



SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

Year 10
Half Yearly Examination 2015

Advanced Mathematics

General Instructions

- Reading Time – 5 minutes
- Working time – 90 minutes
- Write using black or blue pen.
- Approved calculators may be used.
- All necessary working **MUST** be shown in every question if full marks are to be awarded.
- Marks may not be awarded for untidy or badly arranged work.
- If more space is required, clearly write the number of the **QUESTION** on one of the back pages and answer it there. Indicate that you have done so.
- All answers must be given in exact simplified form unless otherwise indicated.
- Clearly indicate your class by placing an X, next to your class

Examiner: *B. Kilmore*

NAME:

Class	Teacher	
10 A	Mr Boros	
10 B	Mr Hespe	
10 C	Mr Dowdell/Ms Ward	
10 D	Mr Parker	
10 E	Ms Millar	
10 F	Ms Chen/Mr Elliott	
10 G	Mr Gainford	

Question	Mark
1	/15
2	/15
3	/15
4	/15
5	/15
6	/15
Total	/90

Section 1 (15 Marks)

1. Write 7.5% as a decimal. (1m)

2. Factorise fully : $m^3n^2 + m^2n^3$ (1m)

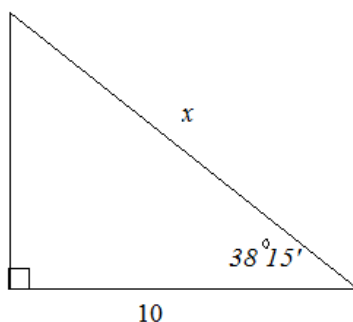
3. Calculate R to 1 decimal place , given $h = \frac{V}{\pi(R^2 - r^2)}$, if $V = 100$, $h = 2.4$ and $r = 3.7$. (2m)

4. Factorise and simplify: $8pq^2 - 6pq + 4p^2q + q^2p - 10qp$ (2m)

5. Calculate the simple interest on \$8000 for 9 months at 5% p.a. (1m)

6. How much will \$500 grow to in 3 years if it earns interest of 3% p.a. compounding annually? (1m)

7. Find the value of x correct to 1 decimal place (1m)



8. A card is drawn at random from a pack of 52 playing cards. Find the probability that the card will be a Queen or a heart. **(1m)**

9. Write as an entire surd: $6\sqrt{50}$ **(1m)**

10. True or False? **(2m)**

a) All rectangles are similar.

b) All rhombuses are parallelograms.

11. When playing darts the probabilities of Frank and Bill hitting a bullseye on the first throw are $\frac{1}{3}$ and $\frac{1}{5}$ respectively. What is the probability that Frank misses and Bill hits the bullseye on the first throw? **(1m)**

12. A family has three children. What is the probability they are all girls? **(1m)**

Section 2 (15 Marks)

1. Simplify and write with positive indices : $\frac{12x^2y^{-5}}{8x^{-6}y}$ (2m)

2. Simplify $\sqrt{2} - \sqrt{18} + \sqrt{32} \div \sqrt{8}$ (2m)

3. An integer is selected at random from the integers 3 to 20 inclusive.
Find the probability that the integer is divisible by both 2 and 3. (1m)

4. Solve the following equations:

a) $9c^2 = 81$ (1m)

b) $a^2 + 11a + 28 = 0$ (1m)

c) $x^2 = 4x$ (1m)

5. The table below shows the results of a test designed to indicate if an animal is a carrier of a new virus.

Test Results

	Positive	Negative	Total
Carrier		3	19
Non- Carrier	5		
Total		271	

- a) Complete the table. **(1m)**
- b) Find the probability that an animal carrying the virus was not detected by the test. **(1m)**
- c) If the testing showed that an animal did not carry the virus, what chance was there that it was wrong? Give your answer as an exact fraction. **(1m)**
6. Given that the volume of a cone is $V = \frac{1}{3}\pi r^2 h$ where r = radius and h = height, find a formula for the diameter of any cone, if you know its height and volume. **(2m)**
7. A new computer bought for \$2000 depreciates by 40% each year for 2 years. Calculate the percentage loss in value over two years. **(2m)**

Section 3 (15 Marks)

1. Solve using the quadratic formula: (Answer correct to 2 decimal places)

$$4a^2 - a - 1 = 0$$

(2m)

2. Express in simplest form without negative indices:

(1m)

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

3. What weekly repayments must be made on a lounge suite priced at \$1200 in order to pay it off in 6 months at 18% p.a. simple interest? (Use 6 months = 26 weeks)

(2m)

4. \$3000 is invested for 5 years at 8%p.a. compounding monthly. Find the amount of interest it has earned at the end of the 5 years.

(2m)

5. What principal must be invested to accumulate to \$15000 after 6 years at 17% p.a. compound interest?

(2m)

6. Each year a printer depreciates by 25% of its value in that year.
A new printer costs \$2400. By how much will it depreciate in the second year? **(2m)**
7. Andrew and James put the same amount of money into different investments for one year.
Andrew's investments increased by 8%. James' investments decreased by 7%.
The difference in the value of their investments was \$750 after the one year.
What was the original amount of money that each invested? **(2m)**
8. A bird cage contains 4 doves. Two are white and two are grey. If two doves escape, find the probability that of the two remaining, one is white and one is grey. **(2m)**

Section 4 (15 Marks)

1. Solve by completing the square, leaving answers in exact form:

a) $x^2 - 6x - 15 = 0$ (2m)

b) $5x^2 - 9x + 2 = 0$ (3m)

2.

a) Expand $(a-b)(a^2 + ab + b^2)$ (1m)

b) Hence fully factorise $a^3 + \frac{a^2}{b} - b^3 - \frac{b^2}{a}$ (3m)

3. \$2500 accumulates to \$4400 after 4 years. What is the monthly compound interest rate correct to 1 decimal place? **(3m)**

4. Twelve more than half a number is 21 less than the square of the number. If the number is positive find the number. **(3m)**

Section 5 (15 Marks)

1. Solve by completing the square, leaving your answer as a simplified surd:

$$4x^2 - ax - a^2 = 0 \quad (\text{where } a \text{ is a constant.}) \quad (3\text{m})$$

2. Solve, leaving your answer in exact form:

$$\frac{1}{2-7x} + \frac{2}{2+7x} = -1 \quad (3\text{m})$$

3. Simplify, writing your answer as a single surd:

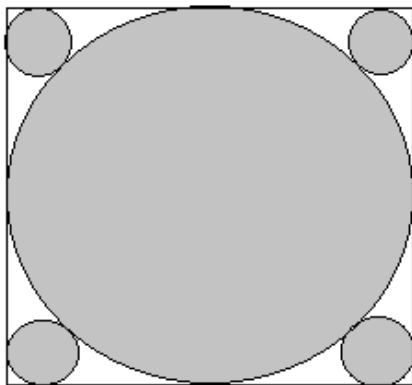
$$\sqrt{7+\sqrt{13}} - \sqrt{7-\sqrt{13}} \quad (3\text{m})$$

4. 200 tickets are sold in a raffle in which 3 prizes are to be drawn by selecting 3 different tickets at random without replacement. Chris buys 3 tickets and wins one of the first two prizes drawn. What is the probability he will now win the 3rd prize? **(3m)**

5. The height, h metres, of a cricket ball after being struck by a batsman is given by the equation $h = 1 + x - \frac{x^2}{40}$ where x metres is the horizontal distance travelled by the ball from the bat. How far, to the nearest metre, does the ball travel before it hits the ground? **(3m)**

4. The concentration of salt in sea water is 34 grams per litre. Given that $1 \text{ m}^3 = 1000 \text{ L}$, and that $1000 \text{ kg} = 1 \text{ t}$, how many tonnes of salt are there in one cubic kilometre of seawater?
(2m)

5. A circle is drawn inside a square with sides of 10cm so that it just touches all four sides of the square. Four small circles are placed in the corners so that they just touch the large circle and two sides of the square. Find the area of that part of the square that is not contained in circles.
(4m)



End of Test



SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

2015

Year 10 HALF YEARLY

Advanced Mathematics

Suggested Solutions

QUESTION	Marker
1	AMG
2	RE/JC
3	JM
4	TE
5	DH
6	RB

Section 1 (15 Marks)

1. Write 7.5% as a decimal. (1m)

$$0.075$$

2. Factorise fully: $m^3n^2 + m^2n^3$ (1m)

$$m^2n^2(m+n)$$

3. Calculate R to 1 decimal place, given $h = \frac{V}{\pi(R^2 - r^2)}$, if $V = 100$, $h = 2.4$ and

$$r = 3.7.$$

$$2.4 = \frac{100}{\pi(R^2 - 3.7^2)} \quad (2m)$$

$$R^2 - 3.7^2 = \frac{100}{2.4\pi}$$

$$R = \sqrt{13.26 + 3.7^2}$$

$$= 5.2$$

4. Factorise and simplify: $8pq^2 - 6pq + 4p^2q + q^2p - 10qp$ (2m)

$$pq(8q - 6 + 4p + q - 10)$$

$$= pq(4p + 9q - 16)$$

5. Calculate the simple interest on \$8000 for 9 months at 5% p.a. (1m)

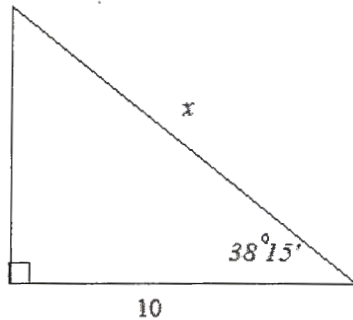
$$I = \$8000 \times \frac{3}{4} \times 0.05$$

$$= \$300$$

6. How much will \$500 grow to in 3 years if it earns interest of 3% p.a. compounding annually? (1m)

$$A_3 = \$500 \left(1 + \frac{3}{100}\right)^3 = \$546.36$$

7. Find the value of x correct to 1 decimal place



$$\cos 38^{\circ}15' = \frac{10}{x}$$

$$x = \frac{10}{\cos 38^{\circ}15'}$$

$$\approx 12.7$$

(1m)

8. A card is drawn at random from a pack of 52 playing cards. Find the probability that the card will be a Queen or a heart. (1m)

$$\frac{16}{52} = \frac{4}{13}$$

9. Write as an entire surd: $6\sqrt{50}$

(1m)

$$\begin{aligned} 6\sqrt{50} &= \sqrt{36 \times 50} \\ &= \sqrt{1800} \end{aligned}$$

10. True or False?

(2m)

a) All rectangles are similar.

False

b) All rhombuses are parallelograms.

True

11. When playing darts the probabilities of Frank and Bill hitting a bullseye on the first throw are $\frac{1}{3}$ and $\frac{1}{5}$ respectively. What is the probability that Frank misses and Bill hits the bullseye on the first throw? (1m)

$$\frac{2}{3} \times \frac{1}{5} = \frac{2}{15} \checkmark$$

12. A family has three children. What is the probability they are all girls? (1m)

$$\frac{1}{8} \checkmark$$

Marker's Comments

3. Candidates exhibited v. poor calculation skills.

Many thought $\sqrt{R^2 - r^2} = R - r$ (say).

4. Many do realise they should factorise fully.

6. "grow to" is not "grows by".

8. Many counted Q of Hearts twice.

9. The term "entire sword" is poorly understood.

Section 2 (15 Marks)

1. Simplify and write with positive indices : $\frac{12x^2y^{-5}}{8x^{-6}y}$ (2m)

$$= \frac{3x^8}{2y^6}$$

2. Simplify $\sqrt{2} - \sqrt{18} + \sqrt{32} + \sqrt{8}$ (2m)

$$= \sqrt{2} - 3\sqrt{2} + 2\sqrt{2} + 2\sqrt{2}$$

$$= 2 - 2\sqrt{2}$$

3. An integer is selected at random from the integers 3 to 20 inclusive. Find the probability that the integer is divisible by both 2 and 3. (1m)

$$n \{3, 4, \dots, 20\} = 18$$

$$n \{ \text{divisible by } 2, 3 \} = n \{ \text{divisible by } 6 \}$$

$$= n \{6, 12, 18\}$$

$$= 3$$

$$P = \frac{3}{18}$$

$$= \frac{1}{6}$$

4. Solve the following equations:

a) $9c^2 = 81$ (1m)

$$c^2 = 9$$

$$c = \pm 3$$

b) $a^2 + 11a + 28 = 0$ (1m)

$$(a + 7)(a + 4) = 0$$

$$a = -4, -7$$

c) $x^2 = 4x$ (1m)

$$x^2 - 4x = 0$$

$$x(x - 4) = 0$$

$$x = 0, 4$$

5. The table below shows the results of a test designed to indicate if an animal is a carrier of a new virus.

Test Results

	Positive	Negative	Total
Carrier	16	3	19
Non-Carrier	5	268	273
Total	21	271	292

- a) Complete the table. (1m)
- b) Find the probability that an animal carrying the virus was not detected by the test. (1m)
- c) If the testing showed that an animal did not carry the virus, what chance was there that it was wrong? Give your answer as an exact fraction. (1m)

$$\frac{3}{19}$$

$$\frac{3}{271}$$

6. Given that the volume of a cone is $V = \frac{1}{3}\pi r^2 h$ where r = radius and h = height, find a formula for the diameter of any cone, if you know its height and volume.

$$3V = \pi r^2 h \quad (2m)$$

$$r^2 = \frac{3V}{\pi h}$$

$$r = \sqrt{\frac{3V}{\pi h}}$$

$$D = 2\sqrt{\frac{3V}{\pi h}}$$

7. A new computer bought for \$2000 depreciates by 40% each year for 2 years. Calculate the percentage loss in value over two years. (2m)

$$\text{Value after 1 year} = 0.6 \times 2000 = 1200$$

$$\text{Value after 2 years} = 0.6 \times 1200 = 720$$

$$\% \text{ Loss} = \frac{1280}{2000} \times \frac{100}{1} = 64\%$$

Y10 HY: Section 3 - Solutions.

1. $4a^2 - a - 1 = 0$

'a' is the variable

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\begin{aligned} \therefore a &= \frac{-(-1) \pm \sqrt{(-1)^2 - 4(4)(-1)}}{2(4)} \\ &= \frac{1 \pm \sqrt{17}}{8} \end{aligned}$$

$$= -0.39 \text{ and } 0.64 \text{ (2.d.p)}$$

[2]

Make sure that you read the question as many students left the answer in exact form when the question clearly started 'correct to 2 decimal places'.

$$\begin{aligned} 2. \quad \frac{a^{-1} + b^{-1}}{a + b} &= \frac{\frac{1}{a} + \frac{1}{b}}{a + b} \\ &= \frac{b + a}{ab} \div \frac{a + b}{1} \\ &= \frac{\cancel{b + a}}{ab} \times \frac{1}{\cancel{a + b}} \\ &= \frac{1}{ab} \end{aligned}$$

[1]

$$\begin{aligned} 3. \quad I &= Prn \\ &= \$1200 \times \frac{18\%}{12} \times 6 \\ &= \$108 \end{aligned}$$

$$\begin{aligned} A &= P + I \\ &= \$1200 + 108 \\ &= \$1308 \end{aligned}$$

$$\begin{aligned} \therefore \text{Weekly Repayments} &= \$1308 \div 26 \\ &= \$50.31 \end{aligned}$$

[2]

Most students forgot to change the interest rate from per annum to monthly. (In questions 3 and 4)

$$4. \quad A = P(1+r)^n$$
$$P = \$3000, \quad r = 8\% \text{ p.a.} \quad n = 5 \times 12$$
$$= 0.08 \div 12 \quad = 60$$
$$= 0.006 \text{ (} \frac{1}{150} \text{)}$$

$$\therefore A = 3000 \left(1 + \frac{1}{150}\right)^{60}$$
$$= \$4469.54$$
$$\therefore I = 4469.54 - 3000$$
$$= \$1469.54$$

[2]

$$5. \quad A = P(1+r)^n$$
$$A = \$15000, \quad n = 6, \quad r = 0.17$$

$$\therefore 15000 = P(1+0.17)^6$$
$$P = \frac{15000}{(1+0.17)^6}$$
$$= \$5847.58$$

[2]

$$6. \quad \text{After the 1st year} = \$2400 \times (1-0.25)$$
$$= \$1800$$
$$\text{After the 2nd year} = \$1800 \times (1-0.25)$$
$$= \$1350$$

$$\therefore \text{Amount it depreciates in the 2nd year}$$
$$= \$1800 - \$1350$$
$$= \$450$$

[2]

7. Original Amount = x

$$\begin{aligned}\text{Andrew's} &= x \times (1 + 0.08) \\ &= 1.08x\end{aligned}$$

$$\begin{aligned}\text{James's} &= x \times (1 - 0.07) \\ &= 0.93x\end{aligned}$$

After 1 year the difference is:

$$1.08x - 0.93x = 750$$

$$0.15x = 750$$

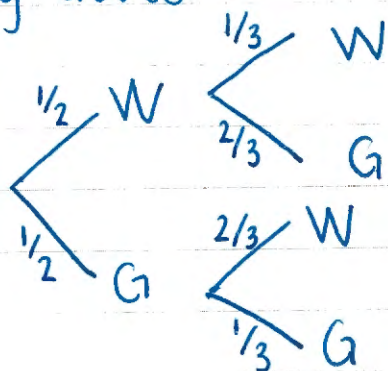
$$x = \$5000$$

\therefore Original investment was \$5000.

[2]

8. 4 doves: (2 white and 2 grey).

Escaping doves:



$$\therefore P(\text{remaining 2 doves}) = 1 - P(\text{WW and GG})$$

$$= 1 - 2 \left(\frac{1}{2} \times \frac{1}{3} \right)$$

$$= \frac{2}{3}$$

[2]

Section 4 (15 Marks)

1. Solve by completing the square, leaving answers in exact form:

a) $x^2 - 6x - 15 = 0$

(2m)

$$x^2 - 6x + (-3)^2 = 15 + (-3)^2$$

$$(x - 3)^2 = 15 + 9$$

$$= 24$$

$$x - 3 = \pm \sqrt{24}$$

$$x = 3 \pm 2\sqrt{6}$$

-1/2 not simplifying $\sqrt{24}$
-1 for arithmetic error

b) $5x^2 - 9x + 2 = 0$

(3m)

$$x^2 - \frac{9x}{5} = \frac{-2}{5}$$

$$x^2 - \frac{9x}{5} + \left(\frac{-9}{10}\right)^2 = \frac{-2}{5} + \left(\frac{-9}{10}\right)^2$$

$$\left(x - \frac{9}{10}\right)^2 = \frac{-2}{5} + \frac{81}{100}$$

$$x - \frac{9}{10} = \pm \sqrt{\frac{41}{100}}$$

$$x = \frac{9}{10} \pm \frac{\sqrt{41}}{10}$$

$$= \frac{9 \pm \sqrt{41}}{10}$$

-1/2 not simplifying $\sqrt{100}$

-1 for arithmetic errors
not \div by 5 before
completing the square
(1m)

no 1/2 marks for this question

2.

a) Expand $(a-b)(a^2 + ab + b^2)$

$$= a^3 + a^2b + ab^2 - a^2b - ab^2 - b^3$$

$$= a^3 - b^3$$

b) Hence fully factorise $a^3 + \frac{a^2}{b} - b^3 - \frac{b^2}{a}$

(3m)

$$a^3 - b^3 + \frac{a^2}{b} - \frac{b^2}{a}$$

$$(a-b)(a^2 + ab + b^2) + \frac{a^3 - b^3}{ab}$$

$$(a-b)(a^2 + ab + b^2) + \frac{(a-b)(a^2 + ab + b^2)}{ab}$$

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\uparrow
= 2

$$= (a-b)(a^2 + ab + b^2)$$

$$\left[1 + \frac{1}{ab}\right]$$

-1 for eliminating fraction
not factorising $a^3 - b^3$
or combining into 1
product of factors

3. \$2500 accumulates to \$4400 after 4 years. What is the monthly compound interest rate correct to 1 decimal place?

(3m)

$$4400 = 2500(1+r)^{48}$$

$$\frac{44}{25} = (1+r)^{48}$$

$$\sqrt[48]{\frac{44}{25}} = (1+r)$$

$$r = \sqrt[48]{\frac{44}{25}} - 1$$

$$\therefore r = 1.2\% \text{ p.m.}$$

-1 for year w/o ref to monthly, wrong no. of periods

4. Twelve more than half a number is 21 less than the square of the number. If the number is positive find the number.

(3m)

-1 for incorrect equation solved correctly
arithmetic errors

$$\frac{x}{2} + 12 = x^2 - 21$$

$$x + 24 = 2x^2 - 42$$

$$2x^2 - x - 66 = 0$$

$$x = \frac{1 + \sqrt{1 - 4 \times 2 \times -66}}{2 \times 2}$$

$$= \frac{1 + \sqrt{529}}{4}$$

$$= \frac{1 + 23}{4}$$

$$= 6$$

(only need positive answer)

\therefore the number is 6

2015 Year 10 Mathematics Half-Yearly: Section 5 Solutions

1. Solve by completing the square, leaving your answer as a simplified surd:

$$4x^2 - ax - a^2 = 0 \text{ (where } a \text{ is a constant).}$$

3

Solution:

$$\begin{aligned} x^2 - \frac{ax}{4} + \left(-\frac{a}{8}\right)^2 &= \frac{a^2}{4} + \frac{a^2}{64}, \text{ or } 4\left(x^2 - \frac{ax}{4} + \left(-\frac{a}{8}\right)^2\right) = a^2 + \frac{a^2}{16}, \\ \left(x - \frac{a}{8}\right)^2 &= a^2 \left(\frac{17}{64}\right), & 4\left(x - \frac{a}{8}\right)^2 &= \frac{17a^2}{16}, \\ x - \frac{a}{8} &= \frac{\pm a\sqrt{17}}{8}, & \left(x - \frac{a}{8}\right)^2 &= \frac{17a^2}{64}, \\ x &= \frac{a(1 \pm \sqrt{17})}{8}. & x - \frac{a}{8} &= \frac{\pm\sqrt{17}a}{8}, \\ & & x &= \frac{a(1 \pm \sqrt{17})}{8}. \end{aligned}$$

Comment: The most common error was failing to make the quadratic monic. Those who used the first method (division) were more likely to succeed than those who tried the second (factor) method.

A number of candidates took half the entire x -term instead of half the *coefficient* of the x -term.

Many candidates failed to simplify their result.

2. Solve, leaving your answer in exact form:

$$\frac{1}{2-7x} + \frac{2}{2+7x} = -1$$

3

Solution: $2 + 7x + 4 - 14x = 49x^2 - 4,$

$$49x^2 + 7x - 10 = 0,$$

$$\begin{aligned} x &= \frac{-7 \pm \sqrt{49 + 1960}}{98}, \\ &= \frac{-7 \pm 7\sqrt{41}}{98}, \\ &= \frac{-1 \pm \sqrt{41}}{14}. \end{aligned}$$

Comment: Most errors were the result of not first multiplying through by the common denominator. As above, many candidates failed to simplify their result.

3. Simplify, writing your answer as a single surd:

$$\sqrt{7 + \sqrt{13}} - \sqrt{7 - \sqrt{13}}$$

3

Solution: Put $x = \sqrt{7 + \sqrt{13}} - \sqrt{7 - \sqrt{13}},$

$$\begin{aligned} x^2 &= 7 + \sqrt{13} + 7 - \sqrt{13} - 2\sqrt{49 - 13}, \\ &= 14 - 12, \end{aligned}$$

$$\text{So } x = \sqrt{2} \text{ as } \sqrt{7 + \sqrt{13}} > \sqrt{7 - \sqrt{13}}.$$

Comment: Using a calculator to get an approximation and then just writing down the solution only gained one mark. A clear and fully worked solution was needed for full marks.

4. 200 tickets are sold in a raffle in which 3 prizes are to be drawn by selecting 3 different tickets at random without replacement. Chris buys 3 tickets and wins one of the first two prizes drawn. What is the probability he will now win the 3rd prize? 3

Solution: One of Chris's tickets taken out, two of the 200 taken out.

$$\begin{aligned}\therefore \text{Probability} &= \frac{2}{198}, \\ &= \frac{1}{99}.\end{aligned}$$

Comment: The majority of errors resulted from a failure to **read** the question, ignoring the "now" in the last sentence. Those who made this mis-interpretation, *i.e.* assuming the examiner wanted the probability of winning only one of the first two prizes plus the third, were given one mark if they correctly calculated

$$\frac{3}{200} \times \frac{197}{199} \times \frac{2}{198} + \frac{197}{200} \times \frac{3}{199} \times \frac{2}{198} = \frac{197}{656\,700}.$$

5. The height, h metres, of a cricket ball after being struck by a batsman is given by the equation $h = 1 + \frac{x^2}{40}$ where x metres is the horizontal distance travelled by the ball from the bat. How far, to the nearest metre, does the ball travel before it hits the ground? 3

Solution: $h = 0$ at ground level,

$$\therefore x^2 - 40x - 40 = 0,$$

$$\begin{aligned}x &= \frac{40 \pm \sqrt{1600 + 160}}{2}, \\ &= 20 \pm 2\sqrt{110}, \\ &\approx 40.976, -0.976.\end{aligned}$$

I.e. the ball travels about 41 m.

Comment: Candidates who did not realise that $h = 0$ at ground level, tended to get lost in the algebra.

General Comment: Legibility is a serious problem:

If the marker cannot read the answer, no mark can be given.

Many candidates seemed unable to read their own writing:

e.g. 9 was sometimes confused with a and sometimes with 4.

YR10 Holy Yearly exam 2015

Question 6

1) Take \$1000 as an investment, 1 year

18% p.a. annually. $A = 1000 \left(1 + \frac{18}{100}\right)^1 = \1180

17% p.a. quarterly $A = 1000 \left(1 + \frac{17}{4 \times 100}\right)^4 = \1181.15

16% monthly $A = 1000 \left(1 + \frac{16}{12 \times 100}\right)^{12} = \1172.27

15% daily $A = 1000 \left(1 + \frac{15}{365 \times 100}\right)^{365} = \1161.80

2A

17% p.a. compounding quarterly (3)

2B

students did not know where to start.
Those that tried assigned a value eg \$1000 to work on

2) mortgage \$600000

4% p.a. compound interest reducible monthly,
repayments \$2200 month.

$$\frac{4\%}{12} = \frac{1}{3}\%$$

$$\$600,000 + \$2000 - \$2200 = \$599,800$$

$$\$599,800 + \$1999.33 - \$2200 = \$599,599.33$$

$$\$599,599.33 + \$1998.66 - \$2200 = \underline{\underline{\$599,397.99}}$$

Many students wanted a quick fix formula and not table form
Impatient to get an answer

(3)

3

$$A \rightarrow B$$

$$30 \text{ km}$$

$$V = \frac{d}{t}$$

$$B \rightarrow A$$

$$30 \text{ km}$$

$$d = v \cdot t$$

let v be the speed from A to B.
km/h.

Then $(v-4)$ km/h is the speed from B to A.

$$30 = vt_1 \quad \checkmark$$

$$t_1 = \frac{30}{v}$$

$$\text{and } 30 = (v-4)t_2 \quad \checkmark$$

$$30 = (v-4) \cdot \frac{30}{v}$$

$$30v = 30v - 120$$

$$t_1 = \frac{30}{v}$$

$$t_2 = \frac{30}{v-4}$$

$$30 = \left(\frac{30}{v} - 4\right) \cdot t$$

$$30 = 30 - 4t$$

$$\text{total trip } \frac{30}{v} + \frac{30}{v-4} = t_1 + t_2$$

at 8 km/h $t_1 + t_2 - \frac{1}{2} = \frac{30}{8} + \frac{30}{8}$

$$t_1 + t_2 = \frac{60}{8} + \frac{1}{2} = 8$$

$$\frac{30}{v} + \frac{30}{v-4} = \frac{8}{1}$$

$$\frac{30(v-4) + 30v}{v(v-4)} = \frac{8}{1}$$

$$A \rightarrow B \quad \frac{30}{8} = 3\frac{3}{4} \text{ hrs}$$

$$B \rightarrow A \quad 3\frac{3}{4} \text{ hrs}$$

total 6 hrs + 90 mins
7 hrs 30 mins

Students had trouble putting all the data into equation form and establishing a link to them solve a quadratic.

So took 8 hours.

$$\frac{30}{V} + \frac{30}{V-4} = \frac{8}{1}$$

$$30(V-4) + 30V = 8V(V-4)$$

$$30V - 120 + 30V = 8V^2 - 32V$$

$$60V - 120 = 8V^2 - 32V$$

$$8V^2 - 92V + 120 = 0$$

$$V = \frac{92 \pm \sqrt{8464 - 4 \times 8 \times 120}}{16}$$

$$= \frac{92 \pm \sqrt{4624}}{16}$$

$$= \frac{92 \pm 68}{16}$$

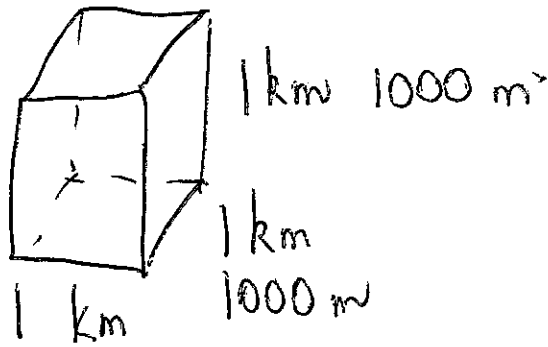
$$= \frac{92+68}{16}, \quad \frac{92-68}{16}$$

$$= 10, \quad 1\frac{1}{2}$$

initial speed was
10 km/hr. (3)

4

Salt in sea water is 34g/L



1000 m

3

$$1 \text{ km}^3 = 1\,000\,000\,000 \text{ m}^3$$

$$1\,000\,000\,000 \text{ m}^3 = 1\,000\,000\,000\,000 \text{ L} \times 34 \text{ grams}$$

$$34\,000\,000\,000\,000 \text{ grams}$$

$$34\,000\,000\,000 \text{ kg}$$

$$34\,000\,000 \text{ t}$$

Many students had 34 in their answer.

eg 34 t

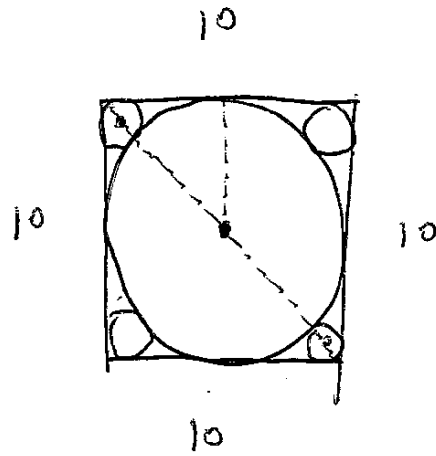
340 t

34 t

etc.

2

5



area square
 $10 \times 10 = 100 \text{ u}^2$

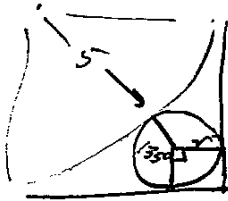
radius big circle $R=5$ $\pi R^2 = 25\pi \text{ u}^2$

length diagonal square is $\sqrt{10^2 + 10^2}$
 $= \sqrt{200}$
 $= 10\sqrt{2}$

diameter big circle is
 10.

Square area = 100 cm^2

Big Circle area = $25\pi \text{ cm}^2$ |



$$5 + r + \sqrt{2}r = 5\sqrt{2}$$

$$\pi(1 + \sqrt{2}) = \sqrt{2} - 5$$

$$r = \frac{5\sqrt{2} - 5}{1 + \sqrt{2}} |$$

$$\approx 0.8579$$

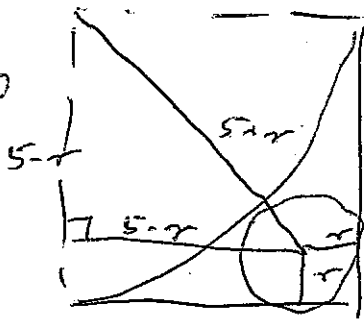
Small circle areas = $4\pi r^2 \text{ cm}^2$ |

Residue $\approx 100 - 25\pi - 4\pi r^2$

$$\approx 12.2122 \text{ cm}^2 |$$

Bodily answered.

11/10
section 6
Q5



$$2(5-r)^2 = (5+r)^2$$

$$50 - 20r + 2r^2 = 25 + 10r + r^2$$

$$r^2 - 30r + 25 = 0$$

$$r = \frac{30 \pm \sqrt{900 - 100}}{2}$$

$$= 15 \pm 10\sqrt{2}$$

$$\hat{=} 29.14, 0.8579$$

But $r < 5$

$$\therefore r = 0.8579$$

(from John Jian in 10MaB).

Hence the rest of the question
can be obtained.