

Revision Booklet

Unit 2

Unit 2 Revision Pack

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2.1a REVERSE PERCENTAGES

Use reverse percentages to calculate an original quantity.

1. These amounts have been reduced by 22%. What was the original amount?

- | | | |
|-----------------|---------------|--------------|
| (a) £85 | (b) 212.5 mm | (c) £63.75 |
| (d) 25.5 litres | (e) 357 miles | (f) 435.2 m |
| (g) 1 275 km | (h) £4 462.50 | (i) 10 200 m |
| (j) 605.2 cm | (k) £658.75 | (l) 76.5 kg |

2. These amounts have been increased by 15%. What was the original amount?

- | | | |
|--------------|-------------------|-------------|
| (a) £26.84 | (b) £54.90 | (c) £87.84 |
| (d) 103.7 ml | (e) £21.35 | (f) 122 cm |
| (g) 3 111 m | (h) 10 370 km | (i) 68.32 m |
| (j) £13 664 | (k) 118.95 litres | (l) £7 564 |

3. A shop is having a sale. There is '20% OFF'. Calculate the original cost of these items.

- | | | |
|---|---|---|
| (a) | (b) | (c) |
|  |  |  |
| £18 | £38 | £26 |

4. A company gave their workers a 6% wage rise. Calculate how much each of these people were earning **each year before** the increase.

- | | | | |
|-----------|------------------|------------|---------------------|
| (a) Irene | £13 375 per year | (b) Billy | £19 324.20 per year |
| (c) Peter | £26 322 per year | (d) Isobel | £40 060.80 per year |

2.1b REVERSE PERCENTAGE**EXAM QUESTIONS**

1. A gym's membership has increased by 17% over the past year. It now has 585 members. How many members did it have a year ago?
2. The number of school pupils not wearing school uniform has decreased by 72% since the start of last year. There are now 42 pupils not wearing school uniform. How many pupils were not wearing school uniform at the start of last year?
3. My house has increased in value by 15% in the last two years. It is now worth £230 000. How much was it worth 2 years ago?
4. I bought a new car in September of last year. By this September the car had depreciated by 20% and was now worth £9600. How much did I pay for the car last September?
5. Jane bought a painting in an auction. Unfortunately the painting depreciated in value by 7% and is now worth £4185. How much was the painting worth when it was bought?
6. An antique chair has increased in value by 34% since it was bought. It is now worth £3 484. What was it worth when it was bought?

2.1c APPRECIATION and DEPRECIATION

1. For each of the investments below, calculate
 - (i) the amount due at the end of the term
 - (ii) the total interest

	Bank/ Building Society	Amount Invested (£)	Rate of interest (per year)	Number of Years
(a)	Hamilton Bank	2000	8 %	2
(b)	Allied Friendly	5000	6 %	3
(c)	Northern Hill	4800	7 %	5
(d)	Highland Bank	3500	7.5 %	3
(e)	Church National	1600	5.5 %	4
(f)	Southern Rock	1750	11 %	3

2. At the beginning of the year, Mr. Bradford borrows £5000 from the bank. The rate of compound interest is 8%. He agrees to pay back £108 per month. Calculate how much he still owes at the end of the second year.
3. The Smiths buy a house for £60,000. If it appreciates in value at the rate of 9% per year, how much will it be worth in 5 years time?
4. Amanda wins some money and decides to spend £200 on some jewellery. If it appreciates at the rate of 2% per year, how much will the jewellery be worth 3 years from now?
5. In 1990 the world population was estimated to be 5300 million, and was increasing at the rate of 1.7% per annum.
What will the population be in the year 2000? (answer to 2 significant figures)
6. Each year a factory's machinery depreciates by 25% of its value at the beginning of the year. The initial value of the machinery was £360 000.
 - (a) What was the value of the machinery after 1 year
 - (b) The machinery was to be scrapped at the end of the year when its value fell below half its original value. After how many years should the machinery be scrapped?

2.1d APPRECIATION & DEPRECIATION

EXAM QUESTIONS

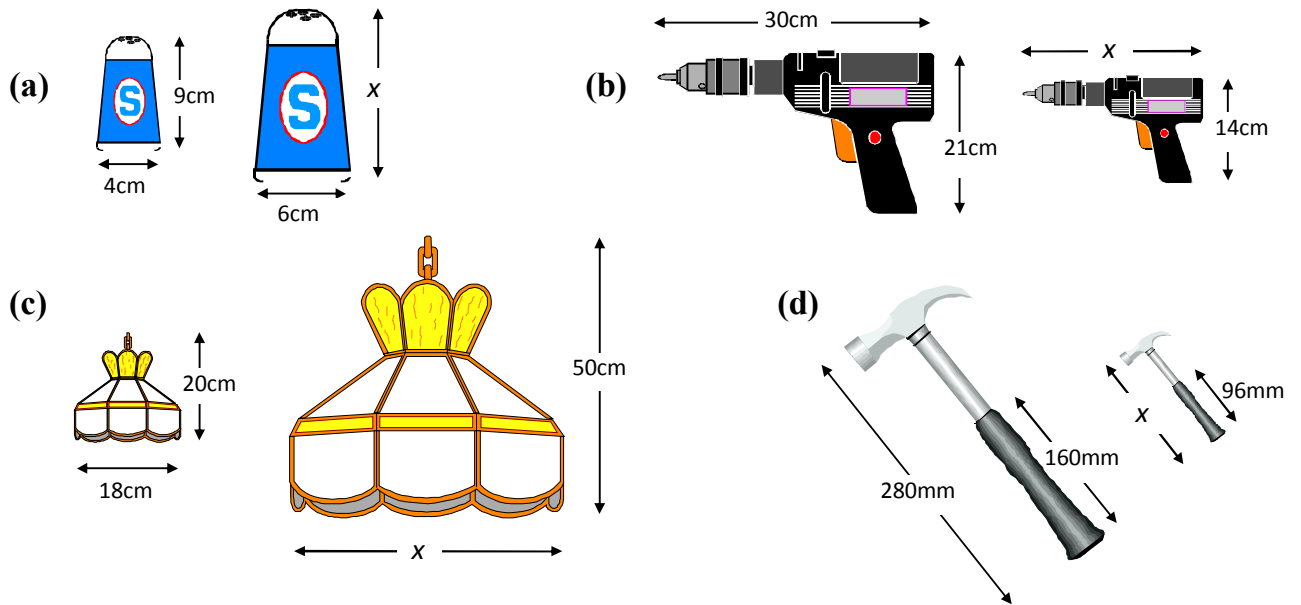
1. Joseph invests £4500 in a bank that pays 6.4% interest per annum.
If Joseph does not touch the money in the bank, how much interest will he have gained after 3 years?
Give your answer to the nearest penny.
2. Jane bought a painting in an auction for £32 250.
Unfortunately the painting depreciated in value by 7% each year.
Calculate how much the painting was worth after 2 years.
Give your answer to 3 significant figures.
3. **Non calculator**
Last year (2008) a company made a profit of £1 000 000. This year (2009) it expects to increase its profit by 20% and by 2010 to have increased it by a further 25%.
Calculate the profit the company expects to make in 2010.

4. A patient in hospital is given 200mg of a drug at 0900. 12% of the amount of the drug at the beginning of each hour is lost, through natural body processes, by the end of that hour.
How many mg of the drug will be **lost** by 1200?
5. Holly buys an antique watch costing £1200. The watch appreciates in value by 3.7% per annum.
How much will the watch be worth in 4 years time?
Give your answer to the nearest pound.
6. A local council recycles 28 000 tonnes of glass each year. After a publicity campaign they expect to increase the amount of glass recycled by 12% each year.
- (a) How much glass do they expect to recycle in 3 years time?
Give your answer correct to **3 significant figures**.
- (b) The council aim to double the amount of glass recycled in 6 years.
If this rate is maintained, will the council meet their target?
Give a reason for your answer.
7. **Non calculator**
Arthur's new car cost him £15 000. The value of it will depreciate by 20% each year.
How much will Arthur's car be worth when he trades it in for a new one in 2 years time?
8. Barry bought a house last year costing £115 000. This year it is valued at £110 400.
- (a) Calculate the percentage decrease in the value of the house.
- (b) If the value of the house continues to decrease at this rate what will the house be worth in a further 3 years time? Give your answer to 3 significant figures.
9. Marcus invested £3000 in a bank which paid 2.5% interest per year.
- (a) Calculate how much money Marcus would have in his account after 3 years.
- (b) How long would it take for Marcus' money to increase by 12%?
10. In 2007 a company made a profit of £45 000. Over the next three years its profit dropped by 3% each year due to increased manufacturing costs.
Calculate, correct to 3 significant figures, the company's profit in 2010.
11. The value of an industrial machine is expected to decrease each year by 14.2% of its value at the beginning of the year.
If it was valued at £15500 at the **beginning** of 2011, what will its expected value be at the **end** of 2013? **Give your answer correct to the nearest pound.**

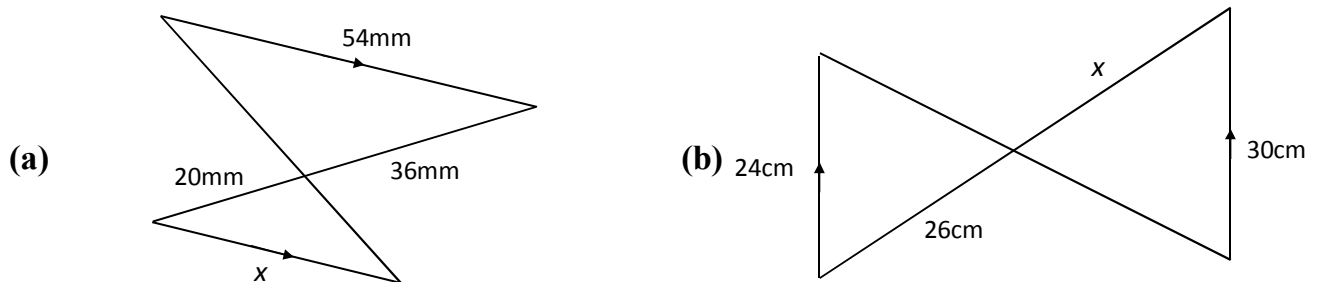
2.2a SIMILAR LENGTHS

1. Each diagram below shows a pair of similar shapes or objects. For each pair

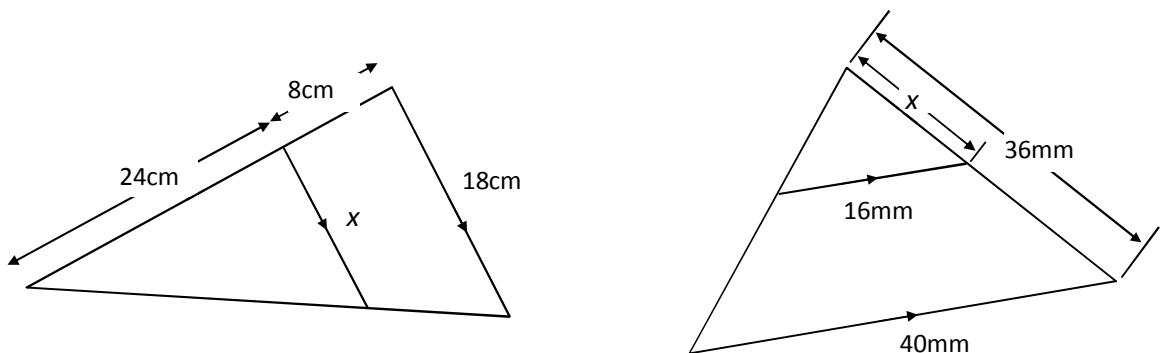
(i) state the scale factor (from left to right) (ii) calculate the length marked x .



2. Calculate the length of the side marked x in each diagram below.



3. Calculate the length of the side marked x in each diagram below.

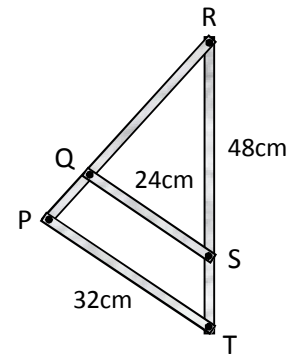


5. The diagram opposite shows an aluminium pipe frame.

The cross members QS and PT are parallel.

RS = 48cm, QS = 24cm and PT = 32cm as shown.

Calculate the length of ST

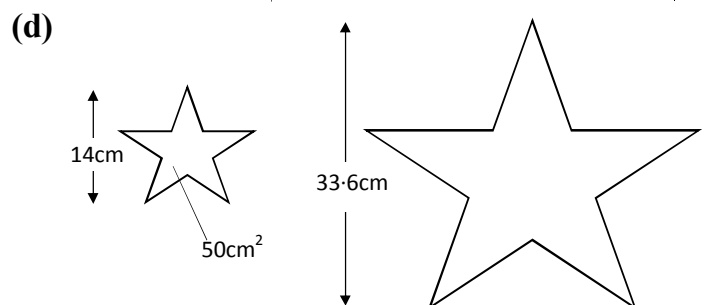
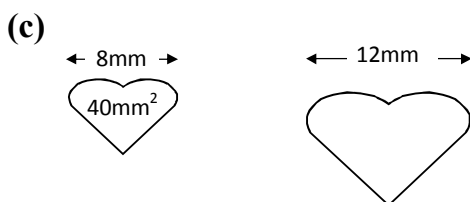
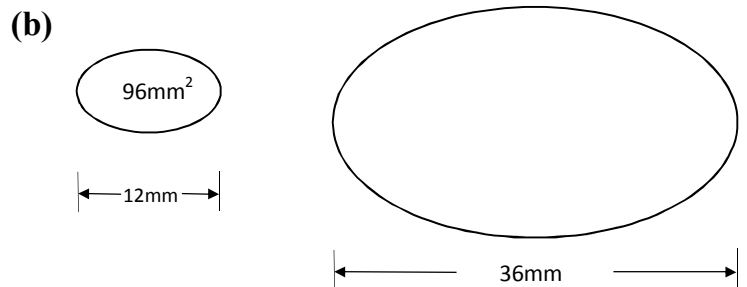
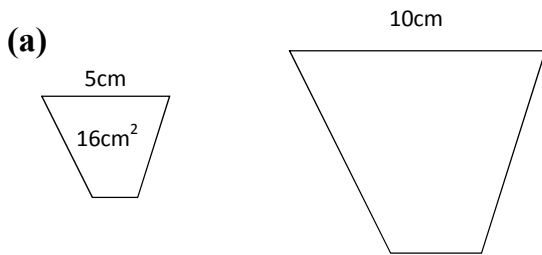


2.2b SIMILAR AREAS & VOLUME

1. For each pair of pictures below (i) State the enlargement scale factor for the lengths

(ii) State the scale factor for the areas.

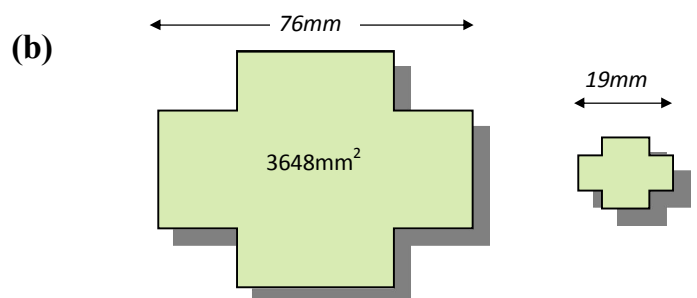
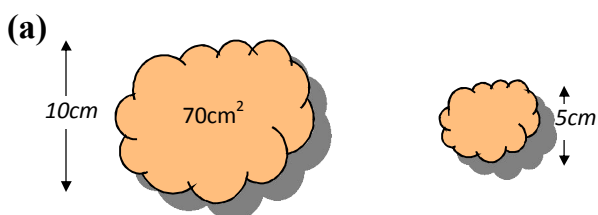
(iii) Calculate the area of the larger shape.

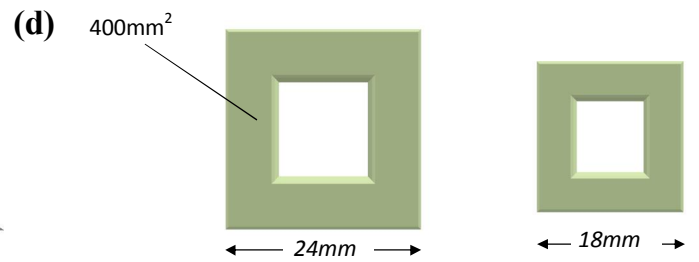
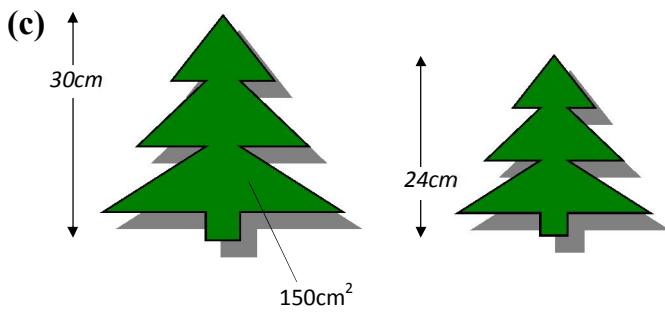


2. For each pair of pictures below (i) State the reduction scale factor for the lengths.

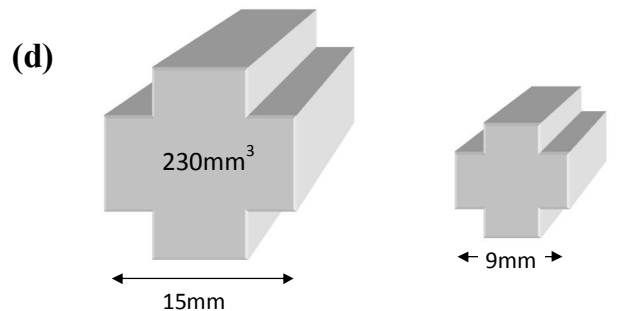
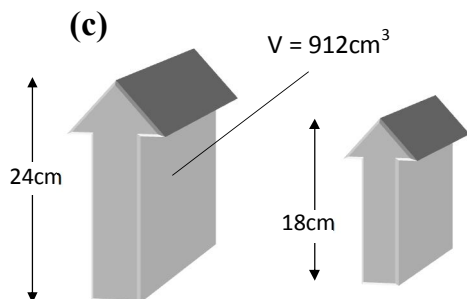
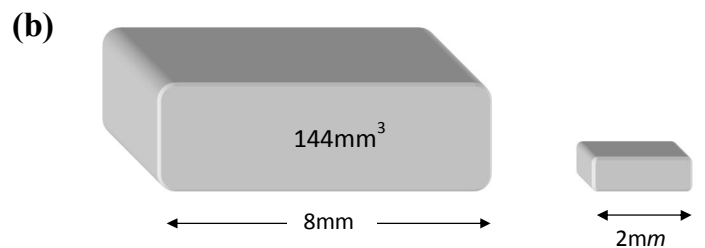
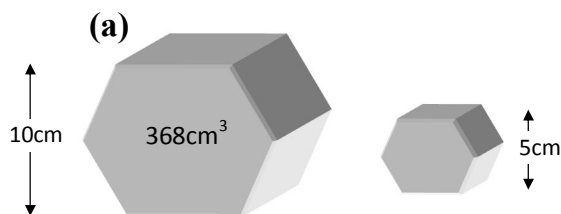
(ii) State the scale factor for the areas.

(iii) Calculate the area of the smaller shape.

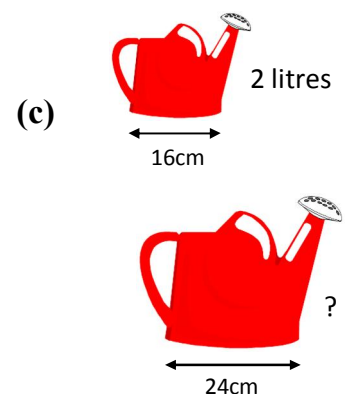
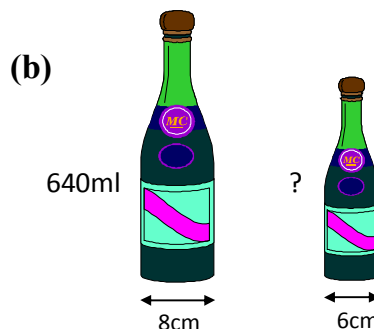
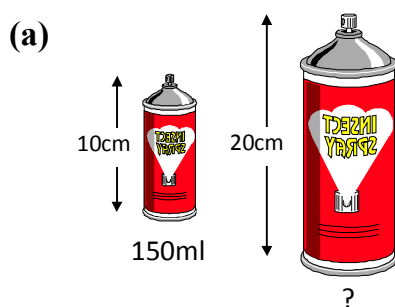




3. For each pair of similar pictures below
- (i) State the reduction scale factor for the lengths.
 - (ii) State the scale factor for the volumes.
 - (iii) Calculate the volume of the smaller solid.

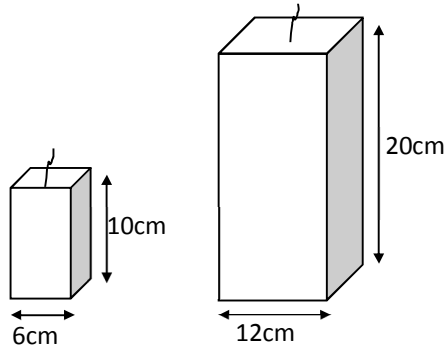


4. Each pair of containers below is mathematically similar.
Calculate the **volume** of each container with a question mark.



1. The diagram below shows two candles. Each candle is in the shape of a cuboid with a square base.

The length of time each candle will burn is proportional to its volume.



The small candle burns for 36 hours.

Nadia reckons that because the large candle’s measurements are double the small candle’s measurements then the large candle should burn for 72 hours.

Is she correct? [You should show all working and give a reason for your answer]

2. An international perfume manufacturer prices their bottles of perfume **by volume**.

The two bottles below, although containing different volumes, are mathematically similar in shape. Their heights and prices are shown.

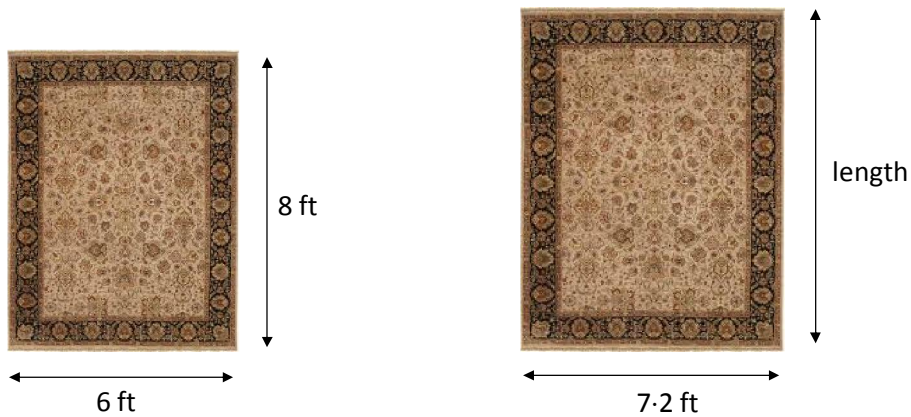


The larger of the two bottles is for sale in France.

Assuming the smaller bottle to be priced correctly, determine whether or not the larger bottle has the correct price tag given that the exchange rate is £1 = 1.10 euros.

3. John is looking to buy a new rug for his main room.

The two rugs below are **mathematically similar** in shape.



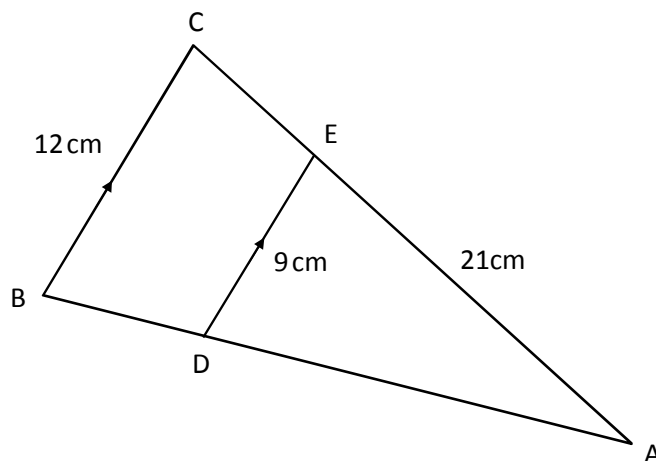
He is hoping that the length of the large rug will be enough to make the **area** of the large rug **at least 72 square feet**.

Does the large rug have the required area?

You must show appropriate working with your answer.

4. In the diagram below triangles ABC and ADE are **mathematically similar**.

$BC = 12\text{ cm}$, $DE = 9\text{ cm}$ and $AE = 21\text{ cm}$.



Find the length of CE.

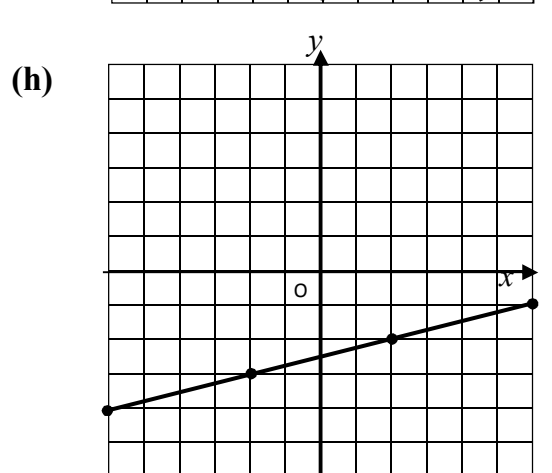
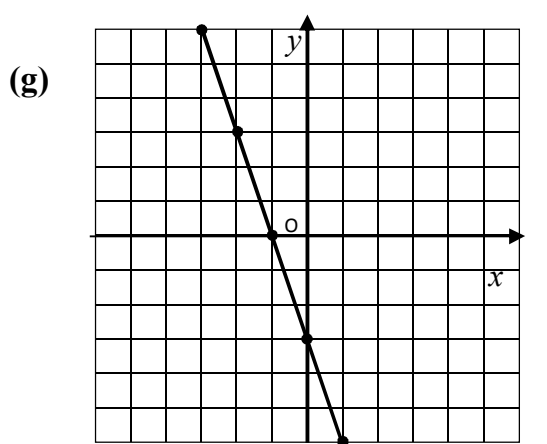
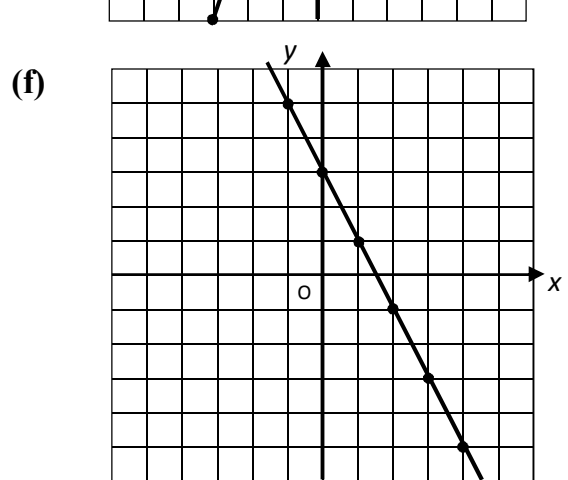
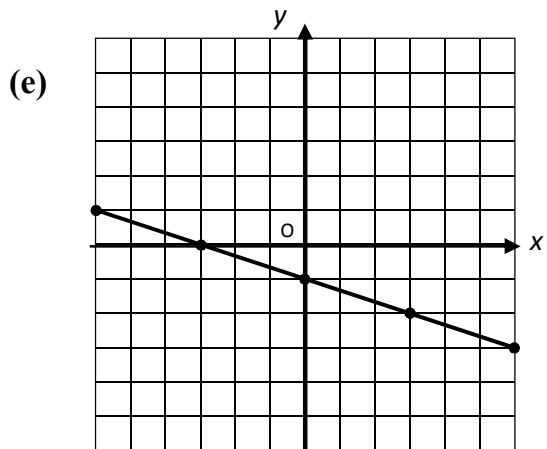
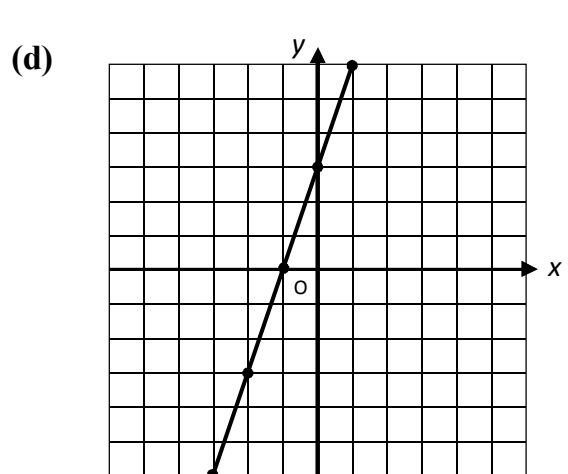
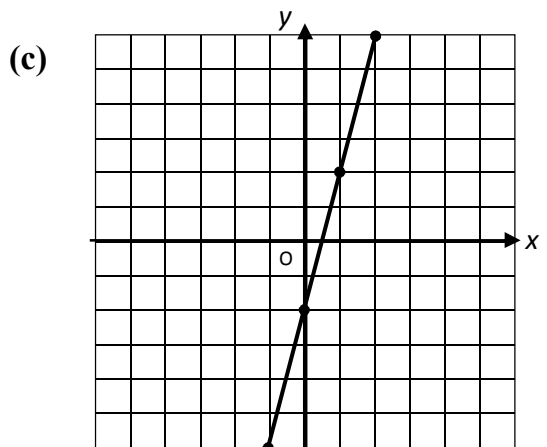
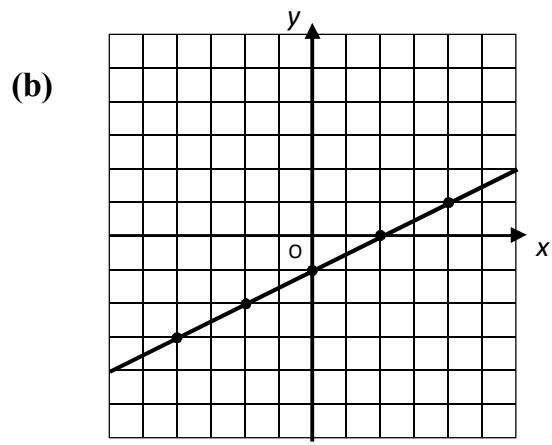
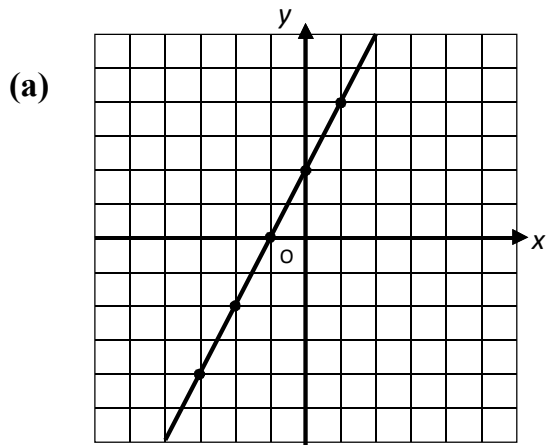
2.3a GRADIENT OF A STRAIGHT LINE

- Calculate the gradient of the line joining each pair of points below:
 - $A(-2, 6)$ and $B(8, 8)$
 - $C(3, -3)$ and $D(4, -1)$
 - $E(5, -9)$ and $F(8, -15)$
 - $G(0, 6)$ and $H(5, 11)$
 - $I(-1, -3)$ and $J(7, -9)$
 - $K(-4, 0)$ and $L(-1, 5)$
- Prove that the following sets of points are collinear:
 - $A(-6, -1)$, $B(2, 3)$ and $C(4, 4)$
 - $P(1, -1)$, $Q(-3, 5)$ and $R(7, -10)$
- Given that each set of points are collinear, find the value of k in each case:
 - $P(-4, -2)$, $Q(-1, -1)$ and $R(8, k)$
 - $A(1, 3)$, $B(3, k)$ and $C(4, -6)$
 - $E(-4, -1)$, $F(k, -1)$ and $G(8, 7)$
- The points E and F have coordinates $(2, -5)$ and $(-4, a)$ respectively. Given that the gradient of the line EF is $\frac{2}{3}$, find the value of a .
- If the points $(3, 2)$, $(-1, 0)$ and $(4, k)$ are collinear, find k .

2.3b DETERMINING the EQUATION of a STRAIGHT LINE

- For each line, write down the gradient and the coordinates of the point where it crosses the y -axis.
 - $y = 4x + 1$
 - $y = \frac{1}{2}x - 6$
 - $y = -2x + 3$
 - $y = -\frac{1}{4}x - 2$
 - $y = 8x - \frac{1}{2}$
 - $y = -\frac{1}{3}x + 6$
- Sketch the graphs of lines with equations:
 - $y = \frac{1}{2}x - 2$
 - $y = -2x - 1$
 - $2y = -6x + 4$

3. Write down the equation of the lines drawn in the diagrams below.



4. State the gradient and the y – intercept for each line below.

- (a) $y = x - 7$ (b) $y = -5x + 3$ (c) $5y = 3x - 10$
(d) $y = -4x$ (e) $2x + y = 11$ (f) $2y = x - 5$
(g) $3y - x = 18$ (h) $3x + 7y - 21 = 0$ (i) $4x - 5y = 20$

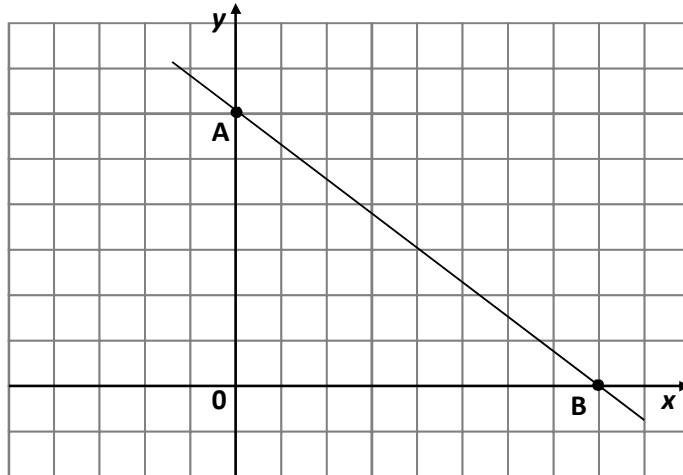
5. Write down the equation of the lines described below:

- (a) with gradient 4, passing through the point (0, 6)
(b) with gradient -2 , passing through the point (0, 1)
(c) with gradient $\frac{3}{4}$, passing through the point (0, -3)
(d) with gradient 3, passing through the point (3, 1)
(e) with gradient -5 , passing through the point (-3 , 1)
(f) with gradient $\frac{1}{2}$, passing through the point (-5 , -2)

6. Find the equation of the line joining each pair of points below.

- (a) A(4, 3) and B(8, 11) (b) C(1, 9) and D(3, 1)
(c) E(-2 , 6) and F(8, 8) (d) G(5, -9) and H(8, -15)
(e) I(0, 6) and J(5, 11) (f) K(-1 , -3) and L(7, -9)
(g) (2, 1) and (6, 3) (h) (1, 5) and (3, 1)
(i) (2, 0) and (4, 6) (j) (-2 , -3) and (2, 3)
(k) A(2, 1) and B(6, 13) (l) C(3, 4) and D(5, -4)
(m) E(-2 , -1) and F(6, 3) (n) G(4, -13) and H(-2 , -1)

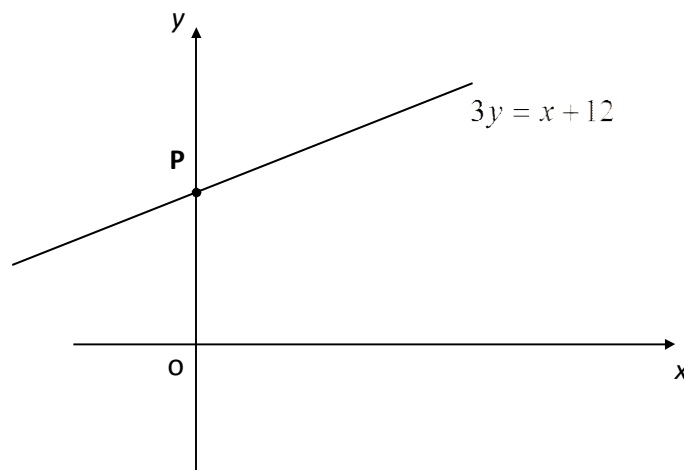
- A straight line has the equation $3x - 2y = -4$.
Find the gradient and y -intercept of the line.
- The line AB passes through the points $(0, 6)$ and $(8, 0)$ as shown in the diagram.



Find the equation of the line AB.

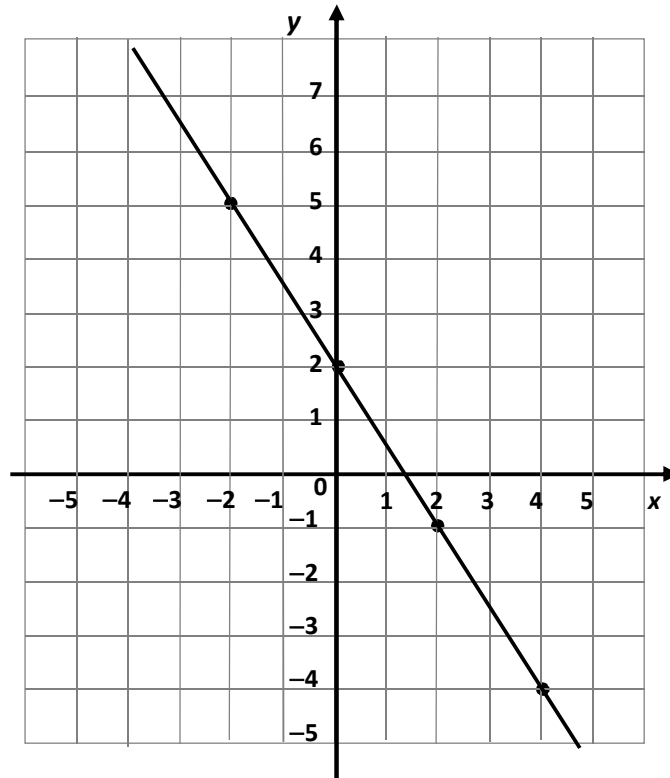
- A straight line has equation $2y + 3x = 8$. Which line of these gives its gradient and y -intercept? Show working to explain your answer.

A. 3 and $(0, 8)$	B. -3 and $(0, 8)$
C. $\frac{3}{2}$ and $(0, 4)$	D. $-\frac{3}{2}$ and $(0, 4)$
- Find the gradient and y -intercept of the straight line with equation $3x - 4y = 12$.
- The diagram below shows the line with equation $3y = x + 12$.

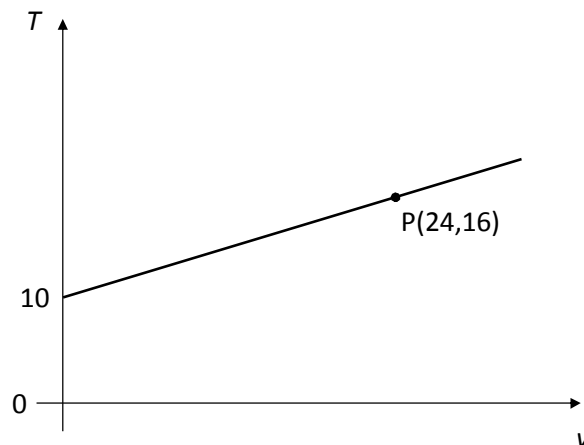


Find the coordinates of **P**, the point where the line cuts the y -axis.

6. Find the equation of the line shown in the diagram below.



7. A line has equation $2y + 6x = 9$. Find its gradient and y - intercept.
8. A line has equation $3y + 4x = 15$. Make a sketch of this line on plain paper showing clearly where it crosses the y - axis.
9. The relationship between variables v and T produces a straight line graph as shown below. The line passes through the point $P(24,16)$ as shown.



- (a) Find the gradient of the line.
- (b) Hence, write down the equation of the line in terms of v and T .

2.3d Equation of Best Fit Line

1. For the following sets of data, draw a scatter diagram and find the equation of the line of best fit.

(a)

x	1	2	3	4	5
y	5	7	8	10	12

(b)

x	1	2	3	4	5
y	2	2.5	2.5	3.5	3

(c)

x	6	7	8	9	10
y	1	2	4	4.5	6

(d)

x	1	2	3	4	5
y	8	6	5	4	2

(e)

x	1	2	3	4	5
y	8	10	8	5	3

(f)

x	5	6	7	8	9
y	6	5.5	5.4	5.5	5

2. The height of a plant measured over five days is shown below.

Days (D)	1	2	3	4	5
Height (H)	1.6	1.9	2.5	3.4	3.5

- (a) Plot the points and draw the best fitting straight line through them
- (b) Work out the equation of the line.
- (c) Use your line to estimate the height after $1\frac{1}{2}$ days.

3. The table shows the results of an experiment.

x	1	2	3	4	5	6
y	9.2	12.0	18.3	19.0	25.1	30.2

Plot the points, draw a best fitting straight line and find its equation.

4. The results below show the length of a spring when a force is applied.

Force (F)	1	2	3	4	5	6
Length (l)	3.0	3.9	4.8	5.9	6.9	8.1

- (a) Plot the points and draw the best fitting straight line through them.
- (b) Find the equation of the line.
- (c) Use your graph to estimate the length when a force of 4.5 is applied.

5. The following table gives the temperature of a bottle of water as it cools.

Time, min (T)	1	3	5	7	9
Temperature (°C)	66	61	57	53	50

- (a) Plot the points and draw the best fitting straight line through them.
- (b) Find the equation of the line.
- (c) Use your graph to estimate the temperature after 2½ minutes.

6. The following table shows the speed of a car accelerating from rest.

Time (secs)	0	2	6	8	12	16
Speed (mph)	0	14	44	56	82	110

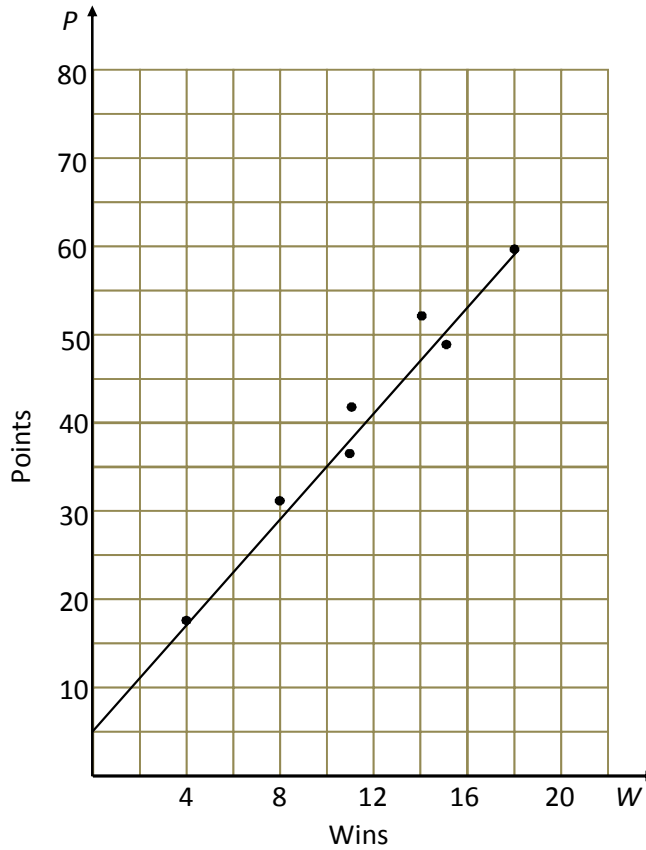
- (a) Plot the points and draw the best fitting straight line through them.
- (b) Find the equation of the line.
- (c) Use your graph to estimate the speed after 10 seconds.

7. A restaurant manager finds that the cost of running his restaurant depends on the number of meals served.

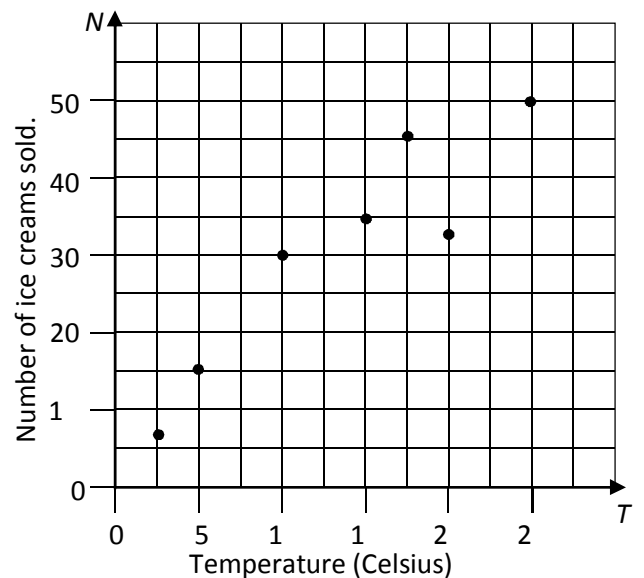
Number of meals	10	20	30	40	50	60
Cost in £	188	192	220	216	232	248

- (a) Plot the points and draw the best fitting straight line through them.
- (b) Find the equation of the line.
- (c) Use your equation to estimate the cost when 35 meals are served.

1. A selection of the number of games won and the total points gained by teams in the Scottish Premier League were plotted on this scattergraph and the line of best fit was drawn.

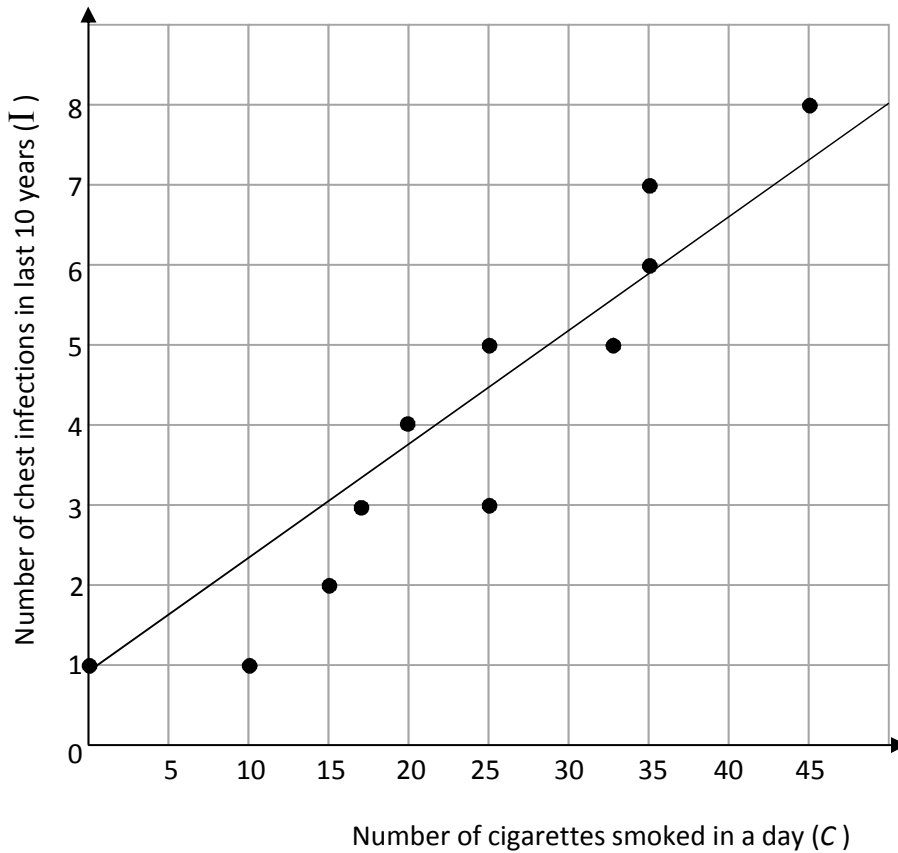


- (a) Find the equation of the line of best fit.
- (b) Use your equation to calculate the points gained by a team who won 27 matches.
2. The graph below shows the temperature and sales of ice cream for one week during the summer.



- (a) Make a copy of the graph and draw the line of best fit on it.
- (b) Find the equation of the best-fit line.

3. A group of smokers were asked how many cigarettes they smoked in a day and how many chest infections they had suffered in the last ten years. The results are shown in the scattergraph with the line of best fit drawn.



- (a) Comment on the correlation between the 2 sets of data.
 (b) Find the equation of the line of best fit.

2.4a SIMULTANEOUS EQUATIONS - GRAPHICAL SOLUTION

1. (a) Copy and complete the tables below.

Table 1 : $y = 9 - x$

x	0	3	7
y		6	

Table 2 : $y = x - 1$

x	2	5	7
y	1		

- (b) Plot the points from table 1. Join them carefully with a straight line.
 (c) Plot the points from table 2 on the same graph. Join them with a straight line.
 (d) Write down the coordinates of the points where the lines cross.

2. Solve the following simultaneous equations "graphically".

(a) $x + y = 6$
 $2x + y = 8$

Draw axes with x and y from 0 to 8

(b) $x + 2y = 8$
 $3x + y = 9$

Draw axes with x and y from 0 to 9

(c) $x + 3y = 6$
 $x - y = 2$

Draw axes with x from 0 to 8 and y from -2 to 4

(d) $2x + 3y = 12$
 $x + y = 5$

Draw axes with x and y from 0 to 7

(e) $3x + 4y = 24$
 $3x + 2y = 18$

Draw axes with x and y from 0 to 9

(f) $5x + y = 10$
 $x - y = -4$

Draw axes with x from -4 to 4 and y from 0 to 10

2.4b SIMULTANEOUS EQUATIONS - ALGEBRAIC SOLUTION

1. Solve the following pairs of simultaneous equations:

(a) $2x + 4y = 24$
 $7x - 2y = 4$

(b) $4a - 3b = 18$
 $2a + 6b = -6$

(c) $2e + 7f = 26$
 $8e - 5f = 38$

(d) $5x + y = -2$
 $3x + 2y = 3$

(e) $2x - 3y = 10$
 $3x - 6y = 18$

(f) $4p + 3q = 1$
 $8p + 5q = -1$

(g) $2g + 3h = 1$
 $5g - 2h = -26$

(h) $-2x + 3y = 6$
 $9x - 7y = -1$

(i) $2u + 4v = -16$
 $11u - 7v = -1$

(j) $2x - 8y = 0$
 $5x - 5y = 15$

(k) $3p + 2q = -11$
 $4p + 3q = -14$

(l) $10a - 3b = 46$
 $6a - 8b = 40$

2. Solve the following pairs of simultaneous equations:

(a) $x + 3y = 17$
 $3x - 2y = -4$

(b) $a - 3b = 6$
 $3a + b = 8$

(c) $2e + f = 1$
 $5e - 2f = -20$

(d) $5x + 3y = 7$
 $4x + y = 0$

(e) $2x - 5y = -14$
 $x - 2y = -5$

(f) $2p + 3q = 6$
 $4p + q = -8$

(g) $2g + h = 11$
 $7g - 8h = 96$

(h) $3x - 2y = 25$
 $x + 5y = -3$

(i) $u - 4v = 10$
 $9u - 2v = 22$

(j) $2x = 3y + 5$
 $x + 5y = 9$

(k) $3p - 2q + 7 = 0$
 $4p + q = -2$

(l) $4a + b - 30 = 0$
 $6a + 5b - 38 = 0$

3. Solve the following pairs of simultaneous equations:

(a) $2x + y = 15$
 $x - y = 6$

(b) $3x + 2y = 32$
 $x - 2y = 8$

(c) $5x + 3y = 26$
 $2x - 3y = 2$

(d) $3x + y = 9$
 $x + y = 5$

(e) $4x + y = 11$
 $2x + y = 5$

(f) $7x + 2y = 36$
 $2x + 2y = 16$

(g) $2x - 5y = -21$
 $3x + 10y = 56$

(h) $3x + 8y = 23$
 $x - 4y = 1$

(i) $3x + 4y = 10$
 $6x + 5y = 17$

4. Solve the following pairs of simultaneous equations:

(a) $5x + 2y = 9$
 $2x - 3y = -4$

(b) $4x + 5y = 7$
 $7x - 3y = 24$

(c) $5x + 2y = 14$
 $4x - 5y = -2$

(d) $3x + y = 16$
 $2x + 3y = 13$

(e) $8x - 3y = 19$
 $3x - 2y = 1$

(f) $5x + 3y = 19$
 $7x - 4y = 43$

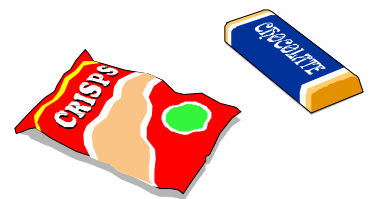
(g) $2x - 5y = 21$
 $3x + 2y = 3$

(h) $2x - 3y = 17$
 $7x - 4y = 40$

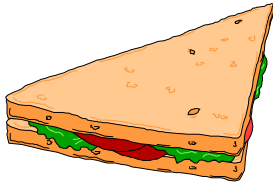
(i) $8x + 2y = 23$
 $5x + 6y = 31$

2.4c SIMULTANEOUS EQUATIONS in CONTEXT

1. Find two numbers whose sum is 56 and whose difference is 16.
2. Find two numbers whose sum is 22 and where twice the bigger one minus three times the smaller one is 24.
3. Two numbers are such that twice the smaller plus the larger is equal to 18 and the difference between twice the larger and the smaller is 11.
Find the two numbers.
4. Two numbers are such that three times the larger plus twice the smaller is equal to 31 and the sum of twice the smaller plus the larger is 13.
Find the two numbers.
5. Four chocolate bars and six packets of crisps together cost £3.40.
Ten chocolate bars and three packets of crisps cost £4.90.
Form simultaneous equations and solve them to find the cost of each packet of crisps and each bar of chocolate.



6.



dog.

Four sandwiches and 3 hot-dogs cost £7.50.
Two sandwiches and 4 hot-dogs cost £6.
Form simultaneous equations and solve them to find the cost of each sandwich and hot-

7.

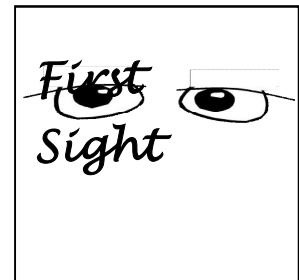
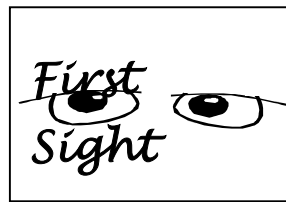
At *Smith's Stationers*, the cost of a ruler and a pencil together is 57p. The ruler costs 23p more than the pencil.
Find the cost of each.

8.

Blair's new album *First Sight* is available on CD and as a download.

5 downloads and 4 CDs cost £97.

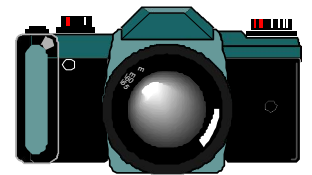
3 downloads and 3 CDs cost £66



Calculate the cost of the download and of the CD.

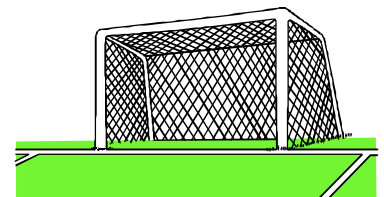
9.

A photographer produces 2 sizes of print, Standard and Jumbo.
A customer who orders 24 standard and 5 jumbo prints pays £7.79
Another customer pays £8.60 for 20 standard and 8 jumbo prints.
How much would I have to pay for 1 standard and 1 jumbo print ?



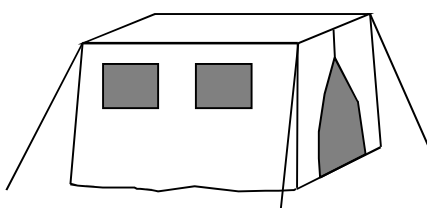
10.

There are 2 types of ticket on sale for a football match – Side Stand and Centre Stand.
You are sent to buy tickets for various members of your family and you pay £71.75 for 4 Side and 3 Centre tickets.
Your friend pays £75.25 for 2 Side and 5 Centre tickets.
What is the price for each type of ticket?



11.

Two small glasses and five large glasses together contain 915 ml.
One small glass and three large glasses together hold 530 ml.
How much does each glass hold?



1. A small printing company sends out letters to customers every day.
- On Monday they sent out 20 first class letters and 15 second class letters and the charge for postage was £19.50.
- On Tuesday they sent out 18 first class letters and 25 second class letters and the charge was £23.30.
- How much will it cost on Wednesday to send 10 first class letters and 30 second class?
2. A concert hall sells two types of tickets, stall tickets and balcony tickets. When **all** seats are sold the concert hall holds a total of 640 people.
- (a) Let s be the number of stall tickets and b the number of balcony tickets.
- From the information above write down an equation connecting s and b .
- (b) On a particular night a concert is sold out (all seats are taken) with stall tickets priced at £8.50 and balcony tickets at £12.20. The total takings at the box office for that night was £6143.
- From this information write down a second equation connecting s and b .
- (c) Hence find how many stall and balcony seats are in this concert hall.
3. In a fast food restaurant Ian buys 3 burgers and 4 portions of French fries and it costs £5.64. Sarah buys 2 burgers and 3 portions of French fries and it costs £4.01.
- Jack had a voucher to receive one burger and one portion of fries for free.
- How much would it cost Jack for 5 burgers and 3 portions of French fries?
4. A hotel owner is buying some new duvets for his hotel.
- One week he bought 7 double duvets and 12 single duvets which cost £168.
- The next week he bought 4 double duvets and 9 singles for £111.
- The hotel owner was given a 14% discount on his next order for 5 double duvets and 5 single duvets.
- How much did he pay for this third order?

5. Find the point of intersection of the lines with equations

$$5x - 2y = 16 \text{ and } 3x + 5y = -9$$

6. Clare has baked 60 scones to sell at the school fayre. Some are fruit scones (f) and some are treacle scones (t).

(a) Write down an equation using f and t to illustrate this information.

She sells the fruit scones for 25p and the treacle scones for 20p each.

She sells all the scones for a total of £13.25.

(b) Write down another equation using f and t to illustrate this information.

(c) Hence, find **algebraically** the number of treacle scones Clare sold.

7. At the funfair coloured tokens are awarded as prizes in some of the games. These tokens can be saved up and exchanged for larger items.

3 green tokens and 4 red tokens have a total value of 26 points.

5 green tokens and 2 red tokens have a total value of 20 points.

Dave has 10 green tokens and 10 red tokens.

Does he have enough points to exchange for a large soft toy with a points value of 75?



8. In a week Peter downloads 5 tracks and 4 films and pays £21.23.

In the same week Frank downloads 7 tracks and 3 films and pays £18.49.

Calculate how much Richard would pay if he downloaded 3 tracks and 2 films.

9. Solve, **algebraically**, the equations

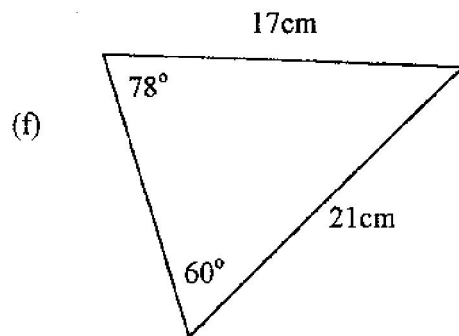
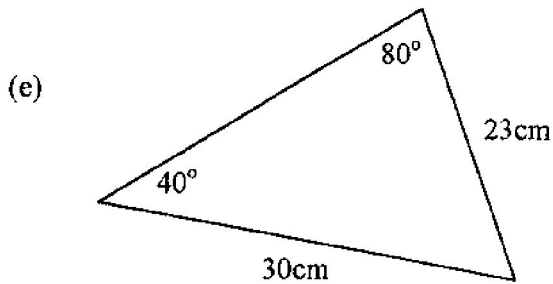
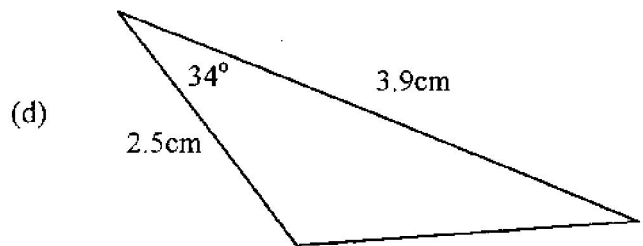
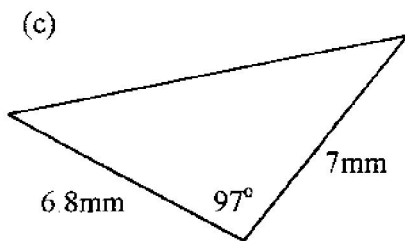
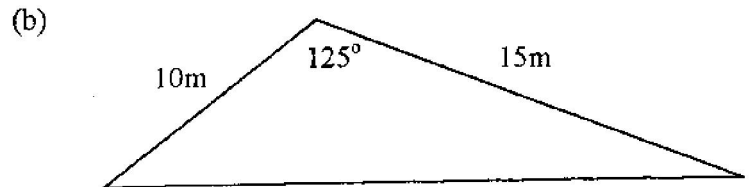
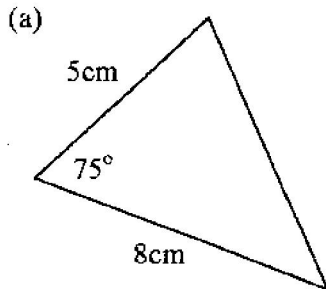
$$3x + 2y = 13$$

$$x = y + 1$$

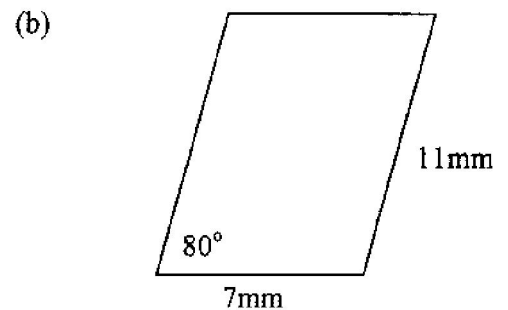
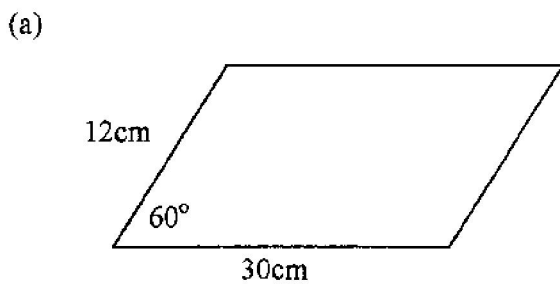
2.5a CALCULATING the AREA of a TRIANGLE using TRIGONOMETRY

$$\text{The area of a triangle : } A = \frac{1}{2}ab\sin C$$

1. Use trigonometry to calculate the area of each triangle below.

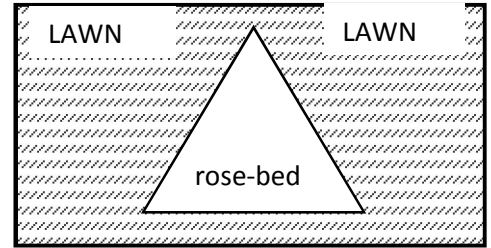


2. Calculate the area of each parallelogram below.

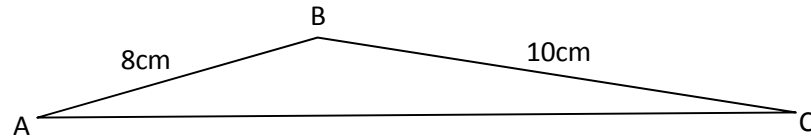


3. Mr. Fields is planting a rose-bed in his garden. It is to be in the shape of an **equilateral** triangle of side 2m.

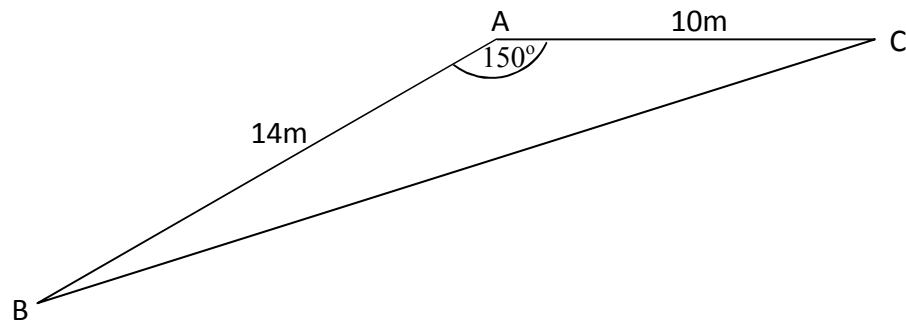
What area of lawn will he need to remove to plant his rose-bed?



4. Given that the area of this triangle is 20cm^2 , calculate the size of the **obtuse** angle ABC.

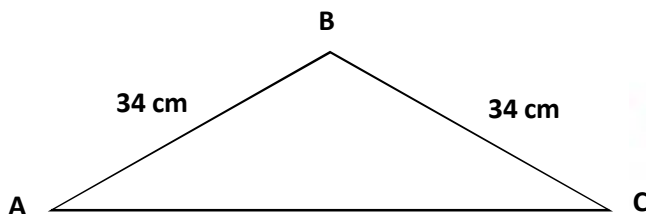


5. In triangle ABC, $AB = 14\text{m}$ and $AC = 10\text{m}$. Angle $BAC = 150^\circ$.



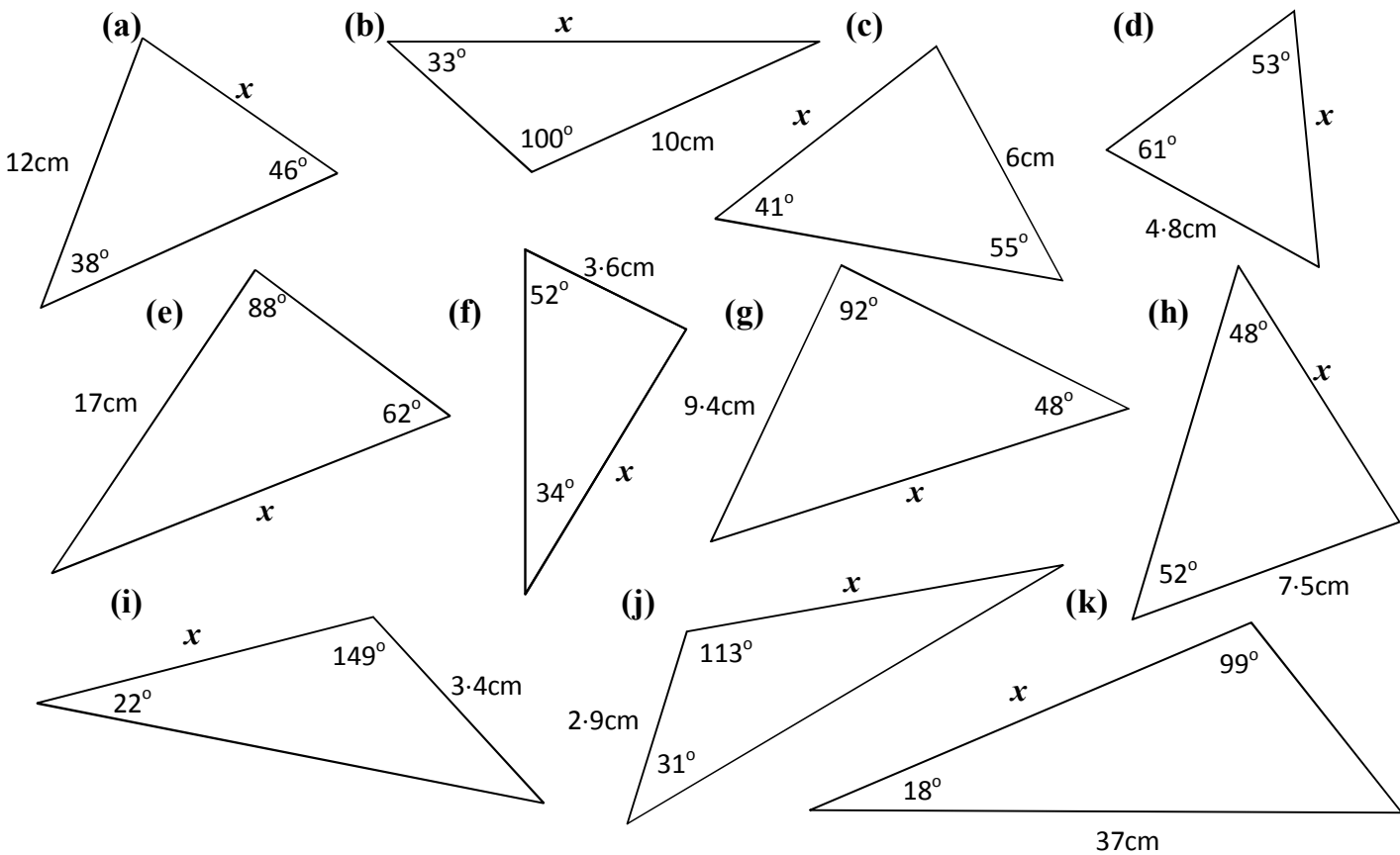
Given that $\sin 150^\circ = 0.5$, calculate the area of triangle ABC.

6. The area of a triangular flag is 429.5cm^2 . Calculate the size of the obtuse angle ABC.

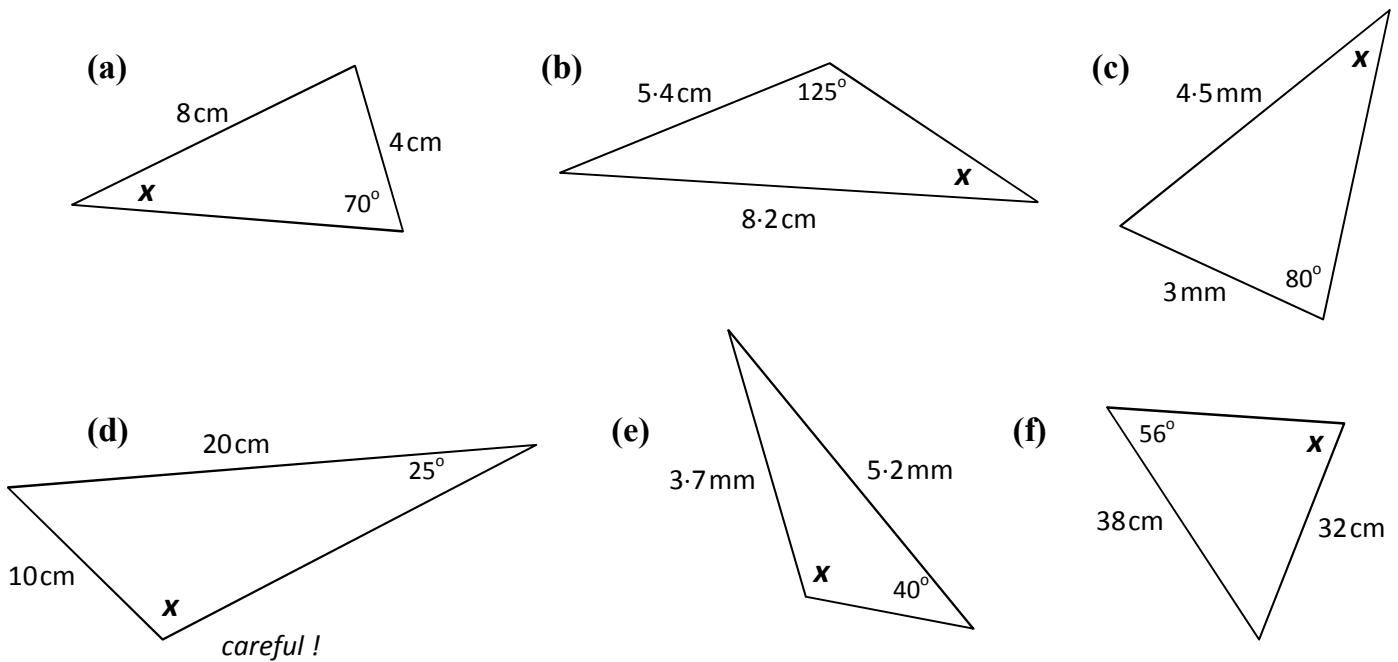


2.5b SINE RULE – FINDING ANGLES & SIDES

1. Use the sine rule to calculate the length of the side marked x in each of the triangles below.

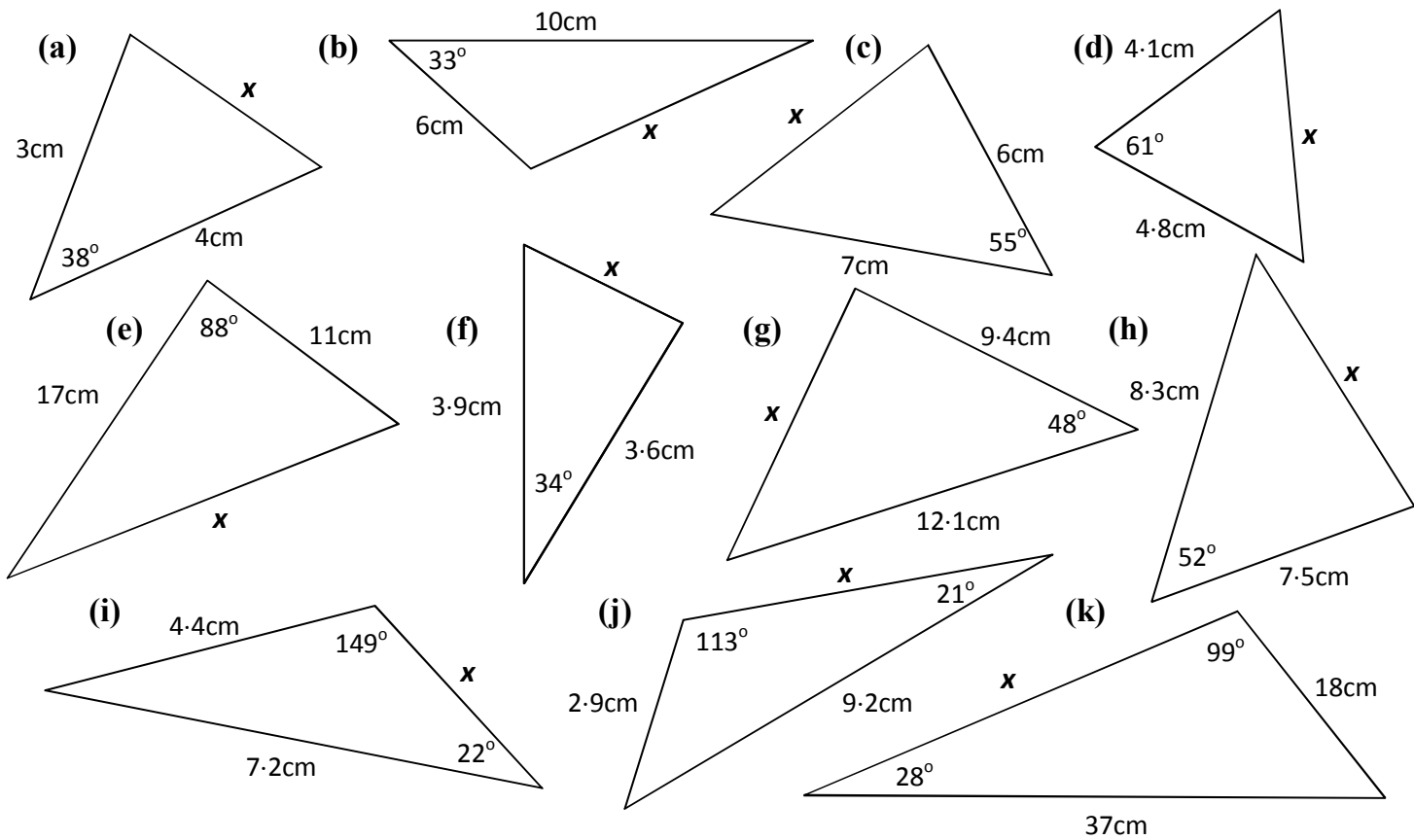


2. Use the *sine rule* to calculate the size of the angle marked x in each triangle below.

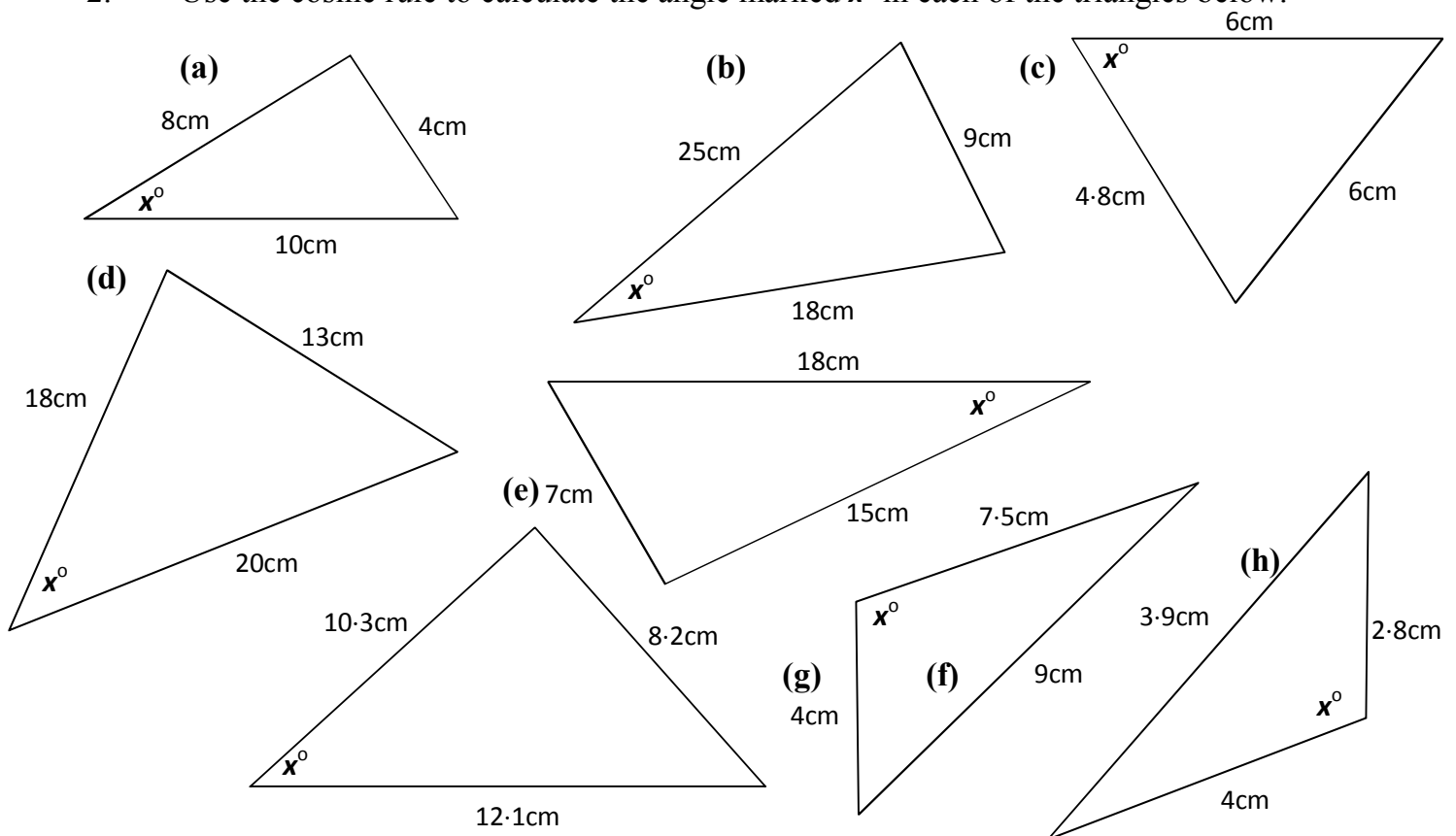


2.5c COSINE RULE – FINDING AN ANGLE & SIDE

1. Use the cosine rule to calculate the length of the side marked x in each of the triangles below.

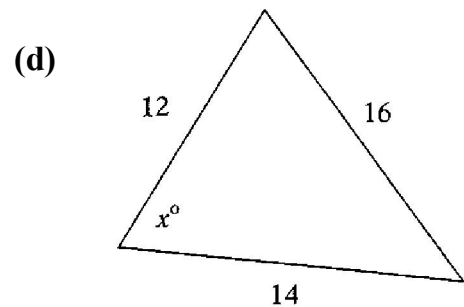
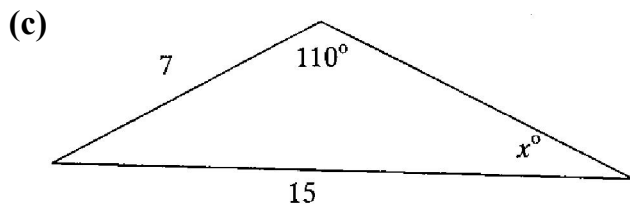
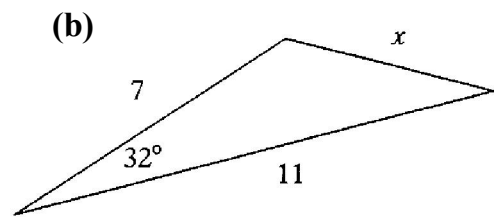
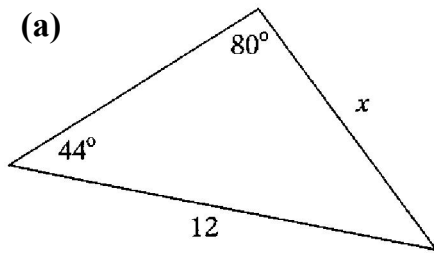


2. Use the cosine rule to calculate the angle marked x° in each of the triangles below.



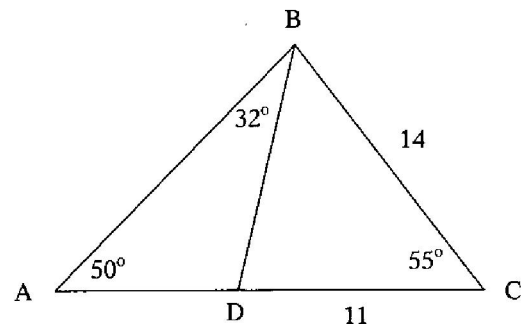
2.5d. TRIGONOMETRY - MIXED QUESTIONS

1. Calculate the value of x in each triangle below.

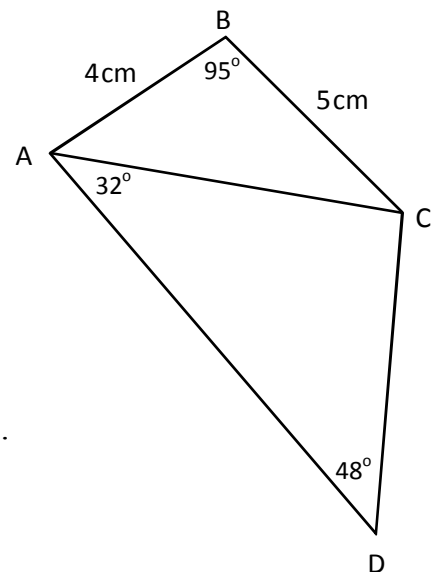


2. Calculate the area of the triangle with sides measuring 12 cm, 14 cm and 20 cm.

3. (a) Calculate the length of BD .
 (b) Calculate the length of AD .
 (c) Calculate the area of triangle ABC

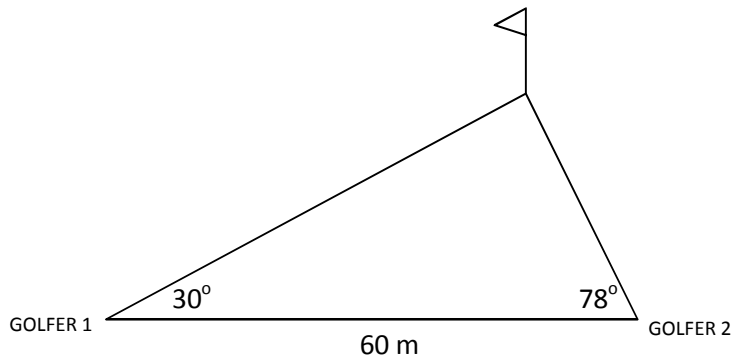


4. From the framework opposite:
 (a) Calculate the length of AC .
 (b) Calculate the size of $\angle BAC$.
 (c) Write down the size of $\angle ACD$.
 (d) Calculate the length of AD .
 (e) Calculate the area of the quadrilateral $ABCD$.



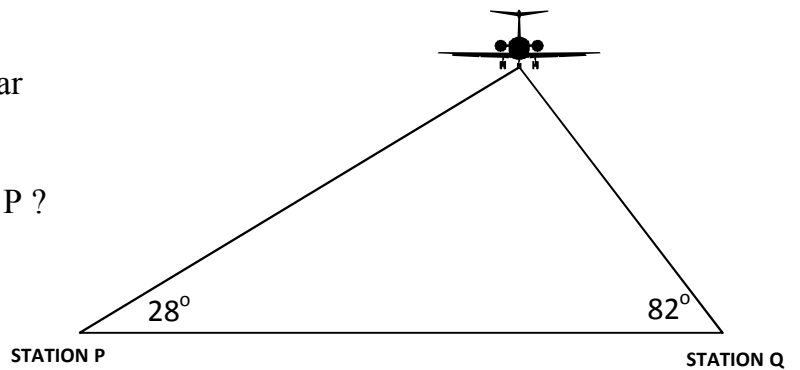
5. Two golfers are aiming for the green. The golfers are 60 m apart and the angles are as shown in the diagram.

What distance will each golfer have to hit the ball in order to reach the pin?

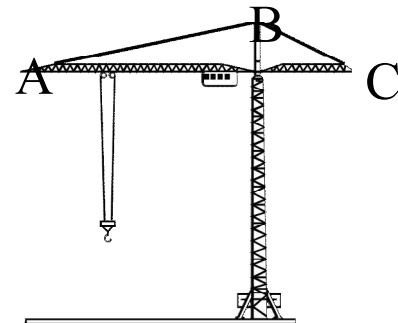
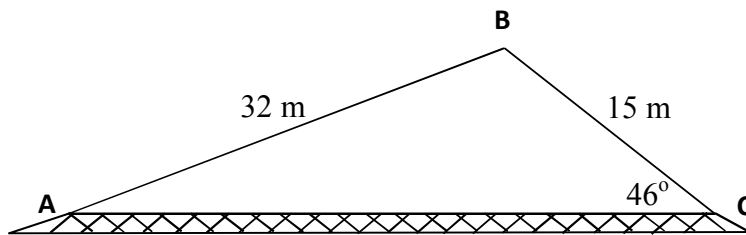


6. An aircraft is picked up by two radar stations, P and Q, 120 km apart.

How far is the aircraft from station P ?



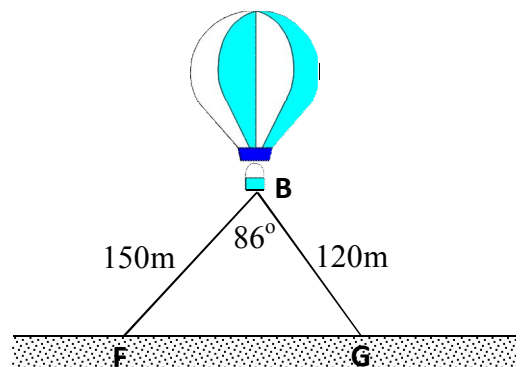
7. A large crane is being used in the construction of a block of flats. The crossbeam is supported by two metal stays.



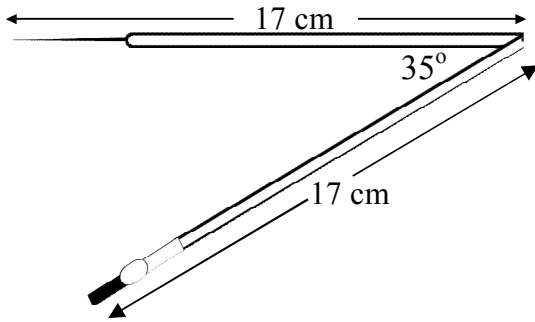
The length of AB is 32 m and the length of BC is 15 m. $\angle BCA$ is 46° . Calculate the size of $\angle BAC$ and the length of the crossbeam AC.

8. A hot air balloon B is fixed to the ground at F and G by 2 ropes 120m and 150 m long.

If $\angle FBG$ is 86° , how far apart are F and G?



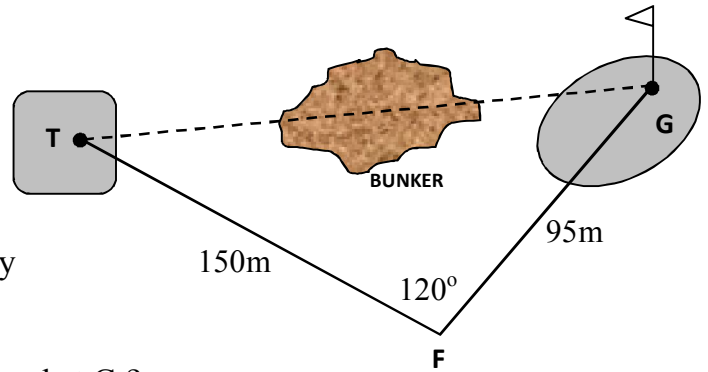
9.



A set of compasses is shown where the angle between the arms is set at 35°

Calculate the diameter of the circle which could be drawn with the arms in this position.

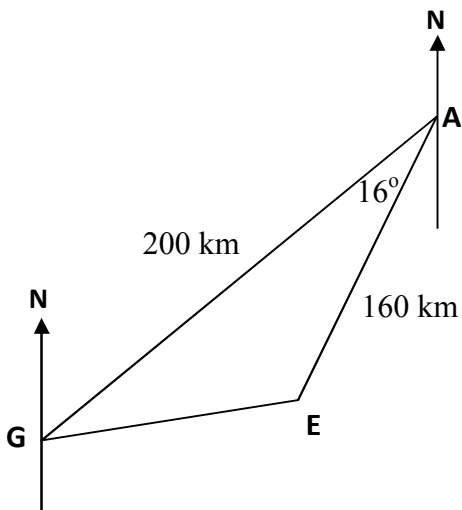
10. During a golf match, Ian discovers that he has forgotten his sand wedge, so to avoid the bunker he plays a shot from T to F and then from F to G.



His opponent Fred decides to play directly from T to G.

How far will Fred need to hit his shot to land at G ?

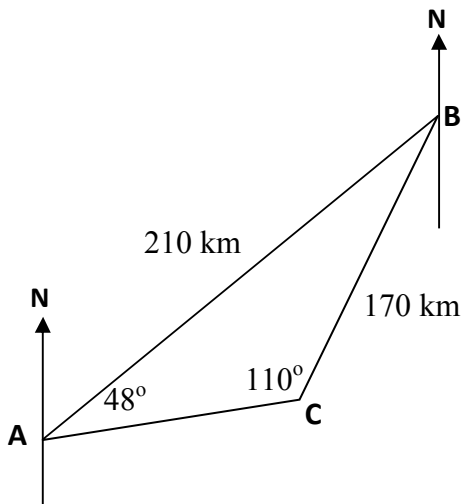
11.



The diagram shows the path of an aircraft from Glasgow to Aberdeen, a distance of 200 km and then from Aberdeen to Edinburgh, a distance of 160 km.

Calculate the distance from Glasgow to Edinburgh.

12.

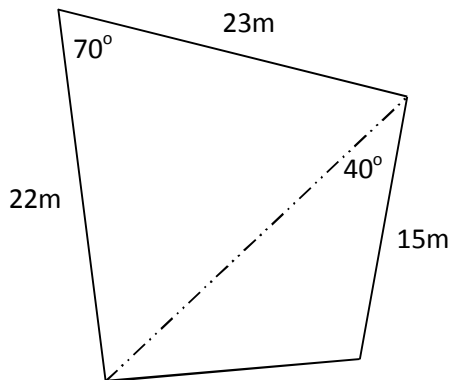


The diagram shows the path of an aircraft from A to B to C.

(a) Write down the size of $\angle ABC$.

(b) Calculate the distance AC

1. The sketch below shows a plot of land purchased to build a house on.

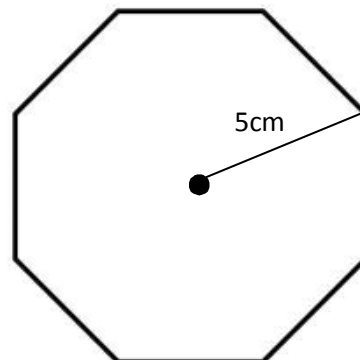


At present the land is valued
£280 per square metre.

Calculate the value of the plot shown to the nearest £10.

2. The distance from the centre of a regular octagon to one of its vertices is 5 cm.

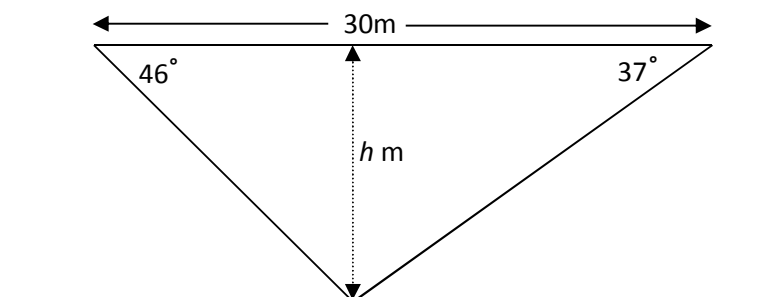
Calculate the area of the octagon.



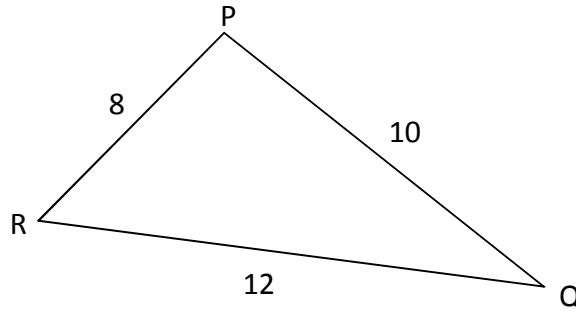
3. Two security cameras are positioned on a beam in a warehouse 30 metres apart.

One camera has an angle of depression of 37° and the other camera has an angle of depression of 46° .

Calculate the height, h metres, of the beam above the ground.



4. Triangle PQR has sides with lengths, in centimetres, as shown.

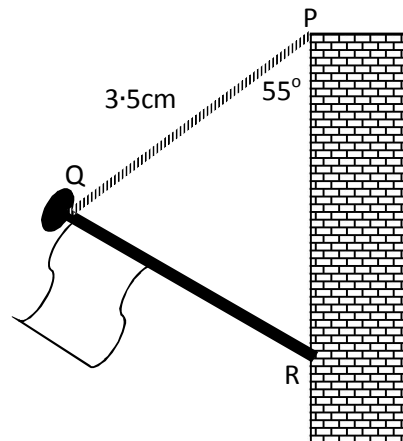


Show clearly that $\cos PQR = 0.75$.

5. A flagpole is attached to a wall and is supported by a wire PQ as shown in the diagram.

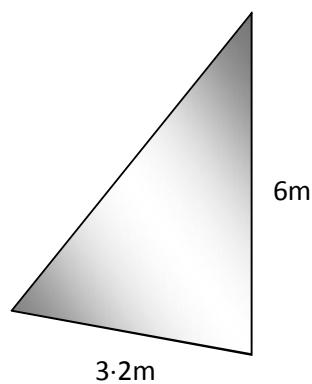
The wire is 3.5 metres long and makes an angle of 55° with the vertical wall.

Given that the point P is 4.5 metres above R in the diagram, calculate the length of the flagpole.



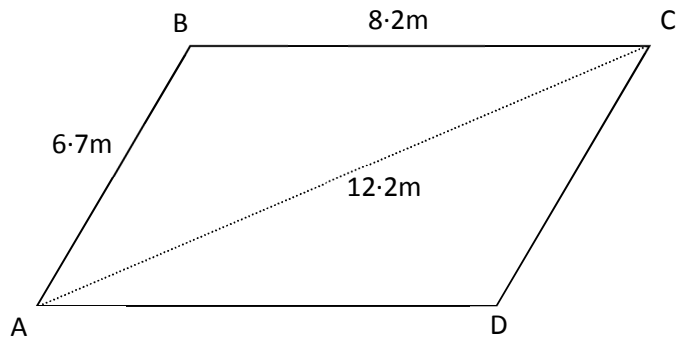
6. A triangular sail designed for a racing yacht is shown below.

Two of its edges measure 6 metres and 3.2 metres.



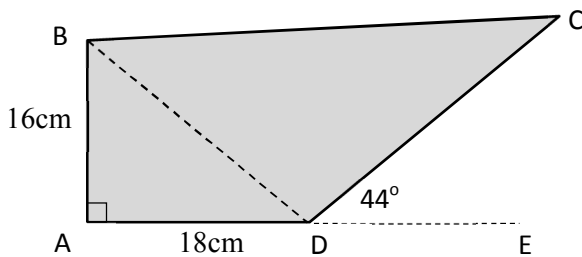
Given that the sail has a **perimeter** of 15.5 metres, calculate the **area** of the sail.

7. A sketch of Lee's garden is shown below.



- (a) Calculate the size of angle ABC.
- (b) Hence, or otherwise, calculate the area of the garden.

8. The diagram below shows a steel plate ABCD.



$$AB = 16 \text{ cm}, AD = 18 \text{ cm}$$

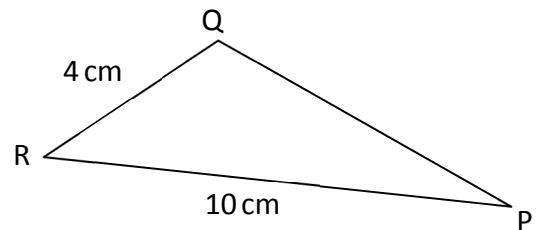
$$\angle DAB = 90^\circ$$

- (a) Calculate the length of BD correct to 1 decimal place.
- (b) Find the size of angle BDC correct to the nearest degree.
- (c) Hence calculate the length of BC given that $DC = 25 \text{ cm}$.

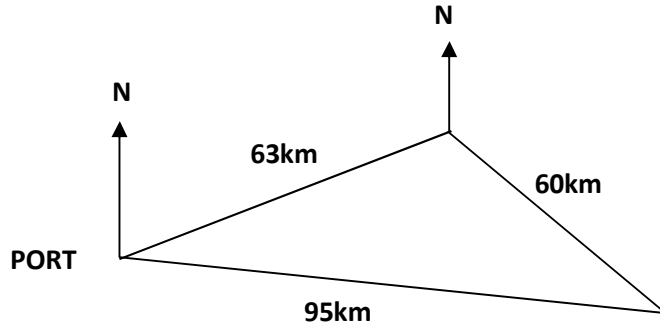
9. In triangle PQR, $PR = 10 \text{ cm}$ $QR = 4 \text{ cm}$.

The perimeter of the triangle is 22 cm.

Find the size of angle PQR.



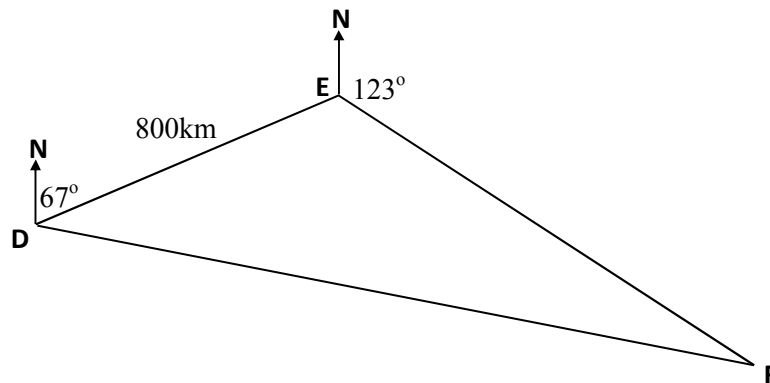
10. A ship leaves a port on a bearing of 073° and sails 63km. The ship then changes course and sails a further 60km on a bearing of 110° where it anchors. When it anchors it is 95km from the port. Calculate the bearing of the ship from the port at this point.



11. A ship's captain is plotting a course for the next voyage.

He knows that he has to sail from Port D to port E on a bearing of 067° for a distance of 800km and from there to Port F on a bearing of 123° .

His course is shown in the diagram below.



- (a) Make a copy of the diagram and calculate the size of angle DEF.
- (b) New instructions come through which inform the captain that he has to sail directly from Port D to Port F, a distance of 1750km.

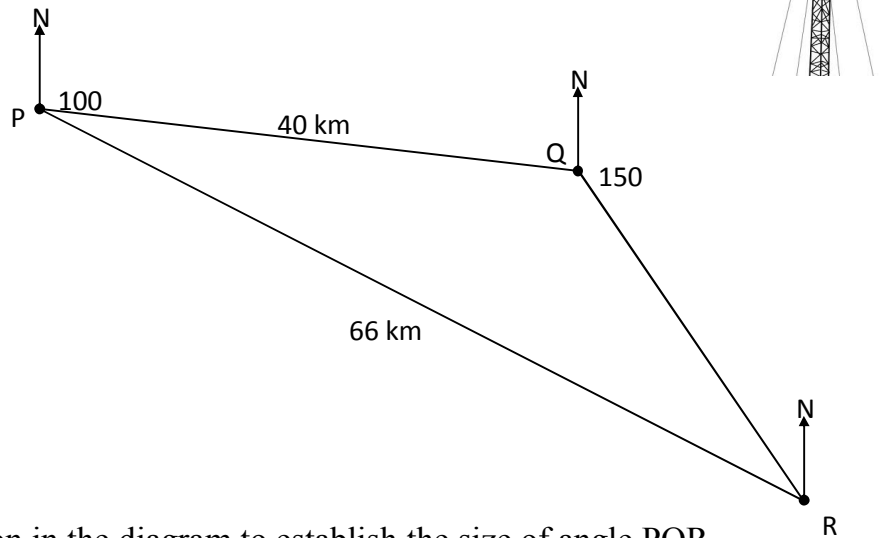
Calculate the bearing on which the ship should sail in order to carry out these instructions. Give the bearing to the nearest degree.

12. The diagram below, which is not drawn to scale, represents the positions of three mobile phone masts.

Mast Q is on a bearing of 100° from mast P and is 40km away.

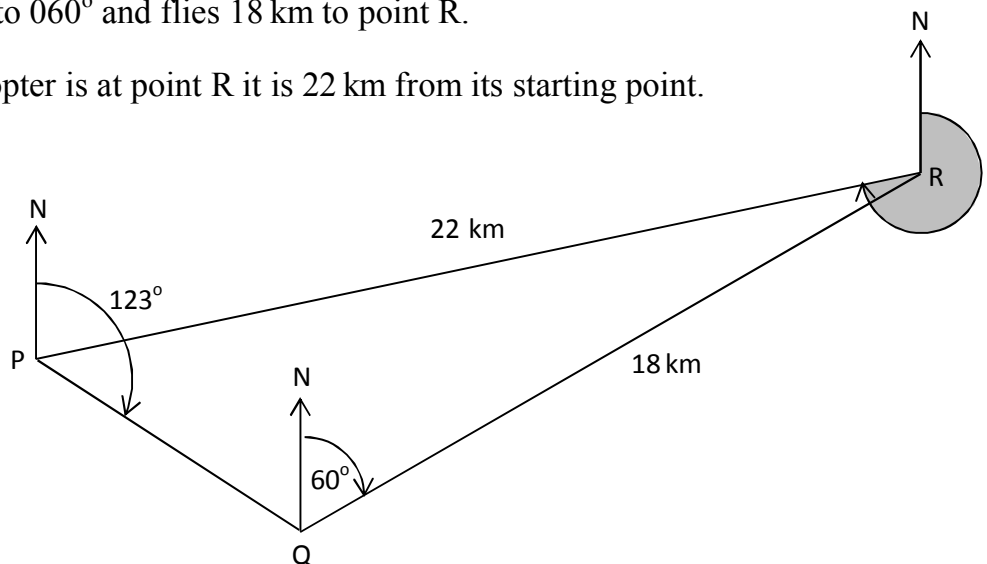
The bearing of mast R from mast Q is 150° .

Masts P and R are 66km apart.



- (a) Use the information in the diagram to establish the size of angle PQR.
- (b) Hence find the bearing of mast P **from** mast R.
13. A helicopter sets out from its base P and flies on a bearing of 123° to point Q where it changes course to 060° and flies 18 km to point R.

When the helicopter is at point R it is 22 km from its starting point.



- (a) Find the size of angle PQR.
- (b) Calculate the bearing on which the helicopter must fly to return directly to its base i.e. the shaded angle in the diagram.

Give answers to the nearest whole number throughout your calculations.

2.6a. STANDARD DEVIATION

1. Calculate the mean and standard deviation for the following sets of data.

(a) 20 21 19 22 21 20 19 20 21 20

(b) 303 299 306 298 304 307 299 302 305 299 300

(c) 15.3 14.9 15.1 15.2 14.8 14.7 15.1 14.8 15.0 15.0

(d) 87 89 84 88 89 87 86 87 86 87

2. A third year pupil conducting an experiment with a die got the following results

6 1 1 4 4 2 2 6 5 6
1 1 1 5 1 4 2 3 4 6
1 4 4 1 5 4 4 3 6 2
5 3 5 6 3 2 6 5 5 2
3 1 4 5 2 4 1 4 4 3

(a) Show these results in a frequency table

(b) Use your table to calculate the mean and standard deviation.

3. A company that manufactures shoelaces spot checks the length (in cm) of the laces.

Here are the results for two different production lines.

Line A	26.8	27.2	26.5	27.0	27.3	27.5	26.1	26.4	27.9	27.3
Line B	26.8	26.7	27.1	27.0	26.9	27.0	27.3	26.9	27.0	27.3

Calculate the mean and standard deviation and comment on any differences between line A and line B.

4. The running times, in minutes, of films shown on television over a week are as follows.

110	95	135	70	100	125	140	105	95	105
95	95	110	90	110	100	125	105	90	120

Calculate the mean and standard deviation.

5. John James plays golf with his brother Joe each month. They keep a note of their scores.

John	74	73	74	73	71	73	72	75	73	73	72	73
Joe	68	74	70	67	80	81	69	68	79	67	70	71

Calculate the mean and standard deviation and comment on John's and Joe's performance over the year.

6. The weekly takings in small store, to the nearest £, for a week in December and March are shown below

December	2131	2893	2429	3519	4096	4810
March	1727	2148	1825	2397	2901	3114

Calculate the mean and standard deviation and comment on any differences.

7. Two sixth year classes take part in a Sponsored Fast for Famine Relief. The number of hours each pupil lasted are shown below.

6C1	20	22	21	20	22	20	22	20	20	24	21	22	23	22	22	23
6C2	15	20	24	23	22	24	18	24	22	23	24	17	20	24	24	20

Calculate the mean and standard deviation for each class and comment on how well each class did.

1. During a recent rowing competition the times, in minutes, recorded for a 2000 metre race were
- 7.2 7.3 7.3 7.5 7.6 8.4
- (a) Calculate the mean and standard deviation of these times. Give both answers correct to 2 decimal places.
- (b) In the next race the mean time was 7.76 and the standard deviation was 0.49. Make two valid comments about this race compared to the one in part (a).
2. 6 friends joined "Super Slimmers", a weight loss class. Their weights were recorded and the results are shown below.
- 65kg 72kg 74kg 81kg 90kg 98kg
- (a) Calculate the mean and standard deviation of the weights.
After 6 weeks the mean weight was 74kg and the standard deviation was 8.6
- (b) Compare the mean and standard deviation of the friend's weights.
3. Stewart and Jenni complete a crossword puzzle every day. Here are the times (in minutes) that Stewart took to complete it each day for a week.
- 63 71 68 59 69 75 57
- (a) Calculate the mean and standard deviation for Stewart's times.
- Every day Jenni took exactly 5 minutes longer than Stewart to complete the puzzle.
- (b) Write down Jenni's mean and standard deviation.
4. The number of hours spent studying by a group of 6 student nurses over a week were
- 20 23 14 21 27 24
- (a) Calculate the mean and standard deviation of this data.
- (b) A group of student teachers had a mean of 21.5 and a standard deviation of 6. Make two valid comments to compare the study times of the 2 groups of students.
5. Barbara is looking for a new 'A-Pod' and searches for the best deal. The costs of the 'A-Pod' are shown below.
- £175 £185 £115 £87 £150 £230
- (a) Calculate the mean and standard deviation of the above data.
- (b) A leading competitor, the 'E-Pod', has a mean price of £170 and a standard deviation of 26.7. Make **two** valid comparisons between the 2 products.