

YEAR 12 2010 HALF YEARLY
ASSESSMENT TASK 3

GENERAL MATHEMATICS

Tuesday, 27th April 2010
8:30am – 11am

Time Allowed – 2 hours and 30 minutes (plus 5 minutes reading time)

WEIGHTING 30% towards final assessment

Outcomes referred to: H2, H3, H4, H5, H6, H7, H8, H10, H11.

INSTRUCTIONS:

1. Attempt ALL questions.
2. Answer each question in Section 1 on the multiple choice answer sheet provided.
3. Begin each question in Section 2 (Questions 23 – 28) in a new booklet.
4. Show all necessary working for your responses in Section 2.
5. Board of Studies approved calculators with cleared memory are permitted.
6. Write your name and your teacher's name on the Section 1 answer sheet and on each answer booklet.
7. A formulae sheet is provided at the back of this examination paper.

	MARKS
Section 1: Questions 1-22	22
Section 2: Question 23	13
Question 24	13
Question 25	13
Question 26	13
Question 27	13
Question 28	13
TOTAL	100

Section 1 (1 mark each totalling 22 marks)

1. The value of $\frac{\sqrt{3.85}}{2.64 + 7.8}$ correct to two decimal places.
(A) 0.19 (B) 0.61 (C) 5.32 (D) 8.54
2. Which packet of peanuts represents the best value?
(A) 500g for \$3.90 (B) 250g for \$2.10
(C) 360g for \$2.70 (D) 1.5kg for \$11.55
3. Simplify $x^{12} \div x^3$.
(A) 1 (B) 1^4 (C) x^4 (D) x^9
4. The number 386.956 correct to two significant figures is:
(A) 39 (B) 386.95 (C) 386.96 (D) 390
5. Use the formula $s = ut + \frac{1}{2}at^2$ to find s if $u = 8$, $t = 5$ and $a = 10$.
(A) 90 (B) 165 (C) 665 (D) 1290
6. Solve the equation $\frac{3x-1}{2} = 7$
(A) $x = \frac{13}{3}$ (B) $x = 5$ (C) $x = \frac{16}{3}$ (D) $x = 12$
7. Consider the following stem and leaf plot.

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

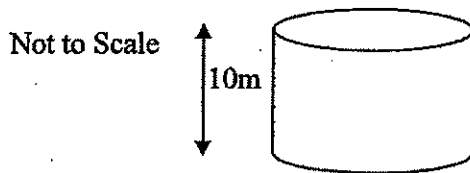
What is the median for this set of data?

- (A) 25 (B) 31.5 (C) 32 (D) 33.5

8. When fully simplified, $\frac{3x+9}{9}$ is the same as:

- (A) x (B) $3x$ (C) $3x + 1$ (D) $\frac{x+3}{3}$

9. A cylindrical tank is used to store chemicals, has a diameter of 6m. What is the storage capacity of this tank to the nearest litre? Note: $(1000\text{cm}^3 = 1 \text{ litre})$.



- (A) 283 (B) 1131 (C) 282 743 (D) 1 130 973

10. The cash price for a computer is \$1990. The computer could be bought on terms for 20% deposit and \$36 per week for one year. What is the total cost when buying on terms?

- (A) \$280 (B) \$1872 (C) \$2270 (D) \$4260

11. Jarred borrows \$60 000 to start a restaurant. Interest is calculated at 9.75% per year. After one year he makes his first repayment of \$15 750. The amount he then owes is closest to:

- (A) \$42 710 (B) \$44 250 (C) \$48 560 (D) \$50 100

12.

MONTHLY REPAYMENTS					
Term of Loan	Amount of Loan				
	\$2 000	\$4 000	\$6 000	\$8 000	\$10 000
6 months	\$353	\$699			
12 months	\$186	\$366	\$570	\$722	\$899
18 months	\$141	\$232	\$380	\$499	\$599
24 months	\$102	\$201	\$289	\$361	\$452
30 months	\$91	\$165	\$251	\$312	\$372
36 months	\$74	\$143	\$282	\$293	\$344

Use the above table to calculate the amount of interest that Robert will pay for a loan of \$8 000 over a term of 18 months.

- (A) \$8 982 (B) \$982 (C) \$664 (D) \$499

13. Hayden was required to solve an equation for homework. This is his solution:

$$\begin{aligned}
 5 - 3(2x - 4) &= 20 \\
 5 - 6x + 12 &= 20 && \text{(Line 1)} \\
 -6x - 7 &= 20 && \text{(Line 2)} \\
 -6x &= 27 && \text{(Line 3)} \\
 x &= -\frac{6}{7} && \text{(Line 4)}
 \end{aligned}$$

Which lines do not follow correctly from the previous line?

- (A) Line 1 and Line 2 (B) Line 1 and Line 4
 (C) Line 2 and Line 3 (D) Line 2 and Line 4

14. Jackie earns \$42 376 pa. She has allowable deductions amounting to \$3 046.

Taxable Income	Tax
\$1 - \$5 400	Nil
\$5 401 - \$20 700	Nil plus 20 cents for each \$1 over \$5 400
\$20 701 - \$38 000	\$3 060 plus 34 cents for each \$1 over \$20 700
\$38 001 - \$50 000	\$8 942 plus 43 cents for each \$1 over \$38 000
\$50 001 and over	\$14 102 plus 47 cents for each \$1 over \$50 000

Use the table to find the amount of tax payable:

- (A) \$8 942 (B) \$1611.90 (C) \$9513.90 (D) \$39 330

15. Which one of the following groups of scores has a mean of 60 and a median of 50?

- (A) 10, 50, 60, 70, 80, 90 (B) 40, 40, 45, 55, 70, 90
 (C) 40, 45, 45, 55, 85, 90 (D) 30, 40, 50, 50, 70, 80

16. In seven games of netball the goal shooter as an average of 13 goals. In the next game, she scores 21 goals. What is her new average?

- (A) 13 (B) 14 (C) 15 (D) 17

17. In five spelling tests, Jim made the following number of mistakes.

7 1 5 4 3

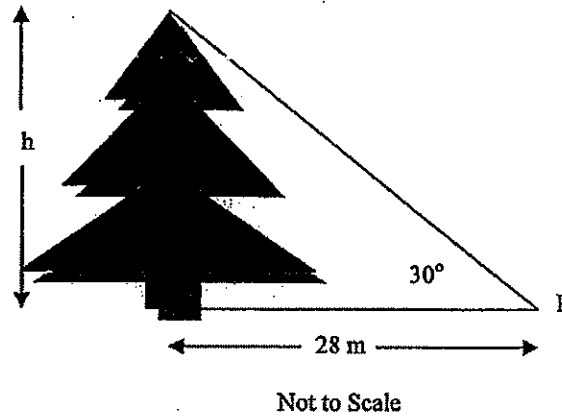
The mean number of mistakes is 4 and the standard deviation is 2. If he makes no mistakes in either of the next two tests, then:

- (A) The mean increases and the standard deviation increases.
 (B) The mean increases and the standard deviation decreases.
 (C) The mean decreases and the standard deviation increases.
 (D) The mean decreases and the standard deviation decreases.

18. If $a^2 = 3^2 + 4^2 - 2 \times 3 \times 4 \cos 50^\circ$, then the value of a is.

- (A) 48.2 (B) 1.84 (C) 1.36 (2 d.p.) (D) 3.1 (1 d.p.)

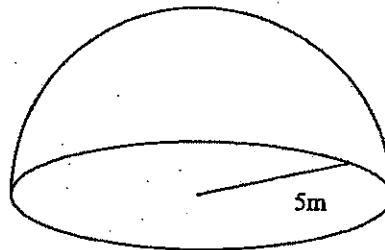
19. The angle of elevation of the top of a tree from a point P on the ground is 30° . The point P is 28 metres from the base of the tree.



The correct expression for h , the height of the tree, is

- (A) $h = 28 \tan 30^\circ$ (B) $h = \frac{28}{\tan 30^\circ}$
(C) $h = \frac{\tan 30^\circ}{28}$ (D) $h = 30 \tan 28^\circ$

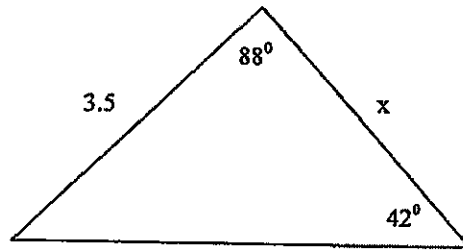
20. A circus company would like to construct a tent in the shape of a hemisphere to cover a circular area of radius 5 metres.



Find the surface area of the material needed to construct the tent correct to 2 decimal places:

- (A) 78.54m^2 (B) 157.08m^2 (C) 235.62m^2 (D) 314.16m^2

21.



Which expression gives the correct value for x ?

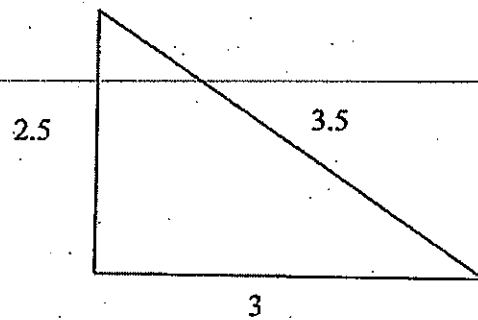
(A) $\frac{3.5 \sin 88^\circ}{\sin 42^\circ}$

(B) $\frac{3.5 \sin 50^\circ}{\sin 42^\circ}$

(C) $\frac{3.5 \sin 42^\circ}{\sin 50^\circ}$

(D) $\frac{3.5 \sin 42^\circ}{\sin 88^\circ}$

22. In the given triangle PQR (not to scale), the largest angle is closest to:



(A) 78°

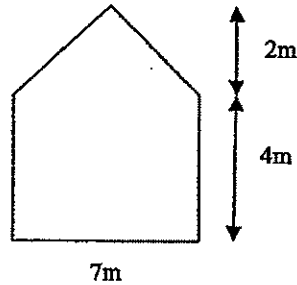
(B) 89°

(C) 93°

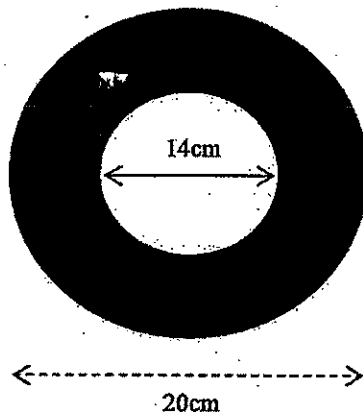
(D) 112°

Question 23 (13 marks)

- a) When quoting, a builder uses a ratio of 50 times the area of a wall to estimate the number of bricks required. A side wall of house cross section is shown below.

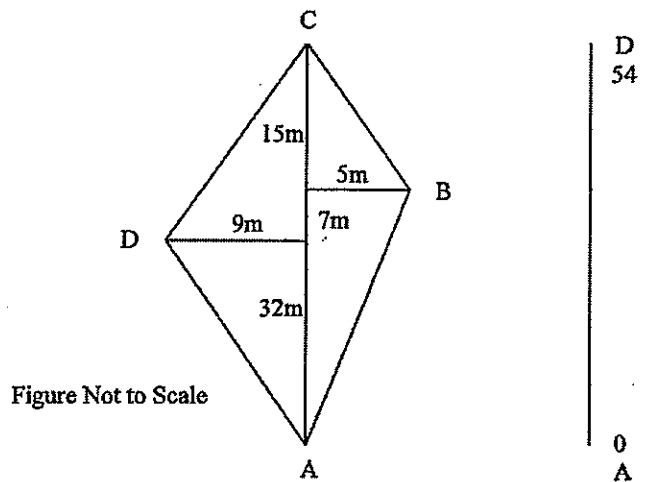


- (i) Calculate the area of the wall in square metres. (2)
- (ii) How many bricks would be needed to build this wall? (1)
- (iii) The house has 2 walls shaped as above. If the builder uses 1200 bricks in the foundations and builds the walls, how much would it cost if he bought bricks at \$120 per thousand? (2)
- (iv) The builder needs to make a 17% profit on materials. How much would the quote state for bricks? (1)
-
- b) A pipe has an outer diameter of 20cm and an inner diameter of 14cm. Calculate the area of the shaded cross section of the pipe correct to the nearest square centimetre. (2)



Not to Scale

c) A surveyor has drawn a field diagram as set out below.



- (i) Copy and fill in the notebook entry. (2)
- (ii) Find the area of the field in square metres. (1)
- (iii) Find the length of the boundary ABC to the nearest metre. (2)

Question 24 (13 marks)

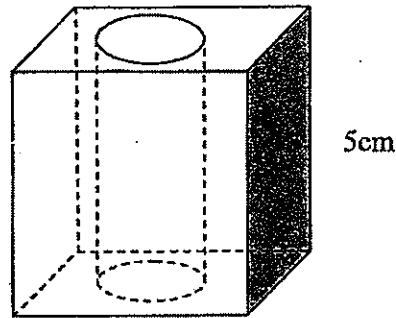
- a) A bag contains 8 red marbles and 6 blue marbles. A marble is selected at random, its colour noted but it is not replaced into the bag. A second ball is then selected and its colour noted. If the first marble is red, what is the probability the second selected will also be red? (2)
- b) The first 100 vehicles to pass a checkpoint gave the following results.

Type of Vehicle	Frequency
Cars	70
Trucks	15
Motor cycles	10
Buses	5

If these figures truly represent the traffic at any time past this checkpoint, determine the probability that the next vehicle will be;

- (i) A car. (1)
- (ii) A motor cycle. (1)
- (iii) A truck or a bus. (1)
- (iv) Not a car. (1)

c)



- (i) What is the volume of the cube? (1)
- (ii) Calculate the volume of the cylindrical hole if the radius is 1cm. (1)
- (iii) What is the remaining volume to the nearest cubic metre? (1)
- (iv) If the price to purchase the solid was \$250.20 per cubic centimetre, use your answer to part (iii) to find the cost of the solid. (1)

d) Gillian has a rectangular backyard which is 16m by 10m. She put in an elliptical swimming pool of length 7m, width 5m and depth 1.6m and laid turf in the rest of the yard.

Find the capacity of the swimming pool in litres, if $1\text{m}^3=1000\text{L}$. (3)

Question 25 (13 marks)

a) (i) For $y = 3x$ and $y = 5 - 2x$, copy and complete the tables for each relationship and graph them on the same number plane.

$y = 3x$

x	-1	0	1	2
y				

$y = 5 - 2x$

x	-1	0	1	2
y				

(3)

(ii) Determine the coordinate of the point of intersection of the two relationships. (1)

- b) State the gradient of the line $2x - y + 3 = 0$ (1)
- c) Simplify $3(2x + 3) - 2(5x - 3)$. (2)
- d) Simplify $\frac{16p^5q^2}{48p^3q^3}$ (2)
- e) Solve the equation $\sqrt{x+1} = 5$ (2)
- f) Substitute $a = 3.28$ and $m = -1.45$ into $\sqrt{a} + am^2$ and give your answer correct to 2 decimal places. (2)

Question 26 (13 marks)

- a) Jack has a credit card which has an interest rate of 18.25% per annum.
- (i) Convert the interest rate to a daily percentage rate. (1)
- (ii) Jack has an outstanding balance of \$975 for a period of twenty-four days. How much interest will be charged? (2)
- b) The table shows monthly payments for each \$1 000 borrowed.

PERIOD OF LOAN					
Interest Rate (% pa)	5 years	10 years	15 years	20 years	25 years
5	\$18.87	\$10.61	\$7.91	\$6.60	\$5.85
6	\$19.33	\$11.10	\$8.44	\$7.10	\$6.44
7	\$19.80	\$11.61	\$9.00	\$7.75	\$7.07
8	\$20.28	\$12.13	\$9.56	\$8.36	\$7.72
9	\$20.76	\$12.67	\$10.14	\$9.00	\$8.39
10	\$21.25	\$13.22	\$10.75	\$9.65	\$9.10
11	\$21.74	\$13.78	\$11.37	\$10.32	\$9.80
12	\$22.24	\$14.35	\$12.00	\$11.01	\$10.53
13	\$22.75	\$14.93	\$12.65	\$11.72	\$11.28

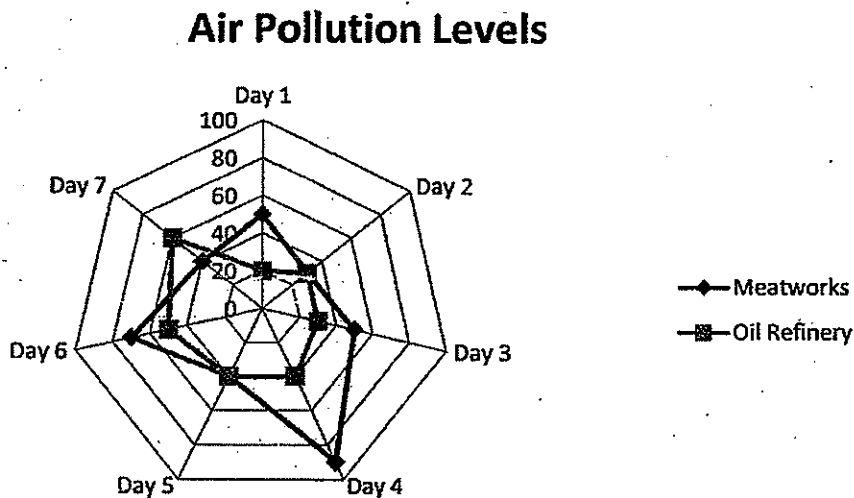
Christopher borrows \$150 000 to buy a house at 8% p.a. over twenty five years.

- (i) Use the information in the table to calculate Christopher's monthly payment on this loan. (1)
- (ii) How much does Christopher pay in total to repay this loan? (1)
- (iii) How much extra per month would Christopher pay if he were to repay the same loan over twenty years? (2)

- e) Michael obtains a personal loan from a bank to buy a computer. The loan is for \$4 500. Michael also pays a loan protection fee of \$1.24 per \$100 borrowed. This fee is added to the \$4 500.
- Find the total amount borrowed. (1)
 - The loan is to be repaid over 3 years, and the interest is charged on the total amount borrowed at 8% p.a. flat. Calculate the interest charged. (1)
 - Michael repays the loan in equal monthly instalments. What is the amount of each instalment? (2)
 - Find the effective annual rate of interest, $a = \frac{2Rn}{n+1}$ Where R is the flat rate of interest and n is the number of instalments. (2)

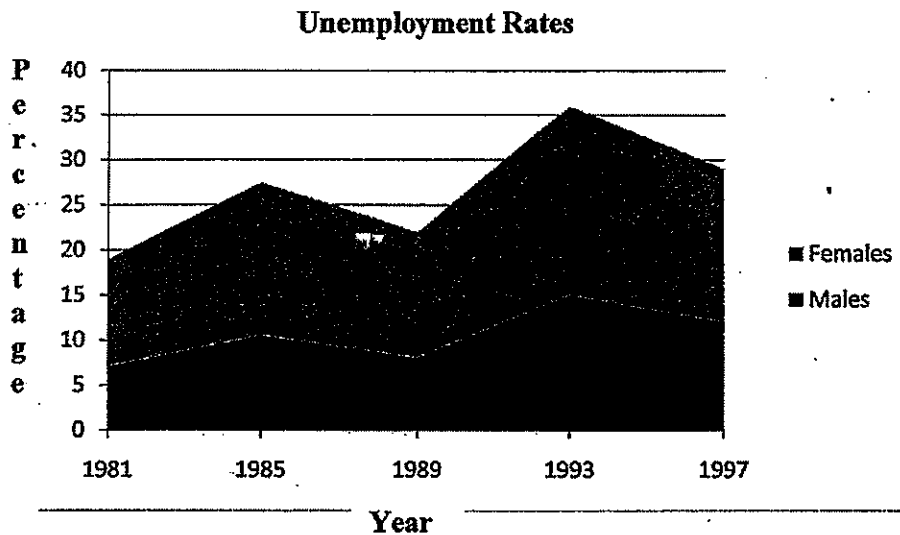
Question 27 (13 marks)

- What is a stratified sample? (1)
- The radar chart below shows air pollution levels at two different workplaces over a 7 day period.



- What was the air pollution level at the Oil Refinery on day 6? (1)
- What were the maximum and minimum pollution levels? When and where did they occur? (2)

- c) This area chart compares the unemployment rates for males and females from 1981 to 1997. What trends in the unemployment rate can be seen over the period from 1981 to 1997? (2)



- d) After Mr Smith had finished teaching Trigonometry, he gave his class a test. As he was disappointed with the test results, he gave the class some remedial work, then gave them a second test.

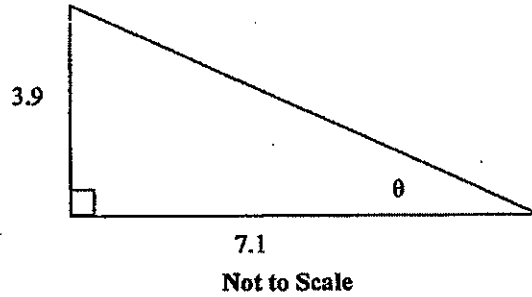
The results of the first test and the second test are shown in this back to back stem and leaf plot.

First Test					Second Test								
			3	2	4								
		7	5	5	4	5	7	7	8				
8	7	5	1	1	1	0	6	3	4	4	6	7	9
		9	5	5	4	3	7	1	2	5	9	9	9
			7	6	4	8	5	5	6	8			
				2	9	4	5	6					

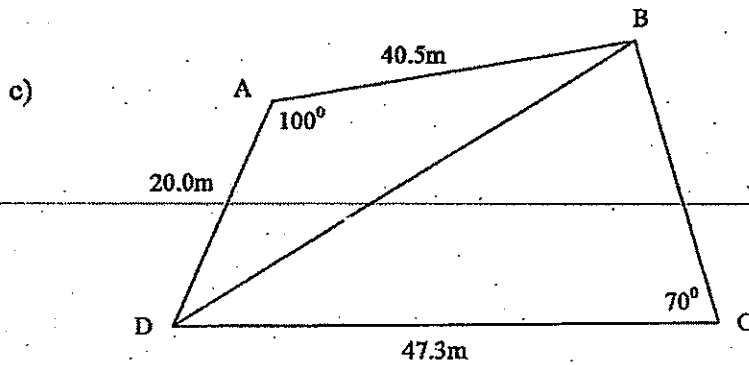
- (i) Find the mode and range for the first test. (2)
- (ii) The mean of the scores on the first test was 67.5 and the standard deviation was 14.2. Calculate the mean and standard deviation for the second test. (2)
- (iii) Draw a box and whisker plot for the second test. (2)
- (iv) Using your answers to parts (i) and (ii), give one reason why Mr Smith is happy with his class's remedial work in Trigonometry. (1)

Question 28 (13 marks)

- a) Find the value of θ correct to the nearest degree. (2)



- b) From a point on a lighthouse, 112m above sea level, the angle of depression of a fishing boat is 16° . Find the distance of the boat from the lighthouse correct to 2 significant figures. (3)



- (i) Use the cosine rule in triangle ABD to find the length of BD correct to one decimal place. (3)
- (ii) Calculate the area of triangle ABD correct to the nearest square metre. (2)
- (iii) Use the sine rule in triangle BCD to find the size of the angle DBC to the nearest degree. (3)

END OF EXAMINATION

2010 YR12 GENERAL HALF YEARLY
SOLUTIONS

NAME: _____ TEACHER: _____

Answer Sheet For Section 1 – (Remove and hand up separately)

- | | | | |
|----------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 1. A <input checked="" type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 2. A <input type="radio"/> | B <input type="radio"/> | C <input checked="" type="radio"/> | D <input type="radio"/> |
| 3. A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input checked="" type="radio"/> |
| 4. A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input checked="" type="radio"/> |
| 5. A <input type="radio"/> | B <input checked="" type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 6. A <input type="radio"/> | B <input checked="" type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 7. A <input type="radio"/> | B <input type="radio"/> | C <input checked="" type="radio"/> | D <input type="radio"/> |
| 8. A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input checked="" type="radio"/> |
| 9. A <input type="radio"/> | B <input type="radio"/> | C <input checked="" type="radio"/> | D <input type="radio"/> |
| 10. A <input type="radio"/> | B <input type="radio"/> | C <input checked="" type="radio"/> | D <input type="radio"/> |
| 11. A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input checked="" type="radio"/> |
| 12. A <input type="radio"/> | B <input checked="" type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| <hr/> | | | |
| 13. A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input checked="" type="radio"/> |
| 14. A <input type="radio"/> | B <input type="radio"/> | C <input checked="" type="radio"/> | D <input type="radio"/> |
| 15. A <input type="radio"/> | B <input type="radio"/> | C <input checked="" type="radio"/> | D <input type="radio"/> |
| 16. A <input type="radio"/> | B <input checked="" type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 17. A <input type="radio"/> | B <input type="radio"/> | C <input checked="" type="radio"/> | D <input type="radio"/> |
| 18. A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input checked="" type="radio"/> |
| 19. A <input checked="" type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 20. A <input type="radio"/> | B <input checked="" type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 21. A <input type="radio"/> | B <input checked="" type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 22. A <input checked="" type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |

Question 23

$$a) (i) A = 4 \times 7 + \frac{1}{2} \times 7 \times 2 \\ = 35 \text{ m}^2$$

$$(ii) 35 \times 50 = 1750$$

$$(iii) \text{ Walls} = 1750 \times 2 + 1200 \\ = 4700$$

$$\text{Cost} = 4700 \times 120 \div 1000 \\ = \$564$$

$$(iv) \$564 \times 1.17 = \$660$$

$$b) A = \pi \times 10^2 - \pi \times 7^2 \\ = 160 \text{ cm}^2 \text{ (nearest cm}^2\text{)}$$

$$c) (i) \begin{array}{r|l} 0 & \\ 54 & \\ \hline 39 & 5 \\ 9 & 32 \\ & 0 \\ & A \end{array}$$

$$(ii) AB = \sqrt{39^2 + 5^2} \\ = \sqrt{1546}$$

$$BC = \sqrt{15^2 + 5^2} \\ = \sqrt{250}$$

$$AB + BC = \sqrt{1546} + \sqrt{250} \\ = 55 \text{ m (nearest m)}$$

Question 24

a) $P(R) = \frac{7}{13}$

b) (i) $P(\text{car}) = \frac{70}{100} = \frac{7}{10}$

(ii) $P(\text{m.cycle}) = \frac{10}{100} = \frac{1}{10}$

(iii) $P(\text{truck or bus}) = \frac{15+5}{100} = \frac{1}{5}$

(iv) $P(\text{not a car}) = 1 - \frac{70}{100} = \frac{3}{10}$

c) (i) $V = 5^3$
 $= 125 \text{ cm}^3$

(ii) $V = \pi \times 1^2 \times 5$
 $= 15.7 \text{ cm}^3$ (1 dp)

(iii) $V = 125 - 15.7$
 $= 109 \text{ cm}^3$ (nearest cm^3)

(iv) $\text{Cost} = \$250.20 \times 109$
 $= \$27\,271.80$

d) $A = \pi \times 3.5 \times 2.5$
 $= 8.75\pi$

$V = 8.75\pi \times 1.6$
 $= 14\pi$

$\text{Capacity} = 14\pi \times 1000$
 $= 43982 \text{ L}$

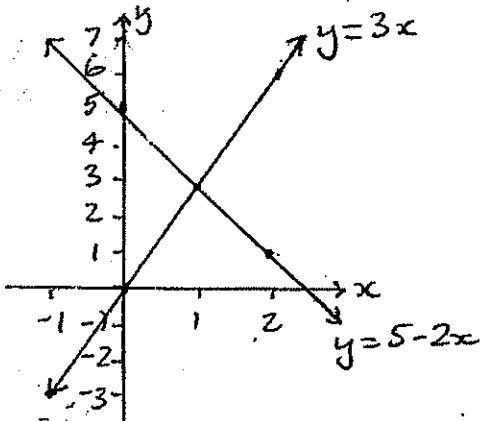
Question 25

a) (i) $y = 3x$

x	-1	0	1	2
y	-3	0	3	6

$$y = 5 - 2x$$

x	-1	0	1	2
y	7	5	3	1



(ii) $(1, 3)$

a) $2x - y + 3 = 0$

$$y = 2x + 3$$

$$\text{gradient} = 2$$

$$\begin{aligned} \Rightarrow 3(2x + 3) - 2(5x - 3) &= 6x + 9 - 10x + 6 \\ &= 15 - 4x \end{aligned}$$

d) $\frac{p^2}{3q}$

e) $\sqrt{x+1} = 5$

$$x+1 = 25$$

$$x = 24$$

f) $\sqrt{3.28} + 3.28 \times (-1.45)^2 = 8.71 \text{ (2 dp)}$

Question 26

$$a) (i) \text{ Daily \% rate} = 18.25 \div 365 \\ = 0.05\%$$

$$(ii) I = \frac{0.05}{100} \times \$975 \times 24 \\ = \$11.70$$

$$b) (i) \text{ Monthly payment} = \$7.72 \times 150 \\ = \$1158$$

$$(ii) \text{ Total paid} = \$1158 \times 12 \times 25 \\ = \$347400$$

$$(iii) \text{ Payment per month} = \$8.36 \times 150 \\ = \$1254$$

$$\text{Extra paid} = \$1254 - \$1158 \\ = \$96$$

$$c) (i) \text{ Total borrowed} = \$4500 + (45 \times 1.24) \\ = \$4555.80$$

$$(ii) \text{ Interest charged} = \frac{8}{100} \times \$4555.80 \times 3 \\ = \$1093.39$$

$$(iii) \text{ Instalments} = (\$4555.80 + \$1093.39) \div 36 \\ = \$156.92$$

$$(iv) r = \frac{2 \times 8 \times 36}{36 + 1} \\ = 15.6\% \text{ (correct to 3 sig. fig.)} \\ \text{or } 0.156$$

Question 27

a) A stratified sample is one where a representative sample is taken from each stratum or layer of a population.

b) (i) 50

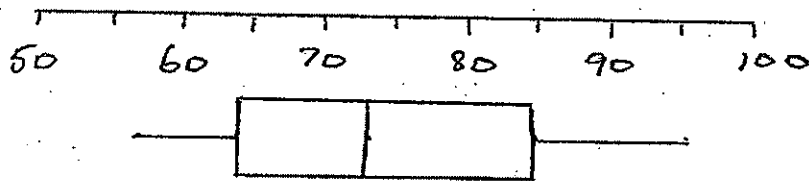
(ii) max. = 90, Day 4 at the Meatworks
min = 20, Day 1 at the Oil Refinery

c) The unemployment rate rose from about 19% in 1981 to 29% in 1997. A fall in the unemployment rate occurred from 1985 to 1989 followed by a rise before another fall from 1993 to 1997. The unemployment rate was at its highest in 1993.

d) (i) - mode = 61, range = $92 - 42 = 50$

(ii) mean = 75.0 (1 dp), standard deviation = 12.2

(iii)



$$Q_2 = \text{median} = \frac{72 + 75}{2} = 73.5$$

$$Q_1 = 64, Q_3 = 85, \text{lowest} = 57, \text{highest} = 96$$

(iv) The mean and mode in the second test is higher which are indicators that the class has done better.

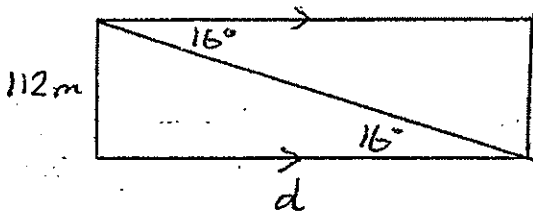
Also, the marks are more consistent as the standard deviation is lower.

Question 28

a) $\tan \theta = \frac{3.9}{7.1}$

$\theta = 29^\circ$ (nearest degree)

b)



$$\tan 16 = \frac{112}{d}$$

$$d = 390 \text{ m}$$

c) (i) $BD^2 = 40.5^2 + 20^2 - 2 \times 40.5 \times 20 \times \cos 100^\circ$
 $BD = \sqrt{2321.56}$
 $= 48.2 \text{ m}$ (correct to 1 dp)

(ii) $A = \frac{1}{2} \times 40.5 \times 20 \times \sin 100$
 $= 399 \text{ m}^2$ (nearest sq. m)

(iii) $\frac{\sin \angle OBC}{47.3} = \frac{\sin 70}{48.2}$

$$\sin \angle OBC = \frac{47.3 \times \sin 70}{48.2}$$

$$= 0.92248$$

$$\therefore \angle OBC = 67^\circ \text{ (nearest degree)}$$