Student Number: _____

# 2015

Higher School Certificate

## Trial Examination

# Mathematics General 2

Teacher Setting Paper: Miss K Cole
Head of Department: Mrs M Hill

**General Instructions**

- Reading time – 5 minutes
- Working time – $2\frac{1}{2}$ hours
- Write using black or blue pen
  Black pen is preferred
- Board-approved calculators may be used
- A formulae and data sheet is provided at the back of this paper
- Write your answers for Section I (questions 1 to 25) on the multiple choice answer sheet provided on page 28
- Write your answers to Section II (questions 26 to 30) in the spaces provided. Show relevant mathematical reasoning and/or calculations

**Total marks** – 100

**Section I** – Pages 2 - 10

**25 marks**

Attempt Questions 1 - 25

Allow about 35 minutes for this section

**Section II** – Pages 11 - 26

**75 marks**

Attempt questions 26 - 30

Allow about 1 hour and 55 minutes for this section

## Section I

**25 marks**
**Attempt Questions 1 – 25**
**Allow about 35 minutes for this section**

Use the Multiple Choice Answer Sheet provided on page 28.

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1. Which of the following would not provide a positive correlation?

   (A) Temperature and lifeguard rescues

   (B) Temperature and amount of gas used for heating

   (C) Temperature and ice cream sales

   (D) Temperature and the time spent outdoors

2. Simplify $6x^3 \times \frac{2x^2}{3}$

   (A) $4x^5$

   (B) $9x^5$

   (C) $4x^6$

   (D) $9x^6$

3. Ken measured the length of a field to be 52.7 m. What is the percentage error of this measurement?

   (A) $\pm 0.5\%$

   (B) $\pm 0.09\%$

   (C) $\pm 0.05\%$

   (D) $\pm 9.49\%$

4. What is the effect on the mean and median when a score of 51 is added to the following set of data?

76 84 97 84 81 93

(A) It has no effect on the mean or median.

(B) The mean increases slightly, the median stays the same.

(C) The median decreases slightly, the mean stays the same.

(D) The mean decreases, the median stays the same.

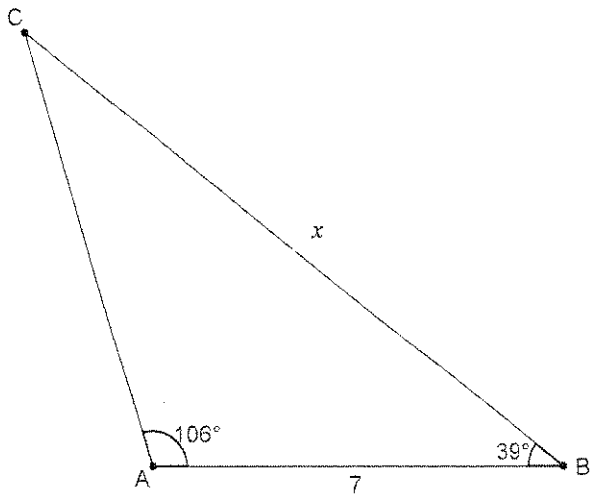
5. Which expression gives the correct value for $x$ in the diagram?

(A) $x = \frac{\sin 106° \times 7}{\sin 39°}$

(B) $x = \frac{\sin 106° \times 7}{\sin 35°}$

(C) $x = \frac{\sin 39° \times 7}{\sin 106°}$

(D) $x = \frac{\sin 35° \times 7}{\sin 106°}$




6. Marie is choosing an alpha-numeric code. She must choose 4 letters and 4 numbers. How many different arrangements are possible?

(A) 144

(B) 4160

(C) 466 976

(D) 4 569 760 000

7. Sally borrowed $18 000 for 5 years at 6.5% p.a. flat rate interest to buy a car. What is her monthly repayment?

(A) $5850

(B) $487.50

(C) $397.50

(D) $97.50

8. The great circle distance between Capetown, South Africa and Brussels, Belgium is 11788 km. What is the angle (to the nearest degree) made at the centre of the Earth by these two cities, if the radius of the Earth is 6400 km?

(A) $106°$

(B) $105°32'$

(C) $105°$

(D) $211°$

9. Which of the following equations is an example of an exponential function?

(A) $y = \frac{2}{x}$

(B) $y = 2x^3$

(C) $y = 2^x$

(D) $y = 2x^2$

10. The weights of coffee packages are normally distributed. The mean weight per package is 500 g and the standard deviation is 8 g. What percentage of coffee packages are between 492 g and 516 g?

(A) 68%

(B) 81.5%

(C) 34%

(D) 47.5%

11. How many 120 MB files can be stored in an 8 GB USB?

(A) 8192

(B) 68

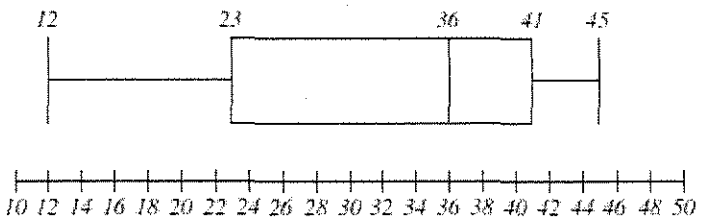
(C) 8000

(D) 67

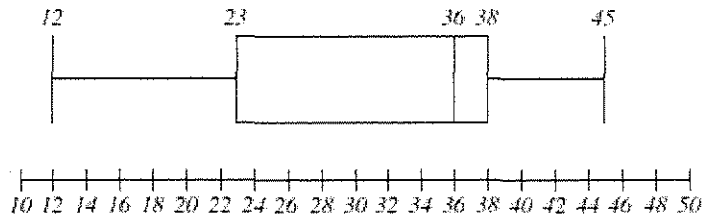
**12.** Which box-and whisker plot matches the following data:

Range: 33
Median: 36
Interquartile range: 18

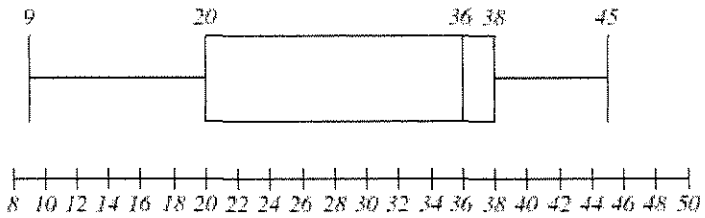
(A)



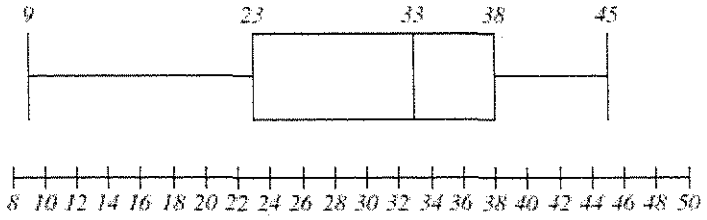

(B)




(C)




(D)



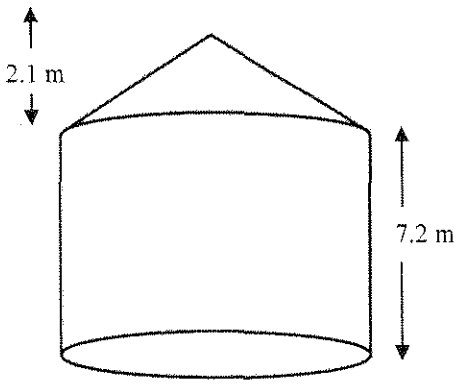

**13.** Calculate the volume of this grain silo to 2 decimal places.

(A) 321.65 $m^3$

(B) 293.15 $m^3$

(C) 85.50 $m^3$

(D) 378.65 $m^3$




Radius = 3.6 m

**14.** This table shows the future value of an annuity with a contribution of $1 at the end of each period.

| Future value interest factors (Future value of an annuity with a contribution of $1 at the end of each period) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Period** | **Interest rate per period** | | | | | | | | |
| | **1%** | **2%** | **3%** | **4%** | **5%** | **6%** | **8%** | **10%** | **12%** |
| **1** | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| **2** | 2.0100 | 2.0200 | 2.0300 | 2.0400 | 2.0500 | 2.0600 | 2.0800 | 2.1000 | 2.1200 |
| **3** | 3.0301 | 3.0604 | 3.0909 | 3.1216 | 3.1525 | 3.1836 | 3.2464 | 3.3100 | 3.3744 |
| **4** | 4.0604 | 4.1216 | 4.1836 | 4.2465 | 4.3101 | 4.3746 | 4.5061 | 4.6410 | 4.7793 |
| **5** | 5.1010 | 5.2040 | 5.3091 | 5.4163 | 5.5256 | 5.6371 | 5.8666 | 6.1051 | 6.3528 |
| **6** | 6.1520 | 6.3081 | 6.4684 | 6.6330 | 6.8019 | 6.9753 | 7.3359 | 7.7156 | 8.1152 |
| **7** | 7.2135 | 7.4343 | 7.6625 | 7.8983 | 8.1420 | 8.3938 | 8.9228 | 9.4872 | 10.0890 |
| **8** | 8.2857 | 8.5830 | 8.8923 | 9.2142 | 9.5491 | 9.8975 | 10.6366 | 11.4359 | 12.2997 |
| **9** | 9.3685 | 9.7546 | 10.1591 | 10.5828 | 11.0266 | 11.4913 | 12.4876 | 13.5795 | 14.7757 |
| **10** | 10.4622 | 10.9497 | 11.4639 | 12.0061 | 12.5779 | 13.1808 | 14.4866 | 15.9374 | 17.5487 |
| **11** | 11.5668 | 12.1687 | 12.8078 | 13.4864 | 14.2068 | 14.9716 | 16.6455 | 18.5312 | 20.6546 |
| **12** | 12.6825 | 13.4121 | 14.1920 | 15.0258 | 15.9171 | 16.8699 | 18.9771 | 21.3843 | 24.1331 |

Use the table to calculate the future value of an annuity with contribution of $5000 per year at 8% p.a. for five years.

(A) $47 745.50

(B) $7346.64

(C) $29 333

(D) $7000

**15.** In a game, there is a ¼ chance that you will win $5, a ½ chance you will draw for no money and a ¼ chance that you will lose $2. What is the financial expectation for the game?

(A) $0.75

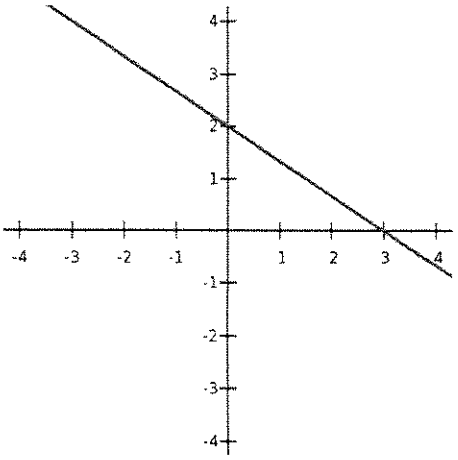
(B) $1.25

(C) $3.00

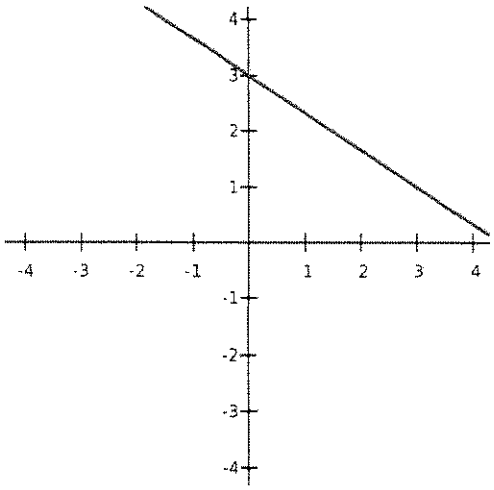
(D) $2.25

**16.** Which graph matches the equation $y = \frac{-2x}{3} + 3$

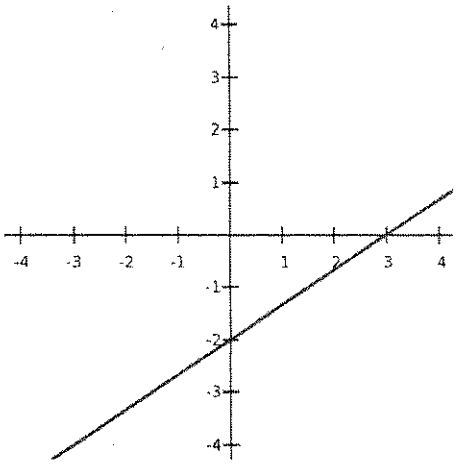
(A)



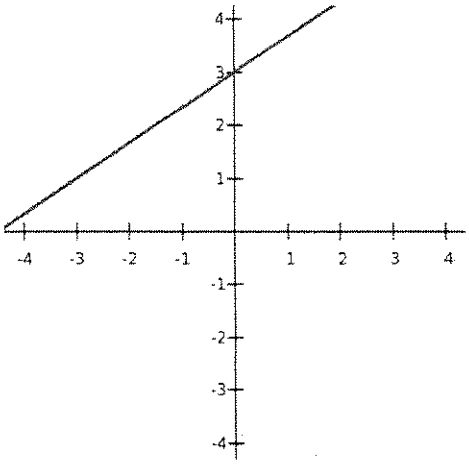
(C)



(B)



(D)



**17.** Briggsburg is on a bearing of 120° from Allentown. What is the bearing from Briggsburg to Allentown?

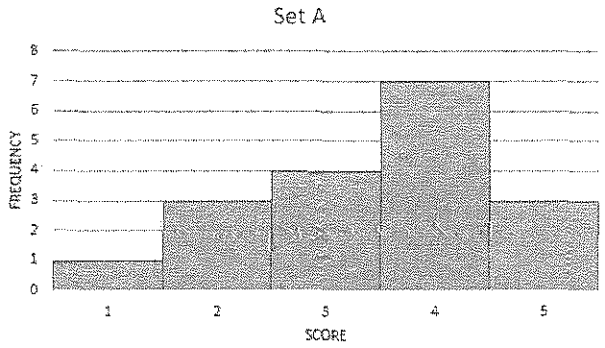
(A) 120°

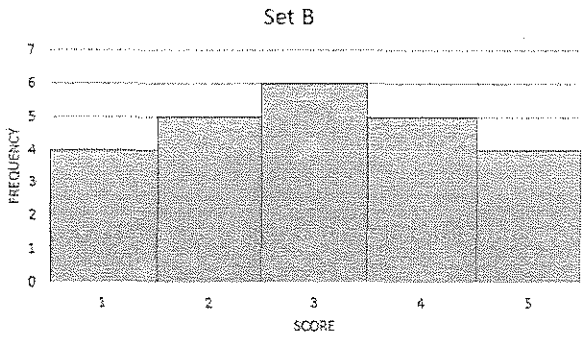
(B) 330°

(C) 30°

(D) 300°

**18.** The data sets A and B are displayed in histograms:




Which of the following statements is false?

(A) Set A has a higher mode than Set B

(B) Set A and Set B have the same range.

(C) Set A is negatively skewed.

(D) Set A has a lower median than Set B.

**19.** What is the percentage change equivalent for an increase of 12% followed by a decrease of 15%?

(A) Decrease of 3%

(B) Decrease of 4.8%

(C) Increase of 1.2%

(D) Increase of 3%

**20.** Australian Eastern Standard Time (AEST) is 10 hours ahead of Greenwich Mean Time. Calculate the local time in London (52°N, 0°) when it is 3 pm in Orange and daylight savings time is operating in the United Kingdom.

(A) 5 am

(B) 6 am

(C) 7 am

(D) 12 am tomorrow

**21.** The time taken to complete a job is inversely related to the number of labourers on the job. If it takes 3 men 6 hours to complete a job, how long will it take to complete a job with 5 labourers?

(A) 10 hours

(B) 3 hours and 30 minutes

(C) 3 hours and 40 minutes

(D) 3 hours and 36 minutes

**22.** The scores on a recent test are normally distributed. The mean is 69% and the standard deviation is 9. If Jams has a z-score of 1.2, what is his score on the test (to the nearest percentage)?

(A) 92%

(B) 74%

(C) 80%

(D) 78%

**23.** Tessa is a female who weighs 65 kg and has a blood alcohol content (BAC) of 0.065. If Tessa was drinking over the course of 5 hours at a party, how many standard drinks did she consume?

(A) 5

(B) 5.5

(C) 6

(D) 6.5

**24.** Jayden pays \$35/month for his phone plan which includes 200 MB data and \$60 of free calls and texts. Additional data costs 25 c per MB. The connection fee is \$0.40 and then 68 c per minute. How much was his bill last month if Jayden made 14 calls lasting an average of 6 minutes each and he exceeds his data allowance by 26 MB?

(A) \$104.22

(B) \$44.22

(C) \$35

(D) \$38.62

**25.** Sam earns 3% commission on every house he sells. If his commission this month was $9870, what was the value of the property he sold?

(A) $296.10

(B) $10 166.10

(C) $29 610

(D) $329 000

**END OF SECTION I**

## Section II

**Student Number:** _____

**75 marks**
**Attempt Questions 26 - 30**
**Allow about 1 hour and 55 minutes for this section**

Answer the questions in the spaces provided.

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

Extra writing space is provided on page 25. If you use this space, clearly indicate which question you are answering.

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**Question 26** (15 marks)

a) Solve these equations simultaneously **2**

$$x + 3y = 14$$

$$y = 2x$$

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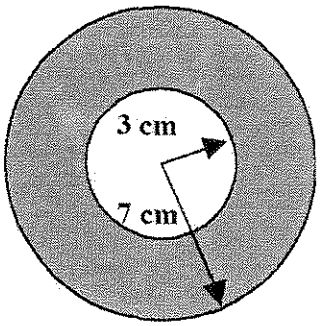
b) Find the area of the annulus correct to 2 decimal places. **2**

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**Question 26 continues on page 12**

c) This table shows the progress of a \$120 000 reducing balance loan at 8% p.a. interest. The monthly repayment is \$1120.

| Amount borrowed | | \$120 000 | | |
|---|---|---|---|---|
| Interest rate | | 8% p.a. | | |
| Monthly repayment | | \$1120 | | |
| Month (n) | Principal (P) | Interest (I) | Amount Owing (P + I) | Balance (P + I – R) |
| 1 | \$120 000 | \$800 | \$120 800 | \$119 680 |
| 2 | \$119 680 | \$797.87 | \$120 477.87 | \$119 357.87 |
| 3 | \$119 357.87 | \$795.72 | \$120 153.59 | \$119 033.59 |
| 4 | \$119 033.59 | \$793.56 | \$119 827.15 | \$118 707.15 |
| 5 | | | | |

i) How much total interest has been paid in the first four months? **1**

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ii) Calculate the interest for the fifth month. **1**

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iii) Calculate the balance at the end of the fifth month. **1**

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**Question 26 continues on page 13**

d) The following two-way table shows the results of a survey conducted of 1200 students about body image.

| | | Body Image | | | |
|---|---|---|---|---|---|
| | | About Right | Overweight | Underweight | **Total** |
| Gender | Female | 560 | 163 | 37 | 760 |
| | Male | 295 | 72 | 73 | 440 |
| | **Total** | 855 | 235 | 110 | 1200 |

i) What fraction of the students surveyed believe that they are "about right" in weight? **1**

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ii) What percentage of students who believe they are overweight are female? **1**

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iii) What percentage of males believe they are either overweight or underweight? **1**

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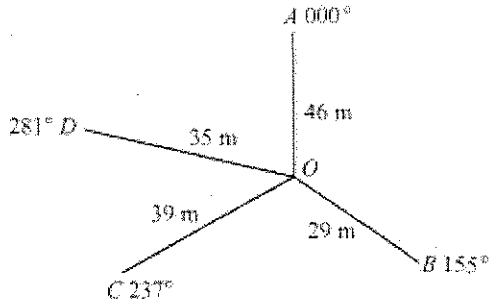
**Question 26 continues on page 14**

e) The diagram below is a compass radial survey.




i) Find size of $\angle BOC$. **1**

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ii) Connect $BC$. Calculate this length to 2 decimal places. **2**

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iii) Find the area of $\Delta BOC$ to the nearest square metre. **2**

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**End of Question 26**

**Question 27** (15marks) **Student Number:** _____

a) In Chris's drawer he has 6 white socks and 4 black socks. He makes two selections (without replacement) hoping to get a pair.

i) Draw a probability tree diagram to represent this situation. **2**

ii) What is the probability of Chris selecting a white sock on his first selection. **1**

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iii) What is the probability that Chris will select a matching pair of socks **2**

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b) Rearrange the equation to make $a$ the subject. **2**

$$s = ut + \frac{1}{2}at^2$$

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**Question 27 continues on page 16**

c) The table below shows the lengths and weights of 8 babies at birth.

| Length (cm) | 49.2 | 48.8 | 48.8 | 49.7 | 49.4 | 49.1 | 49.5 | 49.4 |
|---|---|---|---|---|---|---|---|---|
| Weight (kg) | 3.28 | 3.18 | 3.32 | 3.21 | 3.35 | 3.28 | 3.37 | 3.23 |

i) Using this data, determine the correlation coefficient, correct to 4 significant figures. **1**

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ii) Describe the correlation between length and weight of babies. **1**

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iii) The gradient of the least-squares line of best fit can be determined using the formula:

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

Calculate the gradient for this set of data, correct to 2 decimal places. **1**
Show your working.

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iv) The y-intercept of the least-squares line of best fit can be determined using the formula:

$$b = \text{mean of } y \text{ scores} - m \times \text{mean of } x \text{ scores}$$

Calculate the y-intercept for this set of data, correct to 2 decimal places. **1**
Show your working.

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v) Write the equation for of the least-squares line of best fit using your answers from part iii) and iv). **1**

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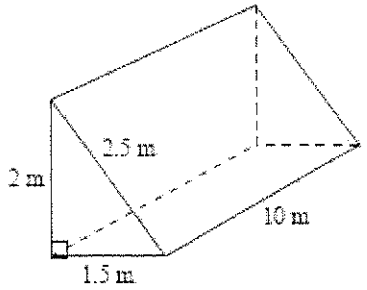
**Question 27 continues on page 17**

d) i) Calculate the surface area of this figure. **2**

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ii) Emily wants to paint this figure. If a litre of paint will cover 11 $m^2$, how many litres of paint will she need to buy? **1**

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**End of Question 27**

**Question 28** (15 marks) **Student Number:** _____

a) Jose is in Rio de Janeiro, Brazil (23°S, 43°W). He wants to call his friend Kali in New Dehli, India (28°N, 77°E).

i) Determine the difference in longitude between the two cities. **1**

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ii) What is the time difference between Rio de Janeiro and New Dehli? **1**

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iii) What time is it in New Dehli, if Jose places a call at 11:00 pm on Tuesday? **2**

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b) The braking distance in metres ($d$) taken by a car directly varies as the square of its speed ($v$). It takes Charles 12 m to stop when his car is travelling 60 km/h.

i) Write the variation equation for finding braking distance ($d$) in terms of speed ($v$). **2**

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ii) What would the braking distance be (to nearest metre) if Charles is travelling at 110 km/h? **1**

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iii) How fast (to the nearest km) is Charles travelling if it takes him 25 m to stop? **1**

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**Question 28 continues on page 19**

c) The capture-recapture technique was used to estimate the number of fish in a lake. 200 fish were caught and tagged and then released. A month later 300 fish are caught, of which 26 fish are tagged. Estimate the fish population of the lake. **2**

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d) Greg has a credit card account with no interest-free period and an interest rate of 14% p.a. Between August 1 and August 31 he makes the following purchases:

| Date | Purchase | Amount |
|---|---|---|
| August 1 | Dinner | $45.00 |
| August 7 | Petrol | $49.55 |
| August 18 | Appliances | $51.90 |

i) Greg pays $0.48 in interest for his petrol purchase. Show how this was calculated. **1**

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ii) Calculate the amount owing, including interest for the month of August. **2**

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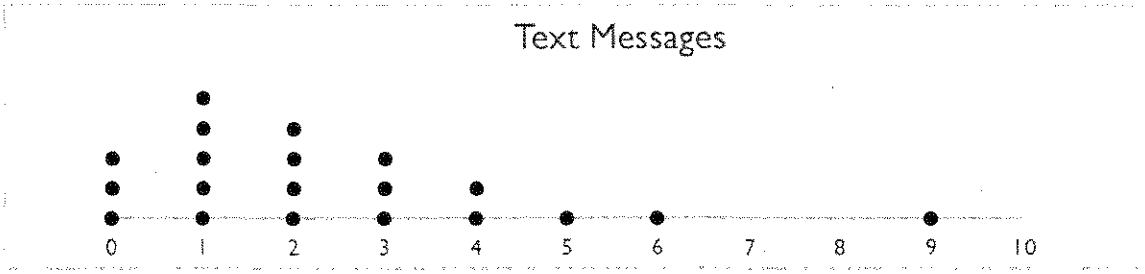
**Question 28 continues on page 20**

e) The dot plot below shows the number of text messages sent by 20 students on a particular day.




i) Describe the shape of the distribution. **1**

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ii) Give the outlier and discuss which measure of central tendency (mean, median or mode) will be most affected by it. **1**

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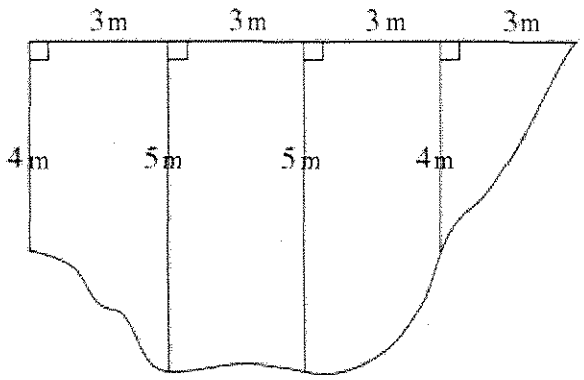
**End of Question 28**

**Question 29** (15 marks) **Student Number:** _____

a) This is a cross-section of a river.




Using two applications of Simpson's rule, find the approximate area of this cross-section of the river. **3**

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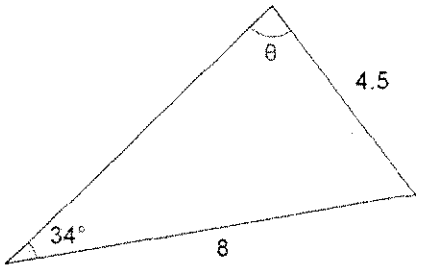
b) Find the value of $\theta$, if $\theta$ is obtuse. **2**

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**Question 29 continues on page 22**

c) Caroline receives chemotherapy via an intravenous drip. The solution delivered contains 150 mg of chemo drugs in every 200 mL of solution.

i) Caroline needs 600 mg of the chemo drugs per day. How much of the solution should the nurse prepare for one day? **1**

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ii) If each millilitre of solution contains 12 drops, how many drops are needed? **1**

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iii) The intravenous drip runs for 4 hours. What is the drip rate (drops per minute)? **1**

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d) There are 10 players on a netball team. Only 7 players take the court at a time. How many different combinations of 7 players are possible? **2**

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e) Karen is 13 years old and weighs 49 kg. She is prescribed a drug with a recommended adult dose of 375 mg twice a day. Use Clark's formula to calculate her daily dosage, to the nearest mg. **2**

$$\text{child's dosage} = \frac{\text{weight in kg}}{70} \times \text{adult dosage}$$

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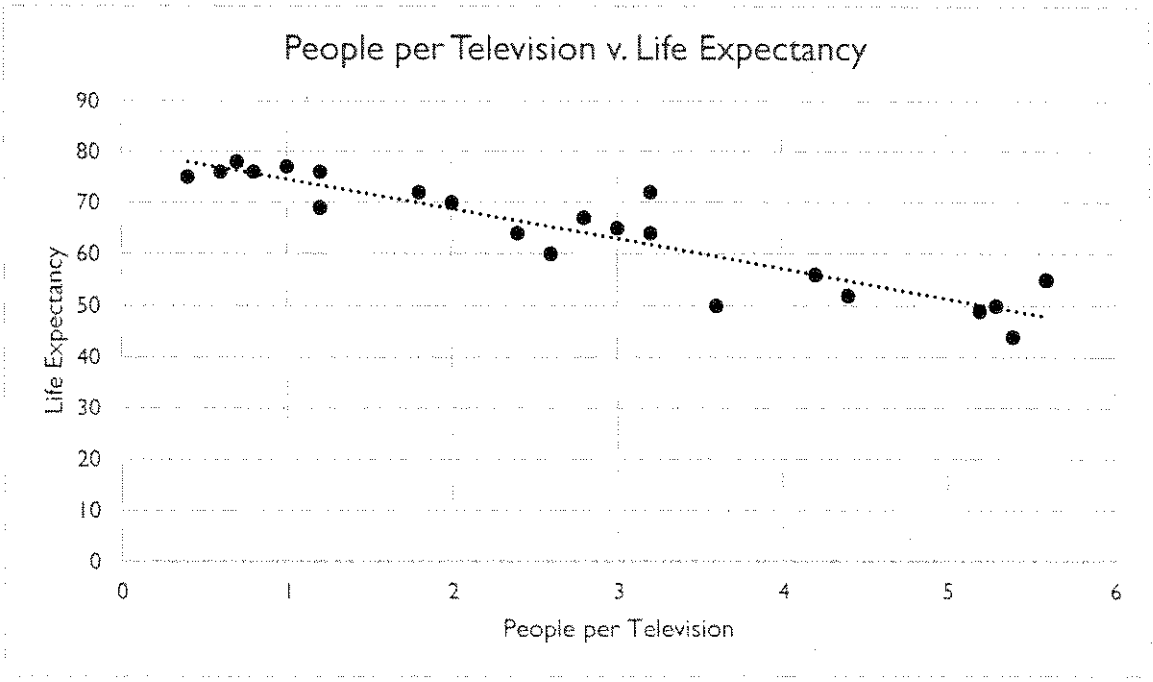
**Question 29 continues on page 23**

f) The following scatterplot compares the number of people per television to their life expectancy.




i) Describe the trend of the data. **1**

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ii) Using the line of best fit, estimate the life expectancy of someone living in an area where there are four people per television. **1**

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iii) Using the line of best fit, estimate the number of people per television for someone with a life expectancy of 60. **1**

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**End of Question 29**

**Question 30** (15 marks) **Student Number:** _____

a) The table below shows Brian's marks in two of his exams.

| Subject | Brian's Mark | Class Average | Class Standard Deviation |
|---|---|---|---|
| English | 68% | 61% | 5 |
| Maths | 72% | 65% | 8 |

i) Find Brian's z-score for each subject. **2**

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ii) In which subject did Brian perform better? Justify your answer. **2**

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b) Stamp duty for purchasing a car is 3% of the purchase price up to $45 000 plus 5% for every dollar over $45 000.

i) Find the stamp duty on a car that is purchased for $53 900. **1**

.....

.....

.....

ii) How much is the purchase price of a car whose stamp duty is $747? **1**

.....

.....

.....

**Question 30 continues on page 25**

c) The table below shows the amount of petrol in the tank in litres ($P$) and the distance travelled in kilometres ($d$).

| Distance travelled ($d$) | 50 | 100 | 150 | 200 | 250 |
|---|---|---|---|---|---|
| Petrol in tank ($P$) | 36.65 | 33.3 | 29.95 | 26.6 | 23.25 |

i) Which is the dependent variable? **1**

.....

ii) Calculate the gradient and describe what it represents. **2**

.....

.....

.....

.....

.....

.....

iii) Calculate the y-intercept and describe what it represents. **2**

.....

.....

.....

.....

.....

.....

iv) Write the linear equation that models this situation. **1**

.....

v) What distance has been travelled (to the nearest km) when there is no petrol remaining in the tank? **1**

.....

.....

.....

.....

**Question 30 continues on page 26**

d) The graph of $y = -x^2 + 2$ is a parabola. Describe whether the graph is concave up or down and give the coordinates for the turning point. **2**

.....

.....

.....

**End of Paper**

Student Number: Solutions

**2015**
Higher School Certificate
**Trial Examination**

# Mathematics General 2

Teacher Setting Paper: Miss K Cole
Head of Department: Mrs M Hill

**General Instructions**

- Reading time – 5 minutes
- Working time – $2\frac{1}{2}$ hours
- Write using black or blue pen
  Black pen is preferred
- Board-approved calculators may be used
- A formulae and data sheet is provided at the back of this paper
- Write your answers for Section I (questions 1 to 25) on the multiple choice answer sheet provided on page 28
- Write your answers to Section II (questions 26 to 30) in the spaces provided. Show relevant mathematical reasoning and/or calculations

**Total marks** – 100

**Section I** – Pages 2 - 10
**25 marks**
Attempt Questions 1 - 25
Allow about 35 minutes for this section

**Section II** – Pages 11 - 26
**75 marks**
Attempt questions 26 - 30
Allow about 1 hour and 55 minutes for this section

## Section I

**25 marks**
**Attempt Questions 1 – 25**
**Allow about 35 minutes for this section**

Use the Multiple Choice Answer Sheet provided on page 26.

---

1. Which of the following would not provide a positive correlation?

   (A) Temperature and lifeguard rescues

   (B) Temperature and amount of gas used for heating

   (C) Temperature and ice cream sales

   (D) Temperature and the time spent outdoors

2. Simplify $6x^3 \times \frac{2x^2}{3}$

   (A) $4x^5$

   (B) $9x^5$

   (C) $4x^6$

   (D) $9x^6$

3. Ken measured the length of a field to be 52.7 m. What is the percentage error of this measurement?

   (A) $\pm 0.5\%$

   (B) $\pm 0.09\%$ $\quad \frac{\pm 0.05}{52.7} \times 100$

   (C) $\pm 0.05\%$

   (D) $\pm 9.49\%$

4. What is the effect on the mean and median when a score of 51 is added to the following set of data?

76 84 97 84 81 93

(A) It has no effect on the mean or median.

(B) The mean increases slightly, the median stays the same.

(C) The median decreases slightly, the mean stays the same.

(D) The mean decreases, the median stays the same.

5. Which expression gives the correct value for $x$ in the diagram?

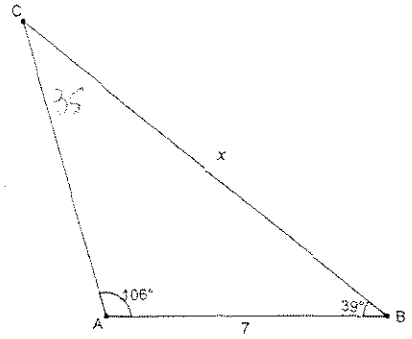
(A) $x = \frac{\sin 106° \times 7}{\sin 39°}$

(B) $x = \frac{\sin 106° \times 7}{\sin 35°}$

(C) $x = \frac{\sin 39° \times 7}{\sin 106°}$

(D) $x = \frac{\sin 35° \times 7}{\sin 106°}$

$\frac{x}{\sin 106} = \frac{7}{\sin 35}$




6. Marie is choosing an alpha-numeric code. She must choose 4 letters and 4 numbers. How many different arrangements are possible?

(A) 144

(B) 4160

(C) 466 976

(D) 4 569 760 000

$26^4 \times 10^4$

7. Sally borrowed \$18 000 for 5 years at 6.5% p.a. flat rate interest to buy a car. What is her monthly repayment?

(A) \$5850

(B) \$487.50

(C) \$397.50

(D) \$97.50

$I = Prt$
$= 18000 \times 0.065 \times 5$
$= 5850$

$A = P + I$
$= 18000 + 5850$
$= 23850$

months in 5 years
$5 \times 12 = 60$

monthly repay
$\frac{23850}{60} =$



8. The great circle distance between Capetown, South Africa and Brussels, Belgium is 11788 km. What is the angle (to the nearest degree) made at the centre of the Earth by these two cities, if the radius of the Earth is 6400 km?

(A) 106°

(B) 105°32′

(C) 105°

(D) 211°

$11788 = \frac{\theta}{360} \times 2\pi \times 6400$

$\frac{11788 \times 360}{2\pi \times 6400} = \frac{\theta \times 2\pi \times 6400}{2\pi \times 6400}$

$\theta = 105°32'$

9. Which of the following equations is an example of an exponential function?

(A) $y = \frac{2}{x}$

(B) $y = 2x^3$

(C) $y = 2^x$

(D) $y = 2x^2$

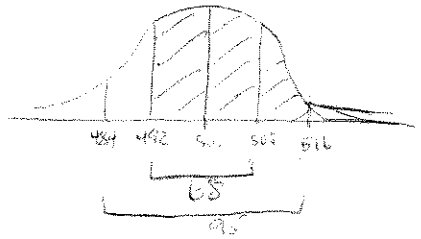
10. The weights of coffee packages are normally distributed. The mean weight per package is 500 g and the standard deviation is 8 g. What percentage of coffee packages are between 492 g and 516 g?

(A) 68%

(B) 81.5%

(C) 34%

(D) 47.5%




$68 + 13.5$

11. How many 120 MB files can be stored in an 8 GB USB?

(A) 8192

(B) 68

(C) 8000

(D) 67

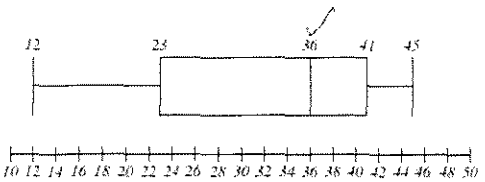
$\frac{8\ GB \times 2^{10}}{120}$

B 2
KB $2^{10}$
MB $2^{20}$
GB $2^{30}$ $\quad 2^{33}$

**12.** Which box-and whisker plot matches the following data:

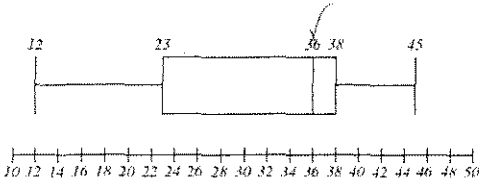
Range: 33
Median: 36
Interquartile range: 18

(A)



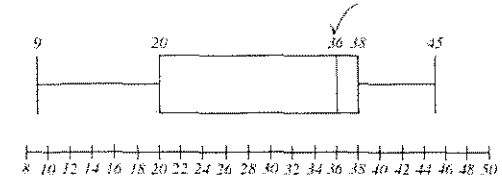

R = 33
IQR = 18

(B)



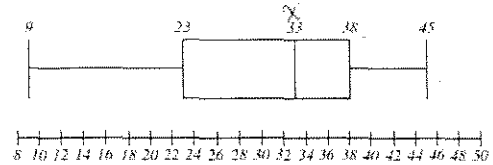

R = 33
IQR = 15 ×

(C)




R = 36 ×
IQR = 18

(D)




**13.** Calculate the volume of this grain silo to 2 decimal places.

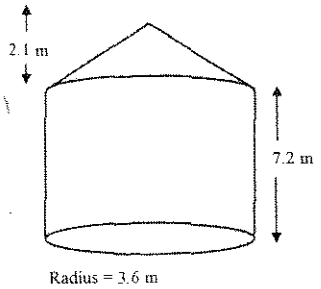
(A) 321.65 $m^3$

(B) 293.15 $m^3$

(C) 85.50 $m^3$

(D) 378.65 $m^3$

$V = \pi \times 3.6^2 \times 7.2$
$+ \frac{1}{3}\pi \times 3.6^2 \times 2.1$




Radius = 3.6 m



**14.** This table shows the future value of an annuity with a contribution of $1 at the end of each period.

**Future value interest factors**
**(Future value of an annuity with a contribution of $1 at the end of each period)**

| Period | Interest rate per period | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1% | 2% | 3% | 4% | 5% | 6% | 8% | 10% | 12% |
| 1 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 2 | 2.0100 | 2.0200 | 2.0300 | 2.0400 | 2.0500 | 2.0600 | 2.0800 | 2.1000 | 2.1200 |
| 3 | 3.0301 | 3.0604 | 3.0909 | 3.1216 | 3.1525 | 3.1836 | 3.2464 | 3.3100 | 3.3744 |
| 4 | 4.0604 | 4.1216 | 4.1836 | 4.2465 | 4.3101 | 4.3746 | 4.5061 | 4.6410 | 4.7793 |
| 5 | 5.1010 | 5.2040 | 5.3091 | 5.4163 | 5.5256 | 5.6371 | 5.8666 | 6.1051 | 6.3528 |
| 6 | 6.1520 | 6.3081 | 6.4684 | 6.6330 | 6.8019 | 6.9753 | 7.3359 | 7.7156 | 8.1152 |
| 7 | 7.2135 | 7.4343 | 7.6625 | 7.8983 | 8.1420 | 8.3938 | 8.9228 | 9.4872 | 10.0890 |
| 8 | 8.2857 | 8.5830 | 8.8923 | 9.2142 | 9.5491 | 9.8975 | 10.6366 | 11.4359 | 12.2997 |
| 9 | 9.3685 | 9.7546 | 10.1591 | 10.5828 | 11.0266 | 11.4913 | 12.4876 | 13.5795 | 14.7757 |
| 10 | 10.4622 | 10.9497 | 11.4639 | 12.0061 | 12.5779 | 13.1808 | 14.4866 | 15.9374 | 17.5487 |
| 11 | 11.5668 | 12.1687 | 12.8078 | 13.4864 | 14.2068 | 14.9716 | 16.6455 | 18.5312 | 20.6546 |
| 12 | 12.6825 | 13.4121 | 14.1920 | 15.0258 | 15.9171 | 16.8699 | 18.9771 | 21.3843 | 24.1331 |

Use the table to calculate the future value of an annuity with contribution of $5000 per year at 8% p.a. for five years.

$5.8666 \times 5000$

(A) $47 745.50

(B) $7346.64

(C) $29 333

(D) $7000

**15.** In a game, there is a ¼ chance that you will win $5, a ½ chance you will draw for no money and a ¼ chance that you will lose $2. What is the financial expectation for the game?

(A) $0.75

(B) $1.25

(C) $3.00

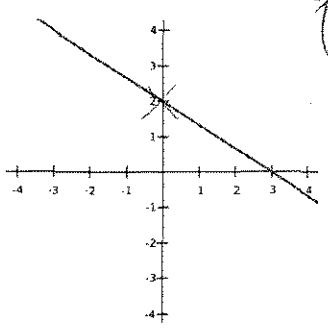
(D) $2.25

$\frac{1}{4} \times 5 = 1.25$
$\frac{1}{2} \times 0 = 0$
$\frac{1}{4} \times -2 = -0.50$
$0.75$

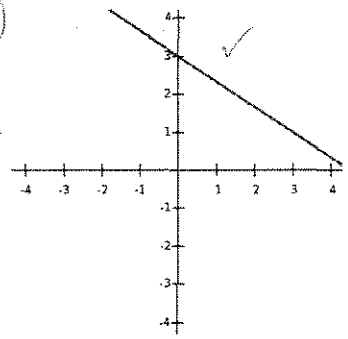
**16.** Which graph matches the equation $y = \frac{-2x}{3} + 3$

neg. gradient
y-int

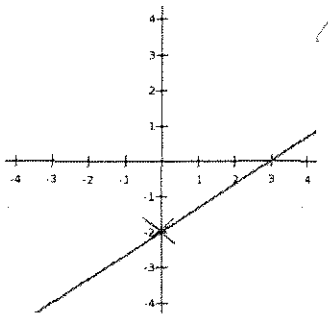
(A)



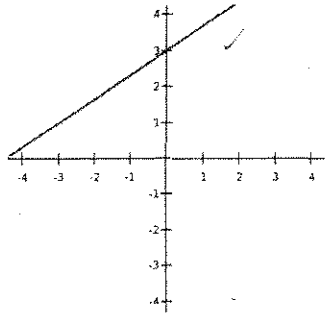
(C)



(B)



(D)



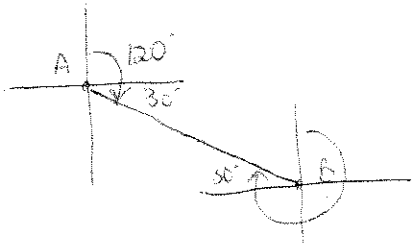
**17.** Briggsburg is on a bearing of 120° from Allentown. What is the bearing from Briggsburg to Allentown?

(A) 120°

(B) 330°

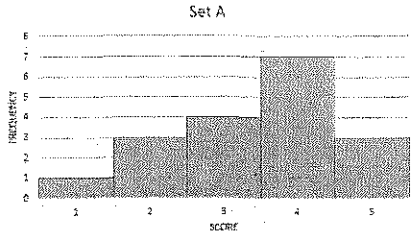
(C) 30°

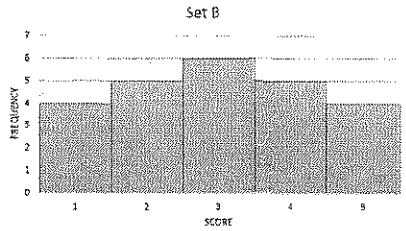
(D) 300°






**18.** The data sets A and B are displayed in histograms:




Which of the following statements is false?

(A) Set A has a higher mode than Set B  A = 4  B = 3

(B) Set A and Set B have the same range.  A = 5 - 1 = 4  B = 5 - 1 = 4

(C) Set A is negatively skewed.

(D) Set A has a lower median than Set B.  A = 4  B = 3

**19.** What is the percentage change equivalent for an increase of 12% followed by a decrease of 15%?

(A) Decrease of 3%

(B) Decrease of 4.8%

(C) Increase of 1.2%

(D) Increase of 3%

100 × 0.12 = 12
100 + 12 = 112
112 × 0.15 = 16.8
112 - 16.8 = 95.2
100 - 95.2 = 4.8% decrease.

**20.** Australian Eastern Standard Time (AEST) is 10 hours ahead of Greenwich Mean Time. Calculate the local time in London (52°N, 0°) when it is 3 pm in Orange and daylight savings time is operating in the United Kingdom.

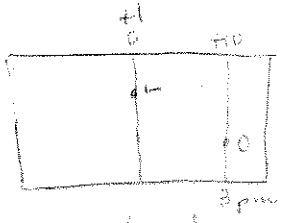
(A) 5 am

(B) 6 am

(C) 7 am

(D) 12 am tomorrow

3pm - 9h =




10 - 1 = 9 hours ahead

**21.** The time taken to complete a job is inversely related to the number of labourers on the job. If it takes 3 men 6 hours to complete a job, how long will it take to complete a job with 5 labourers?

(A) 10 hours

(B) 3 hours and 30 minutes

(C) 3 hours and 40 minutes

(D) 3 hours and 36 minutes

$y = \frac{k}{x}$ $\quad t = \frac{k}{w}$ $\quad 6 = \frac{k}{3}$ $\quad k = 18$

$t = \frac{18}{w}$ $\quad t = \frac{18}{5}$ $\quad = 3.6\text{h}.$

**22.** The scores on a recent test are normally distributed. The mean is 69% and the standard deviation is 9. If Jamis has a z-score of 1.2, what is his score on the test (to the nearest percentage)?

(A) 92%

(B) 74%

(C) 80%

(D) 78%

$1.2 = \frac{x - 69}{9}$

$1.2 \times 9 = x - 69$

$x = 10.8 + 69$

$= 79.8$

**23.** Tessa is a female who weighs 65 kg and has a blood alcohol content (BAC) of 0.065. If Tessa was drinking over the course of 5 hours at a party, how many standard drinks did she consume?

(A) 5

(B) 5.5

(C) 6

(D) 6.5

$0.065 = \frac{10N - 7.5 \times 5}{5.5 \times 6.5}$

$23.2375 = 10N - 37.5$

$60.7375 = 10N$

$N = 6.07\ldots$

**24.** Jayden pays \$35/month for his phone plan which includes 200 MB data and \$60 of free calls and texts. Additional data costs 25 c per MB. The connection fee is \$0.40 and then 68 c per minute. How much was his bill last month if Jayden made 14 calls lasting an average of 6 minutes each and he exceeds his data allowance by 26 MB?

(A) \$104.22

(B) \$44.22

(C) \$35

(D) \$38.62

$35 + 0.40 \times 14 + 14 \times 0.68 \times 6 + 0.25 \times 26 - 60$



**25.** Sam earns 3% commission on every house he sells. If his commission this month was \$9870, what was the value of the property he sold?

(A) \$296.10

(B) \$10 166.10

(C) \$29 610

(D) \$329 000

$\frac{9870}{0.03} = \frac{0.03x}{0.03}$

**END OF SECTION I**

## Section II

**Student Number:** _____

**75 marks**
**Attempt Questions 26 - 30**
**Allow about 1 hour and 55 minutes for this section**

Answer the questions in the spaces provided.

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

Extra writing space is provided on page 25. If you use this space, clearly indicate which question you are answering.

---

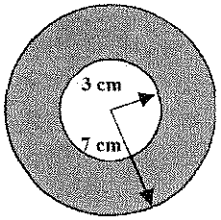
**Question 26** (15 marks)

a) Solve these equations simultaneously **2**

$$x + 3y = 14$$
$$y = 2x$$

$x + 3(2x) = 14$
$\frac{7x}{7} = \frac{14}{7}$ ✓
$x = 2$ ✓ $y = 2 \times 2$
$y = 4$ ✓

b) Find the area of the annulus correct to 2 decimal places. **2**




$A = \pi(7^2 - 3^2)$ ✓
$= 40\pi$
$= 125.66\ cm^2$ ✓

**Question 26 continues on page 12**





c) This table shows the progress of a $120 000 reducing balance loan at 8% p.a. interest. The monthly repayment is $1120.

| | |
|---|---|
| Amount borrowed | $120 000 |
| Interest rate | 8% p.a. |
| Monthly repayment | $1120 |

| Month (n) | Principal (P) | Interest (I) | Amount Owing (P + I) | Balance (P + I − R) |
|---|---|---|---|---|
| 1 | $120 000 | $800 | $120 800 | $119 680 |
| 2 | $119 680 | $797.87 | $120 477.87 | $119 357.87 |
| 3 | $119 357.87 | $795.72 | $120 153.59 | $119 033.59 |
| 4 | $119 033.59 | $793.56 | $119 827.15 | $118 707.15 |
| 5 | 118707.15 | $791.38 | 119498.53 | $118 378.53 |

i) How much total interest has been paid in the first four months? **1**

$800 + 797.87 + 795.72 + 793.56 = \$3187.15$

ii) Calculate the interest for the fifth month. **1**

$118707.15 \times 0.08 \div 12 = \$791.38$

iii) Calculate the balance at the end of the fifth month. **1**

$118707.15 + 791.38 - 1120 = \$118378.53$

**Question 26 continues on page 13**

d) The following two-way table shows the results of a survey conducted of 1200 students about body image.

| | | Body Image | | | |
|---|---|---|---|---|---|
| | | About Right | Overweight | Underweight | **Total** |
| Gender | Female | 560 | 163 | 37 | 760 |
| | Male | 295 | 72 | 73 | 440 |
| | **Total** | 855 | 235 | 110 | 1200 |

i) What fraction of the students surveyed believe that they are "about right" in weight? **1**

$\frac{855}{1200} = \frac{57}{80}$

ii) What percentage of students who believe they are overweight are female? **1**

$\frac{163}{235} \times 100 = 69\%$

iii) What percentage of males believe they are either overweight or underweight? **1**

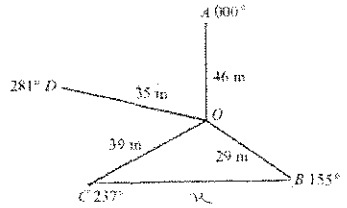
$\frac{72 + 73}{440} \times 100 = 33\%$

**Question 26 continues on page 14**





e) The diagram below is a compass radial survey.




i) Find size of $\angle BOC$. **1**

$237 - 155 = 82^\circ$

ii) Connect $BC$. Calculate this length to 2 decimal places. **2**

$x^2 = 29^2 + 39^2 - 2 \times 29 \times 39 \cos 82^\circ$ ✓

$\approx 2047.19$

$= 45.25\text{ m}$ ✓

iii) Find the area of $\Delta BOC$ to the nearest square metre.

$A = \frac{1}{2} \times 29 \times 39 \sin 82^\circ$ ✓

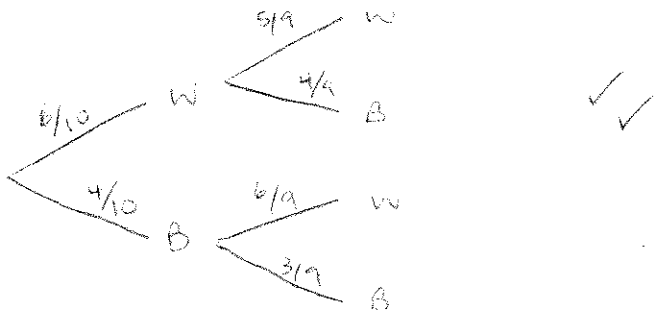
$= 560\text{ m}^2$ ✓

**End of Question 26**

**Question 27** (15marks) **Student Number:** _____

a) In Chris's drawer he has 6 white socks and 4 black socks. He makes two selections (without replacement) hoping to get a pair.

i) Draw a probability tree diagram to represent this situation. **2**




ii) What is the probability of Chris selecting a white sock on his first selection. **1**

$\frac{6}{10} = \frac{3}{5}$

iii) What is the probability that Chris will select a matching pair of socks **2**

$P(WW) = \frac{6}{10} \times \frac{5}{9} = \frac{1}{3}$ ✓

$P(BB) = \frac{4}{10} \times \frac{3}{9} = \frac{2}{15}$

$\frac{1}{3} + \frac{2}{15} = \frac{7}{15}$ ✓

b) Rearrange the equation to make $a$ the subject. **2**

$$s = ut + \frac{1}{2}at^2$$

$s - ut = \frac{1}{2}at^2$

$\frac{2(s-ut)}{t^2} = \frac{at^2}{t^2}$

$a = \frac{2(s-ut)}{t^2}$

**Question 27 continues on page 16**





c) The table below shows the lengths and weights of 8 babies at birth.

| Length (cm) | 49.2 | 48.8 | 48.8 | 49.7 | 49.4 | 49.1 | 49.5 | 49.4 |
|---|---|---|---|---|---|---|---|---|
| Weight (kg) | 3.28 | 3.18 | 3.32 | 3.21 | 3.35 | 3.28 | 3.37 | 3.23 |

i) Using this data, determine the correlation coefficient, correct to 4 significant figures. **1**

$r = 0.1351$

ii) Describe the correlation between length and weight of babies. **1**

weak positive correlation

iii) The gradient of the least-squares line of best fit can be determined using the formula:

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

Calculate the gradient for this set of data, correct to ~~2 decimal places.~~ **1**
Show your working.

$m = 0.1351 \times \frac{0.063196}{0.303858\ldots}$

$m = 0.03$

iv) The y-intercept of the least-squares line of best fit can be determined using the formula:

$$b = \text{mean of } y \text{ scores} - m \times \text{mean of } x \text{ scores}$$

Calculate the y-intercept for this set of data, correct to 2 decimal places. **1**
Show your working.

$b = 3.2775 - 0.03 \times 49.2375$

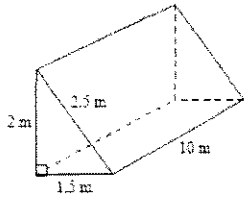
$= 1.80$

v) Write the equation for of the least-squares line of best fit using your answers from part iii) and iv). **1**

$y = 0.03x + 1.80$

**Question 27 continues on page 17**

d) i) Calculate the surface area of this figure. **2**




$SA = 2(\frac{1}{2} \times 2 \times 1.5) + 2.5 \times 10 + 2 \times 10 + 1.5 \times 10$ ✓
$= 3 + 25 + 20 + 15$
$= 63\ m^2$ ✓

ii) Emily wants to paint this figure. If a litre of paint will cover 11 $m^2$, how many litres of paint will she need to buy? **1**

$\frac{63}{11} = 5.73$ 6 Litres of paint.

**End of Question 27**





a) Jose is in Rio de Janeiro, Brazil (23°S, 43°W). He wants to call his friend Kali in New Dehli, India (28°N, 77°E).

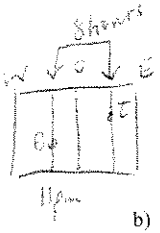
i) Determine the difference in longitude between the two cities. **1**

$77 + 43 = 120°$

ii) What is the time difference between Rio de Janeiro and New Dehli? **1**

$\frac{120}{15} = 8$ hours

iii) What time is it in New Dehli, if Jose places a call at 11:00 pm on Tuesday? **2**




11pm + 8hours = 7am on Wednesday ✓ ✓

b) The braking distance in metres ($d$) taken by a car directly varies as the square of its speed ($v$). It takes Charles 12 m to stop when his car is travelling 60 km/h.

i) Write the variation equation for finding braking distance ($d$) in terms of speed ($v$). **2**

$y = kx^2$
$12 = k \times 60^2$
$\frac{12}{60^2} = \frac{k \times 60^2}{60^2}$
$k = 0.003$ ✓
$d = 0.003v^2$ ✓
$d = \frac{1}{300}v^2$

ii) What would the braking distance be (to nearest metre) if Charles is travelling at 110 km/h? **1**

$d = 0.003 \times 110^2$
$= 40$ m

iii) How fast (to the nearest km) is Charles travelling if it takes him 25 m to stop? **1**

$25 = 0.003v^2$
$\sqrt{7500} = \sqrt{v^2}$
$v = 87$ km

**Question 28 continues on page 19**

c) The capture-recapture technique was used to estimate the number of fish in a lake. 200 fish were caught and tagged and then released. A month later 300 fish are caught, of which 26 fish are tagged. Estimate the fish population of the lake. **2**

$\frac{200}{P} = \frac{26}{300}$ ✓

$P = 2307.69$ ✓

$\approx 2305$ fish

d) Greg has a credit card account with no interest-free period and an interest rate of 14% p.a. Between August 1 and August 31 he makes the following purchases:

| Date | Purchase | Amount | |
|---|---|---|---|
| August 1 | Dinner | $45.00 | 31 days |
| August 7 | Petrol | $49.55 | 25 days |
| August 18 | Appliances | $51.90 | 14 days |

i) Greg pays $0.48 in interest for his petrol purchase. Show how this was calculated. **1**

Aug 31 − Aug 7 = 24 + 1 = 25 days

$\frac{49.55 \times 0.14 \times 25}{365} = 0.475$

$= 0.48$

ii) Calculate the amount owing, including interest for the month of August. **2**

Total = 45 + 49.55 + 51.90 = $146.45

Interest = $\frac{45 \times 31 \times 0.14}{365} = 0.54$

$= \frac{51.90 \times 14 \times 0.14}{365} = 0.28$

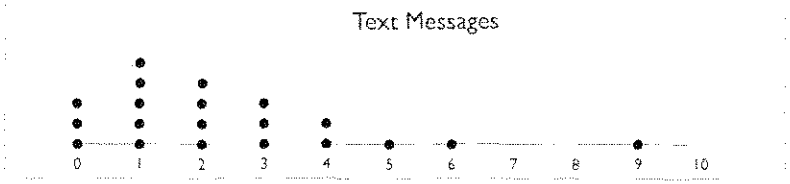
146.45 + 0.54 + 0.28 + 0.48 = $147.75

**Question 28 continues on page 20**





e) The dot plot below shows the number of text messages sent by 20 students on a particular day.




i) Describe the shape of the distribution. **1**

positively skewed
uni-modal

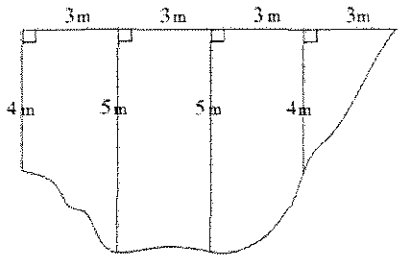
ii) Give the outlier and discuss which measure of central tendency (mean, median or mode) will be most affected by it. **1**

9, The outlier will affect the mean the most
It has no affect on mode or median

**End of Question 28**

**Question 29** (15 marks) **Student Number:** _____

a) This is a cross-section of a river.



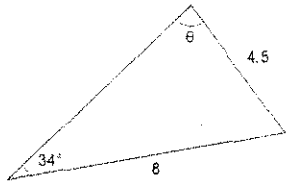

Using two applications of Simpson's rule, find the approximate area of this cross-section of the river. 3

$A = \frac{3}{3}(4+4\times5+5) + \frac{3}{3}(5+4\times4+0)$

$= 29 + 21$

$= 50\,m^2$ ✓

b) Find the value of $\theta$, if $\theta$ is obtuse. 2




$\frac{\sin 34^\circ}{4.5} = \frac{\sin\theta}{8}$

$\sin\theta = 0.99$

$\theta = \sin^{-1}(0.99)$ ✓

$\theta = 82^\circ 47'$

$180 - 82^\circ 47' = 96^\circ 13'$ ✓

**Question 29 continues on page 22**



Question 29 (continued) **Student Number:** _____

c) Caroline receives chemotherapy via an intravenous drip. The solution delivered contains 150 mg of chemo drugs in every 200 mL of solution.

i) Caroline needs 600 mg of the chemo drugs per day. How much of the solution should the nurse prepare for one day? 1

$\frac{150\,mg}{200\,mL} = \frac{600\,mg}{x}$ $x = 800\,mL$

ii) If each millilitre of solution contains 12 drops, how many drops are needed? 1

$12 \times 800 = 9600$ drops

iii) The intravenous drip runs for 4 hours. What is the drip rate (drops per minute)? 1

$9600 \div 240 = 40$ drops/min

$4 \times 60 = 240$ min

d) There are 10 players on a netball team. Only 7 players take the court at a time. How many different combinations of 7 players are possible? 2

$\frac{10\times9\times8\times7\times6\times5\times4}{7!} = 120$ ✓

e) Karen is 13 years old and weighs 49 kg. She is prescribed a drug with a recommended adult dose of 375 mg twice a day. Use Clark's formula to calculate her daily dosage, to the nearest mg. 2

$$\text{child's dosage} = \frac{\text{weight in kg}}{70} \times \text{adult dosage}$$

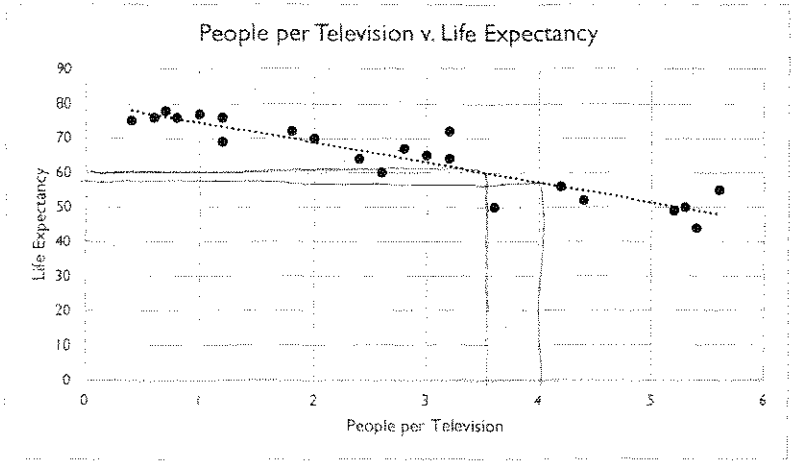
$= \frac{49}{70} \times 375$

$= 262.5 \times 2$ ✓

$= 525$ mg/day ✓

**Question 29 continues on page 23**

f) The following scatterplot compares the number of people per television to their life expectancy.




i) Describe the trend of the data. **1**

negative strong correlation

ii) Using the line of best fit, estimate the life expectancy of someone living in an area where there are four people per television. **1**

55 - 59 (57)

iii) Using the line of best fit, estimate the number of people per television for someone with a life expectancy of 60. **1**

3.3 - 3.7 (3.5)

**End of Question 29**





a) The table below shows Brian's marks in two of his exams.

| Subject | Brian's Mark | Class Average | Class Standard Deviation |
|---|---|---|---|
| English | 68% | 61% | 5 |
| Maths | 72% | 65% | 8 |

i) Find Brian's z-score for each subject. **2**

$z = \frac{68-61}{5}$ $z = \frac{72-65}{8}$

Eng = 1.4 ✓ Maths = 0.875 ✓

ii) In which subject did Brian perform better? Justify your answer. **2**

Brian performed better in English because he was over 1 standard deviation higher above the mean. In maths he was less than 1 standard deviation from the mean ✓

b) Stamp duty for purchasing a car is 3% of the purchase price up to $45 000 plus 5% for every dollar over $45 000.

i) Find the stamp duty on a car that is purchased for $53 900. **1**

$= 0.03 \times 45000 + 0.05 (53900 - 45000)$

$= \$1795$

ii) How much is the purchase price of a car whose stamp duty is $747? **1**

$747 = 0.03 \times x$

$\frac{747}{0.03} \quad \frac{0.03x}{0.03}$

$x = \$24900$

**Question 30 continues on page 25**

c) The table below shows the amount of petrol in the tank in litres ($P$) and the distance travelled in kilometres ($d$).

| Distance travelled ($d$) | 50 | 100 | 150 | 200 | 250 |
|---|---|---|---|---|---|
| Petrol in tank ($P$) | 36.65 | 33.3 | 29.95 | 26.6 | 23.25 |

i) Which is the dependent variable? **1**

petrol

ii) Calculate the gradient and describe what it represents. **2**

$m = \frac{36.65 - 33.3}{50 - 100}$ ✓

$= -0.067$

the amount of petrol used per km travelled. ✓

iii) Calculate the y-intercept and describe what it represents. **2**

$33.3 = -0.067 \times 100 + b$

$33.3 = -6.7 + b$

$+6.7 \quad +6.7$ ✓

$b = 40$

The amount of petrol in the tank before travelling any distance ✓

iv) Write the linear equation that models this situation. **1**

$y = -0.67x + 40$ $P = -0.67d + 40$

v) What distance has been travelled (to the nearest km) when there is no petrol remaining in the tank? **1**

$0 = -0.67d + 40$

$-40 \quad -40$

$\frac{-40}{-0.67} = \frac{-0.67d}{-0.67}$ $d = 597$ km

**Question 30 continues on page 26**





d) The graph of $y = -x^2 + 2$ is a parabola. Describe whether the graph is concave up or down and give the coordinates for the turning point. **2**

concave down ✓

(0, 2) ✓ (y-int)

**End of Paper**

**Section II Extra writing space** **Student Number:** _____

**If you use this space, clearly indicate which questions you are answering.**



**Student Number:** _____

# 2015

# Year 12 Mathematics General 2
## Trial Examination

### MULTIPLE CHOICE ANSWER SHEET

For multiple choice questions, choose the best answer A, B, C or D and fill in the correct circle.

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