

**GCSE MATHEMATICS**

**MARK SCHEME**

Practice Paper Higher 3

Maximum marks: 80

Calculator

View detailed guidance on the conclusions you can draw from your students' performance in these papers on the MERiT welcome page. Understand how your students compare with others and target revision effectively by entering marks into MERiT.

<b>1</b>	1 2 4 8	B1	<b>[1]</b>
<b>2</b>	(a) (2, 16) (b) -2 and 6	B1 B1	<b>[2]</b>
<b>3</b>	(a) $8n - 3$ (b) <b>Alternative method 1</b> $x + 6$ oe $4x + 9$ oe their $(x + 6) + 2x + 7 +$ their $(4x + 9) = 57$ or $7x + 22 = 57$ oe 5 SC2 11, 17, 29 <b>Alternative method 2</b> $x + 6$ oe $4x + 9$ oe their $(x + 6) = 11$ or $2x + 7 = 17$ or their $(4x + 9) = 29$ oe 5 SC2 11, 17, 29 <b>Additional Guidance</b> $(2x + 7 + 5) \div 2$ or $(2x + 12) \div 2$ are oe for $x + 6$ $2(2x + 7) - 5$ or $4x + 14 - 5$ are oe for $4x + 9$	B1 B1 M1 A1 B1 B1 M1 A1 B1 B1	<b>[5]</b>

4 (a) **Alternative method 1**  
 $3 \times 5$  or 15 (children) or 20 (children) M1  
*eg 3 : 15*

15 and 20 and No A1  
*oe No, they had 5 extra children*

**Alternative method 2**

$20 \div 5$  or 20 (children) or 4 (adults) M1  
*eg 4 : 20*

4 and No *oe No, they needed 1 more adult* A1

**Additional Guidance**

Allow misreads for the other sports on Saturday or walking on Sunday or walking on Saturday and Sunday:

$27 \div 5$  or 5.4 (adults) M1A0

$18 \div 5$  or 3.6 (adults) M1A0

$30 \div 5$  or 6 (adults) M1A0

$50 \div 5$  or 10 (adults) M1A0

(b)  $\frac{1}{3}$  or  $\frac{9}{27}$  or  $\frac{8}{24}$  B1  
*oe fraction*

(c)  $12 \div 3$  M1  
 or  $30 \div 5$   
 or  $16 \div 2$   
*4 adults (archery) or  
 6 adults (walking) or  
 8 adults (sailing)  
 NB 4, 6, 3 implies M0*

$12 \div 3$  M1  
**and**  $30 \div 5$   
**and**  $16 \div 2$   
*4 adults (archery) and  
 6 adults (walking) and  
 8 adults (sailing)  
 Condone misread of **one** bar height if number of adults rounded up*

18 *Must be from 12, 30 and 16* A1

**Additional Guidance**

Condone all M marks for misread of Saturday for any bar:

Archery :  $27 \div 3 = 9$

Walking :  $20 \div 5 = 4$

Sailing :  $18 \div 2 = 9$  (Total = 22)

Condone all M marks for misread of both days for any bar:

Archery :  $39 \div 3 = 13$

Walking :  $50 \div 5 = 10$

Sailing :  $34 \div 2 = 17$  (Total = 40)

NB  $1 + 3 = 4$  M0

NB  $1 + 5 = 6$  M0

$12 \div 3 + 30 \div 5 + 15 \div 2 = 4 + 6 + 8 = 18$  M1M1A0  
 (the 8 is from wrong working but one misread of a bar height is allowed)

[6]

**5 Alternative method 1**

60 × 40 or 2400 oe M1

their 2400 – 2000 or 400 M1dep  
 or 2000 – their 2400

$\frac{\text{their } 400}{2000} (\times 100)$  or 0.2 oe M1dep

20(%) A1

**Alternative method 2**

60 × 40 or 2400 oe M1

their 2400 – 2000 or 400 M1dep  
 or 2000 – their 2400

10% = 2000 ÷ 10 or 1% = 2000 ÷ 100 **and** correctly finds multiplier using M1  
 build up or division to find percentage equivalent to total their 400  
 oe

*Correct build up to find percentage equivalent to total  
 their (their 2400 – 2000) or their (2000 – their 2400)  
 implies M3*

20(%) A1

**Alternative method 3**

60 × 40 or 2400 M1

$\frac{\text{their } 2400}{2000} (\times 100)$  or 120(%) or 1.2 M1dep

their 120 – 100 or their 1.2(0) – 1(.00) M1dep  
 or 100 – their 120  
 or 1(.00) – their 1.2(0) or 0.2

oe  
 20(%) A1

**Additional Guidance**

20% on answer line and no working M1M1M1A1

480 × 5 (= 2400) from 5 years scores minimum M1

60 × 40 = 1800 and 200 scores minimum M1M1

60 × 40 = 1800 and 200 and  $\frac{200}{2000}$  M1M1M1A0

60 × 40 = 1800 and  $\frac{200}{2000}$  M1M1M1A0

$\frac{2000}{\text{their } 2400} (= 1.2)$  does not score second method mark on ALT3

[4]

**6** (a)  $\frac{3}{5}$  or 0.6 B1

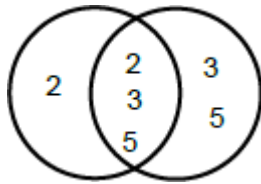
(b) 35 or 35.0 or 34.99(...) B1  
*Do not accept 34.9*

[2]

7 (a) 30 or  $2 \times 3 \times 5$  B1

**Additional guidance**

Venn Diagram (2 circles) with correct values



or Lists of multiples of 60 or 450, eg 120, 180, 240, ...450, 900, ....

(b) 900 B2

**Additional guidance**

60 and 450 seen

SC!. No working or irrelevant working and answer of 1800

[3]

8 (a) 5.15 B1

5.25 B1

(b) 20.6 ft 4 x their 5.15 B1ft

21 ft 4 x their 5.25 B1ft

[4]

9  $\begin{pmatrix} 12 \\ 15 \end{pmatrix}$  or  $\begin{pmatrix} 10 \\ -4 \end{pmatrix}$  or  $\begin{pmatrix} -10 \\ 4 \end{pmatrix}$  M1

$\begin{pmatrix} 2 \\ 19 \end{pmatrix}$  A1

SC1 Answer  $\begin{pmatrix} 2 \\ y \end{pmatrix}$  or  $\begin{pmatrix} x \\ 19 \end{pmatrix}$

[2]

10  $-0.3$   $\frac{1}{3}$  3.03 33.3 B2

B1 for  $\frac{1}{3} = 0.3(\dots)$   
**Or** B1 for  $-0.3$  first and  $33.3$  last  
**Or** B1 for reverse order

[2]

11 **Alternative Method 1**

(P:) (D =)  $90T$  M1  
or (M:) (D =)  $70(T + 1)$  oe

$90T = 70(T + 1)$  *Condone missing bracket, ie  $90T = 70T + 1$  but no further marks unless bracket recovered,* M1dep

$90T - 70T = 70$  oe **NB**  $70 \div 20$  is M3 M1dep

3.5 oe 3.30 is M3, A0 A1

**Alternative Method 2**

Chooses a value for distance travelled and correctly works out time taken at 90kph **and** time taken at 70kph M1

*Lists distance travelled for Paul and Mary (for at least 2 hours)  
Eg 90, 180, 270, 360, ...  
70, 140, 210, 280, 350, ....*

Subtracts their values or repeats above with a different value M1dep  
*Trying a new value implies that the difference between previously calculated times was not 1.*

Chooses a different value for distance travels and correctly works out time taken at 90kph **and** time taken at 70kph, but the difference in times must be closer to 1 hour than the previous choice. M1dep

oe

3.5 oe 3.30 is M3, A0 SC2 315 km A1

**Alternative Method 3**

(P:) (D =)  $90(T - 1)$  M1  
or (M:) (D =)  $70T$

**NB** *this scheme is for working out the time that Mary takes. It can be 'recovered' for full marks but if it ends at 4.5 then 2 marks maximum.*  
oe

$20T = 90$ , and  $T = 4.5$  **NB**  $90 \div 20 = 4.5$  is M2 M1

Their  $4.5 - 1$  oe M1dep

3.5 oe 3.30 is M3, A0 A1

[4]

12  $\frac{36}{99}$  and  $\frac{4}{11}$  B1

[1]

13 Comment comparing mean B1  
*eg On average treated plants are taller*

Comment comparing IQR B1  
*eg Less variation in treated plants  
Treated plants more consistent (height)*

[2]

14	(a)	Any four correct plots	M1	
		$\pm \frac{1}{2}$ square		
		All seven correct plots	A1	
		$\pm \frac{1}{2}$ square		
	(b)	Continuous line within limits	B1	
		<i>Straight line, negative gradient, at least 3 large squares wide that passes / would pass through gate at (2, 8) and (2, 11) and gate at (5, 1) and (5, 5)</i>		
	(c)	Negative (correlation)	B1	
		<i>Must use the word 'negative'</i>		
		<i>Ignore extra words eg strong, weak, ...</i>		
	(d)	Reads across from 5 on the vertical axis	M1	
		<i>Must have a straight line of best fit</i>		
		Answer appropriate to their straight line of best fit with negative gradient	A1ft	
		<i>ft their line of best fit <math>\pm \frac{1}{2}</math> square</i>		
		<i>SC1 Answer only [3.9, 4.3]</i>		[6]
15		$P \left( 1 + \frac{r}{100} \right)^n$	B1	
				[1]
16		$(t + 4)(t^2 + 4t + 4t + 16)$	M1	
		<i>oe Allow one error</i>		
		$t^3 + 4t^2 + 4t^2 + 16t + 4t^2 + 16t + 16t + 64$	M1	
		<i>ft From their <math>(t + 4)(t^2 + 4t + 4t + 16)</math></i>		
		<i>oe Must have at least 4 terms correct</i>		
		<i>M2 <math>t^3 + 3t^2(4) + 3t(4)^2 + 4^3</math> oe</i>		
		$t^3 + 12t^2 + 48t + 64$	A1	
				[3]
17	(a)	Correct box drawn and median and quartiles at 20, 50, 80	B1	
		$\pm \frac{1}{2}$ square		
		IQR box formed and whiskers correctly joined to 15 and 90	B1	
		$\pm \frac{1}{2}$ square		
	(b)	120 is $\frac{3}{4}$ or 40 is $\frac{1}{4}$ seen or implied	B1	
		<i>May be implied by M1 scored</i>		
		<i>Condone lower quartile = 40 or <math>Q_1 = 40</math></i>		
		120 $\div 3 \times 4$ ( $\div 2$ ) or 160 seen oe	M1	
		or 120 - 40		
		$\frac{2}{3} \times 120$ or $40 \times 2$		
		80	A1	
		<i>SC2 median linked with 80 in working</i>		[5]

<b>18</b>	Lists outcomes	M1
	1, 4                      4, 1	
	1, 5                      5, 1	
	1, 6      and /      6, 1	
	2, 4      or      4, 2	
	2, 5                      5, 2	
	2, 6                      6, 2	

One of : M1dep  
 A (both even) has 2 outcomes  
 B (both odd) has 1 outcome  
 C (one odd one even) has 3 outcomes

*One of:*

$$P(\text{both even}) = \frac{1}{2} \times \frac{2}{3} = \frac{1}{3} \text{ or } \frac{2}{6}$$

$$P(\text{both odd}) = \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$$

$$P(\text{odd and even any order}) = \frac{1}{2} \times \frac{2}{3} + \frac{1}{2} \times \frac{1}{3} = \frac{1}{2} \text{ or } \frac{3}{6}$$

*or*  $1 - \frac{2}{6} - \frac{1}{6}$

B, A, C A1  
*All three shown and correct and BAC*

[3]

<b>19</b>	(Vertical scale) does not start at 0 or incorrect height bars or vertical scale is incorrect or Area not proportional to frequency	B1
	Last bar (should be at height 1)	B1
	Label on vertical scale incorrect e.g. should be frequency density <i>Any order</i>	B1

[3]

<b>20</b>	Angle CAD = 46 <b>or</b> Angle ACD = 37 <b>or</b> Angle CDE = 83 <b>or</b> (37 + 46) <b>or</b> Angle ADC = 97 <b>or</b> 180 - (37 + 46) <i>Any of these angles could be correctly marked or named Could be on diagram</i>	M1
	Angle DCE = 46 <b>or</b> Angle ACE = 83 <b>or</b> (37 + 46) 180 - (83 + 46)	M1
	51	A1

[3]

<b>21</b>	(a)	9 or 64 or $3^2 + 4^3$	M1	
		73	A1	
	(b)	$\sqrt[3]{x}$ or $\sqrt[3]{-27}$ or $x^3 = -27$	M1	
		-3	A1	
	(c)	$(3^{2x})^3$	M1	
		$3^{6x}$	A1	
	(d)	C	B1	<b>[7]</b>
<b>22</b>	(a)	$(3x + 1)^2 = 9x^2 + 3x + 3x + 1$	B1	
	(b)	$9x^2 + 3x + 3x + 1 = 4x^2 - x + 7$ or $9x^2 + 6x + 1 = 4x^2 - x + 7$	M1	
		oe		
		$5x^2 + 7x - 6 = 0$	M1	
		<i>all terms correctly collected on one side of the equation</i>		
		$(5x - 3)(x + 2) (= 0)$ or $(5x + a)(x + b) (= 0)$	M1	
		<i>ab = ±6 or 5b + a = ±7 ft their quadratic</i>		
		<i>or quadratic formula allowing one substitution error</i>		
		$x = 0.6$ and $x = -2$ or $x = 0.6$ and $y = 2.8$	A1	
		oe		
		$y = 2.8$ and $y = -5$ or $x = -2$ and $y = -5$	A1	
		oe		<b>[6]</b>
<b>23</b>		20 or 30 seen	B1	
		90 + 35 or 125 seen	B1	
		<i>20 sin 35 and 20 cos 35</i>		
		<i>10 sin 35 and 10 cos 35</i>		
		$20^2 + 30^2 - (2 \times 20 \times 30 \times \cos 125)$		
		<i><math>(30 + 20 \sin 35)^2 + (20 \cos 35)^2</math></i>		
		<i>or <math>(15 + 10 \sin 35)^2 + (10 \cos 35)^2</math></i>		
		or $10^2 + 15^2 - (2 \times 10 \times 15 \times \cos 125)$	M1	
		1988(.29 ...) or 1990	A1ft	
		<i>497(.07 ...) or 500</i>		
		<i>22.29(5 ...) or 22.3 or 22.5</i>		
		<i>ft their 90 + 35</i>		
		44.5 ... or 44.6 or 45	A1	<b>[5]</b>