Pearson

Mark Scheme (Results)

November 2025

Pearson Edexcel International GCSE In Mathematics A

4MA1/1H

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

November 2025
Question Paper Log Number P79785A
Publication Code 4MA1_1H_2511_MS

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

- **Types of mark**
  - M marks: method marks
  - A marks: accuracy marks
  - B marks: unconditional accuracy marks (independent of M marks)
- **Abbreviations**
  - cao – correct answer only
  - ft – follow through
  - isw – ignore subsequent working
  - SC - special case
  - oe – or equivalent (and appropriate)
  - dep – dependent
  - indep – independent
  - awrt – answer which rounds to
  - eeoo – each error or omission

- **No working**
  If no working is shown then correct answers normally score full marks
  If no working is shown then incorrect (even though nearly correct) answers score no marks.

- **With working**
  If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
  If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

  If a candidate misreads a number from the question. Eg. Uses 252 instead of 255; method marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review. If there is a choice of methods shown, mark the method that leads to the answer on the answer line; where no answer is given on the answer line, award the lowest mark from the methods shown.

  If there is no answer on the answer line then check the working for an obvious answer.

- **Ignoring subsequent work**
  It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for

the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

- **Parts of questions**
  Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded to another.

International GCSE Maths				
Values in quotation marks must come from a correct method previously seen unless clearly stated otherwise.				
Q	**Working**	**Answer**	**Mark**	**Notes**
1	2.5 × 8 + 7.5 × 7 + 12.5 × 3 + 17.5 × 10 + 22.5 × 2 **or** 20 + 52.5 + 37.5 + 175 + 45 (= 330) [lower bound products are: 0, 35, 30, 150, 40] [upper bound products are: 40, 70, 45, 200, 50]		4	M2 for at least **4** correct products added (need not be evaluated) (M1 for use of values within interval (including end points) for at least **4** products added **or** correct midpoints used for at least 4 products and not added)
	"330" ÷ 30			M1 dep on M1 allow division by their $\sum f$ provided addition or total under column seen
	Correct answer scores full marks (unless from obvious incorrect working)	11		A1
				Total 4 marks

2	Any **two** from: 2 (or 4) **or** 60 **or** 9 (or 3)		2	M1	for rounding at least 2 of the 3 given numbers to one significant figure
	eg $\frac{2^2 \times 60}{\sqrt{9}} = 80$ or $\frac{4 \times 60}{3} = 80$	80 with rounded calculation seen		A1	dep on M1, all figures rounded correctly and 80 given. ignore any statements – just mark the rounded calculation
	Working required				
					Total 2 marks

3		Correct bisector with suitable arcs shown	2	B2	for a correct bisector with suitable arcs shown (B1 for suitable arcs but no bisector or a bisector without suitable arcs)
					Total 2 marks

4		$e = 2$	3	B3	all three correct (B2 for two correct) (B1 for one correct)
		$f = 6$			
		$g = 10$			
					Total 3 marks

5	$\frac{26}{7}(+)\frac{5}{3}$ **or** oe **or** $(3)\frac{15a}{21a}(+)(1)\frac{14a}{21a}$ oe		3	M1	for correct improper fractions **or** fractional part of numbers written correctly over a suitable common denominator
	eg $\frac{78}{21}+\frac{35}{21}$ **or** $\frac{26\times3}{3\times7}+\frac{5\times7}{3\times7}$ **or** $\frac{26\times3+5\times7}{3\times7}$ **or** $\frac{78a}{21a}+\frac{35a}{21a}$ **or** $3\frac{15}{21}+1\frac{14}{21}=4\frac{29}{21}$ oe **or** $4+\frac{15}{21}+\frac{14}{21}=4+1\frac{8}{21}$ oe			M1	for correct fractions with a common denominator with addition sign present **or** for working with mixed numbers to the stage shown implies the first M1
	eg $\frac{78}{21}+\frac{35}{21}=\frac{113}{21}=5\frac{8}{21}$ **or** $3\frac{15}{21}+1\frac{14}{21}=4\frac{29}{21}=5\frac{8}{21}$ If common denominator is not 21 then cancelling must be shown eg $\frac{156}{42}+\frac{70}{42}=\frac{226}{42}=\frac{113}{21}=5\frac{8}{21}$ oe **or** $\frac{156}{42}+\frac{70}{42}=\frac{226}{42}=5\frac{16}{42}=5\frac{8}{21}$ oe **or** $3\frac{30}{42}+1\frac{28}{42}=4\frac{58}{42}=4\frac{29}{21}=5\frac{8}{21}$ oe	A fully correct solution shown		A1	Dep on M2 for a correct answer from fully correct working If a student shows that $5\frac{8}{21}=\frac{113}{21}$ and has working that shows LHS $=\frac{113}{21}$ this can gain full marks NB Use of decimals scores no marks unless as a check
	Working required				
					Total 3 marks

6	$\frac{275}{2+3}$ (= 55) **or** $\frac{275}{2+3}\times 2$ (= 110) **or** $\frac{275}{2+3}\times 3$ (= 165) **OR** $\frac{2}{5}\times\frac{3}{11}\left(=\frac{6}{55}\right)$ **or** $\frac{3}{5}\times 0.32\left(=\frac{24}{125}\right)$ oe		4	M1	for a method to find 1 part of the ratio **or** a method to find the amount of money that either Eli or Peta gets **OR** finds the proportion of the money that either Eli or Peta gives to charity Allow decimal equivalents eg 0.4 and 0.27(27…) throughout for M marks
	"110" × $\frac{3}{11}$ (= 30) **or** "165" × 0.32 (= 52.8(0)) **OR** "$\frac{6}{55}$" × 275 (= 30) **or** "$\frac{24}{125}$" × 275 (= 52.8(0)) **or** "$\frac{6}{55}$" + "$\frac{24}{125}$" $\left(=\frac{414}{1375}\right)$ **OR** $\left(1-\frac{3}{11}\right)\times$"110"(= 80) **and** (1 – 0.32) × "165" (= 112.2(0))			M1	for a method to find the amount of money that either Eli or Peta gives to charity **OR** finds total proportion of the money that will be given to charity **OR** for a method to find the amount of money that Eli keeps **and** the amount of money that Peta keeps
	"110" × $\frac{3}{11}$ (= 30) **and** "165" × 0.32 (= 52.8(0)) **OR** "$\frac{6}{55}$" × 275 (= 30) **and** "$\frac{24}{125}$" × 275 (= 52.8(0)) **OR** "$\frac{414}{1375}$" × 275 **OR** $\left(1-\frac{3}{11}\right)\times$"110" + (1 – 0.32) × "165"(= 192.2(0))			M1	for a method to find the amount of money that both Eli **and** Peta gives to charity **OR** for a complete method **OR** For a method to find the total amount of money both Eli and Peta keep
	Correct answer scores full marks (unless from obvious incorrect working)	82.8(0)		A1	
					Total 4 marks

7	(a)		474.5	1	B1
	(b)		125	1	B1 allow $124.\dot{9}$ or 124.999(9…)
					Total 2 marks

8	eg $(8^{-2} \times 8^{9} =) 8^{-2+9}$ or 8^{7} or 2^{-6+27} or 2^{21} **or** $(8^{-2} \div 8^{10} =) 8^{-2-10}$ or 8^{-12} or $\frac{1}{8^{12}}$ or 2^{-6-30} or 2^{-36} or $\frac{1}{2^{36}}$ **or** $(8^{9} \div 8^{10} =) 8^{9-10}$ or 8^{-1} or $\frac{1}{8^{(1)}}$ or 2^{27-30} or 2^{-3} or $\frac{1}{2^{3}}$ **or** $(8^{n} \times 8^{10} =) 8^{n+10}$ or 2^{3n+30} **OR** $-2 + 9 = n + 10$ oe eg $-6 + 27 = 3n + 30$ oe **OR** $-2 + 9 - 10$ oe eg $\frac{-6+27-30}{3}$ oe		2	M1 for one correct application of an index rule (must be seen in powers of 8 or correct conversion to powers of 2) this could be after an initial mistake – working will need to be clearly seen **OR** for forming a correct equation in the indices alone **OR** for a complete method for the value of n
	Correct answer scores full marks (unless from obvious incorrect working)	–3		A1 Accept 8^{-3} or $\left(2^{3}\right)^{-3}$
				Total 2 marks

9	100(%) + 12(%) (= 112(%)) **or** 1 + 0.12 (= 1.12) oe **or** $\frac{140}{112}$ (=1.25) oe		3	M1	may be seen embedded. Do **not** allow (1 + 12%) unless correctly processed
	$\frac{140}{"1.12"}$ **or** $\frac{140}{112} \times 100$ oe			M1	for a complete method
	Correct answer scores full marks (unless from obvious incorrect working)	125		A1	
					Total 3 marks

10	(a)		1	1	B1	
	(b)	eg $5y - 7y < 1 - 20$ **or** $-2y < -19$ oe **or** $20 - 1 < 7y - 5y$ **or** $19 < 2y$ oe **or** $y = 9.5$ or $y < 9.5$		2	M1	for correctly isolating terms in y on one side and number terms on the other side of an inequality or an equation. Ignore incorrect inequality signs for this mark
		Correct answer scores full marks (unless from obvious incorrect working)	$y > 9.5$		A1	oe eg $\frac{19}{2} < y$ Must have correct inequality symbol on answer line NB sight of correct answer in working space and just ($y =$) 9.5 on answer line gains M1 only
	(c)		$5w^2x^2(3x^3 + 5w)$	2	B2	for the correct factorisation (B1 for a correct partial factorisation of at least 2 different terms outside the bracket eg $5wx(3wx^4 + 5w^2x)$ or $5w^2(3x^5 + 5wx^2)$ **or** for the correct highest common factor on the outside and one term inside the bracket correct eg $5w^2x^2(3x^3 + ...)$ or $5w^2x^2(... + 5w)$ **or** for $(3x^3 + 5w)$ as a factor)
	(d)		$3a^3c^4$	2	B2	oe eg $\frac{3a^3}{c^{-4}}$ (B1 a single product with 2 of 3, a^3, c^4 correct eg $3a^3c^n$ where $n \neq 4$ **or** $3a^mc^4$ where $m \neq 3$ **or** pa^3c^4 where $p \neq 3$. One term can be missing with 2 correct for B1)
						Total 7 marks

11	eg $\cos(ACB)=\frac{15}{21}$ **or** $\sin(ACB)=\frac{\sqrt{21^2-15^2}}{21}$ oe **or** 44.4(153…) **or** $\tan(DCB)=\frac{9}{15}$ **or** $\sin(DCB)=\frac{9}{\sqrt{9^2+15^2}}$ oe **or** 30.9(637…) **or** $\tan(BDC)=\frac{15}{9}$ **or** $\sin(BDC)=\frac{15}{\sqrt{9^2+15^2}}$ oe **or** 59.0(362…) **or** $\sin(BAC)=\frac{15}{21}$ **or** 45.5(846…) **OR** $(AB=)\ \sqrt{21^2-15^2}$ $(=\sqrt{216}=6\sqrt{6}=14.6(969...))$ **or** $(DC=)\ \sqrt{15^2+9^2}$ $(=\sqrt{306}=3\sqrt{34}=17.4(928...))$		4	M1	for a correct trig statement for angle *ACB* **or** angle *DCB* **or** angle *BDC* **or** angle *BAC* **OR** for use of Pythagoras to find *AB* or *DC* Allow use of any letter to represent the angles or sides Calculations or values do not need to be linked to the correct side or angle
	eg $\cos(ACB)=\frac{15}{21}$ **or** $\sin(ACB)=\frac{\sqrt{21^2-15^2}}{21}$ oe **or** 44.4(153…) **and** $\tan(DCB)=\frac{9}{15}$ **or** $\sin(DCB)=\frac{9}{\sqrt{9^2+15^2}}$ oe **or** 30.9(637…) **OR** $\frac{\sin ACD}{"14.6..."-9}=\frac{\sin(180-"59.0")}{21}$ oe **or** $\frac{\sin ACD}{"14.6..."-9}=\frac{\sin"45.5(846...)}{"17.4(928...)"}$ oe **or** $("14.6..."-9)^2=21^2+"17.4"^2-2\times21\times"17.4"\times\cos ACD$ oe			M1	for a correct trig statement for angle *ACB* **and** angle *DCB* or angle *BAC* **and** angle *DCB* or angle *BAC* **and** angle *ADC* **OR** for a correct trig statement involving angle *ACD* Allow use of any letter to represent the angles or sides Calculations or values do not need to be linked to the correct side or angle
	eg "44.4(153…)" – "30.9(637…)" **OR** $\sin(ACD)=\frac{\sin(180-"59.0")}{21}\times("14.6..."-9)$ $(=0.232...)$ oe **or** $\cos(ACD)=\frac{21^2+"17.4"^2-("14.6..."-9)^2}{2\times21\times"17.4"}$ $(=0.972...)$ oe			M1	for a complete method **OR** for a correct trig statement for angle *ACD* Allow use of any letter to represent the angle
	Correct answer scores full marks (unless from obvious incorrect working)	13.5		A1	Answer in range 13.4 – 13.6
					Total 4 marks

12	$9x + 27 + 2x - 23 = 180$ oe eg $11x + 4 = 180$ **or** $\frac{180-27+23}{9+2}(=16)$ **or** $\frac{180-4}{11}(=16)$		4	M1	for using the angle sum on a line to form an equation in x **or** for a numerical method to find x using the angle sum on the line
	$2\times"16"-23\ (=9)$ **or** $9\times"16"+27\ (=171)$			M1	for using the value of x to find the exterior or interior angle
	eg $\frac{360}{n}="9"$ oe **or** $(n=)\frac{360}{"9"}$ $\frac{180(n-2)}{n}="171"$ oe **or** $(n=)\frac{360}{180-"171"}$ oe			M1	for using the formula for an exterior or an interior angle to form an equation in n **or** for a complete method to find n
	Correct answer scores full marks (unless from obvious incorrect working)	40		A1	
					Total 4 marks

13 (a)			2	B1 B1	for $\frac{3}{5}$ on bottom left oe (0.6) for $\frac{3}{8},\frac{5}{8},\frac{3}{8},\frac{5}{8}$ oe (0.375, 0.625, 0.375, 0.625)
(b)	$\frac{2}{5}\times"\frac{3}{8}"\left(=\frac{6}{40}\right)$oe **or** $\frac{2}{5}\times"\frac{5}{8}"\left(=\frac{10}{40}\right)$oe **or** $"\frac{3}{5}"\times"\frac{3}{8}"\left(=\frac{9}{40}\right)$oe **or** $"\frac{3}{5}"\times"\frac{5}{8}"\left(=\frac{15}{40}\right)$oe		3	M1	ft their tree diagram if probabilities less than 1 Allow equivalent fractions or decimals ie 0.4 or 0.37(5)
	$1-\frac{2}{5}\times"\frac{3}{8}"$ oe **or** $\frac{2}{5}\times"\frac{5}{8}"+"\frac{3}{5}"\times"\frac{3}{8}"+"\frac{3}{5}"\times"\frac{5}{8}"$ oe **or** $\frac{2}{5}\times"\frac{5}{8}"+"\frac{3}{5}"$			M1	ft a correct calculation for the required probability Allow equivalent fractions or decimals ie 0.4 or 0.37(5)
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{17}{20}$		A1 ft	ft oe eg $\frac{34}{40}$ **or** 0.85 **or** 85% Allow equivalent fractions or decimals to 2dp truncated or rounded or equivalent percentage (with % sign) to 2sf truncated or rounded
					Total 5 marks

14 (a)	eg $7x(3x+2)=21x^2+14x$ **or** $7x(2x-5)=14x^2-35x$ **or** $(3x+2)(2x-5)=6x^2-15x+4x-10$ $(=6x^2-11x-10)$		3	M1	an expansion with only one error. Do not award this mark for $21x^2+14x+14x^2-35x$ **or** $\left(21x^2+14x\right)\left(14x^2-35x\right)$	M2 for 3 (out of a maximum of 4) of $42x^3-105x^2+28x^2-70x$
	eg $42x^3-105x^2+28x^2-70x$ **or** $42x^3-77x^2-70x$			M1	ft dep on M1 and a quadratic expression allow one further error	(M1 for 2 correct out of a maximum of 4)
	Correct answer scores full marks (unless from obvious incorrect working)	$42x^3-77x^2-70x$		A1	if no working shown then award B2 for 2 terms out of a maximum of 3 terms correct isw correct factorisation eg $7(6x^3-11x^2-10x)$ provided 3 marks has been awarded do not isw incorrect simplification eg $42x^3-77x^2-70x=6x^3-11x^2-10x$ gets M2A0	
(b)	eg $\frac{9\times7}{7\times2y}+\frac{5\times2y}{7\times2y}(=5)$ oe or $\frac{63}{14y}+\frac{10y}{14y}(=5)$ oe **or** $\frac{63+10y}{14y}(=5)$ oe **or** $\frac{9}{2y}=5-\frac{5}{7}$ **or** $\frac{9}{2y}=4\frac{2}{7}\left(=\frac{30}{7}\right)$ **or** $9+\frac{10y}{7}=10y$ **or** $\frac{63}{2y}+5=35$		3	M1	for writing LHS correctly over the same common denominator **or** for subtracting $\frac{5}{7}$ from both sides allow use of equivalent decimal 0.71(42…) for method marks **or** multiplying through by $2y$ **or** multiplying through by 7	
	eg $63+10y=70y$ oe **or** $63=60y$ oe **or** $\frac{63}{2}=30y$ **or** $2.1=2y$ **or** $2y=\frac{9}{30/7}$ oe			M1	for a correct equation with all fractions removed **or** for a correct equation with y isolated	
	Working required	1.05		A1	oe eg $\frac{63}{60}$ or $\frac{21}{20}$ dep on M1	
						Total 6 marks

15	$\frac{75}{360}\times\pi\times12^2(=30\pi)$ oe		2	M1	a correct method to find the area of the sector Allow 3.14… or $\frac{22}{7}$ for π
	Correct answer scores full marks (unless from obvious incorrect working)	94.2		A1	accept 94.2 – 94.3
					Total 2 marks

16	25 – 4		2	M1	for clearly identifying 25 and 4 as the LQ & UQ (may also indicate 9 (median))
	Correct answer scores full marks (unless from obvious incorrect working)	21		A1	cao
					Total 2 marks

17	$\frac{2\sqrt{7}+2}{\sqrt{7}-3}\times\frac{\sqrt{7}+3}{\sqrt{7}+3}$ **or** $\frac{2\sqrt{7}+2}{\sqrt{7}-3}\times\frac{-\sqrt{7}-3}{-\sqrt{7}-3}$		3	M1	for explicitly multiplying the numerator and denominator by $\sqrt{7}+3$ or $-\sqrt{7}-3$
	$\frac{2\sqrt{7}\sqrt{7}+6\sqrt{7}+2\sqrt{7}+6}{\sqrt{7}\sqrt{7}+3\sqrt{7}-3\sqrt{7}-9}$ oe **or** $\frac{14+6\sqrt{7}+2\sqrt{7}+6}{7-9}$ oe **or** $\frac{20+8\sqrt{7}}{-2}$ **or** $\frac{20+\sqrt{448}}{-2}$ or $\frac{-2\sqrt{7}\sqrt{7}-6\sqrt{7}-2\sqrt{7}-6}{-\sqrt{7}\sqrt{7}-3\sqrt{7}+3\sqrt{7}+9}$ oe **or** $\frac{-14-6\sqrt{7}-2\sqrt{7}-6}{-7+9}$ **or** $\frac{-20-8\sqrt{7}}{2}$ **or** $\frac{-20-\sqrt{448}}{2}$			M1	numerator correctly expanded and may be simplified to at least 2 terms and denominator correctly expanded and may be simplified to one term, this mark implies previous M1 $\frac{2\sqrt{7}+2}{\sqrt{7}-3}\times\frac{\sqrt{7}+3}{\sqrt{7}+3}=-10-4\sqrt{7}$ scores M1M0
	Working required	$-10-\sqrt{112}$		A1	dep on M2 SCB1 for $-10-\sqrt{112}$ gained with no method marks awarded SCB2 for $-10-\sqrt{112}$ gained if you would award 1st M1 but not second M1 (total 2 marks)
					Total 3 marks

18	$p^2 = \dfrac{y+w}{3y-t}$		4	M1	for correctly squaring both sides
	$3p^2y - p^2t = y + w$			M1	ft from their incorrect squaring for multiplying by $(3y - t)$ and expanding the bracket allow one error in one term
	$3p^2y - y = w + p^2t$ oe			M1	ft dep on 2 terms in y and 2 other terms for correctly collecting the terms in y on one side and other terms on the other side
	Correct answer scores full marks (unless from obvious incorrect working)	$y = \dfrac{w+p^2t}{3p^2-1}$		A1	oe eg $y = \dfrac{-w-p^2t}{1-3p^2}$
					Total 4 marks

19	$10^2 = 8^2 + 9^2 - 2\times8\times9\times\cos BAC$ oe		3	M1	correct statement of the cosine rule for this angle in any form
	$\cos BAC = \dfrac{8^2+9^2-10^2}{2\times8\times9}$ oe **or** $\cos BAC = \dfrac{45}{144}$ oe **or** $\cos BAC = \dfrac{5}{16}$ oe eg $\cos BAC = 0.31(25)$			M1	correct statement for angle BAC, this mark implies the previous M mark
	Correct answer scores full marks (unless from obvious incorrect working)	71.8		A1	accept 71.7 – 71.8 SCB1 for an answer of 49.4 to 49.5 **or** 58.7 to 58.8
					Total 3 marks

20	Gradient of **M** = $-\frac{1}{4}$ oe		3	M1	for a statement that the gradient of **M** is $-\frac{1}{4}$, may be implied by equation of line with gradient of $-\frac{1}{4}$
	eg $1 = "-\frac{1}{4}" \times 8 + c$ or $y - 1 = "-\frac{1}{4}"(x - 8)$			M1	ft a gradient of $\frac{1}{4}$ or −4 for this mark, substitution of the given coordinate to find the equation
	Correct answer scores full marks (unless from obvious incorrect working)	$y = -\frac{1}{4}x + 3$		A1	oe $y = –0.25x + 3$ must be in the form $y=$
					Total 3 marks

21	$5(x-2)^2$ ..... **or** $5\left[(x-2)^2 .....\right]$ **or** $5\left(x+\frac{-20}{5\times 2}\right)^2+....$ **or** $5(x-b)^2+c$		3	M1	for a start to completing the square **or** correct substitution into $a\left(x+\frac{b}{2a}\right)^2+....$ from the formula $a\left(x+\frac{b}{2a}\right)^2-\frac{(b)^2}{4a}+c$ **or** $a = 5$ embedded in an incorrect final answer in the form $5(x-d)^2+e$ (must be these signs)
	$5\left[(x-2)^2-2^2\right]$..... **or** $5\left[(x-2)^2-4\right]$..... **or** $5\left[(x-2)^2-2^2.....\right]$ **or** $5\left[(x-2)^2-4.....\right]$ **or** $5(x-2)^2-20$.....			M1	for correctly completing the square but terms do not need to be simplified and 23 may or may not be present correct simplification **or** of the first two parts of $a\left(x+\frac{b}{2a}\right)^2-\frac{(b)^2}{4a}(+c)$ **NB: Please refer to ALT mark scheme for comparison of coefficients method**
	Correct answer scores full marks (unless from obvious incorrect working)	$5(x-2)^2+3$		A1	oe eg $3+5(x-2)^2$ (if student continues to solve a quadratic equation, ISW)
					Total 3 marks

21 **ALT**	$ax^2 - 2abx + ab^2 + c$		3	M1	for multiplying out $a(x-b)^2 + c$ **or** $a = 5$ embedded in an incorrect final answer in the form $5(x-d)^2 + e$ (must be these signs)
	$-2ab = -20$ **or** $2ab = 20$ **or** $ab^2 + c = 23$			M1	for equating coefficients
	Correct answer scores full marks (unless from obvious incorrect working)	$5(x-2)^2 + 3$		A1	oe eg $3 + 5(x-2)^2$ (if student continues to solve a quadratic equation, ISW)
					Total 3 marks

22	$\frac{3}{15}\times\frac{2}{14}\times\frac{1}{13}\left(=\frac{6}{2730}=\frac{1}{455}\right)$ oe **or** $\left(\frac{3}{15}\times\frac{2}{14}\times\frac{10}{13}\right)\left(=\frac{60}{2730}=\frac{2}{91}\right)$ oe **or** $\left(\frac{3}{15}\times\frac{10}{14}\times\frac{9}{13}\right)\left(=\frac{270}{2730}=\frac{9}{91}\right)$ oe **or** $\left(\frac{3}{15}\times\frac{2}{14}\times\frac{2}{13}\right)\left(=\frac{12}{2730}=\frac{2}{455}\right)$ oe **or** $\left(\frac{10}{15}\times\frac{9}{14}\times\frac{8}{13}\right)\left(=\frac{720}{2730}=\frac{24}{91}\right)$ oe **or** $\left(\frac{10}{15}\times\frac{9}{14}\times\frac{2}{13}\right)\left(=\frac{180}{2730}=\frac{6}{91}\right)$ oe **or** $\left(\frac{10}{15}\times\frac{3}{14}\times\frac{2}{13}\right)\left(=\frac{60}{2730}=\frac{2}{91}\right)$ oe **OR** $\left(\frac{2}{15}\times\frac{1}{14}\times\frac{3}{13}\right)\left(=\frac{6}{2730}=\frac{1}{455}\right)$ oe **or** $\left(\frac{2}{15}\times\frac{1}{14}\times\frac{10}{13}\right)\left(=\frac{20}{2730}=\frac{2}{273}\right)$ oe **or** $\left(\frac{2}{15}\times\frac{1}{14}\times\frac{13}{13}\right)\left(=\frac{26}{2730}=\frac{1}{105}\right)$ oe **OR** $\left(\frac{13}{15}\times\frac{12}{14}\times\frac{11}{13}\right)\left(=\frac{1716}{2730}=\frac{22}{35}\right)$ oe **or** $\left(\frac{13}{15}\times\frac{12}{14}\times\frac{2}{13}\right)\left(=\frac{312}{2730}=\frac{4}{35}\right)$ oe		3	M1 one of **numerical** probabilities for RRR **or** RRB **or** RBB **or** RRP **or** BBB **or** BBP **or** BRP **OR** PPR **or** PPB **or** PPP′ **OR** P′ P′ P′ **or** P′ P′P [where P = probability of pink, R = probability of red, B = probability of blue, P′ = probability of not pink] For $\left(\frac{2}{15}\times\frac{1}{14}\times\frac{13}{13}\right)\left(=\frac{26}{2730}=\frac{1}{105}\right)$ accept $\left(\frac{2}{15}\times\frac{1}{14}\right)\left(=\frac{1}{105}\right)$
	$\left(\frac{3}{15}\times\frac{2}{14}\times\frac{1}{13}\right)+3\left(\frac{3}{15}\times\frac{2}{14}\times\frac{10}{13}\right)+3\left(\frac{3}{15}\times\frac{10}{14}\times\frac{9}{13}\right)+3\left(\frac{3}{15}\times\frac{2}{14}\times\frac{2}{13}\right)+\left(\frac{10}{15}\times\frac{9}{14}\times\frac{8}{13}\right)+3\left(\frac{10}{15}\times\frac{9}{14}\times\frac{2}{13}\right)+6\left(\frac{10}{15}\times\frac{3}{14}\times\frac{2}{13}\right)$ **OR** $1-3\times\left(\frac{2}{15}\times\frac{1}{14}\times\frac{3}{13}\right)-3\times\left(\frac{2}{15}\times\frac{1}{14}\times\frac{10}{13}\right)$ **OR** $1-3\times\frac{2}{15}\times\frac{1}{14}\times\frac{13}{13}$ oe **OR** $\left(\frac{13}{15}\times\frac{12}{14}\times\frac{11}{13}\right)+3\left(\frac{13}{15}\times\frac{12}{14}\times\frac{2}{13}\right)$			M1 for adding at least one of each probability for RRR, RRB, RBB, RRP, BBB, BBP and BRP **OR** for subtracting at least one of the probabilities of PPR and PPB from 1 **OR** subtracting at least one of the probabilities for PPP′ from 1 **OR** for adding 3PPR and 3PPB **OR** for 3 PPP′ **OR** for adding at least one of the probabilities for P′ P′ P′ and P′ P′P for $\frac{2}{15}\times\frac{1}{14}\times\frac{13}{13}$ accept $\frac{2}{15}\times\frac{1}{14}$
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{34}{35}$		A1 oe eg $\frac{2652}{2730}$ or 0.97(14…) or 97.(14)%
				Total 3 marks

23	$(a=)\dfrac{2\left(\dfrac{5-2y}{3y}\right)+5}{1-\left(\dfrac{5-2y}{3y}\right)}$ **or** $2\left(\dfrac{5-2y}{3y}\right)+5$ **and** $1-\left(\dfrac{5-2y}{3y}\right)$		3	M1	writing both the numerator and denominator in terms of y, may be seen as one fraction or seen separately
	$(a=)\dfrac{2(5-2y)+5\times3y}{1\times3y-(5-2y)}$ **or** $(a=)\dfrac{10-4y+15y}{3y-5+2y}$ **or** $(a=)\dfrac{10+11y}{5y-5}$ **or** $(a=)\dfrac{\dfrac{2(5-2y)+5\times3y}{3y}}{\dfrac{1\times3y-(5-2y)}{3y}}$ **or** $(a=)\dfrac{\dfrac{10-4y+15y}{3y}}{\dfrac{3y-5+2y}{3y}}$ **or** $(a=)\dfrac{\dfrac{10+11y}{3y}}{\dfrac{5y-5}{3y}}$ **or** $(a=)\dfrac{2(5-2y)+5\times3y}{3y}\times\dfrac{3y}{1\times3y-(5-2y)}$ **or** $(a=)\dfrac{10-4y+15y}{3y}\times\dfrac{3y}{3y-5+2y}$ **or** $(a=)\dfrac{10+11y}{3y}\times\dfrac{3y}{5y-5}$ or			M1	multiplying all terms by $3y$ or a multiple of $3y$ (some simplification may be present) **or** writing numerator and denominator over $3y$ or a multiple of $3y$ **or** multiplying the numerator by the reciprocal of the denominator where the numerator and denominator are separate fractions **or** 3 of a, b, c, d correct if written in the form $\dfrac{a+by}{cy-d}$ or $\dfrac{a+by}{c(y-d)}$ where a, b, c and d are integers
	Working required	$\dfrac{10+11y}{5(y-1)}$		A1	dep on M1 allow any equivalent fraction with integer values for m, n and p eg $\dfrac{30+33y}{15(y-1)}$
					Total 3 marks

24	(i)		(–1, 3)	1	B1
	(ii)		(4, 10)	1	B1
	(iii)		(2, 3)	1	B1
					Total 3 marks

25	$(2x - 7)(x + 4)$ **or** $2x(x + 4) - 7(x + 4)$ **or** $x(2x - 7) + 4(2x - 7)$ **or** $\frac{-1 \pm \sqrt{1^2 - 4 \times 2 \times -28}}{2 \times 2}$ **or** $2\left[\left(x + \frac{1}{4}\right)^2 - \left(\frac{1}{4}\right)^2\right] - 28(= 0)$		3	M1	a correct method to solve the quadratic equation $2x^2 + x - 28 = 0$ Allow $(2x+8)(x-3.5)$ **or** $(2x+8)(2x-7)$ leading to $(x+4)(x-3.5)$ **or** $(2x+8)(2x-7)$ leading to correct values of x Do not allow $(x+4)(x-3.5)$ without previous working (If using formula allow some simplification – as far as $\frac{-1 \pm \sqrt{1+224}}{4}$)
	3.5, −4			A1	oe dep on M1
	Working required	$x > 3.5$, $x < –4$		A1	oe dep on M1
					Total 3 marks

26	$(BF =)\ \sqrt{10^2+14^2}\ (=\sqrt{296}=2\sqrt{74}=17.2...)$		5	M1	for method to find *BF*
	$(EF =)\ "2\sqrt{74}"\tan 50\ (=20.5...)$ oe **or** $(EF =)\ \dfrac{"2\sqrt{74}"}{\tan(180-90-50)}(=20.5...)$ oe **or** $(EF =)\ \dfrac{"2\sqrt{74}"\sin 50}{\sin(180-90-50)}(=20.5...)$ oe			M1	for method to find *EF* other longer ways to find *EF* may be used but must be a complete method eg $(BE =)\ \dfrac{"2\sqrt{74}"\sin 90}{\sin(180-90-50)}(=26.7\ldots)$ **and** $(EF =)\ \sqrt{"26.7..."^2-296}$
	$(BC =)\ \frac{1}{5}\times"20.5..."(=4.1...)$			M1	dep on previous mark for correct method to find *BC*
	eg $\dfrac{"2\sqrt{74}"\tan 50+\frac{1}{5}\times"2\sqrt{74}"\tan 50}{2}\times 10$ oe $\dfrac{"20.5..."+\frac{1}{5}\times"20.5..."}{2}\times 10$ oe **or** $10\times"4.1..."+\frac{1}{2}\times 10\times("20.5..."-"4.1...")$ oe **or** $10\times"4.1..."\times 14$ oe **or** $\frac{1}{2}\times 10\times("20.5..."-"4.1...")\times 14$ oe **or** $10\times"20.5..."\times 14$ oe			M1	for method to find the area of the cross section *ABCD* **or** method to find the volume of the cuboid $AB \times BC \times BG$ **or** method to find the volume of the triangular prism $\frac{1}{2}\times AB\times(AD-BC)\times BG$ **or** method to find the volume of the cuboid $AB \times AD \times BG$ ft their value for *EF* provided first M1 awarded and clearly identified on the diagram or by labelling
	Correct answer scores full marks (unless from obvious incorrect working)	1720		A1	1720 - 1724
					Total 5 marks

27	(a)	$-4\mathbf{b}+\mathbf{a}-2\mathbf{a}+5\mathbf{b}-3\mathbf{a}$ oe		2	M1 for an un-simplified expression for $\overrightarrow{BC}$ in terms of **a** and **b** allow a sign error in one term or in one vector eg $-4\mathbf{b}+\mathbf{a}-2\mathbf{a}-5\mathbf{b}+3\mathbf{a}$ **or** $-4\mathbf{b}-\mathbf{a}-2\mathbf{a}+5\mathbf{b}-3\mathbf{a}$ **or** for an answer of $4\mathbf{a}-\mathbf{b}$
		Correct answer scores full marks (unless from obvious incorrect working)	$\mathbf{b}-4\mathbf{a}$		A1 or $-4\mathbf{a}+\mathbf{b}$
	(b)	$\left(\overrightarrow{OD}=\right)2\mathbf{a}+4\mathbf{b}-\mathbf{a}+\frac{1}{4}(\text{"}\mathbf{b}-4\mathbf{a}\text{"})$ oe $(=\frac{17}{4}\mathbf{b}$ oe) **or** $\left(\overrightarrow{OD}=\right)5\mathbf{b}-3\mathbf{a}-\frac{3}{4}(\text{"}\mathbf{b}-4\mathbf{a}\text{"})$ oe		4	M1 ft their $\overrightarrow{BC}$ provided it is in the form $m\mathbf{a}+n\mathbf{b}$ for all method marks
		eg $\overrightarrow{OP}=2\mathbf{a}+4\mathbf{b}-\mathbf{a}+x(4\mathbf{b}-\mathbf{a})$ **or** $\overrightarrow{OP}=2\mathbf{a}+y(4\mathbf{b}-\mathbf{a})$ **or** $\overrightarrow{OP}=5\mathbf{b}-3\mathbf{a}-(\text{"}\mathbf{b}-4\mathbf{a}\text{"})+\lambda(4\mathbf{b}-\mathbf{a})$ **or** $\overrightarrow{OP}=5\mathbf{b}-3\mathbf{a}-\frac{3}{4}(\text{"}\mathbf{b}-4\mathbf{a}\text{"})+n\left(\text{"}\frac{17}{4}\mathbf{b}\text{"}\right)$ **or** $\overrightarrow{OP}=\text{"}\frac{17}{4}\mathbf{b}\text{"}+n\times\text{"}\frac{17}{4}\mathbf{b}\text{"}$ **or** $\overrightarrow{OP}=n\times\text{"}\frac{17}{4}\mathbf{b}\text{"}$ oe **or** $\overrightarrow{AP}=x(4\mathbf{b}-\mathbf{a})$ **or** $\overrightarrow{AP}=-2\mathbf{a}+n\times\text{"}\frac{17}{4}\mathbf{b}\text{"}$oe **or** $\overrightarrow{BP}=y(4\mathbf{b}-\mathbf{a})$ **or** $\overrightarrow{BP}=\frac{1}{4}(\text{"}\mathbf{b}-4\mathbf{a}\text{"})+n\times\text{"}\frac{17}{4}\mathbf{b}\text{"}$oe			M1 for a correct expression, including a parameter, for vector $\overrightarrow{OP}$, must be clearly identified as $\overrightarrow{OP}$ **or** for a correct expression, including a parameter, for vector $\overrightarrow{AP}$, $\overrightarrow{BP}$, $\overrightarrow{CP}$ or $\overrightarrow{DP}$ must be clearly identified
		eg $\overrightarrow{OP}=2\mathbf{a}+4\mathbf{b}-\mathbf{a}+x(4\mathbf{b}-\mathbf{a})$ **and** $\overrightarrow{OP}=n\times\text{"}\frac{17}{4}\mathbf{b}\text{"}$ **or** $\overrightarrow{OP}=2\mathbf{a}+y(4\mathbf{b}-\mathbf{a})$ **and** $\overrightarrow{OP}=5\mathbf{b}-3\mathbf{a}-\frac{3}{4}(\text{"}\mathbf{b}-4\mathbf{a}\text{"})+n\left(\text{"}\frac{17}{4}\mathbf{b}\text{"}\right)$ **or** $\overrightarrow{AP}=x(4\mathbf{b}-\mathbf{a})$ **and** $\overrightarrow{AP}=-2\mathbf{a}+n\times\text{"}\frac{17}{4}\mathbf{b}\text{"}$oe **or** $\overrightarrow{BP}=y(4\mathbf{b}-\mathbf{a})$ **and** $\overrightarrow{BP}=\frac{1}{4}(\text{"}\mathbf{b}-4\mathbf{a}\text{"})+n\times\text{"}\frac{17}{4}\mathbf{b}\text{"}$			M1 for two correct expressions for vector $\overrightarrow{OP}$ **or** two correct expressions for vector $\overrightarrow{AP}$, **or** two correct expressions for vector $\overrightarrow{BP}$ **or** two correct expressions for vector $\overrightarrow{CP}$ **or** two correct expressions for vector $\overrightarrow{DP}$ one of which contains $n\text{"}\frac{17}{4}\mathbf{b}\text{"}$ and one contains $x(4\mathbf{b}-\mathbf{a})$
		Dependent on a correct vector method shown	$\frac{32}{17}$		A1 dep on M3 oe allow 1.88(235…)
					Total 6 marks

28	eg $2.6 = 3 \times 0.2 + e$ oe ($e = 2$) **or** $y = 3x + 2$ oe			6	M1	correct substitutions to find e may be seen after substituting the original equations to eliminate x or y
	eg $0.2^2 + 2.6^2 = d - 11 \times 0.2$ oe ($d = 9$) **or** $x^2 + y^2 = 9 - 11x$ oe				M1	correct substitutions to find d may be seen after substituting the original equations to eliminate x or y
	eg $x^2 + (3x + "2")^2 = "9" - 11x$ oe **or** $x^2 + (3x + e)^2 = d - 11x$ oe	$\left(\frac{y - "2"}{3}\right)^2 + y^2 = "9" - 11\left(\frac{y - "2"}{3}\right)$ oe **or** $\left(\frac{y - e}{3}\right)^2 + y^2 = d - 11\left(\frac{y - e}{3}\right)$ oe			M1	a correct substitution to create an equation in one variable ft their values of d and e provided clearly stated **or** for substituting the original equations to eliminate x or y
	$10x^2 + 23x - 5(= 0)$ oe **or** $10x^2 + 23x = 5$	$10y^2 + 29y - 143(= 0)$ oe **or** $10y^2 + 29y = 143$			M1	ft (dep on M2) awarded for a quadratic with 2 out of 3 terms correct for their values of e and d
	$(5x - 1)(2x + 5)$ (= 0) **or** $(x =) \frac{-23 \pm \sqrt{23^2 - 4 \times 10 \times -5}}{2 \times 10}$ **or** $10\left[\left(x + \frac{23}{20}\right)^2 - \left(\frac{23}{20}\right)^2\right] - 5(= 0)$ (should give 0.2 and −2.5)	$(2y + 11)(5y - 13)$ (= 0) **or** $(y =) \frac{-29 \pm \sqrt{29^2 - 4 \times 10 \times -143}}{2 \times 10}$ **Or** $10\left[\left(x + \frac{29}{20}\right)^2 - \left(\frac{29}{20}\right)^2\right] - 143(= 0)$ (should give 2.6 and −5.5)			M1	(dep on M2) for method to solve **their** 3 term quadratic using any correct method (allow one sign error and some simplification – allow as far as eg $\frac{-23 \pm \sqrt{529 + 200}}{20}$ (may have just – rather than ±) **or** $\frac{-29 \pm \sqrt{841 + 5720}}{20}$ (may have just –rather than ±) **or** if factorising allow brackets which expanded give 2 out of 3 terms correct) **or** correct values for x **or** correct values for y (may have just one value)
	Working required		(–2.5, –5.5)		A1	oe dep on M3
						Total 6 marks