

**Credit Mathematics**  
**Knowledge and Understanding 2**

**Non-calculator section:**

1. Evaluate

(a)  $2.16 - 31.5 \div 50$       (b)  $0.0037 \times 400 + 32.77$       (c)  $2.2 - 3.12 \times 6 + 21.5$

2. Evaluate

(a)  $\frac{1}{2} + \frac{2}{3} \div 1\frac{1}{5}$       (b)  $\frac{5}{6} + \left(1\frac{1}{2}\right)^2$       (c)  $\frac{5}{6} \div \left(1\frac{1}{2} + 1\frac{1}{3}\right)$       (d)  $\frac{3}{4}$  of  $\left(1\frac{1}{3} - \frac{5}{6}\right)$

3. There are 1260 pupils in a school.  $\frac{5}{9}$  of the pupils are boys.

How many boys are in the school?

4. Michael earns £480 per week. He puts 35% of the money in the bank, gives his mother  $\frac{1}{10}$  in rent and spends the rest.

(a) How much does he put in the bank?

(b) How much does he spend?

5. A bus leaves Aytoun at 1045 and travels to Beeville, 135 km away, where he arrives at 1315. Calculate the average speed of the bus.

6.  $f(x) = 4x - x^3$ . Calculate  $f(-3)$ .

7.  $f(x) = 2x^2 - 5x$ .

(a) Evaluate  $f(-2)$ .

(b) Given  $f(x) = 7$  find two possible values for  $x$ .

8.  $P = \frac{x^2 + xy}{x - y}$ . Find  $P$  when  $x = -4$  and  $y = -2$ .

9. Simplify

(a)  $3(2x - y) - 4(x - y)$       (b)  $(3a - 5b)^2$       (c)  $(3x - 6)(x^2 + 2x - 1)$

(d)  $6x^2 - (2x - 1)(3x - 2)$

10. Solve

(a)  $6 - (x - 3) = 2(2x - 3)$       (b)  $\frac{2}{3}x - \frac{1}{2}(3x - 1) > 3$       (c)  $\frac{2m - 1}{5} + \frac{m}{2} < 1$

11. Factorise fully

(a)  $2xy - 8x$       (b)  $3u^2 - 12u$       (c)  $2n^2 - 18m^2$       (d)  $6p^2 - 7p - 3$

12. Simplify

(a)  $\frac{2x^2 - 8}{x^2 + x - 6}$       (b)  $\frac{4x^2 - 2x}{6x^2 + 5x - 4}$

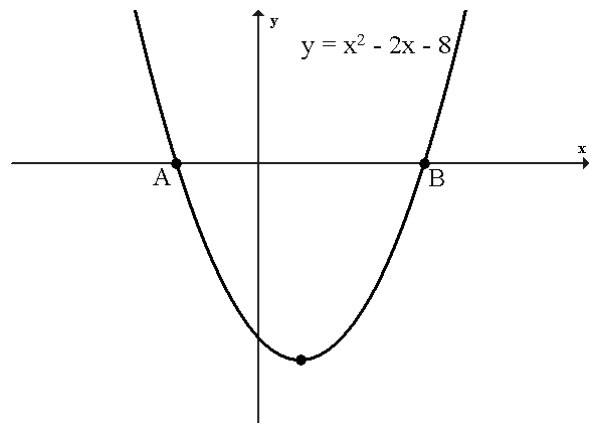
13. Solve

(a)  $5g^2 - 15g = 0$       (b)  $x^2 = 7x - 12$       (c)  $3x^2 - 5x = 2$       (d)  $\frac{x(x-12)}{4} = -8$

14. The parabola opposite has equation

$$y = x^2 - 2x - 8.$$

- (a) Find the coordinates of A and B.
- (b) Find the minimum value of the parabola.
- (c) The point C(7, m) lies on the parabola. Find m.



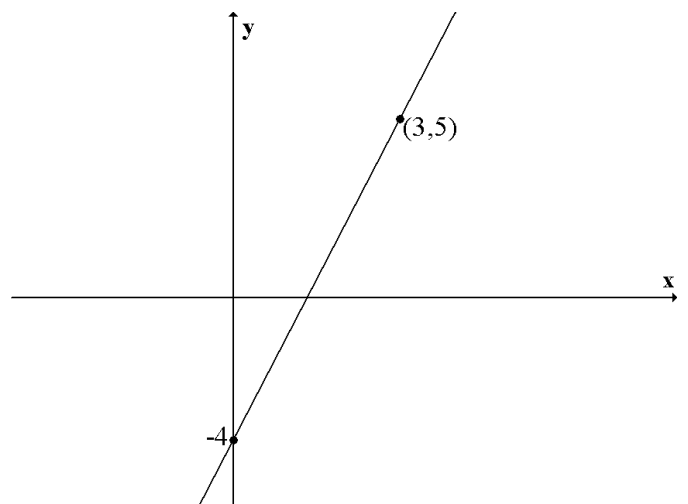
15. Solve  $x + 5y = 16$   
 $5x - 2y = -1$

16. 2 pears and 3 apples cost 85 pence.  
3 pears and 4 apples cost £1.20.

Find the cost of 6 apples and a pear.



17. Find the equation of the line opposite.

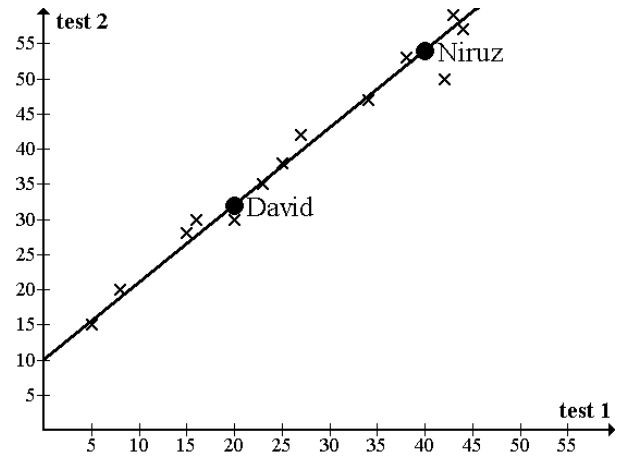


18. The marks of a group of pupils in 2 different maths tests are shown on the scattergraph opposite.

David scored 20 in the first test and 32 in the second test.

Niruz scored 40 in the first test and 54 in the second test.

A line of best fit has been drawn on the graph.



- Describe the relation between test 1 and test 2.
- Find the equation of this line.
- Amanda scored 30 in test 1. Use your equation to estimate her score in test 2.

19. A line has equation  $y = 2x + 3$

- Copy and complete the table below for this line.

|   |   |   |    |
|---|---|---|----|
| x | 3 | 0 | -2 |
| y |   |   |    |

- Draw this line on a graph
- Write down the gradient of the line  $y = 2x + 3$

20. (a) Express  $P = 2(x^2 - 4y)$  in terms of  $x$ .

(b) Express  $w = u + \frac{v}{y}$  in terms of  $y$ .

21. Express as a single fraction

(a)  $\frac{3}{2x} + \frac{1}{3x}$

(b)  $\frac{2}{x^2} + \frac{3}{x}$

(c)  $\frac{3}{6x - 1} - \frac{1}{2x}$

22. Simplify

(a)  $\sqrt{18} + 2\sqrt{27} - \sqrt{200}$

(b)  $2\sqrt{2}(5\sqrt{2} + \sqrt{6})$

23. Express with a rational denominator

(a)  $\frac{10}{\sqrt{5}}$

(b)  $\frac{2\sqrt{3}}{\sqrt{30}}$

24. Simplify

(a)  $\frac{3a^8 \times 6a^{-3}}{2a}$

(b)  $2x^{\frac{1}{2}}(4x^{\frac{7}{2}} - x^{-\frac{1}{2}})$

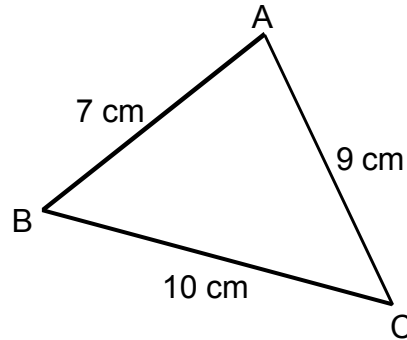
25. Evaluate

(a)  $27^{\frac{2}{3}}$

(b)  $16^{-\frac{3}{4}} + (\frac{1}{2})^0$

26. In the triangle opposite show that

$$\cos BAC = \frac{5}{21}$$



27. In a series of class tests Amanda scored the following

72 54 60 55 57 59 45 56 55 63 80 71

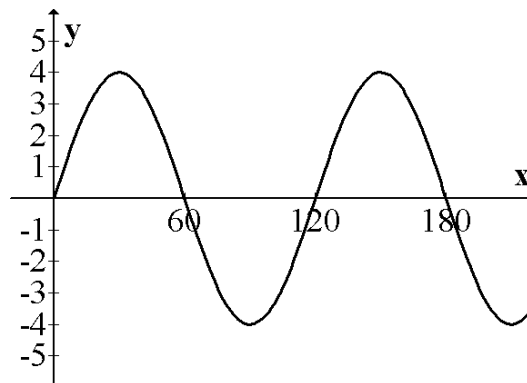
- (a) Write down the range of Amanda's marks.
- (b) Show the information in a boxplot.

28. The wingspans of 15 butterflies are recorded in millimetres.

52 61 45 40 38 66 45 62 70 74 64 45 43 33 45

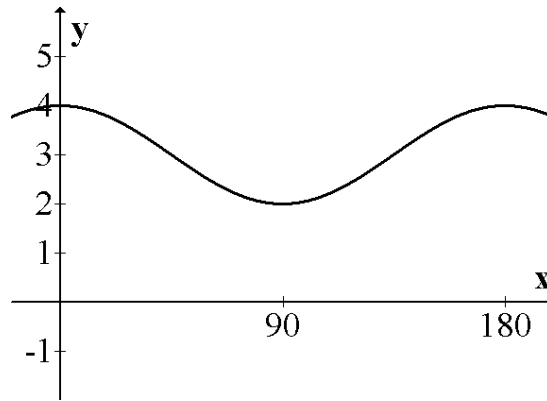
- (a) Show this information in a stem and leaf diagram.
- (b) What is the modal wingspan?
- (c) Find the median wingspan.

29. The diagram below shows the graph of  $y = a \sin bx$ .



Write down the values of a and b.

30. The diagram shows the graph of  $y = \cos bx + c$ . Write down the values of  $b$  and  $c$ .



**Calculator section:**

31. Solve the equation  $2x^2 - x - 7 = 0$  giving your answers correct to 3 significant figures.

32. The scores of a basketball team over 8 games were

66 68 89 75 45 55 60 22

Calculate the mean and standard deviation of these scores.

33. Calculate the mean and standard deviation of 10 numbers where

$$\sum x = 180 \quad \text{and} \quad \sum x^2 = 3356$$

34. Find the annual cost of insuring a house valued at £95500 given an insurance rate of £3.60 per £1000.



35. (a) Niruz goes to France on holiday. She changes £650 into euros at a rate of £1 = 1.42 Euros. How many Euros will she receive?

(b) While in France Niruz spends 700 Euros before changing the rest back to pounds at a rate of £1 = 1.46 Euros. How much will she have, to the nearest penny?

36. Calculate the simple interest on a sum of £2400 at 6.2% per annum for a period of 8 months.

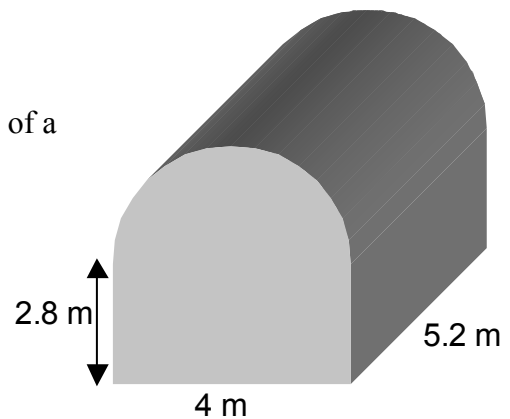
37. An antique cello is valued at £6500. If the value of the cello rises at a rate of 12% per annum, how much will it be worth in 4 years time?



38. A piece of machinery costing £32 000 depreciates at a rate of 4.5% per annum. Find the value of the piece of machinery after 5 years.
39. In a survey of 1250 people, 135 were self-employed. What percentage of the people surveyed were self-employed?

40. The prism opposite has a cross-section in the shape of a rectangle and a semi-circle.

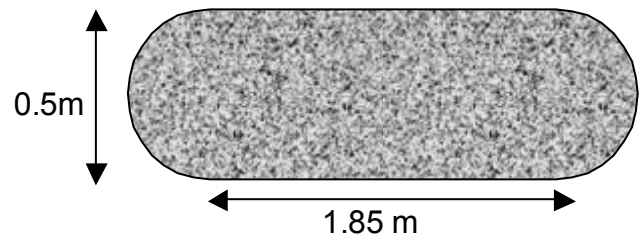
Calculate the volume of this prism.



41. The diagram opposite shows a worktop.

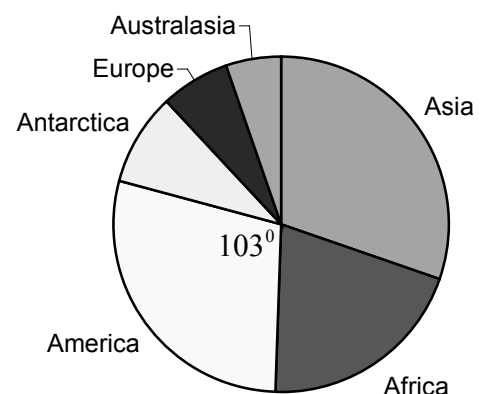
The worktop is rectangular in shape with semi-circular ends.

Calculate the perimeter of the worktop.



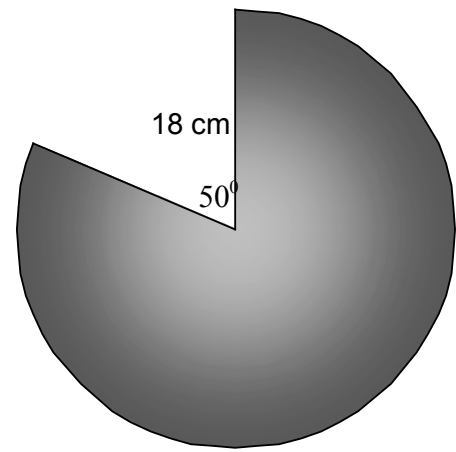
42. The pie chart shows the relative sizes of the continents of the world. The total land mass of the world is  $1.47 \times 10^8$  square kilometres.

- (a) Write this land mass as an ordinary number.
- (b) Calculate the land mass of the continent of America. **Give your answer to the nearest whole number.**



43. The diagram opposite shows a piece of metal in the shape of a sector of a circle. The circle has radius 18 cm.

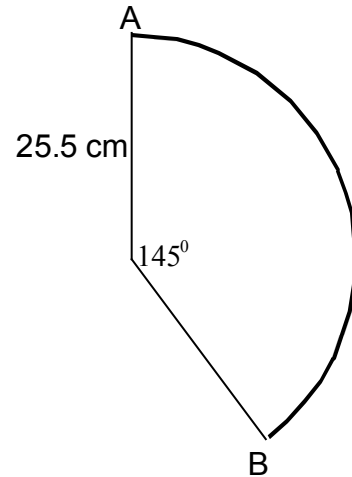
Calculate the area of this sector.



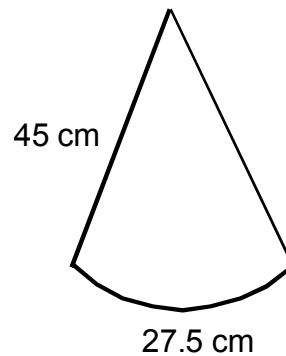
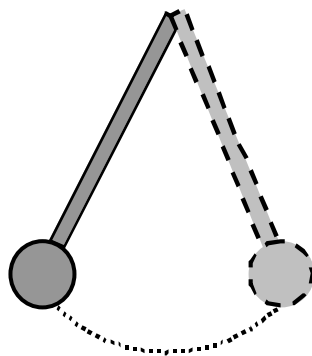
44. The diagram shows an arc of a circle AB.

The radius of the circle is 25.5 cm.

Calculate the length of the arc AB.



45. A pendulum is 45 centimetres long. When the pendulum swings it travels along the arc of a circle and covers a distance of 27.5 centimetres.



Calculate the size of the angle through which the pendulum travels.

46. In a survey of 550 children the ratio of those with a computer to those without is 8:3. How many owned a computer?



47. The cost, £C, of producing a book varies directly as the square root of the number of pages, N, in the book.

A book with 784 pages costs £6.16 to produce.

Find the cost of producing a book with 625 pages.



48. The time, T seconds, taken to slide down a chute varies directly as the length, L metres, of the chute and inversely as the square root of the height, H metres of the chute above the ground.

It takes 10 seconds to slide down a chute 3.75 metres long and 2.25 metres high.

How long does it take to slide down a chute 5 metres long and 2.56 metres high?



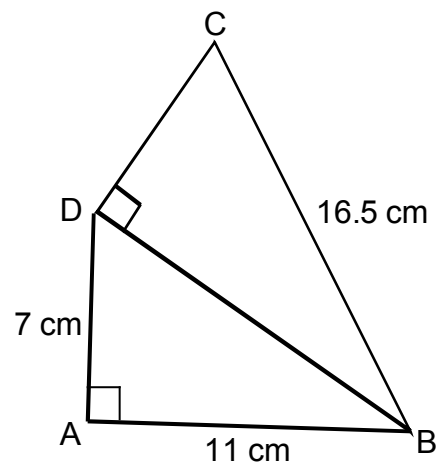
49. Solve the following equations for  $0^\circ \leq x^\circ \leq 360^\circ$

(a)  $3\sin x^\circ + 1 = 0$

(b)  $3\cos 20^\circ + 5\tan x^\circ = 10$

50. In the diagram opposite ABD and BCD are right-angled triangles.

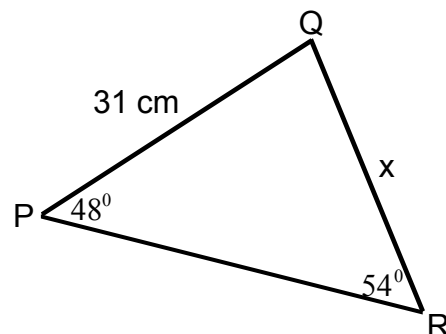
Calculate the size of angle DCB.



51. For triangle PQR shown opposite, find

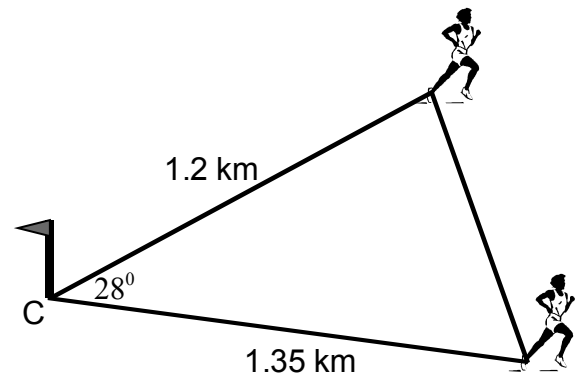
(a) The length of QR

(b) The area of the triangle



52. Two runners leave checkpoint C and run in different directions, as shown.  
One runs a distance of 1.2 km and the other runs a distance of 1.35 km.

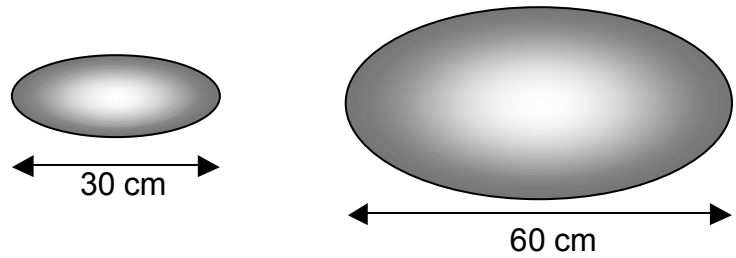
Calculate the distance between the runners.



53. The diagram shows two mathematically similar mirrors.

The smaller mirror has area  $2600 \text{ cm}^2$ .

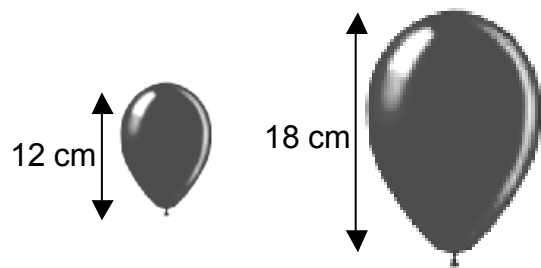
Find the area of the larger mirror.



54. The balloons opposite are similar in shape.

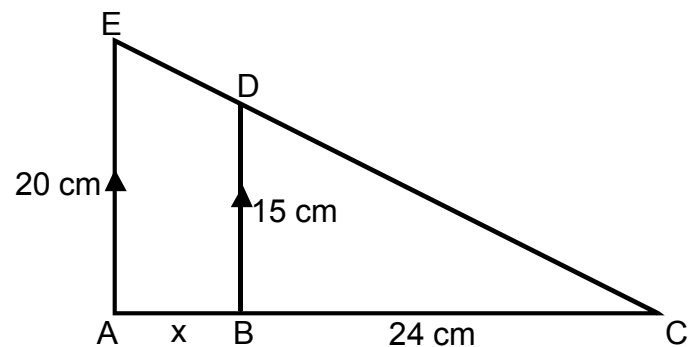
The larger balloon has volume  $1350 \text{ cm}^3$ .

Find the volume of the smaller balloon.



55. Triangles ACE and BCD are similar.

Calculate,  $x$ , the length of AB.



56. A large British company made a profit of  $\text{£}3.75 \times 10^9$  in the year 2007.

Calculate the profit the company made per second.

**Give your answer in Scientific Notation.**

57. In Astronomy, distances can be measured using different units.

For example

$$1 \text{ parsec} = 3.08 \times 10^{13} \text{ kilometres}$$

$$1 \text{ Astronomical Unit} = 1.49599 \times 10^8 \text{ kilometres}$$

Calculate the number of Astronomical Units in a parsec.

**Write your answer in Scientific Notation.**

58. The table below shows the number of children in 40 different families.

| Number of Children | Frequency |
|--------------------|-----------|
| 1                  | 12        |
| 2                  | 14        |
| 3                  | 4         |
| 4                  | 5         |
| 5                  | 2         |
| 6                  | 3         |
|                    | 40        |

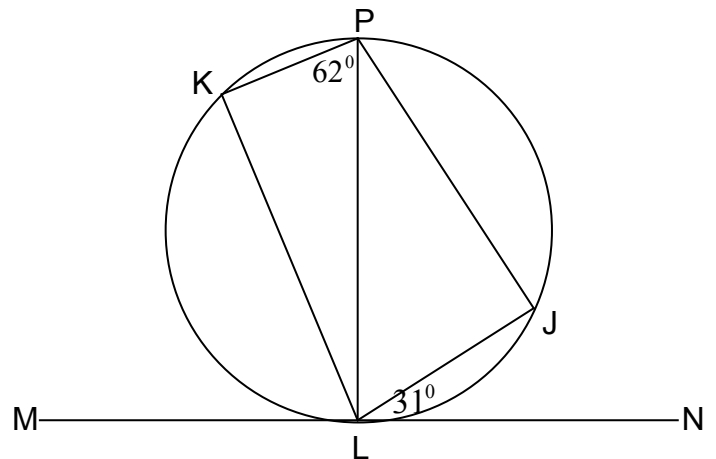
- Construct a column of cumulative frequencies for the table above.
- Construct a column of relative frequencies.
- What is the probability a family chosen at random has more than 4 children?
- What is the probability a family chosen at random has one or two children?

59. A bag contains 30 coloured counters – 8 red, 14 blue, 5 green and 3 yellow.

- A counter is chosen from the bag at random, what is the probability it is red? Simplify your answer.
- A counter is chosen from the bag and replaced. This is done 150 times. How many times would you expect a green counter to be chosen?

60. In the diagram MN is a tangent and PL is a diameter of the circle. Angle JLN =  $31^\circ$  and angle KPL =  $62^\circ$ .

Find the size of angle KLJ.



61. RP is a tangent to the circle, centre O, with a point of contact T. Angle PTQ =  $27^\circ$ .

Calculate the size of angle OPT.

