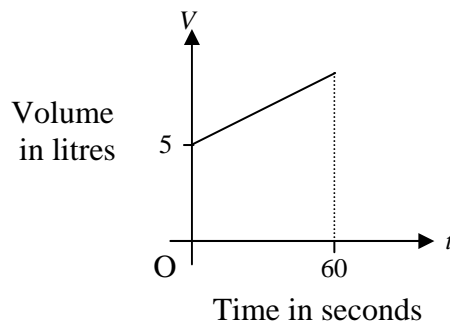


S4 Credit Homework 1 - Gradient

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

- Write down the gradient and y -intercept of each of these lines.
a) $y = 2x + 5$ b) $4y = 3x - 12$ c) $2x - 5y - 35 = 0$
- Calculate the gradients of the lines joining the following points:
a) K(3,4) and L(7,7) b) P(-4,-2) and Q(4,-2)
- Find the equation of the line joining these pair of points.
a) A (3,6) and B (5,8) b) G (1,-2) and H (0,-3)
- Simplify:
a) $a^3 \times a^2$ b) $q^4 \div q^6$ c) $(a^3)^2$
- Simplify:
a) $\sqrt{300}$ b) $\sqrt{3} + 4\sqrt{3}$ c) $\sqrt{8} - \sqrt{2}$
- Solve:
a) $8x + 7 = 6x + 9$ b) $7(3x - 4) - 4(3 - x) = 10$
- The tank of a car contains 5 litres of petrol.
The graph below shows how the volume of petrol in this tank changes as a further 45 litres of petrol is pumped in at a steady rate for 60 seconds.



Find the equation of the straight line in terms of V and t .

S4 Credit Homework 2 - Straight Line

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

- 1 Find the equation of the following lines:
 - a) with gradient 3 passing through (0,4);
 - b) with gradient 2 passing through (3,4).

- 2 Find the equation of the line passing through (1,7) which is parallel to the line with equation $y = 2x + 3$.

- 3
 - a) Express $\frac{y^4 \times y}{y^{-2}}$ in its simplest form .
 - b) Simplify $a^2(a^{-5} + 4)$.
 - c) Express $\frac{3}{\sqrt{5}}$ as a fraction with a rational denominator.

- 4 The travelling expenses claimed by a salesperson depend on the engine capacity of the car and the number of miles travelled per week as shown in the table below.

ENGINE CAPACITY	EXPENSES PER MILE
less than or equal to 1 litre	£0.25 for each of the first 250 miles travelled
greater than 1 litre but less than or equal to 1.4 litres	£0.27 for each of the first 250 miles travelled
greater than 1.4 litres	£0.29 for each of the first 250 miles travelled
Where the number of miles travelled in a week is greater than 250 , £0.15 can be claimed for each additional mile.	

- a) Find the expenses claimed by a salesman in a week when:
550 miles are travelled and the engine capacity is 1.2 litres.

- b) Write down the formula to find the expenses, £ E , claimed for t miles travelled where t is greater than 250, and the engine capacity is 1.6 litres.

S4 Credit Homework 3 - Functions 1

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

- 1 A function is defined by $f(x) = \frac{24}{x}$, where $x \neq 0$. Calculate the value of $f(-2)$
For what value of t , is $f(t) = 8$?

- 2 A function is defined by $f(x) = \frac{3}{\sqrt{x}}$.
Find the exact value of $f(2)$, giving your answer as a fraction with a rational denominator.

- 3 A function is defined by $f(x) = \frac{1}{x^2}$, where $x \neq 0$.
Express $f\left(\frac{3}{2}\right)$ as a fraction in its simplest form.

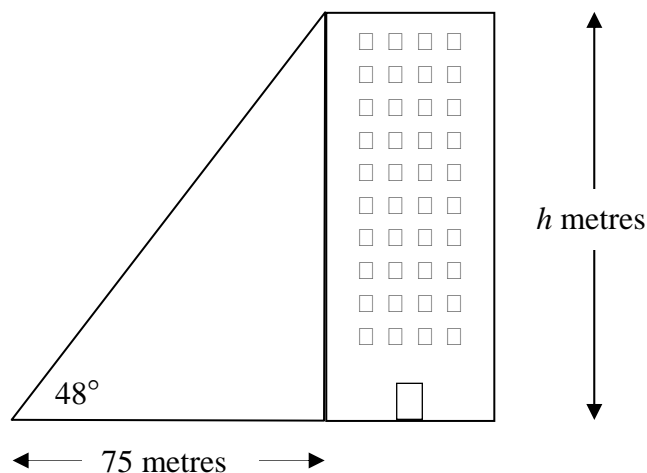


- 4 A satellite travels in a circular orbit.
It travels around the earth once every $2\frac{1}{2}$ hours.
The satellite is 2900 kilometres above the earth's surface.
The earth has a radius of 6400 kilometres.

- (a) What is the radius of the orbit of the satellite?
(b) Calculate the speed of the satellite.

- 5 The angle of elevation from the ground to the top of a block of flats is 48° .
The angle is measured at a point 75 metres from the flats as shown in the diagram below.

Calculate the height, h metres, of the block of flats, correct to 1 decimal place.



S4 Credit Homework 4 - Functions 2

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

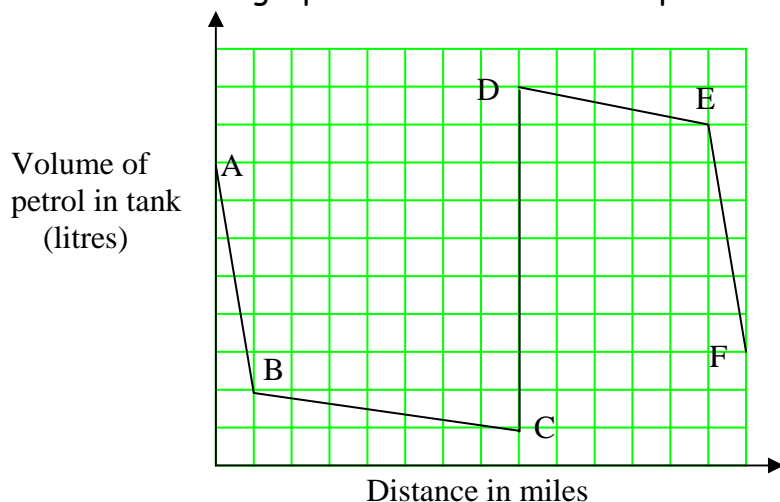
- 1 A function is defined by $f(x) = 3\sqrt{x}$
Find the exact value of $f(12)$ giving your answer as a surd in its simplest form.
- 2 A function is defined by $h(t) = 15t - 3t^2$. Evaluate $h(-2)$
- 3 A function is defined by $f(x) = 3^x$
a) Find $f(4)$ b) Given that $f(x) = \sqrt{27}$ find the value of x .
- 4 The tickets for a Sports Club disco cost £2 for members and £3 for non-members.
a) x tickets were sold to members and y tickets were sold to non-members. The total ticket money collected was £580. Use this information to write down an equation involving x and y .
b) 250 people bought tickets for the disco. Write down another equation involving x and y .
c) How many tickets were sold to members?



- 5 A newspaper report stated:
*"Concorde has now flown 7.1×10^7 miles.
This is equivalent to 300 journeys from the earth to the moon"*

Calculate the distance from the earth to the moon.
Give your answer in scientific notation correct to 2 significant figures.

- 6 The graph shows the volume of petrol in a car's tank during a journey.



- a) Explain the significance of CD.
The journey involves driving through towns and along motorways. In the towns the car uses more petrol per mile than on the motorways.
- b) Which **two** parts of the graph show driving on motorways?
Explain your answer clearly.

S4 Credit Homework 5 - Sectors

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

- 1 This fan has radius of length 20 centimetres
When it is opened the circular edge
measures 56 centimetres.

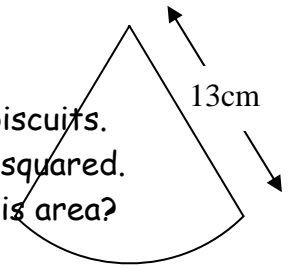


Calculate the area of the open fan.

2



Ice cream cones are made from sectors of biscuits.
Each biscuit has an area of 100 centimetres squared.
What size of the angle is required to give this area?



- 3 Multiply out the brackets and collect like terms.

$$(x-2)(x^2+3x-4)$$

- 4 Calculate:

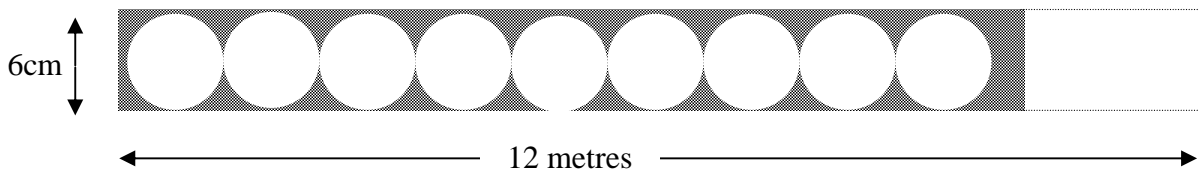
a) $4\frac{1}{3} + 2\frac{3}{5}$

b) $6\frac{3}{4} \times 5$

- 5 Simplify:

$$(x+3)^2 - (x-1)(x+3)$$

- 6 Milk bottle tops are stamped out of a strip of aluminium foil.



If the strip is 12 metres long, calculate the area of the wasted aluminium, in cm^2

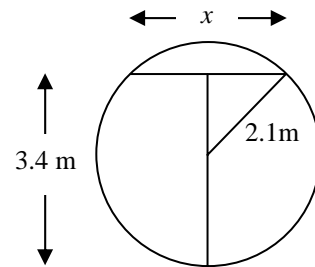
S4 Credit Homework 6 - Circles

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

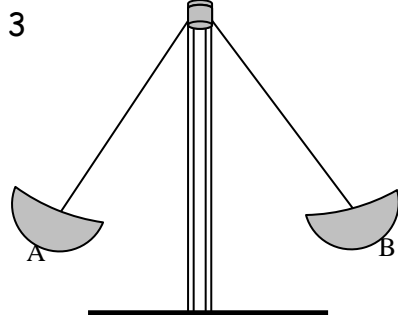
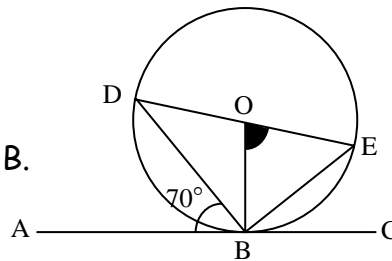
- 1 An oil tank has a circular cross-section of radius 2.1 metres.

It is filled to a depth of 3.4 metres.

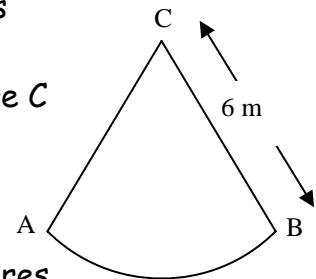
- a) Calculate x , the width in metres of the oil surface.
b) What other depth of oil would give the same surface width?



- 2 In the diagram:
A circle centre O is drawn
The line AC is a tangent to the circle at B .
Angle $DBA = 70^\circ$.
Calculate the size of angle BOE .



The boat on a carnival ride travels along an arc of a circle, centre C . The boat is attached to the centre C by a rod 6 metres long. The rod swings from position CA to position CB . The length of the arc AB is 7 metres. Find the angle through which the rod swings from position A to position B .



- 4 Factorise:

a) $2x^2 + 7x - 4$ b) $9a^2 - 25$ c) $6xy^2 - 2x^2y$

5. The number of people suffering from a virus is 12 million. For each of the next 3 years, the number of people suffering from the virus is expected to be 5% more than the number in the previous year. How many people are expected to be suffering from the virus in 3 years time?
Give your answer in millions.

- 6 a) Evaluate $p^2 + \frac{p}{q}$, where $p = -6$ and $q = -2$
b) If $a = -2$, $b = 3$ and $c = -7$; evaluate $c^2 - \frac{4b}{9a}$

S4 Credit Homework 7 - Inequations

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

1 Solve the inequations:

a) $7p - 3 \geq 4p + 9$

b) $5x - 2(x + 1) \leq 7$

2 Solve the inequations:

a) $24 - 3u < u + 4$

b) $6 - 2(x - 1) > 12$

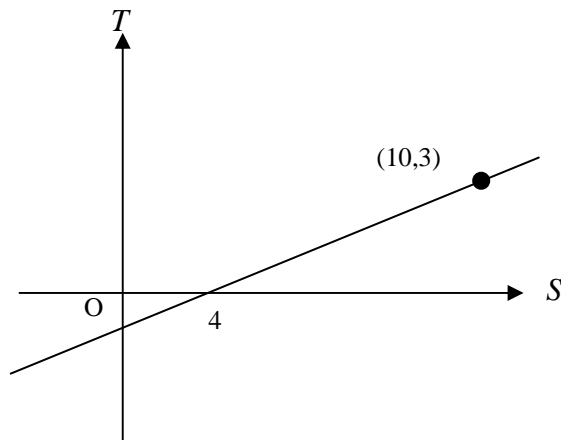
3 Solve the inequality :

$$3(x + 5) - 34 \geq -2(x - 7)$$

4 Factorise fully :

$$6n^2 + 10n - 4$$

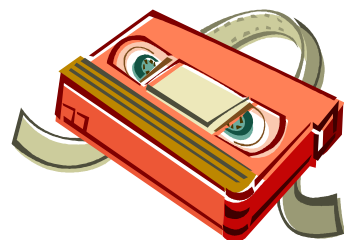
5



Find the equation of the given straight line in terms of T and S

6 Over a period of 20 days, the sales of videos from a shop were

11	4	23	9	17
32	37	15	5	1
29	18	47	30	12
11	3	22	34	16



Construct a stem - and - leaf diagram for these sales

What is the probability that the shop sold **more** than 30 videos on any one day during the 20-day period?

S4 Credit Homework 8 - Trigonometry 1

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

1 Write down the maximum values, and the least period of the following.

a) $y = 2\sin x^\circ$

b) $y = \cos 3x^\circ$

c) $y = 4\sin 2x^\circ$

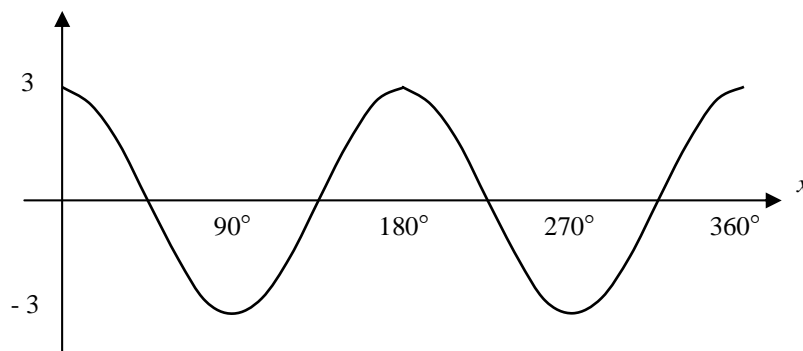
2 Solve the following equations:

a) $\sin x^\circ = 0.23$

b) $\cos x^\circ = 0.76$

c) $\tan x^\circ = 2.36$

3 The diagram shows the graph of $y = a \cos bx^\circ$, $0 \leq x < 360$.



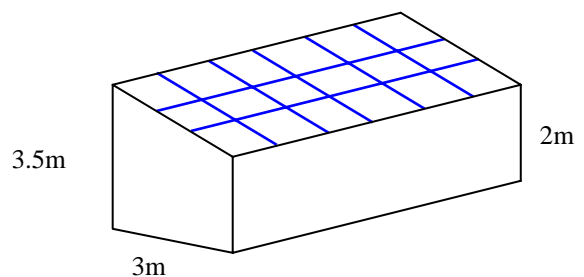
Find the values of a and b .

4 Change the subject of the formula to T .

$$Q = p^2 + 3T$$

5 The Scott family want to build a conservatory as shown below.

The conservatory is to be 3 metres wide. The height of the conservatory at the lower end is to be 2 metres and at the higher end 3.5 metres.



To obtain planning permission, the roof must slope at an angle of $(25 \pm 2)^\circ$ to the horizontal.

Should planning permission be granted? **Justify your answer.**

S4 Credit Homework 9 - Trigonometry 2

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

1 Make a sketch of the following graphs:

a) $y = 3\cos x^\circ$

b) $y = \sin 2x^\circ$

2 Write down the maximum and minimum values of:

a) $y = 3 + \sin x^\circ$

b) $y = 2 + 3\cos x^\circ$

3 Solve the following equations; for $0 \leq x < 360$:

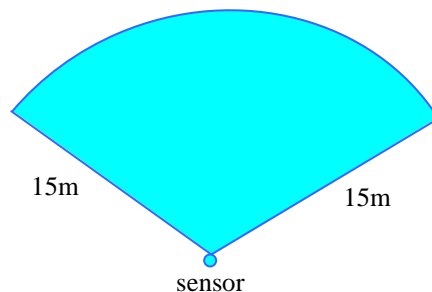
a) $5\sin x^\circ = 4$

b) $2 + \cos x^\circ = 1.5$

4 Find the point of intersection of the straight lines with equations.

$$2x + y = 5 \quad \text{and} \quad x - 3y = 6$$

5 A sensor in a security system covers a horizontal area in the shape of a sector of a circle of radius 15metres



The area of the sector is 200 square metres.

Calculate the perimeter of the horizontal area covered by the sensor.

S4 Credit Homework 10 - Trigonometry 3

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

- 1 Solve the following equations, correct to 1 decimal place, for $0 \leq x < 360$.

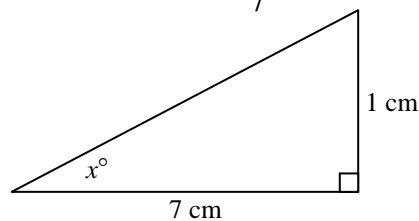
a) $4 \cos x^\circ - 1 = 0^\circ$

b) $3 \sin x^\circ + 2 = 1$

- 2 Solve the equation, correct to 1 decimal place for $0 \leq x < 360$.

$$2 \sin x^\circ + 1 = \cos 60^\circ$$

- 3 In the right angled triangle, $\tan x^\circ = \frac{1}{7}$



- a) Calculate the length of the hypotenuse leaving your answer as a surd.
- b) Hence, write down as a surd: (i) $\sin x^\circ$ (ii) $\cos x^\circ$
- c) If $\sin 2x^\circ = 2 \sin x^\circ \cos x^\circ$,
find the exact value of $\sin 2x^\circ$.
- 4 On a certain day the depth, D metres, of water at a fishing port, t hours after midnight, is given by the formula

$$D = 12.5 + 9.5 \sin(30t)^\circ$$

- a) Find the depth of the water at 1.30 pm
- b) The depth of water in the harbour is recorded each hour. What is the maximum difference in the depth of water in the harbour over the 24 hour period.

S4 Credit Homework 11 - Quadratic Equation 1

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

1 Solve the equation:

$$5 - 2(1 + 3x) = 27$$

2 Solve the equations:

a) $2x(x - 3) = 0$

b) $3t - t^2 = 0$

3 Solve the following equations by factorising.

a) $x^2 + 5x + 6 = 0$

b) $15x^2 - x - 2 = 0$

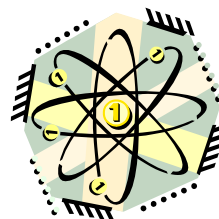
4 Solve the equations,

a) $2x^2 - 7x - 5 = 0$

b) $3p^2 - 5p - 10 = 0$

Give your answers **correct to 1 decimal place**.

5 A cyclotron produces high speed particles.
A particle moving inside the cyclotron
takes 9.78×10^{-10} seconds to travel 2.3×10^{-1} metres.



Calculate the speed of the particle in metres per second.
Express your answer in scientific notation

6 In a competition each team plays every other team twice - once at home, once away.



The total number of games played in the competition is given by the expression

$$T^2 - T$$

where T represents the number of teams entered.

If the total number of games played in a competition was 380,
how many teams entered the competition?

S4 Credit Homework 12 - Quadratic Equation 2

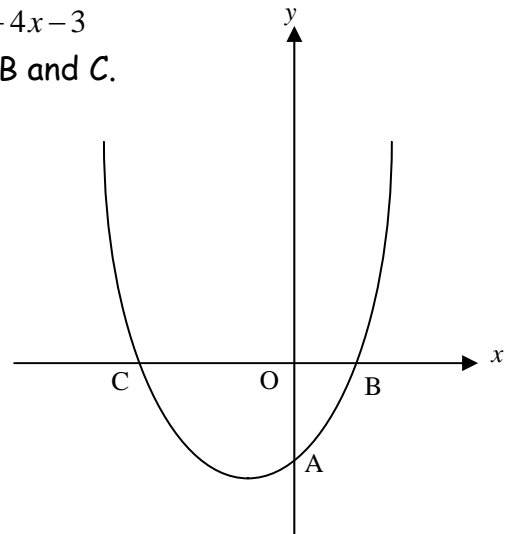
SHOW **ALL** WORKING REQUIRED TO ANSWER EACH QUESTION

- 1 Solve giving your answer **correct to 2 decimal places**.

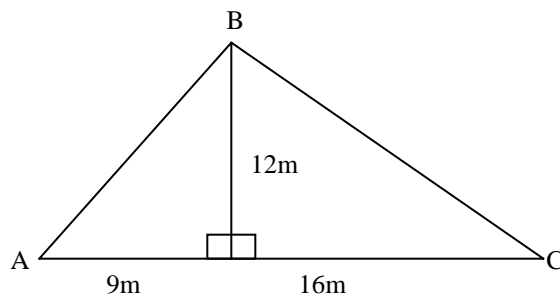
$$2x^2 + 3x - 7 = 0$$

- 2 The diagram shows part of the graph of $y = 4x^2 + 4x - 3$
The graph cuts the y -axis at A and the x -axis at B and C.

- a) Write down the coordinates of A.
b) Find the coordinates of B and C.
c) Calculate the minimum value of $y = 4x^2 + 4x - 3$



- 3 Prove that triangle ABC is right angles



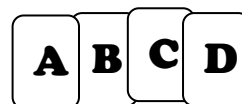
- 4 James sell 100 raffle tickets for charity
Kalil buys 1 ticket. Sarah buys 10 tickets.
Calculate:

- a) the probability that Kalil will win.
b) the probability that Sarah will win.



- 5 In a card game, each letter of the alphabet is printed on its own card.
A card is selected at random. Calculate:

- a) P (vowel) b) P (consonant)



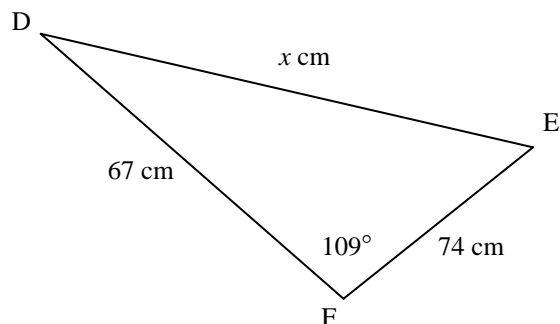
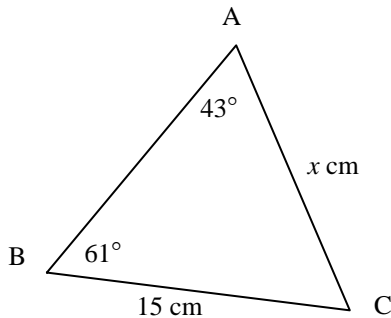
- 6 Solve algebraically the inequality:

$$2 + 5x \geq 8x - 6$$

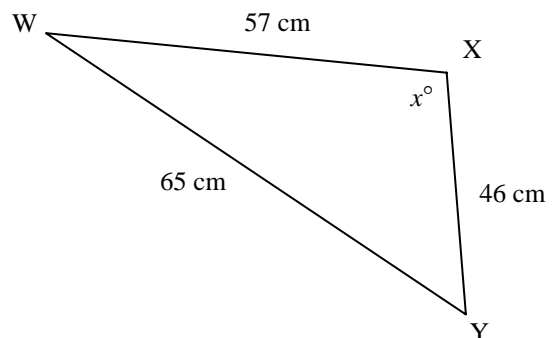
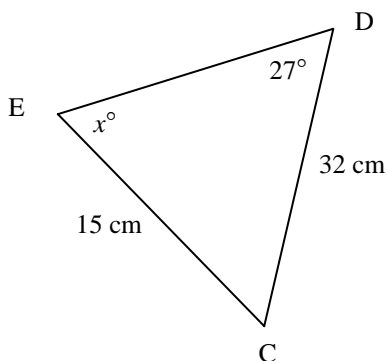
S4 Credit Homework 13 - Sine and Cosine Rules

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

- 1 Calculate the length of the side marked x centimetres.
Correct to **3 significant figures**



- 2 Calculate the size of the angle marked x° , correct to **1 decimal place**.



- 3 Express as a surd in its simplest form:

(a) $\sqrt{80} + \sqrt{20}$

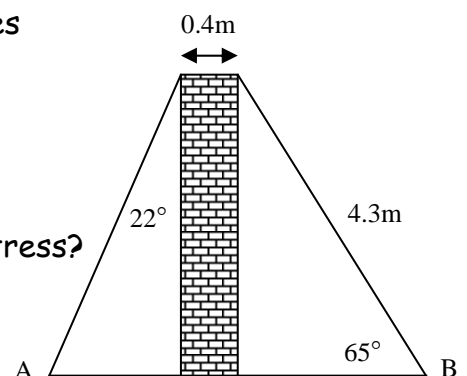
(b) $\sqrt{72} - \sqrt{32}$

(c) $(5\sqrt{2} + 1)(2\sqrt{2} - 3)$

(d) $(2\sqrt{7} - \sqrt{3})^2$

- 4 A wall is supported on both sides by buttresses.
The sloping side of one is 4.3 metres long and makes an angle of 65° with the ground. The other makes an angle of 22° with the wall.

- a) How high is the wall?
b) How long is the sloping side of the smaller buttress?
c) If the wall is 0.4 metres thick, what is the length of the base AB?



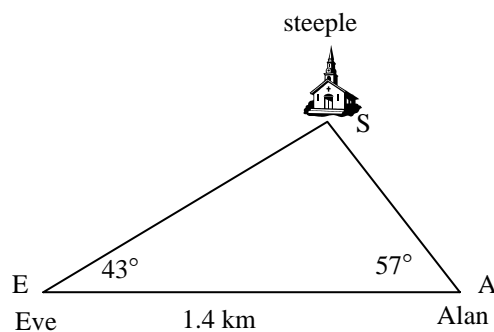
S4 Credit Homework 14 - Trig problem Solving

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

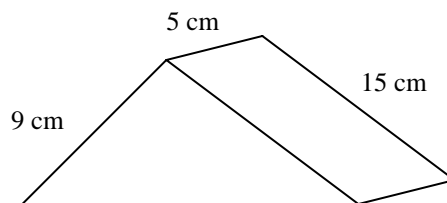
1. Eve and Alan are standing 1.4 kilometres apart. They both take a sighting on a steeple. Eve measures angle SEA as 43° and Alan measures angle SAE as 57° .

a) Calculate the size of angle ESA.

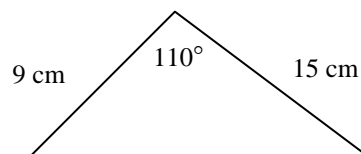
b) Calculate the distance Eve is from the steeple from the steeple.



2. A metal door-stop is prism shaped, as shown.



The uniform cross-section is shown below.



Find the volume of metal required to make the door-stop.

3. Solve the equation $3x^2 - 10x - 5 = 0$
Give your answer **correct to 2 significant figures**
4. Simplify each expression using positive indices.

a) $a^2 \times a^{-3}$

b) $2x^3 \times 4x^{-5}$

c) $5y^{-3} \times 4y^{-2}$

d) $a^2 \div a^5$

e) $y^{-3} \div y^{-1}$

f) $4x^4 \div 12x^6$

S4 Credit Homework 15 - Variation 1

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

1. $E \propto F$ and $E = 10$ when $F = 5$.

- Find a formula for E in terms of F .
- Calculate the value of E when $F = 8$.

2. $R \propto \frac{1}{S}$ and $R = 8$ when $S = 4$.

- Find a formula connecting R and S .
- Calculate the value of R when $S = 16$.

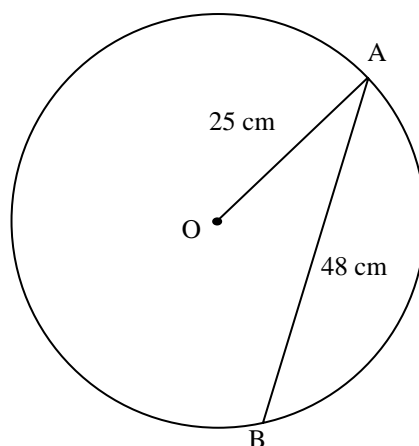
3. P varies directly as Q^2 . $P = 16$ when $Q = 2$.

- Find a formula connecting P and Q .
- Calculate the value P when $Q = 3$.
- Calculate the value Q when $P = 100$
- What is the effect on P of doubling Q ?

4. The number of letters, N , which can be typed on a sheet of paper varies inversely as the square of the size s , of the letters used.

- Write down the relationship connecting N and s .
- The size of the letters used is doubled. What effect does this have on the number of letters that can be typed on the sheet of paper?

5. Calculate the distance from the centre of the circle O to chord AB



S4 Credit Homework 16 - Variation 2

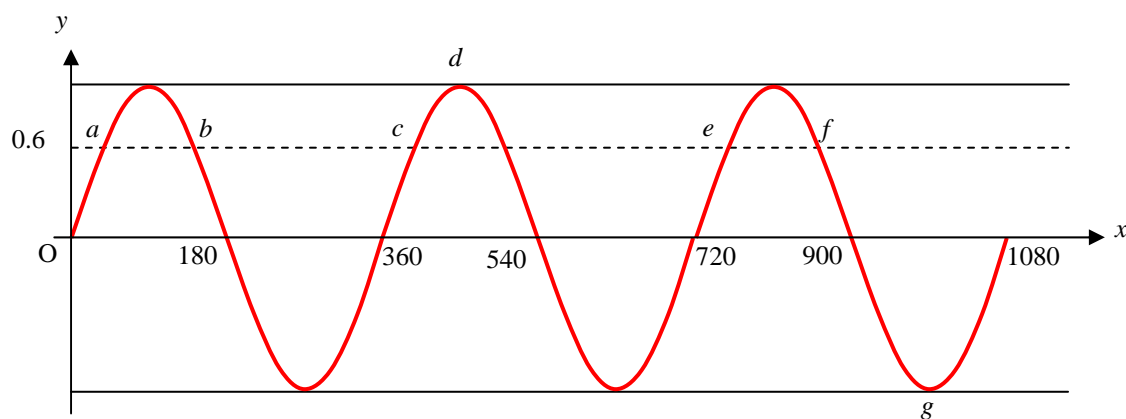
SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

- 1 D varies directly as E and inversely as F .
The value of $D = 12$ when $E = 6$ and $F = 8$.

- a) Find a formula connecting D, E, F .
b) Calculate D when $E = 4$ and $F = 2$.

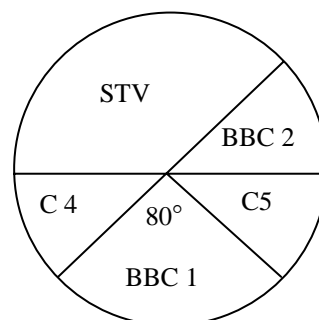
- 2 The electrical resistance R ohms of a wire varies directly as the length L centimetres and inversely as the square of its diameter d centimetres.
 $R = 2.5$ ohms when $L = 200$ centimetres and $d = 0.04$ centimetres.
Calculate the resistance, correct to 3 significant figures, of 120 centimetres of wire with diameter 0.03 centimetres

- 3 Here is a picture of three cycles of the sine graph, showing where the graph cuts the x -axis.



- a) Show that at the point a , $x = 37$, to the nearest whole number
b) Hence write down the values of x at the points b to g .
- 4 The pie chart represents the results of a survey on terrestrial television to determine which channel was viewed most often.

If the total number of people surveyed was 6660,
How many people chose BBC 1?



S4 Credit Homework 17 - Standard Deviation 1

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

- 1 The height of a group of fourth year pupils was measured. The results were as follows

150cm. 158cm. 170cm. 180cm. 199cm.

- a) Calculate their mean height
b) Calculate the standard deviation of their heights

2. John measures how long he spends, in minutes, on phone calls each day for a week.
The total for each day was as follows.

4 2 8 3 1 2 1

Calculate the mean and standard deviation of his calls for the week.

Karen measures her calls during the same week and finds that the mean length of her calls each day is 15.3 minutes with a standard deviation of 4.1. Comment on these results.

- 3 Find the equation of a straight line, which cuts the y -axis at $(0,3)$ and has gradient 2.
4 Solve the equation giving your answer correct to 3 significant figures

$$x^2 = 3x + 1$$

- 5 A flammable liquid is transported in a cylindrical tanker.

For safety reasons the depth of the liquid must not exceed 3 metres.
The radius of the tank is 1.7 metres.
What is width of the liquid when the container is filled to this maximum depth?



S4 Credit Homework 18 - Standard Deviation 2

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

- 1 a) Vestal trains records how late six of it's trains are, in minutes. The results were

5 5 6 7 8 8



Calculate the mean standard deviation of these figures.

- b) Enretard Trains also check how late their trains are and find that their means is 4.1 and standard deviation is 5.2

Compare the results for Enretard with Vestal.

- 2 The table shows the emission levels of harmful gases at different places in a city.

	Emmissions
City Square	111 units
Albert Street	41 units
Wellgate Centre	161 units
Bus Station	146 units
High Road	114 units

Health regulations state that the emission levels of harmful gases should be less than 135 units. The city council plan to reduce the levels in such a way that for each of the next 3 years the emission levels will be 5% less that the level in the previous year. Will all the places listed in the table meet the health regulations in 2 years time? **Show clearly all your working.**

3. Evaluate

a) $8^{\frac{2}{3}}$

(b) $4^{\frac{3}{2}}$

- 4 Simplify

(a) $(2x^2)^3$

(b) $\frac{4y^3}{8y^8}$

(c) $\sqrt{40}$

(d) $\sqrt{27} + \sqrt{18}$

S4 Credit Homework 19 - Fraction 1

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

1 Simplify:

(a) $\frac{8xy^2}{16x^2y}$

(b) $\frac{6x^2 + x - 2}{4x^2 - 1}$

2 Write as a single fraction in the simplest form:

(a) $\frac{3m}{4} + \frac{2m}{5}$

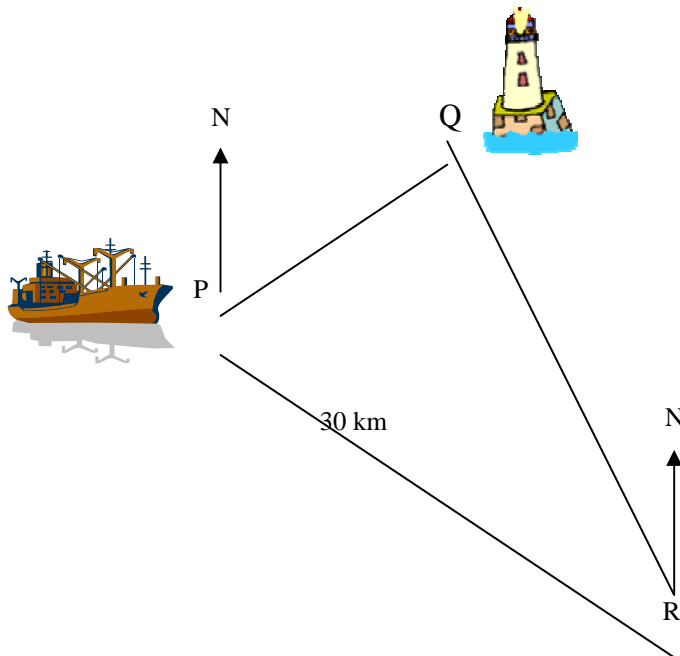
(b) $\frac{3}{a-b} + \frac{2}{a+b}$

3. Solve the following equations:

(a) $\frac{x-2}{5} = 3$

(b) $\frac{d-2}{3} - \frac{d-1}{4} = 1$

4 A ship at position P, observes a lighthouse at position Q on a bearing of 040°



The ship travels 30 kilometres on a bearing of 125° to position R.

From position R, the ship observes the lighthouse on a bearing of 340° .

Show that angle $QPR = 85^\circ$ and angle $QRP = 35^\circ$

When the ship is at position R, how far is it from the lighthouse?

S4 Credit Homework 20 - Fraction 2

SHOW ALL WORKING REQUIRED TO ANSWER EACH QUESTION

1. Solve:

(a) $\frac{2a-1}{3} - \frac{2a-1}{5} = 2$

(b) $2x - \frac{3}{x} = -5 : x \neq 0$

2. Factorise then simplify:

(a) $\frac{x^2 + 3x + 2}{x^2 + 6x + 5}$

(b) $\frac{4x^2 - 9}{2x^2 - x - 3}$

3. Write as a single fraction:

(a) $\frac{a^2}{15} \times \frac{10}{a^7}$

(b) $\frac{a^3}{8} \div \frac{a^6}{12}$

4. The sum S to n terms of a series can be found using the formula

$$S = \frac{1}{2}n[2a + (n-1)d]$$

where:

n is the number of terms

a is the first term and

d is the difference between each term

Use the formula to find the sum of the first 12 terms of the series $3 + 5 + 7 + 9$