Y11 to Y12 Mathematics Summer Independent Learning

June to August 2025

There are two tasks.
Please read the following instructions very carefully and ensure you label and collate all your work ready for checking in September.

For your first Maths lesson please bring

- A large A4 folder with five subject dividers.
- These instructions with the tables filled in (print out/copy the tables onto A4 paper).
- The two practice initial tests (Task 2), fully marked and reviewed.
- A list of questions you need to ask prior to doing your initial test.

Task 1: Preparation Work

1. Complete questions for each topic.
2. Mark and correct work.
3. Where required watch videos to support your understanding.

   Videos are listed after the intro to this task, and also within each topic
4. Do improvement work as necessary.
5. Repeat for each topic.
6. Track by filling in the following table.

Topic	Video(s) *(Tick)*	Worksheet *(Tick)*	Details of Improvement Work Completed
B1 Indices			
B2 Surds			
B3 Quadratics			
B4 Simultaneous Equations			
B5 Inequalities			
Re-arranging equations			
E1 Triangle Geometry			

Task 2

1. Do Practice Initial Test 1 under exam conditions.
2. Mark and correct your test and identify any improvement work necessary.
3. Fill in the review sheet below.

Topic	**Issues / areas for improvement (if relevant)**
B1 Indices	
B2 Surds	
B3 Quadratics	
B4 Simultaneous Equations	
B5 Inequalities	
Re-arranging equations	
E1 Triangle Geometry	

4. Do Practice Initial Test 2 under exam conditions.
5. Mark and correct your test and identify any improvement work necessary.
6. Fill in the review sheet below.
7. Make a list of questions you need to ask prior to doing your initial test for real!

Topic	**Issues / areas for improvement (if relevant)**
B1 Indices	
B2 Surds	
B3 Quadratics	
B4 Simultaneous Equations	
B5 Inequalities	
Re-arranging equations	
E1 Triangle Geometry	

Video hyperlinks

B1 Indices

https://youtu.be/1lThXgU08S0

https://youtu.be/v5bn4HZrmQs

https://youtu.be/W0h4rHj88ys

B2 Surds

https://youtu.be/jHelde32YtI

B3 Quadratics

https://youtu.be/Pziws8ojnlk

https://youtu.be/sn_joGVj15w

https://youtu.be/kk7p6hjn7hQ

https://youtu.be/toIqbX_NXHo

B4 Simultaneous Equations

https://youtu.be/4SRtwS5unwE

B5 Inequalities

https://youtu.be/wDut-In_7Wg

E1 Triangle Geometry

https://youtu.be/uVl6TAb0vBg

TASK 1

Indices and Surds

Topic: B1 Indices **Basic Skills videos:**

https://youtu.be/1lThXgU08S0

https://youtu.be/v5bn4HZrmQs

https://youtu.be/W0h4rHj88ys

Topic: B2 Surds Basic Skills

https://youtu.be/jHelde32YtI

Indices

Question 1

Express in the form x^k

a $\sqrt{x}$ **b** $\frac{1}{\sqrt[3]{x}}$ **c** $x^2 \times \sqrt{x}$ **d** $\frac{\sqrt[4]{x}}{x}$

e $\sqrt{x^3}$ **f** $\sqrt{x} \times \sqrt[3]{x}$ **g** $(\sqrt{x})^5$ **h** $\sqrt[3]{x^2} \times (\sqrt{x})^3$

i $p^{\frac{1}{4}} \div p^{-\frac{1}{5}}$ **j** $(3x^{\frac{2}{5}})^2$ **k** $y \times y^{\frac{5}{6}} \times y^{-\frac{3}{2}}$ **l** $4t^{\frac{3}{2}} \div 12t^{\frac{1}{2}}$

m $\frac{b^2 \times b^{\frac{1}{4}}}{b^{\frac{1}{2}}}$ **n** $\frac{y^{\frac{1}{2}} \times y^{\frac{1}{3}}}{y}$ **o** $\frac{4x^{\frac{2}{3}} \times 3x^{-\frac{1}{6}}}{6x^{\frac{3}{4}}}$ **p** $\frac{2a \times a^{\frac{3}{4}}}{8a^{-\frac{1}{2}}}$

Question 2

Express each of the following in the form 3^y, where y is a function of x.

a 9^x **b** 81^{x+1} **c** $27^{\frac{x}{4}}$ **d** $(\frac{1}{3})^x$ **e** 9^{2x-1} **f** $(\frac{1}{27})^{x+2}$

Exam style question

Solve the equation

$$25^x = 5^{4x+1}.$$

Surds

Question 1

Simplify

a $\sqrt{18} + \sqrt{50}$ **b** $\sqrt{48} - \sqrt{27}$ **c** $2\sqrt{8} + \sqrt{72}$

Question 2

Express in the form $a + b\sqrt{3}$

a $\sqrt{3}(2 + \sqrt{3})$ **b** $4 - \sqrt{3} - 2(1 - \sqrt{3})$ **c** $(1 + \sqrt{3})(2 + \sqrt{3})$

Question 3

Express each of the following as simply as possible with a rational denominator.

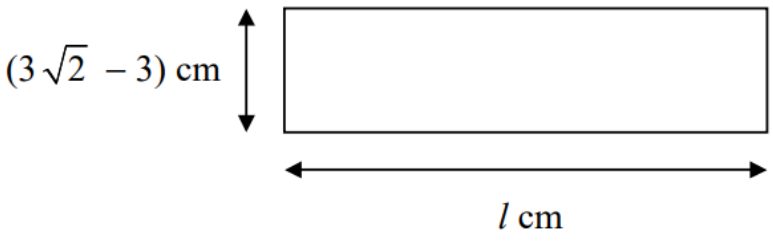
a $\frac{1}{\sqrt{5}}$ **b** $\frac{2}{\sqrt{3}}$ **c** $\frac{1}{\sqrt{8}}$ **d** $\frac{14}{\sqrt{7}}$

Question 4

Express each of the following as simply as possible with a rational denominator.

a $\frac{1}{\sqrt{2}+1}$ **b** $\frac{4}{\sqrt{3}-1}$ **c** $\frac{1}{\sqrt{6}-2}$ **d** $\frac{3}{2+\sqrt{3}}$

Exam style question



The diagram shows a rectangle measuring $(3\sqrt{2} - 3)$ cm by l cm.

Given that the area of the rectangle is 6 cm^2, find the exact value of l in its simplest form.

Indices answers

Question 1

a $= x^{\frac{1}{2}}$ **b** $= x^{-\frac{1}{3}}$ **c** $= x^2 \times x^{\frac{1}{2}} = x^{\frac{5}{2}}$ **d** $= \frac{x^{\frac{1}{4}}}{x} = x^{-\frac{3}{4}}$

e $= (x^3)^{\frac{1}{2}} = x^{\frac{3}{2}}$ **f** $= x^{\frac{1}{2}} \times x^{\frac{1}{3}} = x^{\frac{5}{6}}$ **g** $= (x^{\frac{1}{2}})^5 = x^{\frac{5}{2}}$ **h** $= x^{\frac{2}{3}} \times x^{\frac{3}{2}} = x^{\frac{13}{6}}$

i $= p^{\frac{1}{4}-(-\frac{1}{5})} = p^{\frac{9}{20}}$ **j** $= 9x^{\frac{4}{5}}$ **k** $= y^{1+\frac{5}{6}-\frac{3}{2}} = y^{\frac{1}{3}}$ **l** $= \frac{1}{3}t$

m $= b^{2+\frac{1}{4}-\frac{1}{2}} = b^{\frac{7}{4}}$ **n** $= y^{\frac{1}{2}+\frac{1}{3}-1} = y^{-\frac{1}{6}}$ **o** $= 2x^{\frac{2}{3}+(-\frac{1}{6})-\frac{3}{4}} = 2x^{-\frac{1}{4}}$ **p** $= \frac{1}{4}a^{1+\frac{3}{4}-(-\frac{1}{2})} = \frac{1}{4}a^{\frac{9}{4}}$

Question 2

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

d $= (3^{-1})^x = 3^{-x}$ **e** $= (3^2)^{2x-1} = 3^{4x-2}$ **f** $= (3^{-3})^{x+2} = 3^{-3x-6}$

Exam style question

$$25^x = (5^2)^x = 5^{4x+1}$$

$$5^{2x} = 5^{4x+1}$$

$$2x = 4x + 1$$

$$x = -\frac{1}{2}$$

Surds answers

Question 1

a $= 3\sqrt{2}+5\sqrt{2}=8\sqrt{2}$ **b** $= 4\sqrt{3}-3\sqrt{3}=\sqrt{3}$ **c** $= 4\sqrt{2}+6\sqrt{2}=10\sqrt{2}$

Question 2

a $=3+2\sqrt{3}$

b $=4-\sqrt{3}-2+2\sqrt{3}$
$=2+\sqrt{3}$

c $=2+\sqrt{3}+2\sqrt{3}+3$
$=5+3\sqrt{3}$

Question 3

a $= \frac{1}{\sqrt{5}}\times\frac{\sqrt{5}}{\sqrt{5}} = \frac{1}{5}\sqrt{5}$ **b** $= \frac{2}{\sqrt{3}}\times\frac{\sqrt{3}}{\sqrt{3}} = \frac{2}{3}\sqrt{3}$ **c** $= \frac{1}{2\sqrt{2}}\times\frac{\sqrt{2}}{\sqrt{2}} = \frac{1}{4}\sqrt{2}$

d $= \frac{14}{\sqrt{7}}\times\frac{\sqrt{7}}{\sqrt{7}} = 2\sqrt{7}$

Question 4

a $= \frac{1}{\sqrt{2}+1}\times\frac{\sqrt{2}-1}{\sqrt{2}-1} = \frac{\sqrt{2}-1}{2-1} = \sqrt{2}-1$

b $= \frac{4}{\sqrt{3}-1}\times\frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{4(\sqrt{3}+1)}{3-1} = 2(\sqrt{3}+1)$

c $= \frac{1}{\sqrt{6}-2}\times\frac{\sqrt{6}+2}{\sqrt{6}+2} = \frac{\sqrt{6}+2}{6-4} = \frac{1}{2}(\sqrt{6}+2)$ or $\frac{1}{2}\sqrt{6}+1$

d $= \frac{3}{2+\sqrt{3}}\times\frac{2-\sqrt{3}}{2-\sqrt{3}} = \frac{3(2-\sqrt{3})}{4-3} = 3(2-\sqrt{3})$

Exam style question

$$l = \frac{6}{3\sqrt{2}-3} = \frac{6}{3\sqrt{2}-3}\times\frac{3\sqrt{2}+3}{3\sqrt{2}+3} = \frac{6(3\sqrt{2}+3)}{18-9}$$

$$l = \frac{18(\sqrt{2}+1)}{9} = 2\sqrt{2}+2$$

Quadratics, simultaneous equations and inequalities

Topic: B3 Quadratics **Basic Skills**
https://youtu.be/Pziws8ojnlk
https://youtu.be/sn_joGVj15w
https://youtu.be/kk7p6hjn7hQ **https://youtu.be/toIqbX_NXHo**

B4 Simultaneous Equations
https://youtu.be/4SRtwS5unwE

B5 Inequalities
https://youtu.be/wDut-In_7Wg

Question 1

Factorise

(a)	$x^2 - 3x + 2$	(b)	$x^2 + 5x + 6$	(c)	$x^2 - 9$
(d)	$x^2 - 10x + 25$	(e)	$2x^2 - 3x + 1$	(f)	$5x^2 - 17x + 6$

Question 2

Hence, sketch (showing the coordinates of any points of intersections with coordinate axes):

(a)	$y = x^2 - 3x + 2$	(b)	$y = x^2 + 5x + 6$	(c)	$y = x^2 - 9$
(d)	$y = x^2 - 10x + 25$	(e)	$y = 2x^2 - 3x + 1$	(f)	$y = 5x^2 - 17x + 6$

Question 3

Complete the square, leaving in the form: $(x + a)^2 + b$ or $a(x + b)^2 + c$, where appropriate

(a)	$x^2 - 4x + 3$	(b)	$x^2 + 8x + 30$	(c)	$x^2 - 5x + 4$
(d)	$x^2 + 3x + 3$	(e)	$4x^2 + 8x + 3$	(f)	$8 + 2x - x^2$

Question 4

Hence, sketch (showing the coordinates of turning point, and y intercept):

(a)	$y = x^2 - 4x + 3$	(b)	$y = x^2 + 8x + 30$	(c)	$y = x^2 - 5x + 4$
(d)	$y = x^2 + 3x + 3$	(e)	$y = 4x^2 + 8x + 3$	(f)	$y = 8 + 2x - x^2$

Question 5

Solve these pairs of simultaneous equations:

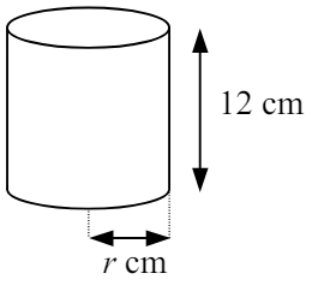
(a)	$y = 2x + 6$ $y = 3 - 4x$	(b)	$3x + 3y + 4 = 0$ $5x - 2y - 5 = 0$	(c)	$x^2 - y + 3 = 0$ $x - y + 5 = 0$
(d)	$2x^2 - y - 8x = 0$ $x + y + 3 = 0$	(e)	$x^2 - 4y - y^2 = 0$ $x - 2y = 0$	(f)	$xy = 6$ $x - y = 5$

Question 6

Solve the following inequalities:

(a)	$12 - 3x < 10$	(b)	$2(3 + x) \geq 4(6 - x)$
(c)	$x^2 - 4x + 3 < 0$	(d)	$9x - 2x^2 \leq 10$

Exam style question



A sealed metal container for food is a cylinder of height 12 cm and base radius r cm.

Given that the surface area of the container must be at most 128π cm^2,

a show that $r^2 + 12r - 64 \leq 0$.

b Hence find the maximum value of r.

Quadratics, simultaneous equations and inequalities answers

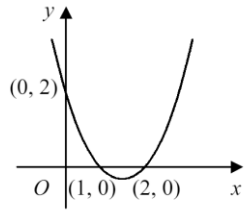
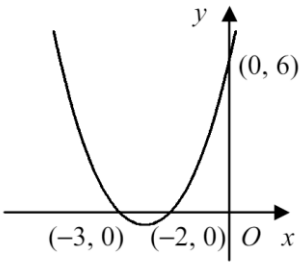
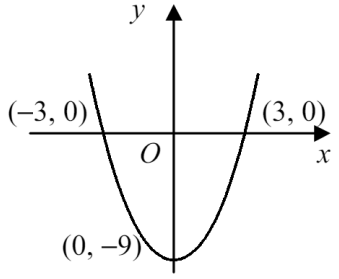
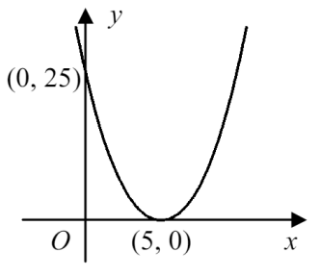
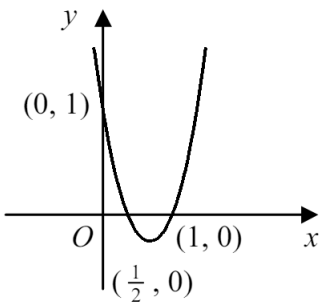
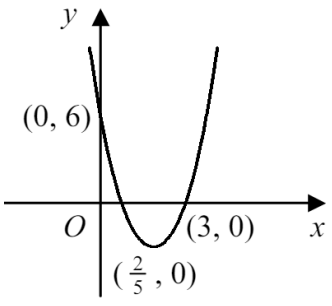
Question 1

Factorise

(a)	$(x-1)(x-2)$	(b)	$(x+3)(x+2)$	(c)	$(x+3)(x-3)$
(d)	$(x-5)^2$	(e)	$(2x-1)(x-1)$	(f)	$(5x-2)(x-3)$

Question 2

Hence, sketch (showing the coordinates of any points of intersections with coordinate axes):

(a)	$x^2-3x+2=0$ $(x-1)(x-2)=0$ $x=1$ or 2 	(b)	$x^2+5x+6=0$ $(x+3)(x+2)=0$ $x=-3$ or -2 	(c)	$x^2-9=0$ $(x+3)(x-3)=0$ $x=-3$ or 3 
(d)	$x^2-10x+25=0$ $(x-5)^2=0$ $x=5$ 	(e)	$2x^2-3x+1=0$ $(2x-1)(x-1)=0$ $x=\frac{1}{2}$ or 1 	(f)	$5x^2-17x+6=0$ $(5x-2)(x-3)=0$ $x=\frac{2}{5}$ or 3 

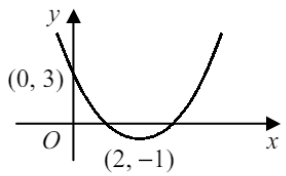
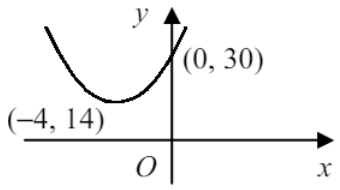
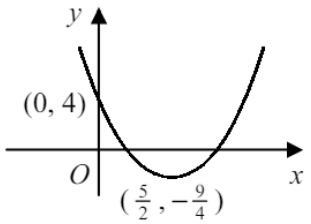
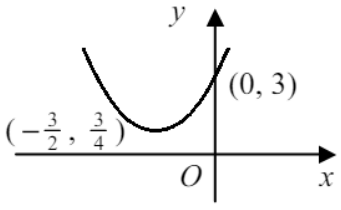
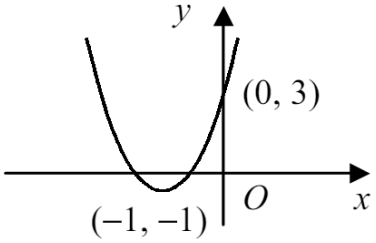
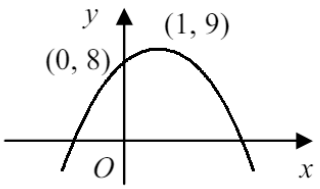
Question 3

Complete the square, leaving in the form: $(x+a)^2+b$ or $a(x+b)^2+c$, where appropriate

(a)	$y=(x-2)^2-4+3$ $y=(x-2)^2-1$	(b)	$y=(x+4)^2-16+30$ $y=(x+4)^2+14$	(c)	$y=(x-\frac{5}{2})^2-\frac{25}{4}+4$ $y=(x-\frac{5}{2})^2-\frac{9}{4}$
(d)	$y=(x+\frac{3}{2})^2-\frac{9}{4}+3$ $y=(x+\frac{3}{2})^2+\frac{3}{4}$	(e)	$y=4[x^2+2x]+3$ $y=4[(x+1)^2-1]+3$ $y=4(x+1)^2-1$	(f)	$y=-[x^2-2x]+8$ $y=-[(x-1)^2-1]+8$ $y=-(x-1)^2+9$

Question 4

Hence, sketch (showing the coordinates of turning point, and y intercept):

(a)	$y=(x-2)^2-4+3$ $y=(x-2)^2-1$ minimum $(2,-1)$ 	(b)	$y=(x+4)^2-16+30$ $y=(x+4)^2+14$ minimum $(-4,14)$ 	(c)	$y=(x-\frac{5}{2})^2-\frac{25}{4}+4$ $y=(x-\frac{5}{2})^2-\frac{9}{4}$ minimum $(\frac{5}{2},-\frac{9}{4})$ 
(d)	$y=(x+\frac{3}{2})^2-\frac{9}{4}+3$ $y=(x+\frac{3}{2})^2+\frac{3}{4}$ minimum $(-\frac{3}{2},\frac{3}{4})$ 	(e)	$y=4[x^2+2x]+3$ $y=4[(x+1)^2-1]+3$ $y=4(x+1)^2-1$ minimum $(-1,-1)$ 	(f)	$y=-[x^2-2x]+8$ $y=-[(x-1)^2-1]+8$ $y=-(x-1)^2+9$ maximum $(1,9)$ 

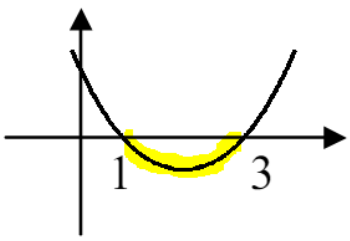
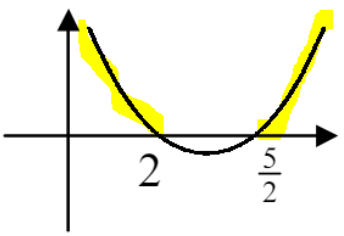
Question 5

Solve these pairs of simultaneous equations:

(a)	$2x + 6 = 3 - 4x$ $x = -\frac{1}{2}$ $\therefore\ x = -\frac{1}{2}, y = 5$	(b)	$6x + 6y + 8 = 0$ $15x - 6y - 15 = 0$ adding $21x - 7 = 0$ $x = \frac{1}{3}$ $\therefore\ x = \frac{1}{3}, y = -\frac{5}{3}$	(c)	$x + 2 = x^2 - 4$ $x^2 - x - 6 = 0$ $(x + 2)(x - 3) = 0$ $x = -2$ or 3 $\therefore$ $(-2, 0)$ and $(3, 5)$
(d)	**Susbtitution is also fine** adding $2x^2 - 7x + 3 = 0$ $(2x - 1)(x - 3) = 0$ $x = \frac{1}{2}$ or 3 $\therefore\quad x = \frac{1}{2}, y = -\frac{7}{2}$ or $\quad x = 3, y = -6$	(e)	$x = 2y$ sub. $(2y)^2 - 4y - y^2 = 0$ $3y^2 - 4y = 0$ $y(3y - 4) = 0$ $y = 0$ or $\frac{4}{3}$ $\therefore\quad x = 0, y = 0$ or $\quad x = \frac{8}{3}, y = \frac{4}{3}$	(f)	$y = x - 5$ sub. $x(x - 5) = 6$ $x^2 - 5x - 6 = 0$ $(x + 1)(x - 6) = 0$ $x = -1$ or 6 $\therefore\quad x = -1, y = -6$ or $\quad x = 6, y = 1$

Question 6

Solve the following inequalities:

(a)	$2 < 3x$ $x > \frac{2}{3}$	(b)	$6 + 2x \geq 24 - 4x$ $6x \geq 18$ $x \geq 3$
(c)	$(x - 1)(x - 3) < 0$  $\therefore\ 1 < x < 3$	(d)	$2x^2 - 9x + 10 \geq 0$ $(2x - 5)(x - 2) \geq 0$  $\therefore\ x \leq 2$ or $x \geq \frac{5}{2}$

Exam style question

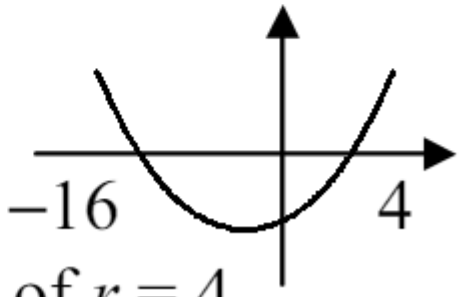
a $\text{S.A} = 2\pi r^2 + 2\pi rh = 2\pi r^2 + 24\pi r$

$\text{S.A} \leq 128\pi \quad \therefore \quad 2\pi r^2 + 24\pi r \leq 128\pi$

$r^2 + 12r \leq 64$

$r^2 + 12r - 64 \leq 0$

b $(r + 16)(r - 4) \leq 0$



$-16 \leq r \leq 4$

$\therefore$ maximum value of $r = 4$

We will look at finding maximum values for these kinds of shapes more formally in A level Maths

Re-arranging (Equations and formulae)

Question 1

Make a the subject $x(a - e) = d$

Question 2

Make x the subject $m(y - x) = t$

Question 3

Make x the subject of $x + a = \frac{x+b}{c}$

Question 4

Make y the subject of $y(\sqrt{3} + \sqrt{2}) = x$

and write it in the form $y = x(\sqrt{a} + \sqrt{b})$

Question 5

Make v the subject of

$$C = \frac{v^2 - ta}{x}$$

Question 6

Rearrange to make x the subject of

$$\frac{2}{x} + 5 = 6y$$

Question 7

Make y the subject of

$$\sqrt{\frac{m(y+a)}{y}} = g$$

Question 8

A cylinder has a radius of 3cm and height, h. The total surface area is $30x\ cm^2$.

Find an expression for the surface area and write h in terms of x and π.

Re-arranging (Equations and formulae)

Question 1

$$xa - xe = d$$
$$xa = d + xe$$
$$a = \frac{d + xe}{x}$$

or

$$a - e = \frac{d}{x}$$
$$a = \frac{d}{x} + e$$

Can you see that these are equivalent?

Question 2

$$my - mx = t$$
$$my = t + mx$$
$$mx = my - t$$
$$x = \frac{my - t}{m}$$

Question 3

$$c(x + a) = x + b$$
$$cx + ca - x = b$$
$$cx - x = b - ca$$
$$x(c - 1) = b - ca$$
$$x = \frac{b - ca}{c - 1}$$

Question 4

$$y = \frac{x}{\sqrt{3}+\sqrt{2}}$$

$$y = \frac{x}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$$

$$y = \frac{x\sqrt{3} - x\sqrt{2}}{3-2}$$

$$y = x(\sqrt{3}-\sqrt{2})$$

Question 5

$$v^2 - ta = Cx$$

$$v^2 = Cx + ta$$

$$v = \pm\sqrt{Cx + ta}$$

Question 6

$$\frac{2}{x} = 6y - 5$$

$$x(6y-5) = 2$$

$$x = \frac{2}{6y-5}$$

Question 7

$$g^2 = \frac{my + ma}{y}$$
$$g^2 y = my + ma$$
$$g^2 y - my = ma$$
$$y(g^2 - m) = ma$$
$$y = \frac{ma}{g^2 - m}$$

Question 8

Surface area of cylinder = $2\pi r^2 + 2\pi rh$

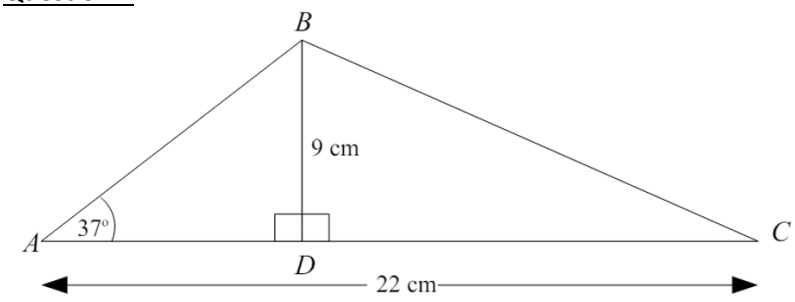
$$30x = (2\pi \times 3^2) + (2 \times 3 \times \pi \times h)$$
$$30x = 18\pi + 6\pi h$$
$$6\pi h = 30x - 18\pi$$
$$h = \frac{30x - 18\pi}{6\pi}$$
$$h = \frac{5x - 3\pi}{\pi}$$

Trigonometry

E1 Triangle Geometry

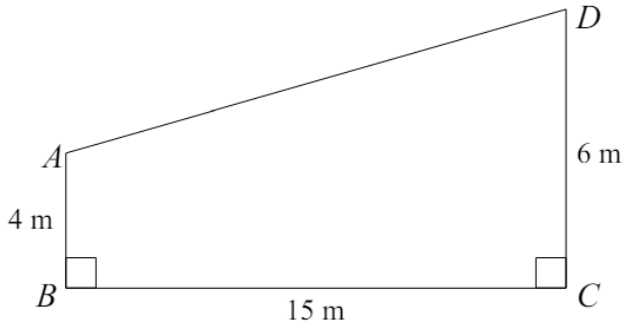
https://youtu.be/uVl6TAb0vBg

Question 1



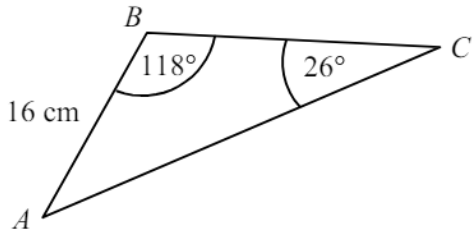
Work out the size of angle *BCD*.
Give your answer to 1 decimal place.

Question 2



Work out the size of angle *BAD*.
Give your answer to 1 decimal place.

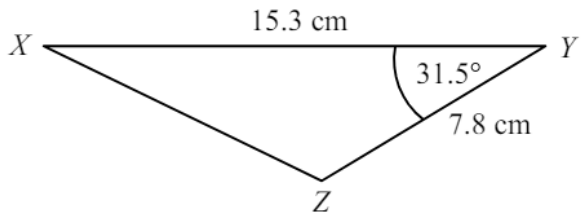
Question 3



The diagram shows triangle ABC in which $AB = 16$ cm, $\angle ABC = 118°$ and $\angle ACB = 26°$.

Find the length AC to 3 significant figures.

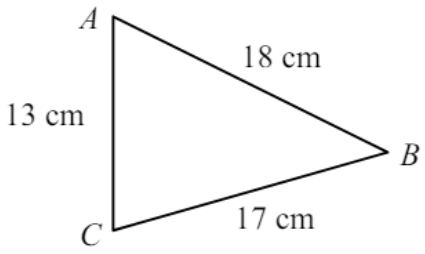
Question 4



The diagram shows triangle XYZ in which $XY = 15.3$ cm, $YZ = 7.8$ cm and $\angle XYZ = 31.5°$.

Find the length of XZ.

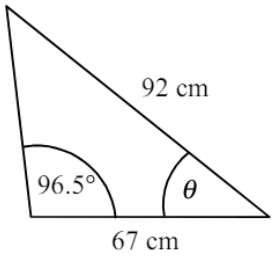
Question 5



The diagram shows triangle ABC in which $AB = 18$ cm, $AC = 13$ cm and $BC = 17$ cm.

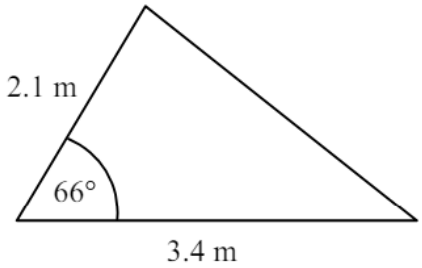
Find the size of the angle ACB

Question 6



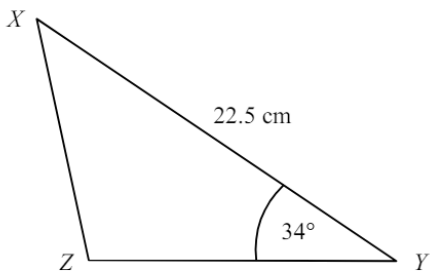
Find the angle θ

Question 7



Find the area of the triangle

Question 8



The diagram shows triangle XYZ in which $XY = 22.5$ cm and $\angle XYZ = 34°$.

Find the length of XZ

Trigonometry answers

Question 1

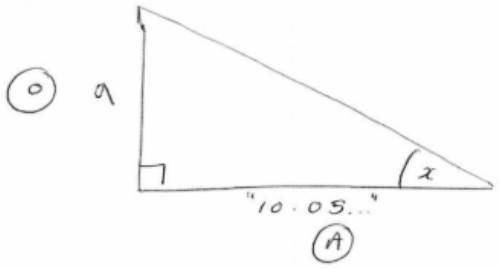
$$\tan(37) = \frac{9}{y}$$

$$y = \frac{9}{\tan(37)}$$

$$= 11.9434...$$

$$CD = 22 - 11.9434$$

$$= 10.05659...$$



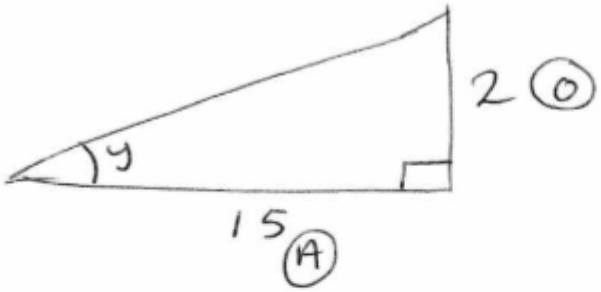
$$\tan x = \frac{9}{"10.05..."}$$

$$x = \tan^{-1}\left(\frac{9}{10.05...}\right)$$

$$= 41.8 \text{ 1dp}$$

41.8°

Question 2



$$\tan y = \frac{2}{15}$$

$$y = \tan^{-1}\left(\frac{2}{15}\right)$$

$$= 7.6^\circ \text{ (1dp)}$$

$$BAD = 90 + 7.6$$

$$= 97.6^\circ$$

Question 3

$$\frac{AC}{\sin 118} = \frac{16}{\sin 26}$$

$$AC = \frac{16 \times \sin 118}{\sin 26}$$

$$= 32.2 \text{ cm}$$

Question 4

$$XZ^2 = 7.8^2 + 15.3^2 \quad - (2 \times 7.8 \times 15.3 \times \cos 31.5°)$$

$$= 91.422$$

$$XZ = 9.56 \text{ cm (3sf)}$$

Question 5

$$18^2 = 13^2 + 17^2 - (2 \times 13 \times 17 \times \cos \angle ACB)$$

$$\cos \angle ACB = \frac{13^2 + 17^2 - 18^2}{2 \times 13 \times 17}$$

$$= 0.3032$$

$$\angle ACB = 72.4° \text{ (1dp)}$$

Question 6

$$\frac{\sin \alpha}{67} = \frac{\sin 96.5}{92}$$

$$\sin \alpha = \frac{67 \times \sin 96.5}{92}$$

$$\sin \alpha = 0.7236$$

$$\alpha = 46.351$$

$$\theta = 180 - 96.5 - \alpha$$

$$\theta = 37.1° \text{ (1dp)}$$

Question 7

$$\text{area}$$

$$= \tfrac{1}{2} \times 2.1 \times 3.4 \times \sin 66$$

$$= 3.26 \text{ m}^2 \text{ (3sf)}$$

Question 8

$$\tfrac{1}{2} \times 22.5 \times YZ \times \sin 34 = 100$$

$$YZ = \frac{200}{22.5 \times \sin 34}$$

$$= 15.896$$

$$XZ^2 = 22.5^2 + 15.896^2 - (2 \times 22.5 \times 15.896 \times \cos 34)$$

$$= 165.906$$

$$XZ = 12.9 \text{ cm (3sf)}$$

TASK 2

Year 12 Initial Test for Mathematics

Write out the solutions to each of the following questions. Show full working, ***without*** *the use of a calculator.*

Practice 1

B1 Indices

1.	Evaluate $\left(\frac{8}{125}\right)^{-2/3}$	**2.**	Express in the form x^k $\frac{\sqrt{x} \times \sqrt[3]{x}}{x^2}$	**3.**	Solve $9^{x-2} = 27$	**4.**	Solve $16^x = 4^{1-x}$

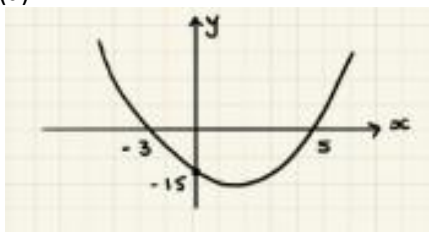
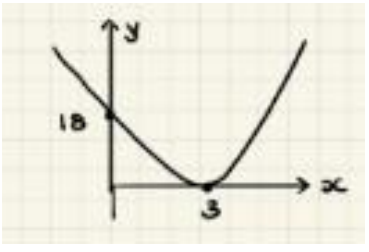
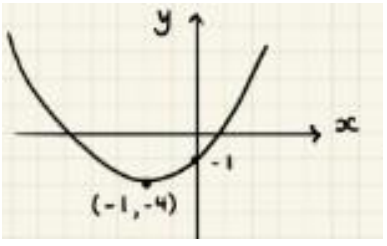
B2 Surds

1.	Simplify $\sqrt{72}$	**2.**	Expand and simplify $(2\sqrt{7} - 5\sqrt{3})\,(3\sqrt{7} + 4\sqrt{3})$	**3.**	Rationalise the denominator $\frac{11}{2\sqrt{5}}$	**4.**	Rationalise the denominator $\frac{8 - 3\sqrt{5}}{2 + \sqrt{5}}$

B3 Quadratics

1. Solve the following quadratic equations by factorising and use your solutions to sketch the related quadratic graph, labelling all intersections with the coordinate axis.		
(a) (i) $x^2 + 3x - 28 = 0$	(b) (i) $x^2 - 6x + 9 = 0$	(c) (i) $2x^2 - 21x + 27 = 0$
(a) (ii) Sketch $y = x^2 + 3x - 28$	(b) (ii) Sketch $y = x^2 - 6x + 9$	(c) (ii) Sketch $y = 2x^2 - 21x + 27$

2. Solve the following quadratic equations by completing the square and use your solutions to sketch the related quadratic graph, labelling all intersections with the coordinate axis and turning point.		
(a) (i) $x^2 + 4x - 7 = 0$	(b) (i) $11 + 8x - x^2 = 0$	(c) (i) $3x^2 - 12x + 2 = 0$
(ii) Write $y = x^2 + 4x - 7$ in the form $y = a(x + b)^2 + c$	(ii) Write $y = 11 + 8x - x^2$in the form $y = a(x + b)^2 + c$	(ii) Write $y = 3x^2 - 12x + 2$ in the form $y = a(x + b)^2 + c$
(iii) Sketch $y = x^2 + 4x - 7$	(iii) Sketch $y = 11 + 8x - x^2$	(iii) Sketch $y = 3x^2 - 12x + 2$

3. Evaluate the equation of the following quadratics, giving your answer in the form $y = ax^2 + bx + c$		
(a) 	(b) 	(c) 

B4 Simultaneous Equations

1.	Solve $3x + 3y = -4$ $5x - 2y = 5$	**2.**	Solve $y = x - 6$ $\frac{1}{2}x - y = 4$	**3.**	Solve $3x^2 - x - y^2 = 0$ $x + y = 1$

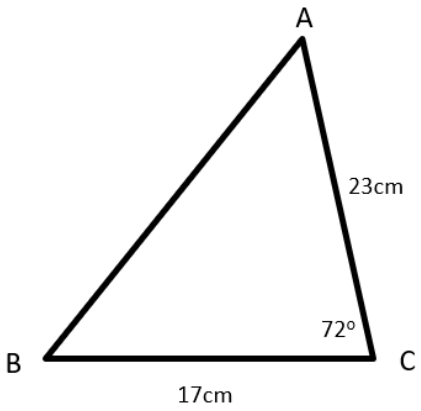
B5 Inequalities

Find the set of values for which…

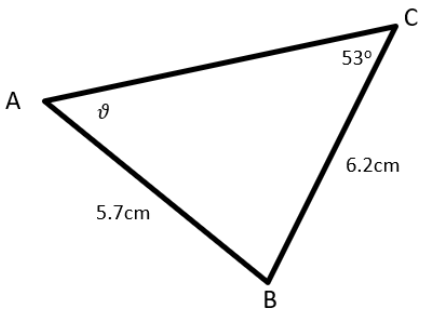
1.	$3(1 - 2t) \leq t - 4$	**2.**	$2x^2 - 9x + 4 \leq 0$	**3.**	$2y + 3 < 3y(y - 2)$

E1 Triangle Geometry (Calculator)

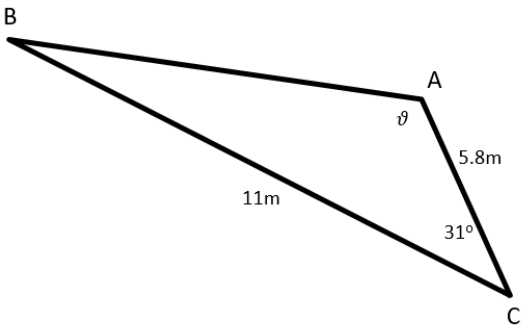
1. Calculate the length AB



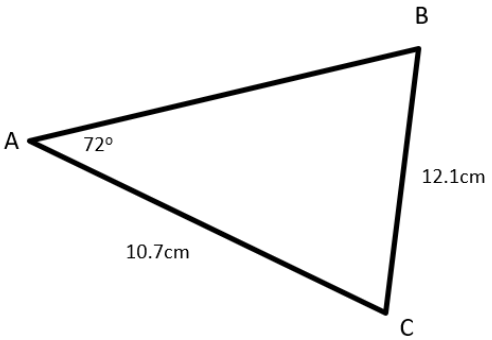
2. Calculate the angle ϑ



3. Calculate the length AB and the obtuse angle ϑ



4. Calculate the area of the triangle ABC



Practice 1

B1 Indices

1. $\left(\frac{8}{125}\right)^{-2/3}$

$= \left(\frac{125}{8}\right)^{2/3}$

$= \left(\frac{5}{2}\right)^{2}$ M1

$= \frac{25}{4}$ A1

2. $\frac{\sqrt{x} \times \sqrt[3]{x}}{x^2}$

$= \frac{x^{1/2} \times x^{1/3}}{x^2}$ M1

$= \frac{x^{5/6}}{x^2}$ A1

$= x^{-7/6}$ A1

3. $9^{x-2} = 27$

$(3^2)^{x-2} = 3^3$ M1

$3^{2x-4} = 3^3$

$2x - 4 = 3$ M1

$2x = 7$

$x = 7/2$ A1

4. $16^{x} = 4^{1-x}$

$(4^2)^{x} = 4^{1-x}$ M1

$4^{2x} = 4^{1-x}$

$2x = 1 - x$ M1

$3x = 1 \Rightarrow x = 1/3$ A1

[11]

B2 Surds

1. $\sqrt{72}$

$= \sqrt{36 \times 2}$

$= 6\sqrt{2}$ A1

2. $(2\sqrt{7} - 5\sqrt{3})(3\sqrt{7} + 4\sqrt{3})$

$42 + 8\sqrt{21} - 15\sqrt{21} - 60$ M1 A1

$-7\sqrt{21} - 18$ A1

3. $\frac{11}{2\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ M1

$= \frac{11\sqrt{5}}{10}$ A1

4. $\frac{8 - 3\sqrt{5}}{2 + \sqrt{5}} \quad \frac{(2 - \sqrt{5})}{(2 - \sqrt{5})}$ M1

$= \frac{16 - 8\sqrt{5} - 6\sqrt{5} + 15}{4 - 5}$ A1 A1

$= \frac{31 - 14\sqrt{5}}{-1} = 14\sqrt{5} - 31$ A1

[10]

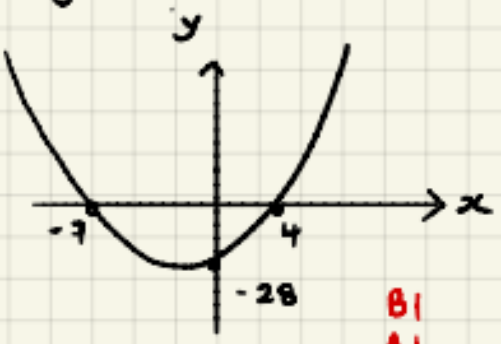
B3 Quadratics

1. (a) (i) $x^2 + 3x - 28 = 0$

$(x + 7)(x - 4) = 0$ M1

$x = -7$ or $x = 4$ A1

(ii) $y = x^2 + 3x - 28$



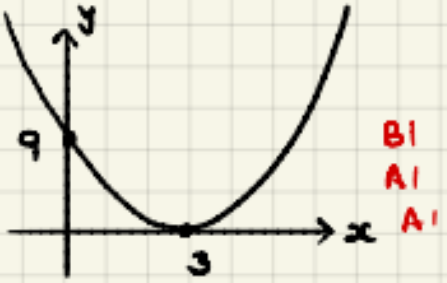
B1
A1
A1

(b) (i) $x^2 - 6x + 9 = 0$

$(x - 3)^2 = 0$ M1

A1 $x = 3$ (repeated)

(ii) $y = x^2 - 6x + 9$



B1
A1
A1

(c) (i) $2x^2 - 21x + 27 = 0$

$(2x - 3)(x - 9) = 0$ M1

$x = 3/2$ $x = 9$ A1

(ii) $y = 2x^2 - 21x + 27$

B1
A1
A1

15

B1 shape, location related to axes

A1 intersections x-axis

A1 intersections y-axis

2. (a) (i) $x^2 + 4x - 7 = 0$

$(x+2)^2 - 4 - 7 = 0$ M1

$(x+2)^2 = 11$

$x + 2 = \pm\sqrt{11}$

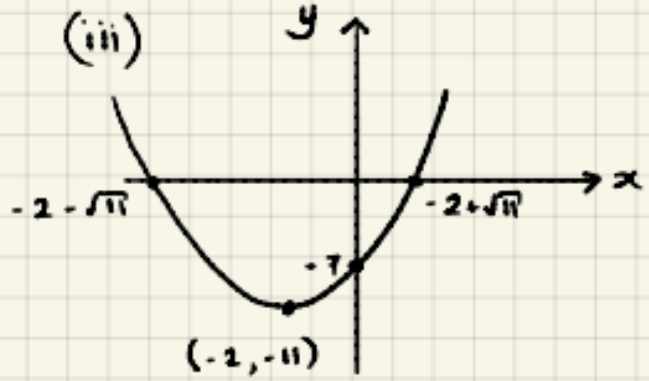
$x = -2 \pm \sqrt{11}$ A1

Graphs
- B1 Shape
- A1 Vertex
- A1 intersections x-axis
- A1 intersections y-axis

(ii) $y = x^2 + 4x - 7$

$y = (x+2)^2 - 11$ B1

(iii)



(b) (i) $11 + 8x - x^2 = 0$

$-(x^2 - 8x - 11) = 0$ M1

$-[(x-4)^2 - 16 - 11] = 0$ M1

$-(x-4)^2 + 27 = 0$

$(x-4)^2 = 27$

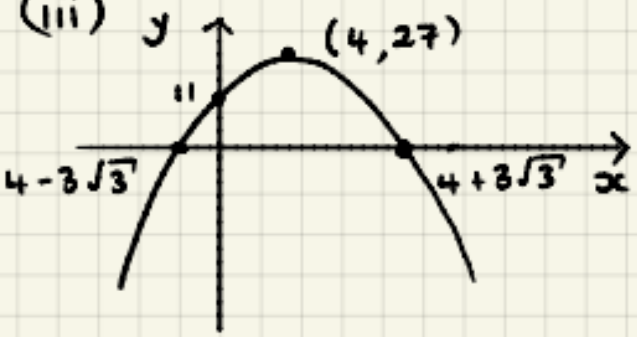
$x - 4 = \pm 3\sqrt{3}$

$x = 4 \pm 3\sqrt{3}$ A1

(ii) $y = 11 + 8x - x^2$

$y = 27 - (x-4)^2$ B1

(iii)



(c) (i) $3x^2 - 12x + 2 = 0$

$3\left[x^2 - 4x + \frac{2}{3}\right] = 0$ M1

$3\left[(x-2)^2 - 4 + \frac{2}{3}\right] = 0$ M1

$3\left[(x-2)^2 - \frac{10}{3}\right] = 0$

$3(x-2)^2 - 10 = 0$

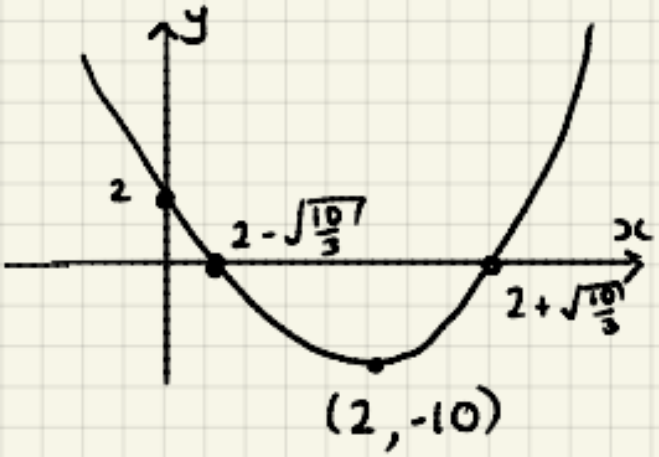
$(x-2)^2 = \frac{10}{3}$

$x - 2 = \pm\sqrt{\frac{10}{3}}$

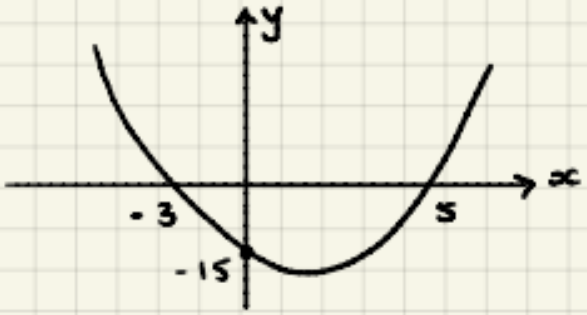
$x = 2 \pm \sqrt{\frac{10}{3}}$ A1

(ii) $y = 3x^2 - 12x + 2$

$y = 3(x-2)^2 - 10$ B1



3. (a)



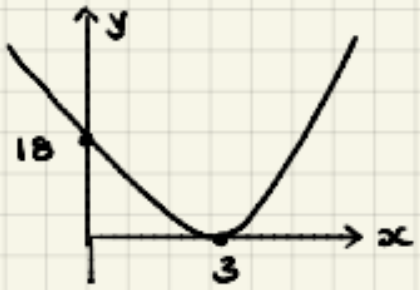
$y = k(x+3)(x-5)$ M1

$-15 = k(3)(-5) \Rightarrow k = 1$ A1

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

$y = x^2 - 2x - 15$ A1

(b)



$y = k(x-3)^2$ M1

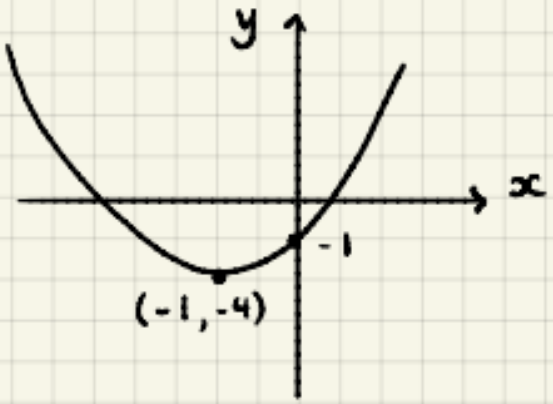
$18 = k(-3)^2 \Rightarrow k = 2$ A1

$y = 2(x-3)^2$

$y = 2(x^2 - 6x + 9)$

$y = 2x^2 - 12x + 18$ A1

(c)



$y = k(x+1)^2 - 4$ M1

$(0,-1)$

$-1 = k(1)^2 - 4$

$\Rightarrow k = 3$ A1

$y = 3(x+1)^2 - 4$

$y = 3(x^2 + 2x + 1) - 4$

$y = 3x^2 + 6x - 1$ A1

[9]

84 Simultaneous Equations

1. $3x + 3y = -4$ $\quad 6x + 6y = -8$

$5x - 2y = 5$ $\quad 15x - 6y = 15$ added M1

$21x = 7$

$x = 1/3$ A1 $\quad 3(1/3) + 3y = -4$

$3y = -5$

$x = 1/3, \; y = -5/3$ A1

2. $y = x - 6$

$\frac{1}{2}x - y = 4$

$\frac{1}{2}x - (x - 6) = 4$ M1

$\frac{1}{2}x - x + 6 = 4$

$-\frac{1}{2}x = -2$

$x = 4$ A1 $\quad y = 4 - 6$

$y = -2$

$x = 4, \; y = -2$ A1

3. $3x^2 - x - y^2 = 0$ $\quad x + y = 1$

$y = 1 - x$

$3x^2 - x - (1-x)^2 = 0$ M1

$3x^2 - x - (1 - 2x + x^2) = 0$

$3x^2 - x - 1 + 2x - x^2 = 0$

$2x^2 + x - 1 = 0$ A1

$(2x - 1)(x + 1) = 0$

$x = 1/2$ $\quad x = -1$ A1

$y = 1 - 1/2$ $\quad y = 1 - -1$

$x = 1/2$ $y = 1/2$ A1 $\quad x = -1$, $y = 2$ A1

11

B5 Inequalities

1. $3(1 - 2t) \leq t - 4$

$3 - 6t \leq t - 4$

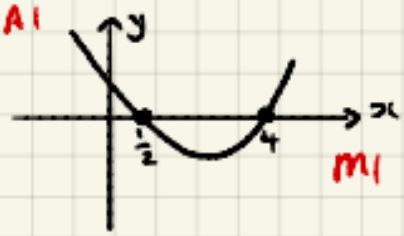
$7 \leq 7t$ M1

$t \geq 1$ A1

2. $2x^2 - 9x + 4 \leq 0$

$(2x - 1)(x - 4) \leq 0$ M1

CVs $x = 1/2$ $\quad x = 4$ A1



M1

$\frac{1}{2} \leq x \leq 4$ A1

3. $2y + 3 < 3y(y - 2)$

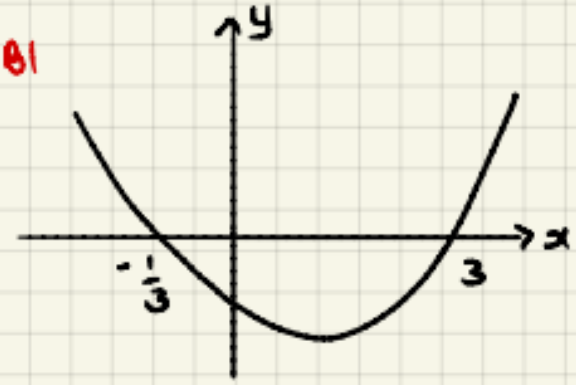
$2y + 3 < 3y^2 - 6y$

$0 < 3y^2 - 8y - 3$ B1

$3y^2 - 8y - 3 > 0$

$(3y + 1)(y - 3) > 0$ M1

CVs $y = -1/3$ $\quad y = 3$ A1



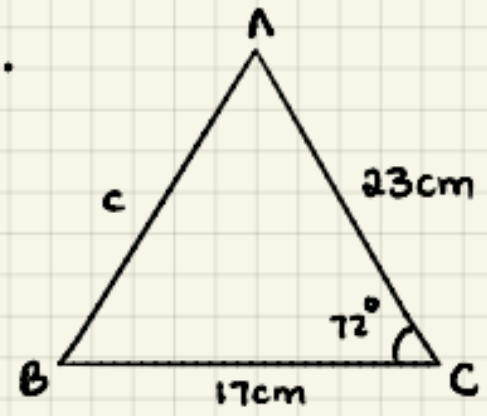
11

M1

$y < -1/3$ $\quad$ or $\quad y > 3$ A1

E1 Triangle Geometry

1.



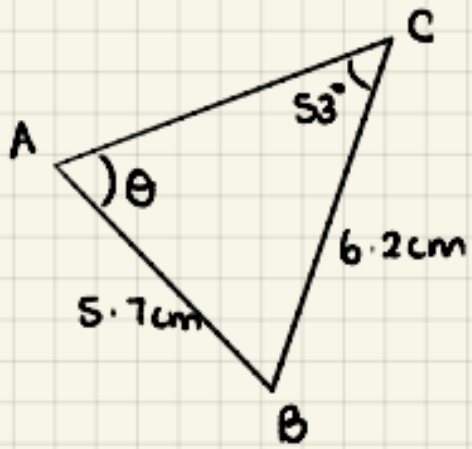
$c^2 = a^2 + b^2 - 2ab\cos C$

$c^2 = 17^2 + 23^2 - 2(17)(23)\cos 72^\circ$

$c^2 = 576.35$ M1

$AB = 24.0\text{cm}$ A1

2.

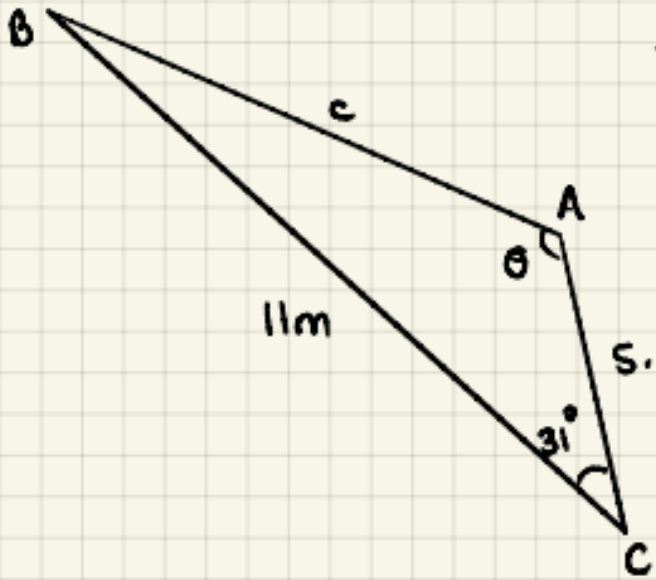


$\frac{\sin\theta}{6.2} = \frac{\sin 53}{5.7}$ M1

$\theta = \sin^{-1}\left(\frac{6.2\sin 53}{5.7}\right)$

$\theta = 60.3^\circ$ A1

3.



AB

$c^2 = 5.8^2 + 11^2 - 2(5.8)(11)\cos 31$

$c^2 = 45.27$ M1

$AB = 6.7\text{m}$ A1

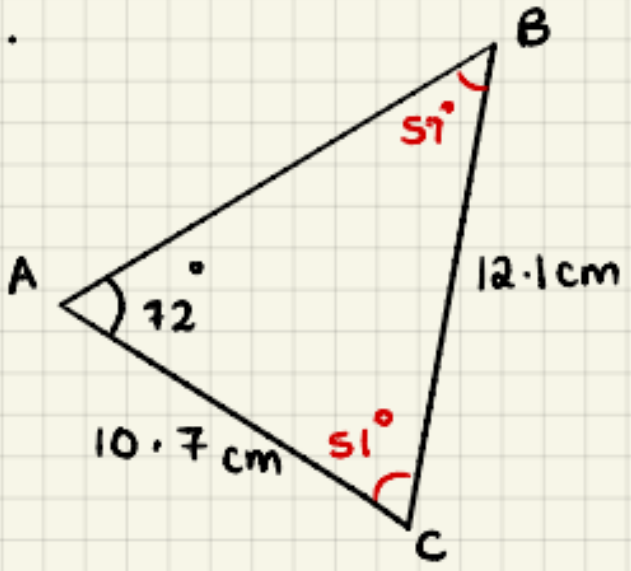
θ

$\cos\theta = \frac{5.8^2 + 6.7^2 - 11^2}{2(5.8)(6.7)}$ M1

$\theta = \cos^{-1}(-0.546)$

$\theta = 123^\circ$ A1

4.



$$\frac{\sin B}{10.7} = \frac{\sin 72^\circ}{12.1}$$ M1

$$B = \sin^{-1}\left(\frac{10.7 \sin 72^\circ}{12.1}\right)$$

$$\theta = 57^\circ$$ A1

$$A = \frac{1}{2} ab \sin C$$

$$= \frac{1}{2}(10.7)(12.1)\sin 51^\circ$$ M1

$$= 50.3 cm^2$$ A1

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Year 12 Initial Test for Mathematics

Write out the solutions to each of the following questions.
*Show full working, **without** the use of a calculator.*

Practice 2 (No Calculator)

B1 Indices

1.	Evaluate $\left(3\frac{3}{8}\right)^{-1/3}$	**2.**	Express in the form x^k $\frac{\sqrt{x}\times\sqrt[5]{x}}{x^2}$	**3.**	Solve $3^{3x-2}=\sqrt[3]{9}$	**4.**	Solve $\left(\frac{1}{2}\right)^{1-x}=\left(\frac{1}{8}\right)^{2x}$

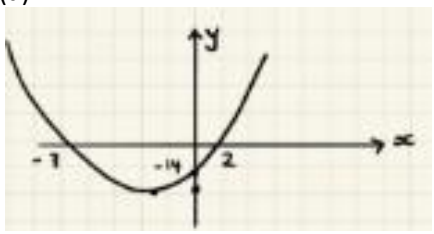
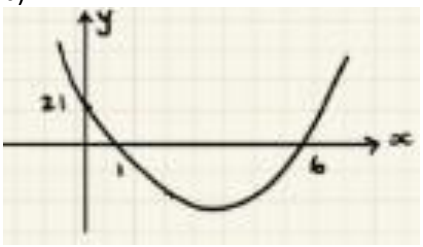
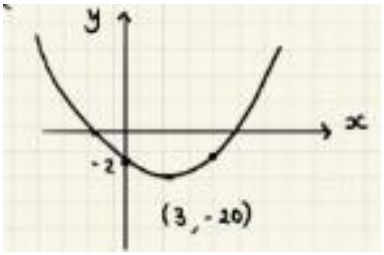
B2 Surds

1.	Simplify $\sqrt{80}$	**2.**	Expand and simplify $(7-3\sqrt{5})(3\sqrt{5}-2)$	**3.**	Rationalise the denominator $\frac{7}{5\sqrt{3}}$	**4.**	Rationalise the denominator $\frac{3+5\sqrt{11}}{7-\sqrt{11}}$

B3 Quadratics

1. Solve the following quadratic equations by factorising and use your solutions to sketch the related quadratic graph, labelling all intersections with the coordinate axis.		
(a) (i) $x^2-13x+40=0$	(b) (i) $x^2+5x=0$	(c) (i) $6x^2+5x-4=0$
(a) (ii) Sketch $y=x^2-13x+40$	(b) (ii) Sketch $y=x^2+5x$	(c) (ii) Sketch $y=6x^2+5x-4$

2. Solve the following quadratic equations by completing the square and use your solutions to sketch therelated quadratic graph, labelling all intersections with the coordinate axis and turning point.		
(a) (i) $x^2+2x-20=0$	(b) (i) $-11+8x-x^2=0$	(c) (i) $3x^2-18x+2=0$
(ii) Write $y=x^2+2x-20$ in the form $y=a(x+b)^2+c$	(ii) Write $y=-11+8x-x^2$in the form $y=a(x+b)^2+c$	(ii) Write $y=3x^2-18x+2$ in the form $y=a(x+b)^2+c$
(iii) Sketch $y=x^2+2x-20$	(iii) Sketch $y=-11+8x-x^2$	(iii) Sketch $y=3x^2-18x+2$

3. Evaluate the equation of the following quadratics, giving your answer in the form $y=ax^2+bx+c$		
(a) 	(b) 	(c) 

B4 Simultaneous Equations

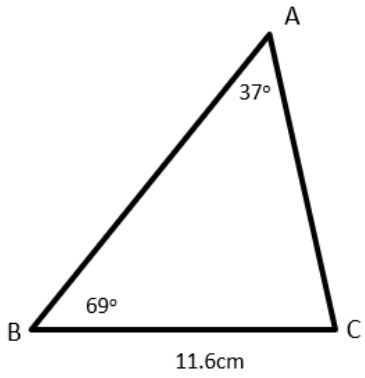
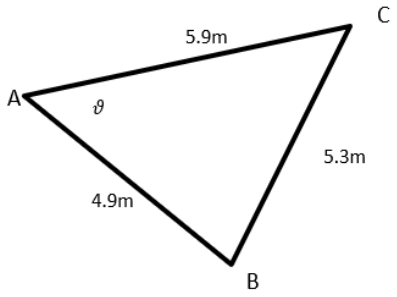
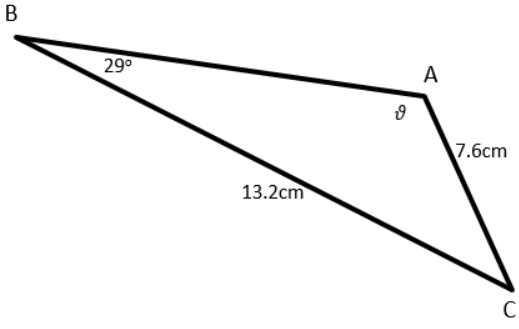
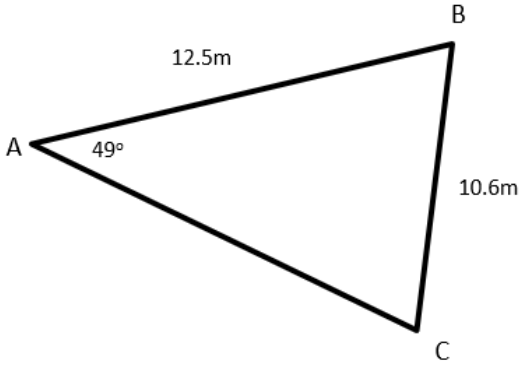
1.	Solve $3x - 4y = 16$ $2x + 12y = 7$	**2.**	Solve $3y = 2x - 8$ $4x + y = -5$	**3.**	Solve $3x^2 - xy + y^2 = 36$ $x - 2y = 10$

B5 Inequalities

Find the set of values for which…

1.	$4(5 - 2y) \geq 3(7 - 2y)$	**2.**	$2x^2 - 5x - 3 > 0$	**3.**	$x(2x + 1) \leq x^2 + 6$

E1 Triangle Geometry (Calculator)

1.	Calculate the length AB 	**2.**	Calculate the angle ϑ 
3.	Calculate the length AB and the obtuse angle ϑ 	**4.**	Calculate the area of the triangle ABC 

Practice Test 2

B1 Indices

1. $\left(3\frac{3}{8}\right)^{-1/3} = \left(\frac{27}{8}\right)^{-\frac{1}{3}}$ M1

$= \left(\frac{8}{27}\right)^{1/3}$

$= \frac{2}{3}$ A1

2. $\frac{\sqrt{x} \times \sqrt[5]{x}}{x^2}$

$= \frac{x^{1/2} \times x^{1/5}}{x^2}$ M1

$= \frac{x^{7/10}}{x^2}$ A1 $= x^{-13/10}$ A1

3. $3^{3x-2} = \sqrt[3]{9}$

$3^{3x-2} = (3^2)^{1/3}$ M1

$3^{3x-2} = 3^{2/3}$

$3x - 2 = \frac{2}{3}$ M1

$3x = \frac{8}{3} \Rightarrow x = \frac{8}{9}$ A1

4. $\left(\frac{1}{2}\right)^{1-x} = \left(\frac{1}{8}\right)^{2x}$

$(2^{-1})^{1-x} = (2^{-3})^{2x}$ M1

$2^{-1+x} = 2^{-6x}$

$-1 + x = -6x$ M1

$7x = 1$

$x = 1/7$ A1

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B2 Surds

1. $\sqrt{80}$

$= \sqrt{16 \times 5}$

$= 4\sqrt{5}$ A1

2. $(7 - 3\sqrt{5})(3\sqrt{5} - 2)$

$= 21\sqrt{5} - 14 - 45 + 6\sqrt{5}$ M1 A1

$= 27\sqrt{5} - 59$ A1

3. $\frac{7}{5\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ M1

$= \frac{7\sqrt{3}}{15}$ A1

4. $\frac{3 + 5\sqrt{11}}{7 - \sqrt{11}} \quad \frac{(7+\sqrt{11})}{(7+\sqrt{11})}$ M1

$= \frac{21 + 8\sqrt{11} + 35\sqrt{11} + 55}{49 - 11}$ A1 A1

$= \frac{76 + 38\sqrt{11}}{38}$

$= 2 + \sqrt{11}$ A1

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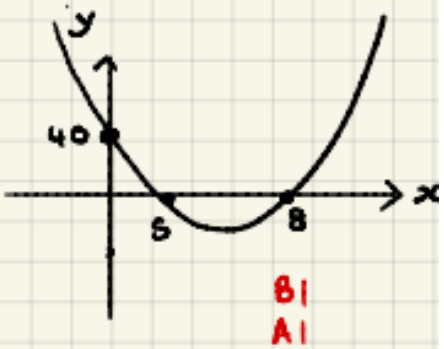
B3 Quadratics

1. (a) (i) $x^2 - 13x + 40 = 0$

$(x-8)(x-5) = 0$ M1

$x = 8 \quad x = 5$ A1

(ii) $y = x^2 - 13x + 40$



B1
A1
A1

(b) (i) $x^2 + 5x = 0$

$x(x+5) = 0$ M1

$x = 0 \quad x = -5$ A1

(ii) $y = x^2 + 5x$

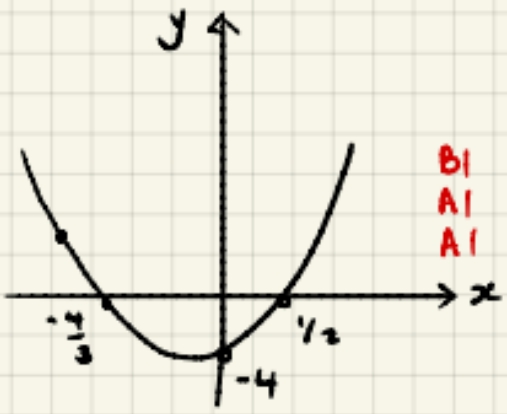
B1
A1
A1

(c) (i) $6x^2 + 5x - 4 = 0$

$(3x+4)(2x-1) = 0$ M1

$x = -4/3 \quad x = 1/2$ A1

(ii) $y =$



B1
A1
A1

15

B1 shape, location related to axes

A1 intersections x-axis

A1 intersections y-axis

2. (a) (i) $x^2 + 2x - 20 = 0$

$(x+1)^2 - 1 - 20 = 0$ M1

$(x+1)^2 = 21$

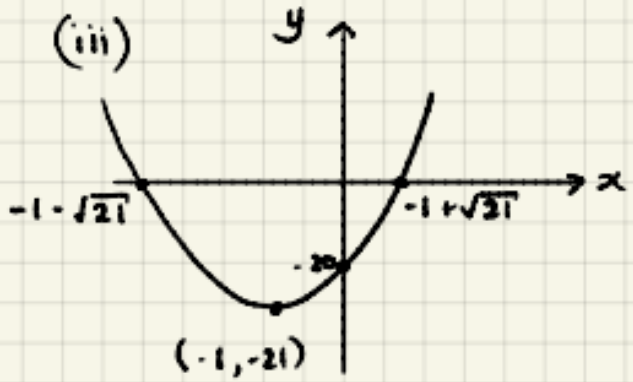
$x+1 = \pm\sqrt{21}$

$x = -1 \pm \sqrt{21}$ A1

(ii) $y = x^2 + 2x - 20$

$y = (x+1)^2 - 21$ B1

(iii)



Graphs
- B1 Shape
- A1 Vertex
- A1 intersections x-axis
- A1 intersections y-axis

(b) (i) $-11 + 8x - x^2 = 0$

$-(x^2 - 8x + 11) = 0$ M1

$-[(x-4)^2 - 16 + 11] = 0$ M1

$5 - (x-4)^2 = 0$

$(x-4)^2 = 5$

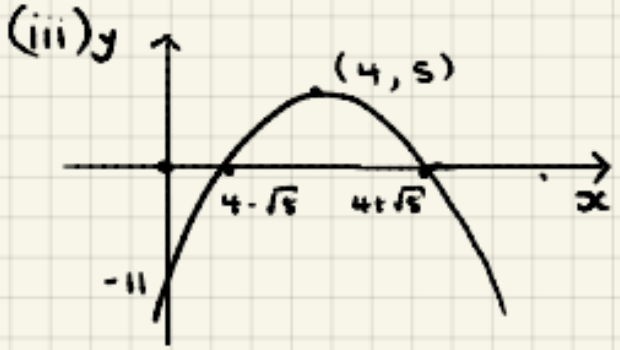
$x - 4 = \pm\sqrt{5}$

$x = 4 \pm \sqrt{5}$ A1

(ii) $y = -11 + 8x - x^2$

$y = 5 - (x-4)^2$ B1

(iii)



(c) (i) $3x^2 - 18x + 2 = 0$

$3\left[x^2 - 6x + \frac{2}{3}\right] = 0$ M1

$3\left[(x-3)^2 - 9 + \frac{2}{3}\right] = 0$ M1

$3\left[(x-3)^2 - \frac{25}{3}\right] = 0$

$3(x-3)^2 - 25 = 0$

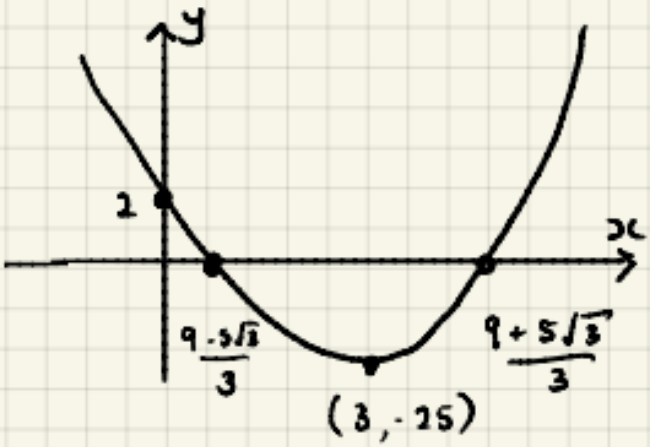
$3(x-3)^2 = 25$

$x - 3 = \pm\frac{5}{\sqrt{3}}$

$x = \frac{9 \pm 5\sqrt{3}}{3}$ A1

(ii) $y = 3x^2 - 18x + 2$

$y = 3(x-3)^2 - 25$ B1



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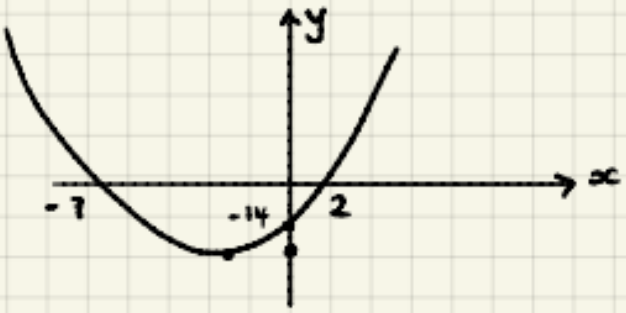
3. (a)



$y = k(x+7)(x-2)$ M1

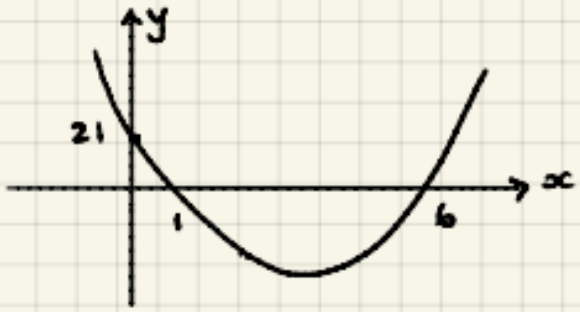
$-14 = k(7)(-2)$

$k = 1$ A1

$y = (x+7)(x-2)$

$y = x^2 + 5x - 14$ A1

(b)



$y = k(x-1)(x-6)$ M1

$21 = k(-1)(-6)$

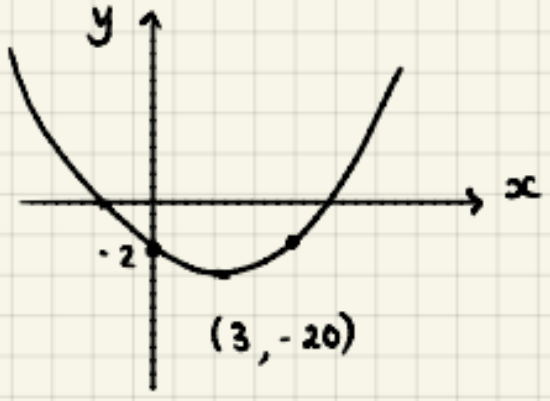
$\Rightarrow k = \frac{21}{6} = \frac{7}{2}$ A1

$y = \frac{7}{2}(x-1)(x-6)$

$y = \frac{7}{2}(x^2 - 7x + 6)$

$y = \frac{7x^2}{2} - \frac{49x}{2} + 21$ A1

(c)



$y = k(x-3)^2 - 20$ M1

$-2 = k(-3)^2 - 20$

$18 = k(9)$

$k = 2$ A1

$y = 2(x-3)^2 - 20$

$y = 2(x^2 - 6x + 9) - 20$

$y = 2x^2 - 12x - 2$ A1

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B4. Simultaneous equations

1. $3x - 4y = 16$ $\quad 9x - 12y = 48$

$2x + 12y = 7$ $\quad 2x + 12y = 7$ M1

$11x = 55$

$x = 5$ A1

$3x - 4y = 16$

$15 - 4y = 16$

$-1 = 4y$

$y = -1/4$

$x = 5, y = -1/4$ A1

2. $3y = 2x - 8 \Rightarrow 2x = 3y + 8$

$4x = 6y + 16$

$4x + y = -5$ M1

$6y + 16 + y = -5$

$7y = -21$

$y = -3$

$2x = 3y + 8$

$2x = 3(-3) + 8$

$x = -1/2$ A1 $\quad x = -1/2$ $y = -3$ A1

3. $3x^2 - xy + y^2 = 36$

$x - 2y = 10 \Rightarrow x = 2y + 10$

$3(2y+10)^2 - (2y+10)y + y^2 = 36$ M1

$3(4y^2 + 40y + 100) - y(2y+10) + y^2 = 36$

$12y^2 + 120y + 300 - 2y^2 - 10y + y^2 = 36$

$11y^2 + 110y + 264 = 0$

$y^2 + 10y + 24 = 0$ A1

$(y+6)(y+4) = 0$

M1

$y = -6$ $\quad y = -4$

$x = 2(-6) + 10$ $\quad x = 2(-4) + 10$

$x = -2$ $\quad x = 2$

$x = -2$, $y = -6$ A1 $\quad x = 2$, $y = -4$ A1

BS Inequalities

1. $4(5-2y) \geqslant 3(7-2y)$

$20 - 8y \geqslant 21 - 6y$ M1

$-1 \geqslant 2y$

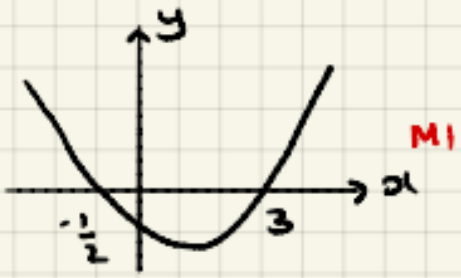
$-\frac{1}{2} \geqslant y$

$y \leqslant -\frac{1}{2}$ A1

2. $2x^2 - 5x - 3 > 0$

$(2x+1)(x-3) > 0$ M1

CVs $x = -\frac{1}{2}$ $x = 3$ A1



M1

$x < -\frac{1}{2}$ or $x > 3$ A1

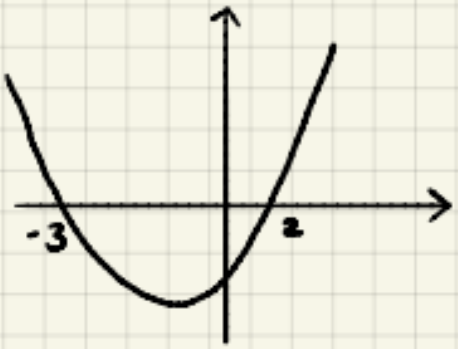
3. $x(2x+1) \leqslant x^2 + 6$

$2x^2 + x \leqslant x^2 + 6$ M1

$x^2 + x - 6 \leqslant 0$

$(x+3)(x-2) \leqslant 0$ M1

CVs $x = -3$ $x = 2$ A1



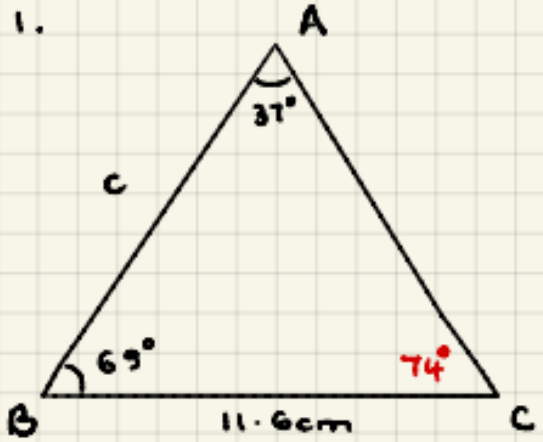
M1

$-3 \leqslant x \leqslant 2$ A1

III

E1 Triangle Geometry

1.

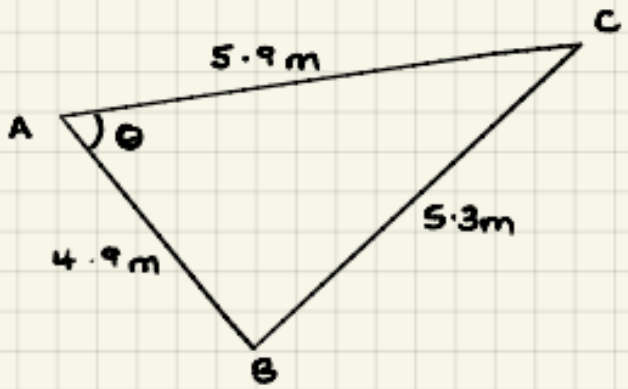


$$\frac{c}{\sin 74^\circ} = \frac{11.6}{\sin 37^\circ}$$

$$c = \frac{11.6 \sin 74^\circ}{\sin 37^\circ} \quad \text{M1}$$

$$c = 18.5\text{cm} \quad \text{A1}$$

2.



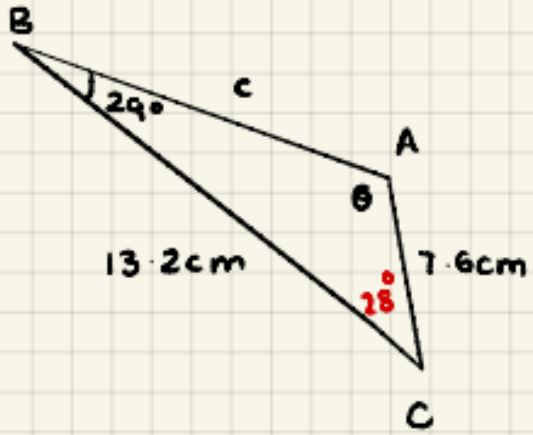
$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos\theta = \frac{5.9^2 + 4.9^2 - 5.3^2}{2(5.9)(4.9)} \quad \text{M1}$$

$$\cos\theta = 0.53148$$

$$\theta = 57.9^\circ \quad \text{A1}$$

3.



θ

$$\frac{\sin\theta}{13.2} = \frac{\sin 29}{7.6}$$

$$\sin\theta = \frac{13.2 \sin 29^\circ}{7.6} \quad \text{M1}$$

$$\sin\theta = 0.8420$$

$$\theta = 57.4^\circ$$

obtuse $\Rightarrow \theta = 123^\circ$ A1

AB

$$c^2 = a^2 + b^2 - 2ab\cos C$$

$$c^2 = 13.2^2 + 7.6^2 - 2(13.2)(7.6)\cos 28 \quad \text{M1}$$

$$c^2 = 54.8 \Rightarrow c = 7.4\text{cm} \quad \text{A1}$$