

pany debentures. If the total value of the two investments was SAR 26 779.35 after 3 years, calculate the amount of money he left in the bank account.

- 8 Margarita bought a second-hand MGB sports car, in 1990, for \$9500. From the time of purchase, the value of the car depreciated at an average annual rate of 17.5%.
- a Copy and complete the table below, showing the book value of Margarita's car at the beginning and end of each of the first three years, and the amount of depreciation for each of those years.

Year	Book Value at start	Depreciation	Book Value at end
1	9500	1662.50	7837.50
2	7837.50		
3			

For the next two years, the value of the car depreciated by 10% per year.

- b Write down the value of the car at the end of each of these two years.
- c i Calculate the total amount of depreciation over the five years.  
ii Find the compounding, annual depreciation rate for the whole of the five years.
- d At the end of 1995, Margarita's MGB was 25 years old. It had become a 'classic'. Classic cars are much sought after by car enthusiasts and the price tends to rise over time. If the average appreciation rate for Margarita's classic MGB was 8% per year after 1995, determine the value of her car at the end of 2005.
- e Calculate the percentage change in the value of the MGB from the day of purchase.

## SPECIMEN EXAMINATION A

### Paper 1

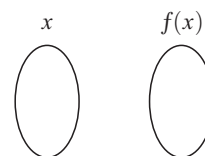
- 1 The following list of numbers is given:

$$\sqrt{3}, \frac{1}{3}, 5, \pi, -5, \sqrt{16}, 0.\dot{6}.$$

- a Write down the numbers from the list which belong to the set of integers.
- b Write down the numbers from the list which belong to the set of rational numbers.
- c Write down the numbers from the list which belong to the set of natural numbers.

- 2 A function  $f : x \mapsto 2x^2 + x - 3$  is defined for  $x \in \{-2, -1, 0, 1, 2\}$

- a Represent  $f$  using the given mapping diagram.



- b i Express the elements of the domain of  $f$  using interval notation.  
ii List the elements of the range of  $f$ .

- 3 The exact measurements of the length and width of a rectangular swimming pool are 9.85 m and 5.90 m respectively.

- a Calculate the area of the surface of the swimming pool.
- b Jonty rounds these measurements to the nearest whole number before he calculates the area. Determine the percentage error in Jonty's calculation.

- 4 30 students were asked the type of milk drinks they liked. 8 students said they liked plain milk only, 13 liked chocolate milk only and 4 students did not like either.

- a Find the number of students who liked both plain and chocolate milk.
- b Represent the information above on a Venn diagram.
- c Determine the probability of a student, chosen at random from this group, liking only one type of milk.

- 5 The frequency table below shows the price of tickets for attending various events at the Festival of Arts.

Cost (\$)	Number of events
20 - 39	12
40 - 59	15
60 - 79	11
80 - 99	7
100 - 119	5

- a Find the probability of a ticket for a randomly chosen event at the festival costing more than \$60.
- b Find the mean and standard deviation for the price of tickets.
- c Find the percentage of events whose ticket price is less than 0.722 standard deviations above the mean.

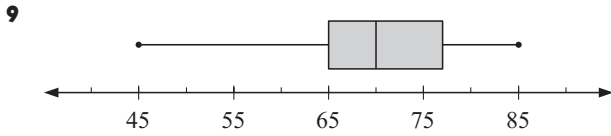
- 6 Andy travels from New York to London. He can buy 1.00 USD for 0.80 GBP and can sell 1.00 USD for 0.75 GBP. Andy converts 2000 USD into GBP.

- a How many GBP does he receive?
- b He spends 1200 GBP whilst in London and then converts the remaining GBP back into USD. Find how many GBP he has remaining?
- c Calculate how many USD he receives.

- 7 The seventh term of a geometric sequence is 320 and the eleventh term is 5120. Find

- a the common ratio  
b the first term  
c the twentieth term.

- 8 James and Lesley invested \$20 000 in a fund which paid 6.8% per annum nominal interest, compounded monthly.
- Find the value of their investment after 48 months.
  - The average rate of inflation during these 4 years was 3.2% per annum.  
Increase the value of the original investment to account for inflation over the four years.
  - The real increase for an investment is defined as the actual increase – the original value, indexed for inflation.  
Calculate the real increase in the value of James and Lesley's investment.

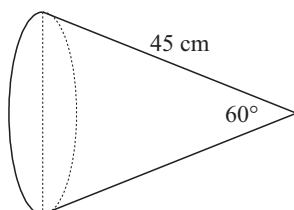


For the box plot shown above:

- Find the values of the upper and lower quartiles.
  - Calculate the value of the interquartile range.
  - Determine whether the minimum value is an outlier.
- 10 A company produces plastic boxes. The company sells the boxes for \$12.50 each. The company estimates the cost of producing  $x$  boxes as  $\$(9.5x + 45)$ . Calculate:
- the profit made when 100 boxes are produced and sold
  - the number of boxes which must be produced and sold for the firm to 'break-even' (Revenue = Cost)
  - the number of boxes needed to be produced and sold to make a profit of \$1000.
- 11 The truth table below shows some truth-values for the statement  $(p \vee q) \Rightarrow \neg(p \wedge q) \vee q$

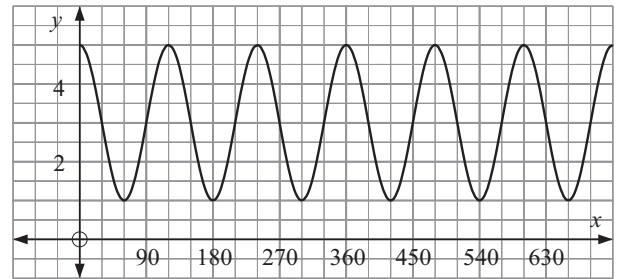
$p \wedge q$	$\neg(p \wedge q)$	$p \vee q$	$\neg(p \wedge q) \vee q$	$(p \vee q) \Rightarrow \neg(p \wedge q) \vee q$
T	F	F		
F	T	T	T	T
F	T	T	T	T
F	T			T

- Fill in the missing truth-values on the table.
  - Write down the contrapositive of the statement:  
If Bozo is a clown then Bozo has a red nose.
- 12
- Find the equation of the line joining the points  $A(-2, -3)$  and  $B(1, 3)$ , giving your answer in the form  $ax + by + d = 0$  where  $a, b, d \in \mathbb{Z}$ .
  - Find the equation of the perpendicular bisector of AB.
- 13 A function is defined as  $f(x) = ax^2 + bx + d$ , where  $a, b$  and  $d$  are integers.
- Find an expression for  $f'(x)$ .
  - If  $f'(x) = 5x - 10$ , find the values of  $a$  and  $b$ .
  - The minimum value of  $f(x)$  is  $-4$ .  
Determine the  $x$ -coordinate of the minimum value of  $f(x)$  and hence find the value of  $d$ .
- 14 A megaphone in the shape of a cone has vertical angle  $60^\circ$  and a slant height of 45 cm as shown in the diagram below.



- Determine the diameter of the megaphone.
- Determine the volume of the megaphone.

- 15 The diagram shows part of the graph of a cosine function.



- Using the graph:
  - write down the amplitude
  - find the period.
- If the graph has equation  $y = a \cos(bx) + c$  state the values of  $a, b$  and  $c$ .

## Paper 2

- 1 The coordinates of the vertices of a parallelogram are  $A(-2, 1)$ ,  $B(6, 3)$ ,  $C(3, -1)$ , and  $D(-5, d)$ . AC is a diagonal of the parallelogram.
- Using a scale of 1 cm to represent 1 unit on both axes, plot the points A, B and C. (2 marks)
  - Find the gradient of the line through B and C.
    - Explain why the gradient of AD is the same as the gradient of BC.
    - Find the value of  $d$ . (5 marks)
  - The length of AC is  $\sqrt{27}$  units and BC is 5 units long.
    - Find the length of AB.
    - Find the value of angle ABC. (6 marks)
  - Find the area of the parallelogram ABCD. (3 marks)
- 2 A sports locker at school contains 6 basketballs, 9 footballs and 5 volleyballs. During a sports lesson, a teacher chooses two balls from the locker at random, without replacement.
- Draw a tree diagram showing all the possible outcomes. Write the probabilities for each branch on the diagram. (4 marks)
  - Find the probability that the teacher chooses:
    - two basketballs
    - one basketball and one football
    - both balls the same. (8 marks)
  - The two balls are replaced at the end of the lesson. During the next lesson, another teacher chooses a ball at random from the locker, replaces it, and then chooses a second ball. Determine the probability that the balls chosen are:
    - two volleyballs
    - both basketballs, given that the two balls are the same. (6 marks)
- 3 The temperature of a cup of coffee in a plastic cup,  $t$  minutes after it is poured, is modelled by  $T_P(t) = 61 \times (0.95)^t + 18$ .
- Calculate the values of  $a$  and  $b$  in the table below.

Time $t$ (min)	0	5	10	15	20	25	30
Temp. ( $^\circ\text{C}$ )	$a$	65.2	54.5	46.3	39.9	34.9	$b$

    - Find the time it will take for the temperature to reach  $25^\circ$ . (4 marks)
  - On graph paper using 1 cm for every two minutes on the horizontal axis and 1 cm for every  $10^\circ\text{C}$  on the vertical axis, draw and label a graph representing this information. (4 marks)

- c** A china cup is used for a new cup of coffee. The temperature of coffee in the china cup  $T_F$ ,  $t$  minutes after it is poured, is given by  $T_F(t) = 53 \times (0.98)^t + 18$
- Determine the initial temperature of the new cup of coffee.
  - Comment on the rate of heat loss of the china cup compared to the original plastic cup.
  - Using your graphic display calculator, determine the time it takes for the temperature within each cup to be equal. Give your answer correct to the nearest tenth of a minute. (6 marks)
- d** In the longer term, what temperature will each cup of coffee approach? (2 marks)

- 4 a** The following table shows the number of people using a public swimming pool in a particular month. The maximum daily temperatures vary from  $18^\circ$  to  $35^\circ$ .

Max. temperature	$^\circ\text{C}$	Daily attendance	
Mean	29.9	Mean	87.3
Standard Deviation	4.78	Standard Deviation	21.4

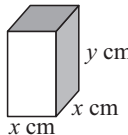
The covariance for temperature and attendance is 93.7.

- Determine the value of the coefficient of correlation ( $r$ ) for this data.
  - Describe the nature of the relationship between the maximum temperature and attendance at the swimming pool. (5 marks)
- Find the equation of the linear regression line for attendance as a function of temperature. (4 marks)
- Use the equation of linear regression to estimate the number of people attending the pool on a day when the maximum temperature is:
  - $20^\circ$
    - $40^\circ$
  - Which of the estimates in **iii a** is the more reliable? Give a reason for your answer. (5 marks)
- The manager of the pool plans to use the forecast temperature to determine the number of staff to be employed each day. Does the manager's plan seem sensible? Justify your answer. (2 marks)
- The manager of the pool records the gender of the swimmers attending the pool each day. She believes that the maximum temperature on any day causes a different attendance pattern for males and females.

Given the following information about average daily attendance and temperature, conduct a chi-squared test at the 5% significance level to determine if the manager is right.

	Temp. $< 30$	Temp. $\geq 30$
Male	36	47
Female	51	40

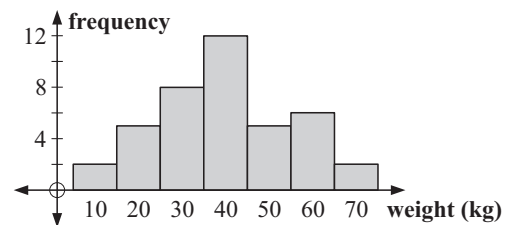
- Write down a suitable hypothesis for the chi-squared test. (1 mark)
- Find the  $p$ -value of the chi-squared statistic for this data. (2 marks)
- What conclusion can be drawn from the test? Justify your answer. (2 marks)

- 5 a** For the function  $f(x) = 3x^3 - 4x + 5$ :
- Find  $f(1)$ . (2 marks)
  - Calculate  $f'(x)$ . (2 marks)
  - Find the gradient of the tangent at  $x = 1$ . (2 marks)
  - Determine, algebraically, the equation of the tangent to the curve given by  $f(x) = 3x^3 - 4x + 5$  at the point where  $x = 1$ . (2 marks)
  - The tangent to the curve at  $x = 1$  intersects  $f(x)$  at one other point. Using your graphic display calculator, find the coordinates of this point of intersection. (2 marks)
- b** A rectangular box has a square base as shown.
- 
- Write down an expression for the volume  $V$  of the box. (2 marks)
  - Given  $y = \frac{30000 - x^2}{2x}$ , write the volume in terms of  $x$  only. (2 marks)
  - Find  $\frac{dV}{dx}$ . (2 marks)
  - Hence, find the value of  $x$  which maximises the volume of the box. (3 marks)

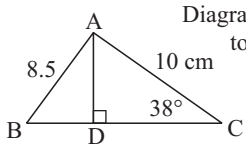
## SPECIMEN EXAMINATION B

### Paper 1

- The number 0.051762 is rounded to 0.0518
  - State which *two* of the following are accurate descriptions of the rounding.
    - Correct to 3 decimal places.
    - Correct to 4 significant figures.
    - Correct to 3 significant figures.
    - Correct to the nearest ten-thousandth.
  - Write 0.0518 in the form  $a \times 10^k$  where  $0 \leq a < 10$ ,  $k \in \mathbb{Z}$ .
  - Calculate the percentage error in the rounding.
- The histogram shows the weight of sheep (to nearest 10 kg).



- Find the number of sheep that were weighed.
- Calculate the mean weight for these sheep.
- The farmer sends all sheep whose weight is more than 25% above the mean, to the market. Determine the percentage of these sheep that will be delivered to the market.

- 3** Triangle ABC is shown in the diagram not to scale with  $AC = 10$  cm and  $AB = 8.5$  cm. Angle  $CDA = 90^\circ$  and angle  $ACD = 38^\circ$ .
- 

Calculate the length of: **a** DC **b** BD

- 4** The cost, in Euros, of producing  $x$  pairs of jeans is  $C(x) = 15.6x + 245$ . Each pair of jeans can be sold for €42.50. Find:
- the total revenue obtained by selling 22 pairs of jeans
  - the cost of producing 22 pairs of jeans
  - the profit made by producing and selling 22 pairs of jeans
  - the profit per pair of jeans.