

OCR • GCSE MATHEMATICS J560

Higher Tier — Paper 2

Calculator

November 2023 exam series

MARK SCHEME

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Higher

GCSE

Mathematics - Paper 5

J560/05: Paper 5 (Higher tier)

General Certificate of Secondary Education

Mark Scheme for November 2023

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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MARKING INSTRUCTIONS

PREPARATION FOR MARKING RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor.
3. Log-in to RM Assessor then mark and annotate the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader via the RM Assessor messaging system.
5. Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners should give candidates the benefit of the doubt and mark the crossed out response where legible.
6. When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.
7. On each blank page the annotation **BP** must be inserted to confirm that the page has been checked. For additional objects (if present), a tick must be inserted on each page to confirm that it has been checked.

8. There is a NR (No Response) option. Award NR (No Response)
- if there is nothing written at all in the answer space
 - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
 - OR if there is a mark (e.g. a dash, a question mark) which is not an attempt at the question.

The hash key (#) on your keyboard will enter NR.

Note: Award 0 marks for an attempt that earns no credit (including copying out the question).

9. The RM Assessor **comments box** is used by the Principal Examiner or your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

If you have any questions or comments for your Team Leader, use the RM Assessor messaging system.

10. Assistant Examiners should send a brief report on the performance of candidates to their Team Leader (Supervisor) by the end of the marking period. Please follow the direction of your Team Leader about which questions you should report on and how to submit your report. Your report should contain notes on particular strengths displayed as well as common errors or weaknesses.
11. Annotations available in RM Assessor. These **must** be used whenever appropriate during your marking.

Annotation	Meaning
	Correct
	Incorrect
	Benefit of doubt
	Follow through

ISW	Ignore subsequent working (after correct answer obtained), provided method has been completed
M0	Method mark awarded 0
M1	Method mark awarded 1
M2	Method mark awarded 2
A1	Accuracy mark awarded 1
B1	Independent mark awarded 1
B2	Independent mark awarded 2
MR	Misread
SC	Special case
^	Omission sign
BP	Blank page
SEEN	Seen

For a response awarded zero (or full) marks a single appropriate annotation (cross, tick, M0 or ^) is sufficient, but not required. For responses that are not awarded either 0 or full marks, you must make it clear how you have arrived at the mark you have awarded and all responses must have enough annotation for a reviewer to decide if the mark awarded is correct without having to mark it independently.

It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.

Subject-Specific Marking Instructions

12. **M** marks are for using a correct method and are not lost for purely numerical errors.
A marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
B marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
SC marks are for special cases that are worthy of some credit.
13. The following abbreviations are commonly found in GCSE Mathematics mark schemes.
- **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point e.g. 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
 - **isw** means **ignore subsequent working** after correct answer obtained and applies as a default.
 - **nfw** means **not from wrong working**.
 - **oe** means **or equivalent**.
 - **rot** means **rounded or truncated**.
 - **soi** means **seen or implied**.
 - **dep** means that the marks are **dependent** on the marks indicated. You must check that the candidate has met all the criteria specified for the mark to be awarded.
 - **with correct working** means that full marks **must not** be awarded without some working. The required minimum amount of working will be defined in the guidance column and **SC** marks given for unsupported answers.
14. Anything in the mark scheme which is in square brackets [...] is not required for the mark to be earned, but if present it must be correct.
15. Unless the command word requires that working is shown and the working required is stated in the mark scheme, then if the correct answer is clearly given and is not from wrong working **full marks** should be awarded.
- Do not award the marks if the answer was obtained from an incorrect method, i.e. incorrect working is seen and the correct answer clearly follows from it.
16. Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct. For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, e.g. $FT\ 180 \times (their\ '37' + 16)$, or $FT\ 300 - \sqrt{(their\ '52' + 72)}$. Answers to part questions which are being followed through are indicated by

e.g. $FT\ 3 \times their\ (a)$.

17. In questions **with no final answer line**, make no deductions for wrong work after an acceptable answer (i.e. **isw**) unless the mark scheme says otherwise, indicated by the instruction 'mark final answer'.
18. In questions **with a final answer line and incorrect answer given**:
 - (i) If the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.
 - (ii) If the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.
 - (iii) If the correct answer is seen in the body of working but a completely different answer is seen on the answer line, then accuracy marks for the answer are lost. Method marks could still be awarded if there is no other method leading to the incorrect answer. Use the **M0**, **M1**, **M2** annotations as appropriate and place the annotation ✗ next to the wrong answer.
19. In questions **with a final answer line**:
 - (i) If one answer is provided on the answer line, mark the method that leads to that answer. A correct step, value or statement that is not part of the method that leads to the given answer should be awarded **M0** and/or **B0**.
 - (ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.
 - (iii) If more than one answer is provided on the answer line and there is more than one method provided, award marks for the poorer response unless the candidate has clearly indicated which method is to be marked.
20. In questions **with no final answer line**:
 - (i) If a single response is provided, mark as usual.

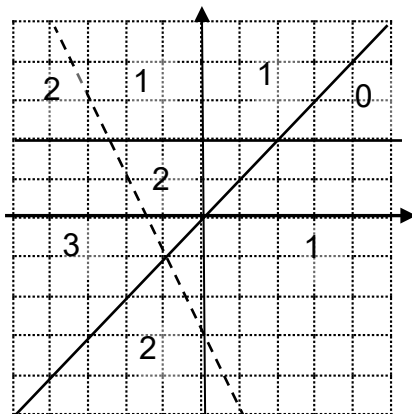
- (ii) If more than one response is provided, award marks for the poorer response unless the candidate has clearly indicated which response is to be marked.
21. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the **MR** annotation. **M** marks are not deducted for misreads. If a candidate corrects the misread in a later part, do not continue to follow through, but award **A** and **B** marks for the correct answer only.
 22. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.
 23. Ranges of answers given in the mark scheme are always inclusive.
 24. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.
 25. If in any case the mark scheme operates with considerable unfairness consult your Team Leader.

Question			Answer	Marks	Part marks and guidance	
1			$2^2 \times 3 \times 5$ or $2 \times 2 \times 3 \times 5$	2	B1 for only 2, 3 and 5 or M1 for any correct factor pair of 60	Condone inclusion of 1 for B1 Not 1 and 60
2			50 with correct 500 and $\sqrt{100}$ or 10 shown nfw	2	M1 for one of 500 or $\sqrt{100}$ or 10	
3	(a)		$12a^7$ final answer	2	B1 for answer ka^7 or $12a^k$ or for correct answer seen then spoiled	
3	(b)		$4x(x-3)$ final answer	2	B1 for answer $4(x^2-3x)$ or $x(4x-12)$ or $2x(2x-6)$ or for correct answer seen then spoiled	Condone omission of final bracket for 2 marks or B1
4	(a)		No with the graph is not rising month on month as they are flat in June and/or dip in July oe	1		Allow for comment on either the flat or dip in the graph e.g. sales fell between July and August Do not accept incorrect statements See Appendix 1
4	(b)		No with no vertical scale numbering so cannot see if sales have doubled oe	1		Accept: No with no values/data/figures/numbers/%s shown [on sales axis] See Appendix 2
5	(a)		$\begin{pmatrix} 1 \\ 3 \end{pmatrix}$	1		Not for $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$
5	(b)		$\begin{pmatrix} 3 \\ 11 \end{pmatrix}$	2	B1 for either 3 or 11 in correct position or for $\begin{bmatrix} 5 \\ 3 \end{bmatrix} + \begin{pmatrix} -2 \\ 8 \end{pmatrix}$ or $\begin{pmatrix} 5 \\ 3 \end{pmatrix} - \begin{pmatrix} 2 \\ -8 \end{pmatrix}$	Not for $\begin{pmatrix} 3 \\ 11 \end{pmatrix}$

Question			Answer	Marks	Part marks and guidance	
6			Reflection in $x = 1$	2	B1 for each If 0 scored, SC1 for $x = 1$ drawn	Extra transformations score zero Additional properties treat as choice Condone for 2 marks e.g. Reflection, centre $x = 1$
7			50 with correct working	4	B2 for 2400 or M1 for $\frac{15}{100} \times 16000$ oe M1 for $(17400 - \text{their } 2400) \div 300$ oe If 0 or M1 scored, instead award SC2 for answer 50 with no or insufficient working If 0 scored, instead award SC1 for 15 000 with no or insufficient working	“Correct working” requires evidence of at least B2 or M1M1 or alternate convincing approach For M1 not $15\% \times 16000$ alone Allow repeated addition of 300 need 5 additions, condone 1 error. Could e.g. start 2400 and try to add on to make 17400 Candidates who use 17400 throughout treat as MR (see marking instructions) B2 for 2610 (15%) and answer 49.3 condone rounded to 49 or 50 if multiples of 300 are used instead of division
8			960	2	M1 for 2.4×400	
9	(a)		25[%]	2	M1 for $\frac{4}{1+4+11} [\times 100]$ oe	
9	(b)		128	4	M1 for $24 \div (4 - 1)$ oe and M2 for $8 \times (1 + 4 + 11)$ oe or 8, 32 and 88 or M1 for <i>their</i> $8 \times (1 + 4 + 11)$ oe or <i>their</i> 8, $4 \times \text{their } 8$ and $11 \times \text{their } 8$ evaluated	Implied by 8 [red] <i>their</i> 8 must be an integer and if 6 or 24 implied by 96 or 384

Question			Answer	Marks	Part marks and guidance	
13	(a)		3	1		
13	(b)		Correct curve	3	B2FT for 7 or 8 correct plots or B1FT for 5 or 6 correct plots	Use overlay as a guide Mark curve first accuracy ± 1 mm, $\frac{1}{2}$ small sq Condone slight feathering Condone ruled segment between $x = -5$ and $x = -4.5$ only If curve incorrect then mark plots accuracy ± 1 mm If no plot, curve implies plot
13	(c)		-1 cao	1		
14	(a)		Any two from Small sample oe Limited to one age group oe May all be one gender oe	2	B1 for each correct reason	Accept e.g: They should have asked more pupils Do not accept they should ask all the pupils They should have asked different age groups They should make sure they ask males and females Accept two disadvantages given in one statement Ignore incorrect statements
14	(b)		The sample is representative of the whole school oe	1		See Appendix 3

Question			Answer	Marks	Part marks and guidance	
15	(a)		Accurate ruled perpendicular from T to AB with correct construction arcs	2	B1 for accurate ruled perpendicular from T to AB with no/incorrect construction arcs $\pm 2^\circ$	For 2 marks or B1 must reach/cross AB Correct arcs could be e.g. Kite method Condone dashed/dotted lines Multiple lines treat as choice
15	(b)		520 000 to 560 000 with correct working oe OR that would be 6 cm on the map but it only measures 5.2 to 5.6 cm oe OR This money would build 3 km but it only measures 2.6 to 2.8 km oe	3	B1FT for [road =] 5.2 to 5.6 [cm] or 2.6 to 2.8 [km] or <i>their</i> (a) measured ± 2 mm M1FT for (<i>their</i> 5.2 to 5.6) $\div 2 \times 200\,000$ oe or $600\,000 \div 200\,000 [\times 2]$	For 3 marks accept e.g. it will be 40 000 to 80 000 less than this B1 may be seen on diagram Accept FT given in km as <i>their</i> (a) $\div 2$ M1 implied by 6 cm or 3 km Method can be implied by correct figures For 3 marks accept e.g. $3 \times 200\,000$ is greater than $2.7 \times 200\,000$
16	(a)		Correct box plot	3	B2 for 4 or 5 correct markers or B1 for 3 correct markers or 16 or 60 soi	Markers must be associated with the correct statistic e.g. do not allow median marked as UQ
16	(b)		11Q [because] it has a smaller IQR oe	1		Accept: 11Q [because] its IQR is 18 but the IQR of 11P is 24 or 25 Do not accept if median also mentioned or if incorrect values given

Question			Answer	Marks	Part marks and guidance									
17			<table><tr><td>x</td><td>1</td><td>2</td><td>5</td></tr><tr><td>y</td><td>7</td><td>56</td><td>875</td></tr></table>	x	1	2	5	y	7	56	875	4	B3 for 56 or 5 or M2 for 7×2^3 or $7x^3 = 875$ or M1 for $y = kx^3$	M1 implied by $y = 7x^3$ seen
x	1	2	5											
y	7	56	875											
18			$\frac{8}{11}$ final answer	4	B3 for $\frac{72}{99}$ oe or B2 for $\frac{28}{99}$ oe fraction or for $0.\dot{7}\dot{2}$ or M1 for $[100x =] 28.28....$ or for 0.4	or any pair that allow elimination of recurring decimal								
19			$y = 2$ ruled and $y = -2x - 3$ broken line and correct region indicated 	6	B1 for $y = 2$ ruled B2 for $y = -2x - 3$ broken line or B1 for $y = -2x - 3$ solid line AND B1 for R on correct side of $y = x$ B1 for R on correct side of $y = 2$ B1 for R on correct side of <i>their</i> $y = -2x - 3$	Penalise one mark only for good freehand lines Additional lines treat as choice Length of line should be fit for purpose to identify <i>their</i> region See marks on diagram for the final B3 marks provided all lines drawn correctly For region, FT <i>their</i> $y = -2x - 3$ provided line with negative gradient only but no FT for $y = 2$ if incorrect Condone shading in or out of region provided R is clearly identified								
20			$\frac{1}{6}$	2	B1 for answer $\frac{1}{n}$ or for answer with $\sqrt{36}$ or better	After correct answer isw any attempt to convert to decimal Allow B1 for e.g. answer -6								
21	(a)		$y = 4 - x^2$	2	B1 for answer $y = k - x^2$	k is any value including zero								

Question			Answer	Marks	Part marks and guidance	
21	(b)		Translation $\begin{pmatrix} -3 \\ -14 \end{pmatrix}$	4	B3 for translation $\begin{pmatrix} -3 \\ k \end{pmatrix}$ or translation $\begin{pmatrix} k \\ -14 \end{pmatrix}$ OR M2 for $[y =] (x + 3)^2 - 5 - 3^2$ or better or M1 for $[y =] (x + 3)^2$ seen B1 for translation	If more than one transformation given then M2 maximum
22	(a)		115	4	M1 for $4x - 150 = 2(x + 20)$ oe M1 for $4x - 150 = 2x + 40$ FT <i>their</i> 4 term linear equation with brackets M1 for $x = 95$ FT <i>their</i> 4 term linear equation	FT linear eqn with more than 4 terms but not fewer, must have at least two terms in x
22	(b)		65 and Opposite angles of a cyclic quadrilateral are supplementary	2	FT 180 – <i>their</i> (a) B1 for 65 FT or for correct reason	Accept [Opp angles of] cyclic quad [add up to 180] [Angles in] opposite segments [are supplementary] Accept complete longer reasons Angles at a point add to 360 and angle at centre is twice angle at circumference oe Any incorrect statement does not score for reason

Question			Answer	Marks	Part marks and guidance	
23	(a)		$[AC =] \frac{4}{\cos 30}$ oe	M2	M1 for $\frac{4}{AC} = \cos 30$ oe or for $\frac{\sin 60}{4} = \frac{\sin 90}{AC}$ oe	Accept any variable for AC provided not incorrect length Accept longer methods using 4 tan 30 to find BC then Pythagoras' or sine rule M2 for AC explicit
			$(AC =) \frac{8}{\sqrt{3}}$ or better	A2	B1 for $\cos 30 = \frac{\sqrt{3}}{2}$ oe	oe for B1 e.g. $\sin 60 = \frac{\sqrt{3}}{2}$
			$\frac{45}{360} \times \pi \times \left(\text{their} \frac{8}{\sqrt{3}} \right)^2$	M1		dep on at least M1
			$\frac{45}{360} \times \pi \times \frac{64}{3}$ or better or $\frac{1}{8} \times \pi \times \frac{8}{\sqrt{3}} \times \frac{8}{\sqrt{3}}$ $= \frac{8}{3} \pi$	A1	with no errors seen	Accept $\frac{1}{8} \times \pi \times \frac{8^2}{3}$
23	(b)		$\frac{8\sqrt{3}}{3} + \frac{8}{3}\pi$	3	M1 for $\frac{1}{2} \times 4 \times \frac{8}{\sqrt{3}} \times \sin 30$ FT <i>their</i> AC from (a) or for $\frac{1}{2} \times 4 \times 4 \times \tan 30$ B1 for $\sin 30 = \frac{1}{2}$ oe or for $\tan 30 = \frac{\sqrt{3}}{3}$ oe	Accept e.g. $\frac{16\sqrt{3}}{6} + \frac{8}{3}\pi$ for 3 marks
24			$a = 11$ $b = -6$	3	B2 for $a - 3 = 8$ or $7 - b = 13$ or better or M1 for $x^2 + ax + 7 = 3x + b$ oe	B2 implied by one correct value e.g. $0 = 3x + b - x^2 - ax - 7$

Question	Answer	Marks	Part marks and guidance
25	Yes and $\frac{336}{720}$ oe or better with correct working	5	“Correct working” requires M4 For 5 marks oe or better e.g. $\frac{7}{15}, \frac{21}{45}$ 0.467 or 0.4666.. where $k = 1$ or 2 M4 for $3 \times \frac{8}{10} \times \frac{7}{9} \times \frac{2}{8}$ oe or M3 for $k \times \frac{8}{10} \times \frac{7}{9} \times \frac{2}{8}$ oe or M2 for $\frac{8}{10}, \frac{7}{9}$ and $\frac{2}{8}$ oe used or M1 for $\frac{8}{10}$ oe seen or for three combinations soi BBR, BRB, RBB <u>Alternative Method:</u> M4 for $3 \times \frac{\frac{8}{22} \times \frac{7}{21} \times \frac{2}{20}}{\frac{10}{22} \times \frac{9}{21} \times \frac{8}{20}}$ oe or M3 for $k \times \frac{\frac{8}{22} \times \frac{7}{21} \times \frac{2}{20}}{\frac{10}{22} \times \frac{9}{21} \times \frac{8}{20}}$ oe or M2 for $\frac{10}{22} \times \frac{9}{21} \times \frac{8}{20}$ oe or $\frac{8}{22} \times \frac{7}{21} \times \frac{2}{20}$ oe or M1 for $\frac{10}{22}$ oe seen or $\frac{8}{22}$ oe seen If 0 or M1 scored, instead award SC2 for answer $\frac{336}{720}$ oe (or better) with no or insufficient working If 0 scored, instead award SC1 for answer $\frac{112}{720}$ or $\frac{224}{720}$ oe (or better) with no or insufficient working where $k = 1$ or 2 <u>With replacement</u> (apply similar to the alternative method): SC2 for $3 \times \frac{8}{10} \times \frac{8}{10} \times \frac{2}{10}$ oe $\left[\frac{48}{125}\right]$ or SC1 for $k \times \frac{8}{10} \times \frac{8}{10} \times \frac{2}{10}$ oe ($k = 1$ or 2) <u>Circle condition missed</u> (apply similar to the alternative method): SC2 for $3 \times \frac{11}{22} \times \frac{10}{21} \times \frac{11}{20}$ oe $\left[\frac{11}{28}\right]$ or SC1 for $k \times \frac{11}{22} \times \frac{10}{21} \times \frac{11}{20}$ oe ($k = 1$ or 2)

Appendix 1**Q4a**

Accept reasons that refer to being flat in one month [June or June to July or July] **or** dip in another month [July or July to August or August]. If the month is mentioned then it must be correct, accept any of the bracketed months

1	No, the sales remained flat in July	1
2	No, the sales did not grow/stayed the same in June and July	1
3	No, the sales dipped in August	1
4	No, there was a decrease in July	1
5	No, there were two months where sales did not grow	1
6	No, sales went down from July to August	1
7	No, in July there is a dip in the graph	1
8	No, in June and July the sales were the same	1
9	Wrong, July the sales dropped	1
10	No, the sales increased then stopped and decreased then it increased. (Describes shape and does not refer to wrong months)	1
11	No, in August it drops down then goes back up	1
12	No from June to August the sales dropped (No as part of the statement is incorrect)	0
13	No, the sales went down at July and only started to rise again middle of August. (Incorrect statement)	0

Appendix 2**Q4b**

1	No, the scale may not start from 0. (Implies no figures on sales axis)	1
2	No, because on the graph no numbers we can't know exactly.	1
3	No, on the graph it's doesn't show the % of sales to check if it double.	1
4	No, it doesn't show what it is measured at. (Does not mention numbers/figures/values etc)	0
5	No, sales have tripled not doubled. There three times more sales.	0
6	No, slightly more than double.	0
7	No, at the end of the year it is only 3 more squares, it would have to be 4 to be double.	0

Appendix 3**Q14b**

1	The sample is representative of the whole school (in mark scheme)	1
2	The same proportion of pupils will choose sports for the rest of the school	1
3	That the 7 [or 20] students reflect the choices of the rest	1
4	7/20 of the rest of the school will choose sports	1
5	The teacher assumes the sample will be proportional for all 500 pupils	1
6	For every 20 people [in the school] 7 will choose sport	1
7	The ratio/fraction/proportion stays the same if more/all people were asked	1
8	Every 20 people will give the same response	1
9	The sample reflects the rest of the school (hints at representative sample)	1
10	The whole school has the same interests as year 8 (BOD hints at representative sample)	1
11	That 7 out of 20 is accurate (It is accurate as the results for the sample)	0
12	Other students in the school will choose the same theme (Not referring to proportion/fraction)	0
13	The same amount will choose sports for the rest of the years (needs proportion not amount)	0
14	There will be 175 students that prefer a sports theme (Not referring to sample)	0
15	All of the students will take part / attend /choose an option	0

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