Stewards Academy

Maths Spring 1

Year 11 Foundation

Blended Learning Booklet

Name:

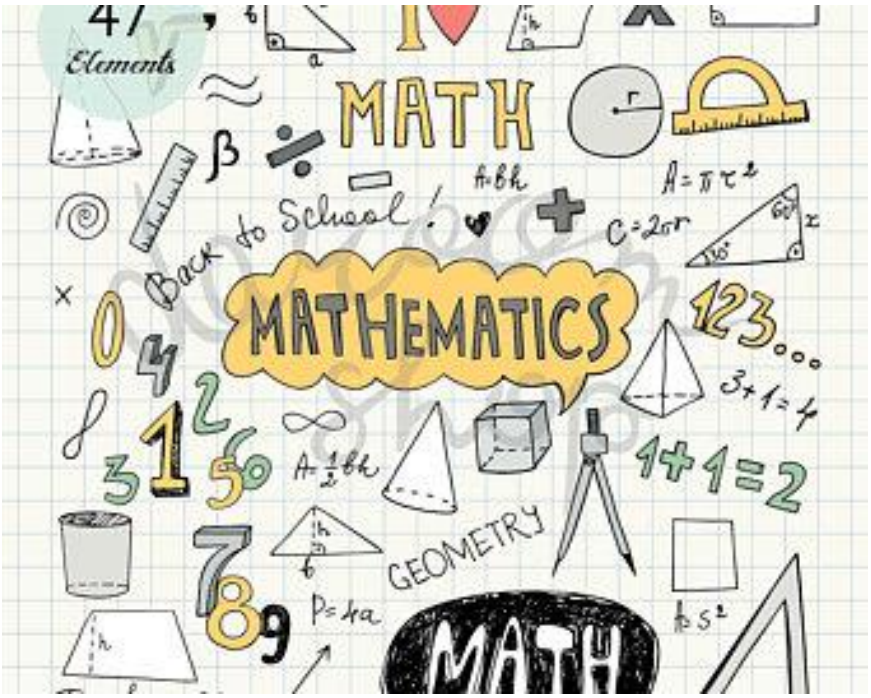
Form:

Each week covers topics you would complete in your 3 Maths lessons that week. Write out the title and LI and then complete the tasks.

All video links are online using the ClassCharts link.

The Knowledge Organiser on page 4 has further practice questions and page numbers linking to your pocket revision guides for all the key information and examples to help you with this unit.

Upload all work onto ClassCharts for feedback.



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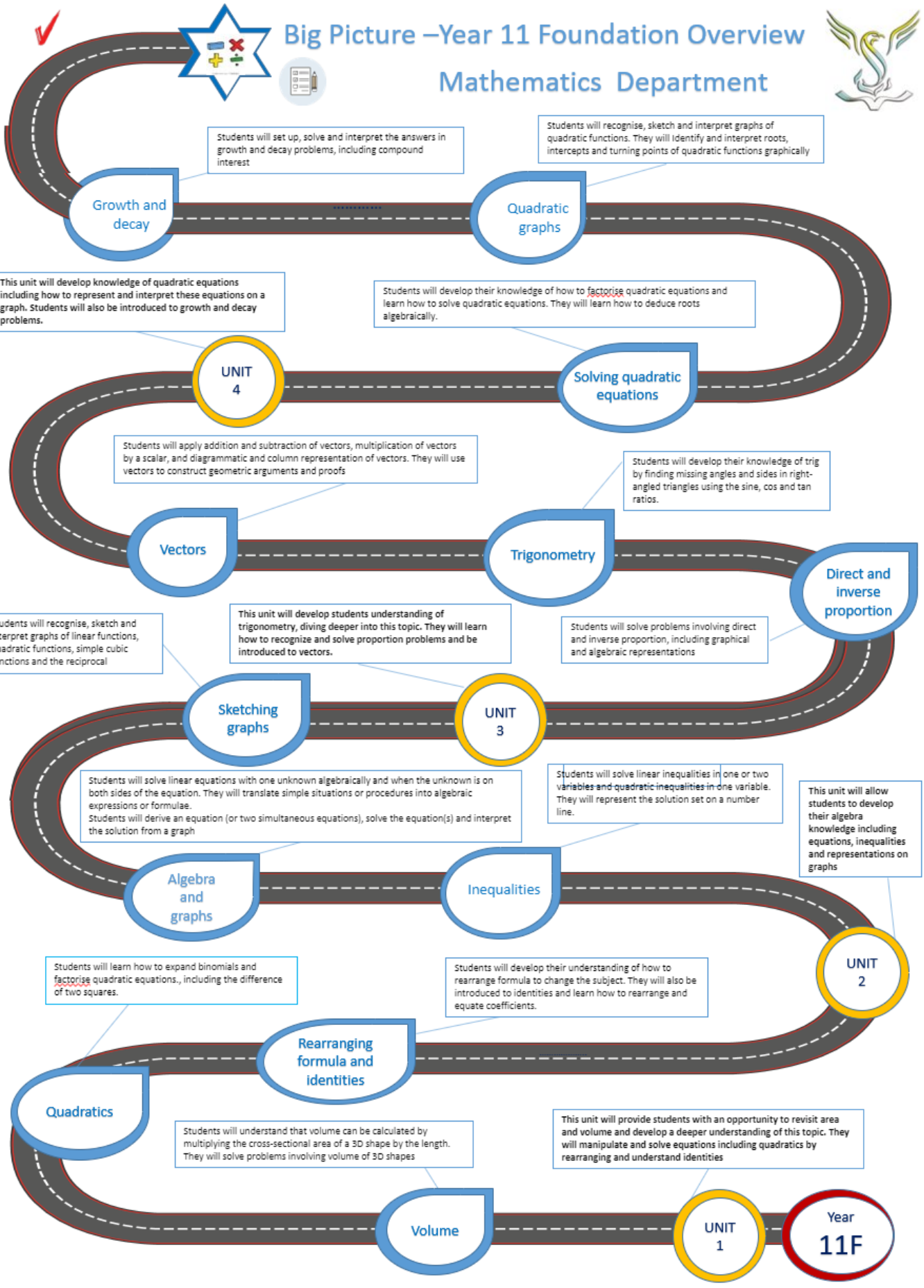
Big Picture –Year 11 Foundation Overview

Mathematics Department



Year 11 – Foundation

Spring One

Proportion, Trigonometry

Revision Guide pages:

Proportion – 58 - 59

Trigonometry – 83

Memory

Use the trigonometry triangles to help establish which formula you need to use.

$$\sin\theta = \frac{\sqrt{bottom\ fingers}}{2}$$

$$\cos\theta = \frac{\sqrt{top\ fingers}}{2}$$

$$\tan\theta = \frac{\sqrt{bottom\ fingers}}{\sqrt{top\ fingers}}$$

Task 1

Calculate x correct to 1 decimal place

1) 12 cm, 37°, x

2) 5 cm, 56°, x

3) 2.5 cm, 62°, x

4) x, 53°, 3.7 cm

Calculate x correct to 1 decimal place

1) 14.9 cm, 4.2 cm, x°

2) 9.5 cm, x°, 5.2 cm

3) 6.5 cm, x°, 4.8 cm

4) 6.5 cm, x°, 4.8 cm

Calculate x correct to 1 decimal place

1) 5.4, 40°, x

2) 10.2 cm, x°, 5.2 cm

3) 5.2 cm, x°, 6.5 cm

4) 3.7 cm, x, 53°

Task 2

Circle the value of $\sin 60^o$.

$\frac{1}{2}$ $\frac{2}{\sqrt{3}}$ $\frac{\sqrt{3}}{2}$ $\frac{1}{\sqrt{3}}$

Bronze

Write down the exact value of $\cos 30^o$

Bronze

Write down the exact value of $\tan 30^o$

Bronze

Task 3

Peter wants to create a graph to help him convert from pounds (£) to dollars ($).
£1.00 = $1.20

a) Complete the table using the information above.

£	0	1	2	3	4	5
$		1.20				

b) Use the table to plot the graph converting pounds (£) to dollars ($)

c) Use the graph to convert £3.20 into dollars.

d) Use the graph to convert $5.00 into pounds.

When two quantities are in direct proportion, the graph is a straight line graph that goes through (0,0).

Task 4

1) If 10 people can paint a fence in 3 days, how long would it take 6 people?

2) If it takes 5 workers 16 hours to paint a church hall, how long would it take 8 workers?

3) If it takes 2 gardeners 6 hours to landscape a garden, how long would it take 3 gardeners?

4) If it takes 3 florists, 2 hours 15 minutes to arrange flours for a wedding, how long would it take 5 florists?

5) If it takes 9 workers 7 days to pack a container, how long would it take 6 workers?

Task 5

If Joe works for 8 hours he gets paid £48. How much would he earn if he worked 3 hours?

If 6 cartons of juice cost £5.40, how much would 5 cartons cost?

If 5 stamps cost £3, how much would 12 stamps cost?

If 4 boats can carry 140 passengers, how many passengers can 7 boats carry

Task 6

In 40 hours, 2 people can harvest a field.

How long does it take... ...8 people to harvest a field?
...10 people to harvest a field?

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Week 1:

- **LI: Solve direct and indirect proportion problems numerically and graphically**

Demonstration Videos:

https://www.mathsgenie.co.uk/proportion.html

https://corbettmaths.com/2012/08/09/conversion-graphs/

Tasks:

Basic Proportion

a) Apples cost 30p each. How much for 3 apples?

b) Jane gets paid £8 per hour. How much is she paid for a 40-hour week?

c) 2 pens cost 40p. What would 5 pens cost?

d) If I buy 2 shirts for £30, how much would 3 cost?

e) It would take 12 hours for John to paint a shed. How long would it take him with help from two friends?

f) 5 bottles of milk cost £4.50. How much for three bottles?

g) Six apples cost £2.70. How much would 8 apples cost?

h) It takes three men 4 hours to paint the garden fence. How long would it take 5 men?

$60	£250	$600	£300	€560
£50	$140	£20	$105	£600
$630	£500	$420	£400	$180
€700	$210	$45	$40	£40
£25	$50	$42	€84	$150

Use the exchange rates £1 = $1.50 USA £1 = €1.40 Euros £1 = $2.10 AUS to change :

£500 into Euros (€)	£300 into AUS ($)	$75 USA into GBP (£)	€700 into GBP (£)
£400 into Euros (€)	$630 AUS into GBP	$84 AUS into GBP (£)	$42 AUS into GBP (£)
€560 into GBP (£)	£30 into USA ($)	£400 into USA ($)	€35 into GBP (£)
£120 into USA ($)	$900 USA into GBP (£)	£20 into AUS ($)	£280 into USA ($)
£100 into USA ($)	£50 into AUS ($)	£60 into Euros (€)	$375 USA into GBP (£)

TOTAL

Question 1: Keith buys 6 pencils for 90p

(a) How much does one pencil cost?
(b) How much would five pencils cost?
(c) How much would eleven pencils cost?

Question 2: Jack and Harry are waiters in a restaurant.
They are both paid the same amount of money for each hour that they work.
Jack worked 6 hours and is paid £48
Harry worked 8 hours.
How much money is Harry paid?

Question 3: A car travels 120 miles in 3 hours at a steady speed.

(a) How far does the car travel in 1 hour?
(b) How far does the car travel in 8 hours?

Question 4: A plumber charges £140 for a 4 hour job.

How much does the plumber charge for a 3 hour job?

Question 5: Seven candles cost £45.29

How much would 25 candles cost?

Question 6: £50 is worth €56

(a) How many euros is £1 worth?
(b) How many euros is £220 worth?

Question 7: If 24 marbles have a mass of 60g, what would the mass of 60 marbles be?

Question 8: Rebecca is making Chilli Con Carne.
Here is a list of ingredients to serve 6 people.

Rebecca wants to make enough Chilli Con Carne for 4 people.

How much of each ingredient does Rebecca need?

serves 6
1.2kg mince
420g tomatoes
3 chillies
600g kidney beans

Question 9: Oscar is making fish pie.
Here is a list of ingredients for 5 people.

Oscar wants to make enough fish pie for 6 people.

How much of each ingredient should Oscar use?

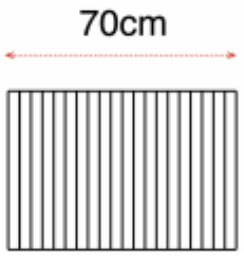
serves 5
500g cod
400g haddock
600ml milk
120g butter
40g flour
1kg potatoes

Apply

Question 1: On a map, 4cm represents 60 miles.
The distance between two towns is 37.5 miles.
On the map, what is the distance between the two towns?

Question 2: Nathan has 20 identical books on a shelf.
The books take up 70cm of space on the shelf.
Nathan removes seven books.

How much space do the remaining books take up?



Question 3: A car uses 8.4 litres of petrol for a 112 mile journey.
When the tank is full, the car holds 54 litres of petrol.

How far should the car be able to travel on a full tank of petrol?

Question 4: A 345ml tin of paint costs £4.80
A 250ml tin of paint costs £3.35
Which tin is better value for money?

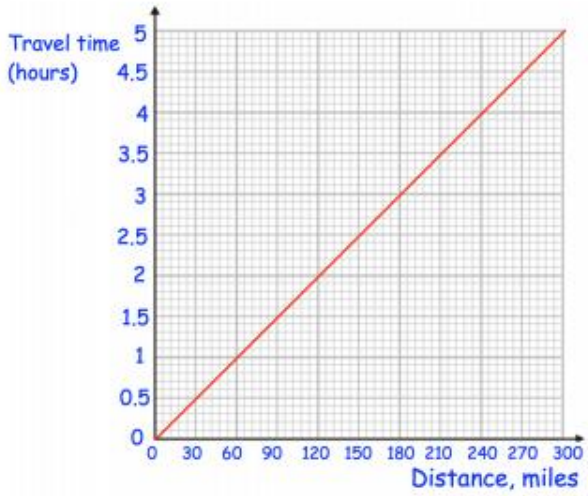
Question 1:

(a) How long should a 120 mile journey take?

(b) How long should a 270 mile journey take?

(c) Carlos has spent 1 hour travelling. What distance is he expected to have travelled?

(d) Rosie has spent 3.5 hours travelling. What distance is she expected to have travelled?



Question 2:

(a) Change £20 into Polish złoty

(b) Change £90 into Polish złoty

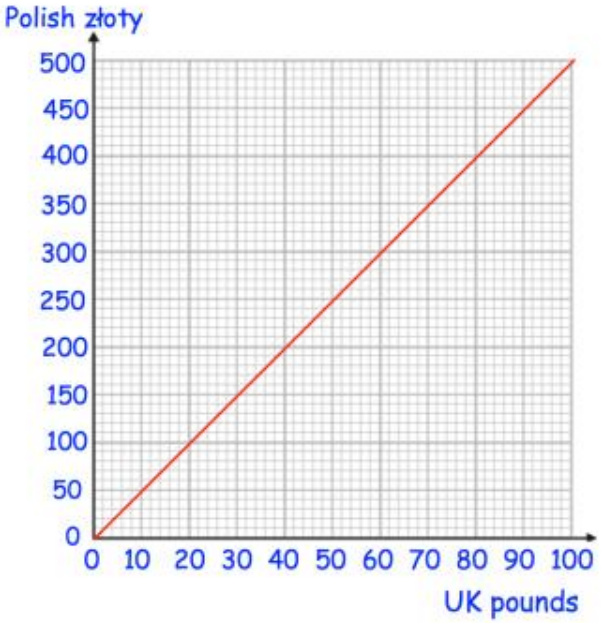
(c) Change 300zł into UK pounds

(d) Change 450zł into UK pounds

(e) Change £50 into Polish złoty

(f) Change £200 into Polish złoty

(g) Change 800zł into UK pounds



Question 3: This conversion graph can be used to change between miles and kilometres.

(a) Change 5 miles into kilometres

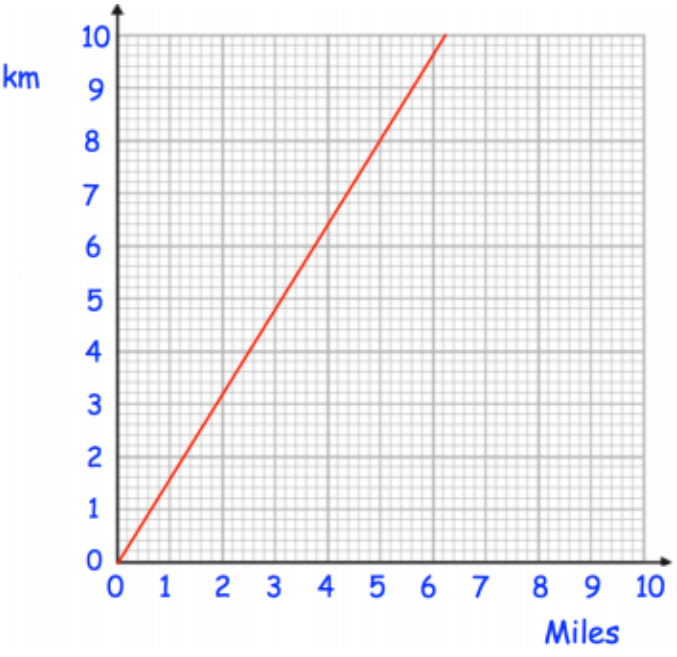
(b) Change 1 mile into kilometres

(c) Change 6km into miles

(d) Change 4.8km into miles

(e) Change 20 miles into kilometres

(f) Change 16km into miles



Challenge:

Reading Conversion Graphs

Use the conversion graphs to complete the tables.
Remember! Readings from conversion graphs are **estimates**.

Litres	Gallons
20	
35	
	8
	12

Petrol (Gallons)	Distance (Miles)
3	
4.5	
	150
	300

USD ($)	Petrol (Gallons)
30	
42	
	11
	55

GBP £)	USD ($)
80	
250	
	70
	96
	250

a) In the USA, a family drives 140 miles. How many gallons of petrol did they use?
How many litres is this? How much did this cost?

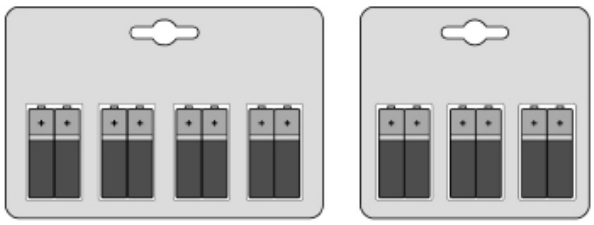
b) A family from the UK goes on holiday to the US. How much petrol can they buy with £35?
(They must exchange pounds for dollars first.)

c) In the UK you can buy 25 litres of petrol for £14. Is this cheaper or more expensive than in the USA?

d) From San Francisco to Yellowstone is 550 miles. How much would this cost a British holidaymaker in GBP?

Exam Practice:

A shop sells two brands of battery.



Brand A
Pack of 8
Price £3.60

Brand B
Pack of 6
Price £2.94

One brand A battery powers a toy for 5 hours.

One brand B battery powers the same toy for $5\frac{1}{2}$ hours.

Which brand is better value?

You **must** show your working.

Answer _____

(Total 5 marks)

All tickets for a concert are the same price.

Amy and Dan pay £63 altogether for some tickets.

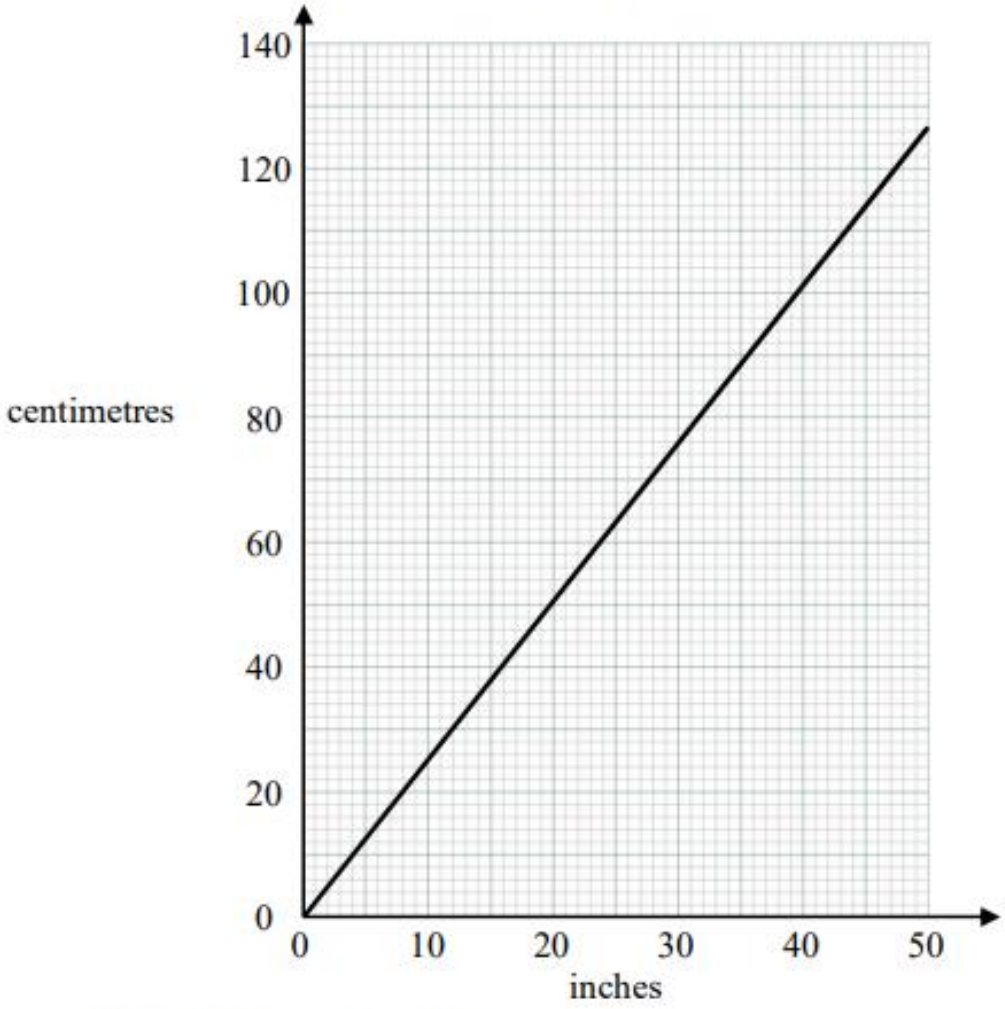
Amy pays £24.50 for 7 tickets.

How many tickets does Dan buy?

Answer _____

(Total 4 marks)

You can use this graph to change between inches and centimetres.



(a) Change 66 cm to inches.

..... inches
(1)

Jamie's height is 6 feet 4 inches.
1 foot = 12 inches.

(b) What is Jamie's height in centimetres?

..... centimetres
(3)

(Total for Question 1 is 4 marks)

Week 2:

- **LI Solve proportion problems algebraically**

Demonstration Videos:
https://corbettmaths.com/2013/04/04/direct-proportion/

https://corbettmaths.com/2013/04/04/inverse-proportion/

Tasks:

Value for Money

a) 1 pen for 50p or 3 pens for £1.29

b) 2 pencils for 70p or 5 pencils for £1.85

c) 4 pints of milk for £1 or 6 pints of milk for £1.48

d) 6 eggs for £1 or 10 eggs for £1.50

e) 4 toilet rolls for £1.75 or 9 toilet rolls for £3.35

f) 3 x 200g tins of beans for £1.29 or 415g tin of beans for 75p

Proportion Using Recipes

SHORTBREAD (20 Biscuits)	
Butter	120g
Caster Sugar	60g
Plain Flour	180g

CUPCAKES (Makes 12)	
Butter	100g
Sugar	100g
Eggs	3
Flour	200g

a) How much... butter for 10 shortbread biscuits?

b) ... flour for 6 cupcakes?

c) ... shortbread can be made with 300g of caster sugar?

d) ... sugar needed for 36 cupcakes?

e) ... butter needed for 6 shortbread biscuits?

f) ... cupcakes can be made with 5 eggs?

g) How much shortbread can be made with 200g of butter, 150g of caster sugar and 250g of plain flour?

h) How many cupcakes can be made with 250g of butter, 240g of sugar, 12 eggs and 300g of flour?

Question 1: A is directly proportional to B.
When A = 12, B = 3
(a) Find a formula for A in terms of B.
(b) Find the value of A when B = 5
(c) Find the value of B when A = 36

Question 2: C is directly proportional to D.
When C = 125, D = 5
(a) Find an equation for C in terms of D.
(b) Find the value of C when D = 10
(c) Find the value of D when C = 75

Question 3: E is directly proportional to F.
When E = 2, F = 8
(a) Find an equation for E in terms of F.
(b) Find the value of E when F = 30
(c) Find the value of F when E = 100

Question 4: y is directly proportional to x.
When x = 400, y = 10
(a) Find a formula for y in terms of x.
(b) Calculate the value of y when x = 450
(c) Find the value of x when y = 200

Question 5: y is directly proportional to x.
Complete the table.

x	4	9	12
y			72

Question 6: y is directly proportional to x
Complete the table.

x	2.5	8	
y	4		50

Question 7: The cost, C pounds, of hiring a car is directly proportional to the number of days, d, it is hired.
When d = 5, C = 180

(a) Find the value of C when d = 3
(b) Find the value of d when C = 252

Question 8: In a spring, the tension (T newtons) is directly proportional to the extension of the spring (y cm).
When the tension is 180 newtons, the extension is 4cm.

(a) Find a formula for T in terms of y.
(b) Work out the tension when the extension is 3cm
(c) Work out the extension, when the tension is 585 newtons.

Question 1: T is inversely proportional to N.
When T = 30, N = 5.
(a) Find an equation connecting T and N.
(b) Work out the value of T when N = 10
(c) Work out the value of N when T = 25

Question 2: w is inversely proportional to f
When $f = 12$, $w = 40$
(a) Find a formula connecting w and f
(b) Find the value of w when $f = 60$

Question 3: B is inversely proportional to y
When B = 0.8, y = 13
(a) Find an equation for B in terms of y.
(b) Work out the value of B when y = 5

Question 4: y is inversely proportional to x
Complete the table.

x	16	8	
y		10	20

Question 5: The number of days, D, to complete research is inversely proportional to the number of researchers, R, who are working.
The research takes 125 days to complete when 24 people work on it.
Find out how many people are needed to complete the research in 60 days.

Question 6: The volume, V litres, which a fixed mass of gas occupies is inversely proportional to its pressure, P pascals.

When the pressure is 200000 pascals, its volume is 6 litres.

(a) Find an equation connecting V and P.
(b) Find the volume of gas when the pressure is 150000
(c) Find the pressure when the volume of gas is 20 litres.

Question 1: A is directly proportional to B^2

When A = 50, B = 5

(a) Find a formula for A in terms of B.

(b) Find the value of A when B = 3

(c) Find the value of B when A = 200

Question 2: y is directly proportional to the square of x

When y = 6.4, x = 4

(a) Find a formula for y in terms of x

(b) Find the value of y when x = 8

(c) Find the value of x when y = 78.4

Question 3: W is directly proportional to P^3.

When P = 2, W = 32

(a) Express W in terms of P

(b) What is the value of W when P = 4?

(c) What is the value of P when W = 4000?

Question 4: Z is directly proportion to $\sqrt{x}$

When Z = 12, x = 36

(a) Express Z in terms of x

(b) Work out the value of Z when x = 121

(c) Work out the value of x when Z = 18

Question 5: C is directly proportional to the cube of D

When D = 5, C = 175

(a) Work out the value of C when D = 6

(b) Work out the value of D when C = 4725

Question 6: y is directly proportional to the cube root of x

When y = 7600, x = 4096

(a) Find an equation connecting y and x.

(b) Calculate the value of y when x = 125

(c) Calculate the value of x when y = 9975

Question 7: The table shows a set of values for x and y.

y is directly proportional the the square root of x.

x	25	
y	9	36

Direct and Inverse Proportion

a) If 2 pens cost 54p, how much will 5 pens cost?

b) If 3 pencils cost 54p, how many can I buy with £1?

c) $a \propto b$ When a = 4, b = 20. Find b when a = 6.

d) $m \propto n^2$ When n = 4, m = 12. Find m when n = 10.

e) $g \propto h$ When h = 3, g = 72. Find h when g = 96.

f) a is directly proportional to b^2. When b = 6, a = 108. Find b when a = 75.

g) x is proportional to the inverse of y. When x = 6, y = 8. Find x when y = 12.

h) c is inversely proportional to d^2. When d = 5, c = 3. Find c when d = 10.

★

Write in the form y = k.....

1) y is directly proportional to x
2) y is proportional to x squared
3) $y \propto \sqrt{x}$
4) y is inversely proportional to x
5) y is proportional to the cube root of x
6) $y \propto x^3$
7) y is inversely proportional to the square of x
8) y is proportional to the square root of x

★★

Express y in terms of x

1) y is directly proportional to x^2 When x = 4 and y = 12
2) y is proportional to the square root of x. When x = 9 y = 12
3) y is inversely proportional to x. When x = 1 y = 2
4) $y \propto x^3$ When x = 2 y = 4
5) $y \propto \sqrt{x}$ When x = 16 y = 32
6) y is directly proportional to x When x = 3 y = 28
7) y is inversely proportional to x^2. When x = 0.5 y = 16
8) y is inversely proportional to $\sqrt{x}$. When x = 4 y = 5

★★★

1) y is proportional to the square root of x. When x = 4, y = 24. Find the value of y when x = 16
2) y is inversely proportional to the square of x. When x = 5, y = 4. Find the value of y when x = ½
3) y is proportional to the cube of x. When x = 2, y = 24. Find the value of x when y = 81
4) y is proportional to the cube root of x. When x = 27, y = 6. Find the value of y when x = 64

Challenges:

LINK **Left & Right**

A	$y \propto x$ $y = 5x$ If $x = 6$, $y =$	15	
B	y is directly proportional to x The constant of proportionality, k = 4 If $x = 9$, $y =$	27	
C	$T \propto Q$ When $Q = 4$, $T = 12$ If $Q = 5$, $T =$	15	
D	y varies directly with x When $x = 8$, $y = 48$ If $y = 18$, $x =$	30	
E	D is directly proportional to E When $D = 24$, $E = 12$ If $D = 18$, $E =$	2	
F	$y \propto x^2$ When $x = 2$, $y = 12$ If $x = 3$, $y =$	10	
G	G varies directly with P When $P = 30$, $G = 75$ If $G = 15$, $P =$	36	
H	y is directly proportional to x squared When $x = 5$, $y = 200$ If $y = 32$, $x =$	9	
I	$S \propto F^3$ When $F = 2$, $S = 32$ If $F = 5$, $S =$	6	
J	$W \propto \sqrt{Z}$ When $Z = 36$, $W = 30$ If $Z = 9$, $W =$	500	
K	y is directly proportional to x cubed When $x = 2$, $y = 1.6$ If $y = 200$, $x =$	3	

DIGIT Puzzle

How many ways can you complete the proportional relationship & the values?

$y \propto \square x$

$When\ x = \square$, $y = \square\square$

$When\ x = \square$, $y = \square\square$

★ Use any digits

★★ Use digits only once

What are the largest & smallest values for x you can make?

DIGIT Puzzle

How many ways can you complete the proportional relationship & the values?

$y \propto \dfrac{\square\square}{x}$

$When\ y = \square$,

$x = \square\square$

★ Use any digits

★★ Use digits only once

What are the largest & smallest values for k you can use?

Exam Practice:

y is inversely proportional to x and k is a constant.

Circle the correct equation.

$y = \frac{k}{x}$ $\quad$ $y = kx$ $\quad$ $y = \frac{x}{k}$ $\quad$ $y = x - k$

(Total 1 mark)

y is directly proportional to x and k is a constant.

Circle the correct equation.

$y = x + k$ $\quad$ $y = kx$ $\quad$ $y = \frac{k}{x}$ $\quad$ $y = x - k$

(Total 1 mark)

$y = \frac{10}{x}$

If the value of x doubles, what happens to the value of y?

Circle your answer.

÷ 2 × 2 ÷ 5 × 5

(Total 1 mark)

2 people working at the same rate will take 6 hours to paint a room.

Assuming that they **all** work at this rate,
how long will it take 3 people to paint the room?

[2 marks]

Answer _____

In fact, the **third** person works at a faster rate. **[1 marks]**

How does this affect the time to paint the room?

y is directly proportional to x.
When $y = 28$, $x = 7$

(a) Work out an equation connecting y and x.

Answer _____

(3)

(b) Work out the value of y when $x = 12$

Answer _____

(2)

(Total 5 marks)

y is inversely proportional to x.

Complete the table.

x	12	6	
y		4	8

(Total 2 marks)

W is inversely proportional to x.
When $W = 6$, $x = 20$

Work out the value of W when $x = 24$

Answer _____

(Total 4 marks)

Week 3:

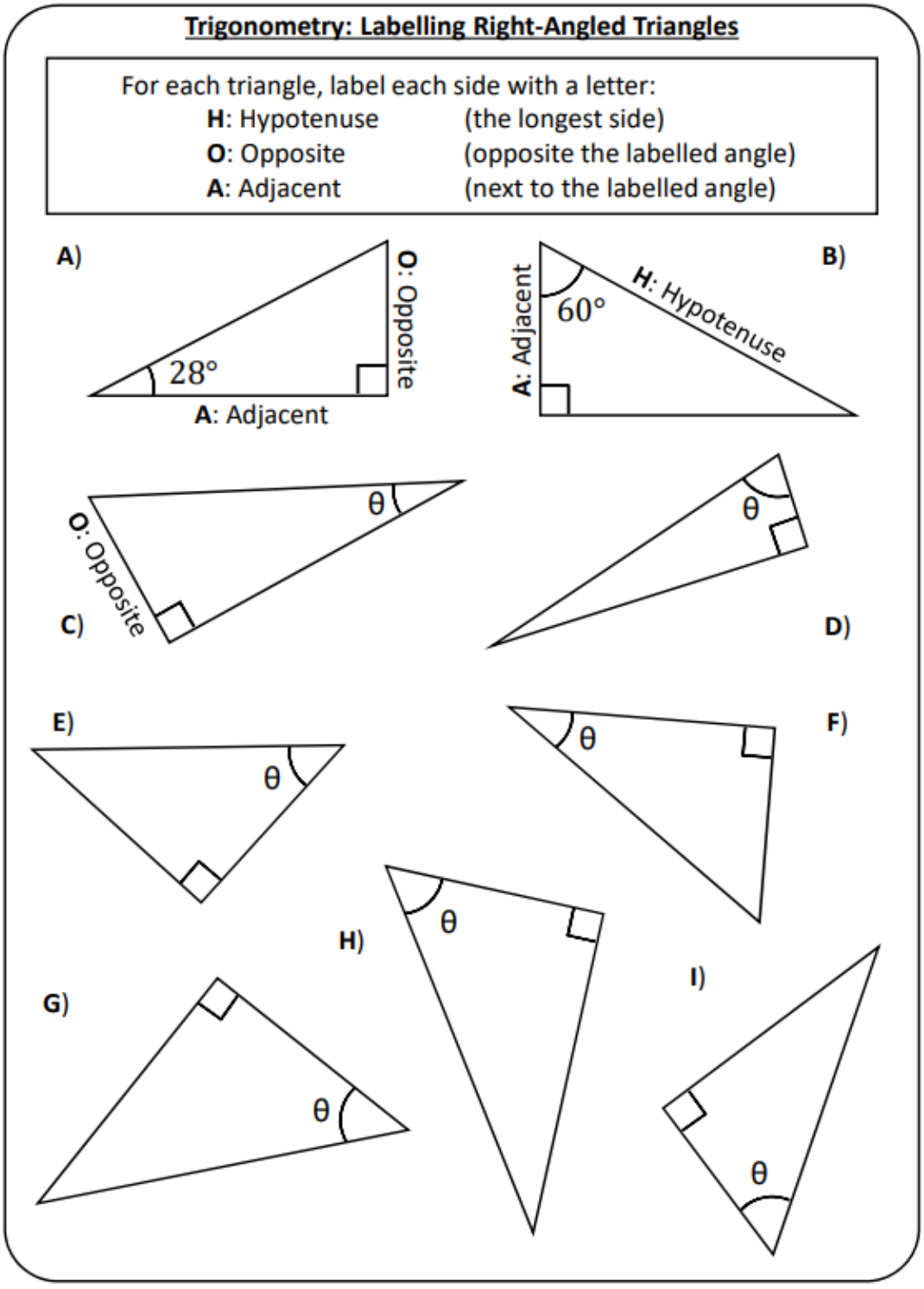
- LI: Recognise the trigonometric ratios
- LI: Find missing angles using trigonometry

Demonstration Videos:

https://corbettmaths.com/2013/03/30/trigonometry-introduction/

https://corbettmaths.com/2013/03/30/trigonometry-missing-angles/

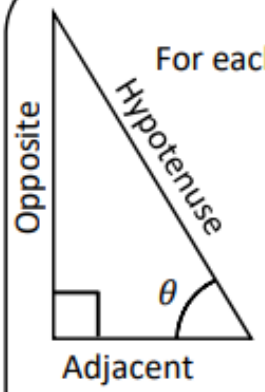
Tasks:

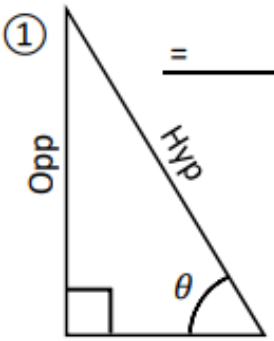


Choosing a Trigonometric Ratio to Use

For each triangle, decide whether you would use...

SOH
CAH
or
TOA



① 

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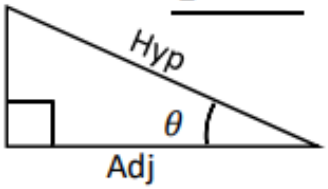
② 

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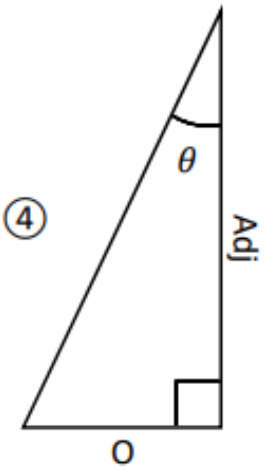
④ 

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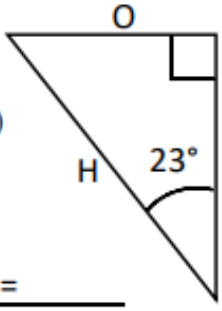
⑤ 

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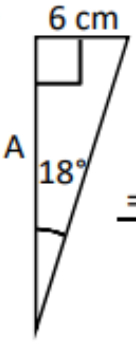
⑥ 

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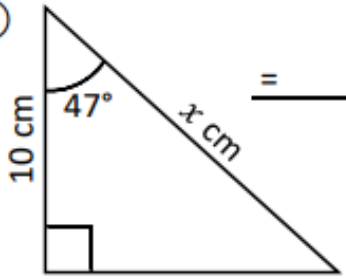
⑦ 

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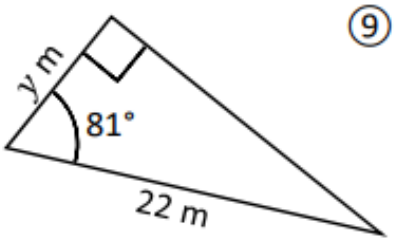
⑧ 

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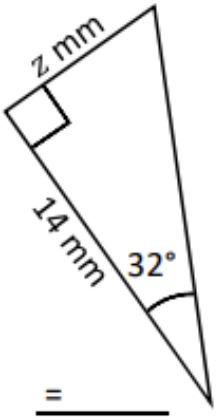
⑨ 

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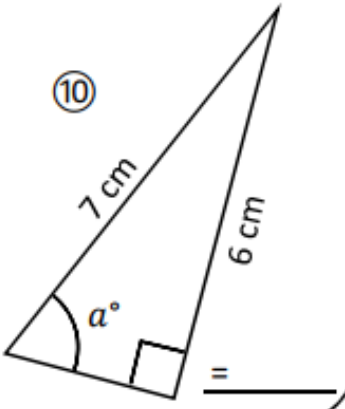
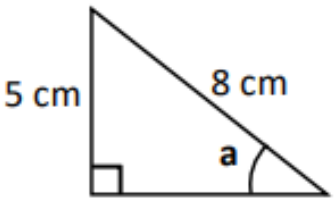
⑩ 

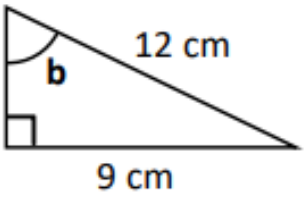
= _____

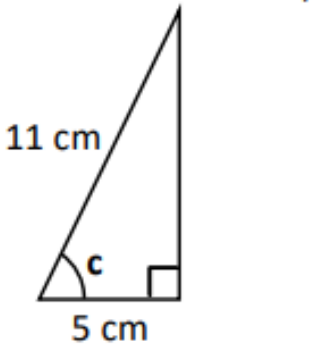
Trigonometry: Finding Angles

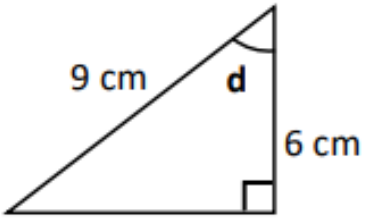
Find each angle to 1 dp.

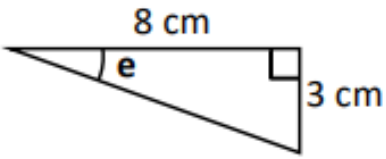
Not drawn accurately.

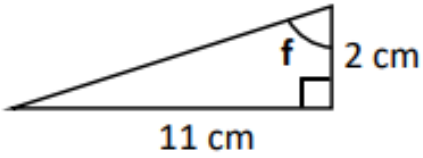


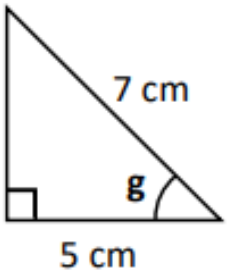


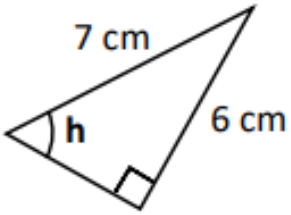


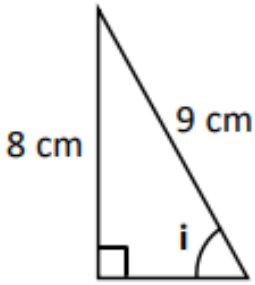


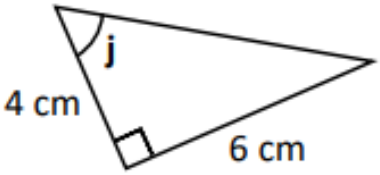


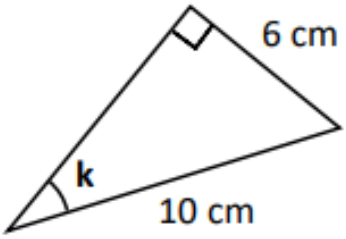


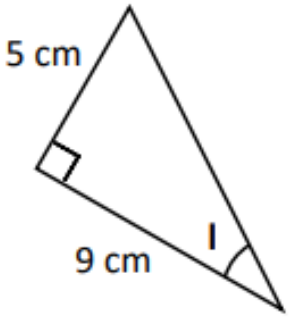


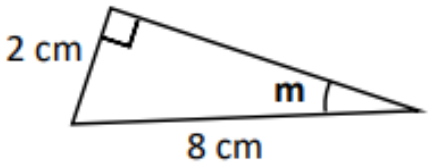


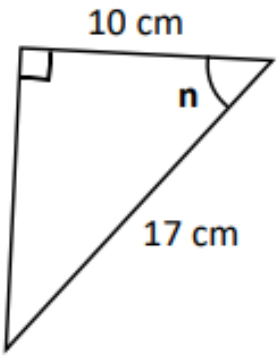


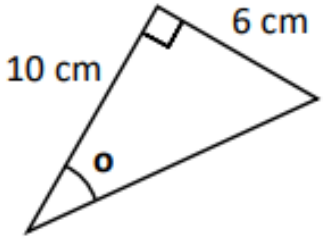






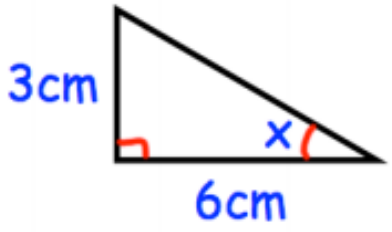




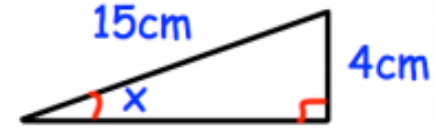


Question 1: Find the size of the missing angles in the triangles below.

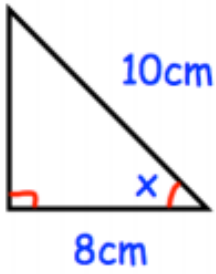
(a)



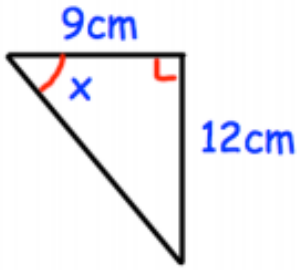
(b)



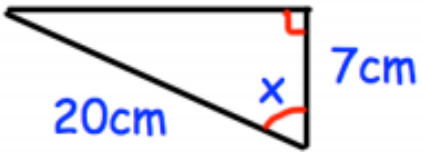
(c)



(d)



(e)



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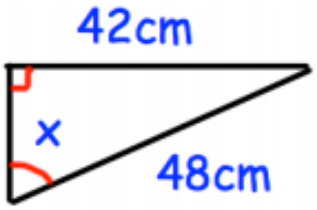
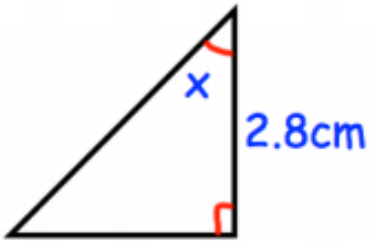
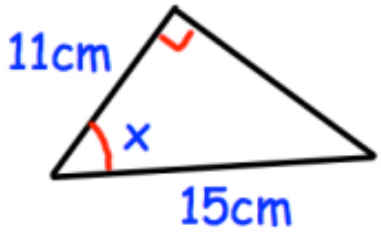


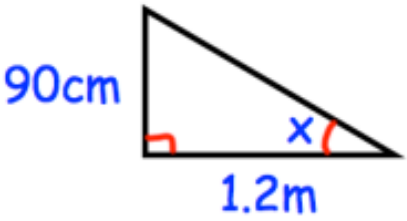
(g)



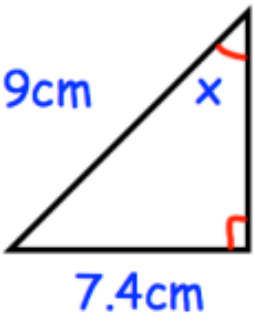
(h)



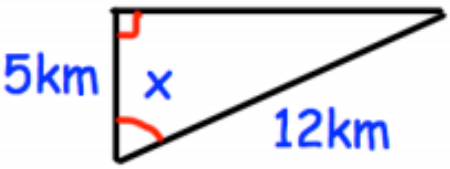
(i)



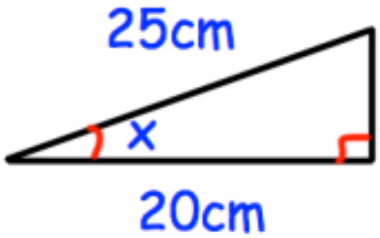
(j)



(k)



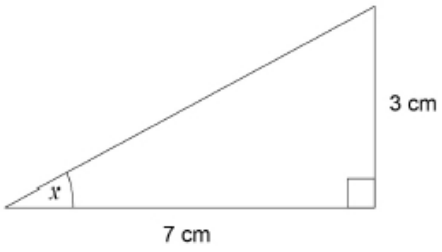
(l)



Exam Practice:

Work out the size of angle x.

Not drawn accurately

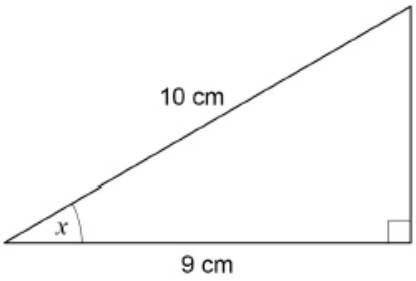


Answer _____ degrees

(Total 2 marks)

Use trigonometry to work out the size of angle x.

Not drawn accurately

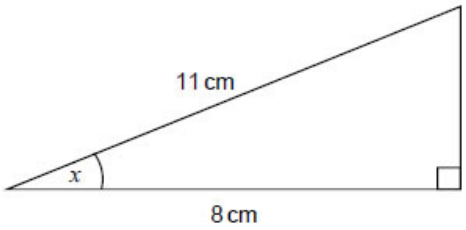


Answer _____ degrees

(Total 2 marks)

Work out the size of angle x.

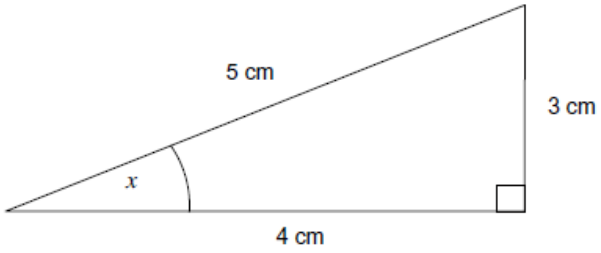
Not drawn accurately



Answer _____ degrees

(2)

Not drawn accurately

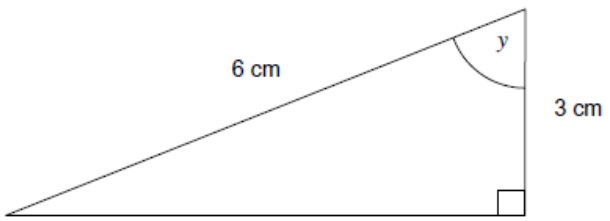


Circle the value of sin x.

$\frac{3}{5}$ $\frac{3}{4}$ $\frac{4}{5}$ $\frac{4}{3}$ $\frac{5}{3}$

(1)

Not drawn accurately



Circle the size of angle y.

30° 36° 45° 50° 60°

(1)

(Total 2 marks)

Week 4:

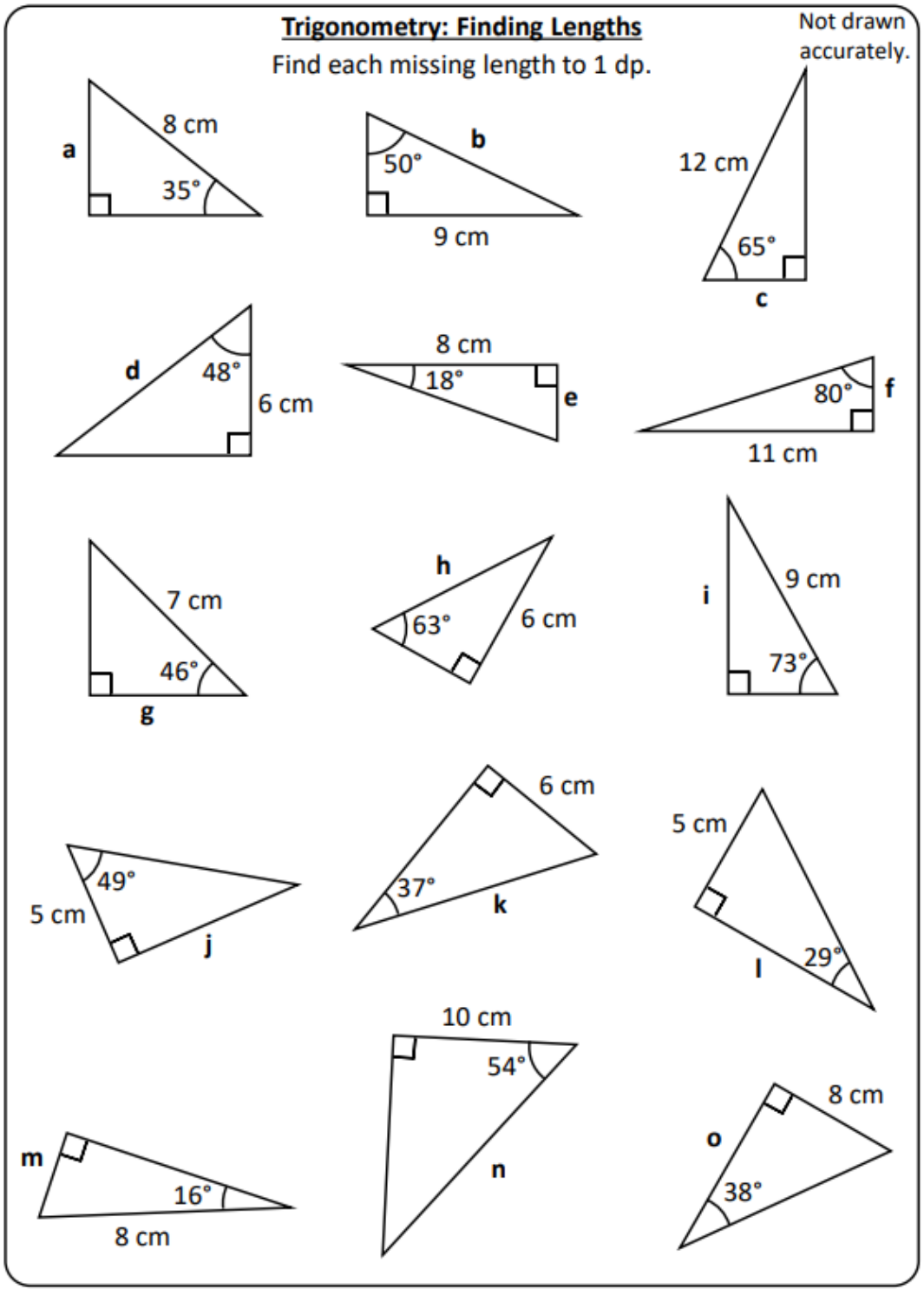
- LI: Find missing sides using trigonometry
- LI: Use exact values of trigonometric functions

Demonstration Videos:

https://corbettmaths.com/2013/03/30/trigonometry-missing-sides/

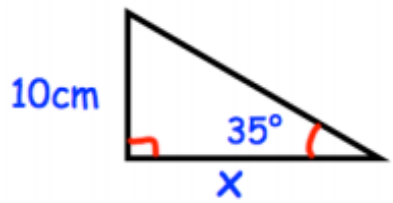
https://corbettmaths.com/2013/04/20/exact-trigonometric-values/

Tasks:

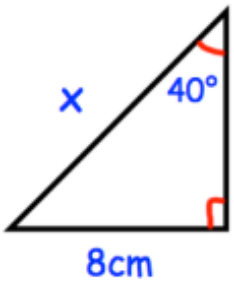


Question 2: Find the lengths of the sides labelled x below.

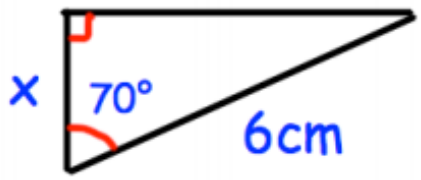
(a)



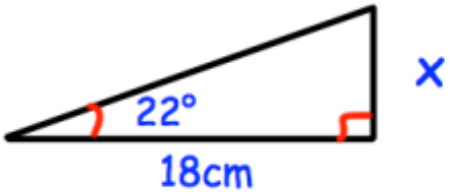
(b)



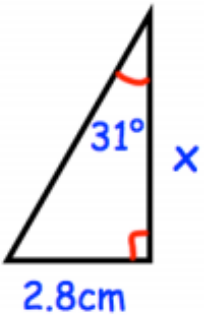
(c)



(d)



(e)



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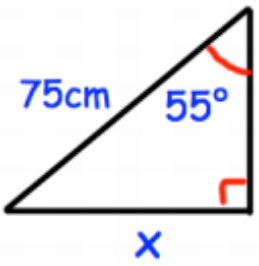
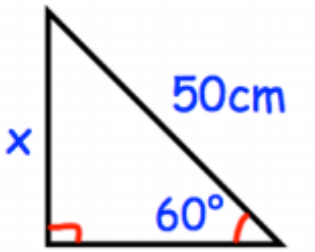
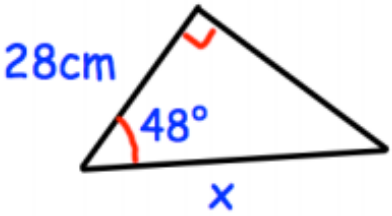


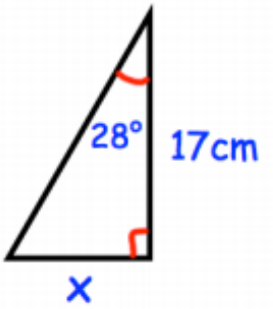
(g)



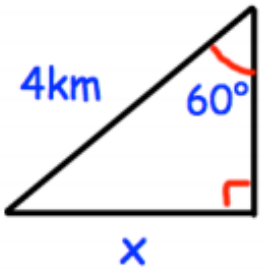
(h)



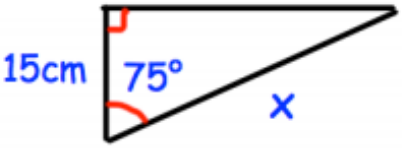
(i)



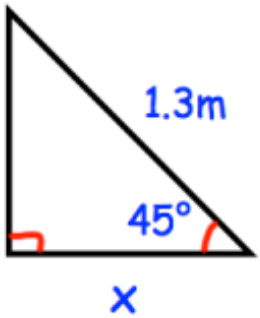
(j)

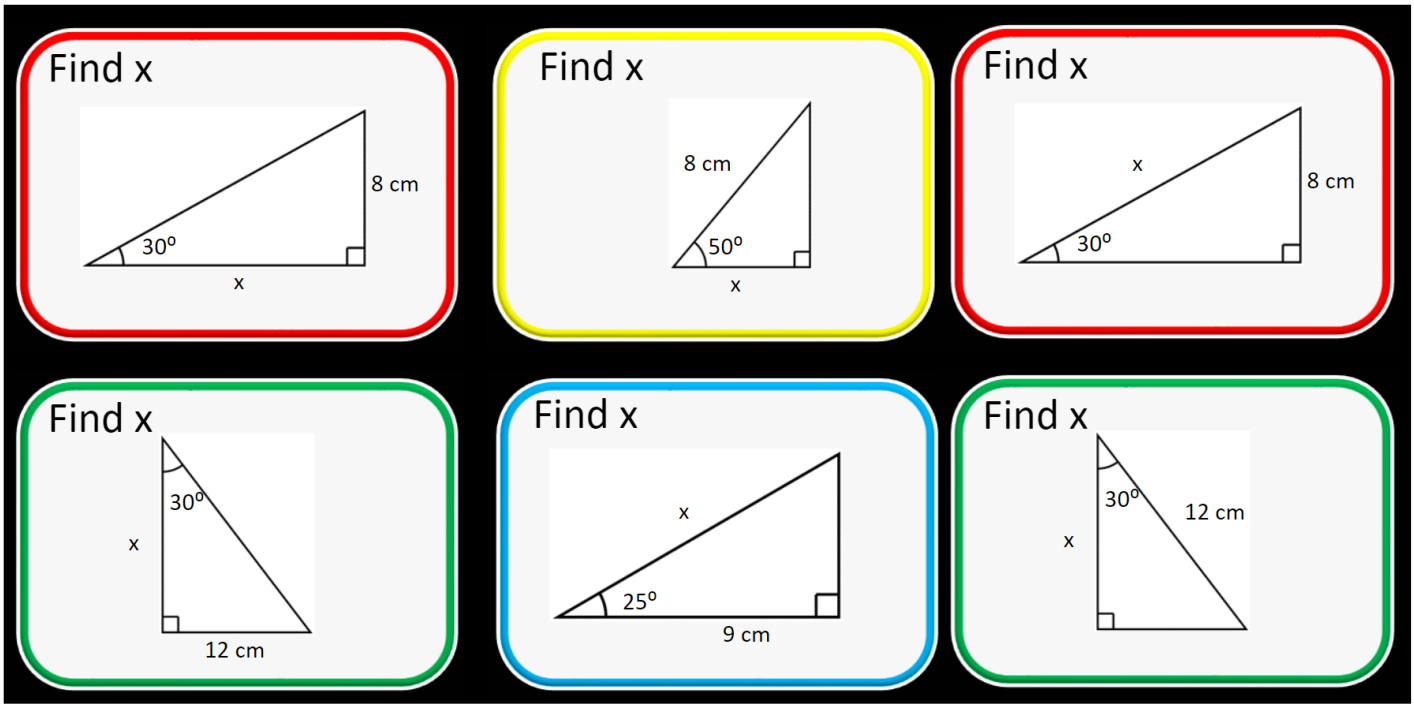


(k)



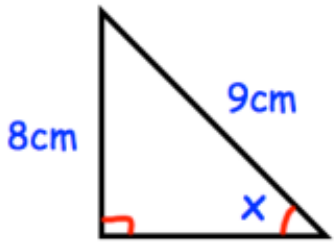
(l)





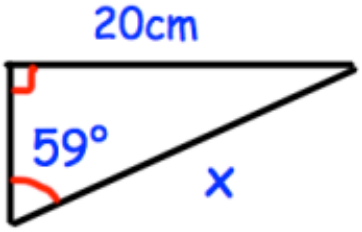
Question 3: Find the size of the missing angles/sides labelled x below.

(a)

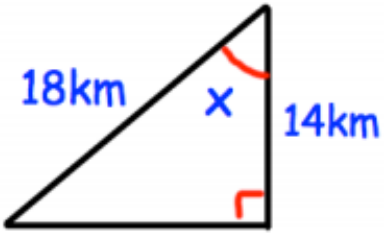


(b)

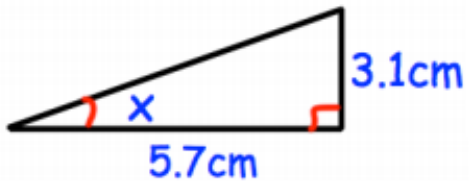
(c)



(d)



(e)



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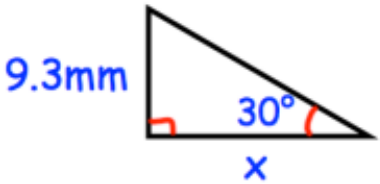
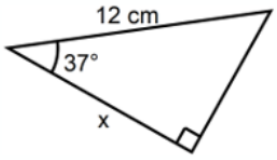
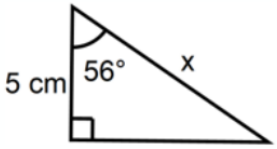
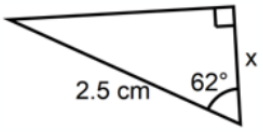


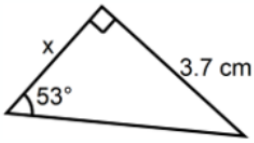
★

Calculate x correct to 1 decimal place

1) 

2) 

3) 

4) 

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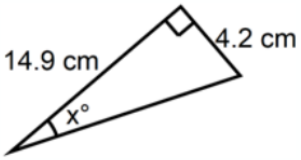
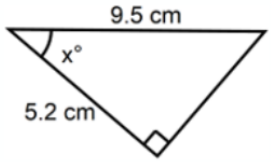
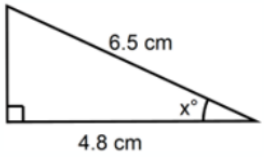
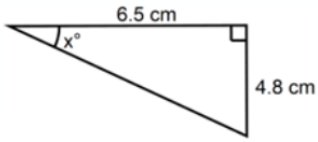
Calculate x correct to 1 decimal place

1) 

2) 

3) 

4) 

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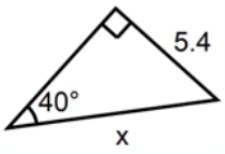
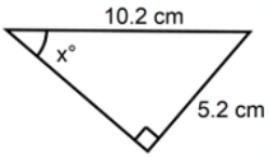
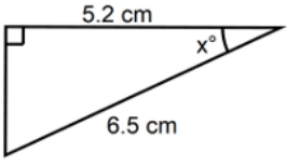
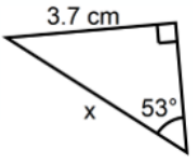
Calculate x correct to 1 decimal place

1) 

2) 

3) 

4) 

	0°	30°	45°	60°	90°
$\sin\vartheta$	$\sqrt{0}$	$\sqrt{1}$	$\sqrt{2}$	$\sqrt{3}$	$\sqrt{4}$
$\cos\vartheta$	$\sqrt{4}$	$\sqrt{3}$	$\sqrt{2}$	$\sqrt{1}$	$\sqrt{0}$
			2		

$$\tan\vartheta = \frac{\sin\vartheta}{\cos\vartheta}$$

Question 1: Write down the exact values of each of the following

(a) $\sin 30°$ (b) $\cos 0°$ (c) $\tan 45°$ (d) $\sin 90°$ (e) $\sin 0°$

(f) $\cos 60°$ (g) $\tan 0°$ (h) $\sin 45°$ (i) $\cos 30°$ (j) $\tan 60°$

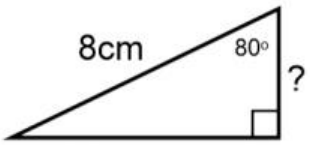
(k) $\cos 90°$ (l) $\sin 60°$ (m) $\cos 45°$ (n) $\tan 30°$

Question 2: Write down the exact values of each of the following

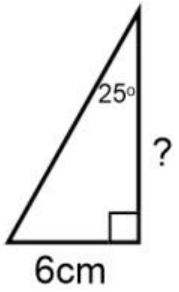
(a) $\cos 60° + \sin 30°$ (b) $\cos 0° + \tan 45° + \sin 90°$ (c) $\sin 30° + \sin 90°$

Challenges:

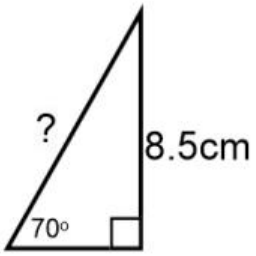
a)



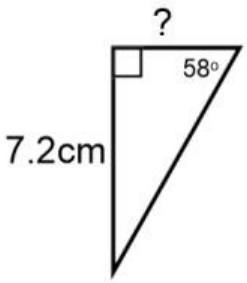
b)



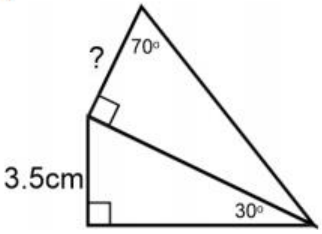
c)



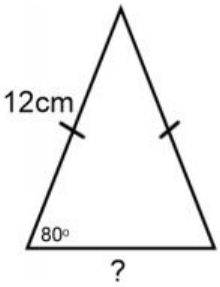
d)



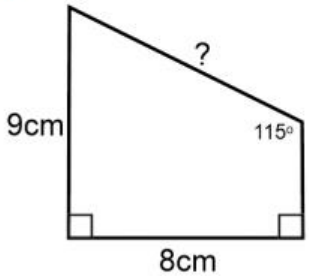
e)



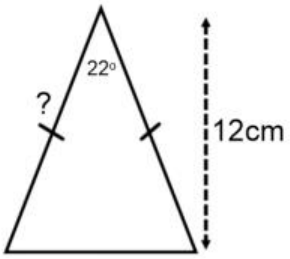
f)



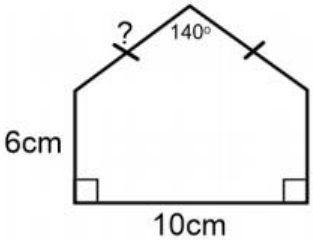
g)



h)



i)

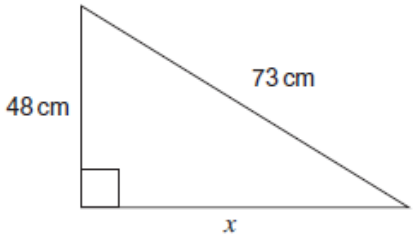


Exam Practice:

Calculate the length x.

You must show your working.

Not drawn accurately



_____

_____

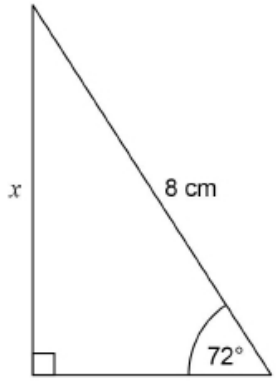
_____

Answer _____ cm

(Total 3 marks)

Use trigonometry to work out the length x.

Not drawn accurately

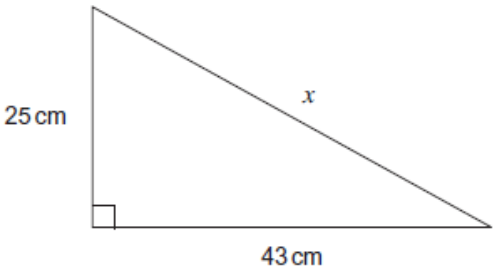


Answer _____ cm

(Total 2 marks)

Calculate the length x in the triangle.

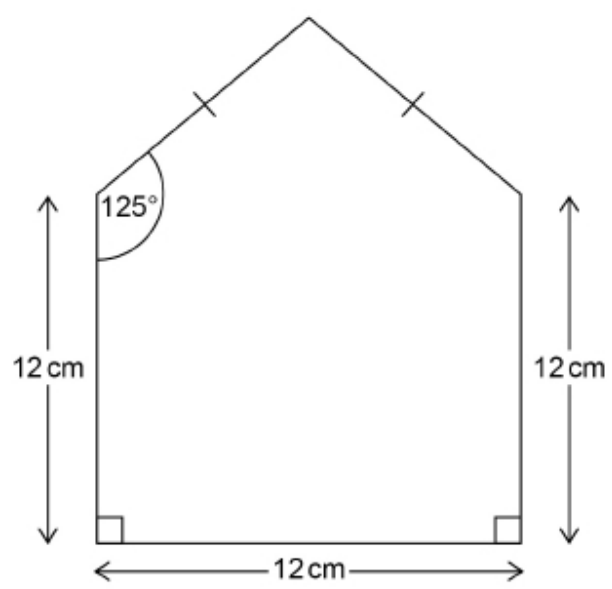
Not drawn accurately



Answer _____ cm

(Total 3 marks)

A pentagon is made from a square and an isosceles triangle.



Work out the perimeter of the pentagon.

Answer _____ cm

(Total 4 marks)

Circle the value of cos 30°

$\frac{1}{2}$ $\frac{\sqrt{3}}{2}$ 0 1

(Total 1 mark)

Circle the value of cos 90°

0 $\frac{1}{2}$ $\frac{\sqrt{3}}{2}$ 1

(Total 1 mark)

For which acute angle do sin x and cos x have the same value?
Circle your answer.

0° 30° 45° 60°

(Total 1 mark)

Show that the value of cos 30° × tan 60° + sin 30° is an integer.

(Total 3 marks)

Week 5:

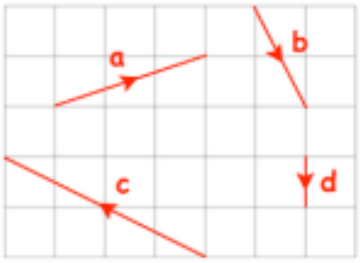
- **LI: Read and draw vectors using column notation**
- **LI: Use column vector notation to add and subtract vectors**

Demonstration Videos:

https://corbettmaths.com/2017/09/25/column-vectors/

Tasks:

Question 1: The vectors **a**, **b**, **c** and **d** are shown on the grid.



(a) Write **a** as a column vector

(b) Write **b** as a column vector

(c) Write **c** as a column vector

(d) Write **d** as a column vector

Question 2: On a grid, draw and label the following vectors.

(a) $\mathbf{a} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$ (b) $\mathbf{b} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$

(c) $\mathbf{c} = \begin{pmatrix} -3 \\ -7 \end{pmatrix}$ (d) $\mathbf{d} = \begin{pmatrix} 0 \\ -6 \end{pmatrix}$

(e) $\mathbf{e} = \begin{pmatrix} 8 \\ -1 \end{pmatrix}$ (f) $\mathbf{f} = \begin{pmatrix} -4 \\ 0 \end{pmatrix}$

Question 3: Shown on the grid is the vector **a**

$$\mathbf{a} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$$

(a) Draw the vector 2**a** on the grid.

(b) Write 2**a** as a column vector

(c) Draw the vector 3**a** on the grid.

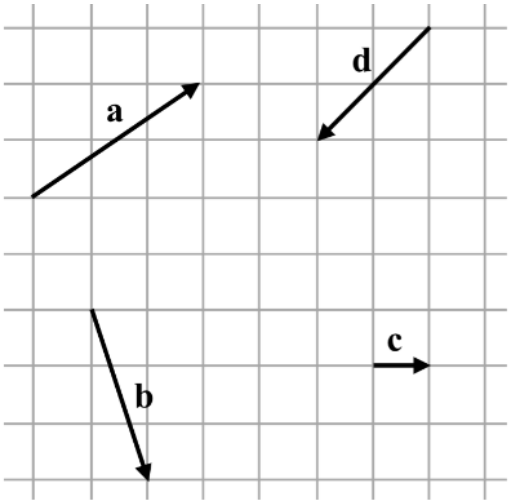
(d) Write 3**a** as a column vector

(e) Write 5**a** as a column vector

Match the column vectors to those shown in the diagram:

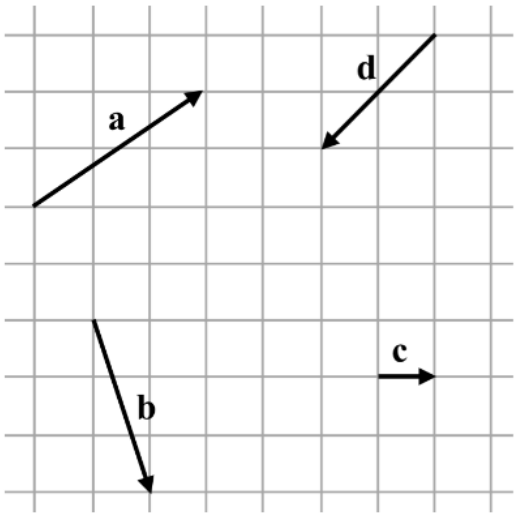
$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$ $\begin{pmatrix} -2 \\ -2 \end{pmatrix}$

Write down the column vectors for **–a**, **–b**, **–c**, and **–d**.



Work out the following, writing your answers as column vectors:

1) $\mathbf{a} + \mathbf{b}$
2) $\mathbf{b} + \mathbf{a}$
3) $\mathbf{a} + \mathbf{c}$
4) $\mathbf{c} + \mathbf{d}$
5) $\mathbf{d} + \mathbf{c}$
6) $\mathbf{b} + \mathbf{c}$
7) $\mathbf{d} + \mathbf{b} + \mathbf{c}$
8) $\mathbf{a} + \mathbf{b} + \mathbf{c} + \mathbf{d}$



Work out the following:

a) $\begin{pmatrix} 1 \\ 3 \end{pmatrix} + \begin{pmatrix} 4 \\ 1 \end{pmatrix} =$

b) $\begin{pmatrix} 2 \\ 7 \end{pmatrix} + \begin{pmatrix} 4 \\ 0 \end{pmatrix} =$

c) $\begin{pmatrix} 0 \\ 6 \end{pmatrix} + \begin{pmatrix} 0 \\ 3 \end{pmatrix} =$

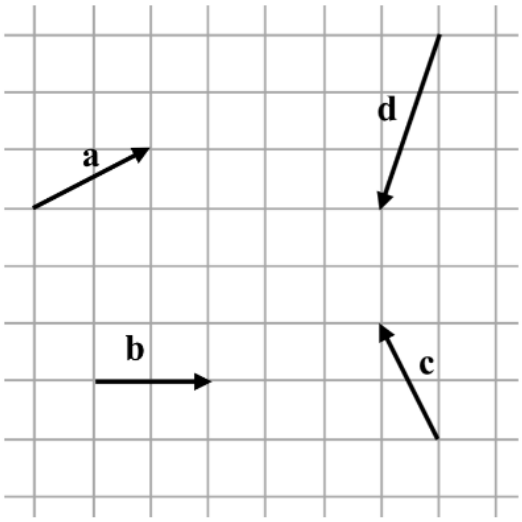
d) $\begin{pmatrix} 7 \\ 2 \end{pmatrix} + \begin{pmatrix} -1 \\ -2 \end{pmatrix} =$

e) $\begin{pmatrix} -3 \\ 0 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} =$

f) $\begin{pmatrix} -3 \\ -6 \end{pmatrix} + \begin{pmatrix} 5 \\ -2 \end{pmatrix} =$

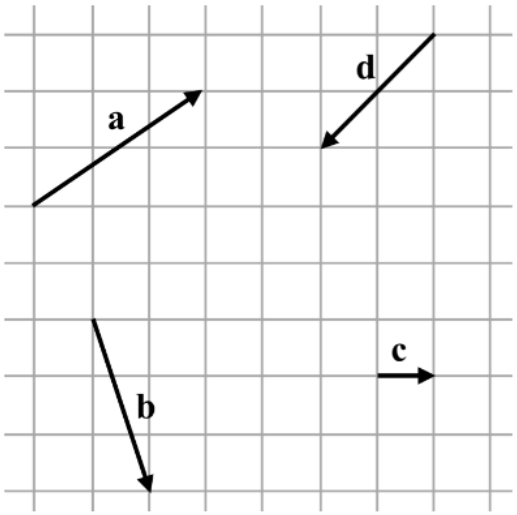
Work out the following, writing your answers as column vectors:

1) $\mathbf{a} + \mathbf{b}$
2) $\mathbf{b} + \mathbf{a}$
3) $\mathbf{a} + \mathbf{c}$
4) $\mathbf{c} + \mathbf{d}$
5) $\mathbf{d} + \mathbf{c}$
6) $\mathbf{b} + \mathbf{c}$
7) $\mathbf{d} + \mathbf{b} + \mathbf{c}$
8) $\mathbf{a} + \mathbf{b} + \mathbf{c} + \mathbf{d}$



Work out the following, writing your answers as column vectors:

1) $\mathbf{a} - \mathbf{c}$
2) $\mathbf{c} - \mathbf{a}$
3) $\mathbf{d} - \mathbf{a}$
4) $\mathbf{c} - \mathbf{b}$
5) $\mathbf{b} - \mathbf{c}$
6) $\mathbf{b} - \mathbf{d}$
7) $\mathbf{a} + \mathbf{d} - \mathbf{c}$
8) $-\mathbf{a} + \mathbf{c} - \mathbf{b}$



Work out the following:

a) $\begin{pmatrix} 7 \\ 3 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \end{pmatrix} =$

b) $\begin{pmatrix} 3 \\ 2 \end{pmatrix} - \begin{pmatrix} 5 \\ 2 \end{pmatrix} =$

c) $\begin{pmatrix} 7 \\ 3 \end{pmatrix} - \begin{pmatrix} -1 \\ -2 \end{pmatrix} =$

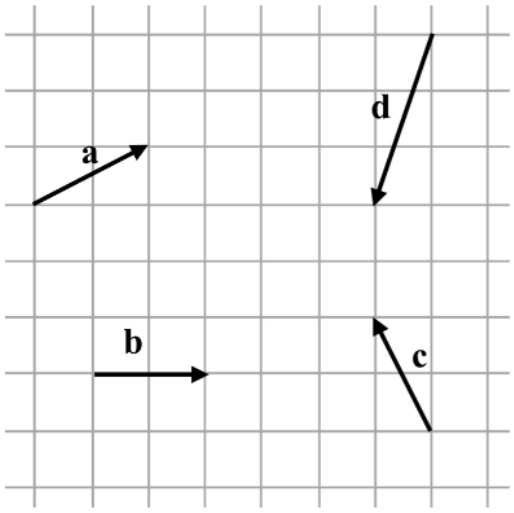
d) $\begin{pmatrix} -4 \\ -5 \end{pmatrix} - \begin{pmatrix} 3 \\ 6 \end{pmatrix} =$

e) $\begin{pmatrix} 0 \\ -1 \end{pmatrix} - \begin{pmatrix} -2 \\ -7 \end{pmatrix} =$

f) $\begin{pmatrix} -6 \\ -7 \end{pmatrix} - \begin{pmatrix} -4 \\ -8 \end{pmatrix} =$

Work out the following, writing your answers as column vectors:

1) $\mathbf{c} - \mathbf{b}$
2) $\mathbf{b} - \mathbf{c}$
3) $\mathbf{d} - \mathbf{a}$
4) $\mathbf{c} - \mathbf{a}$
5) $\mathbf{b} - \mathbf{d}$
6) $\mathbf{a} - \mathbf{c}$
7) $\mathbf{a} + \mathbf{b} - \mathbf{c}$
8) $-\mathbf{a} + \mathbf{b} + \mathbf{d}$



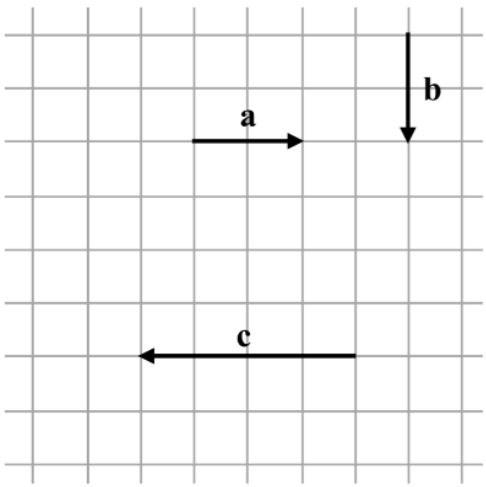
Beau writes:

$$\begin{pmatrix} 5 \\ 3 \end{pmatrix} - \begin{pmatrix} -1 \\ -2 \end{pmatrix} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$$

Beau is wrong. Explain why.

The diagram shows the vectors **a**, **b**, and **c**.

Show clearly using column vectors that $\mathbf{a} + \mathbf{b} + \mathbf{c} = \mathbf{b} - \mathbf{a}$



Exam Practice:

$\mathbf{a} = \begin{pmatrix} 6 \\ -10 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$

(a) Work out **a + b + c**

Answer ( )

(2)

Work out the following:

a) $\begin{pmatrix} 2 \\ -4 \end{pmatrix} + \begin{pmatrix} -3 \\ 7 \end{pmatrix}$

b) $\begin{pmatrix} -3 \\ 8 \end{pmatrix} - \begin{pmatrix} 6 \\ -2 \end{pmatrix}$

Work out $\begin{pmatrix} -4 \\ -7 \end{pmatrix} - \begin{pmatrix} -5 \\ 3 \end{pmatrix}$

Circle your answer.

$\begin{pmatrix} -9 \\ 4 \end{pmatrix}$ $\begin{pmatrix} 1 \\ 4 \end{pmatrix}$ $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$ $\begin{pmatrix} 1 \\ -10 \end{pmatrix}$ $\begin{pmatrix} -9 \\ -10 \end{pmatrix}$

(Total 1 mark)

$\mathbf{a} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Circle the vector **a – b**

$\begin{pmatrix} -3 \\ -5 \end{pmatrix}$ $\begin{pmatrix} 7 \\ 1 \end{pmatrix}$ $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$ $\begin{pmatrix} 7 \\ -5 \end{pmatrix}$

(Total 1 mark)

Week 6:

- Use column vector notation to multiply vectors by a number
- Use vectors in shapes

Demonstration Video:

https://corbettmaths.com/2017/09/25/column-vectors/

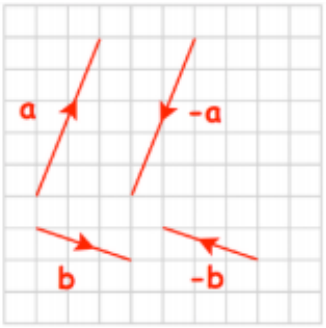
https://corbettmaths.com/2016/04/25/vectors/

Tasks:

Question 5: Shown on the grid are vectors **a**, **–a**, **b** and **–b**

(a) Write **a** as a column vector
(b) Write **–a** as a column vector

(c) Write **b** as a column vector
(d) Write **–b** as a column vector



Question 6: Given $\mathbf{a} = \begin{pmatrix} 2 \\ 11 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -8 \\ 3 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} -4 \\ -6 \end{pmatrix}$

Write the following as column vectors

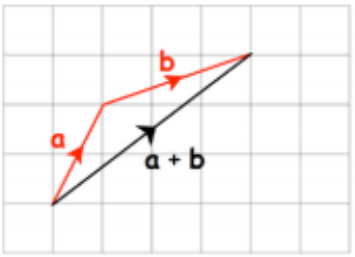
(a) $-\mathbf{a}$ (b) $-\mathbf{b}$ (c) $-\mathbf{c}$ (d) $-2\mathbf{a}$ (e) $-4\mathbf{b}$ (f) $-\frac{1}{2}\mathbf{b}$

Question 7: Shown on the grid are the vector **a**, **b** and **a + b**

(a) Write **a** as a column vector

(b) Write **b** as a column vector

(c) Write **a + b** as a column vector



Question 8: Given $\mathbf{a} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$ $\mathbf{d} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$ and $\mathbf{e} = \begin{pmatrix} -1 \\ -2 \end{pmatrix}$

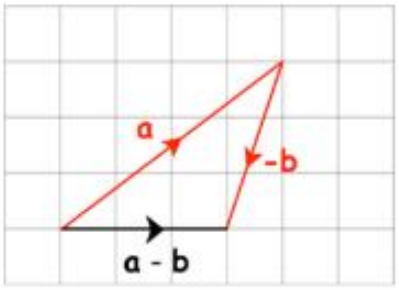
Work out the following as column vectors

(a) $\mathbf{a} + \mathbf{b}$	(b) $\mathbf{b} + \mathbf{c}$	(c) $\mathbf{a} + \mathbf{c}$	(d) $\mathbf{c} + \mathbf{d}$
(e) $\mathbf{b} + \mathbf{e}$	(f) $\mathbf{d} + \mathbf{a}$	(g) $\mathbf{e} + \mathbf{d}$	(h) $2\mathbf{a} + \mathbf{b}$
(i) $3\mathbf{c} + \mathbf{b}$	(j) $\mathbf{a} + 5\mathbf{b}$	(k) $4\mathbf{b} + 3\mathbf{c}$	(l) $7\mathbf{c} + \mathbf{d}$
(m) $\mathbf{a} + 2\mathbf{e}$	(n) $8\mathbf{e} + 3\mathbf{d}$	(o) $\mathbf{a} + \mathbf{c} + \mathbf{e}$	(p) $2\mathbf{b} + 3\mathbf{d} + 10\mathbf{e}$

Question 9: $\mathbf{a} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$

Shown on the grid are the vector **a**, **–b** and **a – b**

Write down the vector **a – b** as a column vector.



Question 10: Given $\mathbf{a} = \begin{pmatrix} 12 \\ 15 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 7 \\ 3 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} 1 \\ 8 \end{pmatrix}$ $\mathbf{d} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$ and $\mathbf{e} = \begin{pmatrix} -8 \\ -9 \end{pmatrix}$

Work out the following as column vectors

(a) **a – b** (b) **a – c** (c) **b – c** (d) **c – b**

(e) **a – d** (f) **e – b** (g) **e – d** (h) **3a – b**

(i) **2c – 2b** (j) **6b – 4a** (k) **3d – 4b** (l) **7e – 10d**

Question 11: $\mathbf{a} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 8 \\ -1 \end{pmatrix}$

Work out **2a + b** as a column vector

Work out the following.

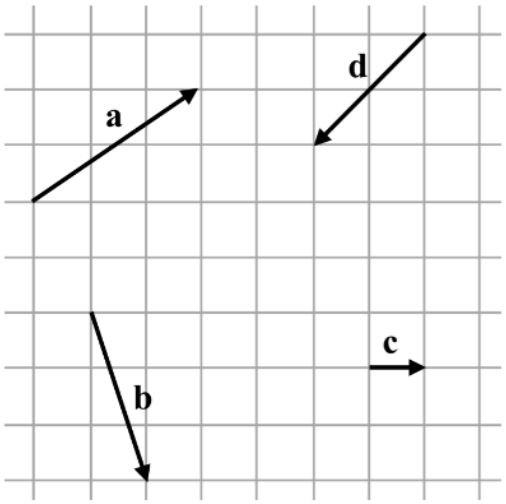
a) $\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 3 \\ 7 \end{pmatrix} =$

b) $\begin{pmatrix} 4 \\ 1 \end{pmatrix} + \begin{pmatrix} 4 \\ 1 \end{pmatrix} + \begin{pmatrix} 4 \\ 1 \end{pmatrix} =$

c) $\begin{pmatrix} -2 \\ -5 \end{pmatrix} + \begin{pmatrix} -2 \\ -5 \end{pmatrix} + \begin{pmatrix} -2 \\ -5 \end{pmatrix} + \begin{pmatrix} -2 \\ -5 \end{pmatrix} =$

Work out the following, writing your answers as column vectors:

1) $2\mathbf{c}$
2) $2\mathbf{a}$
3) $3\mathbf{b}$
4) $\frac{1}{2}\mathbf{d}$
5) $-\mathbf{c}$
6) $-5\mathbf{a}$
7) $2\mathbf{a} + 3\mathbf{c}$
8) $4\mathbf{d} - 3\mathbf{b}$



Work out the following:

a) $7\begin{pmatrix} 3 \\ 4 \end{pmatrix} =$

b) $2\begin{pmatrix} 2 \\ 5 \end{pmatrix} =$

c) $\frac{1}{2}\begin{pmatrix} 4 \\ 0 \end{pmatrix} =$

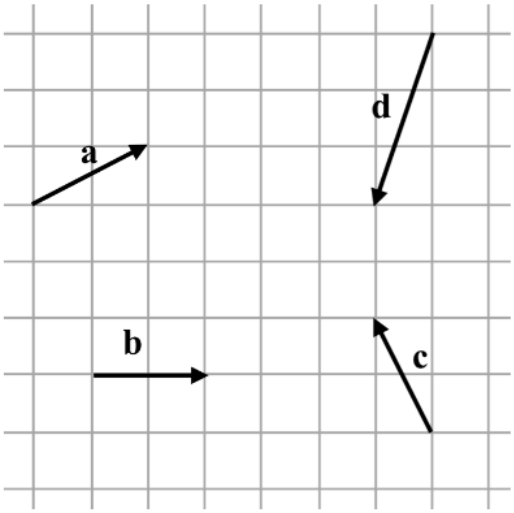
d) $2\begin{pmatrix} -3 \\ -2 \end{pmatrix} =$

e) $-4\begin{pmatrix} -2 \\ 5 \end{pmatrix} =$

f) $-7\begin{pmatrix} -3 \\ -4 \end{pmatrix} =$

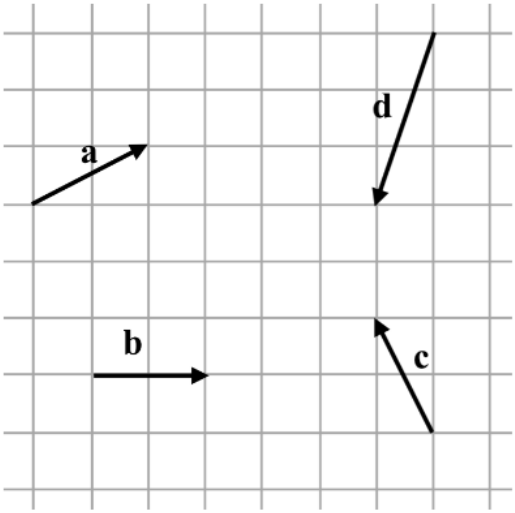
Work out the following, writing your answers as column vectors:

1) $2\mathbf{a}$
2) $5\mathbf{a}$
3) $\frac{1}{2}\mathbf{b}$
4) $3\mathbf{d}$
5) $-\mathbf{d}$
6) $-2\mathbf{c}$
7) $-3\mathbf{a}$
8) $-7\mathbf{d}$



Work out the following, writing your answers as column vectors:

1) $\mathbf{a} + 2\mathbf{b}$
2) $2\mathbf{a} + 5\mathbf{b}$
3) $3\mathbf{a} + \mathbf{c}$
4) $4\mathbf{d} + 3\mathbf{b}$
5) $2\mathbf{b} - \mathbf{c}$
6) $5\mathbf{d} - 2\mathbf{b}$
7) $-2\mathbf{a} + 3\mathbf{b}$
8) $-4\mathbf{c} - 3\mathbf{d}$



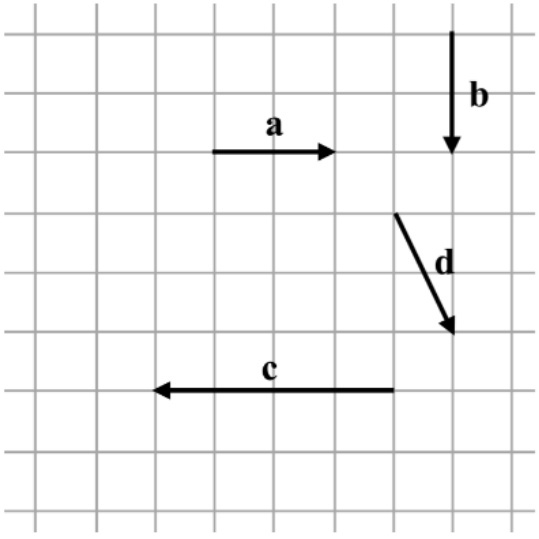
Carol writes:

$$2\begin{pmatrix} -3 \\ 7 \end{pmatrix} = \begin{pmatrix} -6 \\ 7 \end{pmatrix}$$

Carol is wrong. Explain why.

The diagram shows the vectors **a**, **b**, **c**, and **d**.

Show clearly using column vectors that $2\mathbf{a} + 3\mathbf{b} = \mathbf{b} - \frac{1}{2}\mathbf{c} + 2\mathbf{d}$



Exam Practice:

$\mathbf{a} = \begin{pmatrix} -4 \\ -1 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$

Circle the vector $2\mathbf{a} + \mathbf{b}$

$\begin{pmatrix} -5 \\ -3 \end{pmatrix}$ $\begin{pmatrix} -11 \\ -3 \end{pmatrix}$ $\begin{pmatrix} -5 \\ -1 \end{pmatrix}$ $\begin{pmatrix} -11 \\ -1 \end{pmatrix}$

(Total 1 mark)

Here are two column vectors.

$\mathbf{f} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$ $\mathbf{g} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$

Work out $3\mathbf{f} - 2\mathbf{g}$

_____

_____

_____

_____

Answer _____

(Total 2 marks)

$\boldsymbol{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $\boldsymbol{b} = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$

(a) Write down as a column vector

(i) $\mathbf{a} + \mathbf{b}$

.....

(1)

(ii) $2\mathbf{a} + 3\mathbf{b}$

.....

(2)

Questions	Question Title
1	Read and write decimal numbers
2	Solve 1-step equations
3	Line symmetry
4	Converting length
5a	Fractions as pictures
5b	Percentages as pictures
6	Best buys
7	Expressions, equations, identities and formulae
8	Money logic problem
9a	Probability of single events
9b	Systematic listing
10	Scale diagrams
11	Volume of a frustum
12a	Frequency trees, convert fractions to decimals
12b	Profit and loss
13	Speed
14	Area of a triangle
15	Multiples, form and solve an equation
16	Constructing triangles
17	Expand a single bracket, collecting like terms
18	Linear sequences
19a/b	Pie charts
20	Probability of an event not happening
21	Change the subject of the formula
22a/b	Sequences from recurrence relations
23	Venn diagrams
24	HCF, LCM
25	Similar polygons
26	Compound interest, best buys
27a	Straight line graphs (parallel lines)
27b	Straight line graphs (check if a point is on a line)
28	Reverse percentages
29	Prime numbers, linear sequences (nth term)
30a	Combining vectors
30b	Vectors (multiplying by scalars)