



N5 Maths - Applications (Part 2)

In this booklet:

1. The Sine and Cosine Rules PAGES 1 – 15
2. Comparing Data PAGES 16 – 28
3. Scattergraphs and Lines of Best Fit PAGES 29 – 40

TRIGONOMETRY

By the end of this set of exercises, you should be able to

- (a) calculate the area of a triangle using trigonometry
- (b) solve problems using Sine and Cosine rules.

TRIGONOMETRY

Introduction: Sine, Cosine and Tangent Graphs

Exercise 1A

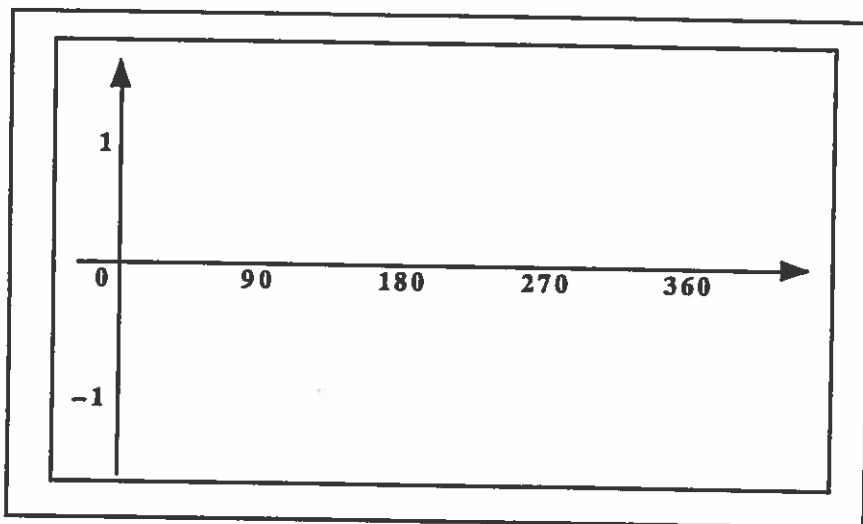
1. The Sine Graph

- (a) Make a copy of this table and use your calculator to help fill it in, giving each answer correct to 2 decimal places.

x	0°	20°	40°	60°	80°	90°	100°	120°	140°	160°	180°
$\sin x^\circ$	0.00	0.34	0.64	0.87	0.98	1.00	...	...	...	...	...

x	200°	220°	240°	260°	270°	280°	300°	320°	340°	360°
$\sin x^\circ$	...	...	...	...	...	...	...	...	...	...

- (b) Use a piece of 2 mm graph paper to draw a set of axes as illustrated below.



- (c) Plot as accurately as possible the 21 points from your table.
(d) Join them up smoothly to create the graph of the function $y = \sin x^\circ$.
2. Repeat question 1 (a) to (d) for the function $y = \cos x^\circ$
3. Repeat for the graph of $y = \tan x^\circ$ (a different scale will be required for the vertical axis).
(These graphs will be studied later).

Sine, Cosine and Tangents of angles other than acute angles

Exercise 1B

1. Use your calculator to find the following trigonometric ratios.
Give each answer correct to 3 decimal places.

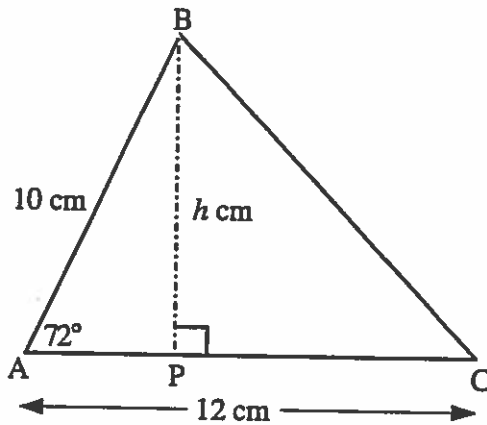
- | | | | |
|------------------------|-------------------------|----------------------|----------------------|
| (a) $\sin 25^\circ$ | (b) $\cos 95^\circ$ | (c) $\tan 107^\circ$ | (d) $\sin 200^\circ$ |
| (e) $\cos 315^\circ$ | (f) $\tan 181^\circ$ | (g) $\cos 240^\circ$ | (h) $\sin 330^\circ$ |
| (i) $\tan 225^\circ$ | (j) $\sin 300^\circ$ | (k) $\tan 315^\circ$ | (l) $\cos 500^\circ$ |
| (m) $\tan (-75^\circ)$ | (n) $\cos (-200^\circ)$ | (o) $\sin 360^\circ$ | (p) $\cos 360^\circ$ |

A. Area of a Triangle using Trigonometry.

Exercise 2

1. In this question you are being asked to calculate the area of triangle ABC, using two methods.

- Method 1** (a) Use basic right angled trigonometry on triangle ABP to calculate the height BP (= h cm).
 (b) Now use the formula $\text{Area} = \frac{1}{2} (\text{base} \times \text{height})$ to calculate the area of $\triangle ABC$.



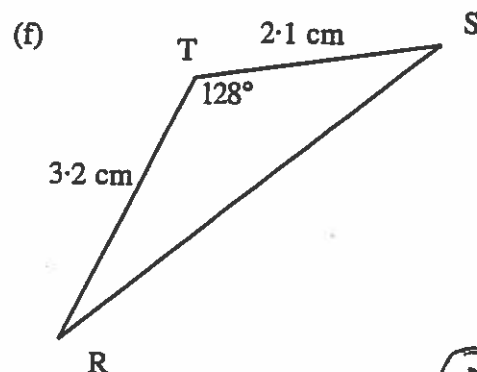
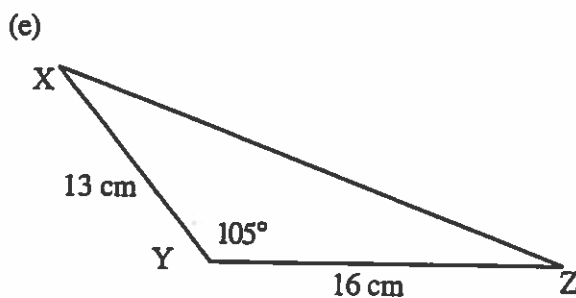
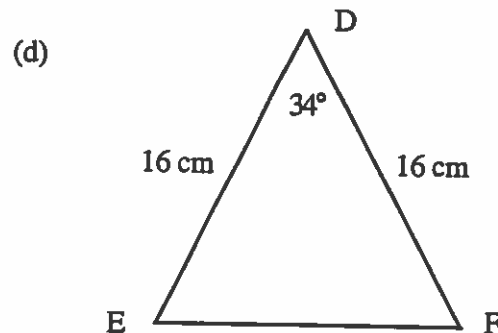
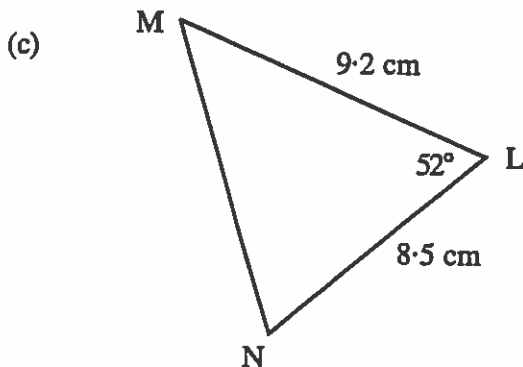
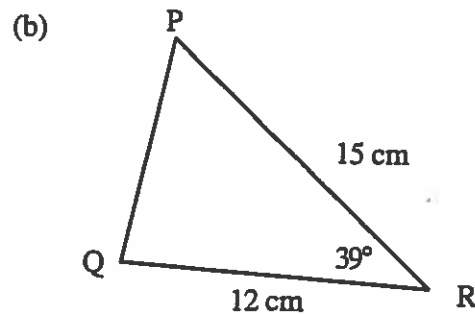
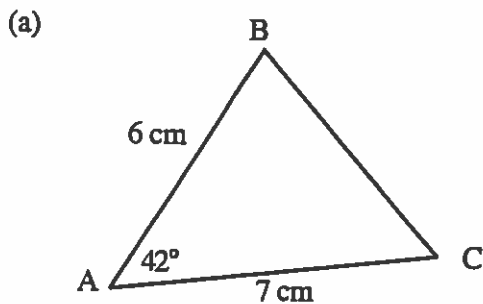
- Method 2** Use the formula:

$$\text{Area} = \frac{1}{2} b c \sin A \quad \text{with } b = 12 \text{ cm, } c = 10 \text{ cm and angle } A = 72^\circ$$

to calculate the area of triangle ABC.

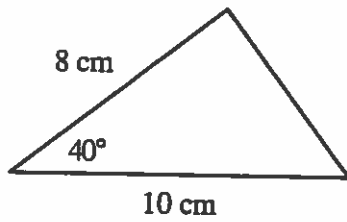
Did you obtain the same answer? Which method was the faster?

2. Use the formula $\text{Area} = \frac{1}{2} a b \sin C$ to calculate the areas of the following six triangles: (Give all answers correct to 1 decimal place).

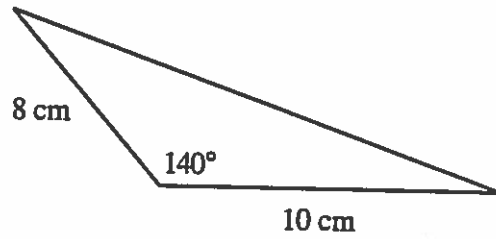


3. Calculate the areas of the following two triangles:

(a)



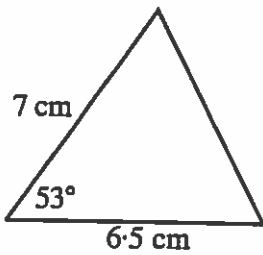
(b)



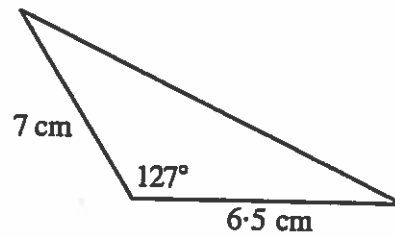
What do you notice?

4. Calculate the areas of the following two triangles:

(a)



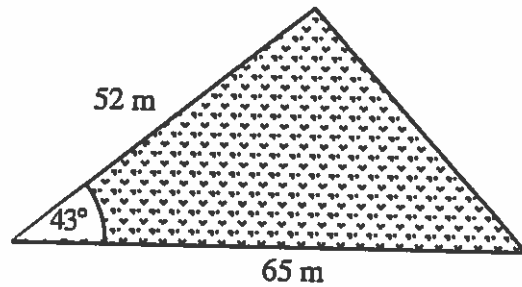
(b)



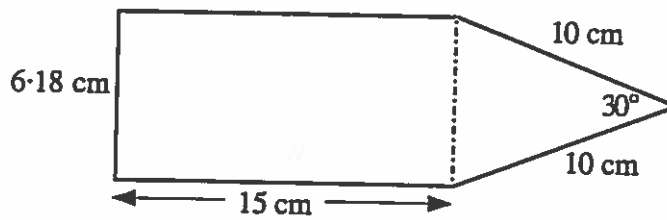
What do you notice? Can you explain your answers to questions 3 and 4?

5. Shown is a sketch of Farmer Giles' triangular field.

Calculate its area in square metres.

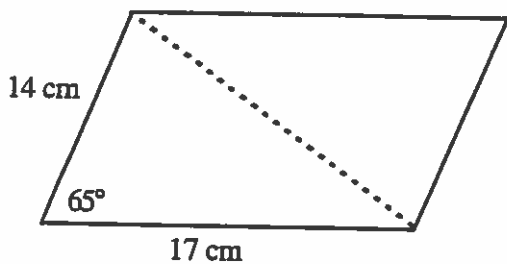


6. Calculate the area of this pentagon:

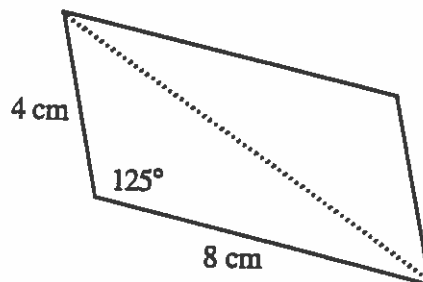


7. Calculate the areas of the following two parallelograms:

(a)



(b)



B. Sine Rule.

Exercise 3

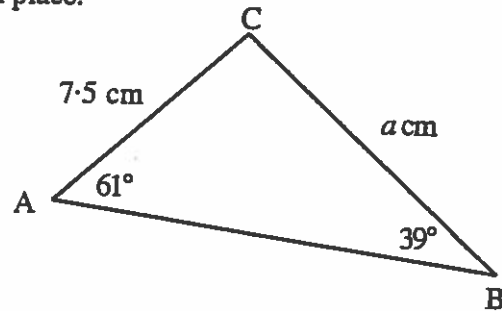
In this exercise, give all answers correct to 1 decimal place.

1. Copy and complete the following:

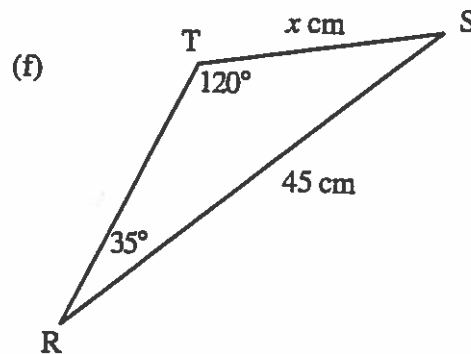
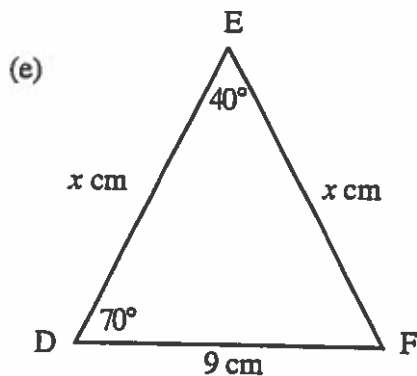
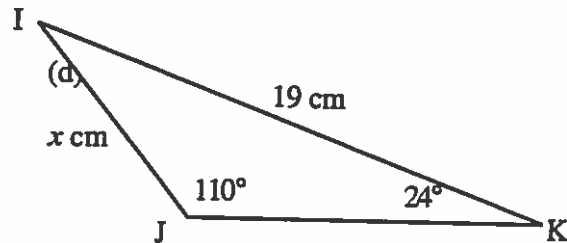
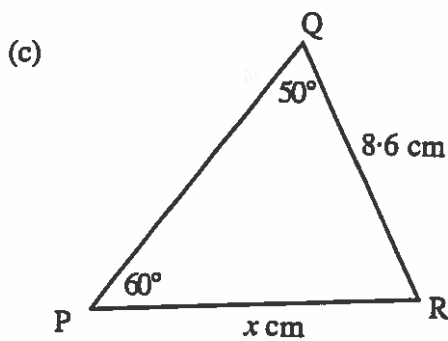
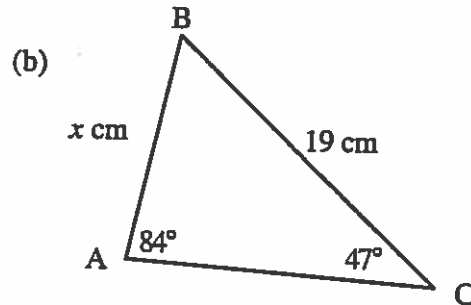
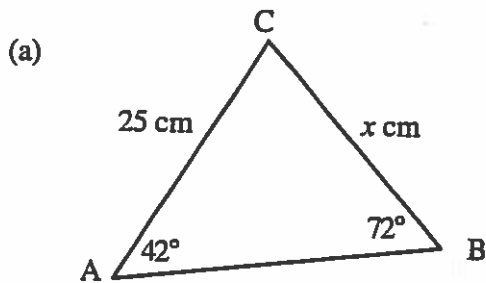
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \left(\frac{c}{\sin C} \right)$$

$$\frac{a}{\sin 61^\circ} = \frac{7.5}{\sin 39^\circ}$$

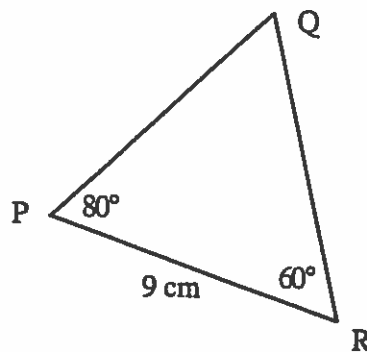
$$\Rightarrow a = \frac{7.5 \times \sin 61^\circ}{\sin 39^\circ} = \boxed{} \text{ cm}$$



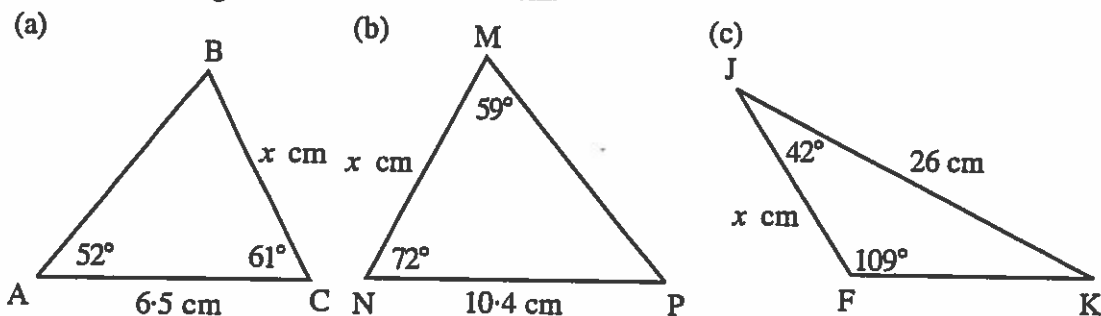
2. Use the Sine Rule in each of the following to calculate the size of the side marked x cm.



3. (a) Write down the size of $\angle PQR$.
 (b) Use the Sine rule to calculate the length of the line QR.



4. In each of the following, calculate the size of the third angle first before attempting to calculate the length of the side marked x cm.



5. Copy and complete:

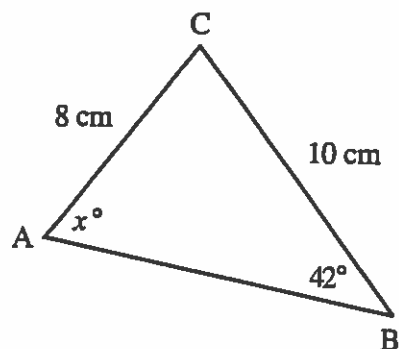
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \left(\frac{c}{\sin C} \right)$$

$$\frac{10}{\sin x^\circ} = \frac{8}{\sin 42^\circ}$$

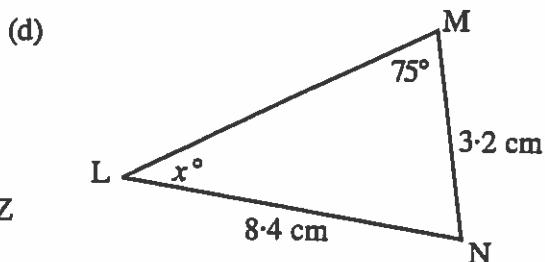
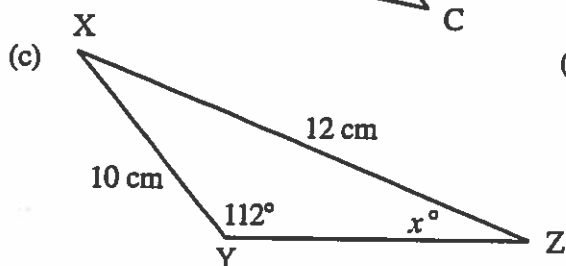
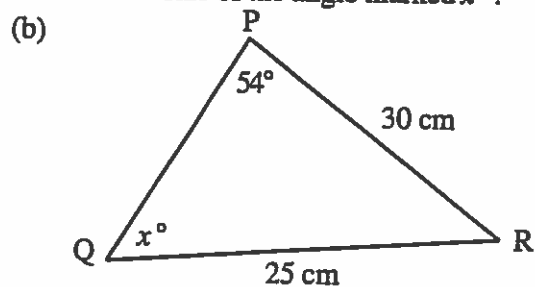
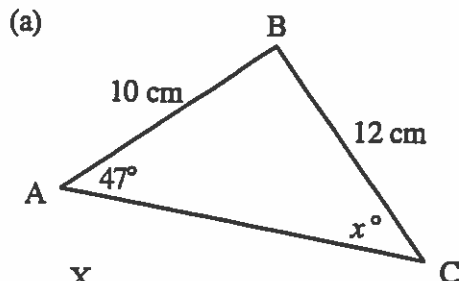
$$\Rightarrow 8 \sin x^\circ = 10 \sin 42^\circ$$

$$\Rightarrow \sin x = \frac{10 \sin 42^\circ}{8} = \boxed{0. \dots}$$

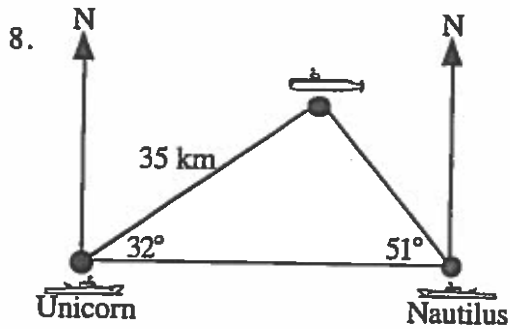
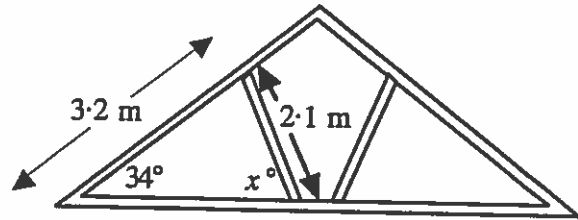
$$\Rightarrow x = \boxed{}$$



6. Use the Sine Rule in each of the following to calculate the size of the angle marked x° .



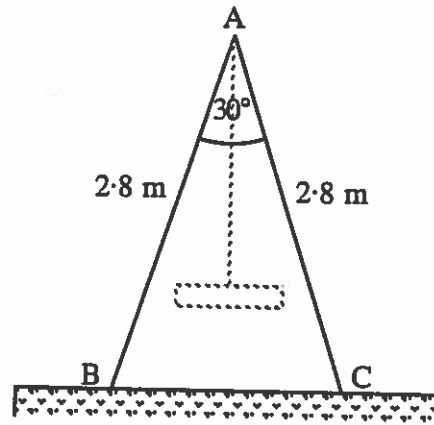
7. The diagram shows a roof truss.
Calculate the size of the angle marked x° between the wooden supports.



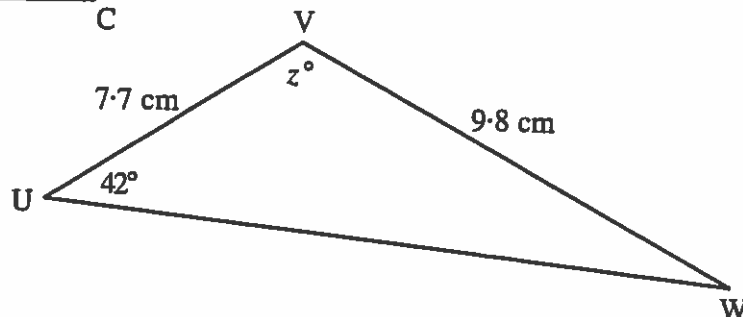
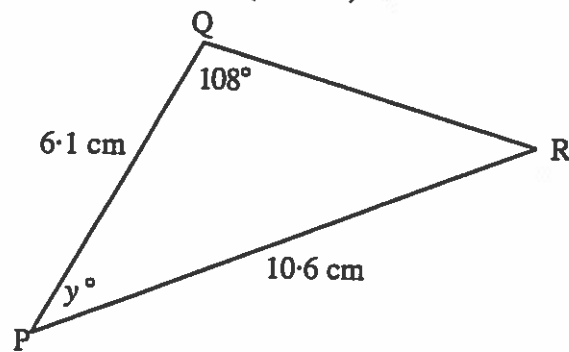
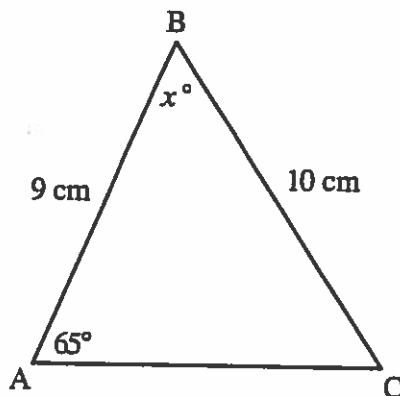
H.M.S. Nautilus lies East of H.M.S. Unicorn.
The diagram shows where an enemy submarine is in relation to the two ships.
Calculate how far the submarine is from H.M.S. Nautilus.

9. This is the metal frame used to support and hold a child's swing.
It is in the shape of an isosceles triangle.

- Calculate the size of $\angle ABC$.
- Use the Sine rule to calculate how far apart points B and C are.
(Answers to 2 decimal places)
- Draw a vertical line through A, creating two right angled triangles and use right angled trigonometry to check your answer to part (b).



10. Calculate the size of the angles marked x° , y° and z° . (careful!)



C. Cosine Rule

Exercise 4A

1. Copy and complete the following:

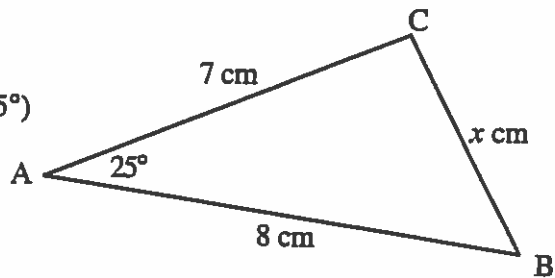
$$a^2 = b^2 + c^2 - (2bc \cos A)$$

$$\Rightarrow x^2 = 7^2 + 8^2 - (2 \times 7 \times 8 \times \cos 25^\circ)$$

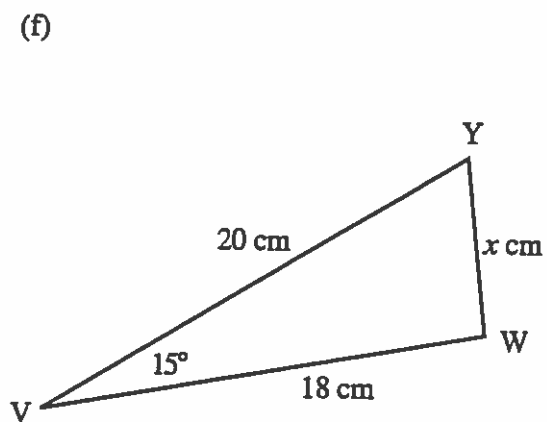
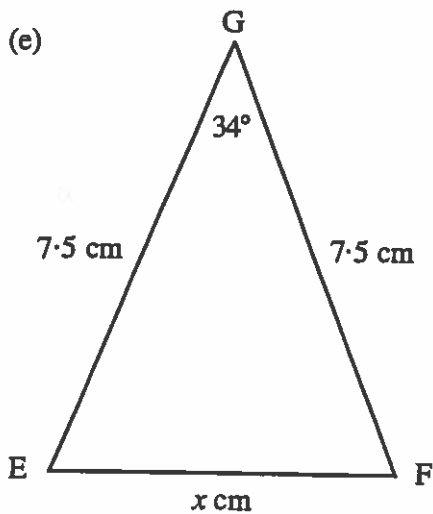
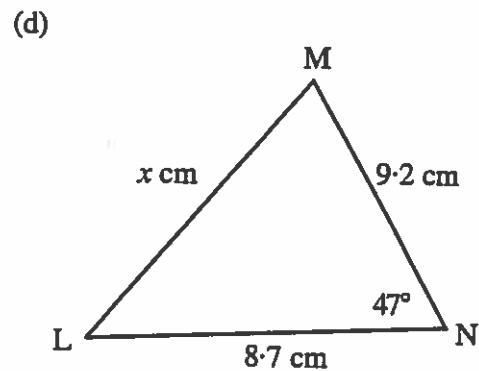
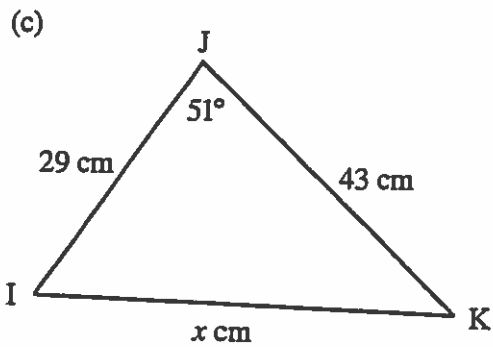
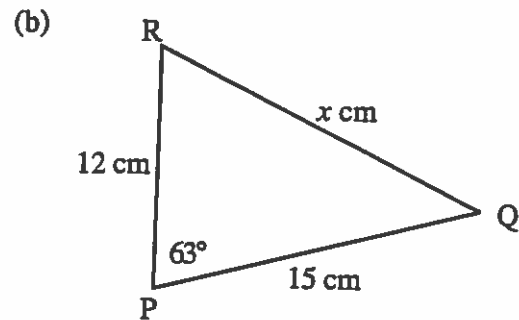
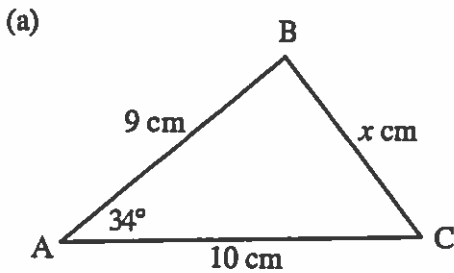
$$\Rightarrow x^2 = \dots + \dots - (\dots)$$

$$\Rightarrow x^2 = \dots$$

$$\Rightarrow x = \boxed{}$$



2. Use the Cosine rule to calculate the size of each side marked x cm here.



3. Copy and complete the following:

$$a^2 = b^2 + c^2 - (2bc \cos A)$$

$$\Rightarrow x^2 = 8^2 + 6^2 - (2 \times 8 \times 6 \times \cos 110^\circ)$$

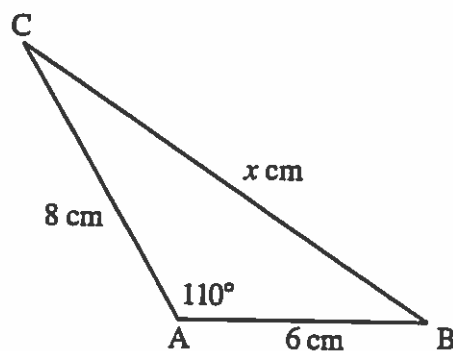
$$\Rightarrow x^2 = \dots + \dots - (96 \times (-0.342\dots))$$

$$\Rightarrow x^2 = \dots - (-32.83\dots)$$

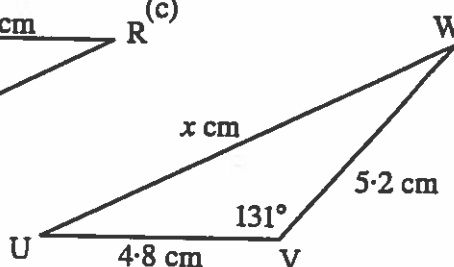
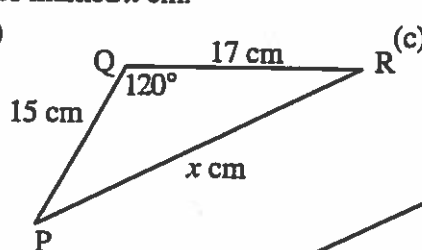
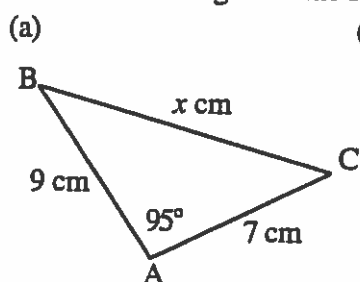
$$\Rightarrow x^2 = \dots + 32.83\dots$$

$$\Rightarrow x^2 = \dots$$

$$\Rightarrow x = \boxed{} \quad (\text{note})$$

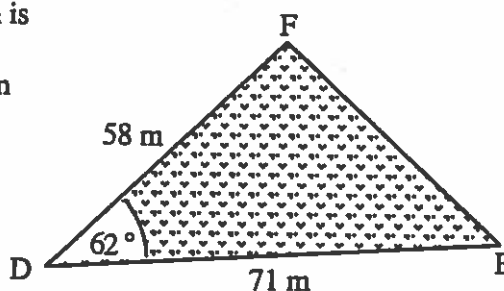


4. Calculate the lengths of the sides marked x cm.



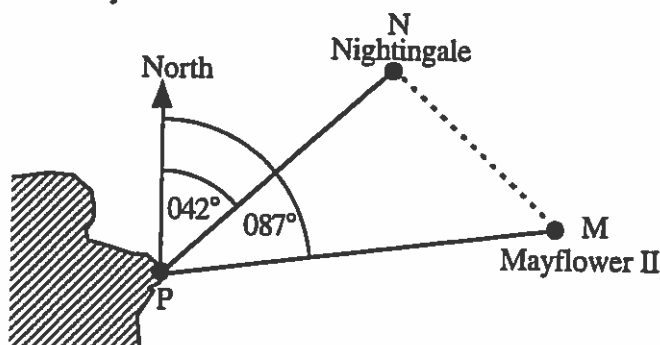
5. A farmer owns a piece of fenced land which is triangular in shape.

Calculate the length of the third side and then write down the perimeter of the field.



6. Two ships leave Peterborough harbour at 1300. The Nightingale sails at 20 miles per hour on a bearing 042° . The Mayflower II sails at 25 miles per hour on a bearing 087° .

- Calculate the size of $\angle NMP$.
- How far apart will the 2 ships be after 1 hour?
- How far apart will they be at 1600?



Exercise 4B

1. Copy and complete the following to find $\angle BAC$:

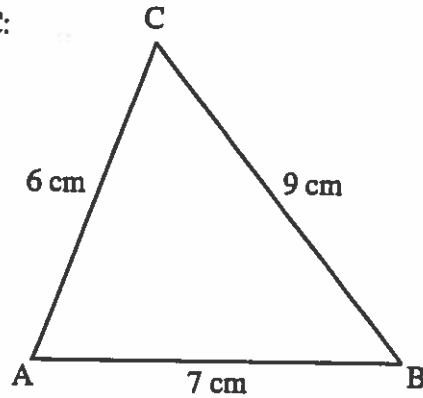
$$a^2 = b^2 + c^2 - (2bc \cos A)$$

$$\Rightarrow \cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\Rightarrow \cos A = \frac{6^2 + 7^2 - 9^2}{2 \times 6 \times 7}$$

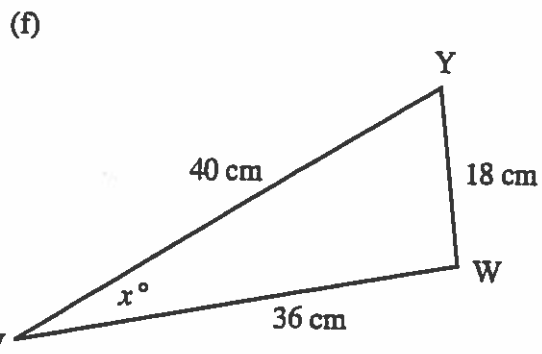
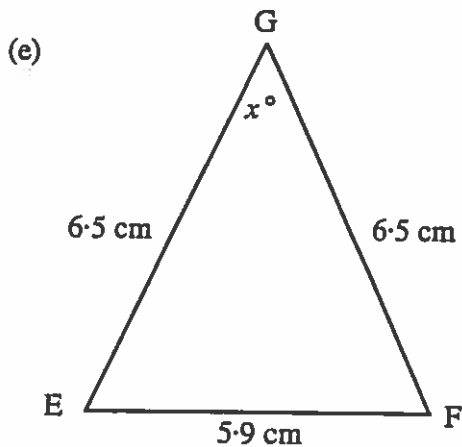
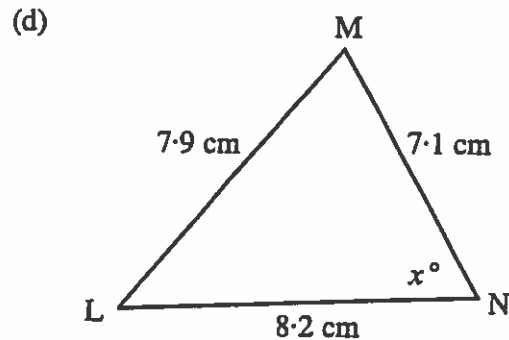
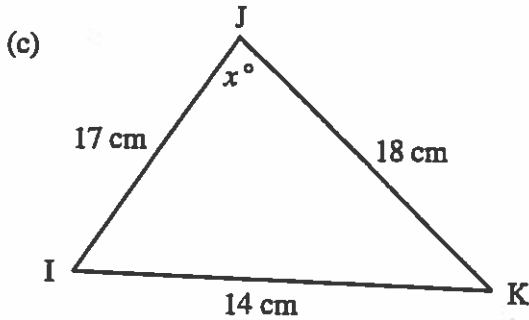
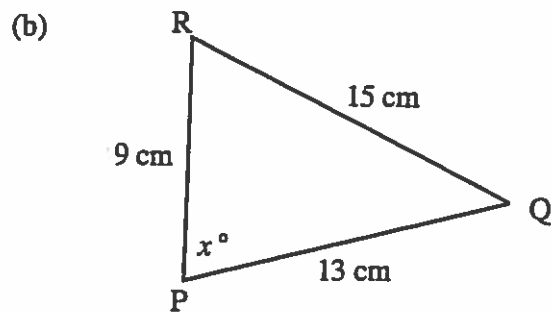
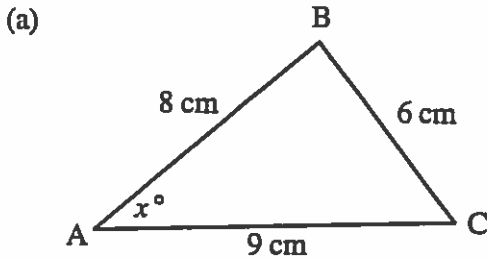
$$\Rightarrow \cos A = 0 \cdot \dots\dots$$

$$\Rightarrow A = \boxed{}$$



2. Use this 'reverse' form of the Cosine rule to calculate the size of each angle marked x° here.

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$



3. Copy and complete the following to find $\angle BAC$:

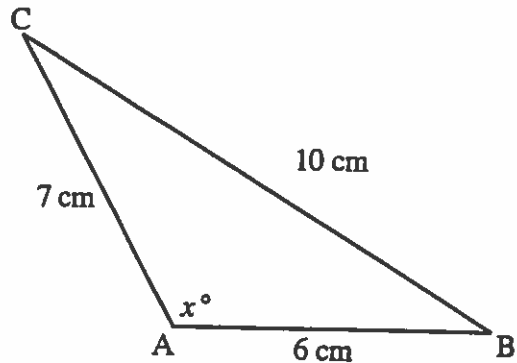
$$a^2 = b^2 + c^2 - (2bc \cos A)$$

$$\Rightarrow \cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\Rightarrow \cos A = \frac{7^2 + 6^2 - 10^2}{2 \times 7 \times 6}$$

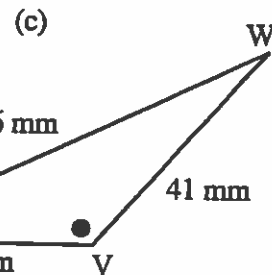
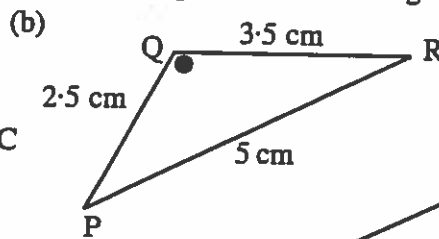
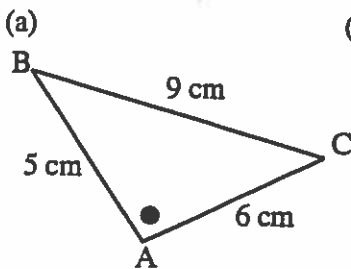
$$\Rightarrow \cos A = -0.178..$$

$$\Rightarrow A = \text{????}$$

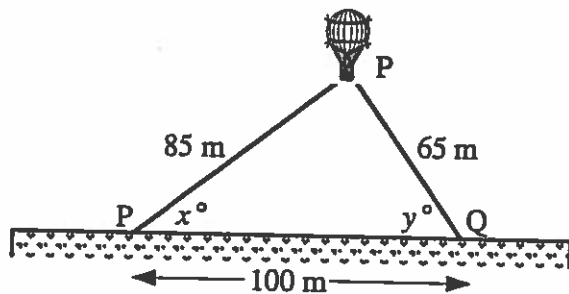


Hint :- try finding SHIFT (or INV) $\cos(-0.178..)$
 if you obtain the correct answer of 100.3° , your calculator can handle negatives.
 if you obtain the wrong answer of -79.7° , ask your teacher/lecturer for help.

4. Calculate the size of each of the obtuse angles in the following three triangles:

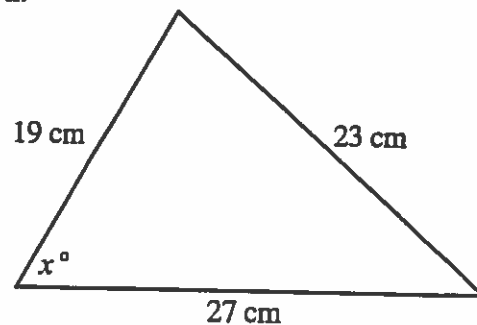


5. Two guy ropes are used to restrain a balloon.
 The ropes are 85 metres and 65 metres long, and are tethered at points 100 metres apart.
 Calculate the sizes of the two angles marked x° and y° .



6. This triangular metal plate has its 3 sides as shown.

- (a) Calculate the size of the angle marked x° .
 (b) Calculate the area of the triangular plate.

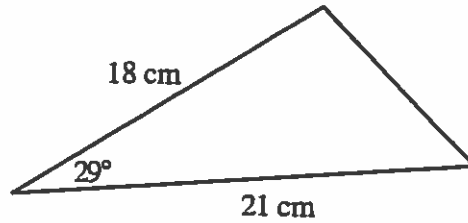


CHECKUP FOR TRIGONOMETRY

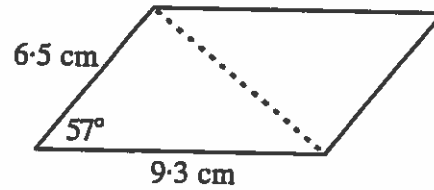
1. Write down the values of the following to 3 decimal places:

- (a) $\sin 200^\circ$ (b) $\tan 320^\circ$ (c) $\cos (-265^\circ)$

2. Calculate the area of this triangle:

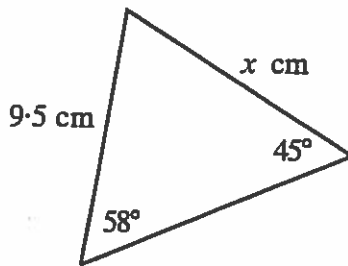


3. Calculate the area of this parallelogram:

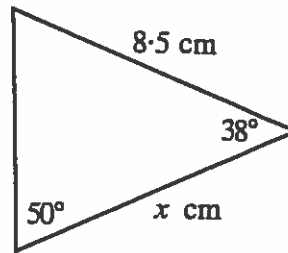


4. Use the Sine Rule or the Cosine rule (2 formats) to calculate the value of x each time here:

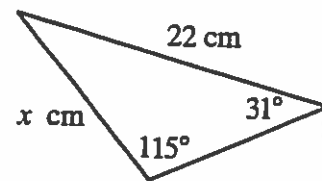
(a)



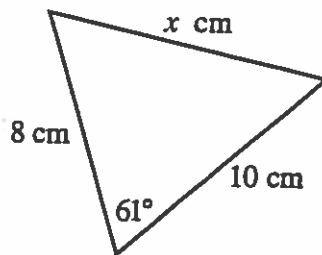
(b)



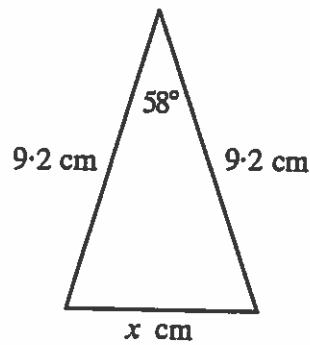
(c)



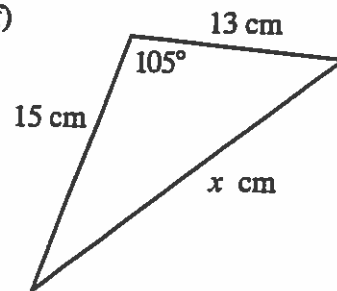
(d)



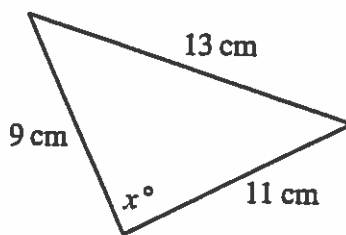
(e)



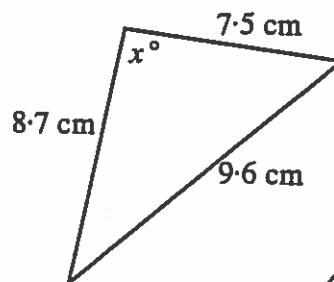
(f)



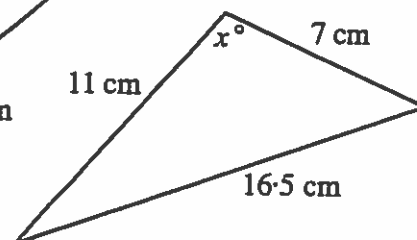
(g)



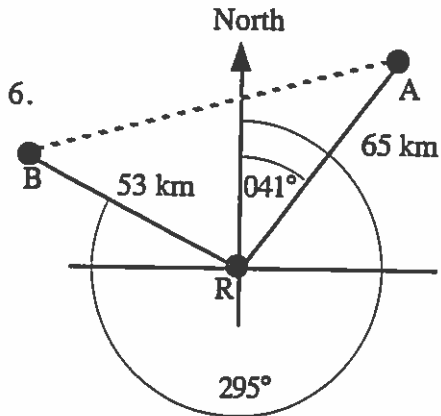
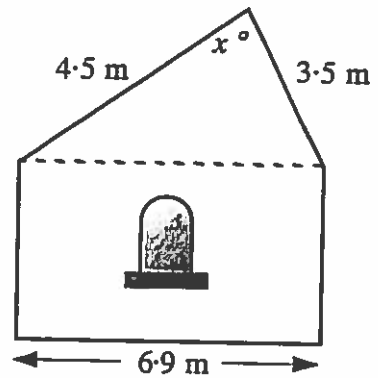
(h)



(i)



5. The diagram shows the side view of a house with a sloping roof.
Calculate the size of the angle, x° , between the two sloping sides of the roof.



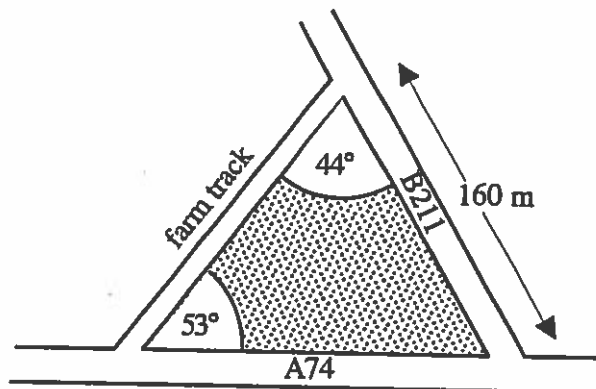
From a radar station at R, signals from two ships are picked up.

Ship A is on a bearing 041° from R and is 65 kilometres away.

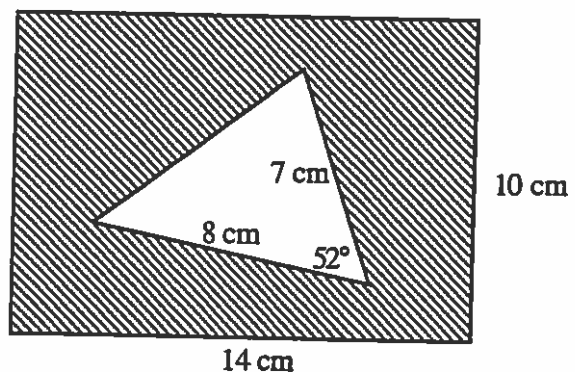
Ship B is on a bearing 295° from R and is 53 kilometres away.

Calculate how far apart the two ships are.

7. A farmer owns a triangular piece of land trapped between 2 main roads and the farm track.
Calculate the length of the farm track to the nearest whole metre.



8. Calculate the shaded area of this rectangular metal plate with a triangular hole cut out of it.

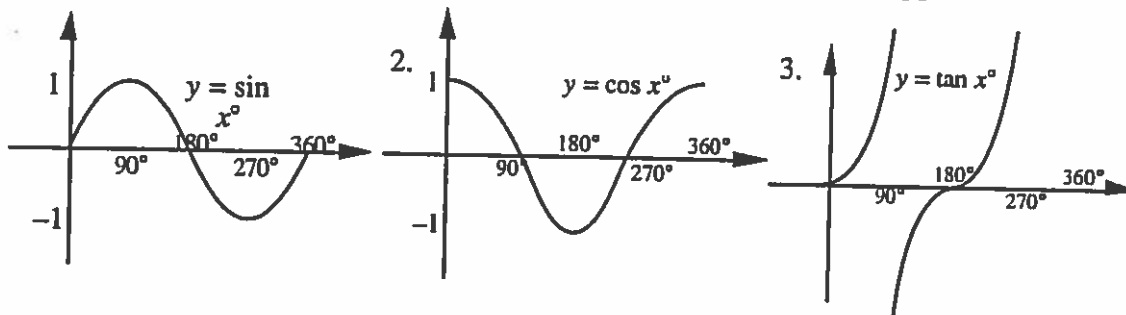


ANSWERS TO MATHEMATICS 2 (INT 2)

Trigonometry

Exercise 1A

1. (a) 0.00 0.34 0.64 0.87 0.98 1.00 0.98 0.87 0.64 0.34 0.00
 -0.34 -0.64 -0.87 -0.98 -1.00 -0.98 -0.87 -0.64 -0.34 0.00



Exercise 1B

1. (a) 0.423 (b) -0.087 (c) -3.271 (d) -0.342 (e) 0.707
 (f) 0.017 (g) -0.5 (h) -0.5 (i) 1 (j) -0.866
 (k) -1 (l) -0.776 (m) -3.732 (n) -0.940 (o) 0 (p) 1

Exercise 2

1. Method: (a) $h = 9.51$ (b) 57.06 cm^2 Method 2: $\rightarrow 57.06 \text{ cm}^2$
 2. (a) 14.1 cm^2 (b) 56.6 cm^2 (c) 30.8 cm^2
 (d) 71.6 cm^2 (e) 100.5 cm^2 (f) 2.6 cm^2
 3. (a) 25.7 cm^2 (b) 25.7 cm^2 same answer
 4. (a) 18.2 cm^2 (b) 18.2 cm^2 same answer because $\sin 53^\circ = \sin 127^\circ$
 5. 1152.6 cm^2 6. 117.7 cm^2 7 (a) 215.7 cm^2 (b) 26.2 cm^2

Exercise 3

1. $a = 10.4 \text{ cm}$
 2. (a) 17.6 cm (b) 14.0 cm (c) 7.6 cm (d) 8.2 cm (e) 13.2 cm (f) 29.8 cm
 3. (a) 40° (b) 13.8 cm
 4. (a) 67° ; 5.6 cm (b) 49° ; 9.2 cm (c) 29° ; 13.3 cm
 5. 0.836 , 56.8° 6. (a) 37.6° (b) 76.1° (c) 50.6° (d) 21.6°
 7. 58.4° 8. 23.9 km 9. (a) 75° (b) 1.45 m (c) 1.45 m
 10. (a) $x = 60.3$ (b) $y = 38.8$ (c) $z = 106.3$

Exercise 4A

1. $x = 3.39$
 2. (a) 5.6 cm (b) 14.3 cm (c) 33.5 cm (d) 7.2 cm (e) 4.4 cm (f) 5.3 cm
 3. $x = 11.5 \text{ cm}$ 4. (a) 11.9 cm (b) 27.7 cm (c) 9.1 cm
 5. 67.4 m ; 196.4 m 6. (a) 45° (b) 17.8 km (c) 53.5 km

Exercise 4B

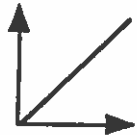
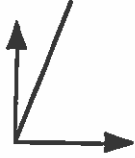
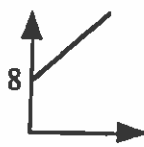
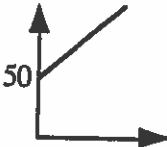
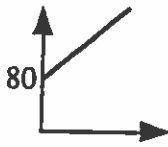
1. 87.3°
2. (a) 40.8° (b) 83.9° (c) 47° (d) 61.7° (e) 54.0° (f) 26.7°
3. 100.3°
4. (a) 109.5° (b) 111.8° (c) 113.3°
5. $x = 40.1^\circ$, $y = 57.4^\circ$
6. (a) $x = 56.9^\circ$ (b) Area = 214.8 cm^2

Checkup for Trigonometry

1. (a) -0.342 (b) -0.839 (c) -0.087
2. 91.6 cm^2
3. 50.7 cm^2
4. (a) 11.4 cm (b) 11.1 cm (c) 12.5 cm (d) 9.3 cm (e) 8.9 cm
(f) 22.2 cm (g) 80.4° (h) 72.3° (i) 131.6°
5. 118.7°
6. 94.5 km
7. 199 m
8. 117.9 cm^2

Simultaneous Linear Equations

Exercise 1

1. (a) 3 (b) $W = 3N$ (c) 30kg (d)(e) 
2. (a) $1/10$ $2/20$ $3/30$ $4/40$ $5/50$ $6/60$ in table (b) 10 (c) $E = 10P$ (d) 90
(e) (f) 
3. (a) $1/20$ $2/40$ $3/60$ $4/80$ $5/100$ $6/120$ in table (b) $T = 20W$ (c) 200 mins
4. (a) £57 £65 (b) $C = 8h + 25$
5. (a) $1/12$ $2/16$ $3/20$ $4/24$ $5/28$ in table (b) $C = 4D + 8$ (c) 
(d) (0, 8) (e) Costs £8 before even paying for any days !!
6. (a) $1/15$ $2/25$ $3/35$ $4/45$ $5/55$ $6/65$ in table (b) $T = 10W + 5$
(c) 105 mins
7. (a) $C = 5k + 50$ (b) £100 (c) 
8. (a) $W = 10P + 80$ (b) £280 (c) 

USE OF SIMPLE STATISTICS

By the end of this set of exercises, you should be able to

- (a) calculate **mean, median, mode** and **range** of a data set.
- (b) calculate **mean, median, mode** and **range** of a set of data presented in an **ungrouped frequency table**.
- (c) calculate the **semi-interquartile range** from a data set and an **ungrouped frequency table**.
- (d) represent information by means of a **boxplot**.
- (e) calculate the **standard deviation** of a data set.
- (f) determine the equation of a **regression line** and use it to estimate the **y-value**, given the **x-value**.
- (g) assign **probability** to a set.

Parts (a) and (b) of this outcome are also covered in Mathematics 2 (Intermediate 1).

- (a) calculate **mean, median, mode** and **range** of a data set.
- (b) calculate **mean, median, mode** and **range** of data presented in an **ungrouped frequency table**.

Range, Mean, Median and Mode

Exercise 1

- For each set of data, find the **range**:
 - 8, 6, 2, 9, 7, 7, 4, 5, 12, 3, 9, 5, 6, 4.
 - 67, 83, 69, 65, 28, 36, 37, 95, 21, 25, 22, 47, 29, 54, 32, 65, 78, 94.
 - 2.1, 3.6, 5.8, 4.7, 2.5, 1.4, 8.9, 4.6, 2.5, 1.4, 2.3, 6.5, 6.8, 2.7, 2.9, 1.3, 4.4, 3.7.
- Calculate the **mean** in each case:
 - 8, 6, 6, 5, 7, 9, 9, 8, 6, 5, 4, 8, 7, 6, 3, 4, 5, 5, 4, 3.
 - 5.8, 7.2, 8.1, 4.9, 7.3, 7.7, 9, 6, 6.9, 8.1, 5.2, 7.8, 9.3, 6.7, 7, 7, 5.9, 9.1, 8.2, 4.8.
 - £12.20, £12.60, £13.50, £14.20, £16.80, £12.80, £11.40, £15.60, £17.20, £18.
- Find the **median**:
 - 6, 3, 5, 5, 2, 4, 7, 7, 8, 9, 1, 1, 4, 5, 8, 8, 7, 4, 5, 2, 9.
 - £16, £16, £17, £19, £20, £21, £16, £17, £18, £15.
 - 35 kg, 28 kg, 27 kg, 24 kg, 15 kg, 26 kg, 27 kg, 19 kg, 23 kg, 25 kg, 27 kg, 15 kg, 15 kg, 35 kg.
- For the following sets of numbers, find the **mode**.
 - 2, 2, 3, 3, 3, 3, 4, 4, 4, 4, 4, 5, 5, 6, 6, 6, 6, 7, 7, 7, 7, 8, 8, 9.
 - 3, 9, 2, 3, 6, 8, 1, 2, 5, 5, 8.
 - 256, 250, 257, 251, 251, 251, 259, 250, 251, 251, 252, 253, 253, 250, 254, 254, 250, 255, 256, 251, 256, 258, 259.
- The children of Langbank took part in a fun-run around the village to raise money for charity. These are the number of laps completed by the under 7s.

15	24	13	26	22	17	8	26
16	26	18	26	21	20	14	21

For the number of laps completed, find:

- (a) the range (b) the mean (c) the median (d) the mode.
- Here are the heights, to the nearest cm, of nine girls:
166 cm 176 cm 162 cm 180 cm 161 cm 176 cm 165 cm 175 cm 172 cm

Calculate: (a) the range of heights
(b) the median height.
(c) the mean height, (to nearest cm).

7. Every morning of his Caribbean holiday, Gerald would climb a different palm tree. This diagram shows the heights of the trees which he climbed.



Find: (a) the range (b) the mean (c) the median (d) the mode.

8. In the following examples: calculate the range, the mean, the median and the mode. In each case, state which 'average' best illustrates the catalogue of numbers.
- (a) 18 18 19 20 20 20 21 25 163.
 (b) 34 34 34 34 36 36 37 57 85.
 (c) 56 56 57 58 59 60 62 65 67.

9. Brenda and her brother went to Disneyland for Easter. They kept a note as to how long they had to queue to get on the rides. Here are the results (in minutes):

16 30 25 20 10 110 10 22 40 17

- (a) Calculate the mean time waited.
 (b) Find the median and modal times waited.
 (c) Say which 'average' should be chosen to give a fair representation of the data. Give two reasons for your choice.
10. Alf and his pals decided to have a day at an army assault course. They each recorded the number of press-ups they could do in one minute before attempting the assault course and again at the end of the course.
 The results were:

Name	Alf	Bert	Karl	Dino	Ed	Flo	Jim	Ned	Ian	Jan
Before	48	46	48	40	45	51	47	40	50	46
After	36	38	42	35	36	46	32	28	41	38

- (a) Which person seemed to be affected most by the assault course?
 (b) Find the RANGE for
 (i) the 'before' data
 (ii) the 'after' data
 (c) Calculate the MEAN for both sets of data.
 (d) Comment on the results.
 (e) Was Ian above or below average both times?

11. Mary and Beth played eight rounds of golf together during their summer holidays.

Mary scored: 71 78 76 76 79 75 75 74
 Beth scored: 76 73 74 77 74 74 75 73

- Calculate the range and mean for Mary.
- Calculate the range and mean for Beth.
- Who had: (i) the lowest score (ii) the highest score?
- Who scored better most of the time?

12. Thirty pupils in Primary Four were given a 30 word spelling test. The teacher was to set a 'pass' mark. Here are the marks out of 30:

18	21	23	19	24	25	17	20	18	18
17	22	20	25	22	19	16	21	22	16
18	23	24	19	15	18	24	23	30	29

- Rewrite the marks in order, starting at the lowest.
- What is the range of marks?
- Calculate the mean, mode and median.
- If you were the teacher, what would your pass mark have been? Give a reason !

13. Mrs. Potts buys Bargain T Bags with an advertised 'average 50 T Bags in every box'. She buys 6 boxes and counts the tea bags in each box! Here is what she finds:

49 49 52 50 52 52

- Calculate the mean number of tea bags.
- What is the mode?
- Should she take the boxes back to the shop and complain?
- What gives a clearer picture here, the mean or the mode?

14. East Athletic had a mean score of four goals per game in their first nine games !

- How many goals had they scored?
- In their next game they scored six, but failed to score in their next four matches. What was their mean score over the 14 games?

15. Five sisters have an average (mean) age of 19. Jean is 14, Joan is 18, Jan is 20 and Josephine is 17. What age is the eldest sister, Mags?

16.

17	9
42	11
18	63
26	18
80	

Here are the number of runs scored by a cricketer, but unfortunately one score is missing. If his mean score is 29 over the ten games, calculate what the missing score must have been.

Range, Mean, Median and Mode from a Frequency Table

Exercise 2

1. Jasmine is playing a game of Junior Darts on her children's dart board. The highest she can score is seven. Here are some of her early scores:

4 3 2 2 4 6 7 5 4 7
 1 2 1 1 3 5 6 4 1 4

- (a) Draw up the frequency table and complete it.

SCORE	TALLY	FREQUENCY	SCORE x FREQUENCY
1			
2			
3			
..			
..			
..			

- (b) Calculate her mean score.
 (c) What is the range of the distribution?
 (d) What is
 (i) the modal
 (ii) the median score?
2. These frequency tables show the points given to 2 teams in a TV challenge quiz. For each team, calculate:
 (a) the mean
 (b) the median
 (c) the mode.
 (d) which team has the better 'average' if:
 (i) the mean is used
 (ii) the median is used
 (iii) the mode is used.

The Grouples						
Points	0	1	2	3	4	5
Frequency	2	0	3	5	4	2

The Magpies						
Points	0	1	2	3	4	5
Frequency	1	4	3	5	2	6

3. Ahid made a survey of the ages of children who appeared on a bouncy castle in a park before 9 a.m. one summer's morning.
- (a) What was the range of the distribution?
 (b) What was the modal age?
 (c) Make up a frequency table and add another column to enable you to calculate the mean age. (correct to 1 decimal place)
 (d) Find the median age.

AGE	2	3	4	5	6	7	8	9	10
Frequency	1	10	11	10	7	5	4	3	2

4. The pupils in Castle High School maths class looked out of their classroom window and noticed that the grass had not been cut for a long time.

Their teacher Mrs. McKenneth, estimated that the grass was about 15 cm high, but the pupils wanted to give their estimates.

A table of results was drawn up.

Height (cm)	Frequency	Height \times Frequency
13	2	
14	4	
15	2	
16	2	
17	10	
18	1	
Total	—	—

- (a) How many pupils took part?
 (b) What was the range?
 (c) Calculate:
 (i) the mean
 (ii) the median
 (iii) the mode.
 (d) What did the pupil's think of Mrs. McKenneth's estimate?
5. Quix's Chocolate Company claim that there are over 20 mini-quix bars in an economy pack. Some economy packs were purchased and the results of the contents were as follows:

No. Bars	Frequency	Number \times Frequency
18	2	
19	9	
20	8	
21	5	
22	5	
23	5	
Total		

- (a) Copy and complete the table.
 (b) What was the range in the number of bars?
 (c) Calculate:
 (i) the mean
 (ii) the median
 (iii) the mode.
 (d) Which average did the company use to back their claim?

Quartiles and Semi-interquartile Range

Quartiles

Just as the median divides a set of scores into two equal sets, the quartiles divide the numbers into four equal sets.

There are three quartiles:
the lower quartile, or Q_1
the middle quartile, or Q_2 (the median)
the upper quartile, or Q_3 .

Semi-Interquartile Range

The interquartile range is simply $Q_3 - Q_1$ and the semi-interquartile range is:

$$SIQR = \frac{1}{2} (Q_3 - Q_1)$$

Exercise 3(a)

1. Twelve college students were given a psychology test mark, out of 20, for an experiment they carried out. The scores were:

14, 8, 14, 11, 10, 9, 19, 16, 14, 14, 8, 12

Find the three quartiles and the semi-interquartile range.

2. Find the range and semi-interquartile range for each of the following sets of scores:

(a) 21, 19, 17, 24, 20, 22

(b) 9, 10, 11, 13, 5, 4, 3, 8, 12, 6, 7

(c) 118, 118, 120, 111, 120, 121, 114, 114, 115, 117

(d) 1004, 1005, 1005, 1001, 1001, 1002, 1008, 1008, 1009, 1009, 1008, 1007, 1002.

3. Each of a group of people measured the lengths of his/her index finger. The lengths, in centimetres, were:

7.0, 6.9, 7.5, 7.9, 7.8, 8.7, 8.7, 8.1, 6.9, 8.1, 8.5, 7.0, 7.8, 7.1

Find the median and semi-interquartile range.

The Semi-interquartile Range from a frequency table

Exercise 3(b)

1. Students in a class were asked to count how many books they had with them in their bags one Monday morning.

<i>Number of books</i>	<i>Frequency</i>	<i>Cumulative Frequency</i>
0	0	0
1	1	1
2	2	3
3	3	6
4	4	--
5	6	--
6	4	--
7	6	--
8	4	--

- (a) Copy and complete the frequency table.
 (b) Find the median number of books.
 (c) Find Q_1 , Q_3 and the semi-interquartile range.
2. The ages of a group of workmen on a building site were recorded.

<i>Ages (in years)</i>	24	25	26	27	28	29	30	31
<i>Frequency</i>	2	2	3	5	6	4	2	1

- (a) Draw up a frequency table for the above and add on a cumulative frequency column.
 (b) Find the median and semi-interquartile range.
3. The number of driving lessons received by a group of young people who had passed their driving tests before they were 18 years old are shown below.

<i>No. of lessons</i>	10	11	12	13	14	15	16	17	18
<i>Frequency</i>	2	6	7	11	8	6	5	4	1

Find the median and calculate the semi-interquartile range.

4. The East Neuk Amateur Golf tournament was held over a week-end and the first round scores were noted.

<i>Score</i>	69	70	71	72	73	74	75	76	77
<i>No. of Golfers</i>	1	3	4	12	14	18	14	11	12

- (a) Was there a definite leader at the end of the first round?
 (b) Find the median and calculate the semi-interquartile range.
5. The local Education Authority made a list of the number of teachers who took retirement between the ages of 55 and 65.

<i>Retiral Age</i>	55	56	57	58	59	60	61	62	63	64	65
<i>No. of Men</i>	2	0	3	13	27	35	29	11	6	0	1
<i>No. of Women</i>	8	12	25	31	17	19	6	0	0	1	0

Find the median and calculate the semi-interquartile range for both men and women.

6. The label on a RED BELL matchbox reads: 'Average contents – 42 matches'
 A sample of 50 boxes was analysed and the following figures obtained.
 (a) Find the mean number of matches per box for the sample.

<i>No. of matches in box</i>	37	38	39	40	41	42	43
<i>Frequency</i>	3	4	7	15	16	4	1

- (b) Find the median and calculate the semi-interquartile range.
 (c) Comment on the statement on the boxes of matches.

The Boxplot

Introductory Question

Copy and complete the working for this question:

Find the median and SIQR for the following set of numbers and draw a box plot to show the results.

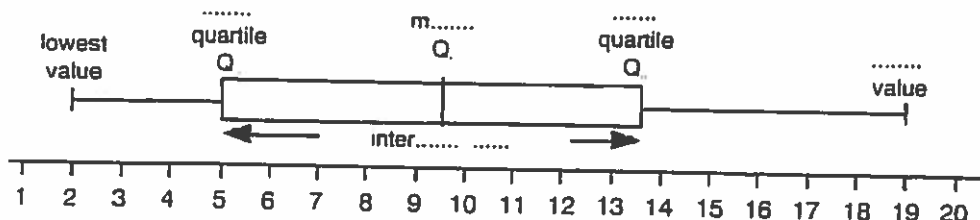
2, 3, 4, | 6, 7, 8, | 11, 11, 12, | 15, 15, 19

The Median (Q_2) is given by $Q_2 = \frac{1}{2}(8 + \dots) = \dots$

The Lower Quartile (Q_1) is $Q_1 = \frac{1}{2}(4 + \dots) = \dots$

The Upper Quartile (Q_3) is $Q_3 = \frac{1}{2}(\dots + \dots) = \dots$

The Boxplot



(Make a copy of this and fill in the blanks).

Exercise 4

1. A father timed how long his daughter was on the phone during 10 phone calls over a two night period. Here are the times in minutes.

2, 5, 6, 8, 10, 10, 10, 12, 17, 22

(a) Find the median and upper and lower quartiles.

(b) Show the information as a boxplot.

2. The daily rainfall (in millimetres) was measured on the roof of the meteorological offices from March 10th to March 23rd.

0, 3, 5, 6, 9, 15, 12, 5, 2, 0, 8, 12, 5, 8

(a) Rearrange the measurements in order and find the medians and quartiles.

(b) Show the results as a boxplot.

3. A man timed himself over a three week period on how long it took him to drive to work in the morning. The times, in minutes, were:

15, 17, 20, 23, 29, 32, 30, 29, 25, 23, 18, 29, 15, 17, 23, 20.

(a) Find the median and quartiles.

(b) Show your results as a boxplot.

4. A factory manager noted the number of absences, due to 'illness', both the men and women had during 1996.

men 2, 2, 2, 3, 3, 3, 5, 5, 5, 6, 7, 7, 7, 7, 8, 8, 8, 10, 11, 11, 12, 12, 13, 17
 women 0, 0, 0, 0, 1, 1, 1, 2, 2, 2, 2, 3, 4, 4, 4, 6, 6, 7, 8, 8, 8, 8, 8, 9, 9

- (a) Find the median and quartiles for each set of data.
 (b) On the same diagram, draw the two boxplots to represent the two sets of data.
 (c) Make two or three observations about your results.
5. A group of women were asked about the number of paperbacks they had read over the previous 12 months.

No. of books	0	1	2	3	4	5	6	7
No. of women	4	1	6	2	5	8	4	1

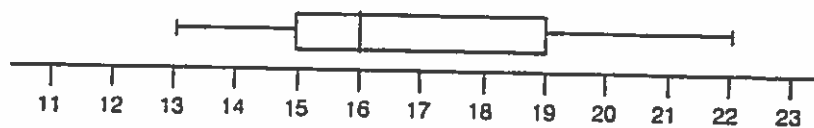
- (a) Draw up a frequency table, adding a cumulative frequency column.
 (b) Find the median number of books and calculate the semi-interquartile range.
 (c) Show your results as a boxplot.

6. A group of senior citizens were asked when they first noticed they had grey hairs. The results are shown as a back-to-back stem and leaf diagram.

men	stem	women
8 5 5 2 1 1	3	8 8 9
8 8 7 5 5 4 2 2 0	4	0 2 4 4 5 7 8
5 2 1 1	5	0 1 1 5 6
7 5 1 0	6	0 2 3 8
	7	1

- (a) Find Q_1 , Q_2 and Q_3 for each sex.
 (b) On a single diagram, show the two boxplots representing this information.
 (c) Make one or two comments about the results.

7. A group of seven young people turned up at the opening of a new youth club. Their ages were noted and the boxplot shown below was drawn up.



Though all the ages cannot be predicted exactly, try to make up a list of possible ages which would fit the above graph.

Standard Deviation

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

standard deviation $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$ where $n =$ the number of scores

Exercise 5

1. Follow through this example carefully to find the standard deviation of this sample of scores.

5, 7, 8, 10, 10, 13, 17

- (a) Find the mean \bar{x} of the set of seven numbers.
 (b) Copy and complete the table and find the total of the $(x - \bar{x})^2$ column. (i.e. find $\sum (x - \bar{x})^2$)
 (c) Now calculate the standard deviation, s , of the seven numbers.

Score x	$x - \bar{x}$	$(x - \bar{x})^2$
5	$5 - 10 = -5$	$(-5)^2 = 25$
7	$7 - 10 = -3$	$(-3)^2 = 9$
8		

2. At Halloween, a group of children each counted out the number of apples they received.
 13, 20, 16, 24, 19, 16
 (a) Calculate the mean number of apples.
 (b) Draw up a table and find the standard deviation.
3. During one week in January 1997 a man recorded the wind speed, in knots, at noon each day in his back garden.
 11, 2, 0, 2, 18, 16, 7
 (a) Find the mean and range.
 (b) Rearrange the above recordings and find the median and semi-interquartile range.
 (c) Calculate the standard deviation.
4. Three groups of Primary 6 children sat the same test.

Blue Group: 12, 13, 14, 14, 14, 14, 15, 16

Red Group: 11, 11, 12, 14, 18, 18

Yellow Group: 8, 8, 9, 9, 14, 19, 19, 20, 20.

- (a) Check that the mean for each of the three groups is exactly the same.
 (b) Use a separate table each time to calculate the standard deviation for each group.
 (c) Comment on the differences in the standard deviations of the groups.

5. A golfer takes a note of his golf scores for each game he plays throughout the golf season.
94, 112, 88, 92, 100, 87, 90, 91, 88, 96, 94, 102, 83, 85, 86
- (a) Calculate the golfer's mean score.
(b) Draw up a table and hence calculate the standard deviation.
6. Bob grows brussel sprouts in his garden. He is hoping to win a prize in the next Campsie Show. He has been advised that if he uses Make-it-grow fertiliser then his sprouts will be bigger than normal.

He weighs each sprout carefully. The weights are in grams.

49, 50, 55, 47, 62, 35, 28, 59, 53, 54, 43, 58, 47, 69, 75, 34

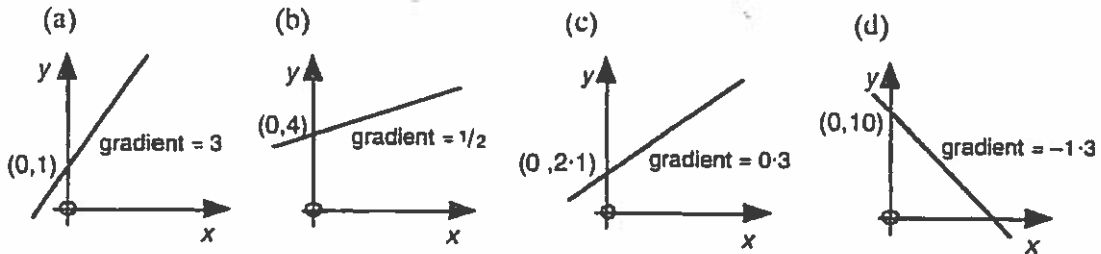
- (a) Calculate the mean weight of the sprouts.
(b) Draw up a table and hence calculate the standard deviation.



Regression Lines

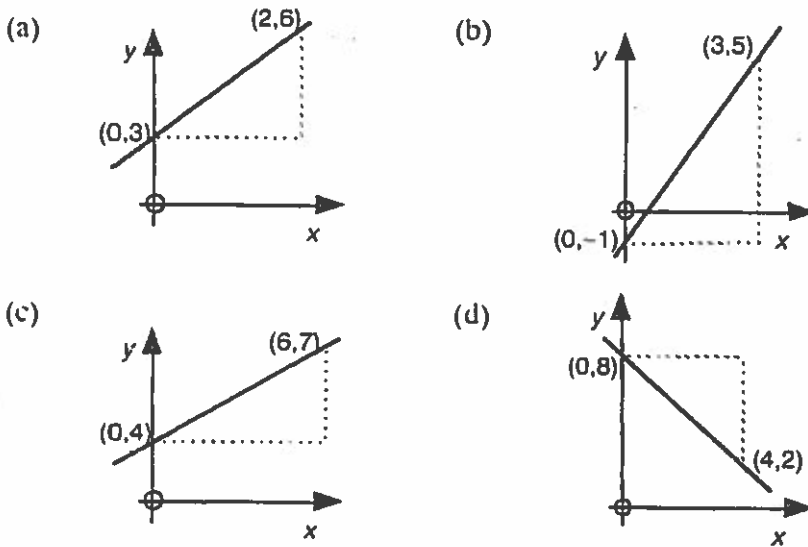
Exercise 6

1. Write down the equations of these lines:

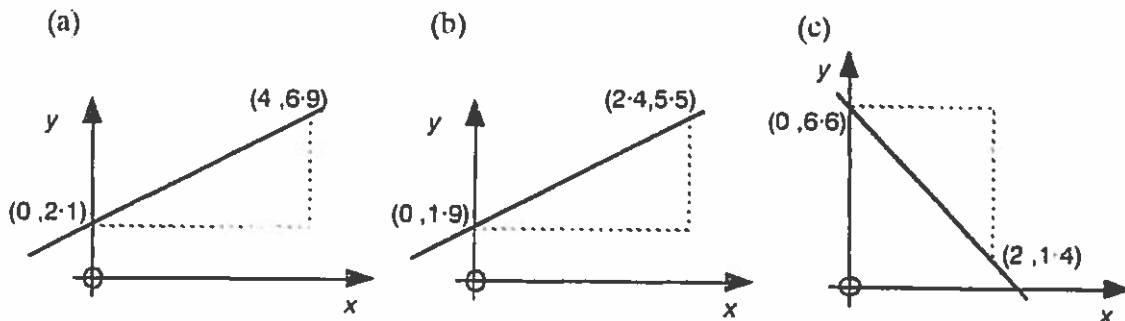


2. For each of the following lines,

- (i) find its gradient
- (ii) then find its equation.



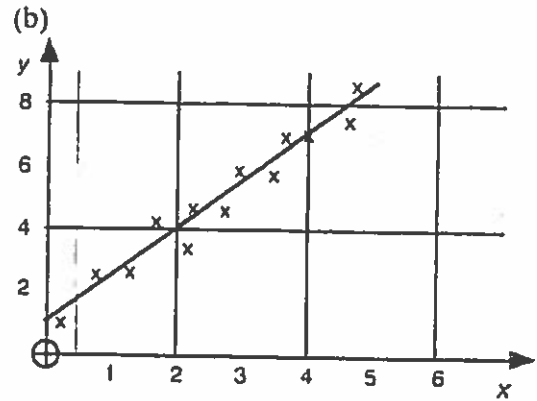
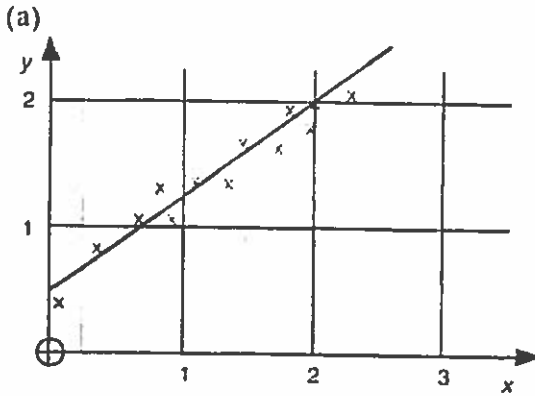
3. These lines all have decimal gradients. Find the equations of these lines:



Regression lines (lines of best fit)

Exercise 7

1. For both of the following sets of points, the regression lines have been drawn for you. Choose two points on each line, find the gradient of it and write down its equation.



2. (i) Use $\frac{1}{2}$ centimetre squared paper to plot the following sets of points.
 (ii) Decide if there is a strong enough correlation (or connection) between the pairs of points to draw a regression line.
 (iii) Where yes, draw, by eye, the best fitting line of regression.
 (iv) Find the equation of the line of regression.

(a)

x	0.5	1.0	1.5	2.0	2.5	3.0	3.5
y	0	1.1	1.5	3.0	4.2	4.6	6.0

Scales

x axis 1cm = 1 unit
 y axis 1cm = 1 unit

(b)

x	0	0.5	1.0	1.5	2.0	3.0	4.0
y	1.25	1.5	1.8	2.2	2.25	2.9	3.2

x axis 2cm = 1 unit
 y axis 2cm = 1 unit

(c)

x	0	5	10	15	20	25	30
y	10	13	18	20	27	28	35

x axis 1cm = 5 units
 y axis 1cm = 5 units

(d)

x	0	0.5	0.75	1.0	1.5	1.75	2.25
y	4.5	3.7	2.8	2.6	1.25	1.0	0

x axis 2cm = 1 unit
 y axis 2cm = 1 unit

Use 2 mm graph paper for the next four questions.

3. The English and the German judges at an ice skating competition gave the following marks for the eight finalists in an International competition.

<i>English (x)</i>	1.5	2.7	5.6	4.9	3.8	4.2	3.8	2.1
<i>German (y)</i>	2.6	3.6	6.4	5.5	4.6	5.0	4.5	3.1

- (a) Plot the eight pairs of scores and draw the line of regression.
(Use a scale of 2 cm = 1 mark on both axes)
- (b) Find the equation of the line of regression in the form $y = mx + c$.
- (c) Use it to decide the most probable mark given by the German judge to a competitor who was given a mark of 1.9 by the English judge.
4. A group of eight pupils compared their French and English marks in two recent tests.

	Ted	Bill	Flo	Lucy	Ian	Eric	Stu	Millie
<i>French (x)</i>	10	35	60	24	56	17	42	49
<i>English (y)</i>	23	57	88	40	85	33	62	?

Millie had not had her English mark back by the time the table was made up.

- (a) Plot the seven pairs of known points. (Scale 1 cm = 5 marks)
- (b) Draw the line of regression through the points.
- (c) Find the equation of the line of regression.
- (d) From it, estimate what Millie's English mark might have been.
5. At different times during his life, David had both his height and the circumference of his head measured. The table shows both of these (in centimetres).

David's Height	(x)	40	60	75	90	120	150	180
Circumference of David's head	(y)	29	30	36	37	45	48	56

- (a) Plot the above pairs of measurements on 2mm graph paper (1 cm = 10 cm).
- (b) Draw the line of regression through the points if you feel there is one.
- (c) Find the equation of this line of regression.
- (d) When David was fourteen years old, his height was 165 centimetres. Estimate what the circumference of his head was at that time.

6. A leak develops in the bottom of a water storage tank on a farm. Using a dipstick, the farmer measures the depth of the water (in metres), in the tank over a period of 9 days.

<i>Day Number</i> (x)	1	3	4	6	8	9
<i>Depth (in m)</i> (y)	2.25	1.75	1.63	1.17	0.84	0.59

- (a) Plot the above pairs of measures. (x scale \rightarrow 2 cm = 1 day)
(y scale \rightarrow 5 cm = 1 metre)
- (b) Draw and find the line of regression.
- (c) Use the line to estimate the depth of water after 5 days.
- (d) After how many days do you think the tank will finally be empty?

MATHEMATICS 2 (INTERMEDIATE 2)

Checkup Exercise 2

1. Find the **range**, the **mean**, the **mode** and the **median** in the following:

- (a) 1, 3, 5, 7, 9, 11, 14, 14
 (b) £11, £15, £3, £6, £2, £14, £7, £13, £11, £10, £7.
 (c) 5cm, 2cm, 2cm, 1cm, 3cm, 3cm, 3cm, 4cm,
 4cm, 3cm, 3cm, 4cm, 2cm, 3cm, 2cm, 4cm.

2. In a maths exam, everyone who sat it got between 51% and 56%.

Here is a frequency table displaying the results.

Mark	Frequency
51	3
52	4
53	7
54	6
55	3
56	1

- (a) What is the **range** of marks?
 (b) What is the **modal** mark?
 (c) Find the **median** mark.
 (d) Calculate the **mean** mark, giving your answer correct to 1 decimal place.

3. A paper boy was informed by his new employer that previous paper boys had been paid:
 £6.56 £9.81 £4.81 £5.96 £8.46 £5.56 per week.
 He was now being offered the **median** of these amounts, but being a true statistician, he said that he would prefer the **mean**!
 Was he correct? Explain fully!

4. A Sunday school teacher was asked about the ages of children in her group. She replied:
 4, 5, 5, 6, 6, 7, 7, 7, 7 and 19!
 (a) Calculate the **mean** age.
 (b) How many of the group were below the mean age?
 (c) Was the mean a good choice for 'average'?
 (d) What 'average' (**mean**, **mode** or **median**) should have been used here?

5. The owner of a shoe shop is ordering from the manufacturer. In order to find out which size of shoe to order most of, he looks carefully at the size of shoes which women buy in his shop.

Here is one common sample of shoe size he found:

3 3 3 3 4 4 5 5 6 6 6 6 6 6 7

- (a) Calculate the mean, mode and median.
 (b) For his own purpose, which one should the shop owner make the most use of?
6. Richard gets the following marks (out of 10) for his spelling tests.
 9 5 5 4 8 9 7 3 4 4 6
- (a) Find: (i) the mean (correct to the nearest whole number)
 (ii) the mode
 (iii) the median.
 (b) Richard's 'average' mark will be used by the teacher in his report. Which 'average' - mean, mode or median, would Richard prefer?

7. This table shows the results of a survey in a factory on the average annual pay of the workers, rounded to the nearest £1000.

Pay (£1000's)	13	14	15	16	17	18	19	20	21	22
Number	1	3	5	3	6	9	2	7	3	1

- (a) How many people took part in the survey?
 (b) What was the range in their pays?
 (c) What was the modal pay?
 (d) What was the median pay?
 (e) Draw up a frequency table and add on a last column to enable you to calculate the mean pay.
8. Find the medians, quartiles and semi-interquartile ranges of the following:
 (a) 17, 17, 19, 20, 23, 23, 25, 27, 27, 27, 30, 31, 33.
 (b) 2.9, 4.6, 3.8, 4.8, 5.0, 4.2, 2.4, 3.1, 4.9, 4.6.

9. A small secondary school noted the number of standard grade maths passes of its fourth year, along with their grades.

Grade	Number
1	3
2	8
3	10
4	13
5	7
6	4
7	2

- (a) Find the median grade.
 (b) Find the lower and upper quartiles and then state the semi-interquartile range.
10. A security guard, overseeing a car park, made a note of the ages of the cars one evening. The ages, in years, were: 5, 1, 3, 7, 6, 5, 10, 2, 1
- (a) Find the median and upper and lower quartiles.
 (b) Show all of this information as a box plot.

11. Show the details from question 9 as a box plot.

12. A girl threw 8 plastic darts at her toy dart-board. Her scores were: 11, 17, 10, 6, 4, 9, 8, 15.

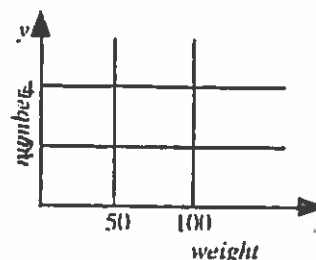
Score (x)	$x - \bar{x}$	$(x - \bar{x})^2$
11		
17		
10		
6		
4		
9		
8		
15		

- (a) Calculate the mean \bar{x} .
 (b) Draw up and complete this table.
 (c) Calculate the standard deviation of the set of scores.

13. An ornithologist believes that the more bread he leaves out for the birds in the morning, the greater the number of different species he'll attract to his garden. Over a nine day period, he weighs out the bread and notes the number of species which land in his garden.

Weight (grams)	50	125	175	225	300	375	500	575	650
No. of Species	3	4	6	6	8	9	13	13	15

- (a) Use $\frac{1}{2}$ centimetre squared paper to plot the results.
 (b) Draw the best fitting line through the set of points.
 (c) Find the equation of this line of the form $y = mx + c$.
 (d) Use your line to estimate how many species might be expected to land in the garden when 400 grams of bread is left out.



14. (a) Plot the following points on 2 mm graph paper.

x	0.0	2.0	3.5	4.0	6.5	7.5	8.0
y	5.9	8.2	12.4	13.3	20.1	22.4	23.9

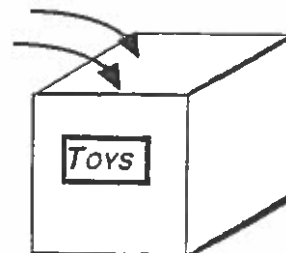
Scales: x - axis (2 cm = 1 unit); y - axis (1 cm = 2 units)

- (b) Draw the line of best fit through the points.
 (c) Find the equation of this line of regression.
 (d) What would you expect the value of y to be when x is 5?
15. A five-sided spinner has a number (1-5) on each of its sides. When it is spun,
- (a) what is the probability that it stops at:
- a 2
 - an even number
 - an odd number?
- (b) what is the probability that:
- it won't stop
 - it will stop at one of the numbers 1-5?

16. Mrs. Young put her two son's toys into one box in the dark attic. Albert's toys were - 3 planes, 4 cars, 2 jigsaws and 1 construction set. Andrew's toys were - 5 books, 4 cars and 1 football.

Albert, sneaks into the attic looking for a football. In the darkness, he plunges his hand into the box! What is the probability that he will first touch:

- a book
- a plane
- a car
- the football
- one of his own toys
- one of Andrew's toys?



Answers to Use of Simple Statistics

Exercise 1

- (a) 10 (b) 74 (c) 7.6
- (a) 5.9 (b) 7.1 (c) £14.43
- (a) 5 (b) £17 (c) 25.5kg
- (a) 4 (b) 5 (c) 251
- (a) 18 (b) 19.6 (c) 20.5 (d) 26
- (a) 19 cm (b) 170 cm (c) 172 cm
- (a) 12 m (b) 10.2 m (c) 10 m (d) 10 m
- | Range | Mean | Mode | Median | Best |
|---------|------|------|--------|----------|
| (a) 145 | 36 | 20 | 20 | Med/Mode |
| (b) 51 | 43 | 34 | 36 | Mode |
| (c) 11 | 60 | 56 | 59 | Mean |
- (a) 30 mins (b) Med = 21 mins Mode = 10 mins
(c) Median; Mean is put out by 110 mins. Mode...only 2 at 10 mins..not enough to justify
- (a) Jim 15 less (b) i) 11 ii) 18 (c) Before = 46.1 After = 37.2
(d) At end...wider range and mean lower. (e) Above both times.
- (a) R 8, M 75.5 (b) R 4, M 74.5 (c) i) Mary ii) Mary (d) Beth
- (a) List Marks in order (b) 15
(c) Mean = 20.9 Mode = 18 Median = 20.5
(d) 20 or 21 Mean & median close to each other and small range
- (a) 50.7 (b) 52 (c) No! (d) Mode
- (a) 36 (b) 3
- 49
- 6

Exercise 2

- (a) Complete table (b) 3.6 (c) 6 (d) i) 4 ii) 4
- (a) B = 3.4 D = 3 (b) B = 3 D = 3 (c) B = 3 D = 5
(d) i) Groupies ii) neither iii) Magpies.
- (a) 8 years (b) 4 (c) 5.3 (d) 5
- (a) 21 (b) 5 cm (c) i) 15.8 cm ii) 17 cm iii) 17 cm
(d) Not great! too low.
- (a) Check table (b) 5 (c) i) 20.5 ii) 20 iii) 19
(d) Median

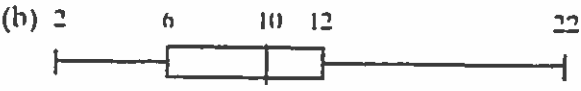
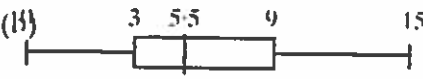
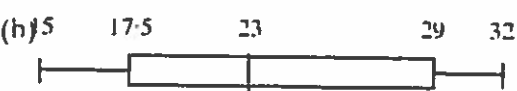
Exercise 3(a)

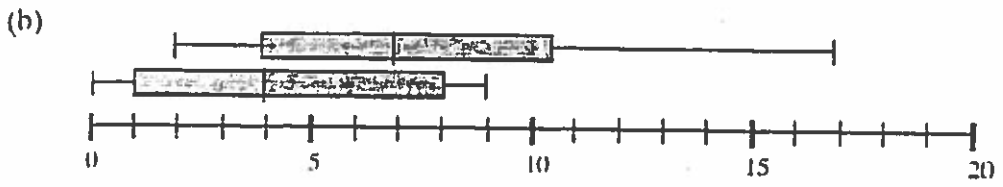
- lower quartile = 9.5, median = 13, upper quartile = 14, SIQR = 2.25
- (a) Range = 7 SIQR = 1.5 (b) Range = 10 SIQR = 3
(c) Range = 10 SIQR = 3 (d) Range = 8 SIQR = 3
- median = 7.8 SIQR = 0.55

Exercise 3(b)

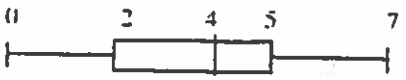
- (a) Cumulative frequencies 0, 1, 3, 6, 10, 16, 20, 26, 30.
(b) median = 5 (c) lower quartile = 4, upper quartile = 7 SIQR = 1.5
- (a) Cumulative frequencies 2, 4, 7, 12, 18, 22, 24, 25.
(b) median = 28 (c) SIQR = 1.5
- median = 13 SIQR = 1.5
- (a) Yes - score = 69 (b) median = 74, SIQR = 1.5
- MEN - median = 60, SIQR = 1 WOMEN - median = 58, SIQR = 1
- (a) mean = 40.1 (b) median = 40, SIQR = 1
(c) median and mean indicate that 'average' contents are only 40, not 42!

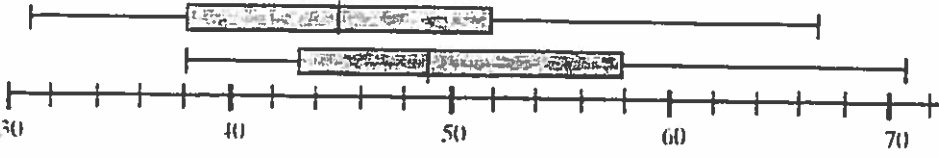
Exercise 4

- (a) median = 10
lower quartile = 6
upper quartile = 12
(b) 
- (a) median = 5.5
lower quartile = 3
upper quartile = 9
(b) 
- (a) median = 23
lower quartile = 17.5
upper quartile = 29
(b) 
- (a) median = MEN - 7 WOMEN - 4
lower quartile = MEN - 4 WOMEN - 1
upper quartile = MEN - 10.5 WOMEN - 8



(c) Range of women's absences smaller, median lower. => generally fewer absences than men.

- (a) Cumulative frequencies: 4, 5, 11, 13, 18, 26, 30, 31.
(b) median = 4, SIQR = 1.5 (c) 

- (a) MEN $Q_1 = 38, Q_2 = 45, Q_3 = 52$.
(b) WOMEN $Q_1 = 43, Q_2 = 49, Q_3 = 58$.


(c) Women go greyer later in life, median age is later in life (or women lie more!)

- Possibly: 13, 15, 15, 16, 17, 19, 22.

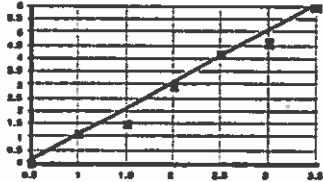
Exercise 5

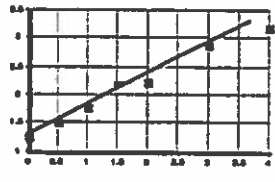
- (a) mean = 10 (b) total = 96 (c) standard deviation = 4
- (a) mean = 18 (b) standard deviation = 3.85
- (a) mean = 8, range = 18 (b) median = 7, SIQR = 7
(c) standard deviation = 7.19
- (a) mean = 14 (b) blue s.d. = 1.20, red s.d. = 3.29, yellow s.d. = 5.52
(c) comments.
- (a) mean = 92.5 (b) standard deviation = 7.61
- (a) mean = 51.125, standard deviation = 12.48

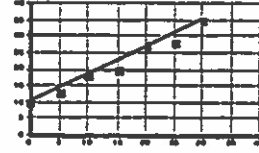
Exercise 6

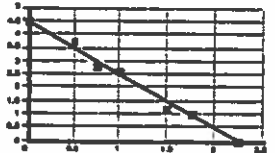
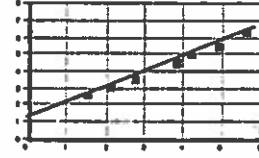
- (a) $y = 3x + 1$ (b) $y = \frac{1}{2}x + 4$ (c) $y = 0.3x + 2.1$ (d) $y = -1.3x + 10$
- (a) $m = 1.5$ ii) $y = 1.5x + 3$ (b) $m = 2$ ii) $y = 2x - 1$
(c) $m = 0.5$ ii) $y = 0.5x + 4$ (d) $m = -1.5$ ii) $y = -1.5x + 8$
- (a) $y = 1.2x + 2.1$ (b) $y = 1.5x + 1.9$ (c) $y = -2.6x + 6.6$

Exercise 7

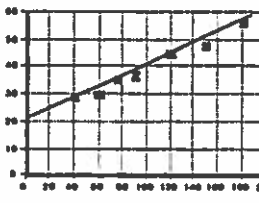
- (a) $y = 0.75x + 0.5$ (b) $y = 1.5x + 1$
- (a)  $y = 2x - 1$

(b)  $y = 0.5x + 1.25$

(c)  $y = 0.8x + 10$

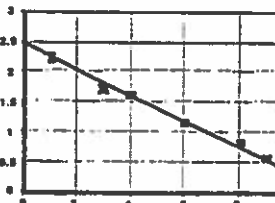
(d)  $y = -2x + 4.5$
- (a) 

(b) $y = 0.9x + 1.1$ (approx)

(c) 2.8
- (a) 

(b) $y = 1.3x + 10$

(c) $y = 1.3x + 10$

(d) 74
- (a) 

(b) $y = -0.2x + 2.4$ (c) 1.4 (d) 12 days

Exercise 8

1. (a) $3/18 = 1/6$ (b) $5/6$
2. (a) $1/6$ (b) $1/2$ (c) $1/3$ (d) $1/2$
3. (a) $8/24$ (b) $4/24$ (c) $2/24$ (d) $6/24$ (e) $4/24$
4. (a) $1/49$ (b) $24/49$ (c) $1/7$ (d) $1/7$
5. 30% (or 3 out of 10)
6. (a) $1/13$ (b) $1/52$ (c) $3/13$ (d) $1/2$ (e) $1/4$
7. (a) $1/5$ (b) $2/5$
8. (a) $7/20$ (b) $1/20$ (c) $8/20 = 2/5$ (d) $3/5$
9. (a) 120 (b) $1/6$ (c) $5/12$ (d) $3/4$
10. (a) $1/8$ (b) $5/16$ (c) $11/16$
11. (a) $7/25$ (b) $2/5$ (c) $17/25$ (d) $17/25$ (e) 0
12. (a) $27/124$ (b) $39/124$ (c) $9/124$
13. (a) (1,1)(1,2)(1,3)(1,4)(1,5)(1,6) (b) 36
 (2,1)(2,2)(2,3)(2,4)(2,5)(2,6)
 (3,1)(3,2)(3,3)(3,4)(3,5)(3,6) (c) i) $1/36$ ii) $1/6$
 (4,1)(4,2)(4,3)(4,4)(4,5)(4,6)
 (5,1)(5,2)(5,3)(5,4)(5,5)(5,6) (iii) $1/6$ iv) $5/18$
 (6,1)(6,2)(6,3)(6,4)(6,5)(6,6)
14. (a) 5560 (b) i) 0-014 ii) 0-0719 iii) 0-719
 (c) There were 10 times as many using Radia as Rainbo.
 This showed up when the probability was 10 times that of Rainbo.
15. (a) 0-5 (b) 0-12 (c) 0-07 (d) 0 (e) 0-2
16. (a) 150
 (b) i) 0-007 ii) 0-1 iii) 0-03 iv) 0 v) 0-073

Checkup Exercise 2

1. Range Mean Mode Median
 (a) 13 8 14 8
 (b) £13 £9 none £10
 (c) 4 cm 3 cm 3 cm 3 cm
2. (a) 5 (b) 53 (c) 53 (d) 53-2
3. Median = £6.26, Mean = £6.86. Yes. He was correct!
4. (a) 7-3 (b) 9 out of 10 !
 (c) No, the teacher included herself, knocking the mean out
 (d) Median
5. (a) Mean 4.9, Mode 6, Median 5
 (b) Mode will tell him which size he sells most.
6. (a) i) 6 ii) 4 iii) 5 (b) Mean gives better mark.

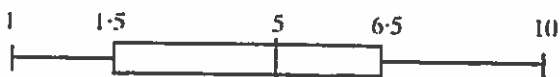
7. (a) 40 (b) 9 (c) £18000 (d) £18000 (e) £17625

8. (a) median = 25, $Q_1 = 19.5$, $Q_3 = 28.5$, SIQR = 4.5

(b) median = 4.4, $Q_1 = 3.1$, $Q_3 = 4.8$, SIQR = 0.85

9. (a) median = 4, $Q_1 = 3$, $Q_3 = 5$, SIQR = 1

10. (a) median = 5, $Q_1 = 1.5$, $Q_3 = 6.5$



11. 1 3 4 5 7

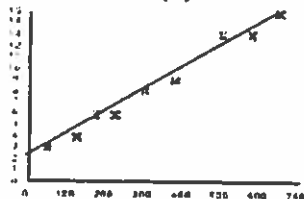


12. (a) $\bar{x} = 10$

(b) table

(c) standard deviation = 3.63

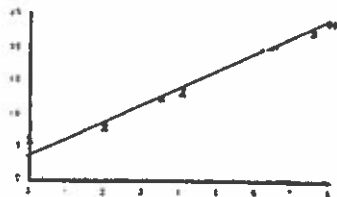
13. (a)



(c) $y = 0.02x + 2$

(d) 10 species

14. (a)



(c) $y = 2.5x + 3$

(d) 15.5

15. (a) i) $1/5$

ii) $2/5$

iii) $3/5$

(b) (i) 0

ii) 1

16. (a) $1/4$

(b) $3/20$

(c) $1/5$

(d) $1/20$

(e) $1/2$

(f) $1/2$

Specimen Questions for Graphs, Charts and Tables

1. (a) 1K

(b) 3

(c) 15

(d) 110

(e) Wk. 4

(f) Wk. 5

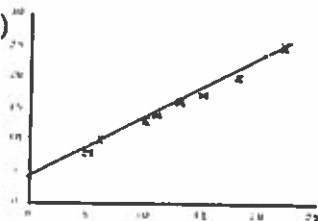
2. (a) i) 250

ii) 125

iii) 50

(b) 25

3. (a)



(b) As History marks rise, so do Geog.

(c) By eye

(d) $y = x + 3$

(e) about 23