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S4 Credit Homework Exercise 1

1. Simplify the following:

(a) $x^2 \div 2x^{-7}$ (b) $(2y^4)^3$ (c) $\frac{4d^5}{18d^8e^6}$ (d) $x^3(x^{-4}+x^7)$

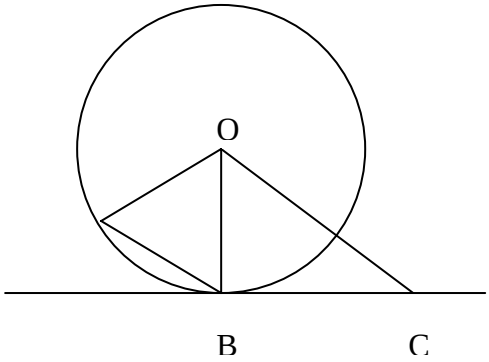
2. Write the following in root form:

(a) $x^{\frac{4}{5}}$ (b) $\frac{1}{y^{\frac{2}{9}}}$ (c) $t^{-\frac{6}{7}}$ (d) $4p^{\frac{5}{2}}$

3. Find the gradients of the lines joining the following pairs of points:

(a) $A(-2,5)$ $B(3,6)$ (b) $C(4,-2)$ $D(-1,-5)$ (c) $E(-1,2)$ $F(4,9)$

4. If AC is a tangent to the circle, and angle ACO is $34°$, copy the diagram and fill in the sizes of all the angles.



5. Factorise the following

(a) $2x^2 - x - 15$ (b) $6x^2 + 11x - 10$ (c) $25x^2 - 81y^2$

6. Multiply out the following:

(a) $(2x-3)(4x+1)$ (b) $12-(x-3)^2$ (c) $(2x-1)^2-(x+4)^2$

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S4 Credit Homework Exercise 2

1. Can three sticks of length 20.7*mm*, 27.6*mm* and 34.5*mm* be joined to form a right angled triangle? Justify your answer.

2. Calculate (*without the use of a calculator and showing working*):

   (a) $9^{\frac{3}{2}}$ (b) $8^{\frac{1}{3}}$ (c) $16^{-\frac{3}{4}}$ (d) $\dfrac{1}{27^{\frac{2}{3}}}$

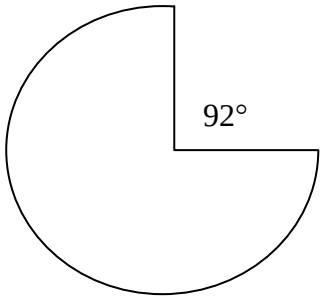
3. Multiply out the brackets:

   (a) $(2x-3)(3x+1)$ (b) $(4x-3)(x+7)$ (c) $(3x-\frac{1}{4})^2$

4. Find the equations of the following lines with:

   (a) Gradient 3 through $(0,5)$
   (b) Gradient 5 through $(0,-4)$
   (c) Gradient 2 through $(2,-4)$
   (d) Gradient -3 through $(2,3)$

5. Calculate the length of the arc and area of this sector of a circle with radius $13mm$.



6. Factorise:

   (a) $2x^2-2x-24$ (b) $5x^2-45y^2$ (c) $9+3x-2x^2$

7. How many degrees does the hour hand turn through between 1700 and 2100?

8. A ladder of length 4.5*m* is placed against a wall. If the foot of the ladder is 1.8*m* from the wall, calculate the angle the ladder makes with the horizontal.

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S4 Credit Homework Exercise 3

1. L is the point $(-3,3)$, M$(3,0)$, N$(4,4)$ and P$(-2,7)$. By finding the gradients of the sides, show that LMNP is a parallelogram.

2. Simplify:

   (a) $\sqrt{20}$ (b) $\sqrt{45}$ (c) $\sqrt{75}$

   (d) $\sqrt{12}+\sqrt{27}$ (e) $\sqrt{45}-\sqrt{20}$

3. (a) If $f(x)=x^2+2x+1$, find the value of $f(-1)$.
   (b) $f(y)=1-y$. Find the value of $f(a)+f(-a)$.

4. Find the value of

   (a) $9^{\frac{1}{2}}$ (b) 6^0 (c) 4^{-2} (d) $8^{-\frac{1}{3}}$ (e) $(4^2)^{-1}$

5. Solve:

   (a) $2(t-3)-4 \le t-3(t+1)$ (b) $(x-3)^2 > (1-x)^2$

6. A is the point $(1,-2)$ and B is $(3,2)$. Find:
   (a) The length of AB, correct to 1 decimal place.
   (b) The gradient of AB
   (c) The equation of the straight line through A and B.

7. Factorise the following

   (a) $2x^2-9x-5$ (b) $10-x-3x^2$ (c) $18x^2-45x-27$

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S4 Credit Homework Exercise 4

1. Solve these pairs of simultaneous equations:

(a) $\begin{aligned} 3x+5y&=-9 \\ 2x-3y&=13 \end{aligned}$ (b) $\begin{aligned} 4x+y&=0 \\ 5x+2y&=3 \end{aligned}$ (c) $\begin{aligned} 3x+2y&=-8 \\ 4x-3y&=-22 \end{aligned}$

2. Solve the following:

(a) $3x-6\geq 33$ (b) $14-4y<10$ (c) $4-2r\geq -4$

(d) $10-3(x-2)\leq 1$ (e) $5+2x>x-12$ (f) $2(x+4)-6<14$

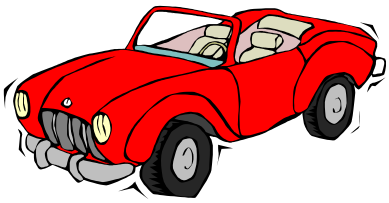
3. Find the equations of the lines joining these pairs of points:

(a) $A(3,6), B(5,8)$ (b) $C(1,-2), D(0,-3)$ (c) $E(0.4,10), F(0.9,20)$

4. Multiply out:

(a) $(a^2+1)(a^{-2}+1)$ (b) $(y^{\frac{1}{2}}+1)(y^{-\frac{1}{2}}-1)$ (c) $n^{-\frac{1}{2}}(n^{\frac{3}{2}}-n^{-\frac{1}{2}})$

5. A model car is $\frac{1}{6}$th life size.



(a) A real tyre has diameter 68*cm*.
What is the diameter of a tyre on the model?

(b) The rear wheel has 15 equally spaced spokes.
What is the size of the angle between two spokes on :

(i) the real car (ii) the model?

6. A downhill skier travels 600*m* in 1 minute. Calculate her speed in *km/h.*

7. Factorise

(a) $6m^2n-8mn^2$ (b) $y-y^3$ (c) $4k^2-11k+6$

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S4 Credit Homework Exercise 5

1. For each of the following

   (i) Write down the maximum and minimum values of y and the number of cycles in the graph for $0 \le x \le 360$

   (ii) Sketch the graph

   (a) $y = 3\sin x$ (b) $y = \cos 2x$ (c) $y = 4\sin 3x$

2. Solve the following equations, giving your answers to the nearest degree for $0 \le x \le 360$:

   (a) $3\sin x - 1 = 1$ (b) $2\tan x + 5 = 9$ (c) $5\cos x - 3 = -2$

3. The cost of a new tyre costs £45.50 including VAT at 17.5%. What was the cost of the tyre before VAT?

4. Each edge of a skeleton cube is 3m long. Calculate as surds, the length of :

   (a) face diagonal (b)a space diagonal
   (*A sketch would be useful here!)*

5. Fixit have a call out charge of £30 plus an hourly charge of £20.

   (a) Draw the graph of cost (£c) against time (t hours).
   (b) Write down the equation for c in terms of t.
   (c) A customer pays £150. How many hours work was this?

6. Change the subject of the formula to x.

   (a) $p = s - 2x$ (b) $y = 3(x+1)$ (c) $y = \frac{a-x}{x}$ (d) $P = \sqrt{\frac{1}{x}}$

7. A cylindrical tea urn is 80cm high, and has a base of radius 25cm. Calculate:

   (a) its capacity in litres (b) the number of 200ml cups it can hold

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S4 Credit Homework Exercise 6

1. Solve the following equations for $0 \le x \le 360°$:

   (a) $3\sin x = 2$ (b) $4\cos x = -3$
   (c) $3\tan x + 2 = -4$ (d) $\cos^2 x = 0.64$

2. Sketch the graph of the following for $0 \le x \le 360°$:

   (a) $3\sin 2x$ (b) $4\cos 3x$ (c) $2\sin x + 1$ (d) $\cos 2x - 1$

3. The pendulum on a clock is 35*cm* long. It swings through an angle of $50°$. Calculate the distance the end of the pendulum travels in one swing.

4. Find the gradient and *y*-intercept of the following lines:

   (a) $y - 2x = 3$ (b) $y + 5x - 1 = 0$ (c) $10y = 5x - 4$
   (d) $2x = -3y$ (e) $2y = -4x + 10$ (f) $-3x + 10y = 7$

5. A house which cost £43,000 four years ago, appreciates in value each year by 1.5%. Calculate the value of the house after four years.

6. Factorise:

   (a) $2a^2 + 5a - 3$ (b) $3x^2 - 18x + 15$ (c) $2 - 18x^2$

7. Multiply out and simplify:

   (a) $(2x+1)^2 + (x-2)^2$ (b) $12x - (x-1)^2$ (c) $(x-4)^2 - 5(x-3)$

8. An oil drum is cylindrical in shape has radius 32*cm* and height 75*cm*. Calculate the volume of oil it will hold.

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S4 Credit Homework Exercise 7

1. An order of three hamburgers and 2 portions of chips came to £4.10. A second order of 4 hamburgers and 3 portions of chips cost £5.70.
Let *h* pence represent the cost of 1 hamburger.
Let *c* pence represent the cost of a portion of chips.

   (a) Write down two equations in *h* and *c*.

   (b) Solve the two equations simultaneously to find the cost of a hamburger and a portion of chips.

2. Solve the following equations for $0 \le x \le 360$.

   (a) $5\sin x = -4$ (b) $7\tan x + 6 = 9$ (c) $8\cos x + 3 = -2$

3. Simplify:

   (a) $3t^{-\frac{2}{3}} \times 2t$ (b) $(x^{\frac{1}{3}})^3$ (c) $\frac{2m^3 \times m^{-3}}{m^2}$ (d) $\frac{y^{12}}{y^3 \times y^4}$

4. Simplify, leaving your answer in surd form:

   (a) $\sqrt{2} \times \sqrt{6}$ (b) $\frac{\sqrt{96}}{\sqrt{3}}$ (c) $\sqrt{24}$ (d) $\frac{1}{\sqrt{50}}$

5. When a silk fan is opened it forms a sector of a circle with an angle of $160°$ at the centre. The distance from the centre to the edge of the fan is 18cm. Calculate the area of the material in the fan.

6. The famous McGlumpher earrings were bought in 1990 for £7400and sold in 1997 for £12500.
Find the percentage appreciation in value.
(*Give your answer correct to three significant figures)*

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S4 Credit Homework Exercise 8

1. Simplify the following

(a) $\sqrt{8} \times \sqrt{6}$ (b) $\sqrt{10} \times \sqrt{6}$ (c) $\sqrt{5}(\sqrt{3} + \sqrt{5})$

2. Solve the following quadratic equations:

(a) $4m^2 - 15m + 9 = 0$ (b) $4y^2 - 8y + 3 = 0$ (c) $9k^2 - 6k - 8 = 0$ `

3. A shop offers 12%off all items in a sale. The sale price of a pair of binoculars is £65. Calculate your answer when there is no sale.
Give your answer to the nearest penny.

4. A wooden fence post is 180cm high. It is shaped like a cylinder. The radius of the top of the post is 4cm. Calculate:

(a) The area of the top

(b) The volume of the post

5. A cake of diameter 20cm is sliced. One slice of the cake with an angle of $37°$ is removed. What is the area of the top of the remaining cake?

6. Solve for $0 \leq x \leq 360$

(a) $3\cos x + 5 = 7$ (b) $8\tan x + 3 = 9$ (c) $7\cos x + 1 = 0$

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S4 Credit Homework Exercise 9

1. Write theses numbers in index form:

(a) $\sqrt{y^3}$ (b) $\frac{1}{\sqrt{h^3}}$ (c) $\sqrt[3]{p^5}$ (d) $\frac{2}{\sqrt[5]{t^9}}$

2. The length, Lm, of the chain in a suspension bridge can be worked out using $L = \frac{3S^2 + 8D^2}{6S}$ where S is the span and D is the drop.

(a) Calculate L when S = 100 and D = 20.

(b) Find the value of D when L = 500 and S = 300.

3. P varies directly with Q and inversely with the square root of R. If P = 12 when Q = 3 and R = 16, find a formula connecting P, Q and R.
Hence find the value of P when Q = 2 and R = 9.

4. Ricky Gaunt is a car salesman. He earns £735 per month plus 2.5% commission. Calculate his gross income in a month where he sells £19,600 worth of cars.

5. Solve:

(a) $m^2 - m - 30 = 0$ (b) $6k^2 - k - 2 = 0$ (c) $2x^2 + 3x - 1 = 0$

6. Mr. Jones keeps a note of pupils attending supported study class over the 20 weeks it is on offer. The figures are

23	25	27	27	24	26	17	26	25	19
22	26	28	24	21	20	18	21	27	18

(a) Write the numbers in order, least first.

(b) Calculate the median and lower and upper quartiles

(c) Draw a boxplot.

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S4 Credit Homework Exercise 10

1. Multiply out and tidy up

(a) $(2x+3)^2-(x-4)^2$ (b) $20-(x-7)^2$ (c) $(2x+1)^2-(x+1)(x-2)$

2. Write the following in positive index form:

(a) x^{-7} (b) $x^{-\frac{3}{2}}$ (c) $3x^{-\frac{1}{2}}$ (d) $\frac{4x^{-6}}{7}$ (e) $\frac{2}{3}x^{-9}$

3. A plot of land was bought three years ago for £21 500. It has appreciated each year by 2% of its value at the start of each year.
How much is the land worth today?

4. A golf ball has a diameter of 4.2cm. Calculate its volume to 3 s.f.

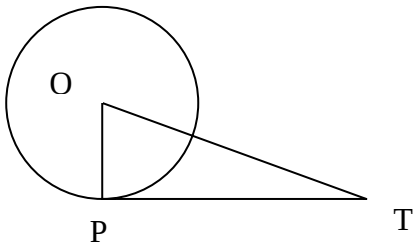
Volume of a sphere
$V = \frac{4}{3}\pi r^3$

where r is the radius

5. Factorise:

(a) $5u^2+15u-20$ (b) $3e^2+20e-7$ (c) $6y^2-27y+12$

6. PT is a tangent to the circle with centre O and radius OP=6*cm*. PT is 12*cm* long. Calculate the distance OT.



7. Solve:

(a) $4\cos x-3=-5$ (b) $2\tan x+4=7$ (c) $\sin x-12=-12.8$

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S4 Credit Homework Exercise 11

1. Multiply out and tidy up:

(a) $(2x-1)(x+4)-(x-3)^2$ (b) $(2x+1)^2-(x-7)^2$
(c) $16-2(x-4)^2$ (d) $(x+2)(3x-4)-(2x+1)(x-3)$

2. Solve the following trigonometric equations for $0 \le x \le 360$:
(Remember: there should be two answers for each question)

(a) $\sin x = -0.35$ (b) $3\sin x = 2$ (c) $5\cos x + 1 = 3$
(d) $2\tan x - 4 = -3$ (e) $3\cos x = -1.2$ (f) $5\tan x + 3 = 1$

3. Solve the following quadratic equations by factorising:

(a) $t^2 - 4t - 12 = 0$ (b) $3p^2 + p - 4 = 0$ (c) $3x^2 - 2x - 8 = 0$

4. Solve the following quadratic equations by using the quadratic formula:
(Answers should be given to 2 decimal places)

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(a) $2x^2 - x - 7 = 0$ (b) $3x^2 - 5x - 9 = 0$ (c) $4x^2 + x - 1$

5. Find the gradients of the lines joining the following pairs of points:

(a) $A(3,5)$ $B(4,-3)$ (b) $C(-3,-7)$ $D(2,7)$ (c) $E(4,9)$ $F(12,-7)$

6. Write down the gradient and the *y*-intercept of the following lines:
($y = mx + c$ is the gradient of a straight line with gradient *m* and *y*-intercept *c*)

(a) $y = 4x - 6$ (b) $y + 5x = -8$ (c) $3y + 2x = -9$ (d) $x + y = 3$

7. Change the subject of the formula to *x*:

(a) $y = 5x - 4$ (b) $ax + b = c$ (c) $tx^2 - 5r = 0$ (d) $p = \sqrt{\frac{x+9}{7}}$

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S4 Credit Homework Exercise 12

1. Simplify the following:

(a) $7a \times 3a^2b$ (b) $r^2 \times \frac{p}{r}$ (c) $-4p \times (pqg)^2$

(d) $33vw^3 \div 11vw$ (e) $42xy^2 \div 6x^2y$ (f) $f^2g((3g - 2f)$

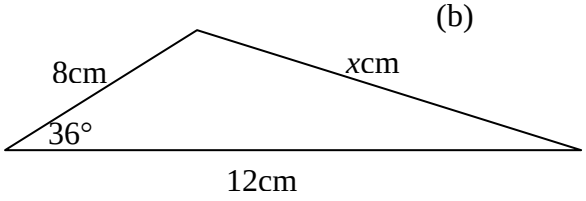
2. Expand and simplify:

(a) $8x(5x-6) - 3(x+4)^2$ (b) $x^2(5x-7) + 4x(3x+2) - x^2$

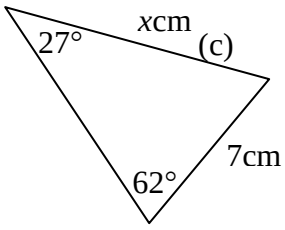
(c) $2(3k + 4j)(3k - 4j)$ (d) $9(x-3)^2 - 4(x-2) - x^2$

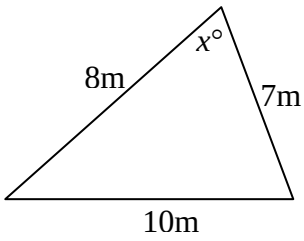
3. Find x in each triangle.

(b)



(c)



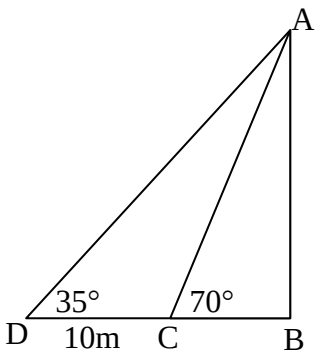


4. In the diagram telegraph pole AB is supported by wires AC and AD.

Find

(a) the length of AC.

(b) the height of the pole.



5. Simplify the following

(a) $\sqrt{12} \times \sqrt{3}$ (b) $\sqrt{8} \times \sqrt{12}$ (c) $3\sqrt{2} \times 5\sqrt{2}$ (d) $\sqrt{3}(\sqrt{3} - 1)$

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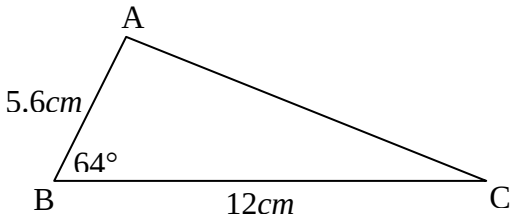
S4 Credit Homework Exercise 13

1. Solve the following:

(a) $x^2 - 2x - 63 = 0$ (b) $2x^2 + 5x - 3 = 0$ (c) $4x^2 - 1 = 0$

2. Find the area of triangle ABC.

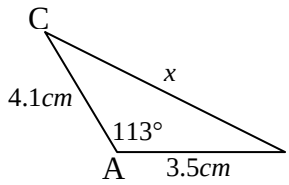


3. Simplify the following:

(a) $(2x-1)^2 - (x-3)^2$ (b) $10 - 2(x-7)^2$ (c) $2x^3 - x(x-2)^2$

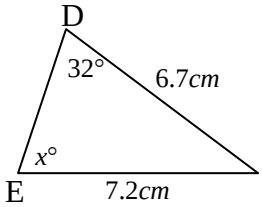
4. Find x in each triangle.

(a)



B

(b)



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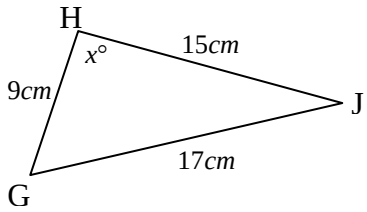
(c)



5. Whole City Food Packers produce two nut mixes for their retail outlets.

Tropicana: 3kg of pecan nuts and 4kg of pistachios; total cost £25.
Crunch: 2kg of pecan nuts and 5kg of pistachios; total cost £26.
A third mix is suggested, Supernut: 5kg of pecan nuts and 2kg of pistachios.

How much will this new mix cost?

6. Shares in the MacSpud Potato Crisp Company have appreciated each year over the last five years by 11% of their value at the start of the year. A single share could be bought five years ago for 86 pence.

How much is a share worth today?

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S4 Credit Homework Exercise 14

1. Simplify the following

(a) $\sqrt{3} \times \sqrt{8}$ (b) $\frac{\sqrt{112}}{\sqrt{7}}$ (c) $\frac{\sqrt{3}}{\sqrt{60}}$ (d) $\sqrt{56} \times \sqrt{2}$

2. Simplify the following, leaving all answers in index form.

(a) $h^{10} \times h^{10}$ (b) $6y^3 \div 2y^{-2}$ (c) $\frac{12t^6}{9t^3}$ (d) $\frac{a^2 \times a^3}{a^4}$

3. A plumber charges £20 for a call-out. He also charges £10 per hour. His total charge is $C(x)$ pounds for x hours of work.

(a) Write a formula for $C(x)$.

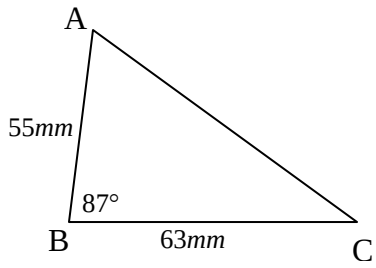
(b) Sketch a graph of the function.

4. Solve the following trigonometric equation for $0 \leq x \leq 360°$.

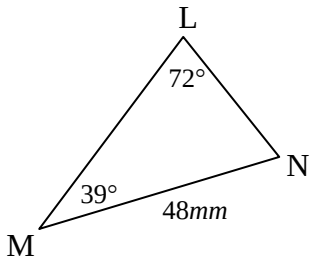
(a) $8\sin x + 5 = 7$ (b) $3\tan x + 7 = 3$ (c) $2\cos x + 6 = 7.5$

5. Calculate all unknown angles and sides in both triangles.

(a)



(b)



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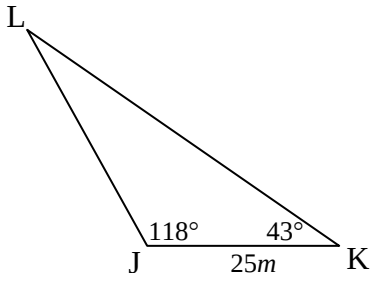
S4 Credit Homework Exercise 15

1. The Everbright Electricity Company carries out a survey of homes to find the number of light sockets in each. Four different streets are visited with these results.

Hazel Road	8	9	12	13	13	14	14	15			
Ash Street	8	9	9	11	13	13	13	14	15		
Lime Grove	9	10	10	12	13	14	14	15	16	18	
Beech Lane	10	10	11	11	13	13	14	14	14	14	15

(a) Work out the median number of sockets for each street.
(b) Calculate the quartiles in the list for (i) Hazel Road (ii) Ash Street
(c) What is the upper quartile of the Lime Grove list?
(d) What is the lower quartile of the Beech Lane list?

2. Three roads meet at a triangular junction. The island created in the centre has to be paved with a kerb fitted round it.



(a) Calculate the length of (i) LK (ii) LJ
(b) What is the perimeter of the triangle JKL?
(c) Calculate the area of the island.

3. Change the subject of the formula to the letter indicated in the square brackets.

(a) $d = e - f \quad [e]$ (b) $y = 4s - t \quad [s]$ (c) $v = u(x + y) \quad [x]$

4. Draw sketches of the following graphs for $0 \leq x \leq 360°$

(a) $y = 2\sin x$ (b) $y = 3\cos x$ (c) $y = 3\sin 2x$

5. In one year Jenny's grandfather will be three times as old as she is just now. The difference between their ages is 41 years.

(a) Form a pair of simultaneous equations to model the situation.
(b) Solve the equations to find the age of each person.

6. In a game of bowls the bowler is standing 24m from the jack. Her bowl travels 23m in a straight line. It comes to rest 3.5m from the jack. By how many degrees was her bowl off-line?

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S4 Credit Homework Exercise 16

1. A function f is defined by $f(x) = \frac{24}{x}$, where $x \neq 0$.

   (a) Calculate (i) $f(1)$ (ii) $f(6)$ (iii) $f(-2)$.

   (b) For what value of x is $f(x) = 8$?

2. The number of gallons of petrol (n) used by the new Super Sports Saloon is in direct proportion to the distance travelled (d miles) and to the square root of the average speed (s mph).

   (a) If 12 gallons are required for a journey of 360 miles travelled at an average speed of 64 mph.
   Find a formula expressing n in terms of d and s

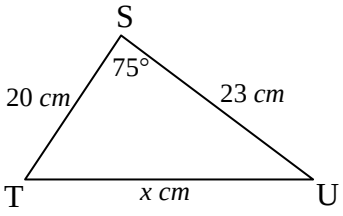
   (b) Calculate n when d = 480miles and s = 49 mph.

3. Simplify:

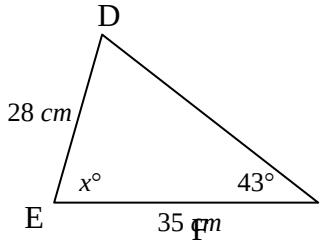
   (a) $\frac{y^{-\frac{1}{3}} \times y^{\frac{4}{3}}}{y}$ (b) $\frac{x^{-\frac{1}{5}} \times x^{\frac{6}{5}}}{x^{-2}}$ (c) $n^{-\frac{1}{2}}(n^{\frac{3}{2}} - n^{-\frac{1}{2}})$

4. Calculate x in each triangle.

   (a)



   (b)



5. Two seaside resorts record their daily rainfall (in millimetres) one fortnight in autumn.

   Riverdale:
   2, 1, 12, 13, 13, 15, 15, 15, 16, 16, 17, 18, 18, 19.

   Sandaybay:
   3, 4, 4, 5, 9, 9, 10, 13, 13, 15, 15, 20, 22, 25.

   (a) Calculate: (i) the mean (ii) the standard deviation for each resort.

   (b) Which would you recommend for an autumn break? Give reasons.

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} \quad \text{or} \quad s = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}}$$