2014
Higher School Certificate
Preliminary Examination

Mathematics General

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black or blue pen
- Board-approved calculators may be used
- Draw diagrams using pencil
- A Formulae Sheet is provided
- Write your student number and/or name at the top of every page

Total marks – 100

Section I – Pages 2–11
20 marks
Attempt Questions 1–20
Allow about 30 minutes for this section

Section II – Pages 12–26
80 marks
Attempt Questions 21–24
Allow about 1 hour and 30 minutes for this section

This paper MUST NOT be removed from the examination room
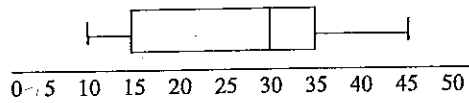
Section I

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

Select the alternative A, B, C or D that best answers the question and indicate your choice with a cross (X) in the appropriate space on the grid below.

	A	B	C	D
1				
2				
3				
4				
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10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

1   What percentage of scores lies between 35 and 45 in this box-and-whisker plot?

(A)   10

(B)   22

(C)   25

(D)   28.6

2   The area of this trapezium is 28 cm².

12 cm

NOT TO SCALE

h

8 cm
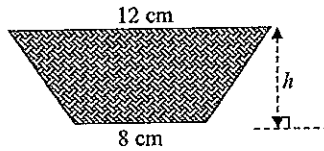
What is the height (h) in cm of the trapezium?

(A)   1.4

(B)   1.75

(C)   2

(D)   2.8

3   Given the formula $P = RI^2$, what is the value of P, if $R = 5$ and $I = -3$?

(A)   −225

(B)   −45

(C)   45

(D)   225

4   A coin is under one of these three identical cups.

Rachel selects one of the cups at random and does not find the coin underneath.

What is the probability that she will find the coin under the next cup she selects?

(A) $\frac{1}{3}$

(B) $\frac{1}{2}$

(C) $\frac{2}{3}$

(D)   1

5   Corey has been promoted at his work and receives an extra $68 per fortnight.

His new fortnightly gross pay is $890.

What was the percentage increase in Corey's pay per fortnight?

(A)   1.1

(B)   7.6

(C)   8.3

(D)   9.2

6   In which one of these data sets does the mode and the range have the same value?

(A)   2,   8,   12,   12,   15

(B)   2,   2,   6,   8,   12
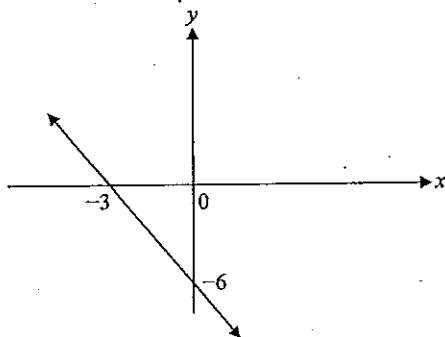
(C)   5,   5,   .5,   8,   10

(D)   6,   6,   6,   6,   6

7

9 cm, 12 cm, with right angle at C, vertices A, B, C.
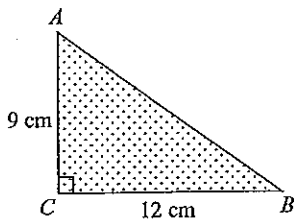
What is the value of $\sin B + \tan A$ in this triangle?

(A) $\frac{29}{15}$

(B) $\frac{31}{20}$

(C) $\frac{27}{20}$

(D) $\frac{29}{12}$

8 What is the equation of the line shown?

(A) $y = -2x - 6$

(B) $y = 2x - 6$

(C) $y = -x - 3$

(D) $y = -3x + 2$

9 Rachel invests $10 000 and earns a flat rate of interest on her investment.

The graph shows the amount of interest Rachel would earn over a period of five years.
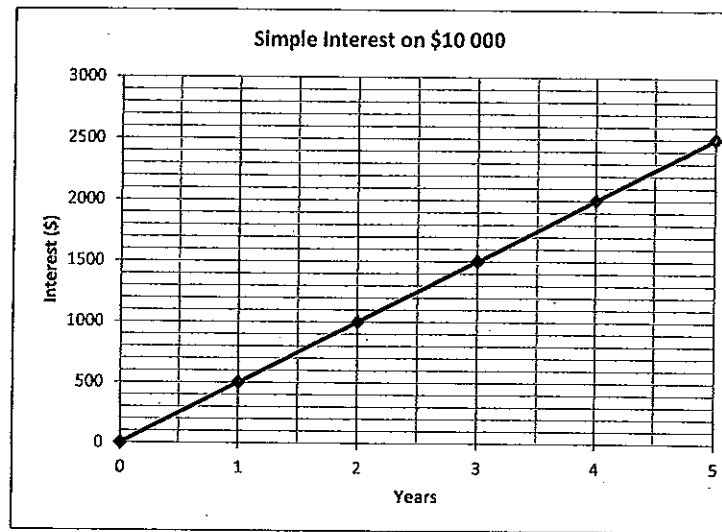
What was the annual rate of interest Rachel earned on her investment?

(A) 2%

(B) 2.5%

(C) 4%

(D) 5%

10 The petrol tank on this truck is cylindrical with a radius of 2.5 m and length of 15 m.

Approximately what quantity of petrol can the tank hold when full?

(A) 37 500 L

(B) 75 000 L

(C) 118 000 L

(D) 294 500 L

11 The linear graph shows the decrease in a person's blood alcohol content (BAC) over time after they have stopped drinking.

James has a BAC of 0.07 and stops drinking at 9:45 pm Friday evening.

At approximately what time should James' BAC show a zero reading?

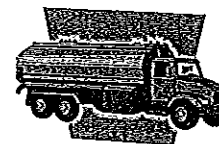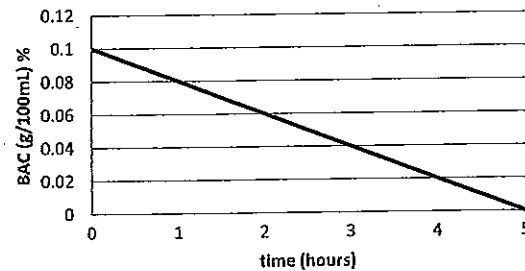(A) 11:15 pm Friday

(B) 12:15 am Saturday

(C) 12:45 am Saturday

(D) 1:15 am Saturday

12 The table shows the number of people who made inquiries about purchasing a mobile phone plan from three different provider networks.

Network provider	Number of inquiries
Optek	110
O-Phone	135
Teknet	80

In a survey of 50 people who made inquiries about phone plans, approximately how many should be interviewed from the Teknet network's shop, in order for the survey to be valid?

(A) 12

(B) 17

(C) 21

(D) 30

13 In a five-number summary of this data set, what is the upper quartile?

20, 22, 25, 28, 36, 40, 40, 42, 46

(A) 38

(B) 40

(C) 41

(D) 42

14 Students are asked to classify various types of data and Elise presents this table to her teacher.

Data collected	Classification
Types of transport	Categorical-nominal
Number of vehicles registered each month	Quantitative-continuous
Achievements of students in an assessment task	Categorical-ordinal
The heights of trees in a forest	Quantitative-discrete

How many errors has Elise made in the classification of data column?

(A) 0

(B) 1

(C) 2

(D) 3

15 A stamp collection is currently valued at $10 000.

The collection continues to increase in value at a rate of 6.5% annually.

Which of these calculations would give the increase in value of the collection at the end of the next 4 years?

(A) $10 000(1.065)^4 - $10 000

(B) $10 000(1.65)^4 - $10 000

(C) $10 000 + (1.65)^4

(D) $10 000 - $10 000(1.065)^4

16   The graph shows the stopping distances for a car travelling at speeds greater than 20 km/h.
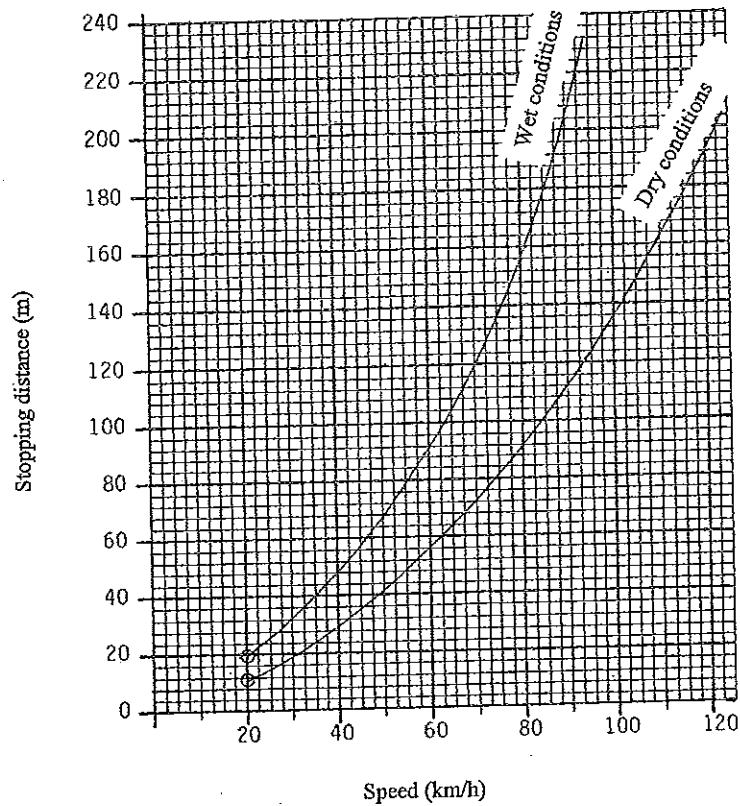
A driver is driving at 100 km/h on a dry road.

If the road was wet, by how much (in km/h) should the driver reduce speed in order to keep the same stopping distance?

(A) 20

(B) 25

(C) 30

(D) 75

17   Megan wants to download a 6.5 MB file.

Her computer's transfer rate is 4 *kilobits/second* (kbps).

Approximately how long should it take to download Megan's file?

(A) 2.5 seconds

(B) 13 seconds

(C) 25 seconds

(D) 1 minute 30 seconds

18   The number of spelling errors found on pages of Jackson's draft research assignment are shown in the following table.

Number of errors	Frequency
2	6
3	4
4	
5	2

The relative frequency of pages with three errors on them was found to be $\frac{1}{5}$.

What number is missing from the table?

(A) 3

(B) 5

(C) 8

(D) 10

19   The cost of hiring a private car is H, plus a charge of d per kilometre.

A passenger hired this car and was charged a total cost of D.

How many kilometres did the passenger travel in the car?

(A) $dD - H$ (B) $\frac{D-H}{d}$ (C) $d(D-H)$ (D) $\frac{H-D}{d}$

20   A trench is to be dug for laying water pipes underground as shown in the diagram.

Ground level

1 m

30 m

Trench for water pipe

120 m

X

When a 30 metre trench is dug, the trench is 1 metre vertically underground as shown.

If the trench needs to be dug a further 120 metres to accommodate the water pipe, what is the vertical depth needed represented by X in the diagram?
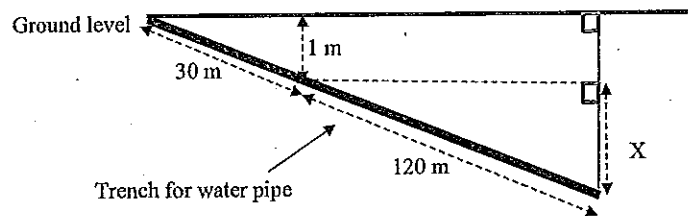
(A) 3 m

(B) 4 m

(C) 5 m

(D) 6 m

Section II

80 marks
Attempt Questions 21–24
Allow about 1 hour and 30 minutes for this section

Answer the questions in the spaces provided.

Your responses should include relevant mathematical reasoning and/or calculations.

Question 21 (20 marks) Begin this question on a new page   Marks

(a) Simplify $2p - 5p(1 - p)$.   2

....

....

(b) A box contains red, yellow and blue beads in the ratio 5:4:3.

There are 60 yellow beads in the box.

(i)   What is the total number of beads in the box?   2

....

....

(ii) A bead is randomly selected from the box.

What is the probability that it is either yellow or blue?   2

....

....

(c) A cube has a volume of 512 cm³.   2

What is the surface area of this cube?

....

....

Question 21 continues on the next page

Question 21 (continued)

Marks

(d) Richard is paid at the rate of $40 per 1000 store brochures delivered to people's homes. On a wet day he is paid an extra 15%.

On one wet day, Richard delivered 1800 brochures.

How much should he be paid for his deliveries? **2**

(e) If $k = 8$ and $j = 40$, determine the value of $\sqrt{\dfrac{5k}{4j}}$. **2**

(f) The following table shows a linear relationship between P and Q.

P	4	5	6	7	
Q	5	1	−3	−7	−479

    (i) Write down an equation representing this linear relationship. **2**

    (ii) What value is missing from the table? **3**

(g) The numbers 6, 7, 8 and 9 are written on separate identical cards, which are then placed face down next to each other at random on a table.

What is the probability that when the four cards are turned over, the numbers from left to right are **9, 6, 5, 8**? **3**

End of Question 21

13

Question 22 (20 marks) Begin this question on a new page

Marks

(a) An enclosure is being constructed for rare butterflies.

The enclosure is a prism, with the front and back ends consisting of a semi-circle on top of a rectangle, as shown in the sketch.
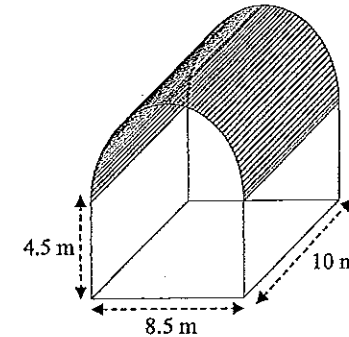
    (i) What is the radius of the semi-circular sections? **1**

    (ii) Calculate the area (correct to <u>one</u> decimal place) of the end of the prism. **2**

    (iii) Find the volume of the enclosure correct to the nearest cubic metre. **1**

    (iv) Water mist is sprayed into the enclosure at a rate of 3 mL/m^3 every 4 hours.

    What quantity of mist (to the nearest litre) is sprayed into the enclosure every day? **2**

Question 22 continues on the next page

14

Question 22 (continued)   **Marks**

(b) The average number of times a website selling concert tickets, was accessed throughout a 24 hour period, is shown on this radar chart.

Website hits
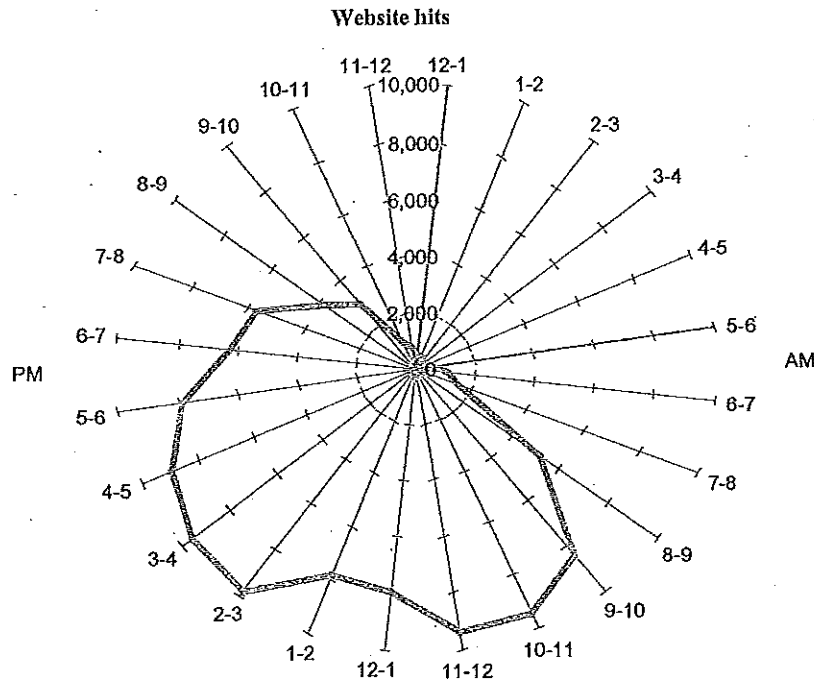
(i) How many times was the web site accessed between 8 pm and 10 pm?   **1**

....

(ii) During which 2-hour period was the website accessed by the most people?   **1**

....

(iii) Describe the trend indicated by the data on the chart.   **1**

....

....

Question 22 continues on the next page

Question 22 (continued)   **Marks**

(c) Under special circumstances, the Government supplements a person's income with allowances.

The following table shows the maximum payment per fortnight for some of these circumstances.

| If you are	Maximum payment per fortnight
Single with no children, 18 years and over and living at home	$265.00
Single with no children 18 years and over and required to live away from home	$402.70
Single with children	$527.50

These allowances are reduced by an amount depending on any income a person receives from employment that exceeds set limits. The following table shows these reductions.

	Income limits per fortnight	Reduction
Job seeker	$62 – $250 Above $250	50 cents in the dollar 60 cents in the dollar
Students and Australian apprentices	$236 – $316 Above $316	50 cents in the dollar 60 cents in the dollar

(i) Kyle is 19 years old, has no children and lives at home. He works as an apprentice carpenter and is paid an income of $380 per fortnight from his employer.

Use the above tables to calculate the total income Kyle receives each fortnight.   **3**

....

....

(ii) Kyle is required to live away from home for the second year of his apprenticeship. The income from his apprenticeship increases to $425 per fortnight.

What is the difference in Kyle's total income compared to when he was living at home?   **3**

....

....

....
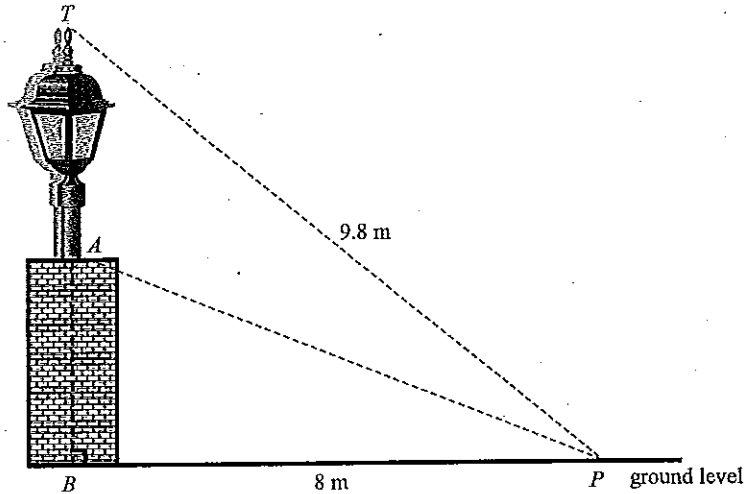
Question 22 continues on the next page

Question 22 (continued)   Marks

(d)   A point P on level ground, is 8 metres from the base B of a brick wall AB.

The distance from the top T of a lamp, standing on the wall, to P, is 9.8 m.

(i)   Calculate the angle of elevation of T from P, to the nearest degree.   2

....

....

....

(ii)   The angle of depression from the top A of the wall to P is $26°$.

Calculate the height (correct to one decimal place) of the lamp above the top of
the brick wall.   3

....

....

....

End of Question 22

17

Question 23 (20 marks) Begin this question on a new page   Marks

(a)   A car was purchased new for $40 000.

Using the straight line method of depreciation, the car depreciates by 12.5% per year.

Using the declining balance method of depreciation, the car depreciates by 20% per
year.

The following table shows some salvage values of the car over 8 years, using both of
these methods of depreciation.

Year	0	1	2	3	4	5	6	7
Straight Line (12.5%)	40 000		30 000	25 000	20 000	15 000	10 000	5000
Declining Balance (20%)	40 000	32 000	25 600		16 384	13 107	10 486	8389

(i)   Complete the table by calculating and writing in the TWO missing values.   3

(ii)   The graphs of the salvage value of the car using both methods of depreciation are
shown on the diagram below.
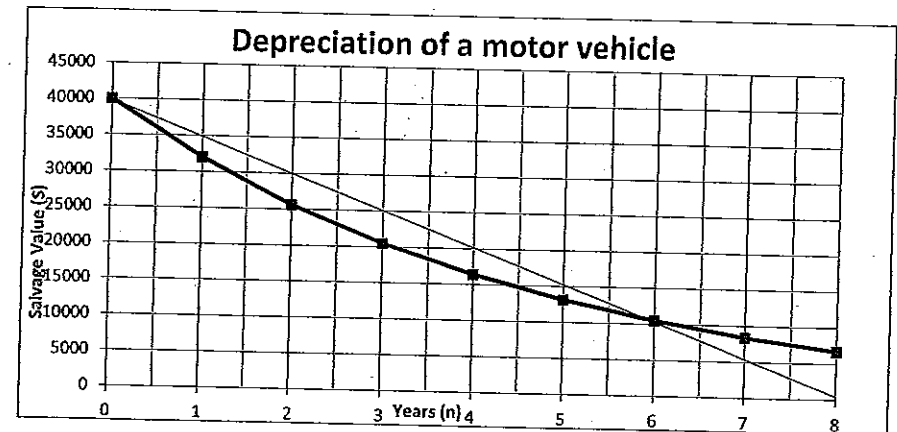
Write down the equation of both graphs.   3

Straight line method: ....

Declining balance method: ....

Question 23(a) continues on the next page

18

Question 23(a) (continued)   Marks

(iii) Give ONE difference between using the two methods of depreciation on the value
       of the car over the 8-year period.   1

       ....

       ....

(iv)   What is the difference in the loss in value of the car after 3 years when comparing
       the use of both depreciation methods?   2

       ....

       ....

       ....

(v)   After approximately how many years will the declining balance method continue
       to value the car higher than the salvage value method?   1

       ....

(vi)   The straight line method of depreciation suggests the car loses $25 000 in value
       over a longer period of time than the declining balance method.

       Approximately how much longer?   1

       ....

(vii) Explain why the use of the declining balance method will mean the car will
       always have some value.   1

       ....

       ....

Question 23 continues on the next page

Question 23 (continued)   Marks

(b)   The cumulative frequency histogram and polygon below shows the delayed departure
       times for a number of flights at an airport one day.

(i)   How many flights had their delayed times recorded?   1

       ....

(ii)   What delayed time represents the mode?   1

       ....

(iii) Estimate the inter-quartile range of the delayed times.   3

       ....

       ....

(iv)   Calculate correct to the nearest minute, the mean delayed time for the flights.   3

       ....

       ....

End of Question 23

Question 24 (20 marks) Begin this question on a new page   Marks

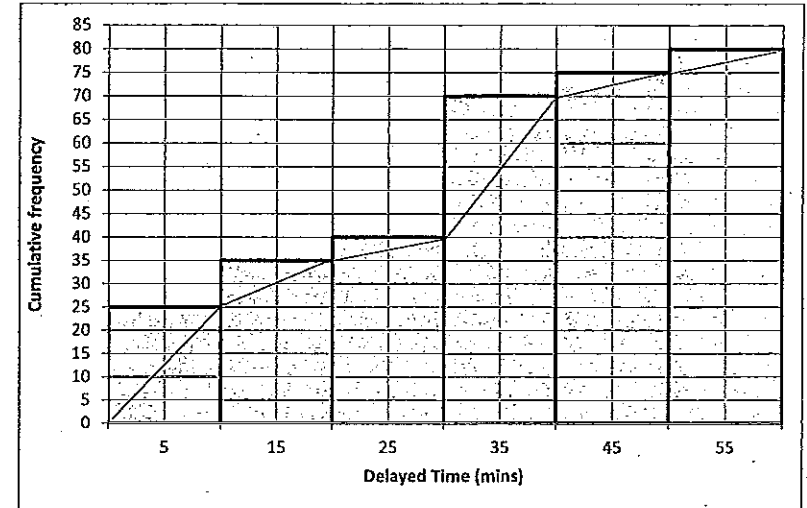(a)   A manufacturer produces office furniture including executive (E) and deluxe (D) desks.

During a particular month, a number of desks were produced according to the following linear equations.

$$D + E = 100 \quad .... (1)$$

$$D = E + 40 \quad .... (2)$$

(i)   In terms of the numbers of each type of desk produced, explain what the TWO equations mean.   2

(1) ....

(2) ....
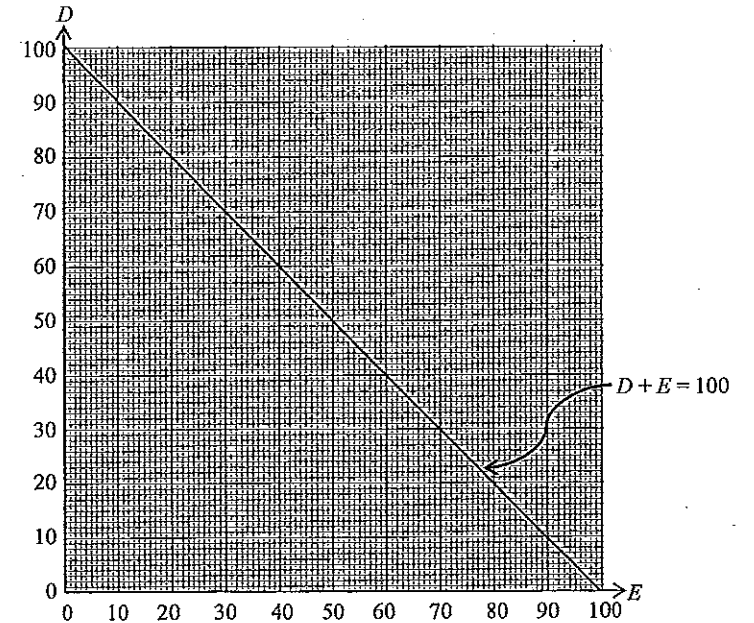
Question 24(a) continues on the next page

Question 24(a) (continued)   Marks

(ii)   The graph of equation (1) has been drawn on the grid below. On the same grid, draw the graph of equation (2) and label it.   3

(iii) Use the two graphs to determine how many of each type of desk the manufacturer produced during the month.   2

Executive desks: ....

Deluxe desks: ....

(iv)   It costs \$525 to produce each executive desk and \$780 to produce each deluxe desk.

What were the total costs to produce the desks during the month?   1

....

Question 24(a) continues on the next page

Question 24(a) (continued)   **Marks**

(v)   The executive desks are sold for $950 each and the deluxe desks are sold for
      $1400 each.

      Write an equation that would give the total profit (*P*) made from selling the desks
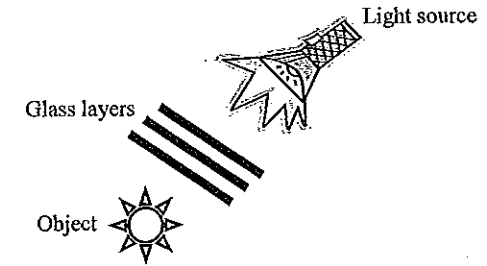   during any month.   **2**

      ....

      ....

      ....

Question 24 continues on the next page

23

Question 24 (continued)   **Marks**

(b)   Each layer of glass reduces the amount of light from a source onto an object by 12%.

      Determine the percentage loss of light from the source through the three layers of glass
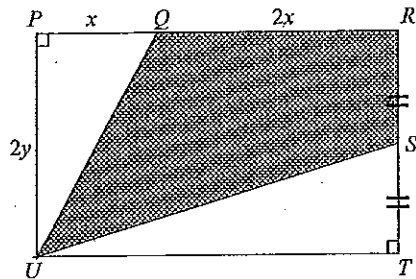   as shown.   **2**

      ....

      ....

Question 24 continues on the next page

24

Question 24 (continued)   Marks

(c)   In the rectangle $PRTU$, $PR = 3x$ and $PU = 2y$.

S is the point, so that $RS = ST$. Q is the point, so that $PQ = x$ and $QR = 2x$.

(i)   Write a simplified expression for the area of the rectangle $PRTU$.   1

....

(ii)   Write a simplified expression for the area of triangle STU.   1

....

(iii)   Show that the area of the shaded quadrilateral $QRSU$ can be expressed as $\frac{7xy}{2}$.   3

....

....

....

(iv)   If $x = 4$ and $y = 5$, what fraction of the area of the rectangle is the area of the quadrilateral?   3

....

....

....

End of paper

25

Mathematics General

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

Spherical Geometry

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

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

- 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

Surface Area

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

NSW INDEPENDENT TRIAL EXAMS – 2014
MATHEMATICS GENERAL PRELIMINARY EXAM
MARKING GUIDELINES

Section I

Question	Answer	Assessed Outcome	Band
1.	C	DS2, MGP-2	2
2.	D	MM2, MGP-4	2
3.	C	AM1, MGP-3	2
4.	B	PB1, MGP-10	2
5.	C	FM1, MGP-6	3
6.	C	DS3, MGP-7	3
7.	A	MM3, MGP-4	3
8.	A	AM2, MGP-2	4
9.	D	FM2, MGP-3	4
10.	D	MM2, MGP-6	4
11.	D	FSDr3, MGP-8	4
12.	A	DS1, MGP-7	4
13.	C	DS2, MGP-2	4
14.	B	DS1, MGP-1	4
15.	A	FM2, MGP-6	5
16.	B	FSD-3, MGP-2/5	4
17.	B	FSCo2, MGP-5	5
18.	C	PB1, MGP-8	5
19.	B	AM2, MGP-3	6
20.	B	MM3, MGP-4	6

Section II

Question 21

Part	Answer	Mark	Outcome Assessed	Band
(a)	$2p - 5p \div 5p^2$	1	AM1, MGP-2	2
	$= -3p + 5p^2$	1		
(b)(i)	$60 \div 4 = 15$	1	MM1, MGP-5	2
	Red: $5 \times 15 = 75$, Yellow: 10, Blue: $3 \times 15 = 45$			
	Total $= 180$	1		
(b)(ii)	Prob(Y or B) $= \frac{60+40}{180} = \frac{7}{12}$	2	PB1, MGP-5/8	2
(c)	Each edge of cube has length $\sqrt[3]{512} = 8$ cm	1	MM2, MGP-4	3
	Surface area $= 6 \times 8 \times 8$	1		
	$= 384$ cm^3			
(d)	Wet day rate is $46/10000 pamphlets delivered	1	FM1, MM1, MGP-2/6	3
	Total paid $= \frac{46}{1000} \times 1800$	1		
	$= \$82.80$			
(e)	$\sqrt{\frac{5 \times 8}{4 \times 40}} = \sqrt{\frac{40}{160}} = \frac{1}{2}$	2	AM1, MGP-2	3
(f)(i)	$Q = -4P + 21$	2	AM2, MGP-2/3	4
(f)(ii)	$-479 = -4P + 21$	1	AM2, MGP-3	5
	$4P = 21 + 479$			
	$4P = 500$	1		
	$P = 125$	1		
(g)	There are $4 \times 3 \times 2 \times 1$ ways that the numbers	1	PB1, MGP-8	5
	can appear, (i.e., 24 ways)	1		
	Prob of 9, 6, 5, 8 $= \frac{1}{24}$	1		

Question 22

Part	Answer	Mark	Outcome Assessed	Band
(a)(i)	8.5 cm $\div 2 = 4.25$ m	1	MM2, MGP-4	2
(a)(ii)	Area $= (0.5 \times \pi \times 4.25^2)$	1	MM1/2, MGP-4	3
	$= 66.6$ m^2	1		
(a)(iii)	$V = AH$	1	MM1/2, MGP-4	2
	$= 66.6 \times 10$			
	$= 666$ m^3			
(a)(iv)	$666 \times 3 \times 6 = 11988$ mL	1	MM1/2, MGP-4	4
	$= 11.988$ L			
	$= 12$ L	1		
(b)(i)	8pm – 9pm: 4000, 9pm – 10pm: 3000	1	DS2, MGP-2/5	2
	Total: 7000			
(b)(ii)	$2 - 4$pm	1	DS2, MGP-2/5	2
(b)(iii)	Most people accessed the site between the hours		DS2, MGP-2/5	3
	of 9 am and 6 pm	1		
(c)(i)	Maximum payment from Govt is **$265/fortnight**	1	FM1, MGP-2/6	4
	This is reduced by $((380 – 316) \times 0.60$			
	$= \$38.40$	1		
	So total income $= \$380 + \$(265 - 38.40)$			
	$= \$606.60$	1		
(c)(ii)	New Govt allowance $= \$402.50$		FM1, MGP-2/6	4
	This reduces by $((425 - 316) \times 0.60$	1		
	$= \$65.40$			
	New total income $= \$445 + (402.70 - 65.40)$			
	$= \$759.30$	1		
	Difference from living at home is **$152.70**	1		
(d)(i)	Cos$<$ TPB $= \frac{8}{9.8} = 0.8163$	1	MM3, MGP4	4
	$<$TPB $= 35°$	1		
(d)(ii)	Using Pythagoras' Theorem: TB$^2 = 9.8^2 - 8^2$		MM3, MGP4, MGP5	5
	TB $= 5.66$ m	1		
	In triangle APB, Tan $26° = \frac{AB}{8}$			
	AB $= 8 \times$ Tan$26°$	1		
	$= 3.9$ m			
	Hence lamp post $= 5.66 - 3.9$			
	$= 1.8$ m above the wall (1 d.p.)	1		

Question 23

Part	Answer	Mark	Outcome Assessed	Band
(a)(i)	$3500 for straight line method. Declining balance method: $S = 40\,000(1 - 0.2)^3$ $= 40\,000(0.8)^3$ $= \$20\,480$	1 1 1	FSDr-2, MGP-2, MGP-3	4 5
(a)(ii)	Straight line: $S = \$40\,000 - \$5000n$ Declining balance: $S = \$40\,000(0.8)^n$	1 2	FSDr-2, MGP-2	5
(a)(iii)	The declining balance method will value the car less than the straight line method up to 6 years	1	FSDr-2, MGP-8	2
(a)(iv)	If the car is valued at $25\,000$, it has lost: $15\,000$ by the straight line method and $20\,000$ by the declining balance method Hence there is a difference of 5000 in loss	1 1	FSDr-2, MGP-8	3
(a)(v)	6 years	1	FSDr-2, MGP-3	3
(a)(vi)	Value of the car is $15\,000$ This is 5 years by the straight line method and 4.5 years by the declining balance method Hence, there is 6 months longer period of valuing the car at $15\,000$	1	FSDr-2, MGP-3	4
(a)(vii)	The graph will never touch the horizontal axis since there is no value of n for which $40\,000(0.8)^n = 0$	1	FSDr-2, MGP-10	6
(b)(i)	80	1	DS2, MGP-2, MGP	3
(b)(ii)	35 mins (frequency is $70 - 40 = 30$)	1	DS2, MGP-7	4
(b)(iii)	Lower quartile approx. 7.5mins Upper quartile approx. 37 mins I.Q.R $= 37 - 7.5$ $= 29.5$mins. (allow +/-1.5)	1 1 1	DS2, MGP-7	5
(b)(iv)	Mean $= [(5 \times 25) + (15 \times 10) + (25 \times 5) + (35 \times 30) + (45 \times 5) + (55 \times 5)] \div 80$ $= 1950 \div 80$ $= 24$ mins	3	DS2, MGP-8	5

Question 24

Part	Answer	Mark	Outcome Assessed	Band
(a)(i)	Equation (1): The total number of desks produced is 100 Equation (2): There are 40 more deluxe desks than executive desks produced during the month	1 1	AM2, MGP-2 MGP-3 MGP-10	5
(a)(ii)	See attached sheet	3	AM2, MGP-3	6
(a)(iii)	The point of intersection gives E = 30, D = 70	2	AM2, MGP-3	5
(a)(iv)	Total cost $= (30 \times \$525) + (70 \times \$780)$ $= \$70\,350$	1	AM2, MGP-9	4
(a)(v)	$P = (950 - 525)E + (1400 - 780)D$ $SP = 425E + 620D$	2	AM2, MGP-2	6
(b)	Amount of light passing through 3 layers of glass is: $0.88 \times 0.88 \times 0.88 = 0.6815$ $= 68.15\%$ Loss of light through the layers $= 31.85\%$	1 1	MM1, MGP-5	6
(c)(i)	$3x \times 2y = 6xy$	1	AM1, MGP-3	4
(c)(ii)	$\frac{1}{2} \times 3x \times y = \frac{3xy}{2}$	1	AM1, MGP-3	4
(c)(iii)	Area of rectangle $-$ area of 2 triangles $= 6xy - (\frac{3xy}{2} + \frac{1}{2}x \times 2y)$ $= 6xy - (\frac{3xy}{2} + xy)$ $= 6 - \frac{5xy}{2}$ $= \frac{12xy - 5xy}{2}$ $= \frac{7xy}{2}$	1 1 1	AM1, MM2, MGP-3	6
(c)(iv)	Let $x = 4$, $y = 5$ Area of quad QRSU $= \frac{7xy}{2} = \frac{7 \times 4 \times 5}{2} = 70$ Area rectangle $= 6xy = 6 \times 4 \times 5 = 120$ Required fraction $= \frac{70}{120} = \frac{7}{12}$	1 1 1	AM1, MM2 MGP-4	6

<u>Solution to Qu 24(a)(ii)</u>

The graphs intersect at (30, 70).

Hence, 30 executive desks and 70 deluxe desks were sold during the month.