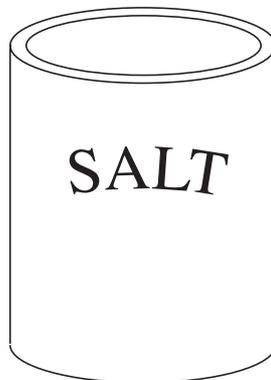# UNITS 7 – 9

Miscellaneous Exercises

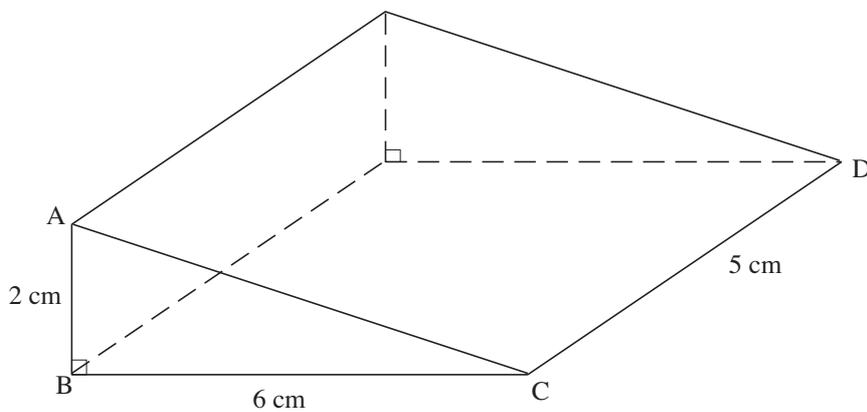1.   A salt container is in the shape of a cylinder.

Not to scale

(a)   The base of the cylinder has a radius of 3 cm.

Calculate the area of the base.

(b)   The volume of the cylinder 565 cm^3.
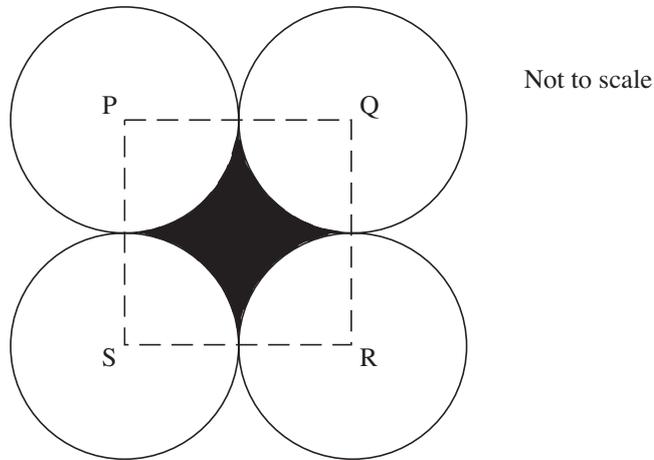
Calculate the height of the cylinder.

(SEG)

2.   The diagram is a drawing of a triangular prism.

(a)   Calculate the area of the triangle ABC.

(b)   Calculate the volume of the prism.

(NEAB)

3.   (a)   A circle has a radius of 28 cm.
             Calculate its circumference.

      (b)

Not to scale

The diagram shows four touching circles.
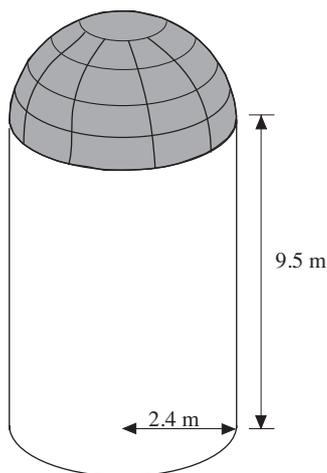
Each circle has a radius of 28 cm.

P, Q, R and S are the centres of the circles.

PQRS is a square.

  (i)   What is the perimeter of the shade region?

  (ii)   Calculate the area of the shaded region.

(*NEAB*)

4.   A farmer's storage container is in the shape of a cylinder with a hemisphere on top.
      The height of the cylinder is 9.5 m.

      The radius of both the cylinder and the hemisphere is 2.4 m.
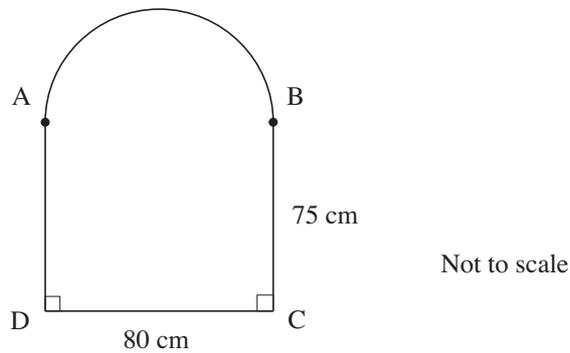

9.5 m

2.4 m

      (a)   Calculate the volume of the farmer's storage container.

      (b)   The volume of a similar storage container is half the volume of the farmer's
             container.

   Calculate the radius of this new container.

(*SEG*)

5. The diagram shows a window.
    The arc AB is a semicircle. BC = AD = 75 cm, DC = 80 cm.

    A   B

    75 cm

    Not to scale

    D   C
    80 cm

   Calculate the area of the window.

    (SEG)

6. The sloping sides of a flower bowl are part of a cone as shown.
    The radius of the top of the bowl is 10 cm and the radius of the bottom of the bowl
    is 5 cm. The height of the full cone is 24 cm.

    |←—10 cm—→| Not to scale

    5 cm

    24 cm
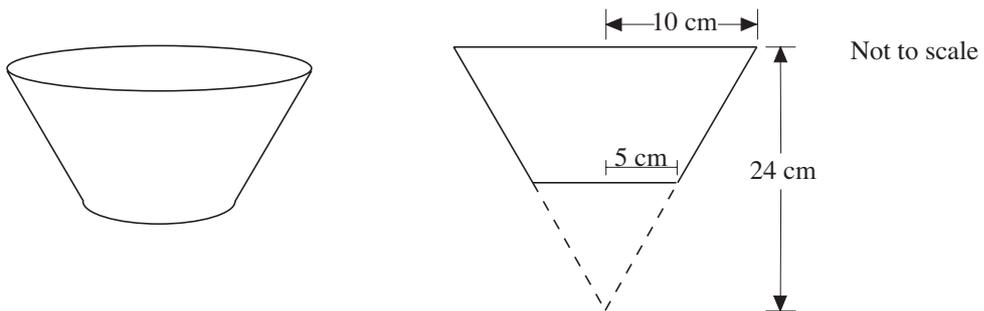
    (a) Calculate the volume of the full cone.

    (b) **By using similar figures,** calculate the volume of the flower bowl.

    (NEAB)

7. An ellipse has lengths a and b.

    y

    b

    O

    a

    x
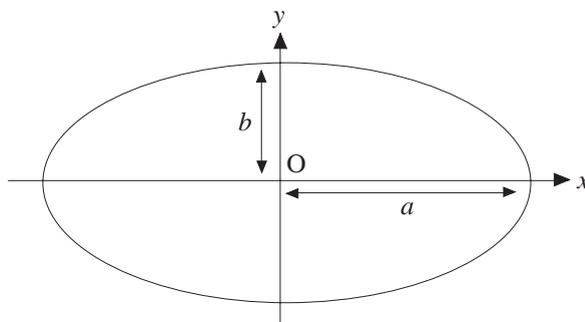
    (a) Which of the following could be a formula for the area of this ellipse?

    (i) $\pi(ab)^2$ (ii) πab (iii) $\pi a^2 b$ (iv) πab^2

    Give a reason for your answer.

(b) The ellipse is rotated around the *x* axis to form a solid. The volume of this solid is

$$V = \tfrac{4}{3}\pi ab^{n}.$$

What is the value of *n*?

(*SEG*)

8. A gardener tests a fertiliser.
He grows some tomatoes with the fertiliser and some without.

He records the weights of all the tomatoes grown.

weight (grams)	frequency with fertiliser	without fertiliser
$50 < W \le 100$	10	2
$100 < W \le 150$	15	42
$150 < W \le 200$	55	46
$200 < W \le 250$	53	41
$250 < W \le 300$	17	34
$300 < W \le 350$	8	1

(a) Draw a frequency polygon for each distribution on a grid like the one below, clearly indicating which is **with fertiliser**, and which is **without fertiliser**.
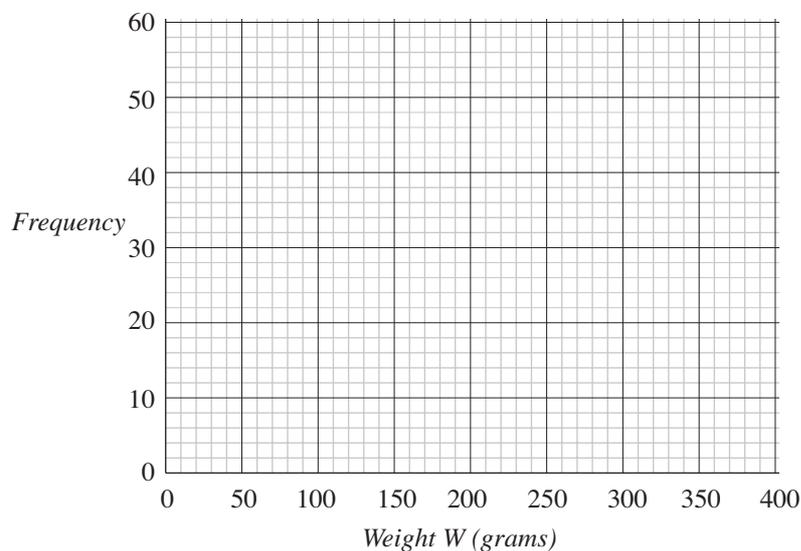
(b) Use the frequency polygons to compare the effects of the fertiliser.

(*NEAB*)

9. There is to be a survey about the need for a new leisure centre in a town.

(a) State why the following question is **not** suitable for use in a questionnaire.

"Do you agree that tennis courts are more important than squash courts?"

(b) Rewrite the question in a suitable form.

(*SEG*)

10. Two groups take the same Maths test.

    The test is marked out of 50.

    Graham writes down the marks for his group.

    25, 47, 49, 31, 38, 24, 19, 22, 38, 25.

    (a) Calculate the mean mark for this group.

    (b) What is the range of marks for this group?

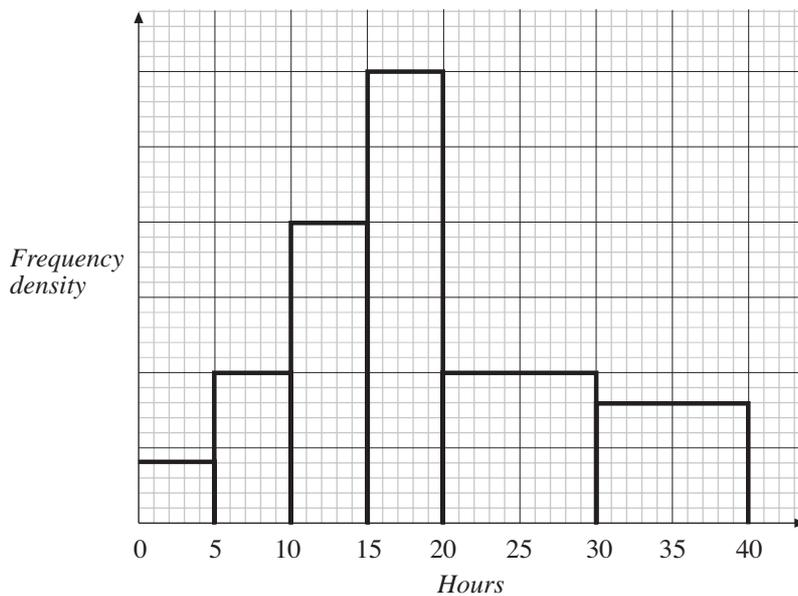   Arpita writes down the marks for her group.

    The lowest mark is 12.

    The range is 30.

    (c) What is the highest mark for her group?

    The mean for her group is 25.

    (d) Compare the results of the two groups.

    (NEAB)

11. In a survey, 50 people were asked how many hours of television they watched in one week.

    The histogram shows the results of the survey.

    No one watched more than 40 hours of television in one week.

    (a) Use the histogram to complete the table of values.

Number of hours	0 -	5 -	10 -	15 -	20 -	30 - 40
Frequency	2					

    (b) The survey was carried out by questioning the first 50 people who went into a shop after 10.00 on a Thursday morning.

        (i) Give one reason why this sample may not be representative of the population.

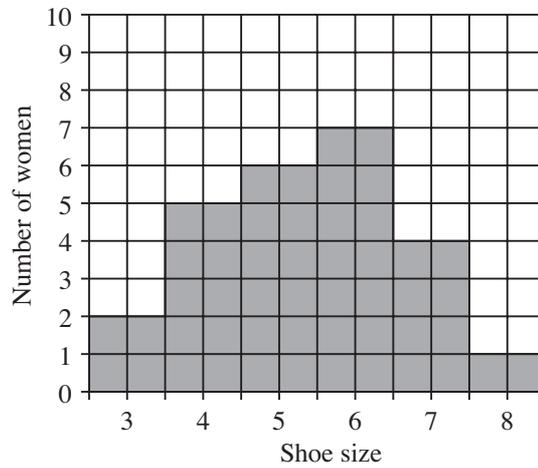(ii)   Suggest a better way of ensuring that the sample is representative of the population.

12.   A survey was carried out on the shoe sizes of 25 men.

The results of the survey were

10	6	9	8	9	8	6	7	9
9	7	7	9	10	9	8	9	8
5	8	8	9	10	8	7.		

(a)   (i)   What is the mode of the shoe sizes?
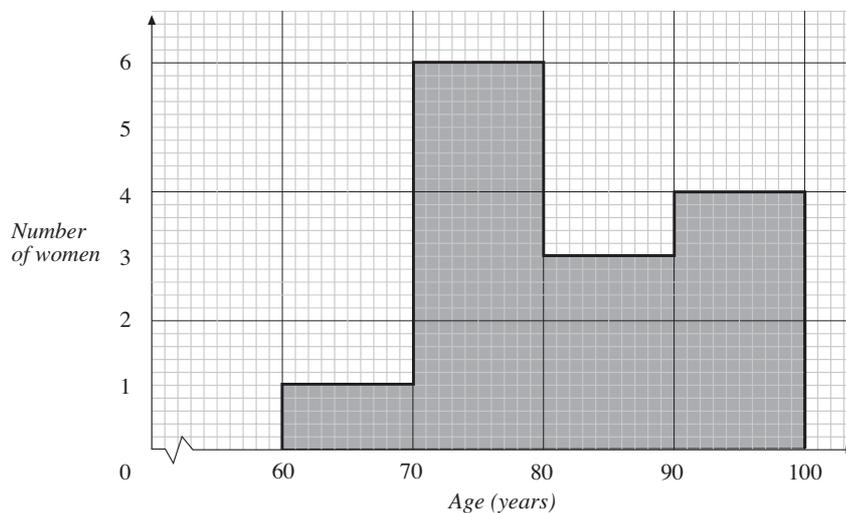
(ii)   What is the median of the shoe sizes?

This frequency diagram shows the results of a survey of the shoe sizes of 25 women.

(b)   Using your answers from part (a) make **two** different comparisons between the shoe sizes of men and women.

13.   There are 14 women in a nursing home.
The graph shows the distribution of their ages.

(a)   Complete the table for these data.

Age y years	Number of women
$60 \leq y < 70$	
$70 \leq y < 80$	
$80 \leq y < 90$	
$90 \leq y < 100$	

(b)   Calculate an estimate of the mean age of these women.

(*SEG*)

14.   The following data refers to the average number of paid hours worked by 5000 men and 5000 women per week in the UK in 1990.

Women			Men		
Number of hours	percentage frequency	cumulative percentage frequency	Number of hours	percentage frequency	cumulative percentage frequency
$0 \leq x < 10$	8	8	$0 \leq x < 10$	2	2
$10 \leq x < 20$	17	25	$10 \leq x < 20$	3	5
$20 \leq x < 30$	18	43	$20 \leq x < 30$	1	
$30 \leq x < 40$	47	90	$30 \leq x < 40$	56	
$40 \leq x < 50$	9	99	$40 \leq x < 50$	35	
$50 \leq x < 60$	1	100	$50 \leq x < 60$	3	

(a)   Complete the table to show the cumulative percentage frequency of the paid hours worked by men.

The graph shows the cumulative percentage frequency of the paid hours worked by women.

(b)   Copy the grid and draw also the cumulative percentage frequency of the paid hours worked by men.

(c)   By finding the interquartile ranges of the two distributions, state whether men or women had the greater variability in the number of paid hours worked per week.
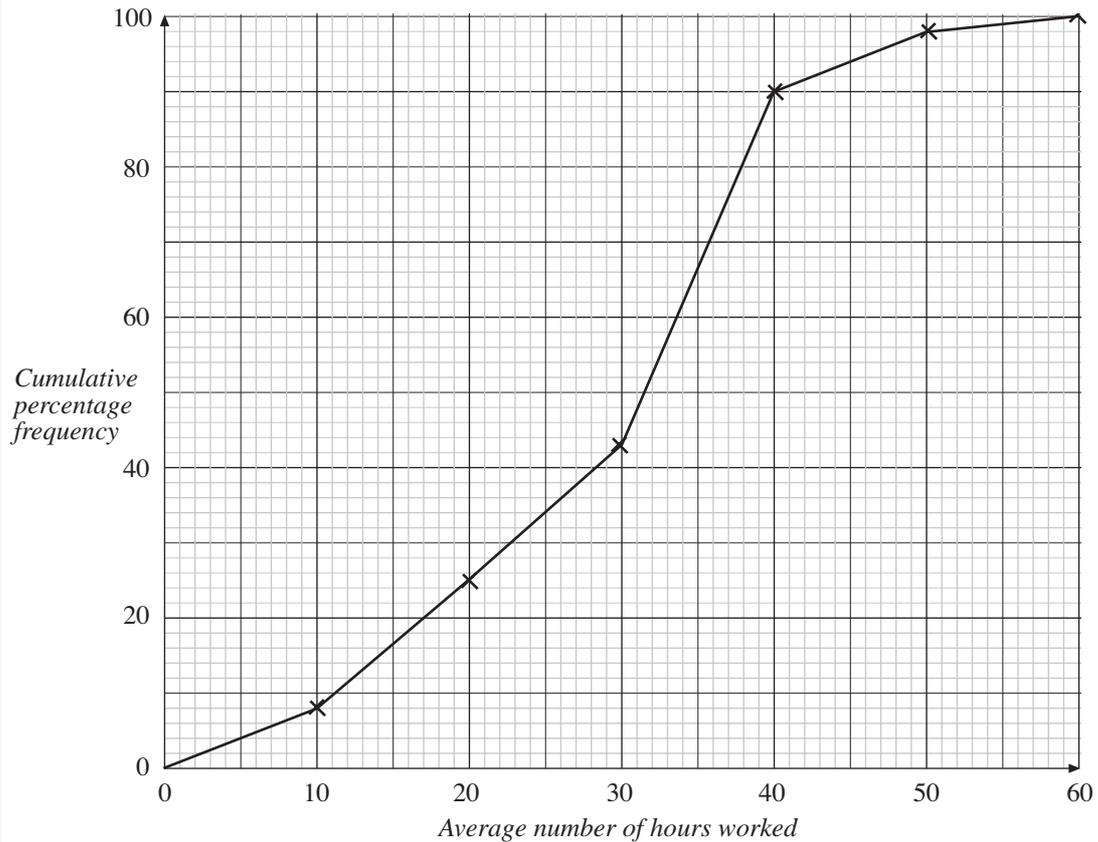
(*NEAB*)

15.   Thirty 14-year old children are surveyed to find out how much television they
      watch in a week. The results are shown below.

Number of hours, x, per week	Frequency
$0 \le x < 10$	2
$10 \le x < 25$	12
$25 \le x < 30$	9
$30 \le x < 40$	7

(a)   On a grid, draw a histogram to represent this information.

(b)   Calculate an estimate of the mean number of hours of television watched per
      week.

(c)   Calculate an estimate of the standard deviation of the number of hours
      watched per week.

(d)   A similar survey of 16-year olds produced a mean of 18.5 hours and a
      standard deviation of 4.8 hours.

      Comment on the differences in the amount of time these 14-year olds and
      16-year olds spend watching television per week.

(*NEAB*)

16. Every day James does a test to see how many units of sugar are present in his blood.

The results of these tests over a period of 50 days are shown in the table below.

Sugar content	Frequency	Cumulative frequency
$2 < x \leq 4$	0	
$4 < x \leq 6$	2	
$6 < x \leq 8$	12	
$8 < x \leq 10$	25	
$10 < x \leq 12$	8	
$12 < x \leq 14$	3	

(a) Complete the table by filling in the cumulative frequencies.

(b) Draw a cumulative frequency diagram.

(c) Use your graph to find the median value of x.

(d) If the sugar content of James' blood is greater than 11.5 units, then it is harmful to his health.

Use your graph to find an estimate of the number of times these readings were greater than 11.5 units.

Show clearly on your graph how you got your answer.

(*NEAB*)

17. A chocolate bar company makes *Lunar Bars* on two different production lines.

(a) The weights, in grams, of a sample of bars on production line A are

68, 67, 64, 65, 65, 63, 66, 68, 68, 66.

Find the mean and standard deviation of the sample from production line A.

(b) A sample from production line B has a mean weight of 67 grams and standard deviation of 3.67 grams.

Given that the *Lunar Bar* wrapper states the weight as 65 grams, which production line is to be preferred by the company? Give your reasons.

(*SEG*)