Pearson

Mark Scheme (Results)

Summer 2017

Pearson Edexcel International GCSE
In Mathematics A (4MA0) Paper 3HR

edexcel

https://xtremepape.rs/

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

Summer 2017
Publications Code 4MA0_3HR_1706_MS
All the material in this publication is copyright
© Pearson Education Ltd 2017

https://xtremepape.rs/

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
    - eeoo – each error or omission

https://xtremepape.rs/

- **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.
  Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.
  If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
  If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.
  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 in another.

https://xtremepape.rs/

Apart from questions 2, 7 and 18 (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method

Ques	Working	Answer	Mark	Notes
1	$\frac{6-2.84}{(\sqrt{5})^2}$ **or** $\frac{6-2.84}{5}$ oe			M1 or for 0.63 NB: Accept 2.23(6…) in place of $\sqrt{5}$
		0.632	2	A1 for 0.632 or $\frac{79}{125}$ SC : B1 for an answer of 1.41(31…)
				Total 2 marks

2	$5x - x = 8 - 10$			M1 for correct rearrangement with x terms on one side and numbers on the other in a correct equation **or** the correct simplification of either x terms or numbers on one side in a correct equation eg. $4x - 8 = -10$; $5x = x - 2$
	$4x = -2$			M1 or $-4x = 2$ **or** $4x + 2 = 0$ **or** $-4x - 2 = 0$ NB: This mark implies the previous M1
		-0.5	3	A1 oe e.g. $-\frac{2}{4}$ dep on M1
				Total 3 marks

3	Angle $BCD = 142^o$ **or** Angle $BCF = 180 - 62$ $(=118^o)$ **or** Angle $ABC = 180 - 142$ $(=38)$			M1 for angle $BCD = 142^o$ or angle $BCF = (180 - 62)^o$
	360 – 142 – "118" **or** "38" + 62			M1 for a complete method to find x
		100	3	A1
				Total 3 marks

https://xtremepape.rs/

4 a	3500 ÷ 119			M1		
		29.41	2	A1	for 29.41 – 29.412	
b	8500 ÷ 52 **or** 163(.461..)			M1	M1 for 8500 × 119 =1011500	M1 for 119 ÷ 52 (=2.28…)
	"163.461.".× 119			M1 dep	M1 for "1011500" ÷ 52	M1 for 8500 × "2.28…"
		19452	3	A1	for 19380 − 19520	
c	24 ÷ 60 (=0.4) **or** 2.4 **or** $2\frac{24}{60}$ oe **or** 2 × 60 + 24 (=144)			M1		
	1534 ÷ 2.4 oe **or** (1534 ÷ 144) × 60 oe			M1	(allow 1534 ÷ 2.24 **or** answer of 684(.82…) or 685)	
		639	3	A1	for 639 – 639.17	
						Total 8 marks

5a	$\pi \times 2.5$ oe **or** $2 \times \pi \times \left(\frac{2.5}{2}\right)$			M1	
		7.85	2	A1	7.85 – 7.86
b	$10 \times \frac{4.7}{2.5}$ oe **or** $10 \times \frac{470}{250}$ oe			M1	or for digits 188
		18.8	2	A1	accept 19 if 18.8 seen
					Total 4 marks

https://xtremepape.rs/

6a	$\frac{a+b+c}{3}=21$ **or** $\frac{a+b}{2}=19$ **or** $3\times 21(=63)$ **or** $2\times 19(=38)$			M1	
	$3\times 21-2\times 19$			M1	for a complete method
		25	3	A1	
b	$2\times 19-20\ (=18)$ **or** $21\times 3-20-$ "25" $(=18)$			M1	ft from (a) for a complete method to find age of 3rd person
	"25" – "18"			M1	dep or for 18 – 25
		7	3	A1	ft from answer in (a)
					Total 6 marks

7	e.g. $2\times 2\times 7\times 12$ **or** at least 3 divisions in a factor tree			M1	for the start of a correct method e.g. may be a factor tree **or** consecutive divisions condone 1 error
	All 6 correct prime factors, no extras (2,2,2,2,3,7,(1))			M1	e.g. from a factor tree, ignore 1s
		$2\times2\times2\times2\times3\times7$	3	A1	oe dep on M1, M1
					Total 3 marks

8a		Correct triangle (−1, −2) (−1, 0) (2, −2)		2	B2 (B1 for a rotation of 90° clockwise about a different centre i.e. a triangle in the same orientation as the correct triangle **or** rotation by 90° anticlockwise about (0, 2))
b		Correct trapezium (1, −1) (1, −2) (3, 1) (3, −2)		1	B1
					Total 3 marks

https://xtremepape.rs/

9a		$10e^5f^2$	2	B2	If not B2 then award B1 for $ke^5f^2, k \neq 10$ or $10e^5f^a$ or $10e^bf^2$ $a, b \neq 0$
b		$(x-6)(x+1)$	2	B2	If not B2 then award B1 for $(x-1)(x+6)$ **or** $(x-3)(x-2)$ **or** $(x+3)(x-2)$ **or** $(x-3)(x+2)$
					Total 4 marks

10a	$100 - 9.4\ (=90.6)$	$\frac{9.4}{100} \times 607$ oe $(=57.058)$			M1
	$\frac{"90.6"}{100} \times 607$ oe	$607 - "57.058"$			M1 (dep)
			550	3	A1 for 549.942 **or** 549.94 **or** 549.9
b	$\frac{100}{20} \times 1320$ oe				M2 for a complete method If not M2 then award M1 for a correct first step $1320 \div 20\ (=66)$ **or** $0.2x = 1320$ **or** $1320 \div 2\ (=660)$
			6600	3	A1
					Total 6 marks

https://xtremepape.rs/

11a	Complete correct binary structure for selection of two counters **OR** At least one additional red branch labelled $\frac{9}{20}$ **and** at least two blue branches labelled $\frac{11}{20}$			M1	
		Correct probability tree diagram	2	A1	
b	$\frac{9}{20} \times \frac{11}{20}$			M1	for $'\frac{9}{20}' \times '\frac{11}{20}'$
		$\frac{99}{400}$	2	A1	(ft diagram) for $\frac{99}{400}$ **or** 0.2475 **or** 24.75%
c	$'\frac{9}{20}' \times '\frac{9}{20}'$ **or** $'\frac{11}{20}' \times '\frac{11}{20}'$			M1	for one correct product ft from diagram M1 for $2 \times '\frac{9}{20}' \times '\frac{11}{20}'$ oe (ft from (a))
	$'\frac{9}{20}' \times '\frac{9}{20}' + '\frac{11}{20}' \times '\frac{11}{20}'$			M1	for the complete method ft from diagram M1 for $1 - 2 \times '\frac{9}{20}' \times '\frac{11}{20}'$
		$\frac{202}{400}$	3	A1	$\frac{202}{400}$ oe **or** 0.505 **or** 50.5%
					Total 7 marks

https://xtremepape.rs/

12a	2, 9, 18, 28, 39, 51, 63, 75, 86, 100	Correct table	1	B1	
b				M1	(ft from sensible table i.e. clear attempt at addition) for at least 8 points plotted correctly at end of interval **or** for all 10 points plotted consistently within each interval in the **freq table** at the correct height
		Correct cf graph	2	A1	accept curve or line segments accept graph that is not joined to (0,15)
c	E.g. for a mark drawn at 25 on their cumulative frequency diagram			M1	for intention to use 25 on cf axis ft from a cumulative frequency graph provided method is shown
		33 – 35	2	A1	33 - 35 ft from a cumulative frequency graph provided method is shown
d	E.g. reading of 66 – 68 (%) **or** reading from graph at $A = 52$ **or** mark on cf axis from using $A = 52$			M1	for a reading taken from 52 on age axis ft from a cumulative frequency graph provided method is shown
	$\frac{"68"}{100} \times 1200(000)$			M1	(dep)
		792000 – 816000	3	A1	for answer in the range 792000 – 816000
					Total 8marks

13				M1	for either $y = 2x + 1$ **or** $x + y = 10$ drawn correctly
				M1	for all lines drawn correctly
		Correct region	3	A1	for all 3 lines correct and the region identified Lines may be full lines or broken lines
					Total 3 marks

https://xtremepape.rs/

14	**Scheme 1 (interior angle and angle *ADC* and an angle in triangle *ADC*)** Let *X* be midpoint of *DC*			
	(Angle *DEA* =) $\frac{(5-2)\times 180}{5} = 108$			M1 or for 108 seen as an interior angle
	Angle *EDA* or *EAD* = (180 – 108)÷2 = 36			M1
	Angle *ADC* or *ACD* = 108 – 36 = 72 **or** Angle *DAC* = 108 – 2 × 36 (=36) **or** Angle *DAC* = $\cos^{-1}\left(\frac{"16.18"^2+"16.18"^2-10^2}{2\times"16.18"\times"16.18"}\right)$ Angle *DAX* or *CAX* = (108 – 2 × 36) ÷ 2 (=18)			M1 Angles may be seen on diagram
	E.g. *AX* = 5×tan72 (=15.38…) **or** *AX* = 5 ÷ tan18 (=15.38…) **or** *AX* = 5×tan*ADC* **or** *AX* = 5 ÷ tan*DAX* **or** $AD^2 = 10^2 + 10^2 - 2\times10\times10\cos108$ (=261.8) **or** $AD = \sqrt{10^2+10^2-2\times10\times10\times\cos108}$ (=16.18) **or** $AD = \frac{10\times\sin 72}{\sin 36}$ (=16.18)			M1 or for $AD = \frac{10}{\sin 36}\times\sin 108$ (=16.18…) **or** $AD = \frac{10}{\sin 36}\times\sin 72$ Allow 16 **or** 16.2 for *AD* throughout NB: Allow the value on the diagram for angle *ADC* or *DAX* if used in an otherwise correct trig statement
	E.g. Area = $\frac{1}{2}$ × 10 × "15.38…" oe **or** 0.5 × 10 × "16.18" × sin72 **or** 0.5 × "16.18"×"16.18"×sin36 **or** 0.5 × 10 × "16.18" × sin*ADC* **or** 0.5 × "16.18"×"16.18"×sin*DAX*			M1 dep on previous M1 NB: Allow the value on the diagram for angle *ADC* or *DAX* if used in an otherwise correct area statement
		76.9	6	A1 for answer in the range 76.5 – 77 SC: B4 for an answer in the range 53 – 53.5
				Total 6 marks

https://xtremepape.rs/

14	**Scheme 2 (only interior angle needed)**				Let X be midpoint of DC
	(Angle DEA =) $\frac{(5-2)\times 180}{5} = 108$			M1	or for 108 seen as an interior angle
	$AD^2 = 10^2 + 10^2 - 2\times 10\times 10\cos 108$ (=261.8) **or** $AD = \sqrt{10^2 + 10^2 - 2\times 10\times 10\times \cos 108}$ (=16.18)			M1	Allow 16 **or** 16.2 for AD throughout
	AX^2 = "261.8" $- 5^2$ (= 236.8) **or** AX^2 = "16.18"$^2 - 5^2$ (= 236.8)			M1	
	$\sqrt{"236.8"}$ (=15.38..)			M1	
	0.5 × 10 × "15.38"			M1	
		76.9	6	A1	for answer in the range 76.5 – 77 SC: B4 for an answer in the range 53 – 53.5
					Total 6 marks

15a	$3\times 2\times x^2 - 3\times 2x - 12$			M1	for one of $3\times 2\times x^2$ (=$6x^2$) or $-3\times 2x$ (=$6x$) or -12
		$6x^2 - 6x - 12$	2	A1	
b	$6\times 2^2 - 6\times 2 - 12$			M1	substitute $x = 2$ in (a) ft from answer to (a) (must be a quadratic expression)
		0	2	A1	
c	$6x^2 - 6x - 12 = -12$			M1	ft from answer to (a) (must be a quadratic expression)
	$x = 1$, 0			A1	for both correct solutions
		1, 0	3	A1	for $k = 1$ and $m = 0$
					Total 7 marks

https://xtremepape.rs/

16	$cxy + dy = ax + b$			M1	both terms in original denominator multiplied by y
	e.g. $cxy - ax = b - dy$ **or** $dy - b = ax - cxy$			M1	for isolating terms in x and non x terms correctly ft from $cxy + d = ax + b$ **or** $cx + dy = ax + b$
	$x(cy - a) = b - dy$			M1	for taking out a factor of x correctly provided there are two terms in x
		$x = \frac{b - dy}{cy - a}$	4	A1	for $x = \frac{b - dy}{cy - a}$ oe e.g. $x = \frac{dy - b}{a - cy}$
					Total 4 marks

17	$12 \times (12+ 6) = 9 \times (9 + BC)$ oe **or** $12 \times (12+ 6) = 9 \times AC$ oe **or** $AC = 24$			M1	
	$(BC =) \frac{12 \times (12 + 6)}{9} - 9$ oe **or** $24 - 9$			M1	for a complete method
		15	3	A1	
					Total 3 marks

https://xtremepape.rs/

18	$y^2 + 4x = 12$ $4x + 6y = 20$ with subtraction **or** $\left(\frac{10-2x}{3}\right)^2 + 4x = 12$ **or** $2\times\left(\frac{12-y^2}{4}\right) + 3y = 10$ oe			M1	for eliminating one variable multiplication of equation(s) to get same multiple of y with subtraction (condone one arithmetic error) **or** either rearrangement of one equation and then correct substitution into second equation (condone algebraic error in rearrangement)
	E.g. $y^2 - 6y = -8$ **or** $4x^2 - 4x - 8 = 0$			A1	reduction to a correct 3 term quadratic; terms may not all be 'on the same side'
	E.g. $(y - 2)(y - 4)$ (= 0) or $4(x - 2)(x + 1)$ (=0)			M1	ft if first M1 awarded and equation is quadratic for correct factorisation **or** correct substitution into formula
				A1	for $y = 2$, $y = 4$ or $x = 2$, $x = -1$ correct x or y values implies previous M1
	$(x =)\frac{10-3\times2}{2}$ or $\frac{10-3\times4}{2}$ $(y =)\frac{10-2\times2}{3}$ or $\frac{10-2\times(-1)}{3}$			M1	(dep on the previous M1) for correct substitution to find **both** values
		$x = 2$, $y = 2$ or $x = -1$, $y = 4$	6	A1	values for x and y must be correctly paired dep on M1 awarded
					Total 6 marks

https://xtremepape.rs/

19	$(V_c =)\frac{\pi}{3}\times 36^2\times 53$ (=22896π = 71930)			M1	for volume of cone
	$(V_H =)\frac{2\pi}{3}\times 36^3$ (=31104π = 97716)			M1	for volume of hemi-sphere NB : 54000π or 169646 implies first two method marks
	$\pi\times r^2\times 2r = "\frac{2\pi}{3}\times 36^3" + "\frac{\pi}{3}\times 36^2\times 53"$ oe			M1	(dep on at least M1) for forming an equation with correct volume expression for cylinder
	$r = \sqrt[3]{\frac{"54000\pi"}{2\pi}} = 30$			M1	
	2 × "30"			M1	(dep previous M1)
		60	6	A1	
					Total 6 marks

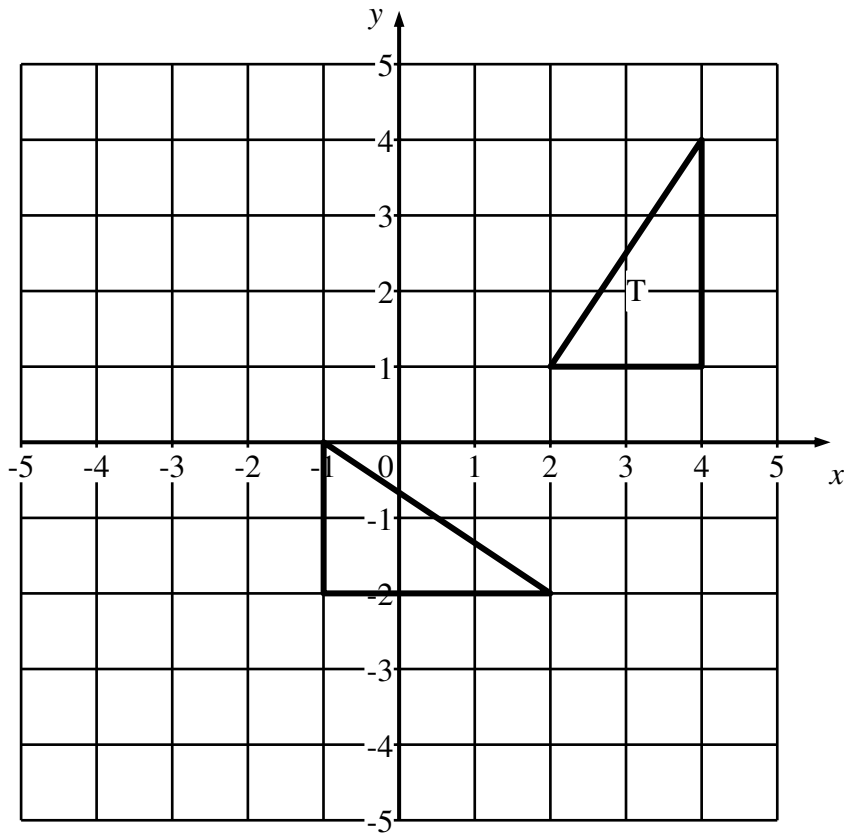
20	$(2^p)^2 - 2^p - 2^p + 1$ **or** $2^{2p} - 2^p - 2^p + 1$ **or** $4^p - 2^p - 2^p + 1$			M2	for correct expansion If not M2 then award M1 for 3 terms correct from $(2^p)^2 - 2^p - 2^p + 1$
	$N = 2^{p+1}(2^{p-1} - 1)$	Shown		A1	for correct factorised expression from correct working (dep on M2)
					Total 3 marks
	Alternative method $N = (k-1)(k+1)$			M1	for correct factorisation
	$N = (2^p - 1 - 1)(2^p - 1 + 1)$			M1	for correct factorisation and substitution (implies B1)
	$N = 2^{p+1}(2^{p-1} - 1)$	Shown	3	A1	for correct factorised expression (dep on M2)

https://xtremepape.rs/

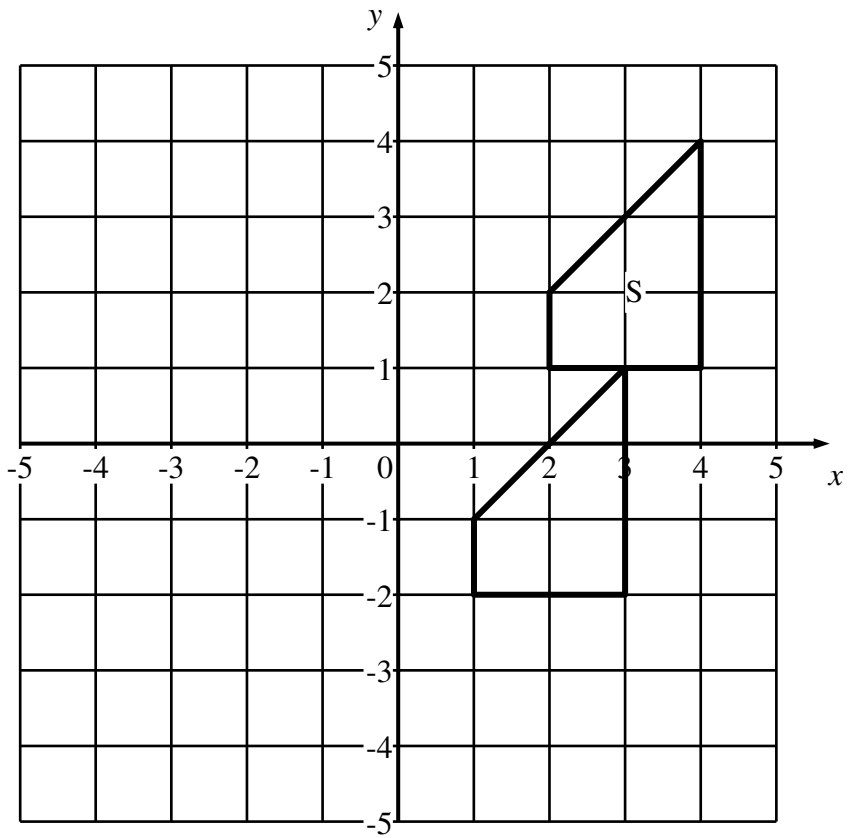
21	$((BD)^2 =)\ (x-2)^2+(x-3)^2-2(x-2)(x-3)\cos(120)$			M1
	$(x-2)^2 = x^2-2x-2x+4$ oe $(x-3)^2 = x^2-3x-3x+9$ oe			M1 (independent) correct expansion of $(x-2)^2$ or $(x-3)^2$
	$x^2-4x+4\ +\ x^2-6x+9\ +\ x^2-5x+6\ (=3x^2-15x+19)$			A1 correct quadratic for BD^2 with all terms expanded may not be simplified
	Area = $2BD^2$ oe **or** Area = $2 \times$ ("$3x^2-15x+19$")			M1 (independent)
		$6x^2-30x+38$	5	A1
				Total 5 marks

https://xtremepape.rs/

8 a

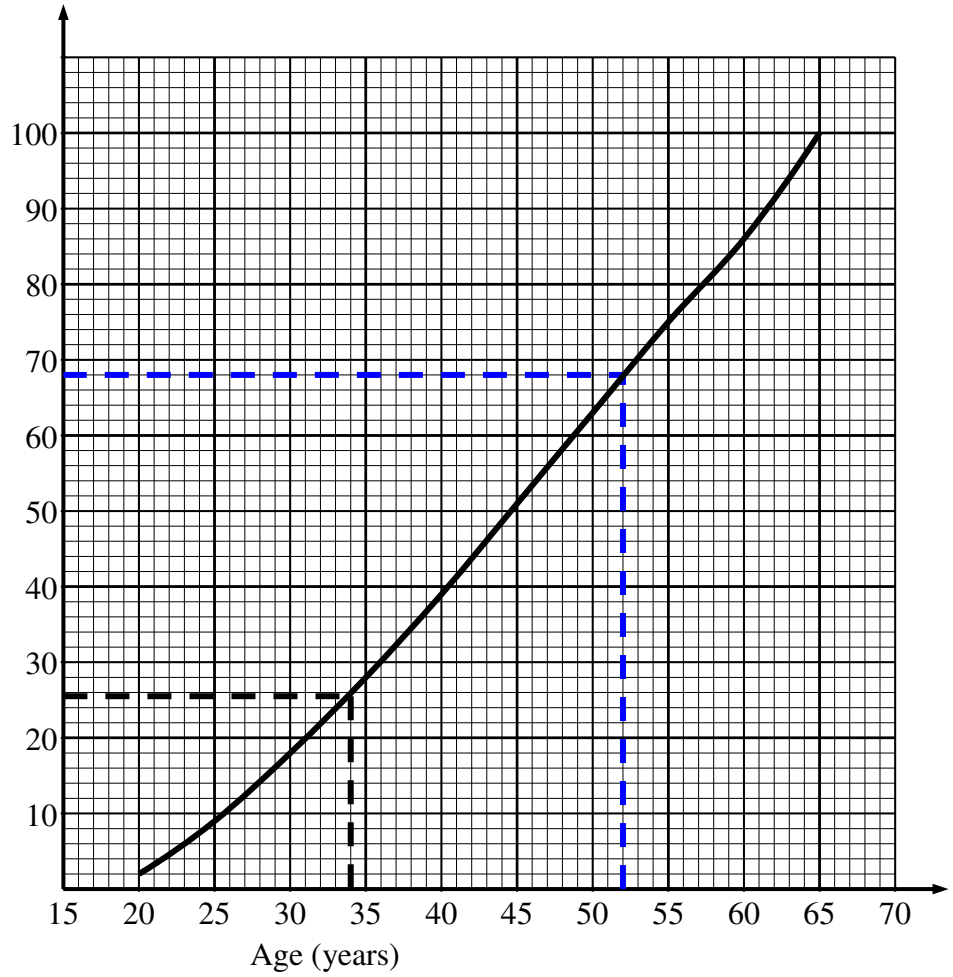


8b



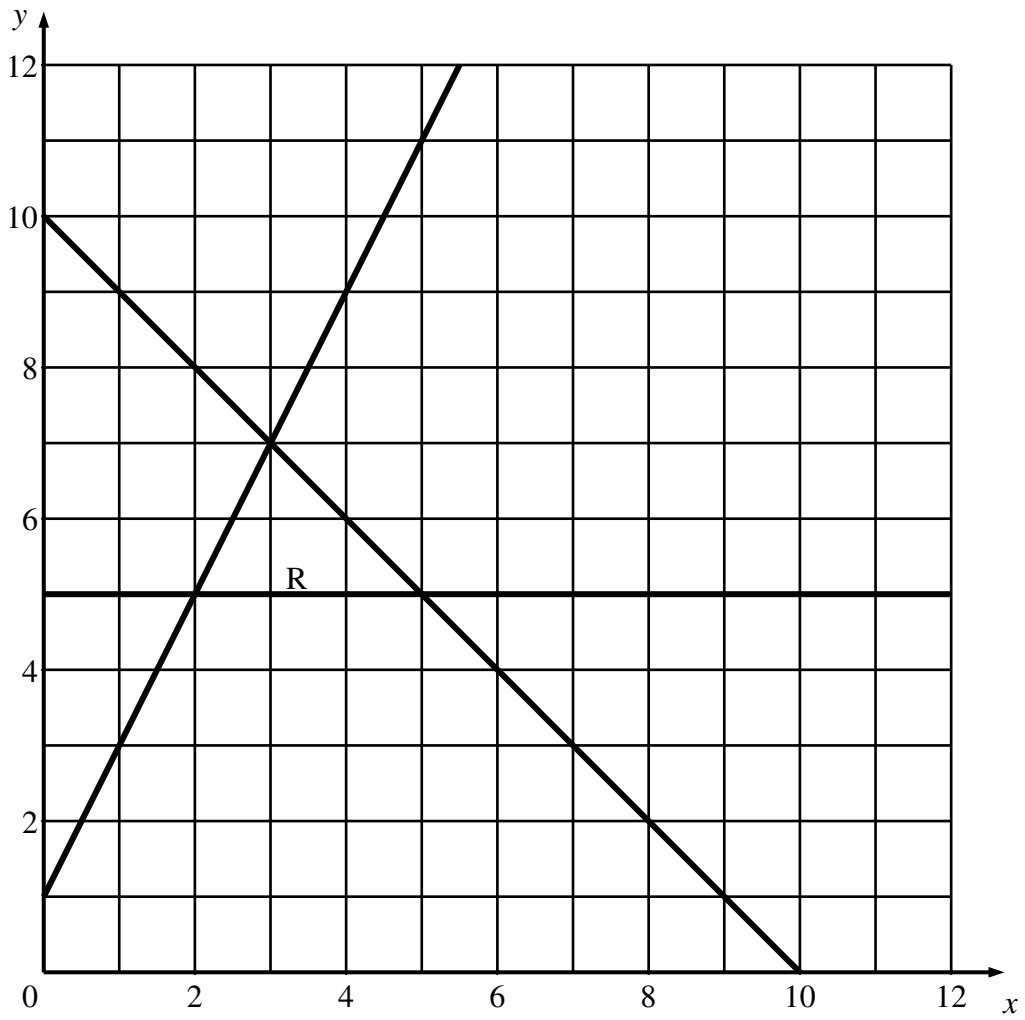
https://xtremepape.rs/

12



https://xtremepape.rs/

13



https://xtremepape.rs/

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom

https://xtremepape.rs/