Stewards Academy

Maths Spring 1

Year 10 Higher

Blended Learning Booklet

Name:

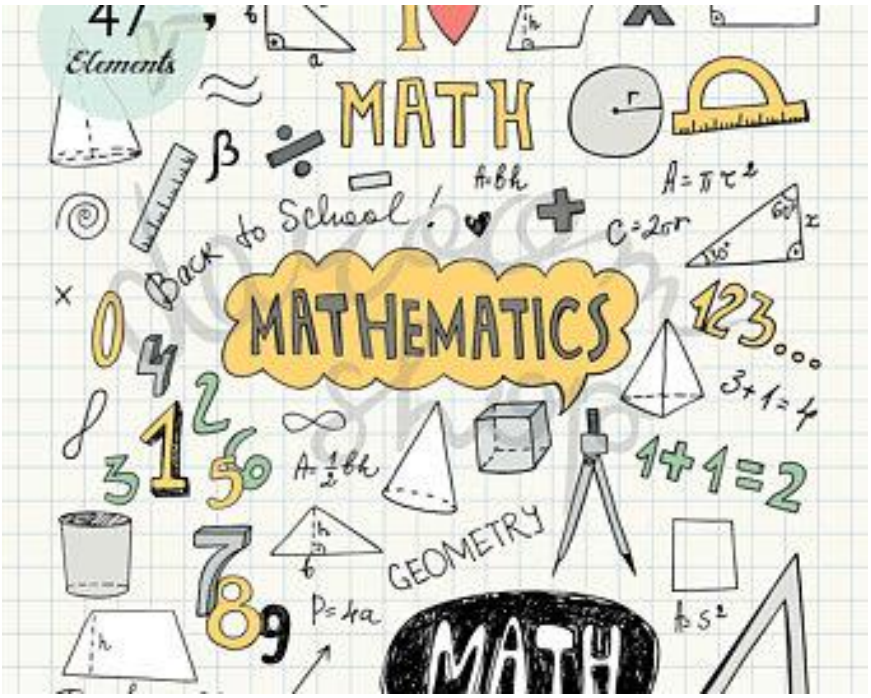
Form:

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.

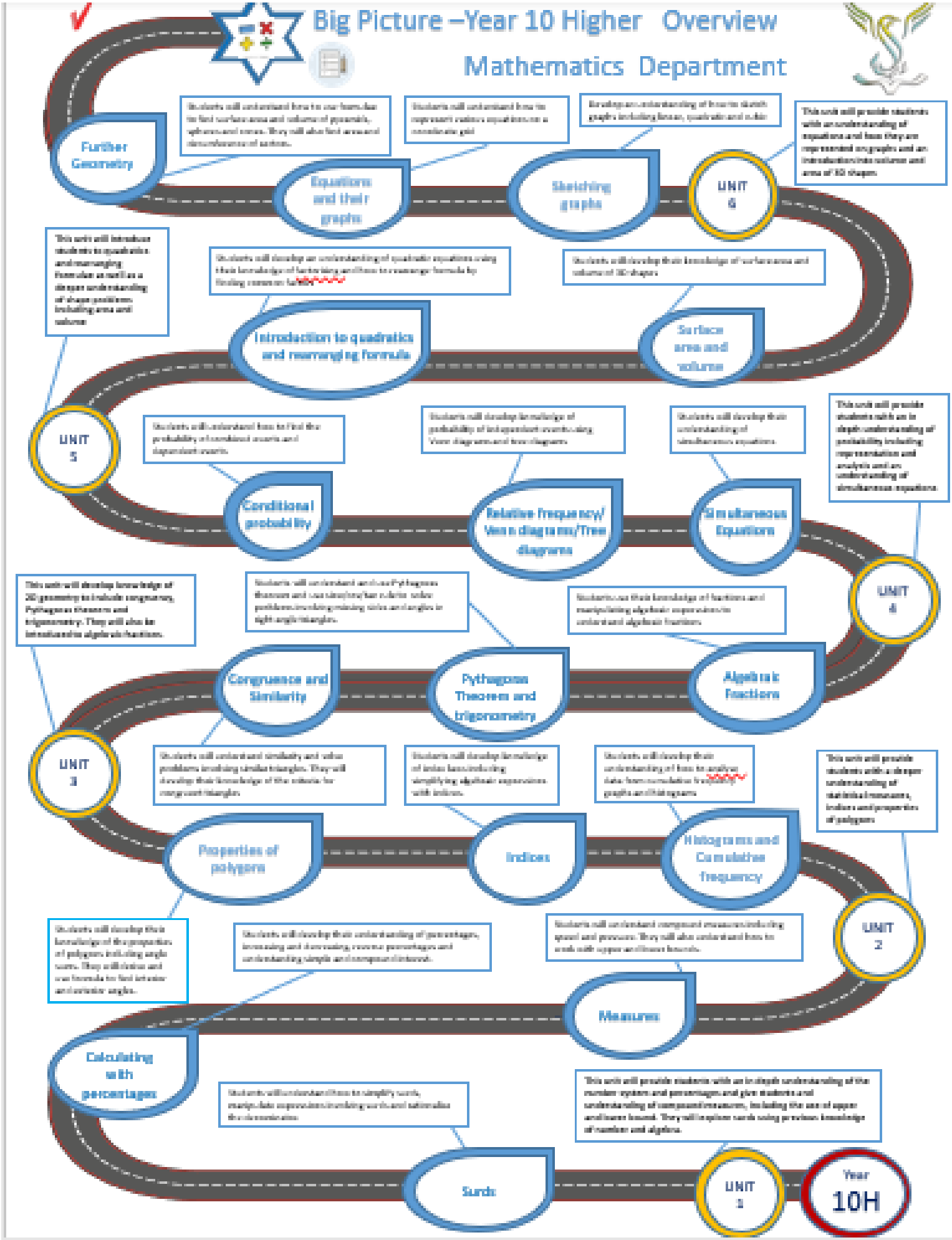
The Knowledge Organiser on page 4 has further practice questions and page numbers linking to your pocket revision guides for all the key information and examples to help you with this unit.

Upload all work onto ClassCharts for feedback.



Contents

Stewards Academy



Year 10 - Higher

Spring One

Congruency & Similarity, Pythagoras' Theorem, Trigonometry, Algebraic fractions

Revision Guide pages:

Congruence and similarity – 75, 85

Pythagoras' Theorem – 90

Trigonometry – 92

Algebraic fractions – 37

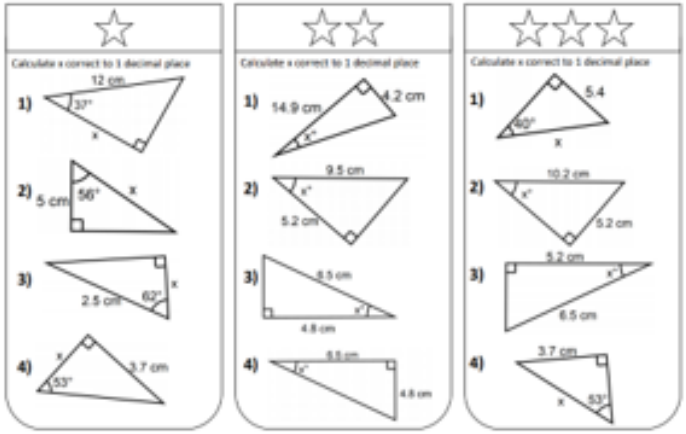
Task 1

Diagram **NOT** accurately drawn

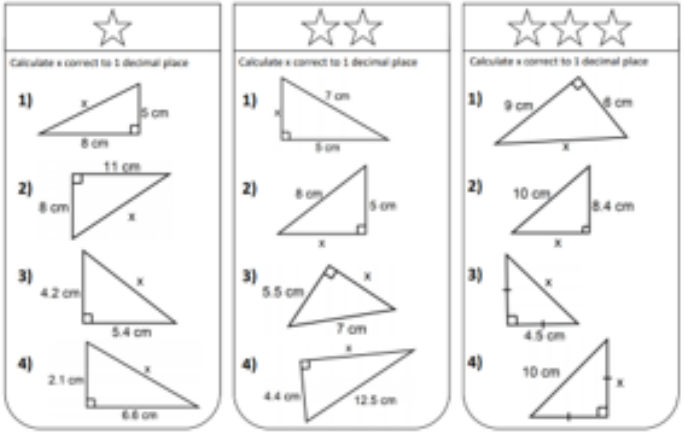
ABC is an equilateral triangle.
D lies on BC.
AD is perpendicular to BC.

Prove that triangle ADC is congruent to triangle ADB.

Task 2



Task 3



Task 4

Diagram NOT accurately drawn

Two solid shapes, A and B, are mathematically similar.
The base of shape A is a circle with radius 4 cm.
The base of shape B is a circle with radius 8 cm.
The surface area of shape A is 80 cm^2.

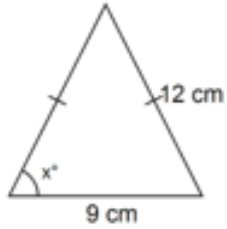
(a) Work out the surface area of shape B.

The volume of shape B is 600 cm^3.

(b) Work out the volume of shape A.

Task 5

Calculate x



Correct to 1 decimal place

Task 6 – Simplify each expression

$$\frac{x+1}{3}+\frac{x}{2}$$

$$\frac{x}{3}+\frac{2x-1}{5}$$

$$\frac{5x+1}{4}-\frac{2x}{3}$$

$$\frac{4x}{5}-\frac{x+2}{2}$$

Stewards Academy

Stewards Academy

Week 1:

- **LI: Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides including the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs**

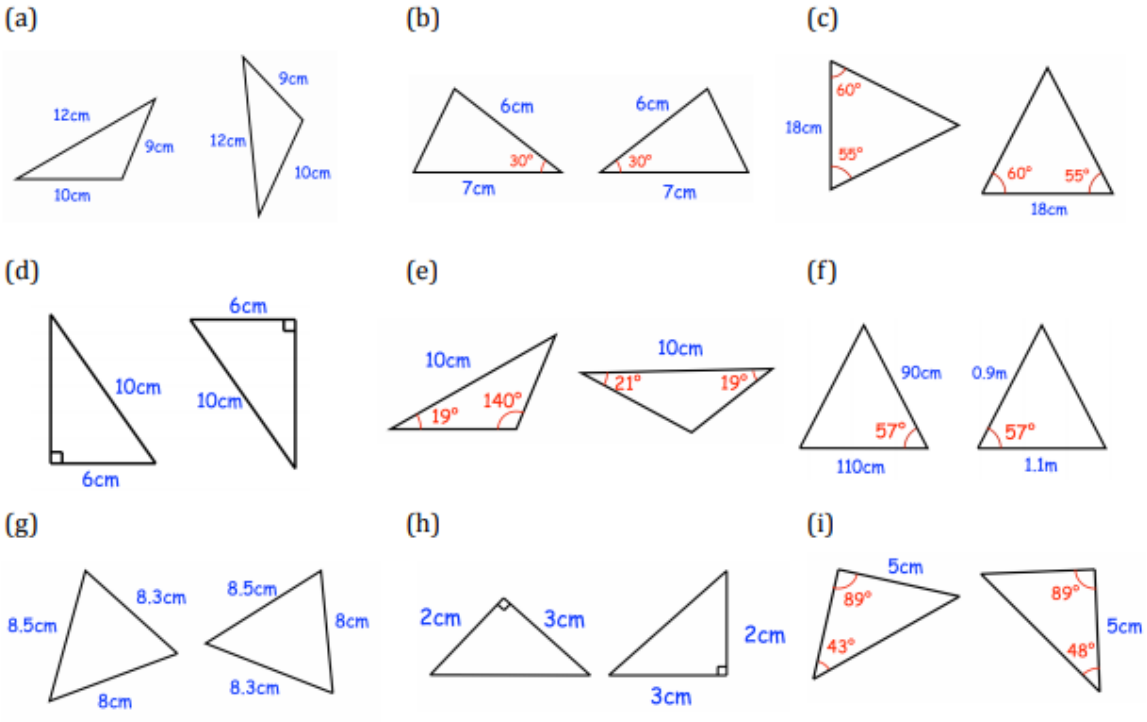
Demonstration Videos:

https://corbettmaths.com/2012/08/10/congruent-and-similar-shapes/
https://corbettmaths.com/2013/04/15/congruent-triangles/
https://www.mathsgenie.co.uk/congruence.html

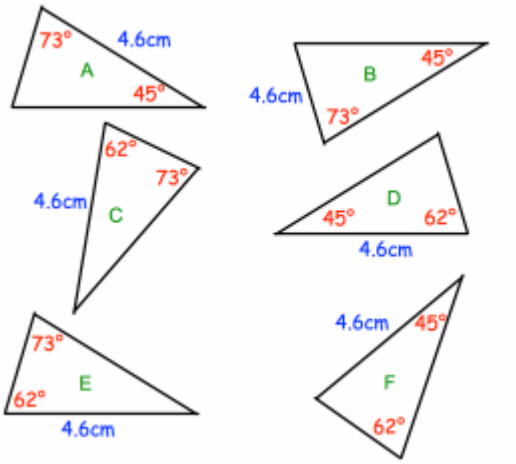
Tasks:

Hint: What do the angles in a triangle add up to?

Question 1: The following pairs of triangles are congruent, state the condition that shows they are congruent.

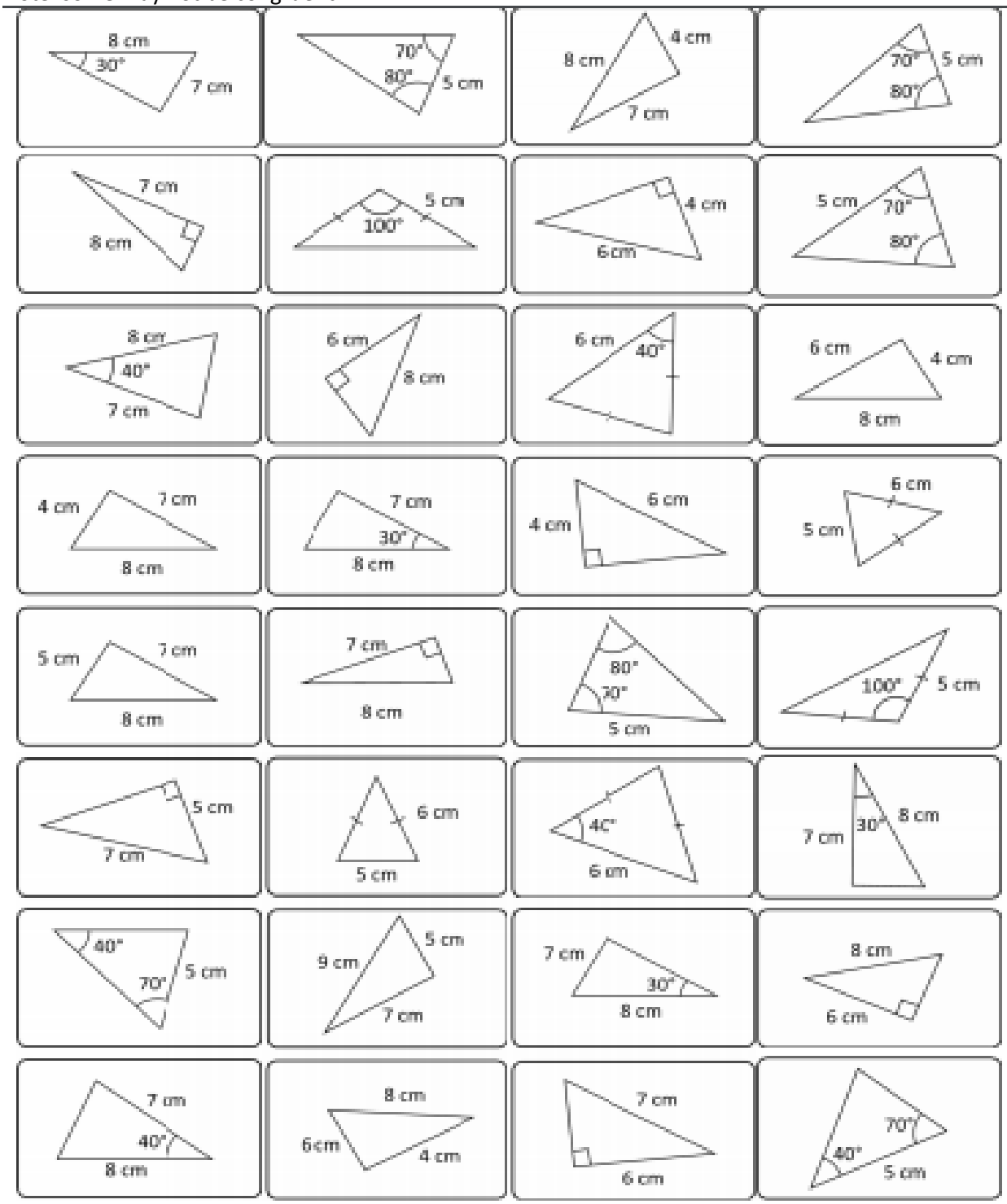


Question 2: Shown are six triangles.
Which triangles are congruent?



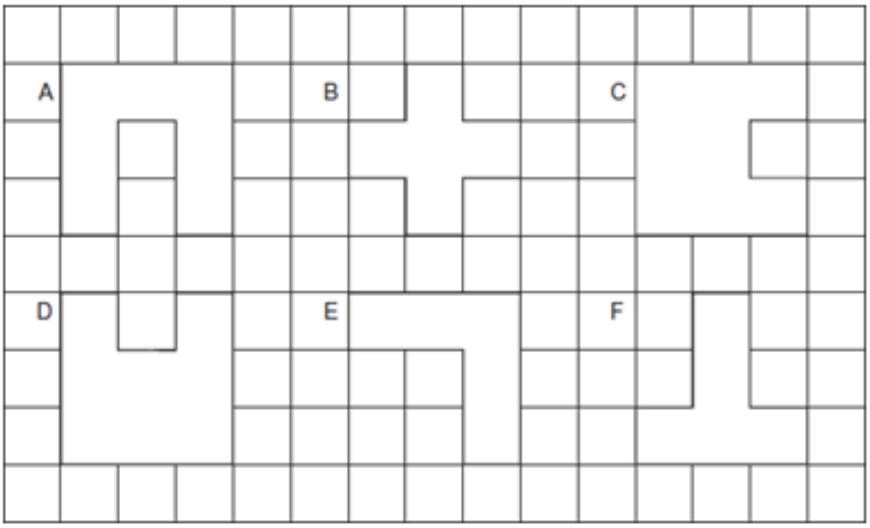
Stewards Academy

Match up the triangles which are congruent and state the condition that shows they are congruent.
Note: some may not be congruent.



RHS	RHS	RHS	ASA
SSS	SSS	SSS	ASA
SAS	SAS	SAS	ASA
Unknown	Not Congruent	Not Congruent	Unknown

Q1.



(a) Which two shapes fit together to make a rectangle?

Answer _____ and _____

(1)

(b) Which two shapes are congruent?

Answer _____ and _____

(1)

(c) Which two shapes have the same area as shape B?

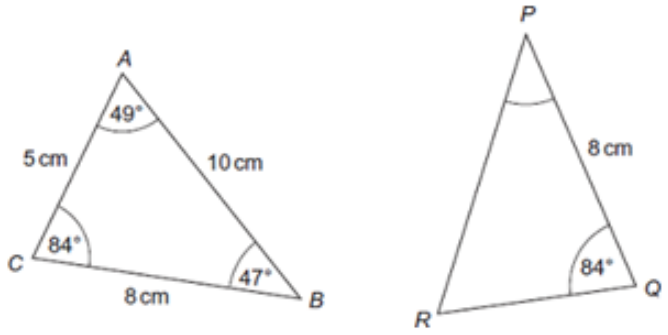
Answer _____ and _____

(2)

Q2.

These two triangles are congruent.

Not drawn accurately



(a) What is the size of angle P?
Circle your answer.

47° 49° 84° none of these

(1)

(b) What is the length of PR?
Circle your answer.

5 cm 8 cm 10 cm none of these

(1)
(Total 2 marks)

Demonstration Videos:

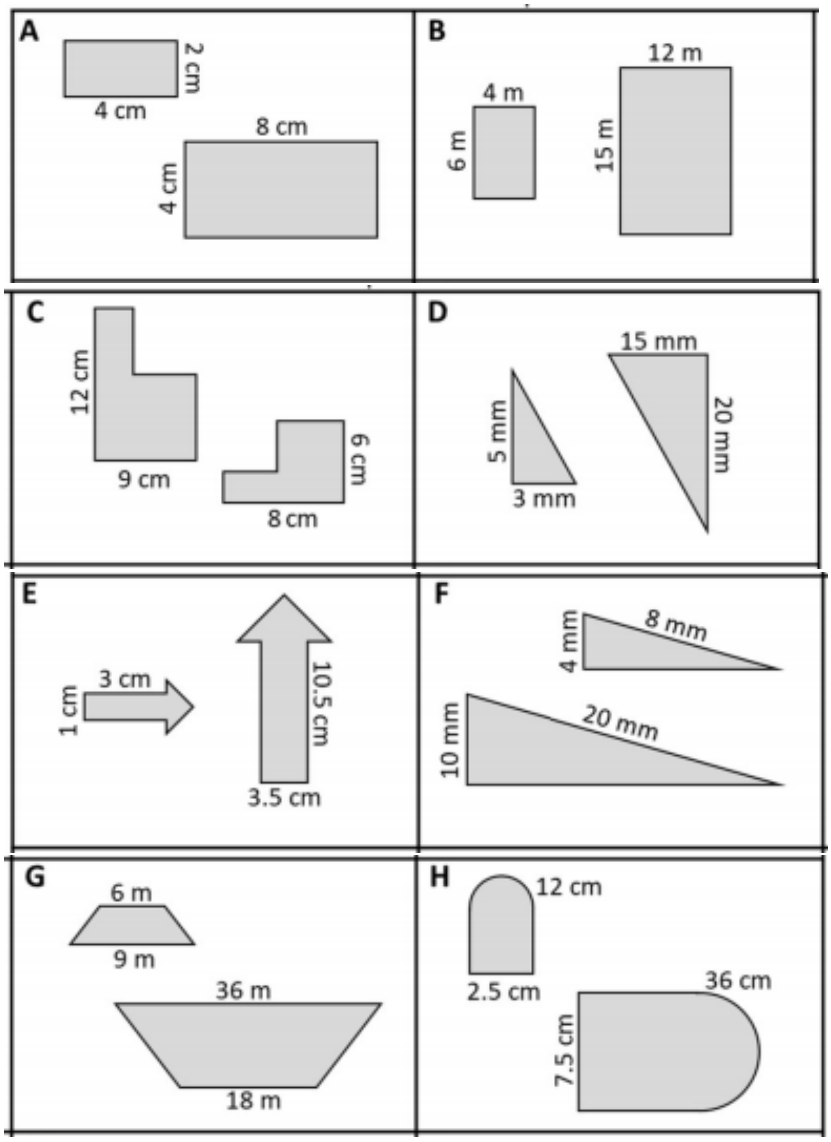
https://corbettmaths.com/2012/08/10/congruent-and-similar-shapes/
https://corbettmaths.com/2013/11/16/similarshapes/

Important Information:

You need to find the scale factor of enlargement to work out the missing sides.
Angles in similar shapes are the same!

Tasks:

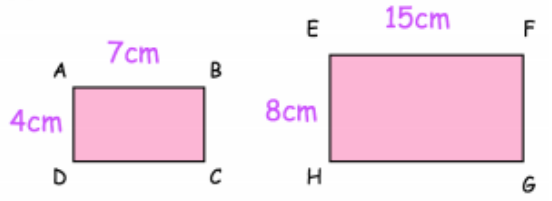
Work out whether these shapes are similar or not



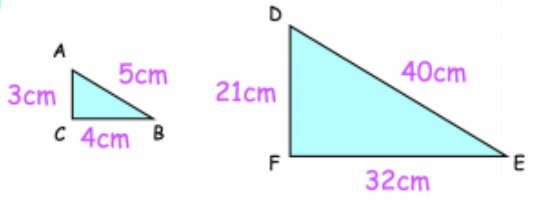
Task 2:

Question 2: These pairs of shapes are **not** similar.
Explain why.

(a)

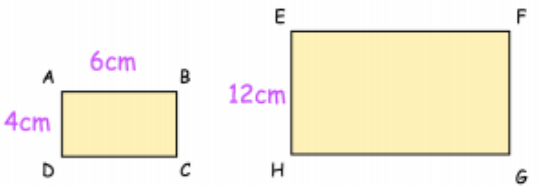


(b)



Question 3: Rectangles ABCD and EFGH are similar.

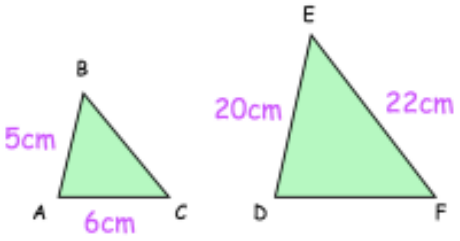
Work out the size of EF



Question 4: Triangles ABC and DEF are similar.

(a) Work out the length of DF

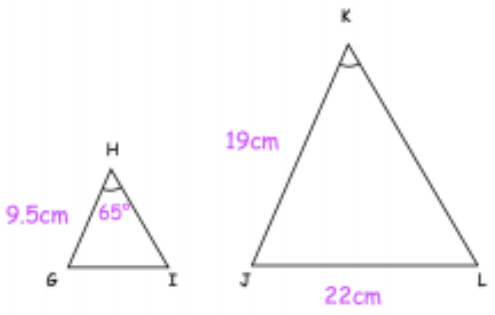
(b) Work out the length of BC



Question 5: Triangles GHI and JKL are similar.

(a) Write down the size of angle JKL

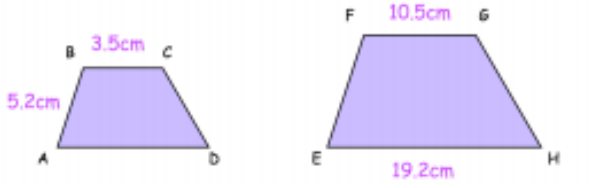
(b) Work out the length of GI



Question 6: Trapezium ABCD and trapezium EFGH are similar.

(a) Work out the length of EF

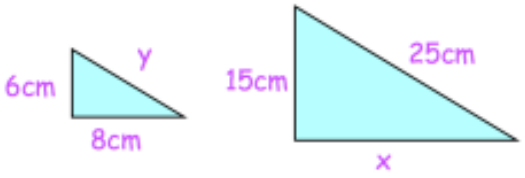
(b) Work out the length of AD



Question 7: The triangles below are similar

(a) Find the size of x

(b) Find the size of y

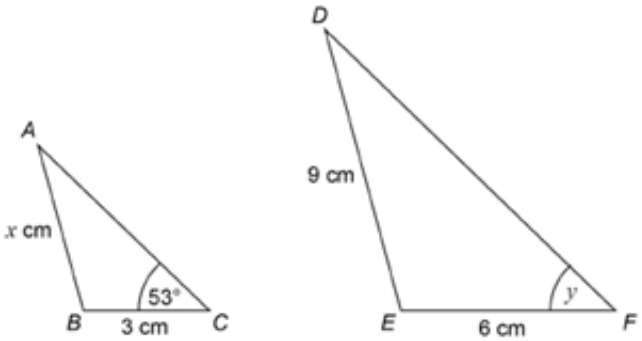


Exam questions:

Q1.

Triangles *ABC* and *DEF* are similar.

Not drawn accurately



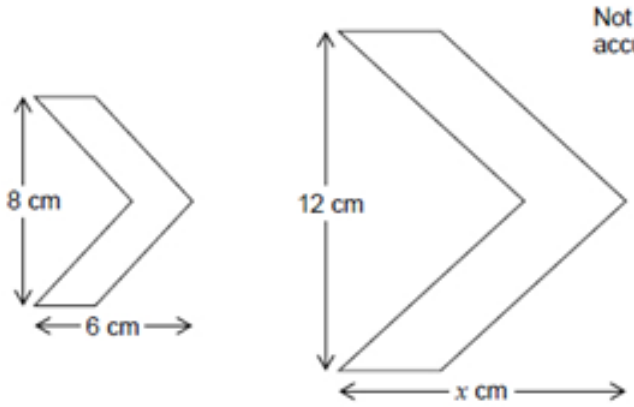
(a) Work out the value of x.

(b) Write down the size of angle y.

Q2.

These two shapes are similar.

Not drawn accurately

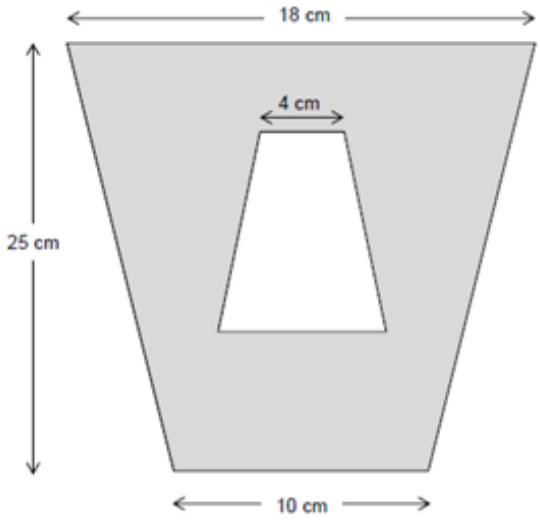


Work out the value of x.

Q3.

A pattern is made from two **similar** trapeziums.

Not drawn accurately



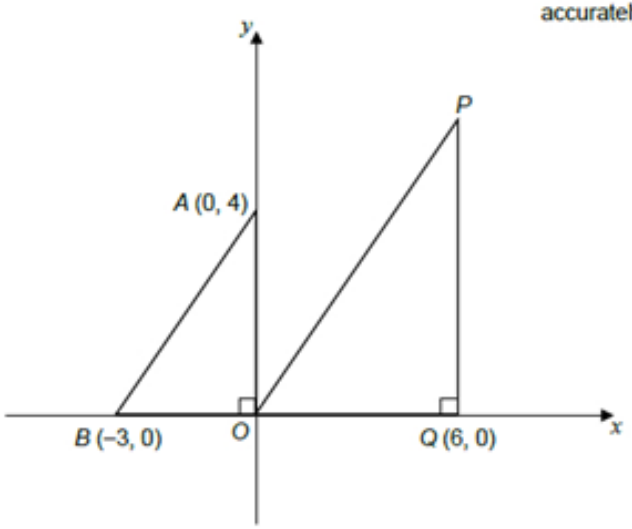
Show that the shaded area is 294 cm²

(Total 4 m

Q4.

Here are two right-angled triangles.

Not drawn accurately



(a) Assume that triangles *AOB* and *PQO* are similar.

Work out the area of triangle *PQO*.

(3)

(b) In fact, *QP* is longer than it would be if the triangles were similar.

How does this affect your answer to part (a)?

(1)

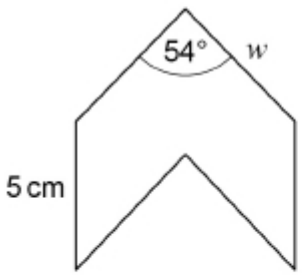
(Total 4 marks)

A and B are similar shapes.

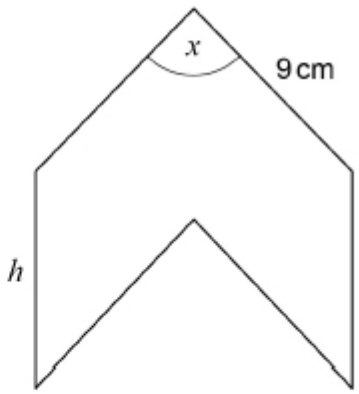
B is an enlargement of A with scale factor 1.5

Not drawn accurately

A



B



Work out the values of x, h and w.

Week 2:

- **LI: Apply the formula for Pythagoras' Theorem to find angles and lengths in right angled triangles and, where possible, general triangles in two and three dimensional figures**

Demonstration Videos:

https://corbettmaths.com/2012/08/19/pythagoras-video/

https://corbettmaths.com/2013/06/22/pythagoras-rectangles-and-isosceles-triangles/

https://corbettmaths.com/2013/06/22/showing-a-triangle-is-right-angled/

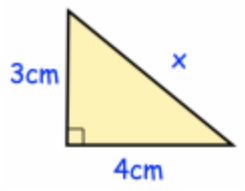
https://www.mathsgenie.co.uk/pythagoras.html

3D Pythagoras Video – Corbettmaths

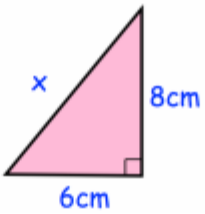
Tasks:

Question 1: For each right angle triangle below, work out x

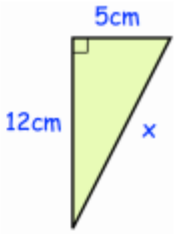
(a)



(b)

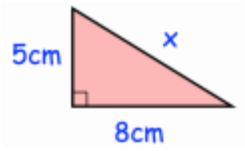


(c)

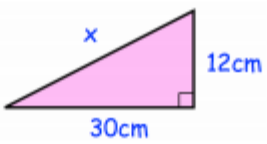


Question 2: Calculate x
Give each answer to 2 decimal places.

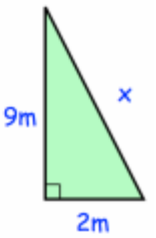
(a)



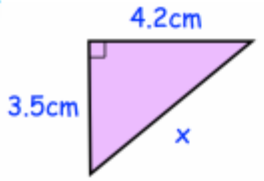
(b)



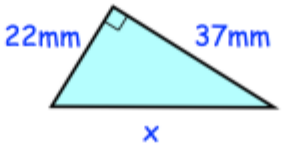
(c)



(d)



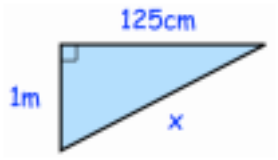
(e)



(f)

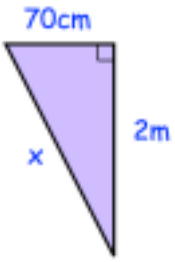
Question 3: Calculate x
Include suitable units and give each answer to 1 decimal place.

(a)



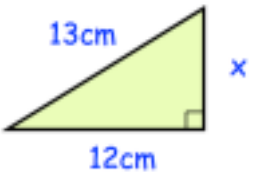
(b)

(c)

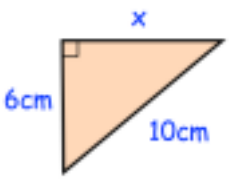


Question 4: For each right angle triangle below, work out x

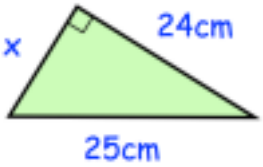
(a)



(b)

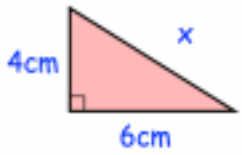


(c)



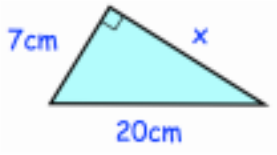
Question 6: Calculate x for each right angle triangle.
Give each answer to 2 decimal places.

(a)



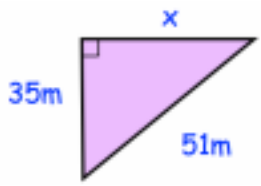
(b)

(c)

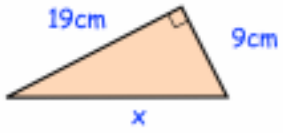


(d)

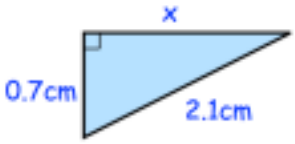
(e)



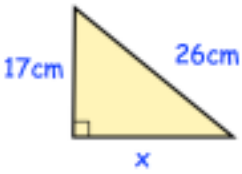
(f)



(g)

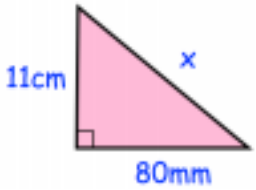


(h)



(i)

(j)



(k)

(l)

Highlight the relevant information for the last four questions and try to draw the triangle out.

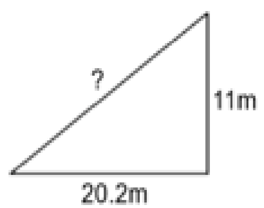
Pythagoras Codebreaker

A	B	C	D	E	F	G	H	I	J	K	L	M
6.9	5.8	6.3	23.4	8.1	14.1	9.5	4.9	16.9	18.3	18	5.7	26.4

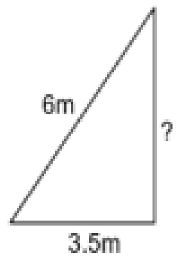
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
27	36.1	4.3	7.2	9.2	22.4	23	3.7	3.6	21.3	22.9	17	32

Answer the questions below (all answers are rounded to 1 decimal place), link your answers to the table above to reveal what I felt about the German sausage joke:

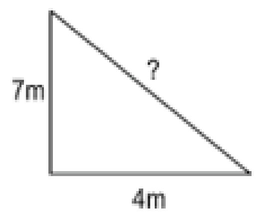
Calculate the missing length:



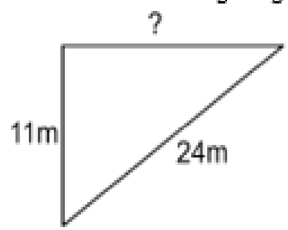
Calculate the missing length:



Calculate the missing length:



Calculate the missing length:



A 4 metre long ladder is leaning against a wall. The base of the ladder is 1.5 metres from the base of the wall. How high up the wall is the top of the ladder?

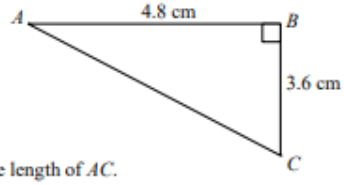
I travel 7km North then 6km West. How far am I from my start point?

The string attached to my kite is 30m long and the kite is immediately above a friend of mine who is 20m away from me. How high is my kite?

A 50m zip wire is attached to them top of a tower and to the ground 44.4m from the base of the tower. How tall is the tower?

Exam Questions:

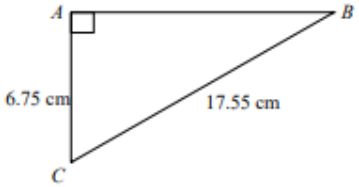
1



Calculate the length of AC.

(Total for question 1 is 3 marks)

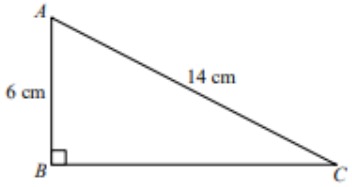
2



Calculate the length of AB.

(Total for question 2 is 3 marks)

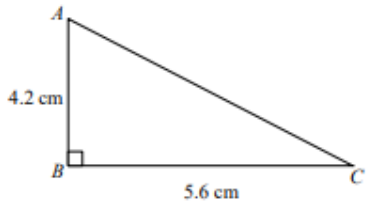
3



Calculate the length of BC.
Give your answer to 1 decimal place.

(Total for question 3 is 3 marks)

4

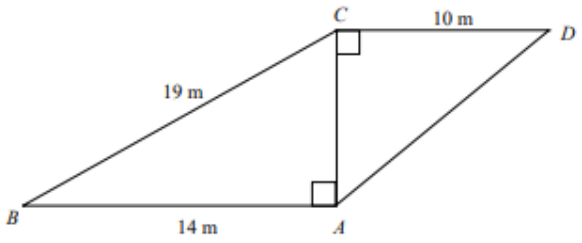


Calculate the length of AC.

(Total for question 4 is 3 marks)

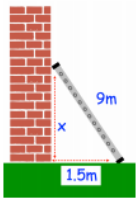
5

Calculate the length of the AD.
Give your answer to 3 significant figures.

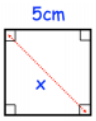


(Total for question 5 is 4 marks)

Apply



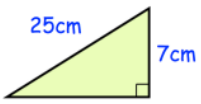
Question 1: A 9m ladder is placed against a wall.
The foot of the ladder is 1.5m from the foot of the wall.
How far up the wall does the ladder reach?



Question 2: Shown is a square with side length 5cm.
Find the length of the diagonal, x.

Question 3: Shown is a right angle triangle.
Calculate:

(a) the perimeter of the triangle.
(b) the area of the triangle.

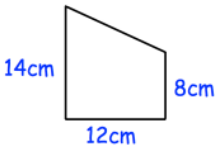


Question 4: A rectangle is 20cm long and 8cm wide.
Find the length of the diagonal of the rectangle.

Question 5: An airplane is flying from Redville to Leek.
The airplane flies 50 miles East and then 180 miles South.
How far is Leek from Redville directly?

Question 6: A frame is made from wire.
The frame is a trapezium
Calculate the total amount of wire needed to make the frame.

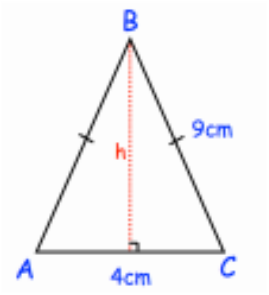
Give your answer to 1 decimal place.



Question 7: ABC is an isosceles triangle.

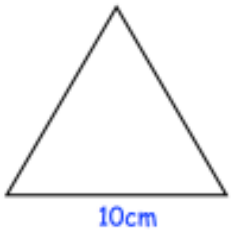
(a) Find h.

(b) Find the area of the triangle.



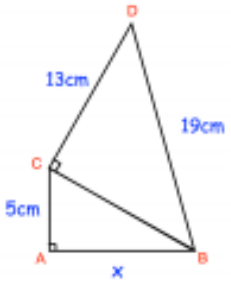
Question 8: Shown is an equilateral triangle.

Find the area of the equilateral triangle.



Question 9: Stanley has drawn a right angle triangle.
One side is 14cm and another is 18cm.
There are two possible lengths for the third side.
What are they?

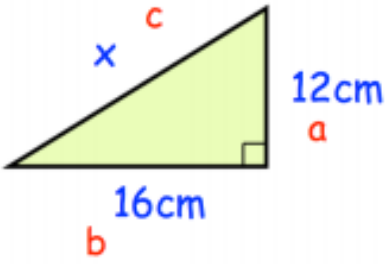
Question 10: ABC and BCD are right angle triangles.
Find the length of AB



Question 11: A wooden flagpole is 25 foot tall.
In a storm, the flagpole is broken and its top touches the ground 5 foot from the base.

Find the lengths of the segments of the flagpole.

Question 12: Benjamin has completed this question.
Can you spot any mistakes?



$a^2 + b^2 = c^2$

$12^2 + 16^2 = x^2$

$144 + 256 = x^2$

$400 = x^2$

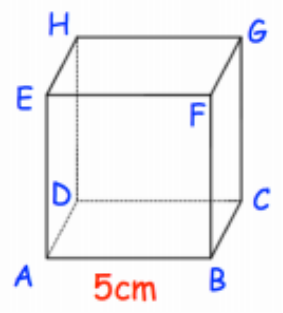
$x^2 = 400$

$x = 200\text{cm}$

Question 1: ABCDEFGH is a cube with side length 5cm.

(a) Work out the length of AC

(b) Work out the length of AG



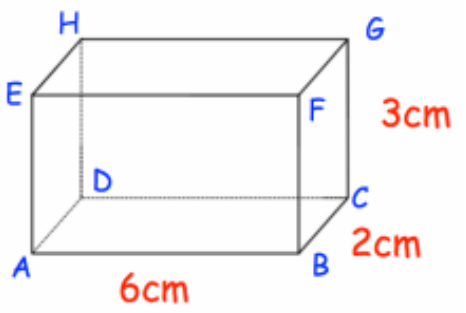
Question 2: ABCDEFGH is a cuboid.
AB = 6cm, BC = 2cm and CG = 3cm.

(a) Work out the length of BG

(b) Work out the length of BD

(c) Work out the length of HC

(d) Work out the length of AG

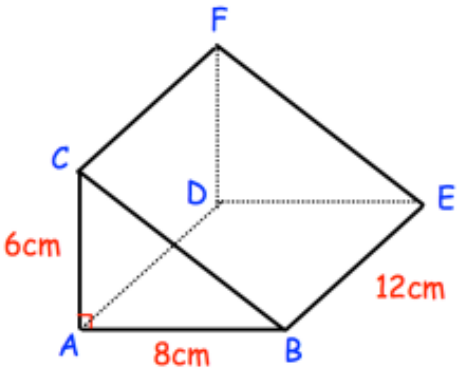


Question 3: Shown is a triangular prism.
Triangle ABC is a right angle triangle.

(a) Work out the length of BC

(b) Work out the length of CD

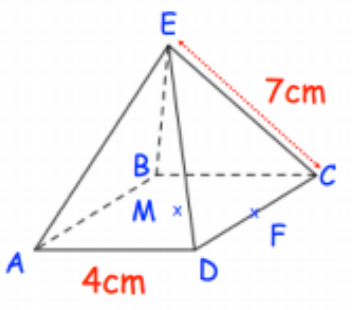
(c) Work out the length of BF



Question 4: Shown is a square based pyramid ABCDE.
F is the midpoint of CD.
M is the point on the base directly below the vertex E.
AD = 4cm and CE = 7cm

Calculate the length of

(a) AC (b) AM (c) EM (d) EF



Week 3:

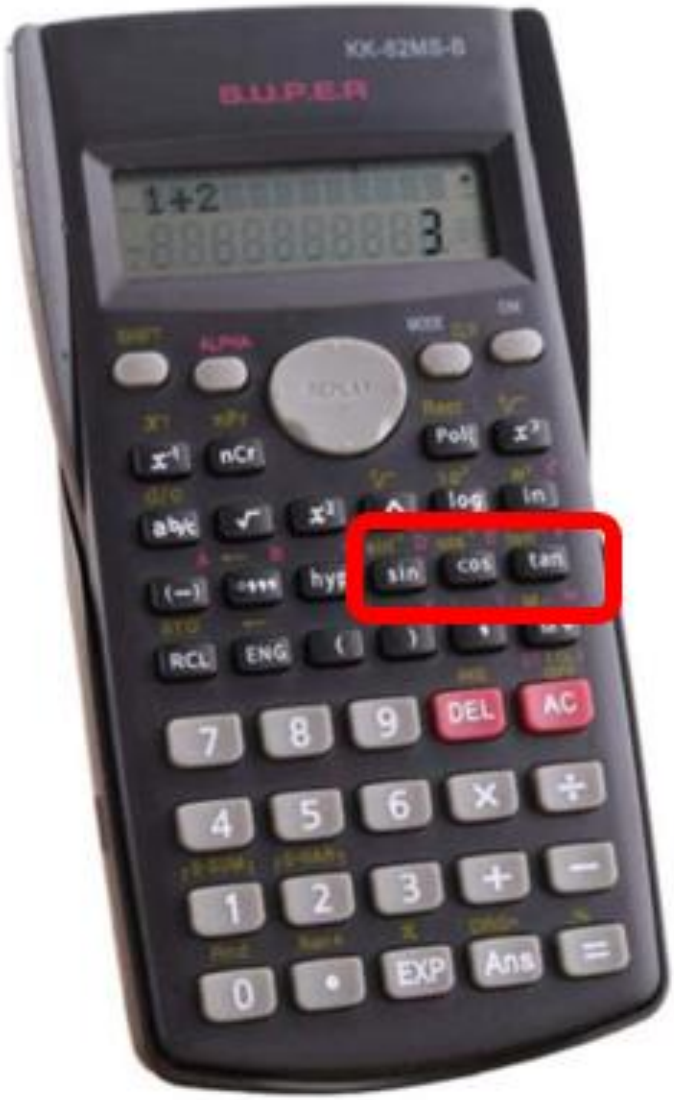
- **LI: Know and use the trigonometric ratios**

Demonstration Videos:

https://corbettmaths.com/2013/03/30/trigonometry-introduction/
https://corbettmaths.com/2013/03/30/trigonometry-missing-sides/
https://corbettmaths.com/2013/03/30/trigonometry-missing-angles/
https://www.mathsgenie.co.uk/sohcahtoa.html

Important Information:

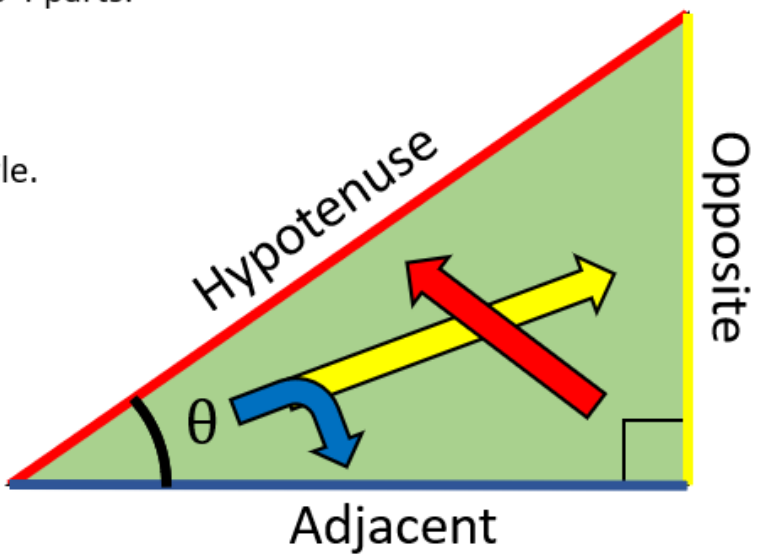
You will need a calculator to complete the majority of these tasks



You will be using these three buttons within this topic. Use the videos to understand how to use them and ask your teacher if you are unsure!

A right-angled triangle has 4 parts.

θ = Theta is either angle.



Hypotenuse – *always* opposite the right-angle & *always* longest.
Opposite – *always* opposite θ.
Adjacent – next to θ.

Remember this …. SOHCAHTOA

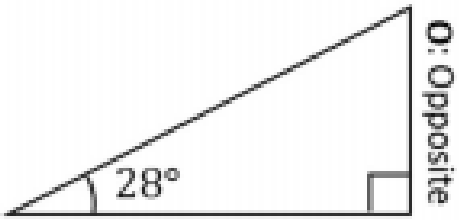
SOH	CAH	TOA
$Sin\ \theta = \frac{Opp}{Hyp}$	$Cos\ \theta = \frac{Adj}{Hyp}$	$Tan\ \theta = \frac{Opp}{Adj}$
O / Sin θ | H	A / Cos θ | H	O / Tan θ | A

Trigonometry: Labelling Right-Angled Triangles

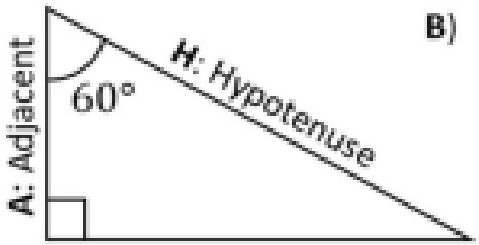
For each triangle, label each side with a letter:

H: Hypotenuse (the longest side)
O: Opposite (opposite the labelled angle)
A: Adjacent (next to the labelled angle)

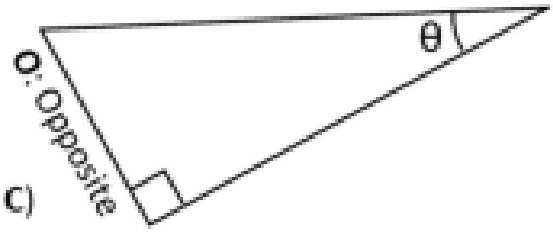
A)



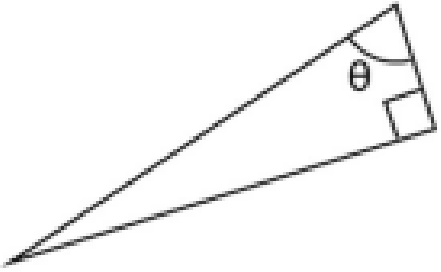
B)



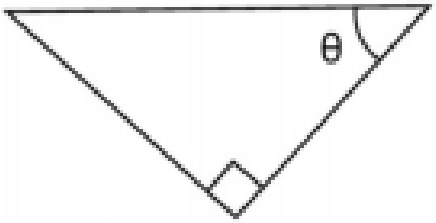
C)



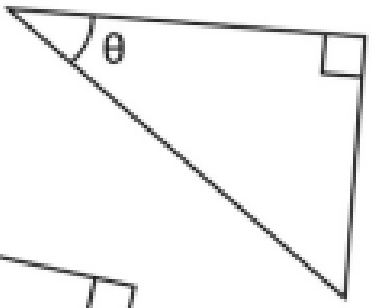
D)



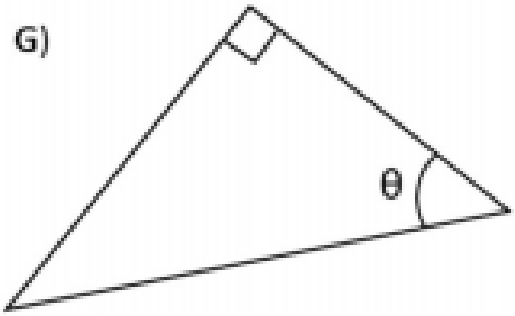
E)



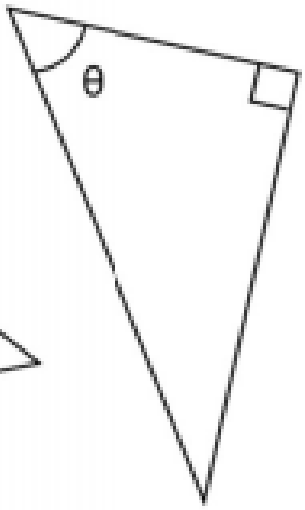
F)



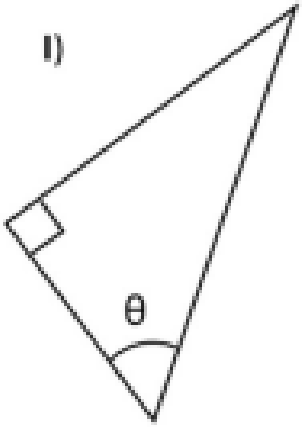
G)



H)



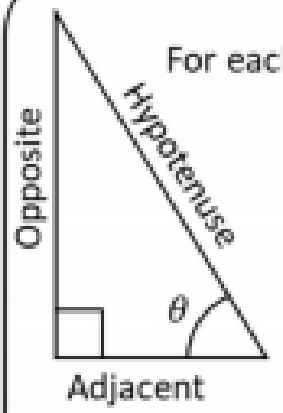
I)

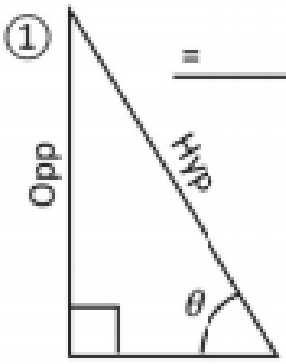


Choosing a Trigonometric Ratio to Use

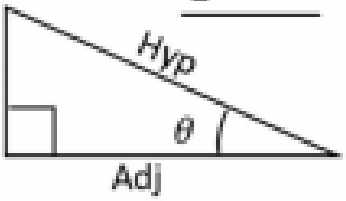
SOH
CAH
or
TOA

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

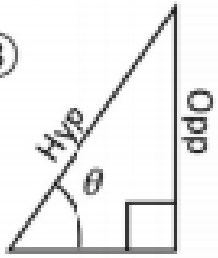


① 

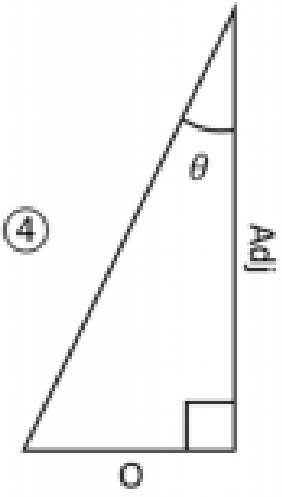
= _____

② 

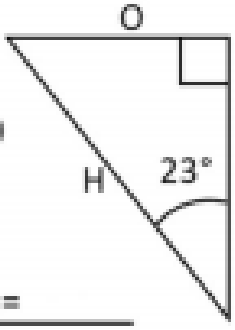
= _____

③ 

= _____

④ 

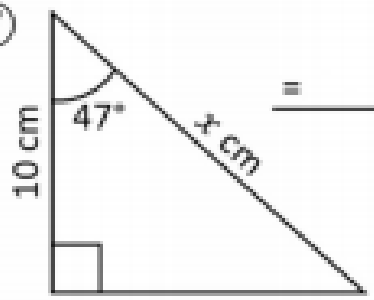
= _____

⑤ 

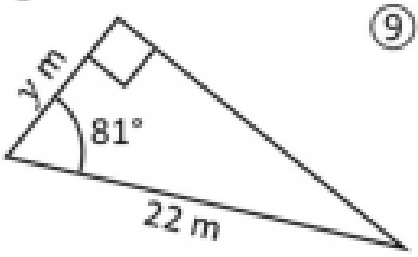
= _____

⑥ 

= _____

⑦ 

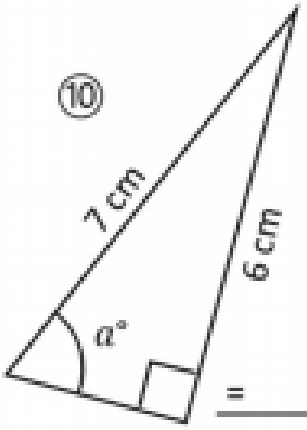
= _____

⑧ 

= _____

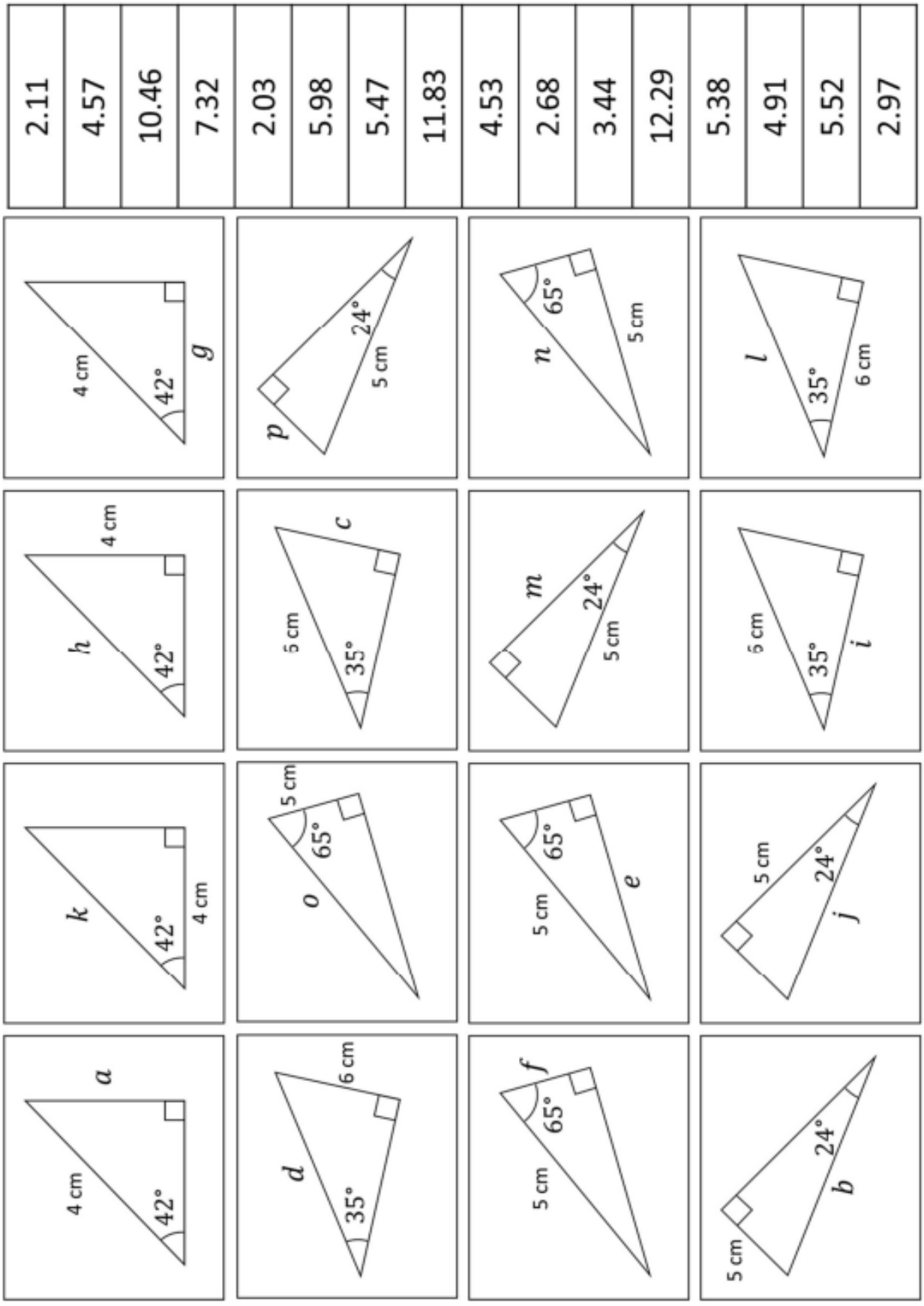
⑨ 

= _____

⑩ 

= _____

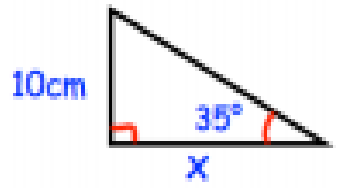
Match up the length of the missing side with one of the answers on the right hand side



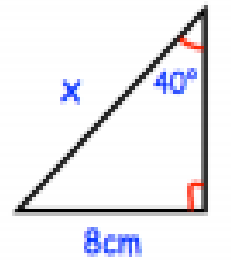
2.11	4.57	10.46	7.32	2.03	5.98	5.47	11.83	4.53	2.68	3.44	12.29	5.38	4.91	5.52	2.97

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

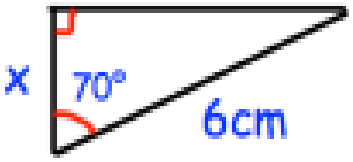
(a)



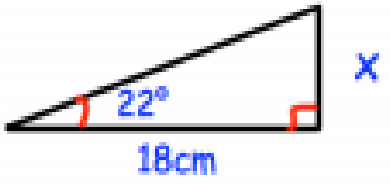
(b)



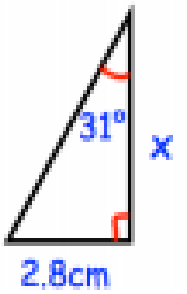
(c)



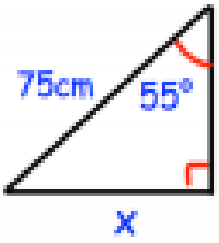
(d)



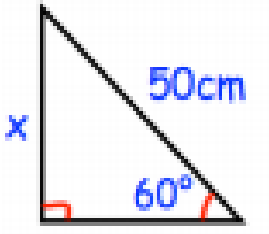
(e)



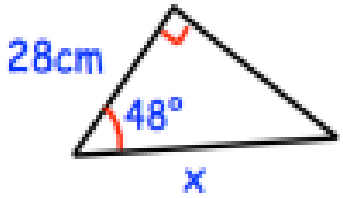
(f)



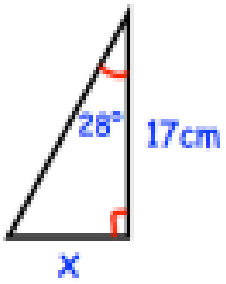
(g)



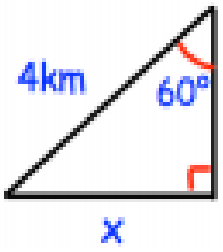
(h)



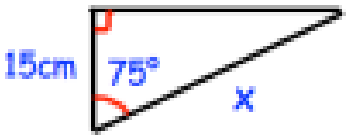
(i)



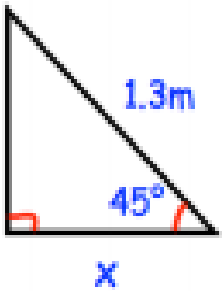
(j)



(k)

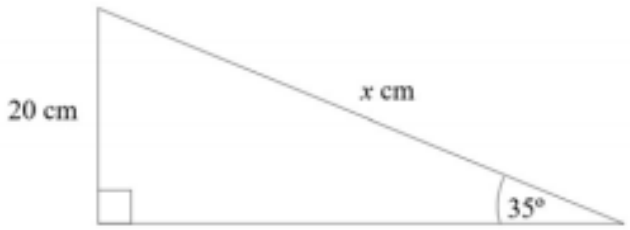


(l)



Exam Questions:

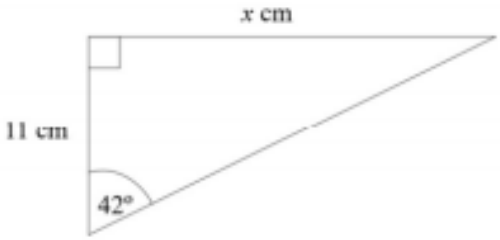
1



Work out the value of x.

(2)

2



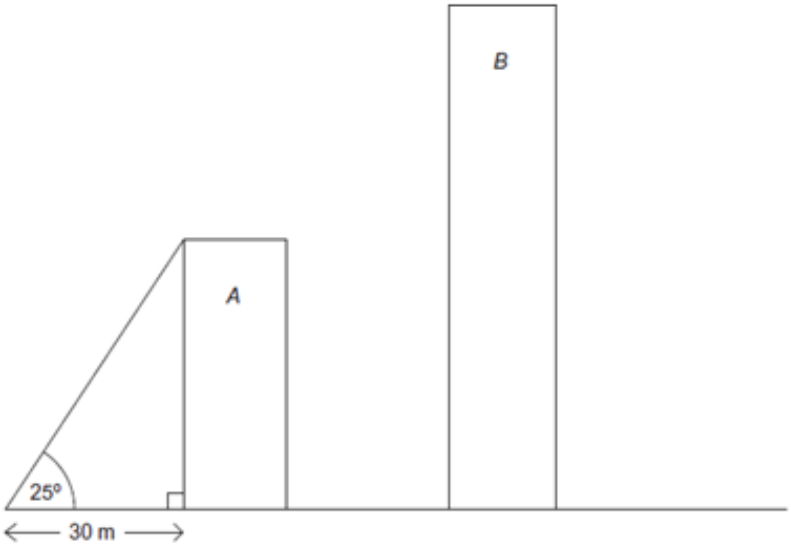
Work out the value of x.

(2)

The diagram shows two buildings, *A* and *B*.

The heights of the buildings are in the ratio 3 : 5

Not drawn accurately



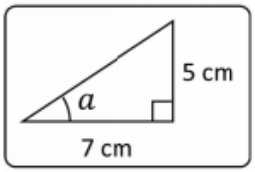
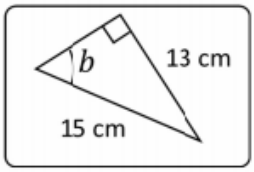
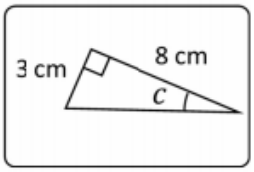
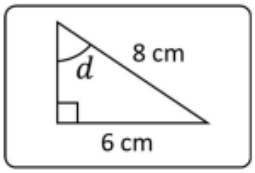
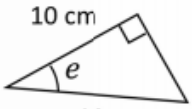
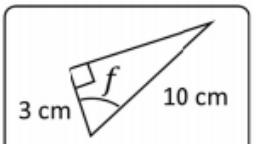
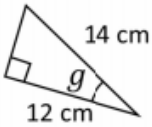
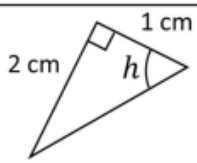
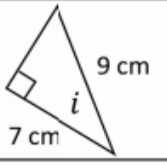
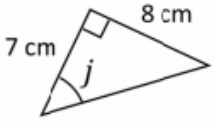
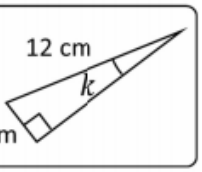
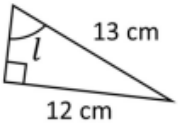
Work out the height of building *B*.

Answer _____ metres

(Total 4 marks)

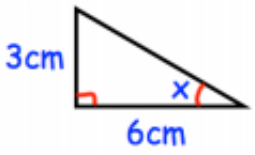
Stewards Academy

Find the missing angle using trigonometry and match it up to the answers below (the answer will be to one decimal place)

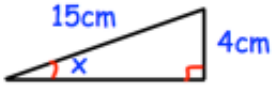
			
			
			
20.6°	48.8°	48.6°	44.4°
14.5°	60.1°	35.5°	63.4°
67.4°	72.5°	31.0°	38.9°

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

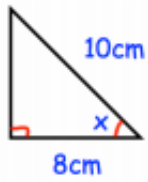
(a)



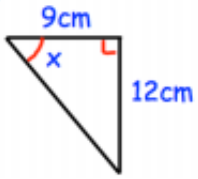
(b)



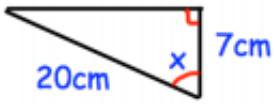
(c)



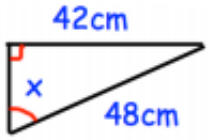
(d)



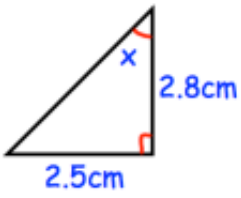
(e)



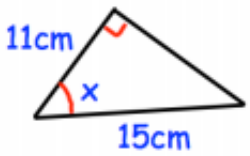
(f)



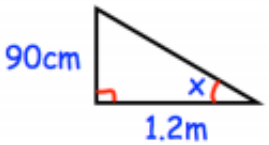
(g)



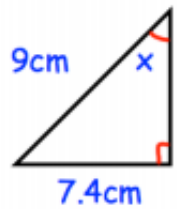
(h)



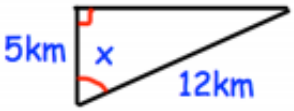
(i)



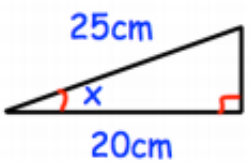
(j)



(k)



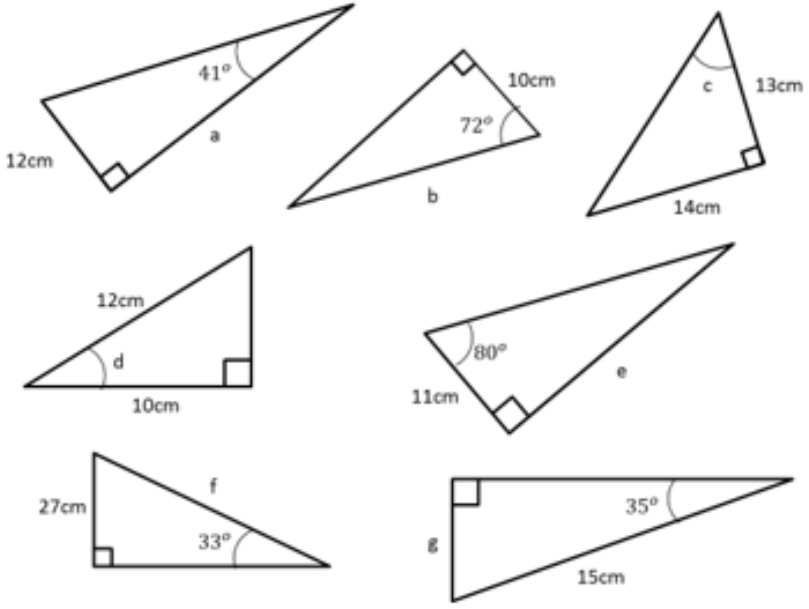
(l)

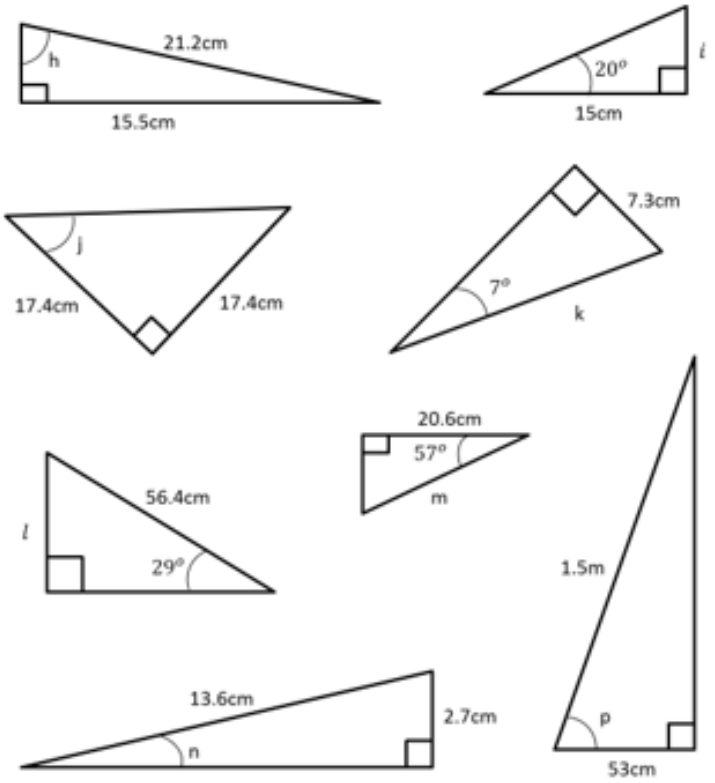


SOHCAHTOA Code Breaker

To	Pub	Obtuse	90	Why	It	Go	Shop	Because	Reflex
9	16	34	11	14	60	50	41	45	40
The	How	What	Was	Sine	Cos	Degrees	Angle	Beach	On
47	18	10	27	65	15	69	62	5	26
Not	Like	Over	30	Tan	Did	Right	Hot	Triangle	Acute
23	48	38	79	83	32	33	40	2	56

Find the missing side or angle labelled (rounded to the nearest whole number), then use the code above to translate your answer into part of the coded joke on the other side.





As you decode your answers, fill in the gaps below.

_____ _____ _____ _____ _____ _____

_____ _____ _____ ?

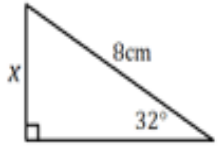
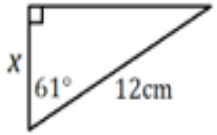
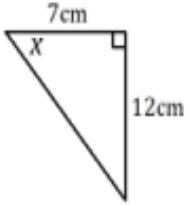
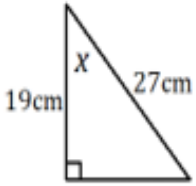
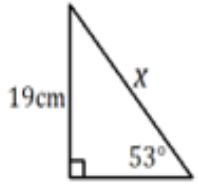
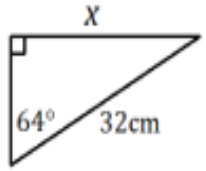
_____ _____ _____ _____ _____ _____

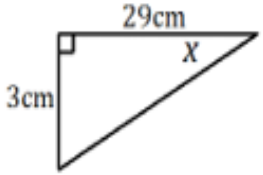
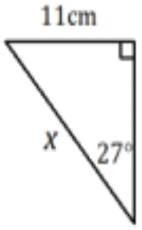
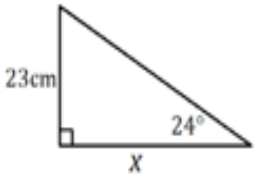
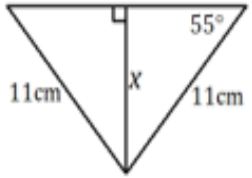
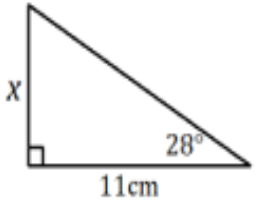
Trigonometry Codebreaker 1

A	B	C	D	E	F	G	H	I	J	K	L	M
24	5	47	56	45	32	10	17	4	30	16	52	60

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
29	9	13	65	28	7	6	21	14	8	27	39	41

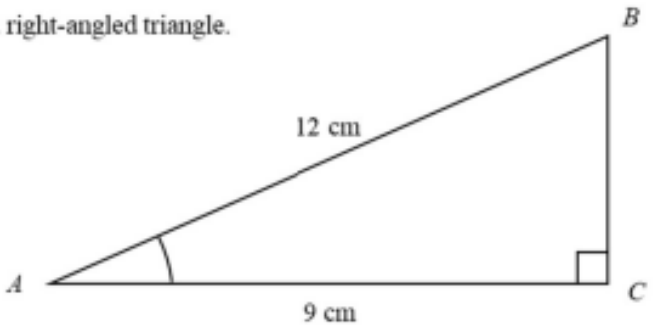
Find the value of x in each case below **giving your answers to the nearest whole number**, link your answers to the table above to reveal why I was so grateful that someone explain the meaning of the word "loads" to me:

Exam Questions:

1 ABC is a right-angled triangle.



(a) Work out the size of angle BAC.
Give your answer correct to 1 decimal place.

.....°

(2)

The length of side AB is reduced by 1 cm.
The length of side AC is still 9 cm.
Angle ACB is still 90°

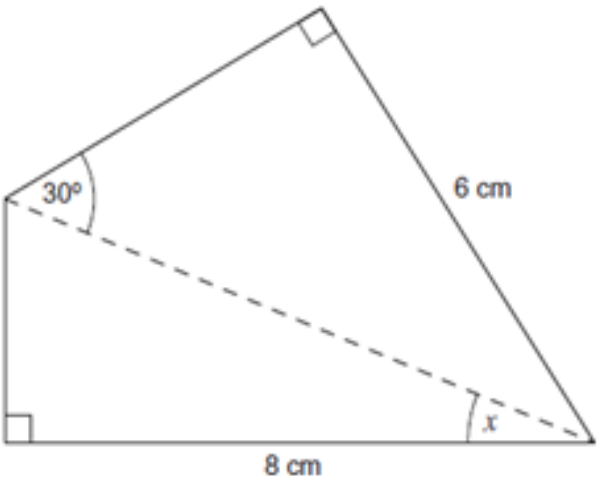
(b) Will the value of cos ABC increase or decrease?
You must give a reason for your answer.

.....

.....

The diagram shows a quadrilateral.

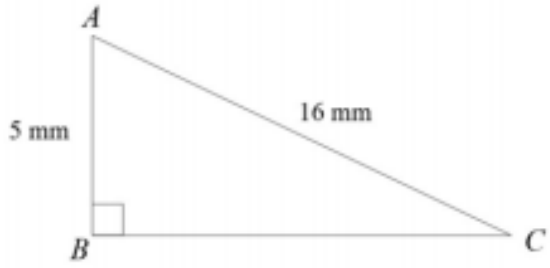
Not drawn accurately



Work out the size of angle x.

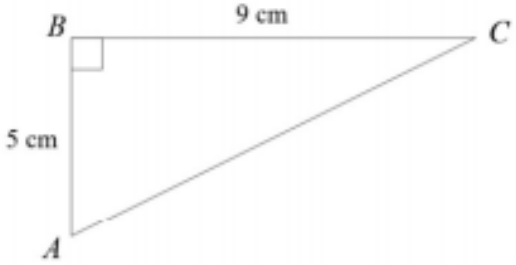
Answer _____ degrees

(Total 4 marks)



Calculate the size of angle *BAC*.

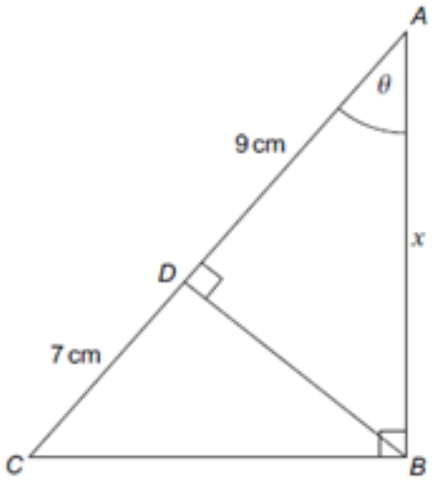
(2)



Calculate the size of angle *ACB*.

(2)

ABC is a right-angled triangle.
D is a point on *AC*.
BD is perpendicular to *AC*.



Not drawn accurately

(a) Use triangle *ABC* to write cos θ in terms of x

cos θ = _____

(1)

(b) By writing another expression for cos θ in terms of x, or otherwise, work out the value of x.

x = _____ cm

(2)

(Total 3 marks)

Week 4:

- **LI: Calculate the exact value of sin and cos 0, 30, 45, 60 and 90 degrees and solve more complex exam style problems involving ratio and trig**

Demonstration Videos:

https://corbettmaths.com/2013/04/20/exact-trigonometric-values/
https://www.mathsgenie.co.uk/exact-trig-values.html

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

Important Information:

You will need to learn these off by heart – use the videos to explore how to memorise them!

Exact Values of Trigonometric Functions

Angle (θ) Degrees	$0°$	$30°$	$45°$	$60°$	$90°$
$\sin(\theta)$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos(\theta)$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan(\theta)$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not Defined

Tasks:
Exact trigonometry values

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° (d) sin 45° + cos 45°

Question 3: Write down the exact values of each of the following

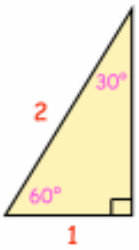
(a) sin 45° + cos 45° (b) tan 30° + tan 60° (c) cos 30° + sin 60°

1	Write down the exact value of sin (45)	**(1 mark)**
2	Write down the exact value of cos (90°)	**(1 mark)**
3	Write down the exact value of tan (30)	**(1 mark)**
4	Write down the exact value of sin (30°)	**(1 mark)**
5	Write down the exact value of tan (45)	**(1 mark)**
6	Write down the exact value of cos (0°)	**(1 mark)**
7	Write down the exact value of sin (60)	**(1 mark)**
8	Write down the exact value of sin (0)	**(1 mark)**

Question 1: Using the triangle below, explain each of the following.

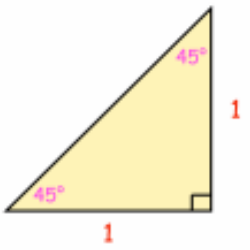
(a) $sin(30°) = \frac{1}{2}$ (b) $cos(30°) = \frac{\sqrt{3}}{2}$ (c) $tan(30°) = \frac{\sqrt{3}}{3}$

(d) $sin(60°) = \frac{\sqrt{3}}{2}$ (e) $cos(60°) = \frac{1}{2}$ (f) $tan(60°) = \sqrt{3}$



Question 2: Using the triangle below, explain each of the following.

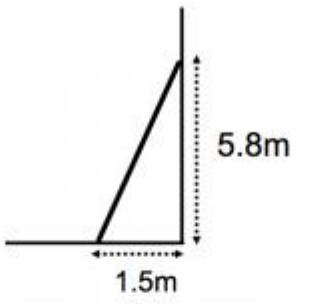
(a) $tan(45°) = 1$ (b) $sin(45°) = \frac{\sqrt{2}}{2}$ (c) $cos(45°) = \frac{\sqrt{2}}{2}$



Question 3: Conor says that $cos(45°) = \frac{1}{\sqrt{2}}$

Is he correct?

5. A ladder is placed against a wall.
To be safe, it must be inclined at between 70° and 80° to the ground.

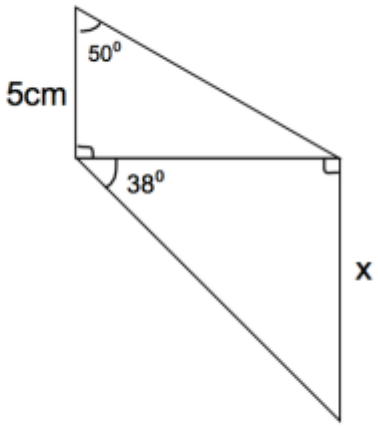


(a) Is the ladder safe?

.....
(3)

(b) Calculate the length of the ladder.

6. The diagram shows two right-angled triangles.



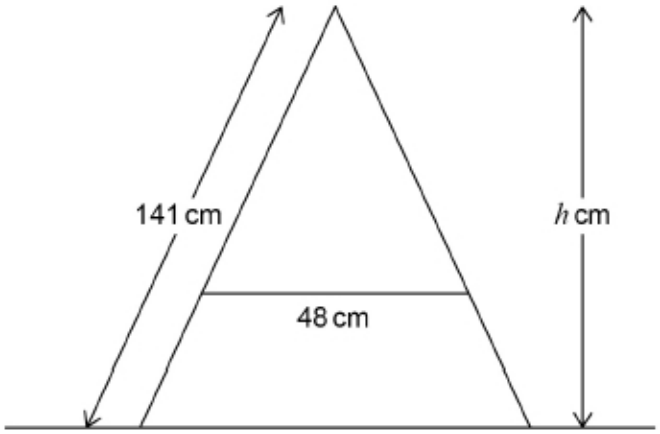
Calculate the value of x.

The diagram shows the side view of a step ladder with a horizontal strut of length 48 cm

The strut is one third of the way up the ladder.

The symmetrical cross section of the ladder shows two similar triangles.

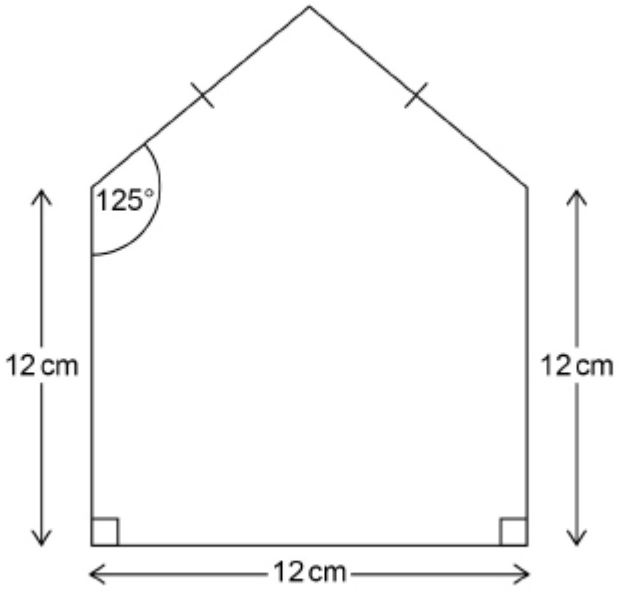
Not drawn accurately



Work out the vertical height, h cm, of the ladder.

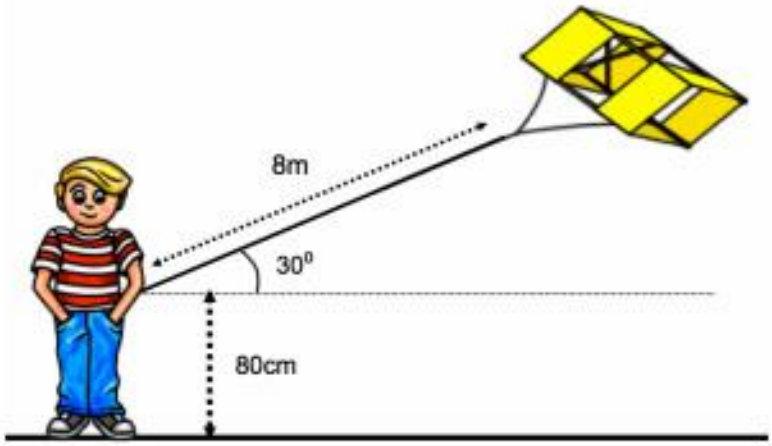
A pentagon is made from a square and an isosceles triangle.

Not drawn accurately



Work out the perimeter of the pentagon.

14. A boy is flying a kite.



The string is held 80cm above the ground.
The kite is on a string which is 8m long.
The string makes an angle of 30° with the horizontal.

Calculate the height of the kite above the ground.

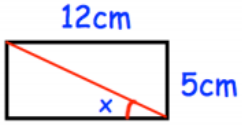
In each question, draw a diagram unless it has been given.

Question 1: A 4 metre long ladder is placed against a wall. The angle between the ladder and the ground is 75°. How far up the wall does the ladder reach?

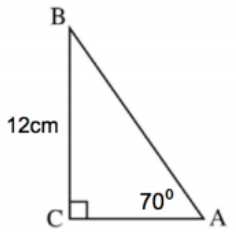
Question 2: A 5 metre long ladder is placed against a wall. It reaches 4.3 metres up the wall. What is the angle between the ladder and the ground?

Question 3: A ladder is placed against a wall.
The base of the ladder is 4 foot from the bottom of the wall.
The angle between the ladder and the ground is 80°.
What is the length of the ladder?

Question 4: A rectangle is 12cm long and 5cm wide. Find the size of the angle marked x.



Question 5: (a) Find the length of AC.
(b) Find the length of AB.
(c) Find the perimeter of triangle ABC.
(d) Find the area of triangle ABC.



Week 5:

- **LI: Apply rules of algebraic simplification to fractions using all four operations**

Demonstration Videos:

Simplifying algebraic fractions Video – Corbettmaths
Adding algebraic fractions Video – Corbettmaths

Tasks:

Question 1: Simplify the following algebraic fractions

(a) $\frac{42xyz}{56}$ (b) $\frac{45ab}{60abc}$ (c) $\frac{16mn}{18n}$ (d) $\frac{40x^2y}{32xy}$

(e) $\frac{17cf}{34c^3}$ (f) $\frac{8x^4}{2x^2}$ (g) $\frac{33a^2b^2}{44a^3b}$ (h) $\frac{12x^3}{20x^7}$

Question 2: Simplify the following algebraic fractions

(a) $\frac{6x+8}{2}$ (b) $\frac{9x-12}{3}$ (c) $\frac{35x^2+20}{5}$

(d) $\frac{7m-70n^3}{7}$ (e) $\frac{10c+25}{15}$ (f) $\frac{8w+2-4x}{12}$

(g) $\frac{9x^2+12x+33}{6}$ (h) $\frac{3x^2+5x}{x}$ (i) $\frac{3x^3-7x^2}{x}$

(j) $\frac{8x^6+x^4+3x}{x}$ (k) $\frac{10x^7+15x^5-30x^4}{5x}$ (l) $\frac{3c^6-15c^4}{6c}$

(m) $\frac{-8x^5-12x^4+2x^3}{-4x}$ (n) $\frac{6c^9-12c^3}{3c^2}$ (o) $\frac{6c^6+2c^2}{4c^4}$

Question 3: Simplify the following algebraic fractions

(a) $\frac{(x+6)(x+3)}{(x+3)}$ (b) $\frac{(x-1)(x+1)}{(x-1)}$ (c) $\frac{(x-3)}{(x-4)(x-3)}$

(d) $\frac{(x+7)^2}{(x+7)}$ (e) $\frac{(x-3)(x+2)}{(x+2)(x+9)}$ (f) $\frac{(x+2)(x+4)^2}{(x+4)}$

(g) $\frac{(x+1)(x+2)(x+3)}{(x+2)(x+3)(x+4)}$ (h) $\frac{x(x+3)^2}{x(x+1)(x+3)}$

Question 4: Simplify the following algebraic fractions

(a) $\frac{x^2+5x+4}{x^2+4x+3}$ (b) $\frac{x^2+6x+9}{x^2-2x-15}$ (c) $\frac{x^2-2x}{x^2+2x-8}$

(d) $\frac{x^2-7x+10}{x^2+3x-10}$ (e) $\frac{x^2+8x+15}{x^2-x-12}$ (f $\frac{x^2+13x+40}{x^2+14x+48}$

(g) $\frac{x^2-2x-8}{x^2+6x-40}$ (h) $\frac{x^2+10x+24}{x^2-36}$ (i) $\frac{x^2+4x-45}{x^2+10x+9}$

(j) $\frac{x^2+11x}{x^2-121}$ (k) $\frac{x^2-1}{x^2+x}$ (l) $\frac{x^2-15x+44}{x^2-16}$

(m) $\frac{x^2-x-6}{x^2-2x-3}$

Answer GRID Cross off each answer, then shade the remaining 5.

$\frac{x^2y}{xy}$	$4xy \div y$	$\frac{4xy^2}{2xy}$	$9y^3 \div 3y$	$\frac{8x^3}{4x}$
$5x^2y^3 \div xy^2$	$\frac{6x^3y^4}{2x^2y}$	$x^5y^3 \div x^3y$	$\frac{4x^6y^3}{4x^4y^3}$	$4x^3y^5 \div x^3y$
$\frac{3x^4y}{6x^2}$	$12x^5y^5 \div 2xy^2$	$\frac{6x^6y}{4x^4y}$	$5x^3y^4 \div 2x^3y^2$	$\frac{12x^4y^3}{4x^4y^2}$
$2x^3y^2 \div \frac{1}{2}x^3y$	$\frac{9x^6y^6}{3xy^4}$	$x^3y^5 \div 2x^2y^2$	$\frac{12x^4y^3}{9xy^3}$	$4x^3y^5 \div 2x^4y^2$

$2x^2$	$\frac{3}{2}x^2$	x^2y^2	$3y^2$	$4y$
$\frac{1}{2}xy^3$	x	$2x^2y^2$	$\frac{4}{3}x^3$	$5xy$
$6x^4y^3$	$3x^5y^2$	$4y^4$	$4x$	$\frac{1}{2}x^2y$
$2x^{-1}y^3$	$3y$	$5y^4$	$\frac{5}{2}y^2$	$3x^3y$
$2y$	$\frac{1}{2}x^3y^4$	$3xy^3$	$\frac{2}{3}x^3y^4$	x^2

Decide if each card is **TRUE** or **FALSE**! Find the factor we can use to simplify the numerator & denominator.

A $\frac{x^2+4x}{2x+8} \Rightarrow \frac{x}{2}$	**B** $\frac{5x-10}{x^2-2x} \Rightarrow \frac{5}{2x}$	**C** $\frac{2x^2-2x}{3x-3} \Rightarrow \frac{2x}{3}$
D $\frac{x^3+5x^2}{4x+20} \Rightarrow \frac{x^3}{4}$	**E** $\frac{2x^2+3x}{8x+12} \Rightarrow \frac{x}{2}$	**F** $\frac{9x-12}{15x^2-20x} \Rightarrow \frac{3}{5x}$
G $\frac{20-8x}{5x^2-2x^3} \Rightarrow \frac{4}{x^2}$	**H** $\frac{10x^4-35x^3}{6x-21} \Rightarrow \frac{5x^2}{3}$	**I** $\frac{x^3+3x}{6x^2+18} \Rightarrow \frac{x}{3}$
J $\frac{2x^2-x^4}{14-7x^2} \Rightarrow \frac{x^2}{7}$	**K** $\frac{12x^2+8}{3x^4+2x^2} \Rightarrow \frac{4}{x^2}$	**L** $\frac{x^2+3x}{x^2+5x+6} \Rightarrow \frac{x}{x+2}$
M $\frac{4x^2-20x}{x^2-x-20} \Rightarrow \frac{4x}{x+4}$	**N** $\frac{x^2+2x-24}{2x^3-8x^2} \Rightarrow \frac{x+2}{2x^2}$	**O** $\frac{x^2+x-42}{x^2-11x+30} \Rightarrow \frac{x+6}{x-5}$

Question 1: Express the following as a single simplified fraction.

(a) $\frac{x}{3} + \frac{x}{5}$ (b) $\frac{c}{2} + \frac{c}{7}$ (c) $\frac{w}{3} + \frac{w}{9}$

(d) $\frac{x}{2} - \frac{x}{3}$ (e) $\frac{a}{5} - \frac{a}{9}$ (f) $\frac{m}{2} - \frac{m}{8}$

(g) $\frac{m}{3} + \frac{2m}{7}$ (h) $\frac{3x}{5} + \frac{x}{2}$ (i) $\frac{3c}{4} + \frac{5c}{9}$

(j) $\frac{m}{2} - \frac{2m}{5}$ (k) $\frac{3n}{4} - \frac{5n}{9}$ (l) $\frac{7h}{8} - \frac{5h}{12}$

Question 2: Express the following as a single simplified fraction.

(a) $\frac{2}{x^2} + \frac{5}{x}$ (b) $\frac{5}{6x} - \frac{1}{3x}$ (c) $\frac{2}{fg} - \frac{4}{g}$

(d) $\frac{6}{ac} + \frac{2}{3}$ (e) $\frac{9}{w} + \frac{wx}{4}$ (f) $\frac{d}{3} + \frac{2}{d^2}$

(g) $\frac{m^2}{6} - \frac{9}{4m}$ (h) $\frac{3}{4b^2} - \frac{1}{2b}$ (i) $\frac{ac}{5} + \frac{4}{c}$

(j) $\frac{x^3}{w} - \frac{2}{wx^2}$ (k) $\frac{2}{ab^2} - \frac{3}{b^3}$ (l) $\frac{xy}{5} - \frac{1}{x}$

Question 4: Express the following as a single simplified fraction.

(a) $\frac{2}{x+5} + \frac{3}{x+1}$ (b) $\frac{2}{x+1} + \frac{1}{x+3}$ (c) $\frac{4}{x+5} - \frac{2}{x-1}$

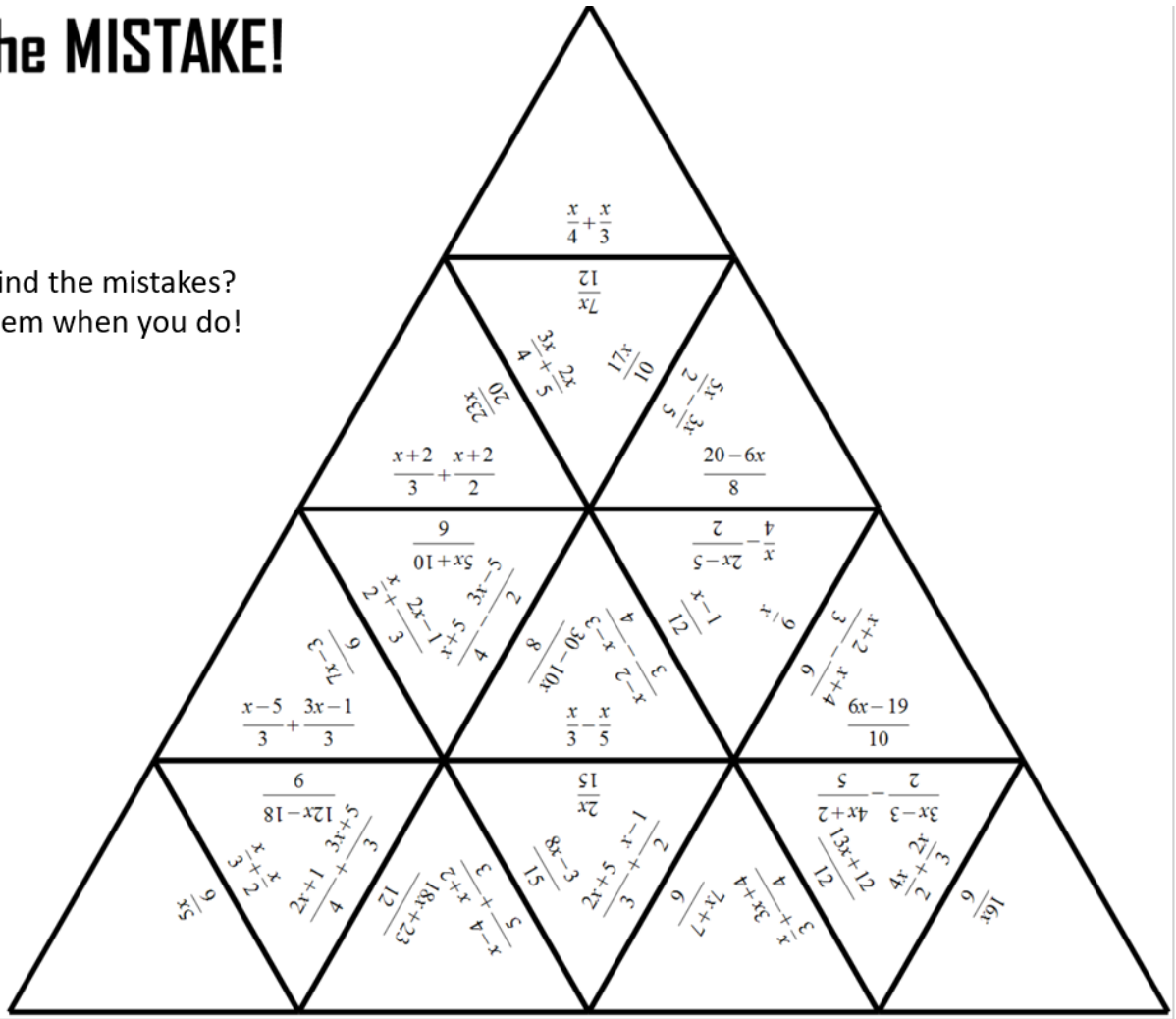
(d) $\frac{x+1}{x-2} + \frac{x+3}{x+5}$ (e) $\frac{x+3}{2x+1} - \frac{x-2}{x-1}$ (f) $\frac{x}{x+7} + \frac{2x+5}{3x+1}$

(g) $\frac{3}{x+1} + \frac{x+7}{(x+1)(x+2)}$ (h) $\frac{1-x}{(x-7)(x+1)} - \frac{2}{x-7}$

	LINK	Left & Right	①
A	$\frac{x}{3}+\frac{x}{4}$	$\frac{17x}{12}$	
B	$\frac{2x}{3}-\frac{x}{4}$	$-\frac{x}{12}$	
C	$\frac{2x}{3}+\frac{3x}{4}$	$\frac{2x^2+12}{3x}$	
D	$\frac{2x}{3}+\frac{4}{x}$	$\frac{17x-15}{12}$	
E	$\frac{x}{3}-\frac{x+1}{4}$	$\frac{7x}{12}$	
F	$\frac{x+3}{3}+\frac{x+1}{4}$	$\frac{5x+9}{12}$	
G	$\frac{2x+3}{3}-\frac{x+1}{4}$	$\frac{17-13x}{12}$	
H	$\frac{2x+3}{3}-\frac{x-1}{4}$	$\frac{5x}{12}$	
I	$\frac{2x-3}{3}+\frac{3x-1}{4}$	$\frac{7x+15}{12}$	
J	$\frac{5-x}{3}-\frac{3x+1}{4}$	$\frac{5x+15}{12}$	
K	$\frac{2x-3}{3}+\frac{4-3x}{4}$	$\frac{x-3}{12}$	

SPOT the MISTAKE!

Can you find the mistakes?
Correct them when you do!



Week 6 :

- **LI: Apply rules of algebraic simplification to fractions using all four operations**

Demonstration Videos:

Multiplying algebraic fractions Video – Corbettmaths
Dividing algebraic fractions Video – Corbettmaths

Tasks:

Question 1: Express the following as a single fraction.

(a) $\frac{2}{g} \times \frac{3}{h}$ (b) $\frac{3}{c} \times \frac{a}{4}$ (c) $\frac{w}{x} \times \frac{3}{a}$

(d) $\frac{3a}{7} \times \frac{2c}{g}$ (e) $\frac{a}{e} \times \frac{f}{b}$ (f) $\frac{e}{8} \times \frac{d}{8}$

(g) $\frac{x}{2} \times \frac{x}{5}$ (h) $\frac{7}{y} \times \frac{2}{y}$ (i) $\frac{3}{w} \times \frac{x}{4} \times \frac{y}{w}$

(j) $\frac{2x}{5} \times \frac{3x}{7}$ (k) $\frac{x}{y} \times \frac{x}{y}$ (l) $\frac{6a}{7c} \times \frac{5a}{c}$

Question 2: Express the following as a single **simplified** fraction.

(a) $\frac{2x}{y} \times \frac{y}{4}$ (b) $\frac{3a}{c} \times \frac{5}{6}$ (c) $\frac{4}{5a} \times \frac{5w}{8}$

(d) $\frac{3a}{7} \times \frac{2c}{9}$ (e) $\frac{10g}{w} \times \frac{w}{5}$ (f) $\frac{4x}{5y} \times \frac{3y}{8x}$

(g) $\frac{2y}{3} \times \frac{2y}{wy}$ (h) $\frac{6x}{5y} \times \frac{4x}{3y}$ (i) $\frac{x^2}{a} \times \frac{a^2}{x^2}$

(j) $\frac{ab}{c} \times \frac{c}{ae}$ (k) $\frac{6c}{w^2} \times \frac{15w^3}{2c^2}$ (l) $\frac{2a^4}{3b^3} \times \frac{6b^2}{5a}$

(m) $\frac{2a^3b}{3} \times \frac{6}{ab^2}$ (n) $\frac{x^4y^4}{z^2} \times \frac{z}{x^6y}$ (o) $\frac{14a^2bc^3}{9} \times \frac{6b^3}{21a^3c}$

Question 3: Express the following as a single fraction. **Simplify** if possible.

(a) $\frac{x}{4} \times \frac{x-3}{2}$

(b) $\frac{x}{9} \times \frac{6}{x+7}$

(c) $\frac{x+1}{15} \times \frac{5}{x}$

(d) $\frac{1}{x+3} \times \frac{2}{x+1}$

(e) $\frac{3x+2}{3} \times \frac{x+1}{3}$

(f) $\frac{x+4}{x-4} \times \frac{x-2}{x+5}$

(g) $\frac{x+1}{x-7} \times \frac{x-5}{x+1}$

(h) $\frac{7}{2x+8} \times \frac{x+4}{14}$

(i) $\frac{4}{2x-1} \times \frac{6x-3}{x+7}$

(j) $\frac{x+8}{15} \times \frac{10}{x^3+8x^2}$

(k) $\frac{4}{x-2} \times \frac{x^2-2x}{8}$

(l) $\frac{x^2+5x+6}{4} \times \frac{2}{x+2}$

(m) $\frac{x^2+2x-8}{x^2+5x+6} \times \frac{x+2}{x+4}$

(n) $\frac{x^2+x-6}{x^2-25} \times \frac{x^2+10x+25}{x^2-4}$

(o) $\frac{3x^2+8x-3}{25} \times \frac{30}{6x^2+13x-5}$

Question 1: Express the following as a single **simplified** fraction.

(a) $\frac{x}{2} \div \frac{2}{3}$ (b) $\frac{a}{c} \div \frac{d}{5}$ (c) $\frac{3}{w} \div \frac{2}{a}$

(d) $\frac{c}{4} \div \frac{3}{c}$ (e) $\frac{3a}{4} \div \frac{6c}{7}$ (f) $\frac{4x}{9y} \div \frac{6x}{7}$

(g) $\frac{10x}{3y} \div \frac{15x}{y}$ (h) $\frac{ab}{3} \div \frac{2a}{b}$ (i) $\frac{4fg}{h} \div \frac{f}{2h}$

Question 2: Express the following as a single fraction. **Simplify** if possible.

(a) $\frac{x-4}{8} \div \frac{3x-12}{2}$ (b) $\frac{x+3}{x+2} \div \frac{x+1}{x+2}$ (c) $\frac{x+1}{2} \div \frac{2x+2}{3}$

(d) $\frac{3x+9}{2} \div \frac{x+3}{4}$ (e) $\frac{4}{x-2} \div \frac{3}{x^2-2x}$ (f) $\frac{11}{4x^2+2x} \div \frac{3}{2x+1}$

(g) $\frac{x+3}{x+1} \div \frac{x}{(x+1)^2}$ (h) $\frac{x^2}{7} \div \frac{6x^3+8x^2}{x^2-7x}$ (i) $\frac{x}{x+6} \div \frac{x+6}{x^2}$

(j) $\frac{x^2+7x+10}{2} \div \frac{x^2+4x-5}{4}$ (k) $\frac{14}{x^2-5x+6} \div \frac{7}{x^2+3x-10}$

(l) $\frac{x+4}{x+5} \div \frac{3x+12}{x^2-25}$ (m) $\frac{x^3-x}{x+2} \div \frac{x^2-x}{x^2-5x-14}$

LINK

	Left & Right	LINK
A	$\frac{9x^2}{20}$	$\frac{x}{3} \times \frac{x}{5}$
B	$\frac{4}{5yx^2}$	$\frac{3x}{4} \times \frac{3x}{5}$
C	$\frac{x^2+2x}{20}$	$\frac{3x}{5y} \times \frac{2y}{x}$
D	$\frac{4x}{3y}$	$\frac{4x}{5y} \times \frac{3y^2}{x}$
E	$\frac{x^2}{15}$	$\frac{x}{4} \times \frac{x+2}{5}$
F	$\frac{15x}{16}$	$\frac{x-3}{5} \times \frac{2x^2}{4}$
G	$\frac{4x}{5y}$	$\frac{2x+4}{6} \times \frac{x}{3}$
H	$\frac{x^3-3x^2}{10}$	$\frac{2x}{5} \div \frac{3y}{10}$
I	$\frac{9x}{8}$	$\frac{3y}{4} \div \frac{4y}{5x}$
J	$\frac{6}{5}$	$\frac{3y}{4} \div \frac{2y}{3x}$
K	$\frac{x^2+2x}{9}$	$\frac{3x^2}{5y^2} \div \frac{3x}{4y}$
L	$\frac{12y}{5}$	$\frac{2x}{3y^2} \div \frac{5x^3}{6y}$

1 Simplify fully $\frac{x^2+5x}{x^2+7x+10}$

(2 marks)

2 Simplify fully $\frac{x^2-x-12}{x^2-9x+20}$

(2 marks)

3 Simplify fully $\frac{3x^2+9x}{x^2-9}$

(2 marks)

4 Simplify fully $\frac{x+4}{x^2-16}$

(2 marks)

5 Write $\frac{3x^2+11x-4}{x^2+3x-4}$ in the form $\frac{ax+b}{x+c}$ where a, b, and c are integers.

(3 marks)

6 Write $\frac{x^2+7x-18}{2x^2-x-6}$ in the form $\frac{x+a}{bx+c}$ where a, b, and c are integers.

(3 marks)

7 Simplify fully $\frac{3x+6}{x-4} \div \frac{2x^2+9x+10}{x^2-4x}$

(3 marks)

8 Simplify fully $\frac{2x-2}{x+5} \div \frac{x^2-4x+3}{2x^2+13x+15}$

(3 marks)

9 Solve $\frac{8}{x+3} + \frac{3}{x+8} = 1$

(4 marks)

10 Solve $\frac{8}{3x-2} + \frac{6}{x+1} = 2$

(4 marks)

11 Solve $\frac{2}{5-x} + \frac{3}{x+7} = 1$

(4 marks)

Stewards Academy

Questions	Question Title
1	Adding column vectors
2	Standard form, cube numbers
3	Changing the subject of a formula, subject in denominator
4	Finding bearings by addition
5	Relative frequency, reverse decimal problems
6	Integer solutions to inequalities
7a/b	Error intervals
8a	Properties of 2D shapes
8b	Congruence
9a	Fractions of amounts
9b	Probability of a single event not happening
10a	Angles on parallel lines, solving equations
10b	Solving equations, angles on straight lines
11	Ratio problems
12	Exponential problems
13	Mean problem solving
14	Identifying proportional relationships
15a/b	Interpreting real-life graphs
16	Repeated percentage decrease
17	Speed, other compound units
18	Exponential decay graphs
19	Circle theorems, angle facts, solving equations
20	Upper and lower bound calculations
21	Solving quadratic inequalities
22	Finding the nth term of a quadratic sequence
23	Finding the coordinates of turning point
24	Instantaneous rate of change
25a	3D Pythagoras' theorem
25b	3D trigonometry
26	Area of compound shapes, solving quadratic equations
27	Proof