

**Credit Mathematics**  
**S3 Revision**

**Non – calculator section:**

1. Evaluate

- (a)  $3.15 \times 600$       (b)  $42.3 \div 90$       (c) 35% of £6400      (d)  $\frac{3}{4}$  of £480  
(e)  $\frac{5}{8}$  of £38      (f)  $213 - 43 \times 4$       (g)  $51.3 + 655 \div 50$       (h)  $7(86.4 - 7.18 \times 8)$

2.  $f(x) = 2x^2 - x^3$ . Evaluate  $f(-3)$ .

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

- (a) Find the value of  $f(-6)$ .  
(b) Given  $f(x) = 36$ , find **two** values for  $x$ .

4.  $g(x) = 3x^2 - 2x$ .

- (a) Evaluate  $g(-2)$   
(b) Given  $g(x) = 1$ , find **two** values for  $x$ .

5.  $H = \frac{x^2 + y^2}{x - y}$ . Find  $h$  when  $x = -4$  and  $y = -2$ .

6.  $P = \frac{a(a - b^2)}{a - b}$ . Find  $P$  when  $a = -3$  and  $b = -5$ .

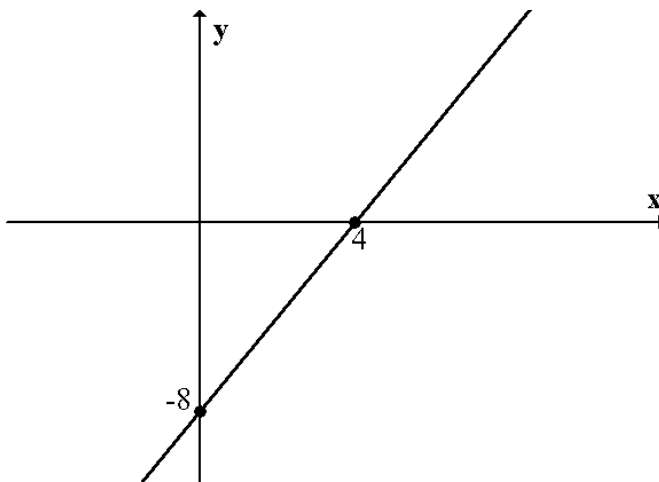
7. Expand the brackets and simplify

- (a)  $2(x - 2y) - 3(2x - 3y)$       (b)  $(2a - 3)(2a + 3)$       (c)  $(6x - 3)^2$   
(d)  $(3p - 4)(p^2 - 2p - 1)$       (e)  $(3x - 2y)^2 + 12xy$       (f)  $6n^2 - (2n + 3)(2n - 4)$

8. Solve

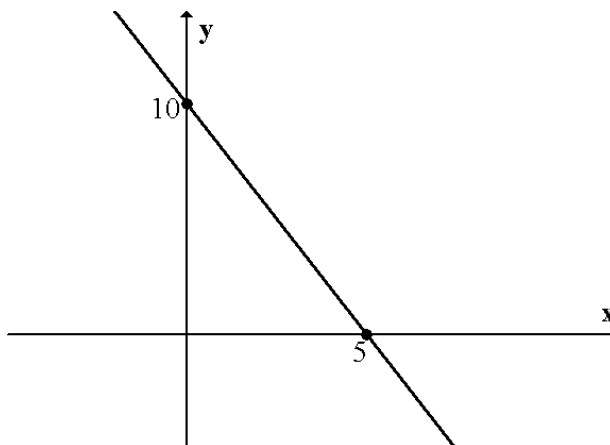
- (a)  $2(4x - 3) - 4 = 3x - 5$       (b)  $4 - 3(2a - 4) > 4(2a + 3)$   
(c)  $6 - (x - 3) = 2x - 15$       (d)  $4p - 3(1 - p) < 2p + 7$

9. Find the equation of the line opposite.



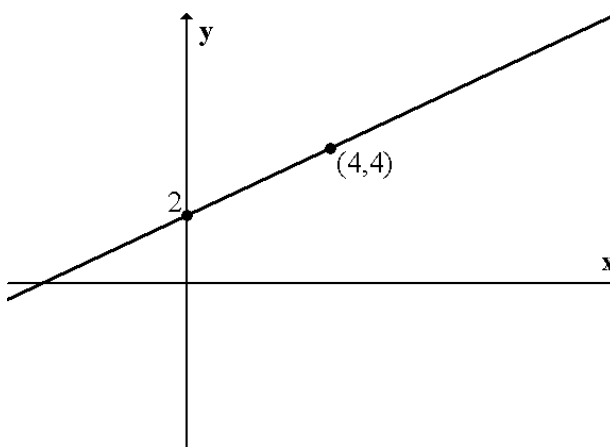
10. (a) Find the equation of the line shown.

(b) The point  $(-6, a)$  lies on this line.  
Find  $a$ .

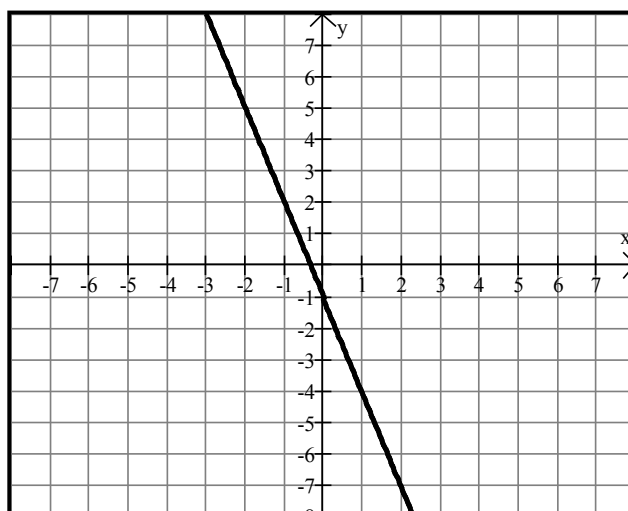


11. (a) Find the equation of the line opposite.

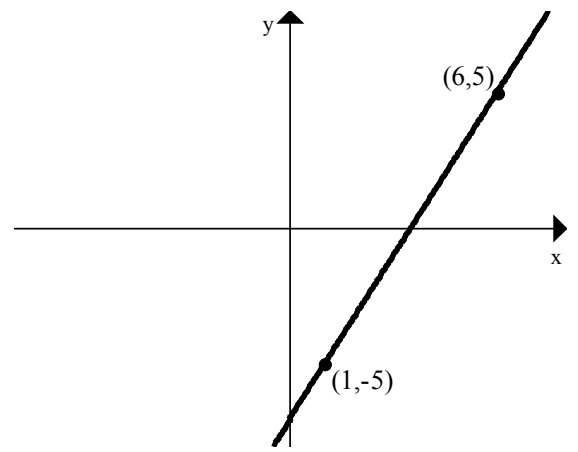
(b) Does the point  $(10, 8)$  lie on this line.



12. Find the equation of the line opposite.



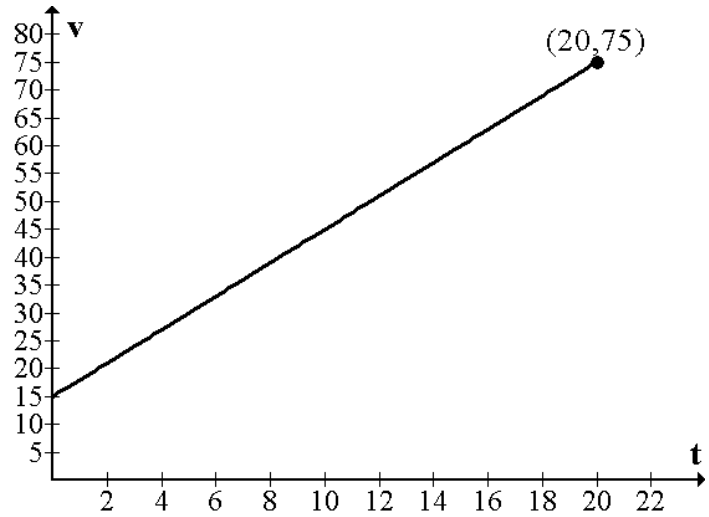
13. Find the equation of the line opposite.



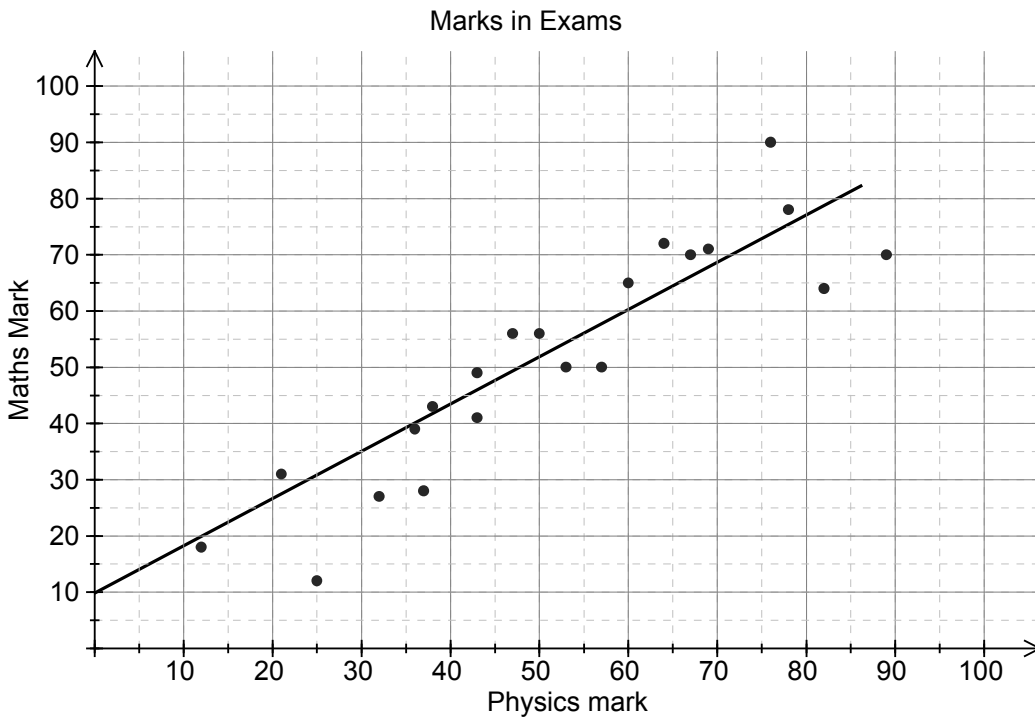
14. A tank of water contains 15 litres of water.

The graph opposite shows how the volume of water in the tank changes as a further 60 litres of water is added to the tank at a steady rate for 20 seconds.

Find the equation of the straight line in terms of  $v$  and  $t$ .

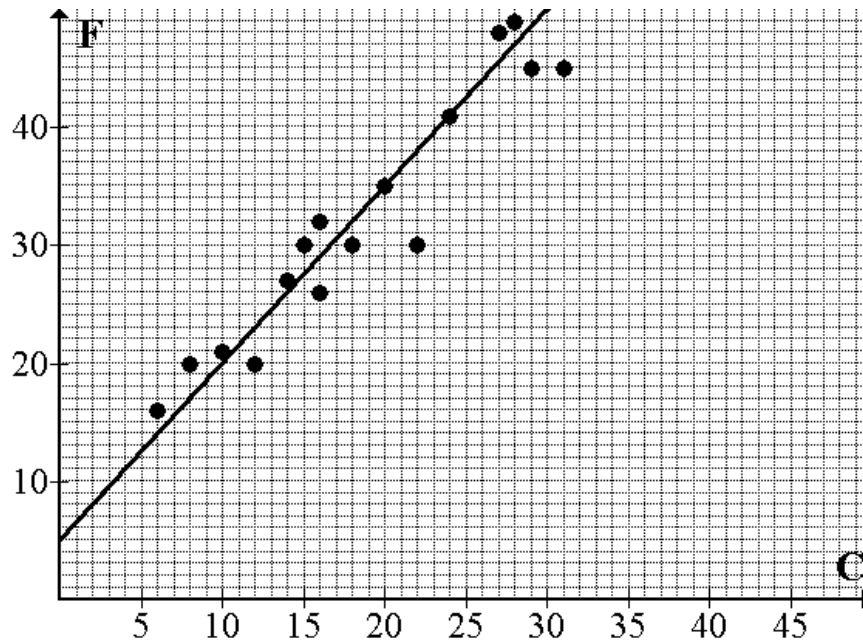


15. The scattergraph below shows the Maths and Physics marks of a group of pupils in a third year examination. A line of best fit has been drawn on the diagram. The points  $(0, 10)$  and  $(60, 60)$  both lie on this line.



- Describe the relation between the Physics and Maths marks.
- Find the equation of this line of best fit.
- Use your equation to estimate the Maths mark for a pupil who scored 72 in Physics.

16. The marks of a group of students in a class test (C) and in the final exam (F) are shown in the scattergraph below. A line of best fit has been drawn.



David scored 20 in the class test and 35 in the final exam.

- (a) Find the equation of the line of best fit.
- (b) Use your answer to part (a) to predict the final exam mark for a student who scored a mark of 26 in the class test.

17. Factorise

- |                     |                      |                     |                    |
|---------------------|----------------------|---------------------|--------------------|
| (a) $x^2 - 6x$      | (b) $2p + 6p^2$      | (c) $u^2 - 100$     | (d) $3m^2 - 12$    |
| (e) $4x^2 - 49y^2$  | (f) $a^2 - 11a + 30$ | (g) $p^2 - 7p - 18$ | (h) $12 - h - h^2$ |
| (i) $2g^2 + g - 15$ | (j) $5y^2 - 16y + 3$ | (k) $6y^2 - y - 2$  |                    |

18. (a) Factorise fully  $2m^2 - 10m$

(b) Hence simplify  $\frac{2m^2 - 10m}{2m^2 - 50}$

19. (a) Factorise  $2x^2 - 5x - 12$

(b) Hence simplify  $\frac{2x^2 - 5x - 12}{x^2 - 3x - 4}$

20. Solve the equations

(a)  $w^2 + 8w = 0$

(b)  $2c^2 = 18c$

(c)  $3d^2 - 12 = 0$

(d)  $x^2 - 13x + 30 = 0$

(e)  $u^2 = 3u + 10$

(f)  $2p^2 - 11p + 12 = 0$

(g)  $5a^2 = 11a - 2$

(h)  $\frac{t^2 - 8t}{5} = 4$

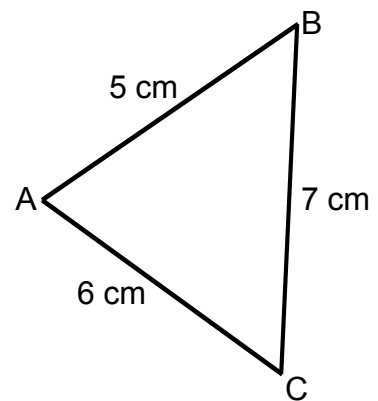
21. The number of diagonals,  $d$ , in a polygon with  $n$  sides is given by the formula

$$d = \frac{n(n-3)}{2}.$$

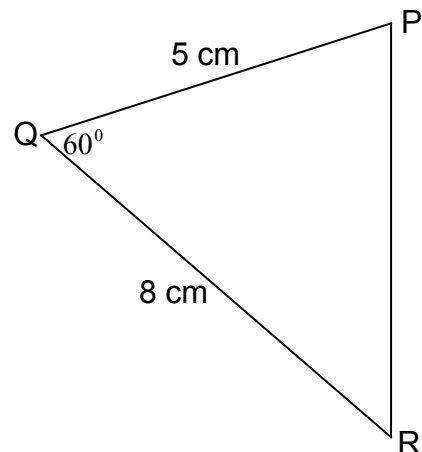
A polygon has 20 diagonals. How many sides does it have?

22. The diagram above shows triangle ABC with measurements as shown.

Show that  $\cos \text{BAC}^\circ = \frac{1}{5}$ .



23. The diagram opposite shows a triangle PQR.  
Given that  $\cos 60^\circ = \frac{1}{2}$ , find the length of PR.



24. The distances, in yards, 12 different golfers hit the ball with their driver is recorded. The results are shown below.

255	234	222	249	250	247
234	235	221	245	248	263

- Show this information in a stem and leaf diagram.
- Find the median distance the ball was hit.
- Write down the range of these distances.
- What is the probability the ball was hit over 250 yards?
- What is the modal distance the ball was hit?



25. The stem and leaf diagram below shows the number of pupils in 20 different classes in a secondary school.



0	8 9
1	3 3 4 6 7
2	0 1 5 5 5 6 8 9 9
3	0 0 1 2

$n = 20$       3 | 2 represents 32

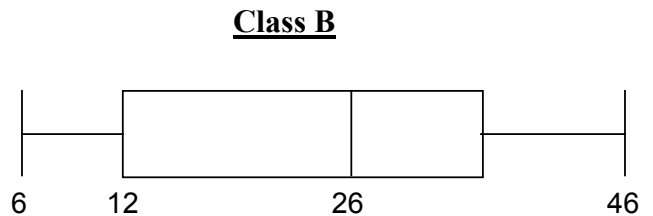
- (a) Find the median and lower and upper quartiles of this data.
- (b) Draw a boxplot to illustrate the data.
- (c) Calculate the semi-interquartile range of the data.
- (d) What is the probability a class contained more than 25 pupils?

26. Two 4<sup>th</sup> year maths classes sit the same test.

The results for class A are shown in a stem and leaf diagram, and in a boxplot for class B.

<u>Class A</u>	
0	9 9
1	2 3 4 8
2	4 5 8 8 9 9
3	0 0 1 9
4	1 2 2 7 8

1 | 2 represents 12  
 $n = 21$



When the marks of the two classes are compared it is found both classes have the same semi-interquartile range.

Find the value of the upper quartile for Class B.

27. The average monthly temperature in a holiday resort was recorded.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature ( <sup>o</sup> C)	9	14	16	19	23	26	28	28	24	17	14	7

Draw a suitable statistical diagram to illustrate the median and quartiles of this data.

**Calculator section:**

28. Solve the equation

$$x^2 - 7x + 1 = 0$$

**giving your answers correct to one decimal place.**

29. Solve the equation

$$3x^2 - 2x = 10$$

**giving your answers correct to 3 significant figures.**

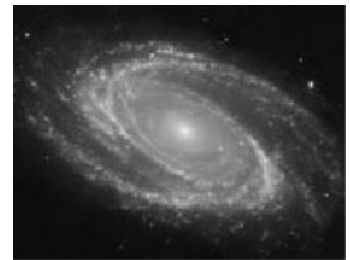
30. (a) Newton's constant of gravitation is  $6.674 \times 10^{-11}$ . Write this as an ordinary number.

(b) In Science the Magnetic Constant is 0.000001257. Write this in Scientific Notation..

(c) The speed of light in a vacuum is  $2.998 \times 10^8$  metres per second. Write this as an ordinary number.

(d) A light year is a distance of 9 460 000 000 000 kilometres. Write this in Scientific Notation.

(e) The large Magellanic cloud is  $1.69 \times 10^{18}$  kilometres from Earth. Write this distance as an ordinary number.



31. Carry out the following calculations, **giving your answers in Scientific Notation.**

(a)  $(2.15 \times 10^8) \times (3.6 \times 10^{-2})$

(b)  $465\,000\,000 \times (4.25 \times 10^3)$

(c)  $7.55 \times 10^7 \div (5.2 \times 10^4)$

(d)  $4.86 \times 10^{-4} \div 620\,000$

32. A comet travels a distance of  $4.88 \times 10^7$  kilometres in one year. Calculate the speed of the comet in kilometres per hour.

**Give your answer in Scientific Notation.**

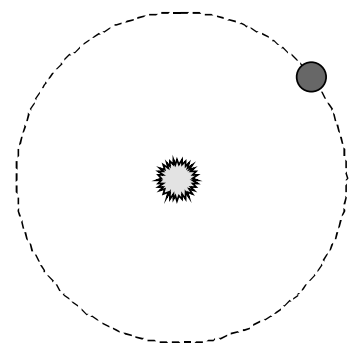


33. As it orbits the Sun the planet Mercury travels approximately at a speed of  $1.65 \times 10^5$  kilometres per hour.

This orbit takes 88 days.

Calculate the distance covered by Mercury in one orbit of the Sun, assuming the orbit is circular.

**Give your answer in Scientific Notation.**



34. Calculate the simple interest on a sum of £3600 at a rate of 5.5% pa for 8 months.
35. Calculate the simple interest on a sum of £420 at 11.25% pa for 1 year and 7 months.

36. A motorcycle costing £6500 is sold at a discount of 15% in a sale. Calculate the sale price of the motorcycle.



37. Computers Direct buy a computer for £320 and sell it to make a 20% profit.

- (a) What is the selling price of the computer?
- (b) Computers Direct add 30% to the selling price when the computer is bought on credit. Credit terms are a deposit of £60 followed by 24 equal payments. Calculate the cost of each payment.



38. Calculate the compound interest on £2800 at a rate of 6.2% pa for a period of 5 years.

39. Michael invests £6500 in the shares of a chemical company. The shares are expected to grow at an annual rate of 7%. Calculate how much Michael's shares should be worth in 10 years time.

**Give your answer correct to 2 significant figures.**

40. The number of Great White sharks in the Indian Ocean is estimated to be 35 000. Due to various factors this number is falling at a rate of 7.2% per annum. Calculate the number of Great White sharks which will be in the Indian Ocean in 4 years time.



41. A farmer buys a tractor costing £72 000. In its first year the tractor depreciates at a rate of 15%. For each of the next three years the tractor depreciates at a rate of 8%. Calculate the value of the tractor after 4 years.



42. In one area of South West England scientists have been studying spread of the American grey squirrel.. In 2005 the scientists estimated the population of grey squirrels at 4200. By 2006 this had grown to 4830. If the population of grey squirrels continues to grow at this percentage rate, how many grey squirrels will there be in 6 years time?



43. A bowler in cricket bowls 6 balls in an over. The speed of each ball bowled is recorded in miles per hour. These speeds are given below.

72 78 76 75 76 79

Calculate the mean and standard deviation of these speeds.



44. The costs of a microwave oven in 7 different shops are given below.

£45 £50 £42 £44 £42 £45 £47

- (a) Calculate the mean and standard deviation of these costs.  
 (b) Each shop cuts its prices by £8. Write down the mean and standard deviation of the costs now.



45. The numbers of pupils in 8 first year classes are

28 27 25 29 28 29 30 28

- (a) Calculate the mean and standard deviation of these numbers.  
 (b) There are also 8 second year classes. The mean and standard deviation of these classes are 24 and 3.2.  
 Make **two** valid comparisons between the numbers of pupils in the first and second year classes.

46. Solve the simultaneous equations

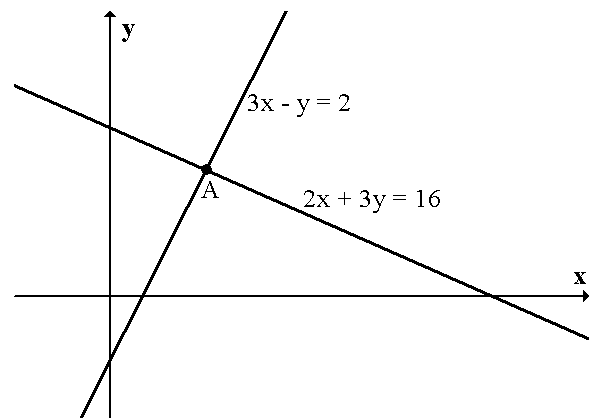
(a)  $2x + 3y = 14$   
 $3x - y = 10$

(b)  $3m + 2n = 9$   
 $5m + 3n = 16$

47. The diagram opposite shows the lines

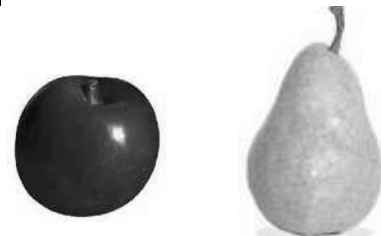
$3x - y = 2$  and  $2x + 3y = 16$

Find the coordinates of A, the point of intersection of these lines.



48. 3 apples and 4 pears cost £1.48.  
 2 apples and 3 pears cost £1.06.

Find the cost of an apple and of a pear.



49. A group of lecturers and university students are going to study an old ruined castle. To get to the castle they travel by train. The train tickets for the lecturers cost £12 but the students get a discount and pay £7. The total cost of the tickets is £132.



(a) Write down an equation to represent this information.

There are a total of 16 people in the group.

(b) Write down an equation to represent this.

(c) How many lecturers and how many students are in the group?

50. Solve the following equations

(a)  $3\sin x^\circ - 2 = 0$        $0^\circ \leq x^\circ \leq 360^\circ$       (b)  $4\cos x^\circ + 7 = 4$        $0^\circ \leq x^\circ \leq 360^\circ$

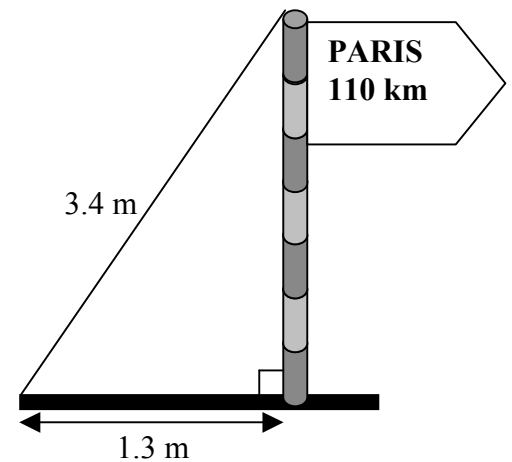
(c)  $8\sin x^\circ - 3\tan 45^\circ = 1.5$        $0^\circ \leq x^\circ \leq 360^\circ$       (d)  $5\sin 30^\circ + 3\tan x^\circ = 0$        $0^\circ \leq x^\circ \leq 180^\circ$

51. A triangle ABC has area  $35 \text{ cm}^2$ .  $AB = 15 \text{ cm}$  and  $AC = 20 \text{ cm}$ . Calculate **two** possible sizes for angle BAC.

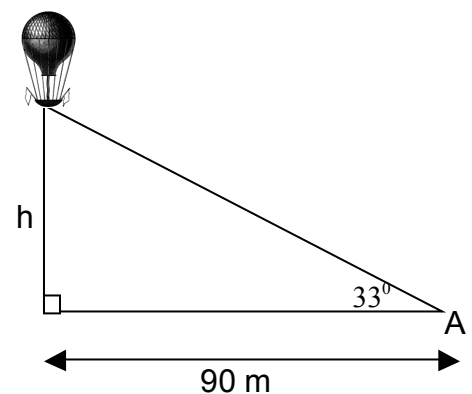
52. A triangle PQR has area  $80 \text{ cm}^2$ .  $PQ = 12 \text{ cm}$  and  $QR = 22 \text{ cm}$ . Angle PQR is obtuse. Calculate its size.

53. A signpost is supported by a metal wire 3.4 metres long. The wire is connected to the ground 1.3 metres from the signpost.

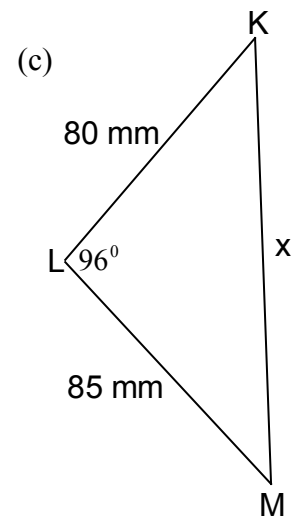
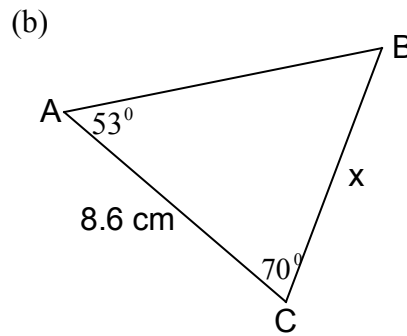
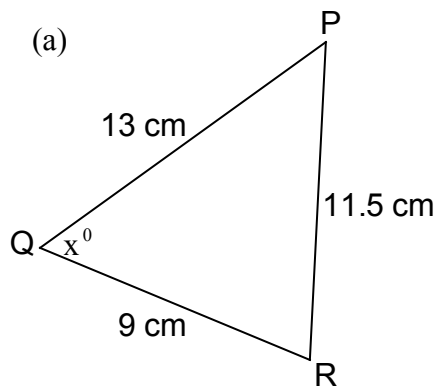
Calculate the height of the signpost.



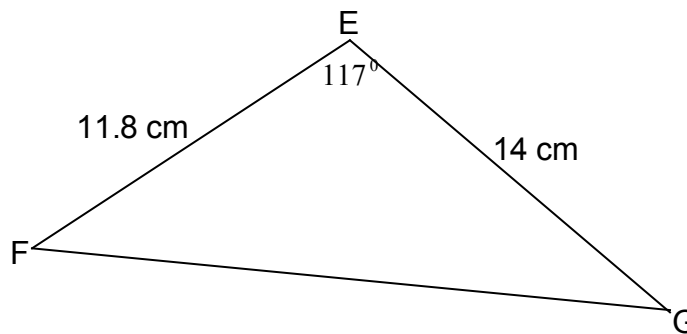
54. Amanda is looking at a hot air balloon in the sky. From her position at A, the angle of elevation to the balloon is  $33^\circ$ . Calculate  $h$ , the height the balloon is above the ground.



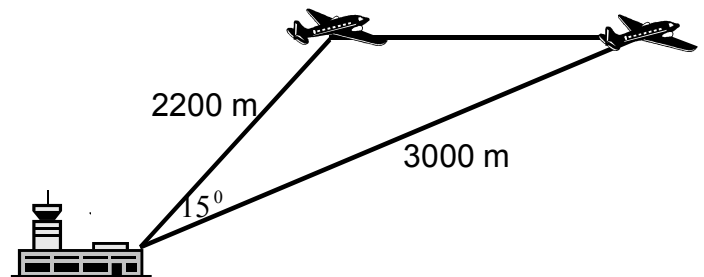
55. Calculate  $x$  in each of the following.



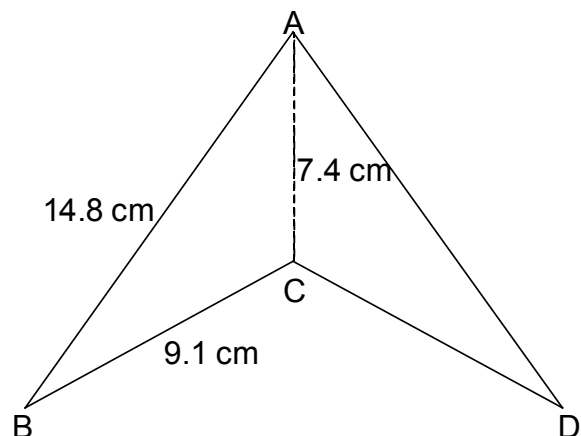
56. Calculate the area of the triangle below.



57. The diagram shows the position of an airport and two aeroplanes flying at the same height..  
Calculate the distance between the aeroplanes.

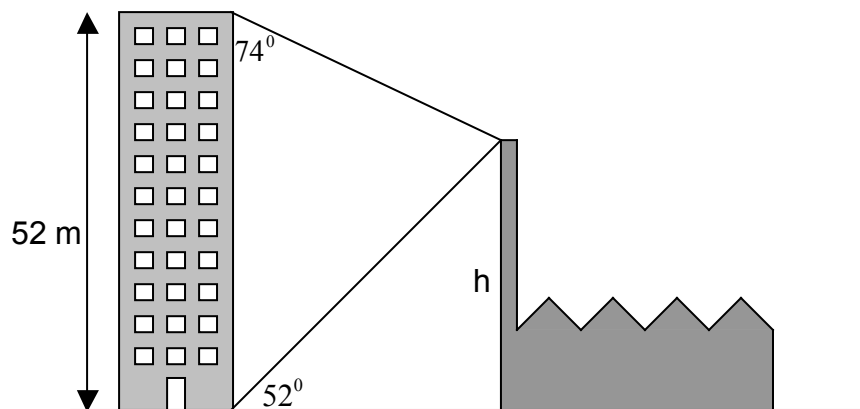


58. The sketch shows a V-shaped kite.  
AB is 14.8 centimetres, BC is 9.1 centimetres and the diagonal AC is 7.4 centimetres.



- Calculate the size of angle ACB.
- Calculate the area of the kite.

59. The diagram below shows a block of flats next to a factory with a chimney.



The block of flats is 52 metres high.  
From the bottom of the flats the angle of elevation to the top of the chimney is  $52^\circ$ . From the roof of the flats the angle to the top of the chimney is  $74^\circ$ .

Calculate  $h$ , the height of the chimney from the ground.

60. 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 625 pages costs £1.25 to produce.

Find the cost of producing a book with 576 pages.



61. 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?



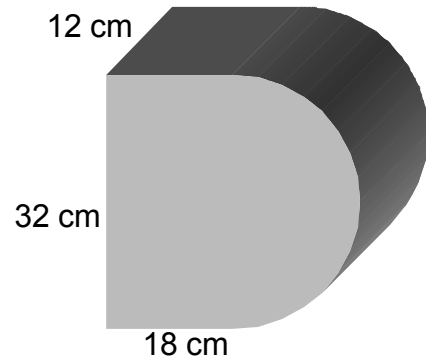
62.  $P$  varies directly as the square of  $Q$  and as  $R$ . If  $Q$  is multiplied by 4 and  $R$  is doubled, what happens to  $P$ ?

63. The electrical resistance,  $R$ , of copper wire varies directly as its length,  $L$  metres, and inversely as the square of its diameter,  $d$  millimetres. The length of a piece of copper wire is trebled and its diameter is halved. What effect does this have on the resistance?



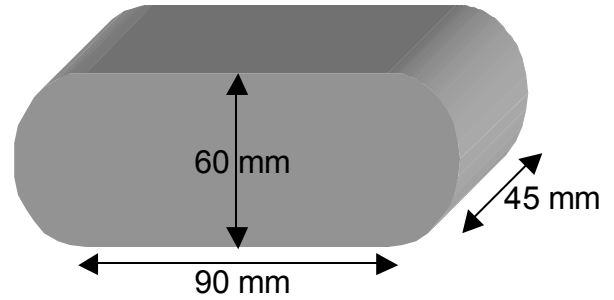
64. The diagram opposite shows a prism.  
The cross-section of the prism is in the form of a rectangle and a semi-circle.

Calculate the volume of this prism.

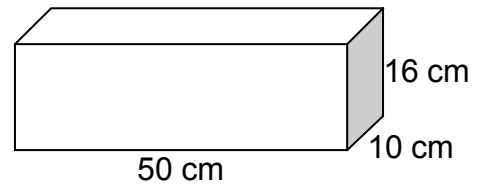


65. The diagram opposite shows a prism whose cross-section is a rectangle with semi-circular ends.

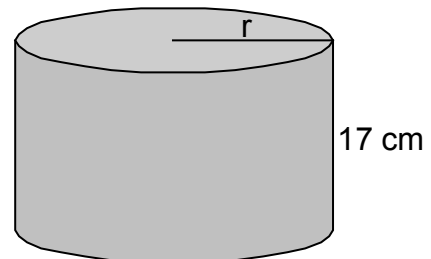
Calculate the volume of this prism.



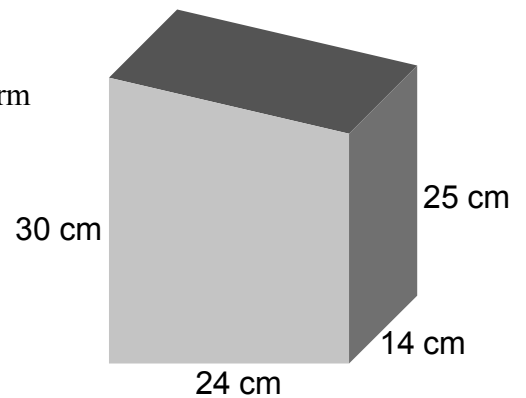
66. (a) Find the volume of the cuboid shown.



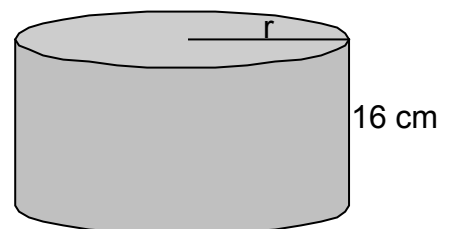
- (b) The cylinder opposite has the same volume as the cuboid in (a).  
Find the radius,  $r$ , of the cylinder.



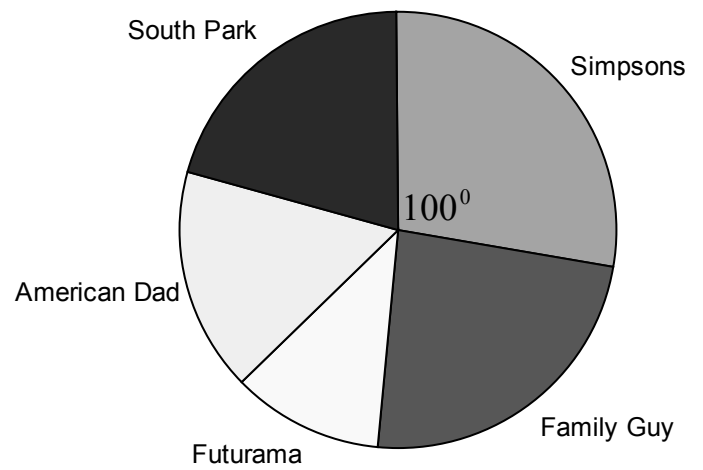
67. (a) The prism opposite has a cross-section in the form of a rectangle and a triangle.  
Calculate the volume of this prism.



- (b) The cylinder opposite has the same volume as this prism.  
Find the radius of the cylinder.

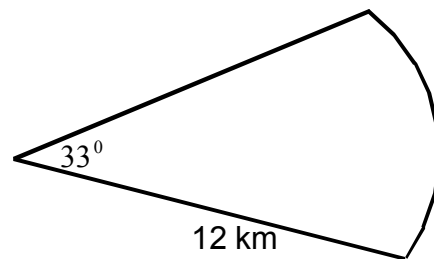


68. 540 secondary school children were asked to name their favourite television cartoon series. The results are shown in the pie chart.



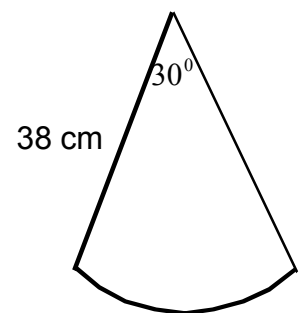
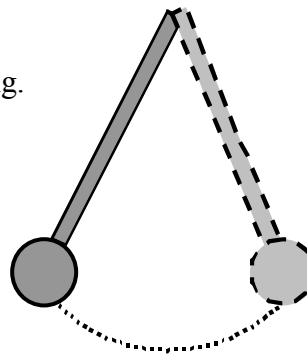
How many children chose The Simpsons as their favourite cartoon series?

69. The beam from a lighthouse reaches a distance of 12 kilometres and spreads to an angle of  $33^\circ$ .

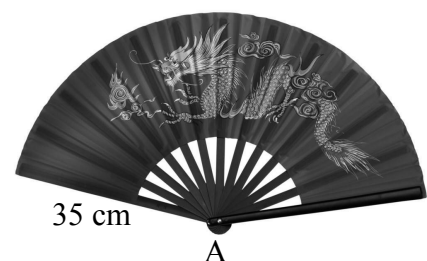


Calculate the area covered by the beam from the lighthouse.

70. The pendulum of a clock is 38 cm long. It swings through an angle of  $30^\circ$ . Calculate the length the pendulum travels in one swing.



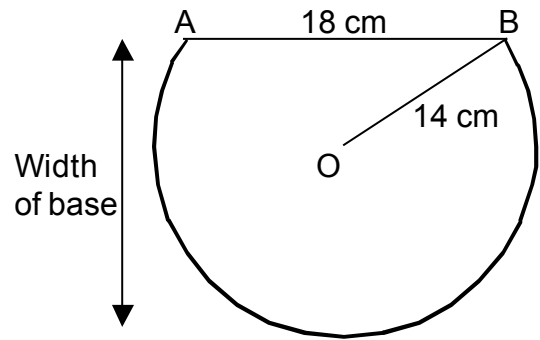
71. The diagram shows a fan in the shape of an arc of a circle with radius 35 cm. The area of the fan is  $1710 \text{ cm}^2$ . Calculate the size of the angle at A.



72. The base of a lamp is in the shape of part of a circle with a straight edge, as shown.

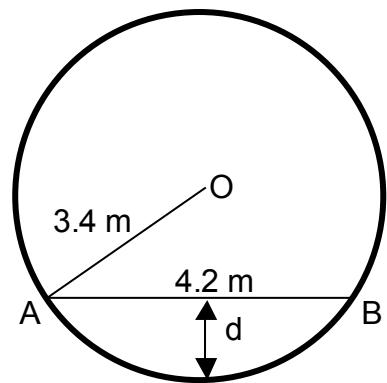
The centre of the circle is  $O$ .  
 $AB$  is a chord of the circle.  
 $AB$  is 18 centimetres.  
The radius,  $OB$ , of the circle is 14 centimetres.

Calculate the width of the base.



73. The diagram opposite shows a cylindrical oil tank.  
 $AB = 4.2$  metres and the radius  $OA = 3.4$  metres.

Calculate the depth  $d$  metres.

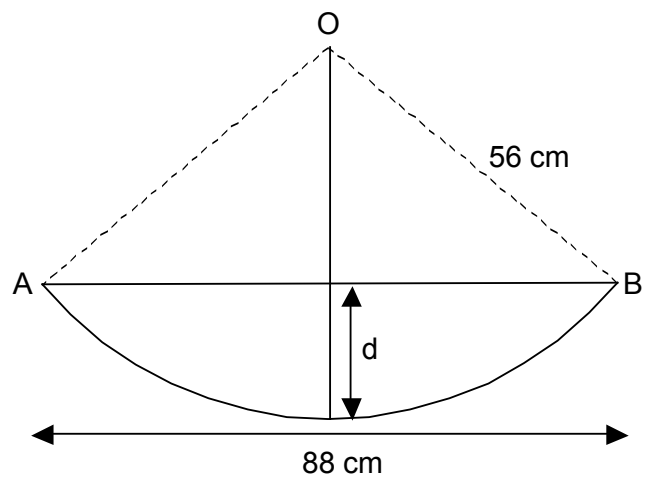


74. The diagram shows a drainage ditch at the side of a road.

The ditch is in the shape of an arc of a circle centre  $O$ .

The radius of the circle is 56 centimetres.  
The distance  $AB$  is 88 centimetres.

Calculate the depth of the ditch,  $d$ .



## Answers:

1. (a) 1890      (b) 0.47      (c) £2240      (d) £360      (e) £23.75      (f) 41  
(g) 64.4      (h) 202.72

2.  $f(-3) = 45$

3. (a)  $f(-6) = 66$       (b)  $x = -4, 9$

4. (a)  $g(-2) = 16$       (b)  $x = -\frac{1}{3}, 1$

5.  $H = -10$

6.  $P = 42$

7. (a)  $5y - 4x$       (b)  $4a^2 - 9$       (c)  $36x^2 - 36x + 9$       (d)  $3p^3 - 10p^2 + 5p + 4$   
(e)  $9x^2 + 4y^2$       (f)  $2n^2 + 2n + 12$

8. (a)  $x = 1$       (b)  $\frac{2}{7} > a$       (c)  $x = 8$       (d)  $p < 2$

9.  $y = 2x - 8$

10. (a)  $y = -2x + 10$       (b)  $a = 22$

11. (a)  $y = \frac{1}{2}x + 2$       (b) No

12.  $y = -3x - 1$

13.  $y = 2x - 7$

14.  $v = 3t + 15$

15. (a) Positive correlation      (b)  $y = \frac{5}{6}x + 10$  ( or  $M = \frac{5}{6}P + 10$ )      (c) 70

16. (a)  $y = \frac{3}{2}x + 5$  ( or  $F = \frac{3}{2}C + 5$ )      (b) 44

17. (a)  $x(x - 6)$       (b)  $2p(1 + 3p)$       (c)  $(u - 10)(u + 10)$       (d)  $3(m - 2)(m + 2)$   
(e)  $(2x - 7y)(2x + 7y)$       (f)  $(a - 6)(a - 5)$       (g)  $(p - 9)(p + 2)$       (h)  $-(h - 3)(h + 4)$   
(i)  $(2g - 5)(g + 3)$       (j)  $(5y - 1)(y - 3)$       (k)  $(3y - 2)(2y + 1)$

18. (a)  $2m(m - 5)$       (b)  $\frac{m}{m + 5}$

19. (a)  $(2x + 3)(x - 4)$       (b)  $\frac{2x + 3}{x + 1}$

20. (a)  $w = 0, -8$       (b)  $c = 0, 9$       (c)  $d = -2, 2$       (d)  $x = 3, 10$       (e)  $u = -2, 5$   
(f)  $p = \frac{3}{2}, 4$       (g)  $a = \frac{1}{5}, 2$       (h)  $t = -2, 10$

21. 8 sides

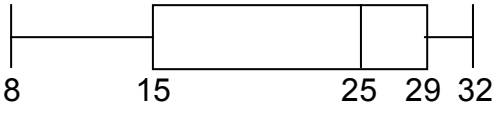
22. Proof

23.  $PR = 7$  cm

24. (a) 

22		1	2		
23		4	4	5	
24		5	7	8	9
25		0	5		
26		3			

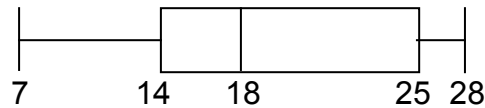
(b) 246
(c) 42
(d)  $\frac{1}{6}$ 
(e) 234  
Key

25. (a) Median = 25     $Q_1 = 15$      $Q_3 = 29$     (b) 

(c) 7    (d)  $P(>20) = \frac{2}{5}$

26.  $Q_3 = 36$

27. Lowest = 7    Highest = 28     $Q_1 = 14$     Median = 18     $Q_3 = 25$



28.  $x = -0.1, 6.9$

29.  $x = -1.52, 2.19$

30. (a) 0.000 000 000 066 74    (b)  $1.257 \times 10^{-6}$     (c) 299 800 000    (d)  $9.46 \times 10^{12}$   
 (e) 1 690 000 000 000 000 000

31. (a)  $7.74 \times 10^6$     (b)  $1.97625 \times 10^{12}$     (c)  $1.45 \times 10^3$     (d)  $7.84 \times 10^{-10}$

32.  $5.57 \times 10^3$  kmph

33.  $3.48 \times 10^8$  km

34. £132

35. £74.81

36. £5525

37. (a) £384    (b) £18.30

38. £982.51

39. £13000

40. 25957

41. £47655

42. 11172

43. Mean = 76    Standard Deviation = 2.45

44. (a) Mean = £45    Standard Deviation = £2.83    (b) Mean = £37    S.D. = £2.83

45. (a) Mean = 28    Standard Deviation = 1.51    (b) 2<sup>nd</sup> year classes smaller overall and class sizes more varied.

46. (a)  $x = 4$   $y = 2$       (b)  $m = 5$   $n = -3$

47.  $A(2,4)$

48. Apple = 20 pence    pear = 22 pence

49. (a)  $12x + 7y = 132$       (b)  $x + y = 16$       (c) 4 lecturers, 12 students

50. (a)  $41.8^0$ ,  $138.2^0$       (b)  $138.6^0$ ,  $221.4^0$       (c)  $34.2^0$ ,  $145.8^0$       (d)  $140.2^0$

51. Angle BAC =  $13.5^0$  or  $166.5^0$

52. Angle PQR =  $142.7^0$

53. 3.14 m

54. 58.4 m

55. (a)  $x = 59.8^0$       (b)  $x = 8.19$  cm      (c)  $x = 122.7$  mm

56.  $73.6$  cm<sup>2</sup>

57. 1043.9 m

58. (a) Angle ACB =  $127.2^0$       (b) Area =  $53.6$  cm<sup>2</sup>

59.  $h = 42.5$  m

60. £1.20

61. 12.5 seconds

62. P is multiplied by 32

63. R is multiplied by 12

64.  $11737$  cm<sup>3</sup>

65.  $370235$  mm<sup>3</sup>

66. (a)  $8000$  cm<sup>3</sup>      (b)  $r = 12.2$  cm

67. (a)  $9240$  cm<sup>3</sup>      (b)  $r = 13.6$  cm

68. 150 children

69.  $41.5$  km<sup>2</sup>

70. 19.9 cm

71.  $160^0$

72. Width = 24.7 cm

73.  $d = 0.73$  m

74.  $d = 21.4$  cm