7p + 3q = 36(2)		
		7p + 3q = 36 (1) × 3: $9p + 12q = 87$ (3)		
		$(2) \times 4: \ ^{28p+12q} = 144 (4)$	MI	
		$(2) \times 4$: (4) (4) - (3):		
		28p + 12q - (9p + 12q) = 144 - 87	MI	Many did not label
		19p = 57		equations or show
		p=3		what was done to labelled equations,
		p-3	Al	resulting in confusing
1		Substituting $p=3$ into (1),		presentation.
		Substituting $P = 1$ into (1), $3p + 4q = 29$		
		3(3) + 4q = 29		
		4q = 20		
			AI	
-		q=5	Ai	
10	(0)	W		- 41 1 4
10	(a)	When $t = 3$,		
		$p = 28 + 32(3) - 8(3)^2$		
1		p = 52	BI	
	(b)	28 m	B1	
	(c)	Correct Scales used for both Axes (must label)	B1	Some got the wrong
		Correct Points Plotted	BI	axis (swapped)
		Points joined up with a Smooth Curve	B1 -	
	(d)(i)	Greatest height $= 60 \text{ m}$	B1	
	(d)(ii)	Length of time = $3.15 - 0.85$	MI	Accept 2.1s to 2.5s
	(4)(11)	= 2.3 s	A1	-
W. 6. Co.	(e)	t = 4.75 s	BI	Accept 4.65s to 4.85s
West and the second				

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• • •

[End of Marking Scheme]