Summer Independent Learning:

A level Mathematics

Year 11 into Year 12

Welcome to A level maths!

These activities have been designed to help you prepare for the initial assessment in September, which will indicate how well-prepared you are for A level study. It is based on key GCSE Higher content which forms the basis for our first few A level topics.

If you have access to a printer please print the first 2 pages of this document and fill them in as you complete the tasks. If not, please make a copy of each table and fill it in.

You do not need to print the other pages and should complete all questions **on separate paper** so you have enough room to show full detailed methods. Don't be tempted to just write the answers!

Please bring your **completed tables** and **all the work you have done** to your first lesson.

Section 1: Preparation Work

1. Complete the practice questions for each topic. The videos are provided for additional support.
2. Mark and correct your work in a different colour.
3. Red/amber/green rate your confidence with this topic.
4. Make a note of any questions you would like to ask in September.

Topic	***Done and marked? ✓***	***RAG Rating***	**Comments/questions**
B1 Indices			
B2 Surds			
B3 Quadratics			
B4 Simultaneous equations			
B5 Inequalities			
Rearranging equations			
E1 Triangle geometry			

Section 2: Practice Papers

1. Attempt Practice Test 1 without referring to any notes or videos.
2. Mark and correct your work in a different colour.
3. Red/amber/green rate how well you did with this topic.
4. Go back to the Task 1 questions/videos and do some more practice for any red/amber rated topics.

Topic	***RAG Rating***	**Comments/questions**
B1 Indices		
B2 Surds		
B3 Quadratics		
B4 Simultaneous equations		
B5 Inequalities		
E1 Triangle geometry		
Rearranging equations		

5. Repeat steps 1-4 for Practice Test 2.

Topic	***RAG Rating***	**Comments/questions**
B1 Indices		
B2 Surds		
B3 Quadratics		
B4 Simultaneous equations		
B5 Inequalities		
E1 Triangle geometry		
Rearranging equations		

B1 Indices

Videos:

https://youtu.be/1lThXgU08S0

https://youtu.be/v5bn4HZrmQs

https://youtu.be/W0h4rHj88ys

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** $\frac{4x^{\frac{2}{3}} \times 3x^{-\frac{1}{6}}}{6x^{\frac{1}{4}}}$ **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

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

B1 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

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

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

$$2x = 4x + 1$$

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

B2 Surds

Video: https://youtu.be/jHelde32YtI

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.

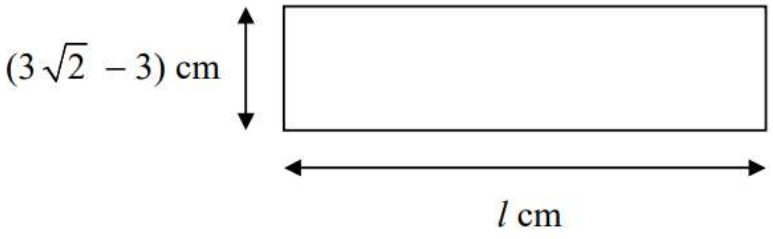
a $\frac{1}{\sqrt{5}}$ **b** $\frac{2}{\sqrt{3}}$ **c** $\frac{1}{\sqrt{8}}$ **d** $\frac{14}{\sqrt{7}}$

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.

B2 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

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

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

B3 Quadratics

Videos:

https://youtu.be/Pziws8ojnlk

https://youtu.be/sn_joGVj15w

https://youtu.be/kk7p6hjn7hQ

https://youtu.be/tolqbX_NXHo

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):

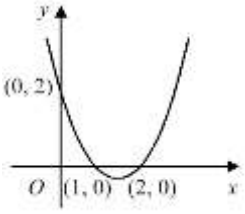
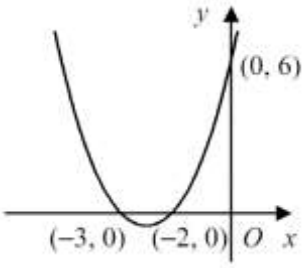
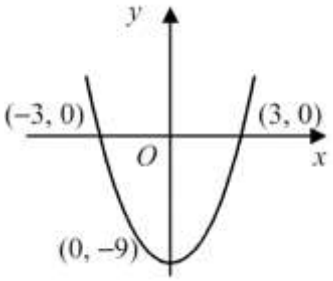
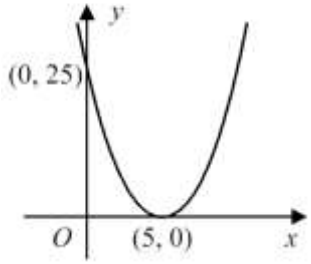
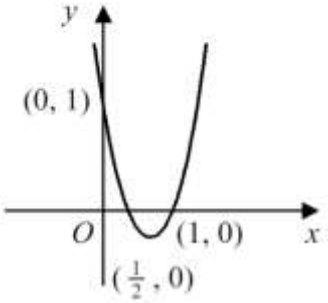
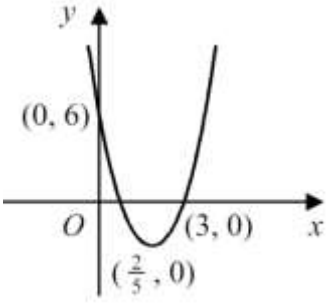
(a)	$y = x^2 - 4x + 3$	(b)	$y = x^2 + 8x + 30$	(c)	$y = x^2 - 5x + 4$
(d)	$y = x^2 + 3x + 3$	(e)	$y = 4x^2 + 8x + 3$	(f)	$y = 8 + 2x - x^2$

B3 Quadratics – Answers

Question 1

(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)	$(5x-2)(x-3)$

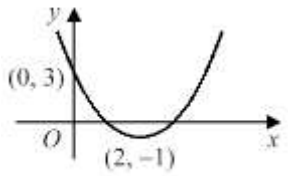
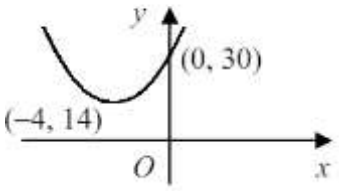
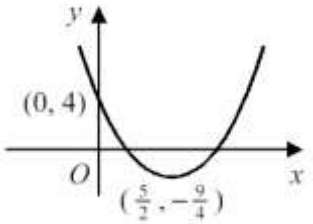
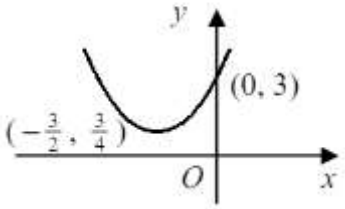
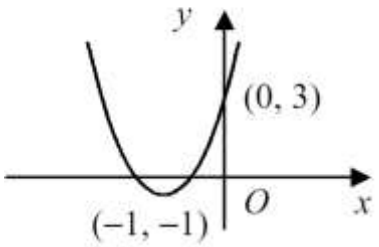
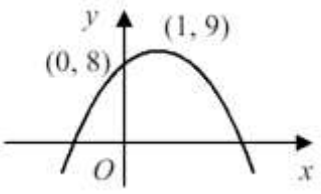
Question 2

(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

(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

(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 $(1, 9)$ 

B4 Simultaneous equations

Video: https://youtu.be/4SRtwS5unwE

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)	$xy = 6$ $x - y = 5$

B4 Simultaneous equations – Answers

(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 $\quad x = 6, y = 1$

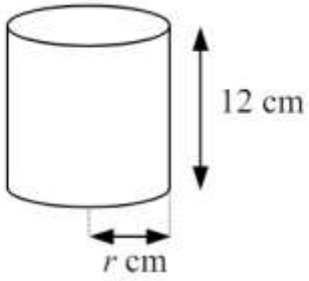
B5 Inequalities

Video: https://youtu.be/wDut-In_7Wg

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



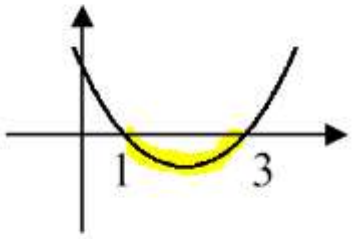
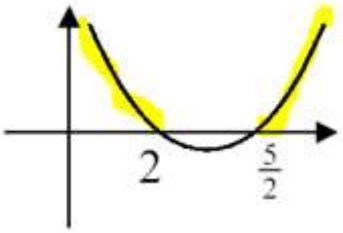
A sealed metal container for food is a cylinder of height 12 cm and base radius r cm.

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.

B5 Inequalities – Answers

(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

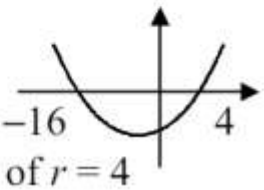
a $\text{S.A} = 2\pi r^2 + 2\pi rh = 2\pi r^2 + 24\pi r$

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

$r^2 + 12r \leq 64$

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

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

Rearranging equations

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.

Rearranging equations – Answers

Question 1

$$xa - xe = d \qquad a - e = \frac{d}{x}$$
$$xa = d + xe \quad or$$
$$a = \frac{d + xe}{x} \qquad a = \frac{d}{x} + e$$

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

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

Question 8

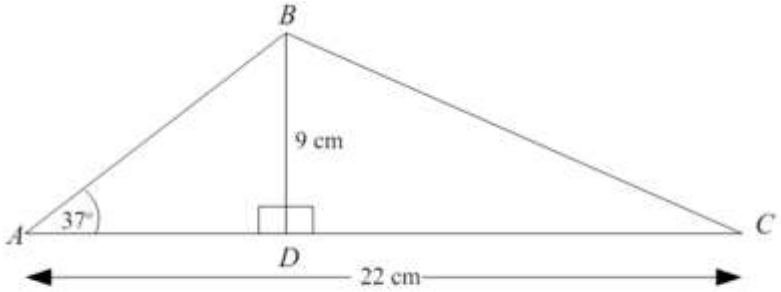
Surface area of cylinder = $2\pi r^2 + 2\pi rh$

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

E1 Triangle geometry

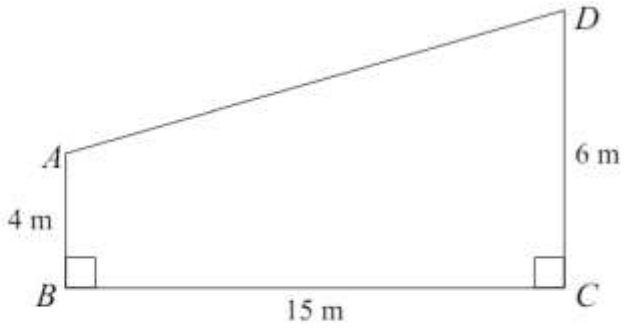
Video: https://youtu.be/uVl6TAb0vBg

Question 1



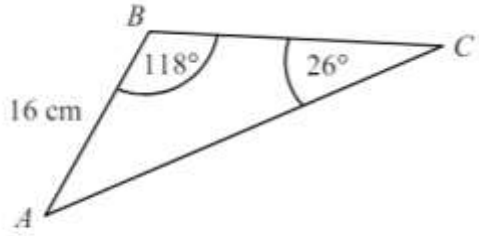
Work out the size of angle *BCD*.
Give your answer to 1 decimal place.

Question 2



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

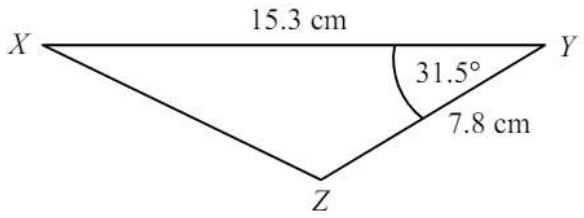
Question 3



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.

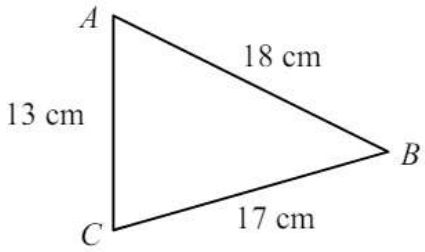
Question 4



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.

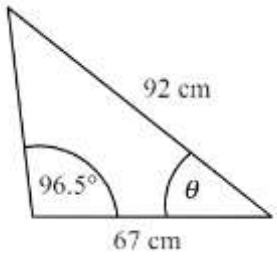
Question 5



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

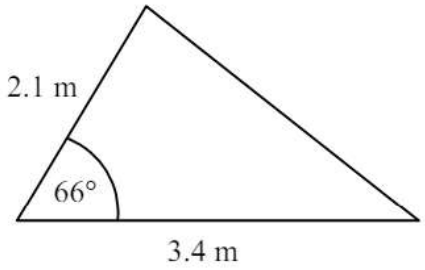
Find the size of the angle ACB

Question 6



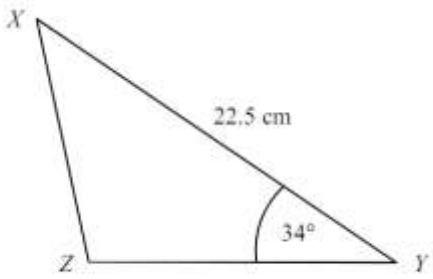
Find the angle θ

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

E1 Triangle geometry – Answers

Question 1

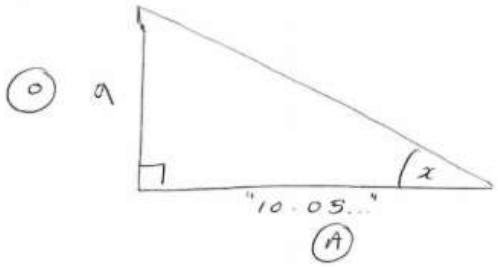
$$\tan(37) = \frac{9}{y}$$

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

$$= 11.9434...$$

$$CD = 22 - 11.9434$$

$$= 10.05659...$$



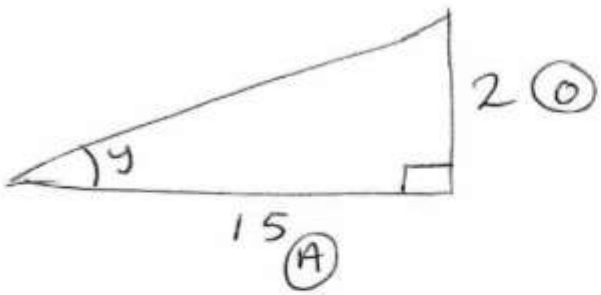
$$\tan x = \frac{9}{"10.05.."}$$

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

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

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

area

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

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

Question 8

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

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

$$= 15.896$$

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

$$= 165.906$$

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

Practice Test 1

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

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.

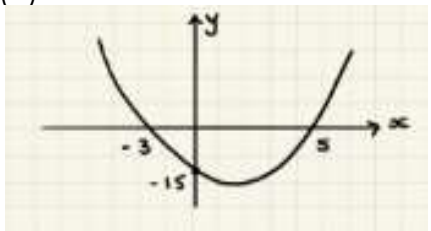
(a) (i) $x^2 + 3x - 28 = 0$	(b) (i) $x^2 - 6x + 9 = 0$	(c) (i) $2x^2 - 21x + 27 = 0$
(a) (ii) Sketch $y = x^2 + 3x - 28$	(b) (ii) Sketch $y = x^2 - 6x + 9$	(c) (ii) Sketch $y = 2x^2 - 21x + 27$

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.

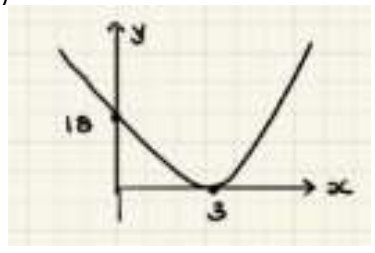
(a) (i) $x^2 + 4x - 7 = 0$	(b) (i) $11 + 8x - x^2 = 0$	(c) (i) $3x^2 - 12x + 2 = 0$
(ii) Write $y = x^2 + 4x - 7$ in the form $y = a(x + b)^2 + c$	(ii) Write $y = 11 + 8x - x^2$in the form $y = a(x + b)^2 + c$	(ii) Write $y = 3x^2 - 12x + 2$ in the form $y = a(x + b)^2 + c$
(iii) Sketch $y = x^2 + 4x - 7$	(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 $y = ax^2 + bx + c$

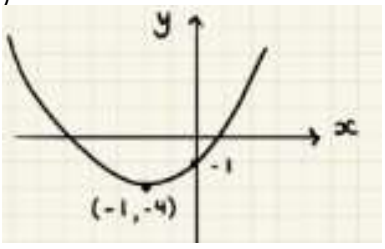
(a)



(b)



(c)



B4 Simultaneous Equations

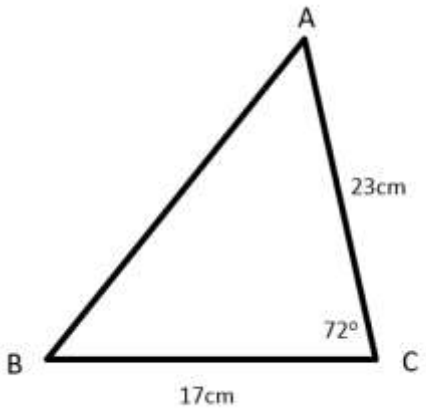
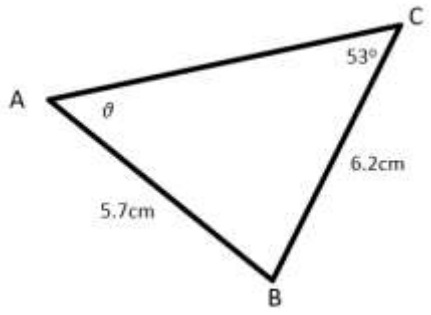
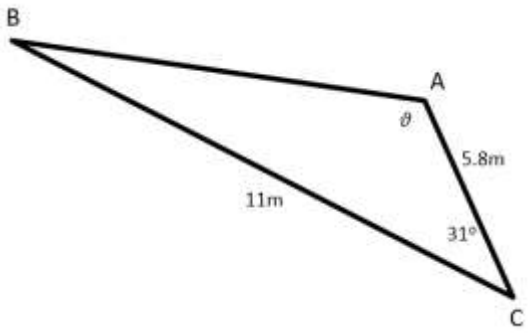
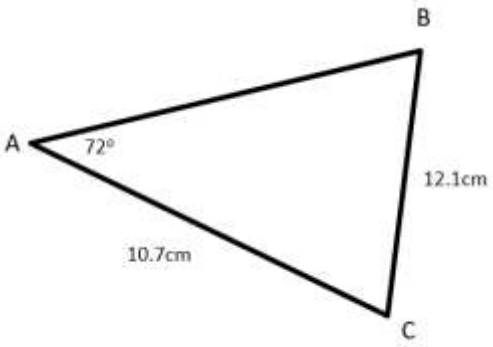
1.	Solve $3x + 3y = -4$ $5x - 2y = 5$	**2.**	Solve $y = x - 6$ $\frac{1}{2}x - y = 4$	**3.**	Solve $3x^2 - x - y^2 = 0$ $x + y = 1$

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 

Re-arranging equations

1.	To find velocity, v, we use the formula $v^2 = u^2 + 2as$ Rearrange to find s	**2.**	Make x the subject of $4F = F + \frac{a}{y+x}$

Practice Test 1 – Answers

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

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

$2x = 1 - x$ M1

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

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]

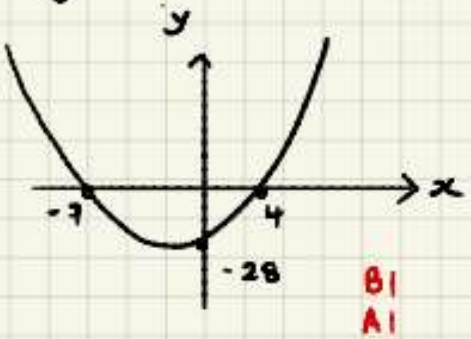
B3 Quadratics

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

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

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

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



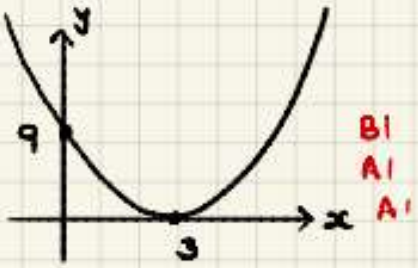
B1
A1
A1

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

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

A1 $x = 3$ (repeated)

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



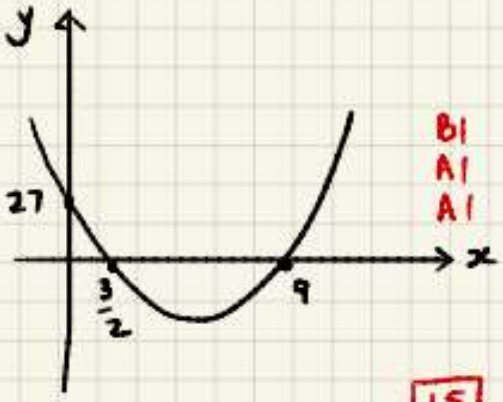
B1
A1
A1

(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

$(x+2)^2 = 11$

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

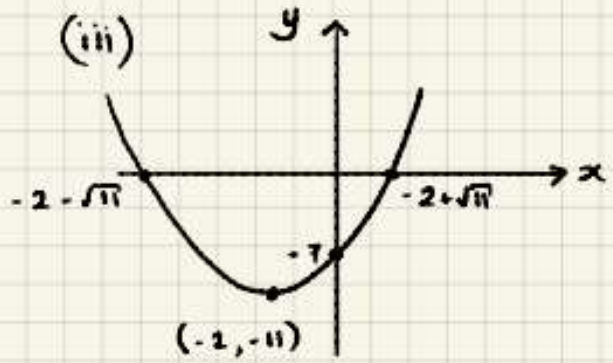
$x = -2 \pm \sqrt{11}$ A1

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

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

$(x-4)^2 = 27$

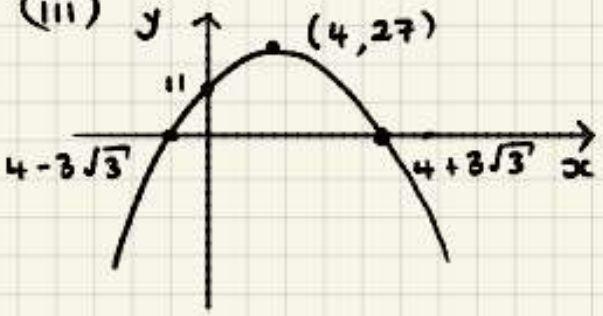
$x - 4 = \pm 3\sqrt{3}$

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

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

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

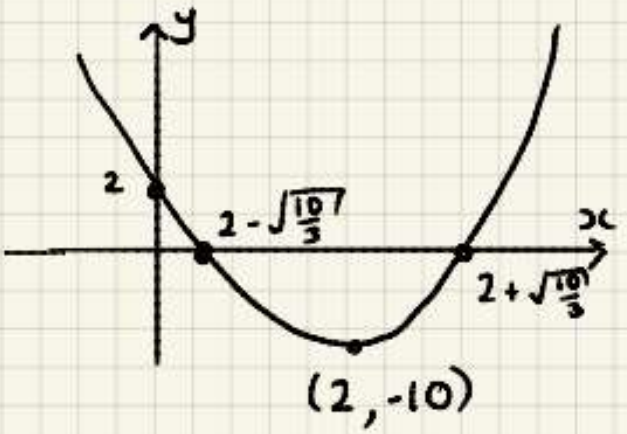
$(x-2)^2 = \frac{10}{3}$

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

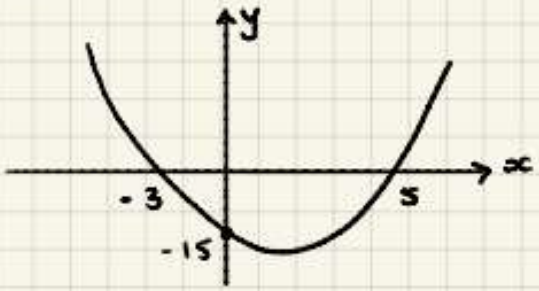
$x = 2 \pm \sqrt{\frac{10}{3}}$ A1

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

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



3. (a)



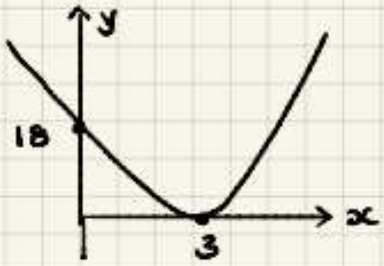
$y = k(x+3)(x-5)$ M1

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

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

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

(b)



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

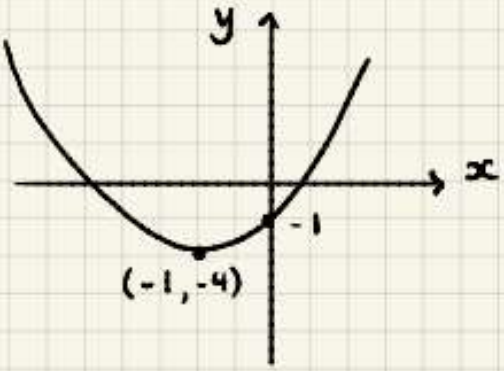
$18 = k(-3)^2 \Rightarrow k = 2$ A1

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

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

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

04 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. $3x^2 - x - y^2 = 0$ $\quad x + y = 1$

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

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

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

$2x^2 + x - 1 = 0$ 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. $3(1 - 2t) \leq t - 4$

$3 - 6t \leq t - 4$

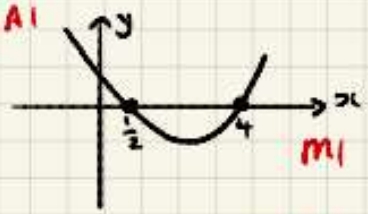
$7 \leq 7t$ M1

$t \geq 1$ 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. $2y + 3 < 3y(y - 2)$

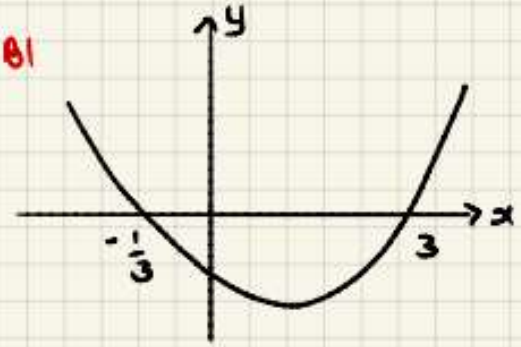
$2y + 3 < 3y^2 - 6y$

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

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

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

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



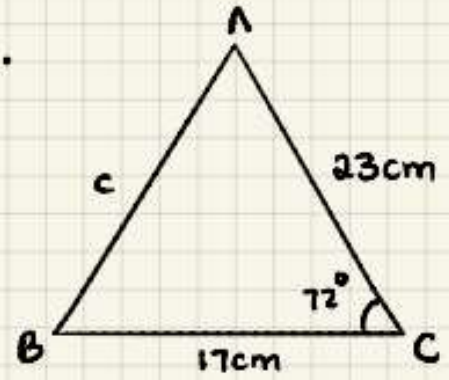
M1

11

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

E1 Triangle Geometry

1.



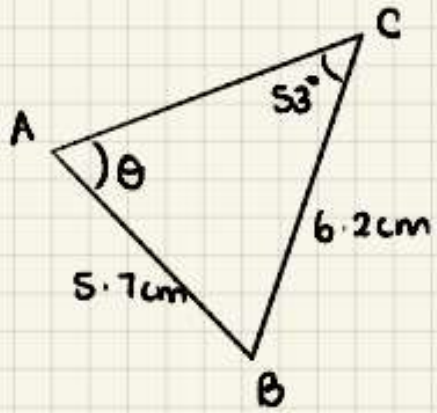
$c^2 = a^2 + b^2 - 2ab\cos C$

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

$c^2 = 576.35$ M1

$AB = 24.0\text{cm}$ A1

2.

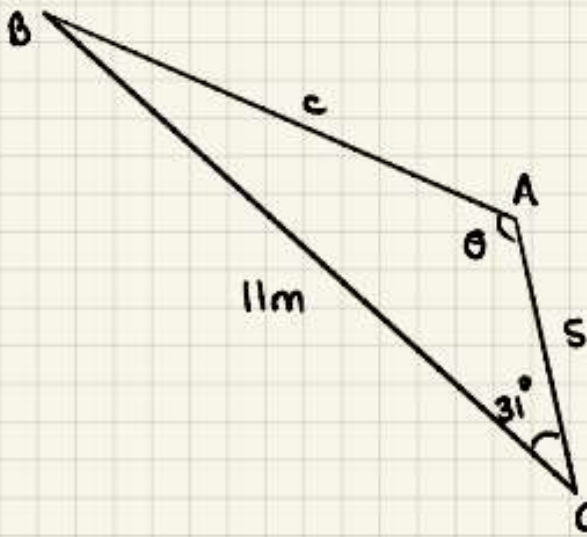


$\frac{\sin\theta}{6.2} = \frac{\sin 53}{5.7}$ M1

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

$\theta = 60.3^\circ$ 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

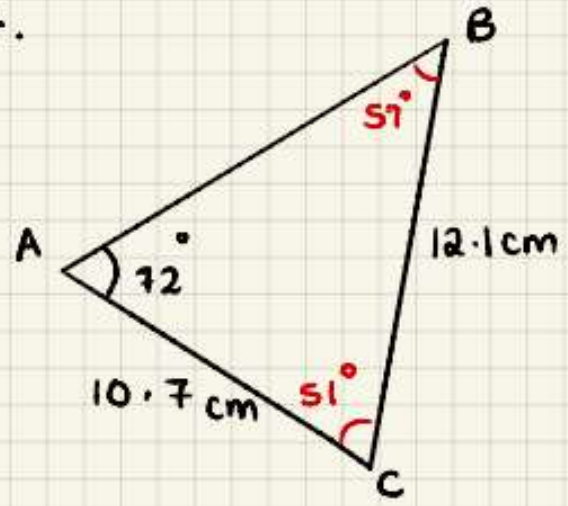
θ

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

$\theta = \cos^{-1}(-0.546)$ A1

$\theta = 123^\circ$

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

$$= 50.3 \text{cm}^2$$ A1

12

Re-arranging equations

1.	To find velocity, v, we use the formula → $v^2 = u^2 + 2as$ Rearrange to find s $v^2 - u^2 = 2as$ $s = \frac{v^2 - u^2}{2a}$
2.	Make x the subject of $4F = F + \frac{a}{y + x}$ → $3F = \frac{a}{y + x}$ $3Fy + 3Fx = a$ $3Fx = a - 3Fy$ $x = \frac{a - 3FY}{3F}$

Practice Test 2

Write out the solutions to each of the following questions. Show full working, without the use of a 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 $\frac{3+5\sqrt{11}}{7-\sqrt{11}}$

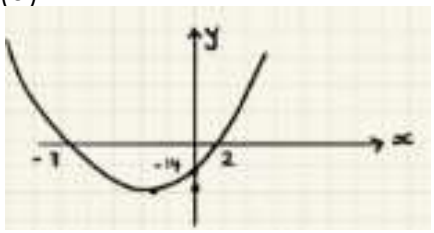
B3 Quadratics

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 $y = 6x^2 + 5x - 4$

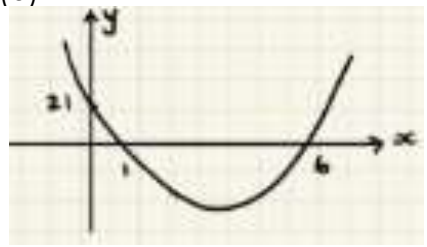
2. Solve the following quadratic equations by completing the square and use your solutions to sketch the related quadratic graph, labelling all intersections with the coordinate axis and turning point.		
(a) (i) $x^2 + 2x - 20 = 0$	(b) (i) $-11 + 8x - x^2 = 0$	(c) (i) $3x^2 - 18x + 2 = 0$
(ii) Write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

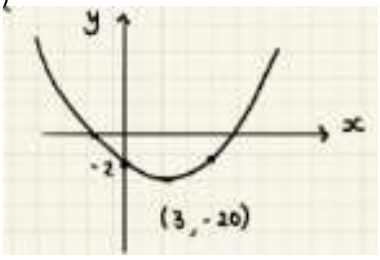
(a)



(b)



(c)



B4 Simultaneous Equations

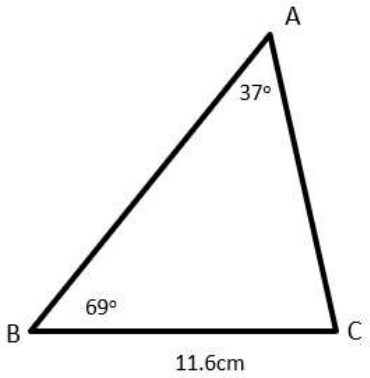
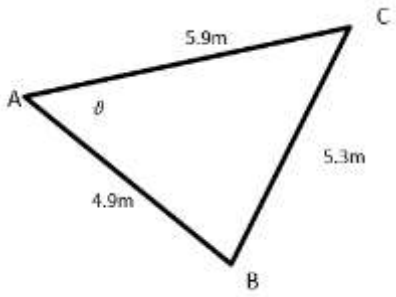
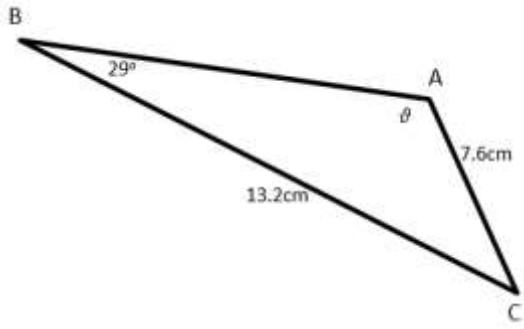
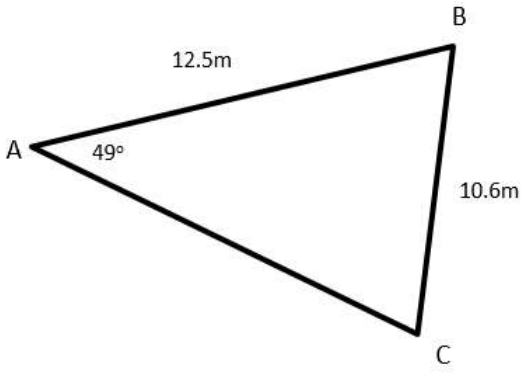
1.	Solve $3x - 4y = 16$ $2x + 12y = 7$	**2.**	Solve $3y = 2x - 8$ $4x + y = -5$	**3.**	Solve $3x^2 - xy + y^2 = 36$ $x - 2y = 10$

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 

Re-arranging equations

1.	Make x the subject of $x + a = \frac{x+b}{c}$	**2.**	Make a the subject of $\frac{1-a}{1+a} = \frac{x}{y}$

Practice Test 2 – Answers

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

11

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

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

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

$= 2 + \sqrt{11}$ A1

10

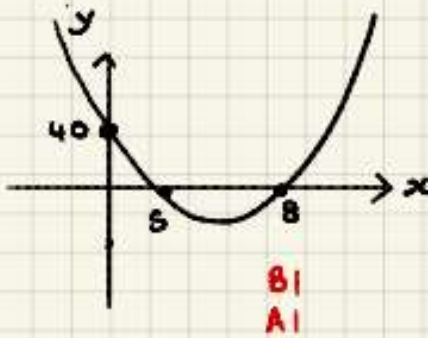
B3 Quadratics

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

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

$x = 8 \quad x = 5$ A1

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



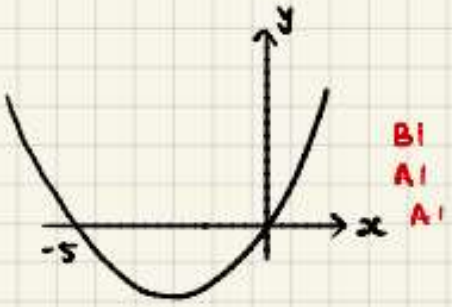
B1
A1
A1

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

$x(x+5) = 0$ M1

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

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



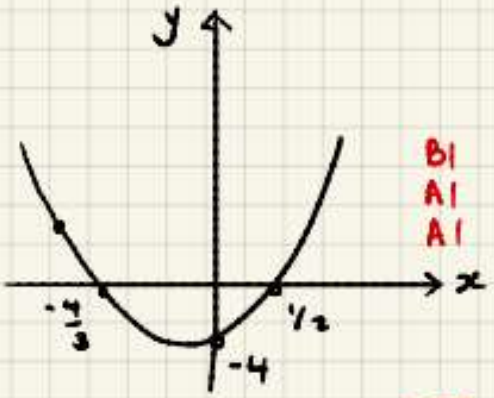
B1
A1
A1

(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

$(x+1)^2 = 21$

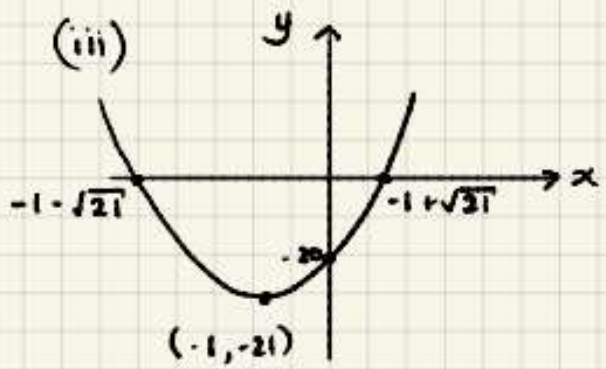
$x+1 = \pm\sqrt{21}$

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

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

$(x-4)^2 = 5$

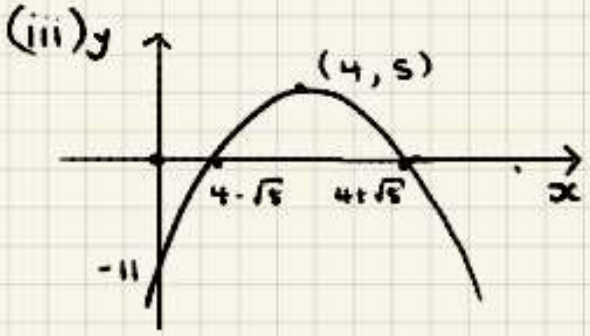
$x - 4 = \pm\sqrt{5}$

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

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

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

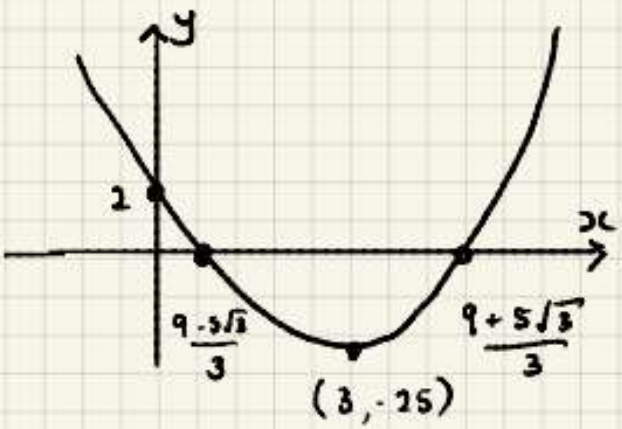
$3(x-3)^2 = 25$

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

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

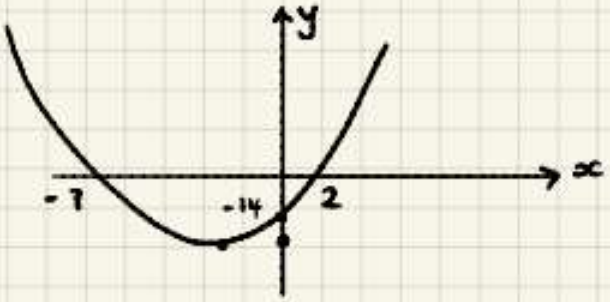
(ii) $y = 3x^2 - 18x + 2$

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



23

3. (a)



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

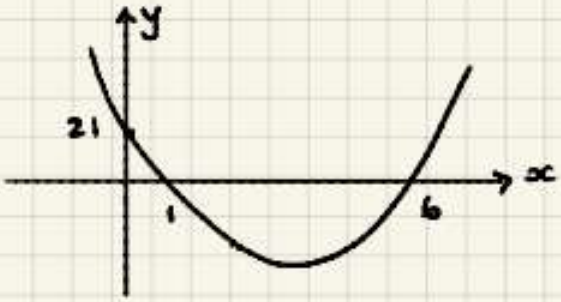
$-14 = k(7)(-2)$

$k = 1$ A1

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

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

(b)



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

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

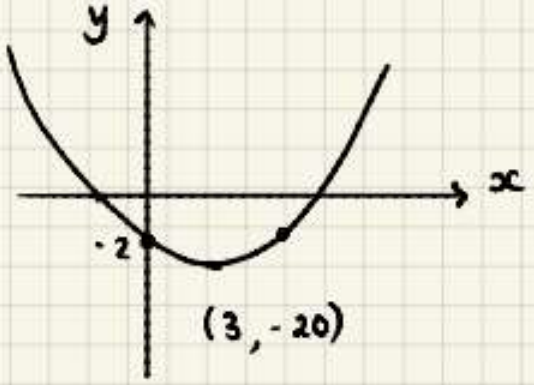
$\Rightarrow k = \frac{21}{6} = \frac{7}{2}$ A1

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

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

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

[9]

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

11

BS Inequalities

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

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

$-1 \geqslant 2y$

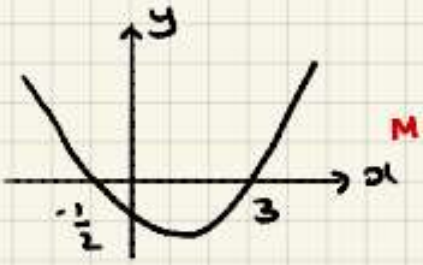
$-\frac{1}{2} \geqslant y$

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

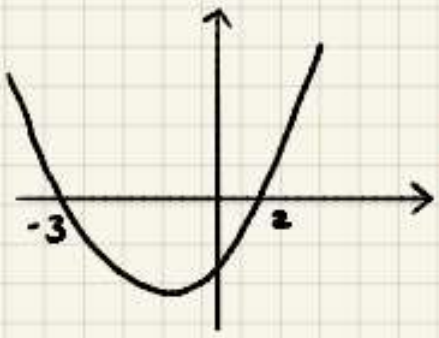
3. $x(2x+1) \leqslant x^2 + 6$

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

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

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

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



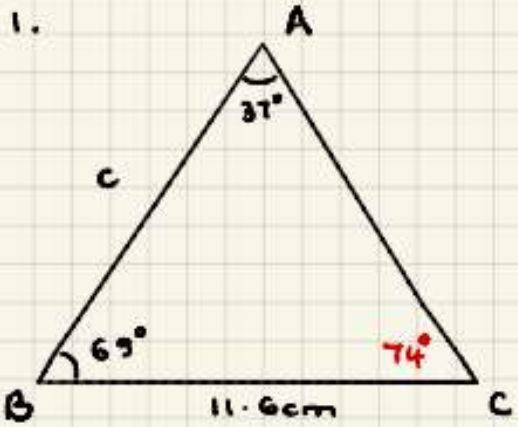
M1

$-3 \leqslant x \leqslant 2$ A1

III

E1 Triangle Geometry

1.

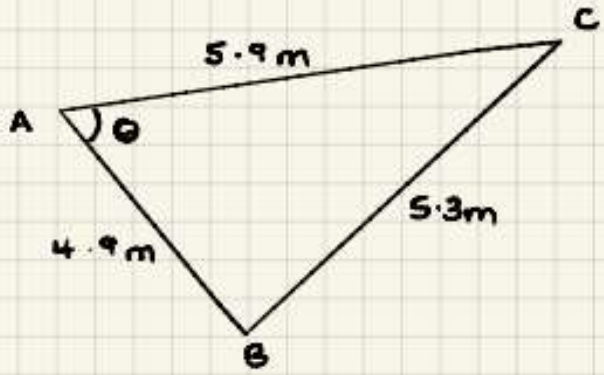


$$\frac{c}{\sin 74^\circ} = \frac{11.6}{\sin 37^\circ}$$

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

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

2.



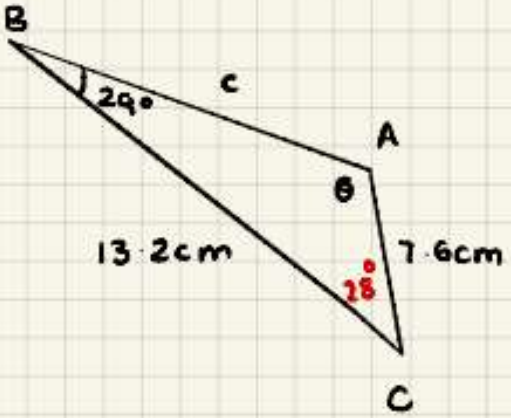
$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

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

$$\cos\theta = 0.53148$$

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

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

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

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

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

Re-arranging equations

1.	Make x the subject of $x + a = \frac{x+b}{c}$	$c(x+a) = x+b$ $cx + ca - x = b$ $cx - x = b - ca$ $x(c-1) = b - ca$ $x = \frac{b-ca}{c-1}$
2.	Make a the subject of $\frac{1-a}{1+a} = \frac{x}{y}$	$y(1-a) = x(1+a)$ $y - ay = x + xa$ $y - x = xa + ay$ $a(x+y) = y - x$ $a = \frac{y-x}{x+y}$