N·B·C·S
Northern Beaches Christian School

2015
HSC Course
Half Yearly Examination

MATHEMATICS GENERAL

General instructions

- Reading time – 5 minutes
- Writing time – 2 hours

- Write using blue or black pen
- Scientific Calculators may be used
- A formulae sheet is provided
- Start a new booklet for each question.
- Multiple choice answer sheet is attached to the back of this paper and may be removed.

Section I
Total marks (20)
- Attempt Questions 1 – 20
- Allow about 30 minutes for this section

Section II
Total marks (60)
- Attempt Questions 21 – 26
- Allow about 1hour 30 minutes for this section

Section I

Total marks (20)
Attempt Questions 1 – 20
Allow about 30 minutes for this section

Use the multiple choice answer sheet.
Select the alternative A, B, C or D that best answers the question.
Fill in the response oval completely.

Sample   2 + 4 =   (A) 2   (B) 6   (C) 8   (D) 9
                     A ○   B ●   C ○   D ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

                A ●   B ⊗   C ○   D ○

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows.

correct

                A ⊗   B ⊗   C ○   D ○

1 What is $-5xy^2 - 6 + 3xy^2$ simplified?

A $-2xy^2 - 6$

B $-8xy^2 - 6$

C $2xy^2 - 6$

D $-2x^2y^4 - 6$

2 Jenny goes on a water-saving crusade. Jenny brushes her teeth twice a day for 5 minutes at a time. Jenny stops leaving the tap running to save water. A running tap uses 10 litres of water per minute but Jenny now only uses 1 litre of water each time she brushes her teeth. The amount of water that Jenny saves per year is:
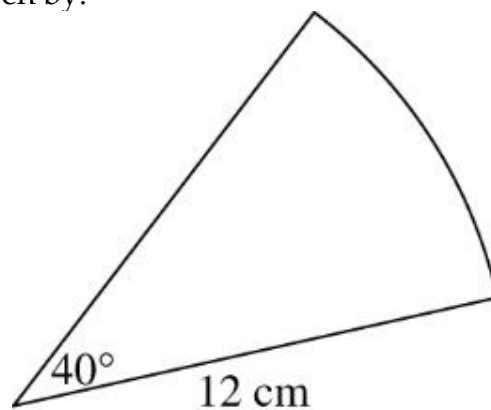
A 3285 L

B 17 885 L

C 18 200 L

D 35 770 L

3 Which of the following pieces of information can be obtained from an ogive?

A The median

B The interquartile range

C The top decile

D All of the above

4 The area of the sector drawn below is given by:

A $A = \dfrac{40}{360} \times 2\pi \times 12$

B $A = \dfrac{320}{360} \times \pi \times 12^2$

C $A = \dfrac{40}{360} \times \pi \times 12$
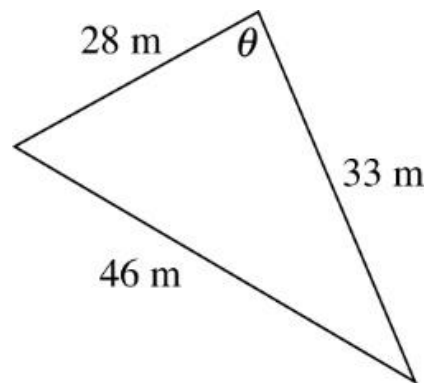
D $A = \dfrac{40}{360} \times \pi \times 12^2$

40° 12 cm

5 A small circle on Mars at latitude 30°N has a radius of 2950 km. The circumference of the small circle is closest to:

A   5560 km

B   9250 km

C   18 550 km

D   88 500 km

6 What is $\dfrac{12x^2 yz}{4xz}$ simplified?

A $3xy$

B $\dfrac{x^2 y}{3}$

C $\dfrac{xy}{8}$

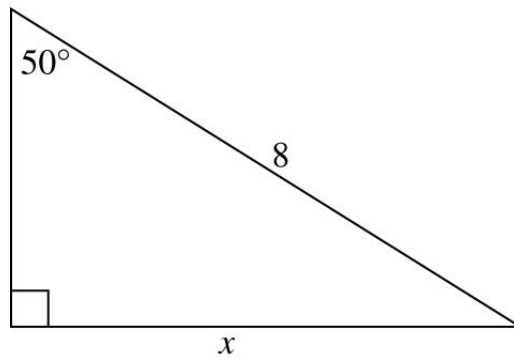D $\dfrac{xy}{3}$

7 Consider the triangle drawn.

Which of the following expressions can be used to find the size of the angle θ?

A $\cos \theta = \dfrac{28^2 + 33^2 - 46^2}{2 \times 33 \times 46}$

B $\cos \theta = \dfrac{28^2 + 46^2 - 33^2}{2 \times 28 \times 46}$

C $\cos \theta = \dfrac{33^2 + 46^2 - 28^2}{2 \times 33 \times 46}$

D $\cos \theta = \dfrac{28^2 + 33^2 - 46^2}{2 \times 28 \times 33}$

8 The length x is closest to:

A   5.14

B   6.13
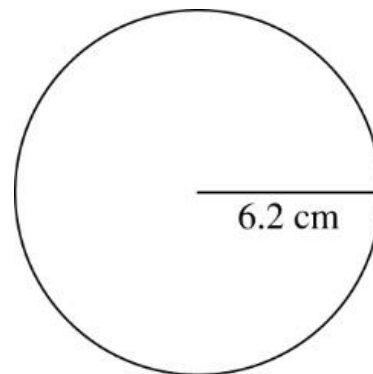
C   9.53

D   10.44

50°

8

x

NOT TO SCALE

9 The circle below has its radius measured correct to 1 decimal place.

The maximum percentage error in calculating
the area of the circle is:

6.2 cm

A   1.61%

B   1.62%

C   1.94%

D   1.96%

10 In order to make two applications of Simpson's rule, how many offset measurements
need to be taken?

A   2

B   3

C   4

D   5

11 A bearing of 290°T is the same as:

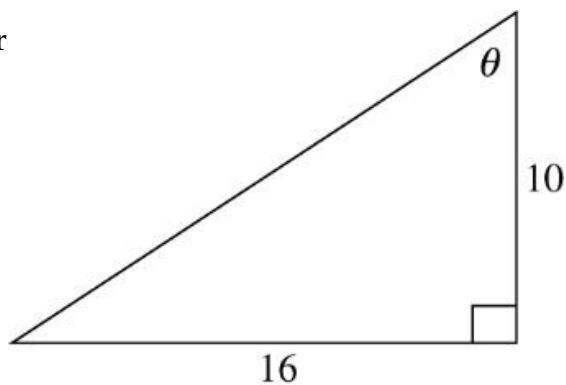   **A**   N20°W

   B   S20°W

   C   S70°W

   D   N70°W

12 Two points U and V are given by the coordinates (40°N, 40°E) and (10°N, 40°E). The angular distance between U and V is:

   A   30°

   B   40°

   C   50°

   D   60°

13 The angle θ, to the near

   A   38°

   B   51°

   C   58°

   D   60°

14 At a point on the Earth's surface the coordinates are (36°N, 24°E). The local time at this point is:

   A   1 h 36 min ahead of GMT

   B   1 h 36 min behind GMT

   C   2 h 24 min ahead of GMT

   D   2 h 24 min behind GMT

15 Town B is 12.6 km directly north of town A. Town C is 8.3 km from A on a bearing of 140°T. The distance of town B from town C is:

A   17.74 km

B   9.65 km

C   19.69 km

D   20.08 km

16 The equation $4(x + 5) = 3x + 34$ is solved as shown below.

Step 1: $4x + 20 = 3x + 34$

Step 2: $7x + 20 = 34$

Step 3: $\qquad 7x = 14$

Step 4: $\qquad x = 0.5$

How many errors have been made in the solution?

A   0

B   1

C   2

D   3

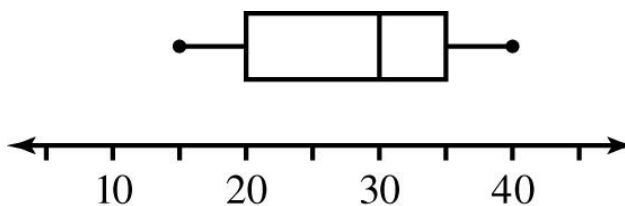**17** Consider the data set below:

9, 22, 27, 28, 28, 31, 33, 33, 40

Which score in the data set can be defined as an outlier?

A   9

B   40

C   Neither 9 or 40

D   Both 9 and 40

18 Examine this box-and-whisker plot.

For the distribution shown in the box-and-whisker plot, it is true to say that:

A   the range is 35

B   the interquartile range is 15

C   the mean is 30

D   the interquartile range is 25

19 The number of chocolates eaten during each hour at a Valentine's Day chocolate festival is shown on the stem-and-leaf plot below.

Key: 1|5 = 15

Stem	Leaf
0	8
1	5 6 6 7
2	0 2 3 6 9
3	7 9

The standard deviation of this set of data to the nearest whole number is:
A   9
B   11
C   21
D   22

20 The surface area of a cube with side length 10 cm is:
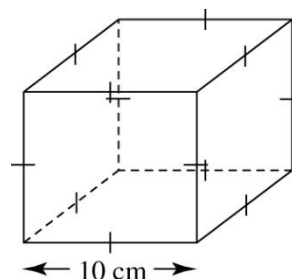
A   100 cm²

B   600 cm²

C   1000 cm²

D   6000 cm²

Section II Total marks (60)
Attempt Questions 21 - 26
Allow about 1 hour 30 minutes for this section

**QUESTION 21** (10 marks) Answer each question in a separate writing booklet

(a) Simplify

$$\frac{3x}{5} - \frac{x}{2}$$

2

(b) Two satellites orbit the Earth at an altitude of 75 km and 125 km respectively. How much further does the higher satellite travel each orbit of the Earth? Take the radius of the Earth to be 6400 km and give your answer correct to the nearest 10 km.

3

(c) Use the sine rule to find the length of the side marked x in the figure below, correct to 1 decimal place.

3
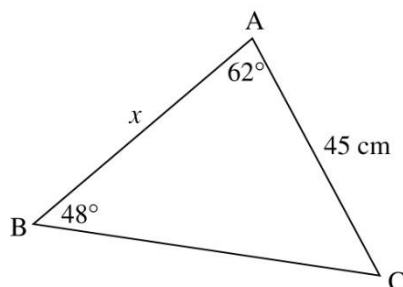
(d) The data below show the heights of twenty Year 12 boys.

2

| 183 | 174 | 166 | 171 | 189 | 180 | 172 | 173 | 162 | 168 | 173 | 179 | 158 | 159 |
| 170 | 168 | 166 | 165 | 180 | 177 | | | | | | | | |

Using a class size of 5, put the data into a frequency table.

QUESTION 22 (10 marks) Start a new writing booklet

(a) In a round the world yacht race, the yacht *Bellmoe* is at (75°E, 30°S) while the *Lexicon* is at **3**
(75°E, 27°S). Taking the radius of the Earth to be 6400 km, find the distance between the
yachts, correct to the nearest kilometre.

(b) Simplify each of the following **4**

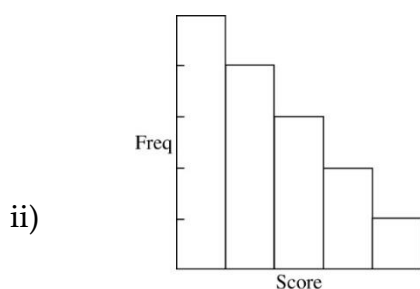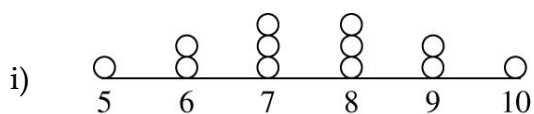   i) $4y^3 \times 4y^2$

       ii) $32z^3 \div 4z^3$

       iii) $(2x^4)^2$

       iv) $\dfrac{24a^2 b}{8a^2 b^2}$

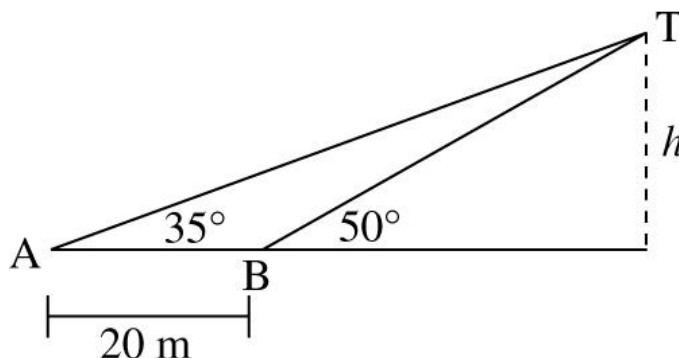(c) Describe the skewness for each of the distributions below. **3**

    i)

    ii)

    iii)

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

QUESTION 23 (10 marks) Start a new writing booklet

(a) From point A, the angle of elevation to the top of the building T is 35°. From point B,   5
20 m closer to the building, the angle of elevation to the top of the building is 50°, as
shown below.

(a) Find the size of ∠ATB.

(b) Show that BT can be given by the expression: BT = $\dfrac{20\sin 35°}{\sin 15°}$

(c) Find the height (h) of the building, correct to 1 decimal place.

(b) Expand and simplify the following   2

$3(4p - 2q) - 4(3p - 2q)$

(c) The marks that three students, X, Y and Z, obtained on Maths tests during the first   3
semester were recorded and are shown below.

X	67	74	70	83	81	76	72	79
Y	80	77	86	82	84	88	83	81
Z	72	74	78	77	73	76	74	75

Display this data using parallel box-and-whisker plots.

QUESTION 24 (10 marks) Start a new writing booklet

(a)   The figure below shows an area bounded by a road and the beach.   8
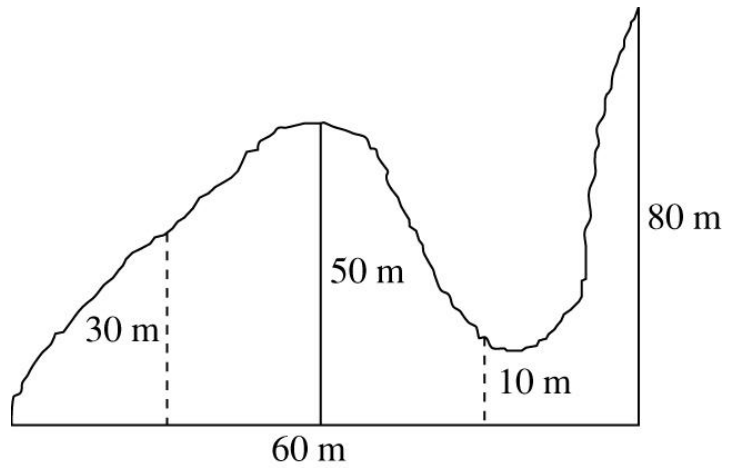
i)   Use one application of Simpson's rule to approximate the area.

ii)   Approximate the area using two applications of Simpson's rule.

iii)   Explain which of the two approximations will be the more accurate.

(b)   Solve the following equation for x 2

$7(5 - 3x) = 28$

QUESTION 25 (10 marks) Start a new writing booklet

(a) Complete each of the following. 3

      i)   75 W = ___ kW

      ii)   10 000 kW = ___ MW

      iii)   1.8 GW = ___ MW

(b) A speedboat leaves buoy A and travels in a direction of N80°E for a distance of 10.7 km 3
to reach buoy B. It then heads due north for 11.2 km to buoy C. How far is buoy C from
buoy A, correct to 2 decimal places?

(c) A television runs on 325 watts of power. On average the television is watched for 4
8 hours per day.

    (a) Calculate the number of kWh used per week.

    (b) Calculate the cost of running the television for a year at 21c/kWh.

QUESTION 26 (10 marks) Start a new writing booklet

(a) Calculate the surface area of the follow shapes. Give answers correct to 1 decimal place.   4

    i)   a closed cylinder with height 4 m and radius 3 m

    ii)   a sphere with radius 50 cm.

(b) The times (in seconds) that students held on to a chin-up bar in a fitness test are given   6
below. Note that two classes are recorded.

Class A						
11	15	20	25	12	16	21
31	32	21	23	26	28	29

Class B						
27	16	17	17	22	23	24
10	15	20	25	30	35	16

For each data set, find:
    (i)   the median

    (ii)   the range

    (iii)   the interquartile range.

End of Examination

FORMULAE AND DATA SHEET

Financial Mathematics

Simple interest

$$I = Prn$$

P is initial amount

r is interest rate per period, expressed as a decimal

n is number of periods

Compound interest

$$A = P(1+r)^n$$

A is final amount

P is initial amount

r is interest rate per period, expressed as a decimal

n is number of compounding periods

Present value and future value

$$PV = \frac{FV}{(1+r)^n}, \qquad FV = PV(1+r)^n$$

r is interest rate per period, expressed as a decimal

n is number of compounding periods

Straight-line method of depreciation

$$S = V_0 - Dn$$

S is salvage value of asset after n periods

V_0 is initial value of asset

D is amount of depreciation per period

n is number of periods

Declining-balance method of depreciation

$$S = V_0(1-r)^n$$

S is salvage value of asset after n periods

V_0 is initial value of asset

r is depreciation rate per period, expressed as a decimal

n is number of periods

Data Analysis

Mean of a sample

$$\bar{x} = \frac{\text{sum of scores}}{\text{number of scores}}$$

z-score

For any score x,

$$z = \frac{x - \bar{x}}{s}$$

$\bar{x}$ is mean

s is standard deviation

Outlier(s)

score(s) less than $Q_L - 1.5 \times IQR$

or

score(s) more than $Q_U + 1.5 \times IQR$

Q_L is lower quartile

Q_U is upper quartile

IQR is interquartile range

Least-squares line of best fit

$$y = \text{gradient} \times x + y\text{-intercept}$$

$$\text{gradient} = r \times \frac{\text{standard deviation of } y \text{ scores}}{\text{standard deviation of } x \text{ scores}}$$

$$y\text{-intercept} = \bar{y} - (\text{gradient} \times \bar{x})$$

r is correlation coefficient

$\bar{x}$ is mean of x scores

$\bar{y}$ is mean of y scores

Normal distribution

- approximately 68% of scores have z-scores between −1 and 1
- approximately 95% of scores have z-scores between −2 and 2
- approximately 99.7% of scores have z-scores between −3 and 3

Circumference of a circle

$$C = 2\pi r \quad \text{or} \quad C = \pi D$$

r is radius

D is diameter

Arc length of a circle

$$l = \frac{\theta}{360} 2\pi r$$

r is radius

θ is number of degrees in central angle

Radius of Earth

(taken as) 6400 km

Time differences

For calculation of time differences using longitude:

$15° = 1$ hour time difference

Area

Circle

$$A = \pi r^2$$

r is radius

Sector

$$A = \frac{\theta}{360} \pi r^2$$

r is radius

θ is number of degrees in central angle

Annulus

$$A = \pi\left(R^2 - r^2\right)$$

R is radius of outer circle

r is radius of inner circle

Trapezium

$$A = \frac{h}{2}\left(a + b\right)$$

h is perpendicular height

a and b are the lengths of the parallel sides

Area of land and catchment areas

unit conversion: 1 ha $= 10\,000$ m^2

Sphere

$$A = 4\pi r^2$$

r is radius

Closed cylinder

$$A = 2\pi r^2 + 2\pi rh$$

r is radius

h is perpendicular height

Volume

Prism or cylinder

$$V = Ah$$

A is area of base

h is perpendicular height

Pyramid or cone

$$V = \frac{1}{3}Ah$$

A is area of base

h is perpendicular height

Volume and capacity

unit conversion: 1 m$^3 = 1000$ L

Approximation Using Simpson's Rule

Area

$$A \approx \frac{h}{3}\left(d_f + 4d_m + d_l\right)$$

h is distance between successive measurements

d_f is first measurement

d_m is middle measurement

d_l is last measurement

Volume

$$V \approx \frac{h}{3}\left\{A_L + 4A_M + A_R\right\}$$

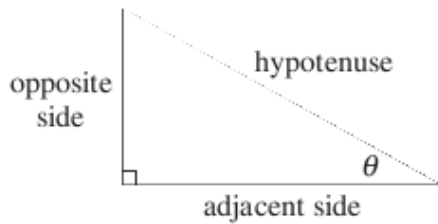h is distance between successive measurements

A_L is area of left end

A_M is area of middle

A_R is area of right end

Trigonometric Ratios

$$\sin\theta = \frac{\text{opposite side}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{\text{adjacent side}}{\text{hypotenuse}}$$

$$\tan\theta = \frac{\text{opposite side}}{\text{adjacent side}}$$

Sine rule

In $\triangle ABC$,

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Area of a triangle

In $\triangle ABC$,

$$A = \frac{1}{2}ab\sin C$$

Cosine rule

In $\triangle ABC$,

$$c^2 = a^2 + b^2 - 2ab\cos C$$

or

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Units of Memory and File Size

1 byte $=$ 8 bits

1 kilobyte $= 2^{10}$ bytes $=$ 1024 bytes

1 megabyte $= 2^{20}$ bytes $=$ 1024 kilobytes

1 gigabyte $= 2^{30}$ bytes $=$ 1024 megabytes

1 terabyte $= 2^{40}$ bytes $=$ 1024 gigabytes

Blood Alcohol Content Estimates

$$BAC_{male} = \frac{10N - 7.5H}{6.8M}$$

or

$$BAC_{female} = \frac{10N - 7.5H}{5.5M}$$

N is number of standard drinks consumed
H is number of hours of drinking
M is person's mass in kilograms

Distance, Speed and Time

$$D = ST, \quad S = \frac{D}{T}, \quad T = \frac{D}{S}$$

$$\text{average speed} = \frac{\text{total distance travelled}}{\text{total time taken}}$$

$$\text{stopping distance} = \left\{\begin{array}{c}\text{reaction-time}\\ \text{distance}\end{array}\right\} + \left\{\begin{array}{c}\text{braking}\\ \text{distance}\end{array}\right\}$$

Probability of an Event

The probability of an event where outcomes are equally likely is given by:

$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$

Straight Lines

Gradient

$$m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$$

Gradient–intercept form

$$y = mx + b$$

m is gradient
b is y-intercept

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Student Number: _____

Teacher (please circle): Mrs Massey Miss Guermandi Mr Owen

YEAR 12

GENERAL MATHEMATICS-MULTIPLE CHOICE ANSWER SHEET

Sample $2 + 4 = ?$ (A) 2   (B) 6   (C) 8   (D) 9

(A) ⬭   (B) ⬤   (C) ⬭   (D) ⬭

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

(A) ⬭   (B) ✖   (C) ⬤   (D) ⬭

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows   *correct*

(A) ⬭   (B) ✖   (C) ✖   (D) ⬭

ATTEMPT ALL QUESTIONS

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)⬭

SOLUTIONS   2015
                 HSC Course ½ yearly
Maths General   Yr 12.

1. $-5xy^2 - 6 + 3xy^2$

 $= -2xy^2 - 6$

 Ⓐ

2. Previously $5 \times 10 \times 2 \times 365 = 36500L$

        ↑Mins   ↑   ↑Twice a day   ↑yearly

now $1 \times 2 \times 365 = 730$

        $36500 - 730 = 35770L$

 Ⓓ

3. Ogive is a cumulative frequency graph. Shows median, interquartile + top decile.

 Ⓓ All of the above

4. Area of sector $A = \pi r^2 \times \dfrac{\Theta}{360}$

        $A = \pi \times 12^2 \times \dfrac{40}{360}$

        $A = \dfrac{40}{360} \times \pi \times 12^2$

 Ⓓ

5. $C = 2\pi r$

$C = 2 \times \pi \times 2950$

$C = 18535.4$

$\doteq 18550 \text{ km}$

(C)

6. $\dfrac{12 x^{\cancel{3}} y \cancel{z}}{4 \cancel{x} \cancel{z}}$

$= 3xy$

(A)

7. $\cos C = \dfrac{a^2 + b^2 - c^2}{2ab}$

$\cos \theta = \dfrac{28^2 + 33^2 - 46^2}{2 \times 28 \times 33}$

$a = 28$
$b = 33$
$c = 46$

(D)

8. $\sin 50 = \dfrac{x}{8}$

SOHCAHTOA

$8 \sin 50 = x$

$x = 6.128$

$x \doteq 6.13$

(B)

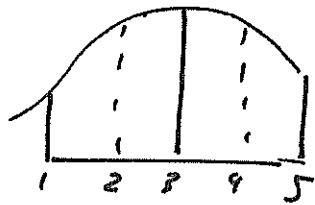9. Area 6.2 = 120.76

   Area 6.25 = 122.71

   difference 1.95&

   $$\frac{1.95&}{120.76} \times 100 = 1.6217.$$
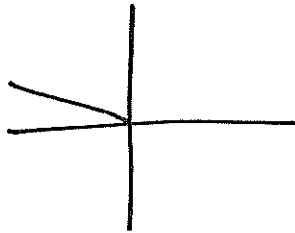
   (B) $\doteq 1.62 \,\%.$

10. (D)

11.

   290°

   20°N W°

   or

   N 70°W

   (D)

12. 40° - 10° = 30°

   (A)

SOHCAHTOA

13. $\tan \Theta = \dfrac{16}{10}$

$\Theta = 57°59'$

$\Theta = 58°$

Ⓒ

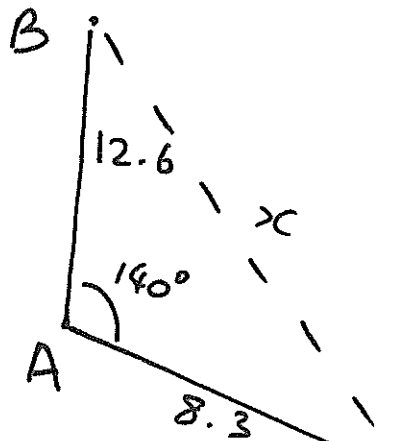14. East is important. Not North.

$\dfrac{24}{360} \times 24 = 1°36'$

1 hour 36 minutes.

East is Ahead!

Ⓐ

15.

$c^2 = a^2 + b^2 - 2ab\cos C$

$x^2 = 12.6^2 + 8.3^2 - 2 \times 12.6 \times 8.3 \cos 140 \ C$

$x^2 = 387.875$

$x = 19.6945$

$x \doteq 19.69 \ km$

Ⓒ

16.

their Solution

$$4(x+5) = 3x + 34$$

$$4x + 20 = 3x + 34$$

$$7x + 20 = 34$$

$$7x = 14$$

$$x = 0.5$$

1 error

2 errors

My Solution

$$4(x+5) = 3x + 34$$

$$x + 20 = 34$$

$$x = 34$$

$$x = \frac{14}{7}$$

$$x = 2$$

Ⓒ

17.

median = 28

$$Q_L = 23.5$$

$$Q_U = 33$$

$$IQR = 10.5$$

$$Q_L - 1.5 \times IQR =$$

$$= 7.75 \quad \therefore \quad 9 \text{ is not an outlier.}$$

$$Q_U + 1.5 \times IQR$$

$$= 48.75 \quad \therefore \quad 40 \text{ is not an outlier.}$$ Ⓒ

18. Ⓑ Between the box is the interquartile range.

16.

their Solution

$4(x + 5) = 3x + 34$

$4x + 20 = 3x + 34$ (1 error)

$7x + 20 = 34$

$7x = 14$ (2 errors)

$x = 0.5$

My Solution

$4(x + 5) = 3x + 34$

$x + 20 = 34$

$x = 34$

$\searrow$ $x = \dfrac{14}{7}$

$x = 2$

Ⓒ

17.

$9, 22 | 27, 28, 28, 31 | 33 | 33, 40$

$QL = 27.5$

$Qu = 33$

$Med = 28$

$IQR = 8.5$

$QL - 1.5 \times IQR$
$= 11.75$

∴, 8 is an outlier

$\rightarrow Qu + 1.5 \times IQR$
$= 45.75$

∴ 40 is not an outlier

∴ answer = Ⓐ

18. Ⓑ Between the box is the interquartile range.

19.   Calculator work

$6x = 8.778$

$\div 9$

(A)

20. $10 \times 10 = 100 \, cm \qquad \times \; 6 = 600 \, cm^2$

(B)

END OF   MULTIPLE CHOICE.

21

a)

$$\frac{3x}{5} - \frac{x}{2}$$

$$= \frac{6x}{10} - \frac{5x}{10} \quad \ldots \text{①}$$

$$= \frac{x}{10} \quad \ldots \ldots \text{①}$$

b) Satellite 1: 6475 km

$$C = 2 \times \pi \times 6475$$

$$= 40683.62 \quad \ldots \ldots \text{①}$$

2: 6525

$$C = 2 \times \pi \times 6525$$

$$= 40997.78 \ldots \ldots \text{①}$$

② − ① =

$$314.16^2 \ldots \text{①}$$

$$\div 310 \text{ km}$$

$\angle ACB = 70°$

c) $\frac{\sin 48}{45} = \frac{\sin 70}{x}$

$$\frac{45}{\sin 48} = \frac{x}{\sin 70} \quad \ldots \quad \text{①}$$

$$\frac{45 \sin 70}{\sin 48} = x \quad \ldots \ldots \text{①}$$

$$x = 56.9 \quad \text{①}$$

[21] continued....

a)

158
159
162
165
166
166
168
168
170
171
172
173
173
174
177
179
180
180
183
189

189 − 158
= 31

31 ÷ 5
= 6.2

groups of 6.

result	frequency
158 − 163	3
164 − 169	5
170 − 175	6
176 − 181	4
182+	2
⋮ ①	⋮ ①

158 − 162	
163 − 167	
168 − 172	
173 − 178	
179 − 182	
183 − 188	
188+	

alternative
oppo option.

158 − 162	3
163 − 167	3
168 − 172	5
173 − 177	4
178 − 182	3
183 − 187	1
188 − 192	1

22

a) $30 - 27 = 3°$ ..... ①

$2 \times \pi \times r \times \dfrac{\theta}{360}$

$2 \times \pi \times 6400 \times \dfrac{3}{360}$ ..... ①

$= 335.103...$

$\doteqdot 335 \, km$ ..... ①

b) i) $16y^5$ ---- ①

ii) 8 ---- ①

iii) $4x^8$ ---- ①

iv) $\dfrac{3}{b}$ ---- ①

c) i) The graph is symmetrical, and the median and mean are at the ① centre, 7.5. | SYMMETRICAL, BALANCED |

ii) The majority of data is at the ① lower ends of the scores | POSITIVELY SKEWED |

iii) The majority of the data is at the higher end of the scores, with one outlier at ① 31. | NEGATIVELY SKEWED |

23/

a)

i) $\angle ABT = 130°$ (angle sum of straight line)

$180 - 130 - 35 = 15°$ ①

$\angle ATB = 15$ (angle sum of triangle)

ii) $\dfrac{AB}{\sin 15} = \dfrac{BT}{\sin 35}$ $AB = 20$

$\dfrac{20}{\sin 15} = \dfrac{BT}{\sin 35}$ — — — — — — — ①

$\dfrac{20 \sin 35}{\sin 15} = BT$ ∴ $BT = \dfrac{20 \sin 35}{\sin 15}$

iii)

$BT = 44.32 \ldots$ · · · ①

$\sin 50 = \dfrac{h}{44.32}$

$44.32 \sin 50 = h$ — — — — ①

$h = 33.95 \ldots$

~~$h = 33$~~
$h = 34.0\,m$ — — — — — — — ①

24

a)

i) $A = \frac{h}{3}(d_f + 4d_m + d_l)$

$A = \frac{30}{7}(0 + 4 \times 50 + 80)$ ---- ①

$A = 10 (200 + 80)$

$= 10 (280)$

$A = 2800 \, m^2$ ----- ①

ii) $\frac{15}{3}(0 + 4 \times 30 + 50)$ ① $+$ $\frac{15}{3}(50 + 4 \times 10 + 80)$ ①

$5(120 + 50)$ $+$ $5(50 + 40 + 80)$

850 ① $+$ 850

$= 1700 \, m^2$ -------- ①

iii) The 2nd approximation is more accurate ... ① as it takes into account more aspects of the shape of the mountain including a large dip not registered by the first estimation. ----- ①

b) $7(5 - 3x) = 28$

$35 - 21x = 28$ ----- ①

$-21x = -7$

$21x = 7$

$x = \frac{7}{21}$ $\boxed{x = \frac{1}{3}}$ ---- ①

b)

$3(4p - 2q) - 4(3p - 2q)$

$12p - 6q - 12p + 8q$ .... ①

$= 2q$ . . . . ①

c)

Y 77, 80, 81, 82 | 83, 84, 86, 88

X 67, 70, 72, 74 | 76, 79, 81, 83

         71   75   80

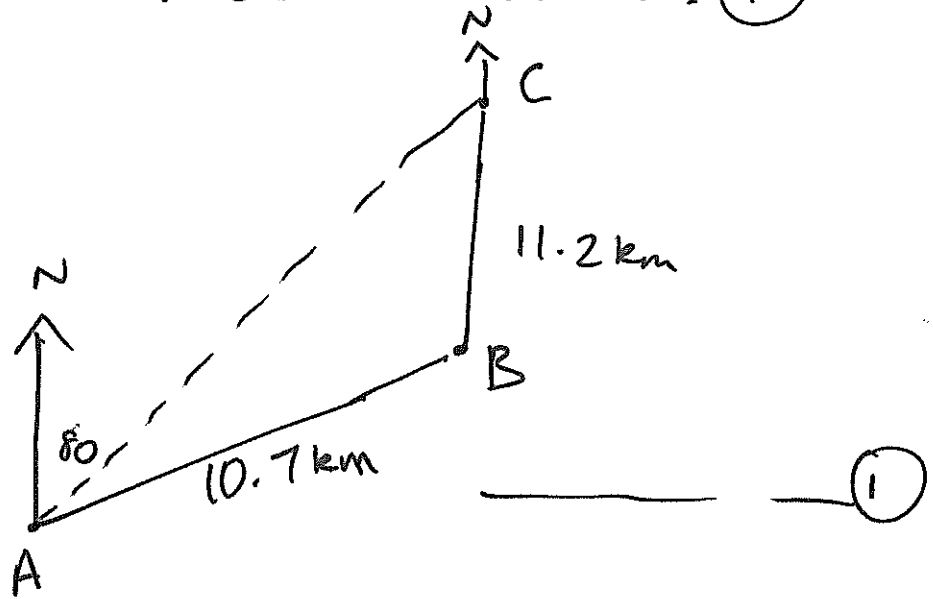Z 72, 73, 74, 74, 75, 76, 77, 78

60   65   70   75   80   85   90 ①

X

67   71   75   80   83 ①

Y

77   80.5 82.5 85   88 ①

Z

72 73.5 74.5 76.5   78 ①
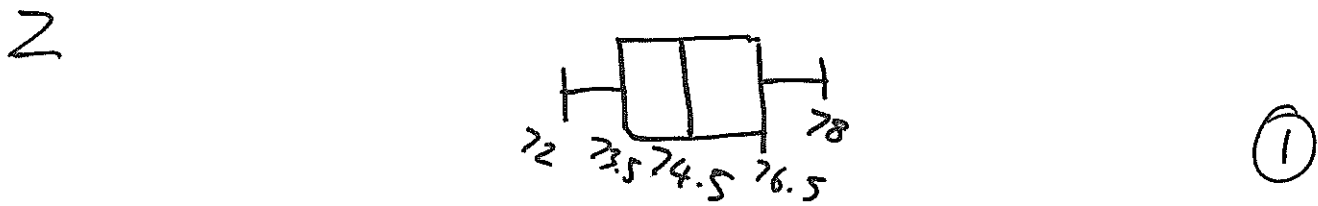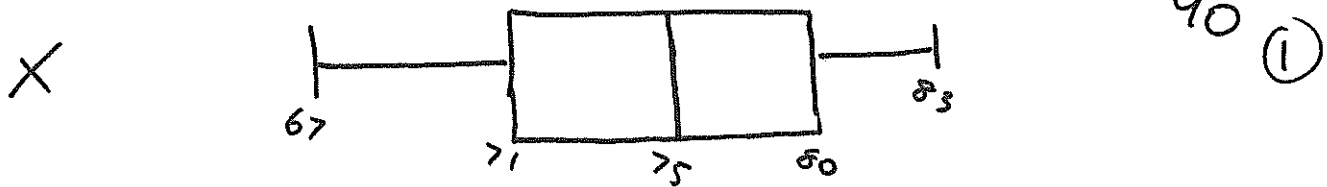
25

a)

i) $75W = 0.075 kW$ ———. ①

ii) $10\,000kW = 10 MW$ ————. ①

iii) $1.8\ GW = 1800 MW$ —————. ①

b)

$\angle ABC = 100°$ (co-interior angles)

$c^2 = a^2 + b^2 - 2ab\cos C$

$x^2 = 10.7^2 + 11.2^2 - 2 \times 10.7 \times 11.2 \times \cos 100$ ————— ①

$x^2 = 281.5499...$

$x = 16.779$

$x \doteq 16.78 km$ ——————— ①

c)

i) $325 \times 8 \times 7 = 18200$ &Wh _ _ _ _ ①

$= 18.2 \, kWh$ _ _ _ .①

ii)

$18.2 \times 52 = 946.4 \, kWh$ (in a year)

_ _ _ ①

$\times 0.21 = \$198.74$

_____ _ ①

or

$325 \times 8 \times 365 = 949 \, kWh$ _ _ ①

$\times 0.21 = \$199.29$ _____ ①

26 |

a)

$$A = 2\pi r^2 + 2\pi r h$$

i) top $\pi \times 3^2 = 28.274$,

bottom   same   — — — ①

total $= 56.55$

Curved area $= 2\pi r \times h$

$= 2 \times \pi \times 3 \times 4$

$= 75.398$

total surface area $=$

131.9 m^2 — — — ①

ii) $A = 4\pi r^2$

$= 4 \times \pi \times 50^2$ ————— ①

$= 31415.92 \text{ cm}^2$

$= 31415.9 \text{ cm}^2$. ————— ①

b) i) A): 11, 12, 15, ⑯, 20, 21, 21 ⃝ 23, 25, 26, ㉘, 29
31, 32

B): 10, 15, 16, ⑯, 17, 17, 20 ⃝ 22, 23, 24, ㉕, 27, 30, 35

i) median A: 22 ①
B: 21 ①

ii) range A: 21 ①
B: 25 ①

iii) IQR A: 12 ①
B: 9 ①

2015 Yr 12 Half-yearly marking Comments

Multiple Choice   Q 2,3,8, 9,10,11,16,17,18,19,

Q21
a)   Some students forgot to find a common demoniator. Some student cross multiplied
incorrectly. *1 mark for common denominator. 1 mark for the correct answer.*
b)   Some students used wrong formula and so they got extremely large numbers.
1 mark for each satellite. 1 mark for subtracting and get the correct answer.
c)   Some got confused when manipulating the equation.
1 mark for substituting. 1 mark for rearranging. 1 mark for the answer, ROUNDED CORRECTLY.
d)   This question caused some confusion over the 5 class frequency table. If the student had
down 5 classes (each with ranges of around 6 or 7) then they could've received the marks.
Alternatively I also awarded marks to students who had done classes with a range of each of
exactly 5.
1 mark for the frequency column. 1 mark for the results and classes column

Q22
a)   *1 mark 3 degree. 1 mark substituting correctly. 1 mark correct answer.*
b)   *1 mark each*
c)
i) symmetrical. No skewed. Balanced. Anything like this. 1 mark.
ii) Skewed positively. This was badly done.
ii) Skewed negatively. This was badly done.
*If the student swapped ii and iii around, but had the correct terminology, I granted them 1
mark.*

Q23
a.   errors in incorrect use of the trigonometric formulae, such as using the wrong ratio,
selecting the wrong sides etc. Errors carried forward.

The box and whisker plot seemed to have many errors. Marks were taken off for:
● incorrect calculation of quartiles
● individual plots instead of parallel
● incorrect scale
● quartiles not clear on either the plot or listed

Q24
a.   i) most people correctly used Simpson's Rule. One mark taken away for incorrect
substitution, with the error carried forward.

ii) most people correctly used Simpson's Rule twice. One mark taken away for each incorrect substitution, with the error carried forward.

iii) one mark for correctly identifying that twice was more accurate, second mark for giving a correct reason why.

b. Most people either expanded brackets or divided correctly (error carried if present). Some mistakes in the following steps of solution (eg. dividing the negative coefficient)

Q25 (a) Mostly ok. Some people had forgotten to learn what prefixes k, M and G stood for

(b) The main problem here was that some students represented the N80 degrees in the wrong place in their diagram

(c) The 2nd part was done well but in the first part there were some who didnt multiply by by 7 in the first part for kWh per week

Q26 (a) (i) Mostly done well. Some people forgot that you needed to calculate the area of 2 circles for the surface area of a closed cylinder

(ii) Some people used the formula for the volume of a sphere instead of the surface area of a sphere for this question.

(b) This question was done pretty well unless the student didn't actually know how to correctly find the quartiles in the first place. (Something they need to revise properly in that case)