NORMANHURST BOYS HIGH SCHOOL

STAGE 5.1-5.3 MATHEMATICS

2017 Year 9 Yearly Examination
Friday, 27 October 2017

General instructions

- Working time – 100 minutes.
- Write using blue or black pen. Where diagrams are to be sketched, these may be done in pencil.
- NESA approved calculators may be used.
- Attempt all questions.
- At the conclusion of the examination, bundle Section I answer sheet together with any additional sheets used in the correct order within this paper and hand to examination supervisors.

Total marks – 96

SECTION I (20 marks)

- Multiple choice questions
- Mark your answers on the multiple choice answer sheet provided

SECTION II (76 marks)

- Free response questions
- Write your working and answers in the space provided.

Class: (please ✓)

○ 9MAT.N – Mr Tan

○ 9MAT.B – Mrs Gan

○ 9MAT.H – Ms Park

○ 9MAT.S – Mr Wall

FULL NAME: .....

Marker's use only

SECTION	**1**	**2**								**Total**	**%**
QUESTIONS	**1-20**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
MARKS	/20	/16	/8	/10	/6	/7	/10	/11	/8	/96	

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Section I

20 marks
Attempt Question 1 to 20

Mark your answers on the answer grid provided

1. $\dfrac{(a^3)^2}{a^4 \times a^2} =$

(A) 1 (B) $\dfrac{1}{a}$ (C) $\dfrac{1}{a^2}$ (D) $\dfrac{1}{a^3}$

2. $\sqrt{(a^8)^8} =$

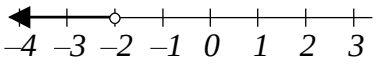
(A) a^4 (B) a^8 (C) a^{16} (D) a^{32}

3. Use your calculator to evaluate $\dfrac{\sqrt{3}-1}{2\sqrt{2}}$ correct to *2* decimal places.

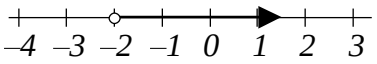
(A) *0·26* (B) *0·52* (C) *1·02* (D) *1·38*

4. The graph that illustrates the solution of $-3x > 6$ is:

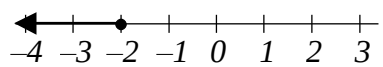
(A)



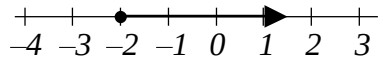
(B)



(C)



(D)



5. The solution of the equation $3(p-2) = 5p + 2$ is

(A) $p = -4$ (B) $p = -2$ (C) $p = -1$ (D) $p = 1$

6. Which of these is equal to $\dfrac{a-1}{6-6a}$?

(A) -6 (B) $-\dfrac{1}{6}$ (C) $\dfrac{1}{6}$ (D) 6

7. The point $(a, 2)$ lies on the line whose equation is $2x + y + 4 = 0$. What is the value of a ?

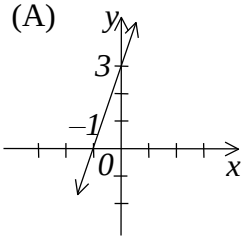
(A) -8 (B) -3 (C) 3 (D) 8

8. What is the gradient of the line $2x - 3y + 7 = 0$?

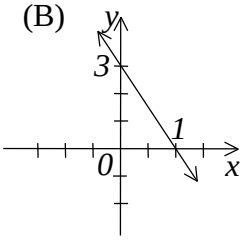
(A) $-\frac{3}{2}$ (B) $-\frac{2}{3}$ (C) $\frac{2}{3}$ (D) $\frac{3}{2}$

9. Which diagram represents the graph of $y = 3x + 3$?

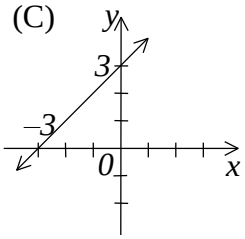
(A)



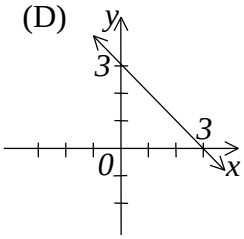
(B)



(C)



(D)



10. What is the equation of the line passing through the point $(-3, 4)$ and parallel to the y axis ?

(A) $x = -3$ (B) $y = -3$ (C) $x = 4$ (D) $y = 4$

11.

AIRSHIP FLIGHTS
discount tickets now
40% off regular price
SAVE *$80*

What is the price of a ***discount*** ticket?

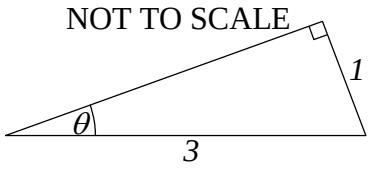
(A) $48 (B) $112 (C) $120 (D) $200

12. 'SPARKLE' toothpaste comes in four different sizes. Which size is the best buy?

(A) *75* g for $*1·29* (B) *110* g for $*1·99*

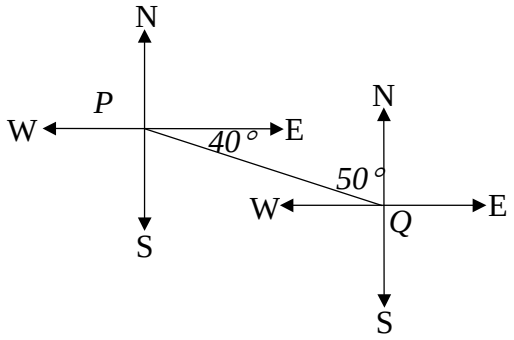
(C) *150* g for $*2·40* (D) *175* g for $*2·85*

13. What is the size of angle θ ?



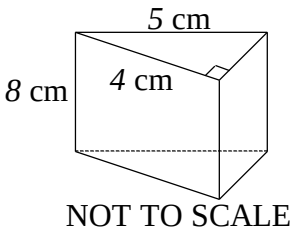
(A) $18°26'$ (B) $18°43'$ (C) $19°28'$ (D) $19°47'$

14. What is the bearing of P from Q ?



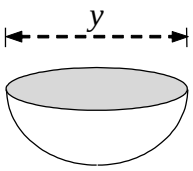
(A) $040°$ (B) $050°$ (C) $130°$ (D) $310°$

15. What is the volume of this triangular prism ?



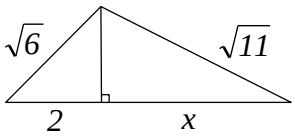
(A) 48 cm^3 (B) 60 cm^3 (C) 80 cm^3 (D) 96 cm^3

16. What is the surface area of this solid hemisphere in square units ?



(A) $\frac{1}{2}\pi y^2$ (B) $\frac{3}{4}\pi y^2$ (C) $2\pi y^2$ (D) $3\pi y^2$

17. What is the value of x?



(A) 1 (B) 3 (C) $\sqrt{13}$ (D) $\sqrt{21}$

18. Paul will sit for 10 tests this year. Each test is marked out of 50. After 8 tests, his mean mark is $77{\cdot}5\%$. What is the highest mean mark (***as a percentage***) that Paul could achieve for this year?

(A) 72% (B) 82% (C) $88{\cdot}75\%$ (D) $92{\cdot}5\%$

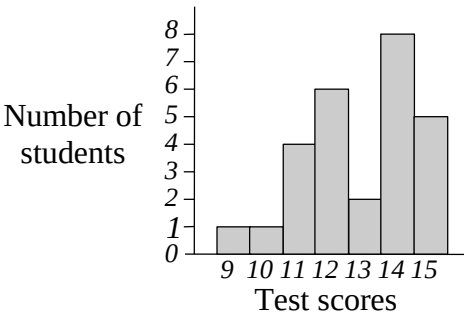
19.

Score	Frequency
2	2
3	3
4	1
5	4
6	7
7	3
	20

The mean of this set of scores is 5. If another score of 5 is added to the set, which of these measures will change?

(A) mean (B) median (C) mode (D) range

20. The results of a Year 10 class test are shown in the frequency histogram below.



What is the median test score ?

(A) 11 (B) 12 (C) 13 (D) 14

End of Section I

Section II

76 marks
Attempt Question 1 to 8

Question 1 (16 marks)

(a) Factorise fully:

i. $(x-2)^2-25$ **2**

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ii. $x^2-3x-4yx+12y$ **2**

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iii. $3x^2-7x-6$ **2**

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(b) Simplify $\frac{3x+1}{5}-\frac{2x-1}{3}$ **2**

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(c) Find the value of k if $5^k(5^2)^3 = 1$ **2**

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(d) Express in the simplest form without negative indices: **2**

$$\frac{a^2-b^2}{a^{-1}+b^{-1}}$$

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(e) Expand and simplify $(3\sqrt{2}+4)^2$ **2**

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(f) Rationalise the denominator of $\frac{\sqrt{2}}{3+\sqrt{2}}$ **2**

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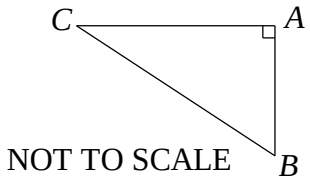
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Question 2 (8 marks)

(a) The diagram shows point *B* is *844* metres due south of point *A*. Point *C* is due west of point *A*. The bearing of *C* from B is *295°*.



NOT TO SCALE

(i) Find the size of $\angle ABC$ **1**

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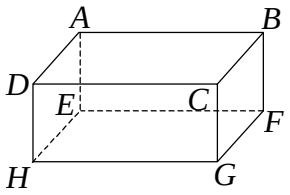
(ii) Hence find the distance *BC*, to the nearest metre. **2**

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(b) The diagram shows a rectangular prism with *AB = 4* m, *BF = 2* m, *FG = 3* m. Find the size of angle *BHF* to the nearest minute. **2**



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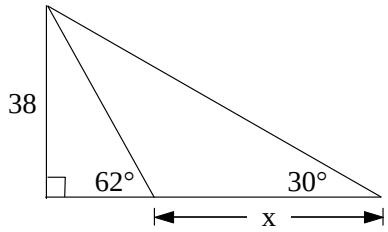
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(c)



Find *x* correct to 1 decimal place. **3**

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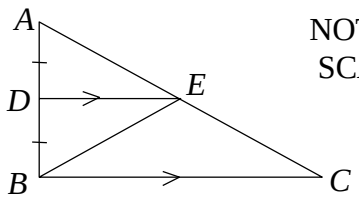
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Question 3 (10 marks)

(a) The triangle *ABC* has a right angle at *B*. *D* is the midpoint of *AB*. *E* lies on *AC* and *DE* is parallel to *BC*.



(i) Give reason why *ADE* is a right angle. **1**

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(ii) Prove that triangle AED is congruent to triangle BED. **3**

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(iii) Hence prove that *BE* = *EC*, giving reasons **3**

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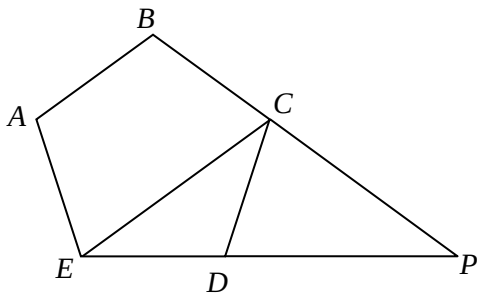
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(b) The diagram shows a regular pentagon *ABCDE*. Sides *ED* and *BC* are produced to meet at *P*.



(i) Find the size of $\angle CDE$. **1**

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(ii) Hence find the size of $\angle CPD$. **2**

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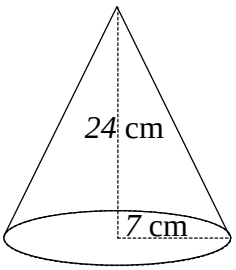
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Question 4 (6 marks)

(a) The cone has a perpendicular height of 24 cm and a base radius of 7 cm. Find the area of the curved surface of the cone. (correct your answer to 1 decimal place) **2**



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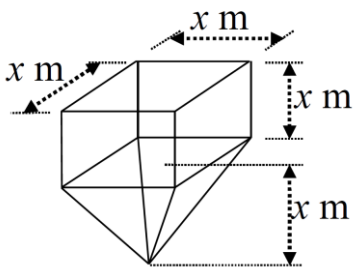
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(b) A `hopper' is a hollow storage container. This hopper is made by joining a cube and square pyramid, each of height x m.



Find the volume of the hopper in terms of x. **2**

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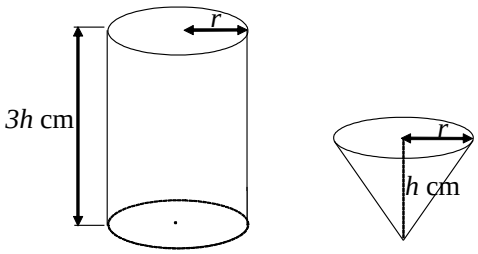
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(c) How many times must the cone be filled with water and emptied into the cylinder in order to fill the cylinder? (show all clear workings) **2**



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Question 5 (7 marks)

(a) The diagram below shows a stem-and-leaf plot for *22* scores.

2	3 5 9
3	1 4 7 9
4	2 4 4 5 7
5	1 2 4
6	2 3 7
7	5 8 8 8

(i) What is the mode for this data? **1**

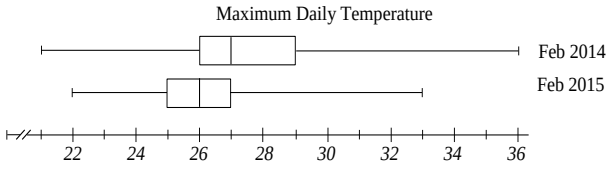
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(ii) What is the median for this data? **1**

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(b) The box-and-whisker plots bellow show the maximum daily temperature for Sydney in February 2014 and 2015.



(i) What is the interquartile range of temperatures in February 2015 **1**

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(ii) How many days in February 2014 (*28 days in this month*) had a temperature of 26º or less? **1**

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(c) For the scores represented in the frequency distribution table, the mean is *5* and the mode is *4*.

Score	Frequency
x	*10*
y	*5*

(i) Find the value of *x*. **1**

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(ii) Form an equation in *x* and *y* for the mean. **1**

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(iii) Hence solve for *y*. **1**

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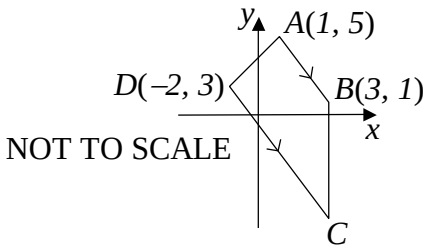
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Question 6 (10 marks)

(a) *ABCD* is a trapezium. *AB* is parallel to *DC*. *BC* is parallel to the *y* axis.



(i) Find the gradient of the line *AB*. **1**

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(ii) Find, in general form, the equation of the line *DC*. **2**

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(iii) Find the coordinates of the point *C*. **2**

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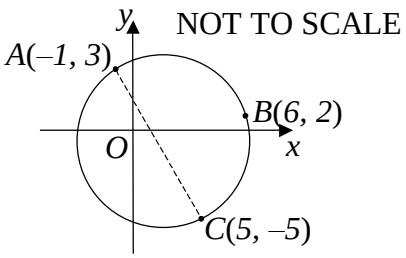
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(b) *A*(*–1, 3*), *B*(*6, 2*) and *C*(*5, –5*) lie on a circle. *AC* is a diameter.



(i) Find the coordinates of the centre of the circle. **1**

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(ii) Find the radius of the circle. **2**

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(iii) Given that the gradient of *BC* is 7. By finding the gradients of *AB*, show that *AB* and *BC* are perpendicular. **2**

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Question 7 (11 marks)

(a) STAR real estate company has the following sliding scale of commission for the sale of property based on the selling price.

First *$50 000*	*5%*
Next *$70 000*	*3%*
Next *$50 000*	*2·5%*
Thereafter	*2%*

A property was sold for $168 000.

Calculate the commission they would charge. **2**

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(b) Pauline works part-time on Ozzie Wonder Cruises. Her regular hourly rate of pay is *$13·60* for Monday to Friday. On weekends she receives "time-and-a-half".

(i) In a particular week Pauline worked a total of *12* hours, Monday to Friday, how much does she earn? **1**

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(ii) If her total pay for this particular week was *$346·80*, how many hours did she work on the weekends? **2**

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(c) Taren has a gross annual income of $*42 600*. He has allowable deductions of $*1420*. He must pay tax on all taxable income. His employer has deducted $*4265* in PAYG tax throughout the year.

(i) Show that Taren's taxable income is $*41180*. **1**

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(ii) Using the tax table given below, calculate the income tax that Taren must pay. **1**

Taxable income	Tax on this income
0–$18 200	Nil
$18 201– $37 000	19c for each $1 over $18 200
$37 001– $80 000	$3 572 plus 32.5c for each $1 over $37 000
$80 001–$180 000	$17 547 plus 37c for each $1 over $80 000
$180 001 and over	$54 547 plus 45c for each $1 over $180 000

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(iii) Will Taren receive a refund or will he need to pay an additional amount in tax? What is the amount of his refund or tax bill? **2**

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(d) $*1200* is invested for *7* months at a simple interest rate of *6·4%* per annum. Find the interest earned on this investment at the end of *7* months. **2**

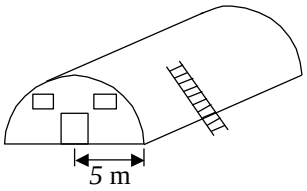
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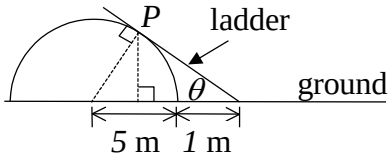
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Question 8 (8 marks)

(a) A ladder leans against a building of semi-circular cross section, radius 5 m, as shown.



The base of the ladder is *1* m from the building and the ladder touches the building at the point *P*.



(i) Find the angle, θ, the ladder makes with the ground. (Give your answer to the nearest degree.) **2**

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(ii) Find the height, in metres, of the point *P* above ground level. (Give your answer correct to one decimal place.) **2**

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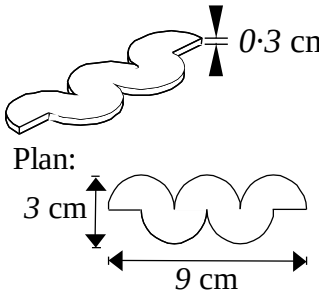
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(b) Special Olympic badges have been designed as shown below.



All the curves in the design are semicircles with the same radius.

The thickness of the badge is *0·3* cm.

(i) Find the volume of the badge (correct to two decimal place). **2**

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(ii) It is given that *1* cm^3 of gold has a mass of *19·63* grams and that gold costs *$13* per gram. Find the cost of the gold needed for one of these badges. **2**

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End of paper

You may use this page for your additional answers. Indicate clearly the question numbers or part numbers

NORMANHURST BOYS HIGH SCHOOL

STAGE 5.1-5.3 MATHEMATICS

2017 Year 9 Yearly Examination
Friday, 27 October 2017

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Total marks – 96

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- Multiple choice questions
- Mark your answers on the multiple choice answer sheet provided

SECTION II (76 marks)

- Free response questions
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Class: (please ✓)

○ 9MAT.N – Mr Tan

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○ 9MAT.S – Mr Wall

FULL NAME: Solution

Marker's use only

SECTION	**1**	**2**								**Total**	**%**
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MARKS	/20	/16	/8	/10	/6	/7	/10	/11	/8	/96	

Section I

20 marks
Attempt Question 1 to 20

Mark your answers on the answer grid provided

1. $\dfrac{(a^3)^2}{a^4 \times a^2} =$

(A) 1 (B) $\dfrac{1}{a}$ (C) $\dfrac{1}{a^2}$ (D) $\dfrac{1}{a^3}$

2. $\sqrt{(a^8)^8} =$

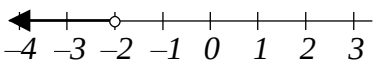
(A) a^4 (B) a^8 (C) a^{16} (D) a^{32}

3. Use your calculator to evaluate $\dfrac{\sqrt{3}-1}{2\sqrt{2}}$ correct to *2* decimal places.

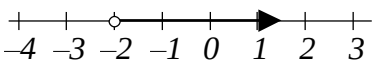
(A) *0·26* (B) *0·52* (C) *1·02* (D) *1·38*

4. The graph that illustrates the solution of $-3x > 6$ is:

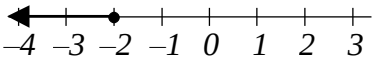
(A)



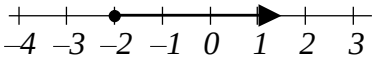
(B)



(C)



(D)



5. The solution of the equation $3(p-2) = 5p + 2$ is

(A) $p = -4$ (B) $p = -2$ (C) $p = -1$ (D) $p = 1$

6. Which of these is equal to $\dfrac{a-1}{6-6a}$?

(A) -6 (B) $-\dfrac{1}{6}$ (C) $\dfrac{1}{6}$ (D) 6

7. The point $(a, 2)$ lies on the line whose equation is $2x + y + 4 = 0$. What is the value of a ?

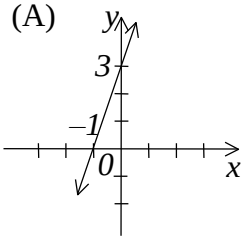
(A) -8 (B) -3 (C) 3 (D) 8

8. What is the gradient of the line $2x - 3y + 7 = 0$?

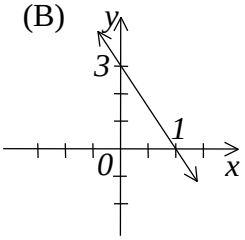
(A) $-\frac{3}{2}$ (B) $-\frac{2}{3}$ (C) $\frac{2}{3}$ (D) $\frac{3}{2}$

9. Which diagram represents the graph of $y = 3x + 3$?

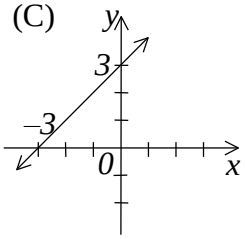
(A)



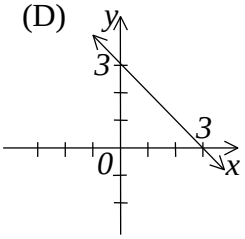
(B)



(C)



(D)



10. What is the equation of the line passing through the point $(-3, 4)$ and parallel to the y axis ?

(A) $x = -3$ (B) $y = -3$ (C) $x = 4$ (D) $y = 4$

11.

AIRSHIP FLIGHTS discount tickets now *40%* off regular price SAVE *$80*

What is the price of a ***discount*** ticket?

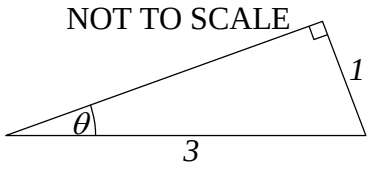
(A) $48 (B) $112 (C) $120 (D) $200

12. 'SPARKLE' toothpaste comes in four different sizes. Which size is the best buy?

(A) *75* g for $*1·29* (B) *110* g for $*1·99*

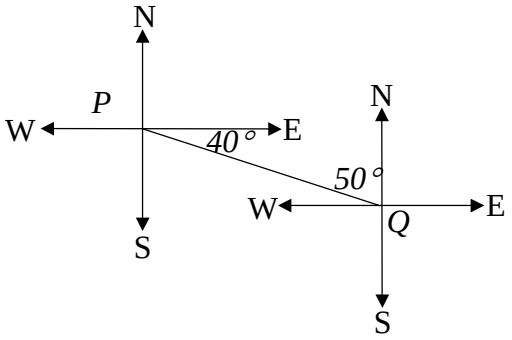
(C) *150* g for $*2·40* (D) *175* g for $*2·85*

13. What is the size of angle θ ?



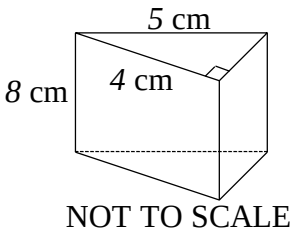
(A) $18°26'$ (B) $18°43'$ (C) $19°28'$ (D) $19°47'$

14. What is the bearing of P from Q ?



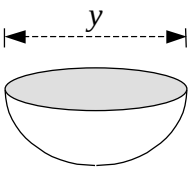
(A) $040°$ (B) $050°$ (C) $130°$ (D) $310°$

15. What is the volume of this triangular prism ?



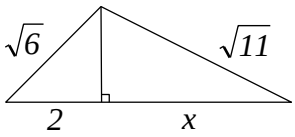
(A) 48 cm^3 (B) 60 cm^3 (C) 80 cm^3 (D) 96 cm^3

16. What is the surface area of this solid hemisphere in square units ?



(A) $\frac{1}{2}\pi y^2$ (B) $\frac{3}{4}\pi y^2$ (C) $2\pi y^2$ (D) $3\pi y^2$

17. What is the value of x?



(A) *1* (B) *3* (C) $\sqrt{13}$ (D) $\sqrt{21}$

18. Paul will sit for *10* tests this year. Each test is marked out of *50*. After *8* tests, his mean mark is *77·5*%. What is the highest mean mark (***as a percentage***) that Paul could achieve for this year?

(A) *72*% (B) *82*% (C) *88·75*% (D) *92·5*%

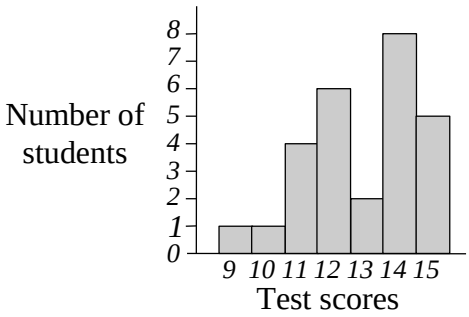
19.

Score	Frequency
2	*2*
3	*3*
4	*1*
5	*4*
6	*7*
7	*3*
	20

The mean of this set of scores is *5*. If another score of *5* is added to the set, which of these measures will change?

(A) mean (B) median (C) mode (D) range

20. The results of a Year *10* class test are shown in the frequency histogram below.



What is the median test score ?

(A) *11* (B) *12* (C) *13* (D) *14*

End of Section I

Full Name: _____

Class: (please ✓)

- ○ 9MAT.N – Mr Tan
- ○ 9MAT.B – Mrs Gan
- ○ 9MAT.H – Ms Park
- ○ 9MAT.S – Mr Wall

Year 9 Yearly Examination

Stage 5 Mathematics 2017

Section I: Multiple Choice

Instructions: Colour in the circle of the letter that represents the correct answer.

1.	**A**	B	C	D		11.	A	B	**C**	D
2.	A	B	C	**D**		12.	A	B	**C**	D
3.	**A**	B	C	D		13.	A	B	**C**	D
4.	**A**	B	C	D		14.	A	B	C	**D**
5.	**A**	B	C	D		15.	**A**	B	C	D
6.	A	**B**	C	D		16.	A	**B**	C	D
7.	A	**B**	C	D		17.	A	**B**	C	D
8.	A	B	**C**	D		18.	A	**B**	C	D
9.	**A**	B	C	D		19.	A	**B**	C	D
10.	**A**	B	C	D		20.	A	B	**C**	D

Section II

76 marks
Attempt Question 1 to 8

Question 1 (16 marks)

(a) Factorise fully:

i. $(x-2)^2 - 25$ **2**

$= (x-2+5)(x-2-5)$ ✓

$= (x+3)(x-7)$ ✓

ii. $x^2 - 3x - 4yx + 12y$ **2**

$= x(x-3) - 4y(x-3)$ ✓

$= (x-4y)(x-3)$ ✓

iii. $3x^2 - 7x - 6$ **2**

$= (3x+2)(x-3)$ ✓ ✓

(b) Simplify $\frac{3x+1}{5} - \frac{2x-1}{3}$ **2**

$= \frac{3(3x+1) - 5(2x-1)}{15}$ ✓

$= \frac{9x+3-10x+5}{15}$

$= \frac{8-x}{15}$ ✓

(c) Find the value of k if $5^k(5^2)^3 = 1$ **2**

$5^{-k+6} = 5^0$ ✓

$k+6 = 0$

$k = -6$ ✓

(d) Express in the simplest form without negative indices: **2**

$$\frac{a^2 - b^2}{a^{-1} + b^{-1}}$$

$= \frac{(a+b)(a-b)}{\frac{1}{a} + \frac{1}{b}}$ ✓

$= \frac{(a+b)(a-b)ab}{a+b}$

$= ab(a-b)$ ✓

(e) Expand and simplify $(3\sqrt{2}+4)^2$ **2**

$(3\sqrt{2})^2 + 2(3\sqrt{2})(4) + 4^2$ ✓

$= 18 + 24\sqrt{2} + 16$

$= 34 + 24\sqrt{2}$ ✓

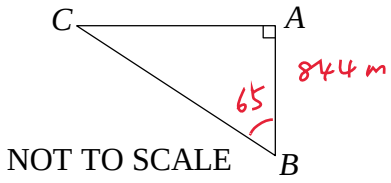
(f) Rationalise the denominator of $\frac{\sqrt{2}}{3+\sqrt{2}}$ **2**

$\frac{\sqrt{2}}{3+\sqrt{2}} \times \frac{3-\sqrt{2}}{3-\sqrt{2}}$ ✓

$= \frac{3\sqrt{2}-2}{7}$ ✓

Question 2 (8 marks)

(a) The diagram shows point B is *844* metres due south of point A. Point C is due west of point A. The bearing of C from B is *295°*.



(i) Find the size of $\angle ABC$ **1**

$360° - 295° = 65°$

(ii) Hence find the distance BC, to the nearest metre. **2**

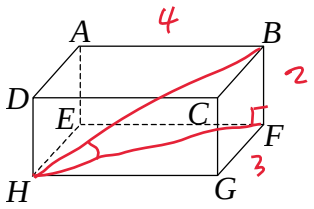
$\cos 65° = \frac{844}{BC}$

$BC = \frac{844}{\cos 65°}$ ✓

$= 1997.07\ldots$

$\doteq 1997$ m ✓

(b) The diagram shows a rectangular prism with $AB = 4$ m, $BF = 2$ m, $FG = 3$ m. Find the size of angle BHF to the nearest minute. **2**



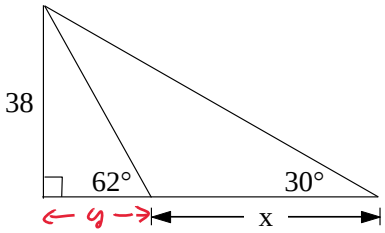
$HF = 5$ m

$\tan \angle BHF = \frac{2}{5}$ ✓

$\angle BHF = \tan^{-1}\left(\frac{2}{5}\right)$

$= 21° 48'$ ✓

(c)



Find x correct to 1 decimal place. **3**

$\tan 62° = \frac{38}{y}$

$y \doteq 20.205$ ✓

$\tan 30 = \frac{38}{x+y}$

$x + y \doteq 65.817$ ✓

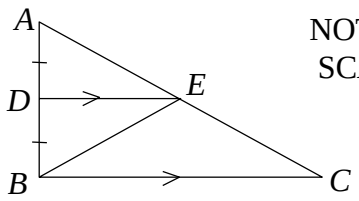
$x \doteq 65.817 - 20.205$

$\doteq 45.612$

$\doteq 45.6$ m ✓

Question 3 (10 marks)

(a) The triangle *ABC* has a right angle at *B*. *D* is the midpoint of *AB*. *E* lies on *AC* and *DE* is parallel to *BC*.



NOT TO SCALE

(i) Give reason why *ADE* is a right angle. **1**

$\angle ADE = \angle ABC = 90°$

(corresponding angles, DE // BC)

(ii) Prove that triangle AED is congruent to triangle BED. **3**

AB = BD (given)

$\angle ADE = \angle BDE = 90°$ ✓✓

(adjacent supplementary angles)

DE is common

$\therefore \triangle AED \equiv \triangle BED$ (SAS) ✓

Note correct statements 1 mark

correct reasonings 1 mark

Conclusion 1 mark

(iii) Hence prove that *BE* = *EC*, giving reasons **3**

$\angle ECB = \angle AED$ (corresponding angles ✓ DE // BC)

$\angle AED = \angle BED$ (matching angles of congruent triangles)

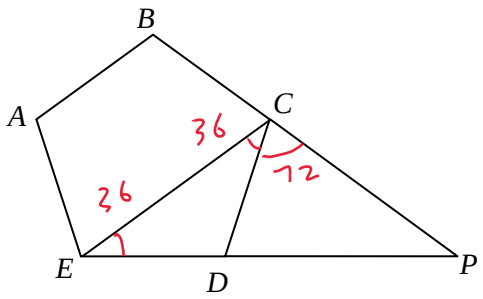
$\angle DEB = \angle EBC$ (alternate angles DE // BC)

$\therefore \angle ECB = \angle EBC$ ✓

BE = EC ✓

(Equal sides opposite equal angles)

(b) The diagram shows a regular pentagon *ABCDE*. Sides *ED* and *BC* are produced to meet at *P*.



(i) Find the size of $\angle CDE$. **1**

$\frac{3 \times 180}{5} = 108°$ ✓

or $180 - \frac{360}{5} = 180 - 72 = 108°$

(ii) Hence find the size of $\angle CPD$. **2**

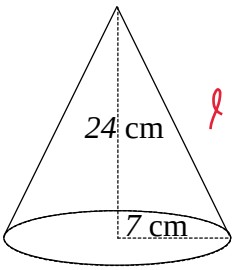
$\angle CEP = \frac{180 - 108}{2} = 36°$ ✓

$\angle CPD = 180° - 36 - 36 - 72$

$= 36°$ ✓

Question 4 (6 marks)

(a) The cone has a perpendicular height of 24 cm and a base radius of 7 cm. Find the area of the curved surface of the cone. (correct your answer to 1 decimal place) **2**



$l^2 = 24^2 - 7^2$

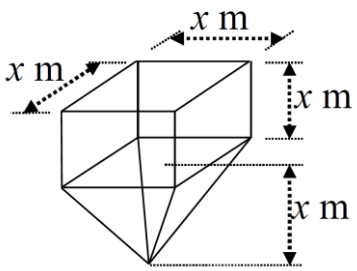
$l = 25$ cm

curved SA $= \pi \times 7 \times 25$ ✓

$= 549.778...$ ✓

$\doteq 549.8$ cm^2

(b) A `hopper' is a hollow storage container. This hopper is made by joining a cube and square pyramid, each of height x m.

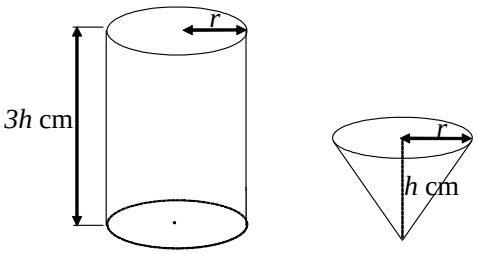


Find the volume of the hopper in terms of x. **2**

Vol $= x^3 + \frac{1}{3}(x^2)x$ ✓

$= \frac{4}{3}x^3$ ✓

(c) How many times must the cone be filled with water and emptied into the cylinder in order to fill the cylinder? (show all clear workings) **2**



$V_{cylinder} = \pi r^2 (3h)$

$= 3\pi r^2 h$ ✓

$V_{cone} = \frac{1}{3}\pi r^2 h$

$V_{cylinder} = 9\left(\frac{1}{3}\pi r^2 h\right)$

$= 9 V_{cone}$

$\therefore$ 9 times ✓

Question 5 (7 marks)

(a) The diagram below shows a stem-and-leaf plot for *22* scores.

2	3	5	9		
3	1	4	7	9	
4	2	4	4	5	7
5	1	2	4		
6	2	3	7		
7	5	8	8	8	

(i) What is the mode for this data? **1**

78

.....

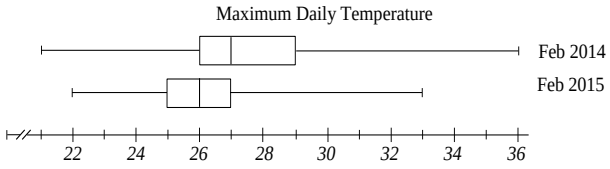
(ii) What is the median for this data? **1**

$\frac{45+47}{2} = 46$

.....

.....

(b) The box-and-whisker plots bellow show the maximum daily temperature for Sydney in February 2014 and 2015.



(i) What is the interquartile range of temperatures in February 2015 **1**

$27 - 25 = 2$ ✓

.....

(ii) How many days in February 2014 (*28 days in this month*) had a temperature of 26° or less? **1**

$\frac{1}{4} \times 28 = 7$ ✓

.....

.....

(c) For the scores represented in the frequency distribution table, the mean is *5* and the mode is *4*.

Score	Frequency
x	*10*
y	*5*

(i) Find the value of *x*. **1**

4

.....

(ii) Form an equation in *x* and *y* for the mean. **1**

$10x + 5y = 15 \times 5$ ✓

.....

$= 75$

.....

or $2x + y = 15$

.....

(iii) Hence solve for *y*. **1**

$10(4) + 5y = 75$

.....

$5y = 35$

.....

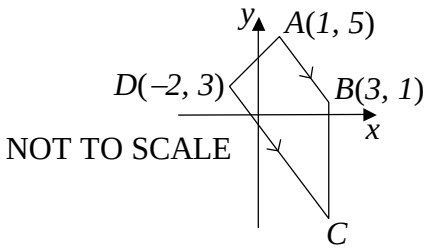
$y = 7$ ✓

.....

.....

Question 6 (10 marks)

(a) *ABCD* is a trapezium. *AB* is parallel to *DC*. *BC* is parallel to the *y* axis.



(i) Find the gradient of the line *AB*. **1**

$m_{AB} = \frac{5-1}{1-3} = \frac{4}{-2}$

$= -2$ ✓

(ii) Find, in general form, the equation of the line *DC*. **2**

$m_{DC} = m_{AB} = -2$

$y - 3 = -2(x+2)$ ✓

$2x + y + 1 = 0$ ✓

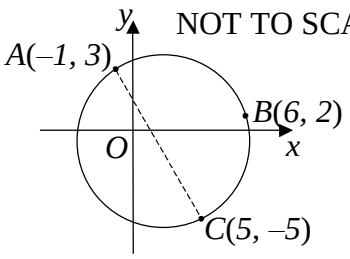
(iii) Find the coordinates of the point *C*. **2**

$2(3) + y + 1 = 0$

$y = -7$ ✓

$\therefore C = (3, -7)$ ✓

(b) *A*(*–1*, *3*), *B*(*6*, *2*) and *C*(*5*, *–5*) lie on a circle. *AC* is a diameter.



(i) Find the coordinates of the centre of the circle. **1**

$\left(\frac{-1+5}{2}, \frac{3-5}{2}\right)$

$= (2, -1)$ ✓

(ii) Find the radius of the circle. **2**

$AC = \sqrt{(-1-5)^2 + (3+5)^2}$

$= \sqrt{100} = 10$

radius $= 5$

(iii) Given that the gradient of *BC* is 7. By finding the gradients of *AB*, show that *AB* and *BC* are perpendicular. **2**

$m_{BC} = 7$

$m_{AB} = \frac{3-2}{-1-6}$

$= -\frac{1}{7}$ ✓

$m_{BC} \times m_{AB} = 7 \times -\frac{1}{7}$

$= -1$ ✓

$\therefore AB \perp BC$

Question 7 (11 marks)

(a) STAR real estate company has the following sliding scale of commission for the sale of property based on the selling price.

First *$50 000*	*5%*
Next *$70 000*	*3%*
Next *$50 000*	*2·5%*
Thereafter	*2%*

A property was sold for $168 000.

Calculate the commission they would charge. **2**

5% × 50000 + 3% × 70000
+2.5% × 48000
= $5,800 ✓

(b) Pauline works part-time on Ozzie Wonder Cruises. Her regular hourly rate of pay is *$13·60* for Monday to Friday. On weekends she receives "time-and-a-half".

(i) In a particular week Pauline worked a total of *12* hours, Monday to Friday, how much does she earn? **1**

12 × $13.60
= $163.20 ✓

(ii) If her total pay for this particular week was *$346·80*, how many hours did she work on the weekends? **2**

overtime pay = 346.80 − 163.20
= 183.60 ✓

overtime = 183.6 ÷ (13.60 × 1.5)
= 9 hours ✓

(c) Taren has a gross annual income of *$42 600*. He has allowable deductions of *$1420*. He must pay tax on all taxable income. His employer has deducted *$4265* in PAYG tax throughout the year.

(i) Show that Taren's taxable income is *$41180*. **1**

42600 − 1420
= $41,180

(ii) Using the tax table given below, calculate the income tax that Taren must pay. **1**

Taxable income	Tax on this income
0–$18 200	Nil
$18 201– $37 000	19c for each $1 over $18 200
$37 001– $80 000	$3 572 plus 32.5c for each $1 over $37 000
$80 001–$180 000	$17 547 plus 37c for each $1 over $80 000
$180 001 and over	$54 547 plus 45c for each $1 over $180 000

3572 + 0.325 × (41180 − 37000)
= $4,930.50

(iii) Will Taren receive a refund or will he need to pay an additional amount in tax? What is the amount of his refund or tax bill? **2** ✓

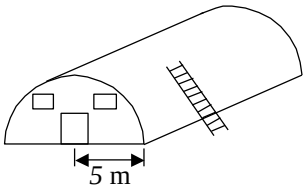
He will have pay additional
amount in tax = 4930.50 − 4265
= $665.20 ✓

(d) *$1200* is invested for *7* months at a simple interest rate of *6·4%* per annum. Find the interest earned on this investment at the end of *7* months. **2**

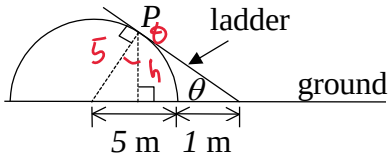
$I = 1200 \times \frac{7}{12} \times \frac{6.4}{100}$ ✓
= $44.80 ✓

Question 8 (8 marks)

(a) A ladder leans against a building of semi-circular cross section, radius 5 m, as shown.



The base of the ladder is *1* m from the building and the ladder touches the building at the point *P*.



(i) Find the angle, θ, the ladder makes with the ground. (Give your answer to the nearest degree.) **2**

$\sin\theta = \frac{5}{6}$

$\theta = \sin^{-1}\left(\frac{5}{6}\right)$

$\doteq 56^\circ$

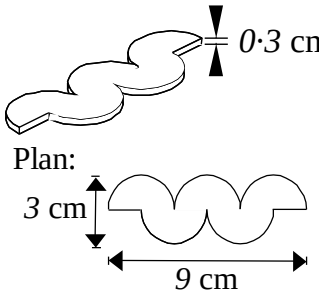
(ii) Find the height, in metres, of the point *P* above ground level. (Give your answer correct to one decimal place.) **2**

$\cos\theta = \frac{h}{5}$

$h = 5\cos(56^\circ)$

$\doteq 2.8$ m

(b) Special Olympic badges have been designed as shown below.



All the curves in the design are semicircles with the same radius.

The thickness of the badge is *0·3* cm.

(i) Find the volume of the badge (correct to two decimal place). **2**

$V = 5 \times \frac{1}{2} \times \pi (1.5)^2 \times 0.3$

$= 5.3014\ldots$

$\doteq 5.30\ \text{cm}^3$

(ii) It is given that *1* cm^3 of gold has a mass of *19·63* grams and that gold costs *$13* per gram. Find the cost of the gold needed for one of these badges. **2**

$\text{cost} = 19.63 \times 5.3 \times 13$

$= \$1352.51$

or \$1352.87 if using exact values in (i)

End of paper