



**2012**  
**HIGHER SCHOOL CERTIFICATE**  
**TRIAL EXAMINATION**

Number	
Teachers Name	

Examiner: T Garvey

# General Mathematics

## General Instructions

- Reading Time - 5 minutes
- Working Time -  $2\frac{1}{2}$  hours
- Write using a blue or black pen
- Board Approved calculators may be used
- A formulae sheet is provided at the back of this paper which may be detached and used throughout the paper.
- Your number and your teacher's name must be written on this exam booklet and on each of your answer booklets
- Include your Multiple Choice Sheet in your Booklet for Q29

## Total Marks 100

### Section I

#### Total marks (25)

- Attempt Questions 1-25
- Answer on the Multiple Choice answer sheet provided.
- Allow about 30 minutes for this section

### Section II

#### Total marks (75)

- Attempt questions 26 – 30
- Answer on the booklets provided, unless otherwise instructed. Start a new booklet for each question.
- Allow about 2 hours for this section

**Section 1 Multiple Choice**

**Answer on Multiple Choice Sheet at the back of the exam.**

1 A survey of Year 12 students asks how many people typically sleep in their home.

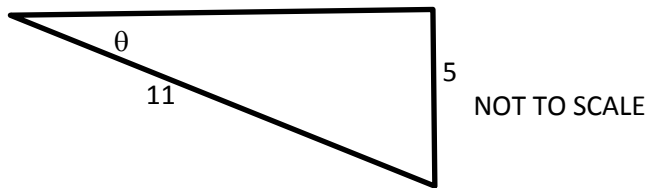
The type of information being collected is

- |   |                    |   |                      |
|---|--------------------|---|----------------------|
| A | Categorical        | B | Continuous Numerical |
| C | Discrete Numerical | D | Personal             |

2 Simplify the expression  $2x(x-1) - x(3-x)$

- |   |             |   |            |
|---|-------------|---|------------|
| A | $3x^2 - 5x$ | B | $x^2 - 5x$ |
| C | $3x^2 - x$  | D | $x^2 - x$  |

3 Find the value of the angle  $\theta$  correct to the nearest degree



- |   |    |   |    |
|---|----|---|----|
| A | 24 | B | 27 |
| C | 45 | D | 63 |

4 \$3000 is invested at 6.5%pa compounded annually for 10 years.

What is the value of the investment after this time?

- |   |        |   |        |
|---|--------|---|--------|
| A | \$1950 | B | \$2631 |
| C | \$4950 | D | \$5631 |

5 On a scale diagram of a home the scale use is 1:300.

The length of the 15m swimming pool on this diagram is

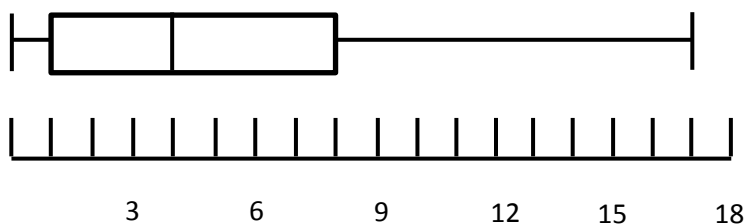
- |   |       |   |        |
|---|-------|---|--------|
| A | 5mm   | B | 50mm   |
| C | 500mm | D | 5000mm |

6 Beau and his mother were driving at a speed of 38km/h in a school zone.

Their speed in m/s is closest to

- A 1
- B 10
- C 13
- D 130

For Questions 7 and 8 use the box and whisker plot below which shows the hours of study of Mathematics completed by students in the 2 weeks before their Trial HSC exam.



7 In describing the distribution it could be said that the data

- A is negatively skewed
- B is fair
- C is normally distributed
- D is positively skewed

8 Which of the following is incorrect

- A The interquartile range is 7
- B The average is 4
- C The range is 17
- D At least 1 student did no study

9 Kieron compared fitness among smokers and finds that the more cigarettes smoked the less fit the individual is. In this case the data could have a correlation coefficient of

- A -0.7
- B -0.1
- C 0.7
- D impossible to tell

10 A circle is drawn inside a square so that it just touches the middle of each side

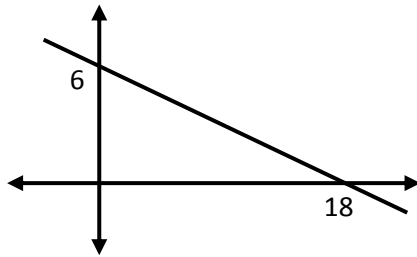
If the square has a side length of 6cm, the area of the circle is closest to

- A 14 cm<sup>2</sup>
- B 28 cm<sup>2</sup>
- C 57 cm<sup>2</sup>
- D 113 cm<sup>2</sup>

11 For the data 2, 3, 4, 5, 7, 9, 12, the standard deviation correct to 1 decimal place is

- |   |     |   |     |
|---|-----|---|-----|
| A | 1.9 | B | 2.6 |
| C | 3.3 | D | 3.9 |

12 The graph shown represents the graph of the equation



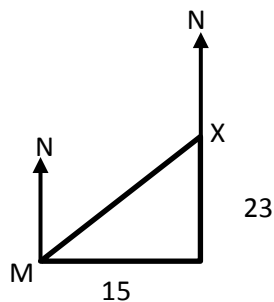
- |   |               |   |                        |
|---|---------------|---|------------------------|
| A | $y = 18 - 3x$ | B | $y = 18 - \frac{x}{3}$ |
| C | $y = 6 - 3x$  | D | $y = 6 - \frac{x}{3}$  |

13 A rectangle is measured to be 3cm by 7cm, correct to the nearest cm.

Between which two limits will its area (in  $\text{cm}^2$ ) lie?

- |   |                 |   |               |
|---|-----------------|---|---------------|
| A | 16.25 and 26.25 | B | 17.5 and 24.5 |
| C | 19.5 and 22.5   | D | 20.5 and 21.5 |

14 M is 15km west and 23km south of X as shown in the diagram.



NOT TO SCALE

The bearing, in degrees, of M from X is closest to

- |   |     |   |     |
|---|-----|---|-----|
| A | 33  | B | 57  |
| C | 123 | D | 213 |

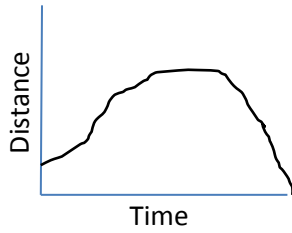




24 Saxon is calculating the depreciated value of his firm's office furniture. It had an initial value of \$22 500 and has been depreciating according to the formula  $S = 22500(.85)^n$ . The furniture is now 4 years old. The remaining value of the firm's furniture is

- A \$76 500
- B \$54 000
- C \$11745
- D \$10 755

25 A graph of Josh's trip is provided. What is the dependant variable?



- A Time
- B Distance
- C Speed
- D Kilometers

Section 2 short response questions. Start each question in a fresh booklet.

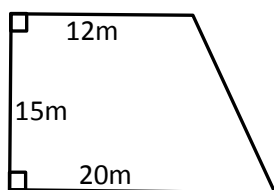
**Question 26**    Begin a new answer booklet **Marks**

- a)    Ramtin earns a fortnightly gross wage of \$2080.
- i)    Calculate his annual income **1**
- ii)    He claims the following tax deductions for the year **1**  
           tools and work equipment replacement    \$1235, union fees    \$875  
           depreciation of vehicle and work computer    \$4575  
           Calculate his taxable income for the year.
- iii)    Ramtin pays tax according to the following tax table. Calculate his tax payable **2**

Taxable income \$	Tax payable
0 to 6 500	nil
6 501 to 23 500	0.15 of each dollar in excess of 6 500
23 501 to 54 600	2 550 plus 0.28 of each dollar in excess of 23 500
54 601 to 107 500	11 258 plus 0.32 of each dollar in excess of 54 600
107 501 and above	28 186 plus 0.41 of each dollar in excess of 107 500

- b)    Jake and Hayden are fencing a trapezium shaped yard to grow vegetables in. **3**

Find the perimeter of the yard.



- c)    The 5 players in Joshua’s basketball team have an average height of 178cm. A reserve player who is 190cm tall joins the team. What is the new average height of the squad? **2**
- d)    Edwin completes a transverse survey of a playground area LMNPQ His notebook entry is provided below

	P	
	55	
N25	32	
	19	30Q
M20	10	
	L	

- i)    Using a scale of 1 cm =5m, produce a scale diagram of the field showing the measurements and the off-sets. **2**
- ii)    Calculate the area of the playground **2**
- e)    The coordinates of Safra and Medianta are (175<sup>0</sup>E, 42<sup>0</sup>S) and (160<sup>0</sup>W, 45<sup>0</sup>S) **2**  
           Ignoring time zones, what is the local time difference between these 2 places?



**Question 27**    Begin a new answer booklet **Marks**

- a)    Patrick and Matthew are investigating the lobster population in northern Tasmania. **2**  
 They set 60 lobster pots and retrieved 80 lobsters, tagged and released them back into the water.  
 They later trap and observe another 55 lobsters and find that 13 of them are tagged.

Showing your calculations, estimate the lobster population where they investigated.

- b)    The spread sheet shows the beginning of a loan repayment where Nick borrowed \$6700 to buy a car. He repays \$200 per month

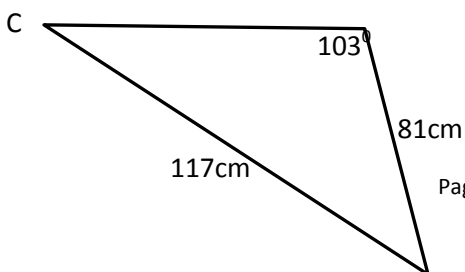
Month	Beginning Balance	Interest charged	New Balance	Payment	Final Balance
1	\$6,700	\$40.20	\$6,740.20	200	\$6,540.20
2	\$6,540.20	\$39.24	\$6,579.44	200	\$6,379.44
3	\$6,379.44	\$38.28	\$6,417.72	200	\$6,217.72
4	\$6,217.72	\$37.31	\$6,255.02	200	\$6,055.02
5	\$6,055.02	\$36.33	\$6,091.35	200	\$5,891.35

- i)    How much does Nick owe at the end of 5 months? **1**  
 ii)    Explain with reason what is happening to the monthly interest amount. **2**  
 iii)    Calculate the percentage interest rate charged per month. **1**
- c)    Find the future value of an investment where Kevin invests \$400 per month for 20 years **3**  
 at 6%pa, compounding monthly.

	A	B	C	D	E
1		<b>Monthly repayments</b>			
2		<b>Term of loan (in months)</b>			48
3					
4	<b>Amount</b>	<b>Interest rate p.a.</b>			
5	<b>borrowed</b>	6%	7%	8%	9%
6	\$27 000	\$634.10	\$646.55	\$659.15	\$671.90
7	\$27 500	\$645.84	\$658.52	\$671.36	\$684.34
8	\$28 000	\$657.58	\$670.49	\$683.56	\$696.78
9	\$28 500	\$669.32	\$682.47	\$695.77	\$709.22
10	\$29 000	\$681.07	\$694.44	\$707.97	\$721.67
11	\$29 500	\$692.81	\$706.41	\$720.18	\$734.11
12	\$30 000	\$704.55	\$718.39	\$732.39	\$746.55

- d)    Patrick borrows \$29000 for a car and repays the loan over a period of 4 years.
- i)    If he pays 8%pa, find his monthly repayment. **1**
- ii)    Find the interest which Patrick pays over the course of the loan **2**

- e)    Find  $\angle C$  correct to the nearest degree. **3**



**Question 28** Begin a new answer booklet

**Marks**

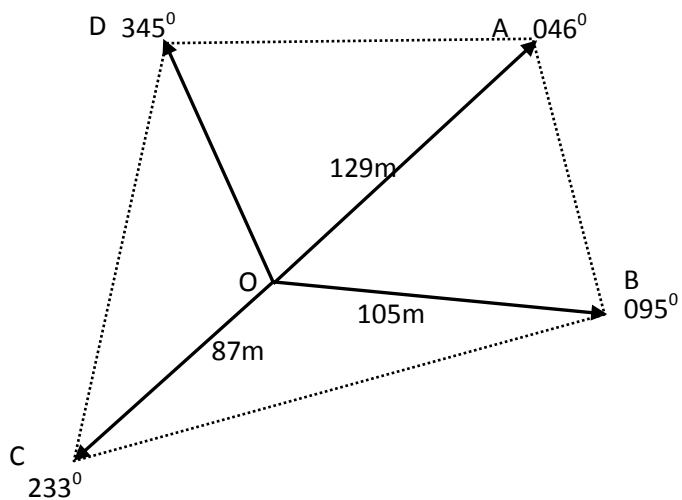
a) Julian atoll has coordinates  $(4^{\circ}\text{S}, 123^{\circ}\text{E})$ .

**2**

Smithers' Lighthouse is  $9^{\circ}$  north and  $15^{\circ}$  west of the atoll.

What are the co-ordinates of Smithers' Lighthouse?

b) A radial survey of an irregular field was taken



i) Find  $\angle AOB$

**1**

ii) Find AB

**2**

iii) Given  $\widehat{BOC} = 138^{\circ}$  find the area of  $\triangle BOC$  correct to the nearest metre

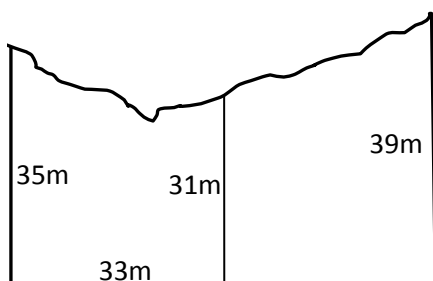
**2**

c) Find the mean and the standard deviation for the set of scores 2, 5, 6, 8, 8, 7, 9, 11

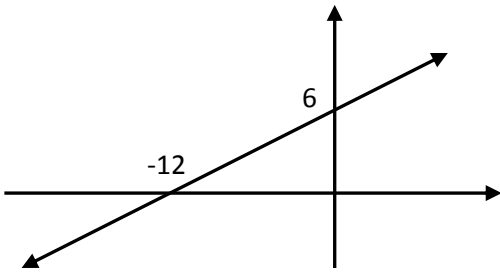
**2**

d) Use Simpson's Rule to find the approximate area of the field shown

**3**



e) Consider the line provided in the diagram



i) What is the gradient of the line? **1**

ii) What is the equation of the line in the form  $y = mx + b$  **2**

**Question 29**    Begin a new answer booklet **Marks**

- a)    Kendall borrows \$5500 to buy a car from Tom. He pays **simple** interest of 6% pa for 2 years **2**

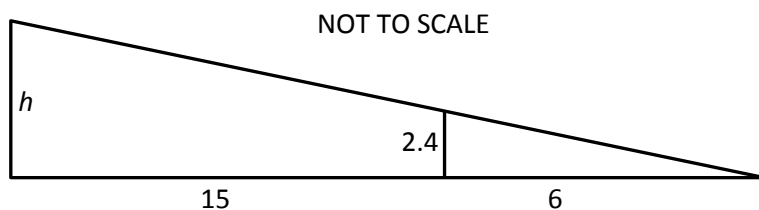
What is the **total** Kendall must repay for the car?

- b)    Mr Param pre-tests his boys on their understanding of Financial Mathematics.  
 After a refresher course he re-tests his students.  
 The results of both tests are shown in the Back to Back Stem and leaf plot

Pretest		After
8 5 3 1	4	9
7 6 2 2 0	5	2 4 7 8 8
7 6 4	6	0 2 6 7
6 5 3	7	3 5 7
	8	2 4

- i)    What is the range of the Pretest Scores? **1**
- ii)    Calculate the median of each side, compare and comment. **2**
- c)    The diagram shows two triangles which are similar **2**

Use them to calculate the value of  $h$ .



- d)    24 prefects are elected by the student body.
- i)    As a group the prefects elect a Captain, Vice Captain and Senior Prefect. **1**  
 In how many different ways can these positions be filled?
- ii)    From the group of 24, 5 are selected to play Basketball. In how many ways can this be done? **1**

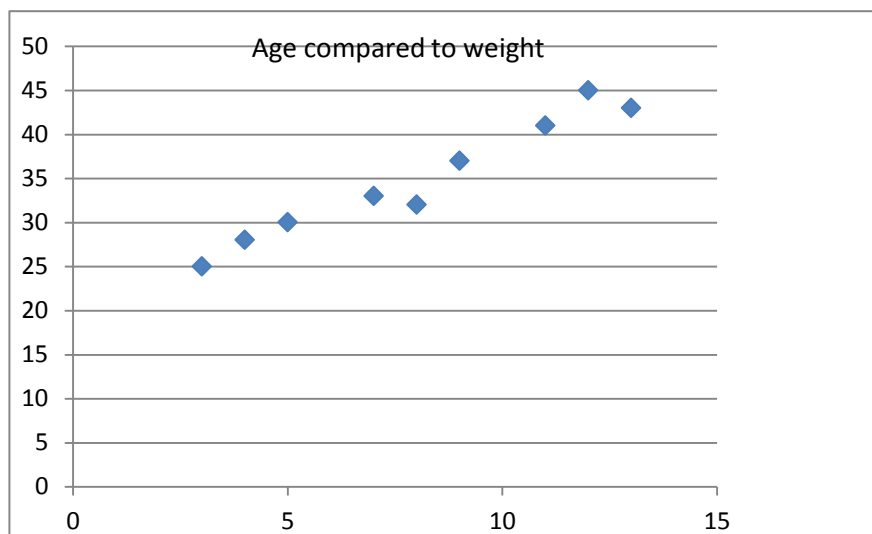


e) Edwin's triple-decker ice-creams are made up from 10 flavours

Each of the 3 scoops must be different.

- i) Customers communicate their wishes to Ed by choosing the bottom, middle and then top layers in order. How many different ice-creams are possible. **2**
- ii) Liquorice is one of flavours. What is the probability of it being one of the scoops in a randomly chosen ice-cream **1**

f) The following scattergram is provided comparing the variables weight and age



- i) Put an approximate value to the correlation between weight and age. **1**
- ii) Find the graph on the back of the multiple choice sheet and indicate on it the positions of the medians  $M_1, M_2, M_3$  **2**

Place your multiple choice sheet inside your booklet for Q29

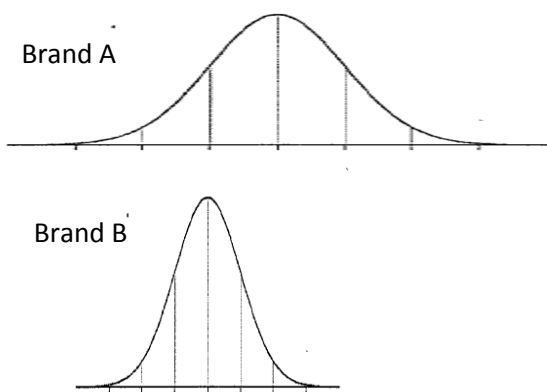
**Question 30**    Begin a new answer booklet **Marks**

a)    Solve the equation  $\frac{x-2}{3} + \frac{x-3}{2} = x-4$  **3**

b)    Find the volume of a cylinder of height 30cm and radius 5cm. **2**  
 Express your answer to 1 decimal place.

c)    Alex is taking a holiday on a cruise ship. He leaves from Padlock Bay ( $1^{\circ}\text{N}$ ,  $158^{\circ}\text{E}$ ) and sails to Hera Harbour ( $13^{\circ}\text{N}$ ,  $158^{\circ}\text{E}$ ).  
 i)    Calculate the distance travelled **1**  
 ii)    If his boat averages 9knots, how long will the trip take? **1**

d)    The surface area,  $A$ , of a statue varies as the square of its height,  $h$  **3**  
 A 20cm tall statue has a surface area of  $352\text{cm}^2$ .  
 i)    Use  $A = kh^2$  and the information given to calculate  $k$  **1**  
 ii)    Calculate the surface area of a 60cm tall statue. **2**



e)    The two normal curves show the life expectancy of two brands of batteries.

Brand A has  $\bar{x} = 200$  and  $x\sigma_n = 50$

Brand B has  $\bar{x} = 150$  and  $x\sigma_n = 25$

- i)    Copy or trace the two normal curves into your examination booklet and complete the scale on the bottom of each one. **1**
- ii)    What is the probability that Brand B will last longer than 200 hours **1**
- iii)    Brand A is more likely to last longer but what mathematical feature makes Brand B more reliable? **1**
- iv)    It is regarded as a dud if a battery lasts less than 100 hours Frank claims that Brand B is more likely to be a dud than Brand A. Comment on this assertion providing justification. **2**

# General Mathematics

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## FORMULAE SHEET

### Area of an annulus

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

$R$  = radius of outer circle

$r$  = radius of inner circle

### Area of an ellipse

$$A = \pi ab$$

$a$  = length of semi-major axis

$b$  = length of semi-minor axis

### Area of a sector

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

$\theta$  = number of degrees in central angle

### Arc length of a circle

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

$\theta$  = number of degrees in central angle

### Simpson's rule for area approximation

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

$h$  = distance between successive measurements

$d_f$  = first measurement

$d_m$  = middle measurement

$d_l$  = last measurement

### Surface area

Sphere  $A = 4\pi r^2$

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

$r$  = radius

$h$  = perpendicular height

### Volume

Cone  $V = \frac{1}{3}\pi r^2 h$

Cylinder  $V = \pi r^2 h$

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

Sphere  $V = \frac{4}{3}\pi r^3$

$r$  = radius

$h$  = perpendicular height

$A$  = area of base

### Sine rule

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

### Area of a triangle

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

### Cosine rule

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

or

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

## FORMULAE SHEET

### Simple interest

$$I = Prn$$

$P$  = initial quantity

$r$  = percentage interest rate per period, expressed as a decimal

$n$  = number of periods

### Compound interest

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

$A$  = final balance

$P$  = initial quantity

$n$  = number of compounding periods

$r$  = percentage interest rate per compounding period, expressed as a decimal

### Future value ( $A$ ) of an annuity

$$A = M \left\{ \frac{(1+r)^n - 1}{r} \right\}$$

$M$  = contribution per period, paid at the end of the period

### Present value ( $N$ ) of an annuity

$$N = M \left\{ \frac{(1+r)^n - 1}{r(1+r)^n} \right\}$$

or

$$N = \frac{A}{(1+r)^n}$$

### Straight-line formula for depreciation

$$S = V_0 - Dn$$

$S$  = salvage value of asset after  $n$  periods

$V_0$  = purchase price of the asset

$D$  = amount of depreciation apportioned per period

$n$  = number of periods

### Declining balance formula for depreciation

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

$S$  = salvage value of asset after  $n$  periods

$r$  = percentage interest rate per period, expressed as a decimal

### Mean of a sample

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$\bar{x}$  = mean

$x$  = individual score

$n$  = number of scores

$f$  = frequency

### Formula for a z-score

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

$s$  = standard deviation

### Gradient of a straight line

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

### Gradient–intercept form of a straight line

$$y = mx + b$$

$m$  = gradient

$b$  = y-intercept

### Probability of an event

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

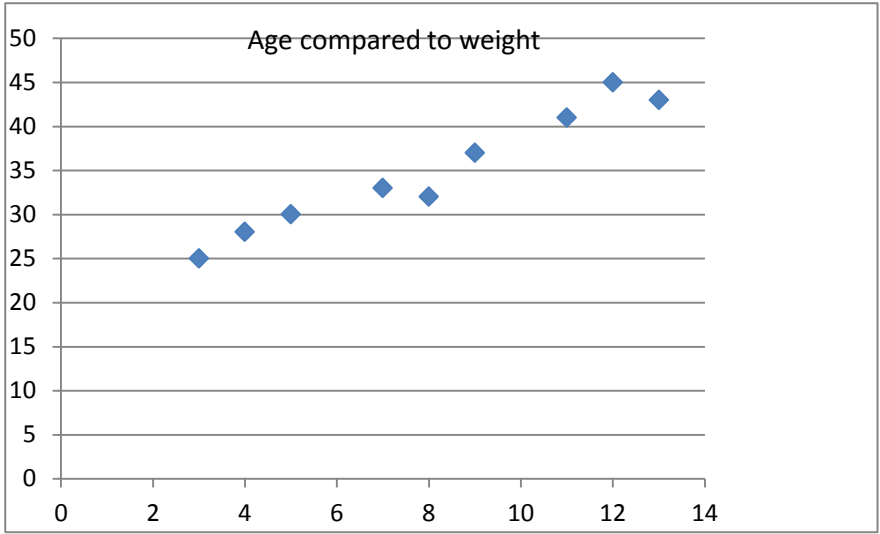
$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$



Indicate your chosen answer for each question by placing an X in the appropriate box.

Ensure you indicate 1 answer per question

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
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22				
23				
24				
25				



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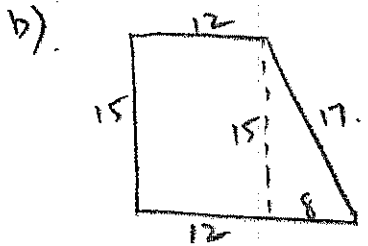
- |                   |       |       |       |       |
|-------------------|-------|-------|-------|-------|
| 1 C               | 2 A   | 3 B.  | 4 D   | 5 B   |
| 6 B               | 7 D   | 8 B   | 9 A   | 10 B  |
| 11 C              | 12 D. | 13 A  | 14 D. | 15 D. |
| 16 <del>A</del> A | 17 C  | 18 A  | 19 C  | 20 A  |
| 21 D.             | 22 C  | 23 B. | 24 C  | 25 B. |

Q26.

a)  $2080 \times 26 = 54080.$  1

ii)  $54080 - 1235 - 875 - 4575 = 47395$  1  
CFPA

iii)  $(2550 + 47395 - 2350) \times 28 = 924060$  1,1  
CFPA 1 for progress.



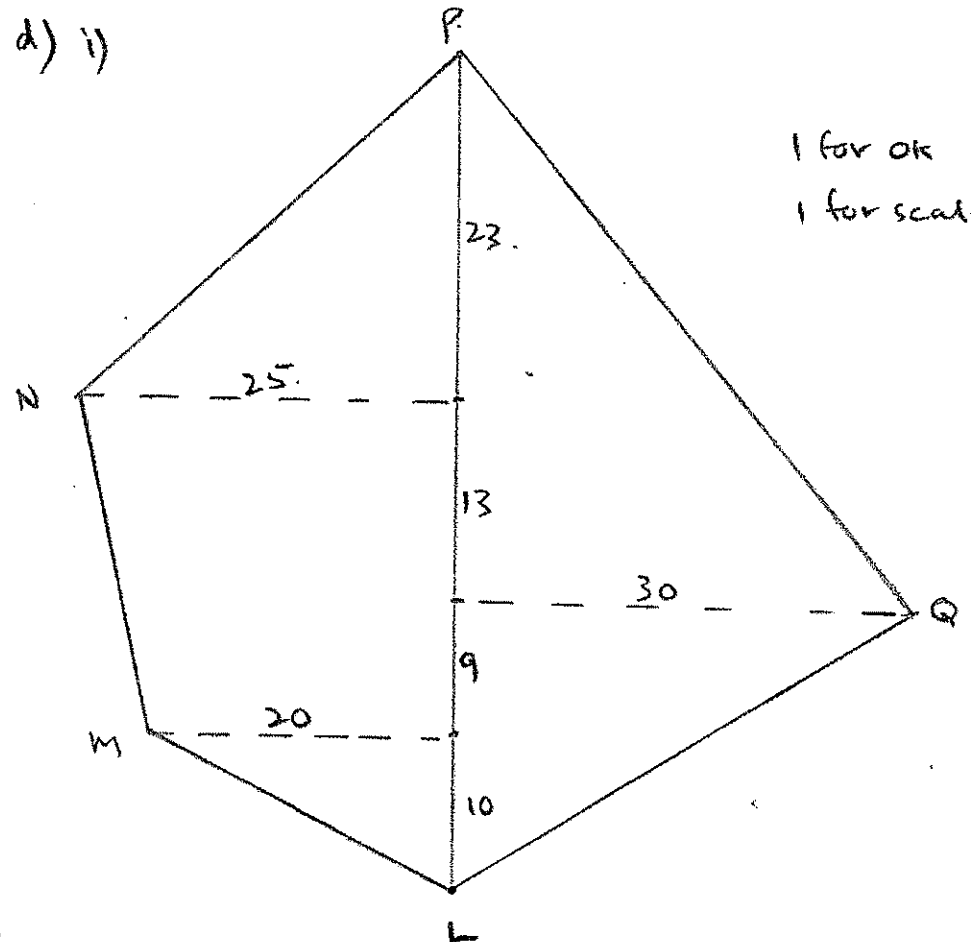
$20 + 15 + 12 + 17 = 64.$

1 for Pyth.  
1 for addition  
1 for correct

c)  $5 \times 178 + 190 = 1080.$   
 $1080 \div 6 = 180$

1  
1.

d) i)



1 for ok  
1 for scale.

ii)  $\frac{55 \times 30}{2} + \frac{20 \times 10}{2} + \frac{25 \times 23}{2} + \frac{(20 + 25) \times 22}{2}$

$= 1707.5 \text{ m}^2.$

1 + 1

1 for progress

e) 175 E to 160 W 25° time difference.

$25 \times 4 = 100 \text{ minutes. 2}$

accept 22 hrs 20 min (2).

SOLUTIONS General Mathematics 2012.

27 a)  $\frac{13}{55} = \frac{80}{x}$  1

$13x = 4400$   $x = 338$  IRE 1

b) i) 58 91-35 1

ii) Monthly interest decreases  
each month 1

because balance is decreasing 1

iii)  $\frac{40-20}{6700} \times \frac{100}{1} = -6\%/m$  1

c)  $FV = 400 \left( \frac{1.005^{240} - 1}{0.005} \right)$  1

$= \$184\ 816.36$  IRE. 2.

allow 1 for correct n  
& r.

d) i) 707-97. 1

ii)  $707-97 \times 48 = 29000$  CFPA. 1

$= 49\ 82.56$  IRE. 1

allow 1 for bald.

$339\ 82.56$  1

e)  $\frac{\sin C}{81} = \frac{\sin 103}{117}$  1

$\sin C = 0.67456\dots$  1

$C = 42^\circ$  1.

28. a)  $S^\circ N$  1

$108^\circ E$  1

b) i)  $\angle AOB = 95-46 = 49^\circ$  1

ii)  $AB^2 = 129^2 + 105^2 - 2 \times 129 \times 105 \times \cos 49$  1

CFPA.

$= 9893-36$

$AB = 99m$  IRE 1

iii)  $A = \frac{1}{2} \times 87 \times 105 \times \sin 138$  1

$= 3056 m^2$  IRE. 1

c)  $\bar{x} = 7$  1

$\sigma_n = 2.55$  IRE. 1

(markers discretion allow 2.725  
for 1?)

d)  $A = \frac{1}{3} (d_1 + 4d_m + d_2) = 11(35 + 124 + 39)$  1

$= 2178 m^2$  2

e) i)  $m = \frac{1}{2}$  1

ii)  $y = \frac{1}{2}x + 6$  2.

29. a)  $5500 \times 0.06 \times 2 = 660$  |

Total = \$660 |

b)  $76 - 41 = 35$  |

Medians 56 & 62 |

Median higher after course  
or similar. |

(don't need correct medians)

c)  $\frac{h}{2.4} = \frac{21}{b}$  |

$bh = 50.4$  |

$h = 8.4$  |

accept  
6 for 1 mark.

d) i)  $24 \times 23 \times 22 = 12144$  |

ii)  ${}^4P_5 = \frac{24 \times 23 \times 22 \times 21 \times 20}{5 \times 4 \times 3 \times 2 \times 1} = 42504$  |

e) i)  $10 \times 9 \times 8$  |

= 720 |

ii)  $\frac{3}{10}$  |

f) i) 0.7 say between 0.5 & 1 |

ii) Ann correct M |

30 a)  $2x - 4 + 3x - 9 = 6x - 24$  |

$5x - 13 = 6x - 24$  |

$11 = x$  |

b)  $V = \pi r^2 h = 235.6 \times 2$  | 1 for progress

c)  $D = 12^\circ$  difference |

=  $12 \times 60 = 720$  N |

or  $\frac{12}{360} \times 6400 \times 2 \times \pi = 1340 \text{ km}$  |

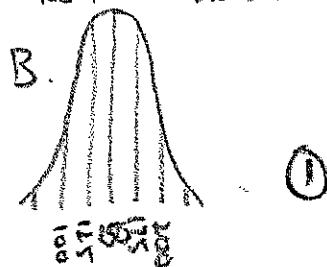
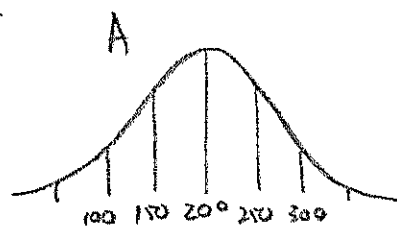
ii)  $720 \div 9 = 80$  hours |

d) i)  $352 = k \times 20^2$  |

$0.88 = k$  |

$A = 0.88 \times 60^2 = 3168$  |

e) |



ii) 2.5% (1)

iii) smaller St Dev (1)

iv) False. both batteries score (1)

$Z = -2$  at 100 hrs. (1)