Stage (9-12)

Worksheet 1 | Mark Scheme

1st Semester | 2023-2024

Subject: Math **Chapter:** Number 1, Number 2, Number 3

Objectives:

- To review fractions, standard form, percentages, prime factors, HCF, LCM, and Ratio

Mark Scheme

Q1.

Q	Working	Answer	Mark	Notes
	eg $\frac{14}{3}$ **and** $\frac{11}{6}$		3	M1 for both mixed numbers expressed as improper fractions
	eg $\frac{14}{3}\times\frac{6}{11}$ **or** $\frac{28}{6}\div\frac{11}{6}$ **or** $\frac{28n}{6n}\div\frac{11n}{6n}$			M1 seeing this stage gains M2
	eg $\frac{14}{3}\times\frac{6}{11}=\frac{84}{33}=\frac{28}{11}=2\frac{6}{11}$ **or** $\frac{14}{3}\times\frac{6}{11}=\frac{84}{33}=2\frac{18}{33}=2\frac{6}{11}$ **or** $\frac{14}{\cancel{3}^{1}}\times\frac{\cancel{6}^{2}}{11}=\frac{28}{11}=2\frac{6}{11}$ **or** $\frac{14}{3}\div\frac{11}{6}=\frac{28}{6}\div\frac{11}{6}=\frac{28}{11}=2\frac{6}{11}$ **or** correct working to $\frac{28}{11}$ **and** writing $2\frac{6}{11}=\frac{28}{11}$ *Working required*	Shown		A1 dep on M2 for conclusion to $2\frac{6}{11}$ from correct working – either sight of result of multiplication eg $\frac{84}{33}$ must be seen or correct cancelling to $\frac{28}{11}$ or complete method using division and common denominators
				Total 3 marks

Q2.

Q	Working	Answer	Mark	Notes
	eg $\frac{27}{4}$ **and** $\frac{18}{7}$		3	M1 Both fractions expressed as improper fractions.
	$\frac{27}{4}\times\frac{7}{18}$ oe **or** eg $\frac{189}{28}\div\frac{72}{28}$			M1 for both fractions expressed as equivalent fractions with denominators that are a common multiple of 4 and 7 (seeing this stage gains M2)
	eg $\frac{27}{4}\times\frac{7}{18}=\frac{189}{72}=\frac{21}{8}=2\frac{5}{8}$ **or** $\frac{27}{4}\times\frac{7}{18}=\frac{189}{72}=2\frac{45}{72}=2\frac{5}{8}$ **or** $\frac{27^{3}}{4}\times\frac{7}{18^{2}}=\frac{21}{8}=2\frac{5}{8}$ **or** $\frac{189}{28}\div\frac{72}{28}=\frac{189}{72}=2\frac{45}{72}=2\frac{5}{8}$ oe if the student clearly shows $2\frac{5}{8}=\frac{21}{8}$ then they only need to complete the LHS to $\frac{21}{8}$ (often done in 1st line of working)	shown		A1 dep M2 conclusion to $2\frac{5}{8}$ from correct working – either sight of the result of the multiplication e.g. $\frac{189}{72}$ must be seen then cancelled or correct cancelling prior to the multiplication with $\frac{21}{8}$ seen. NB entire solution using decimals scores no marks.
				Total 3 marks

Q3.

Q	Working	Answer	Mark	Notes
	eg $\frac{2}{5}\times150(=60)$ **or** eg $0.32\times150\ (=48)$		5	M1 for finding the number of small mugs **or** number of medium mugs
	eg $150-$"60"$-$"48" $(=42)$			M1 for finding the number of large mugs
	eg "60" $\times$ 8.50 + "48" $\times$ 11.20 + "42" $\times$ 14.20 $(=1644)$ **or** $510 + 537.6 + 596.4$ $(=1644)$			M1 for working out the income, Profit = 504 implies M3
	eg $\frac{"1644"-1140}{1140}\times100$ **or** $\frac{"1644"}{1140}\times100-100$			M1 (indep) for a complete method to find the percentage profit for **their total income** (must be greater than 1140) An answer of 144 implies M4
		44		A1 44 or better (44.2105…)
				Total 5 marks

Q4.

Q	Working	Answer	Mark	Notes
	$\frac{16}{3}(-)\frac{20}{7}$ or $(5)\frac{7}{21}(-)(2)\frac{18}{21}$		3	M1 for correct improper fractions or fractional part of numbers written correctly over a common denominator (no need for minus sign)
	$\frac{112}{21}-\frac{60}{21}$ or $5\frac{7}{21}-2\frac{18}{21}=3-\frac{11}{21}$ oe or $5\frac{7}{21}-2\frac{18}{21}=4\frac{28}{21}-2\frac{18}{21}$			M1 for correct fractions with a common denominator with minus sign or mixed numbers to the stage shown
	$\frac{112}{21}-\frac{60}{21}=\frac{52}{21}=2\frac{10}{21}$ oe or $3-\frac{11}{21}=2\frac{10}{21}$ or $5\frac{7}{21}-2\frac{18}{21}=4\frac{28}{21}-2\frac{18}{21}=2\frac{10}{21}$	Shown		A1 Dep on M2 for a correct answer from fully correct working If all 3 fractions turned into improper fractions on the first line $\frac{16}{3}-\frac{20}{7}=\frac{52}{21}$ then the student **clearly** needs to show that the LHS $=\frac{52}{21}$
				Total 3 marks

Q5.

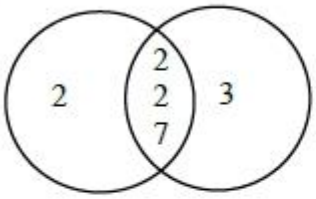
Q	Working	Answer	Mark	Notes
	$\frac{8}{3}(+)\frac{15}{4}$ **or** $(2)\frac{8}{12}(+)(3)\frac{9}{12}$ **or** $(2)\frac{8a}{12a}(+)(3)\frac{9a}{12a}$		3	M1 for correct improper fractions **or** fractional part of numbers written correctly over a common denominator
	eg $\frac{8\times4+15\times3}{3\times4}$ **or** $\frac{32}{12}+\frac{45}{12}$ **or** $\frac{32a}{12a}+\frac{45a}{12a}$ **or** $2\frac{8}{12}+3\frac{9}{12}=5\frac{17}{12}$ oe			M1 for correct fractions with a common denominator of 12 or a multiple of 12
	$\frac{32}{12}+\frac{45}{12}=\frac{77}{12}=6\frac{5}{12}$ **or** $5\frac{17}{12}=6\frac{5}{12}$ **or if shows** $6\frac{5}{12}=\frac{77}{12}$ at the beginning then show that the addition comes to $\frac{77}{12}$	Shown		A1 dep on M2 for a correct answer from fully correct working **or** shows that RHS = $\frac{77}{12}$ **and** fully correct working shows LHS = $\frac{77}{12}$
				Total 3 marks

Q6.

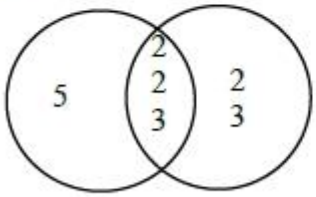
Q	Working	Answer	Mark	Notes
	$300 \div (7 + 5 + 3)\ (= 20)$ **clear correct use** of $7 + 5 + 3\ (= 15)$ eg division at the end by 15 $\left(\frac{"2.8"+"1.8"}{15}\right)$ or correct use of 15 in a fraction eg $\frac{2}{5}\times\frac{7}{15}$		5	M1 (no mark for "15" unless it is used correctly) use of 7×20 or 140 or 5×20 or 100 in further work assumes this mark
	$\frac{2}{5}\times(7\times"20")\ (=56)$ oe eg $0.4 \times "140"\ (= 56)$ or $\frac{2}{5}\times 7\left(=\frac{14}{5}=2.8\right)$ eg $\frac{2}{5}\times\frac{7}{15}\left(=\frac{14}{75}=0.186...\right)$			M1 finding $\frac{2}{5}$ of the number of birthday cards or $\frac{2}{5}$ of the share of 7 or $\frac{2}{5}$ of fraction of amount
	$0.36 \times (5 \times "20")(=36)$[from working] or $0.36 \times 5\ (= 1.8)$ eg $\frac{36}{100}\times\frac{5}{15}\left(=\frac{180}{1500}=0.12\right)$ oe			M1 finding 36% of anniversary cards Or 36% of the share of 5 or 36% of fraction of amount
	$\frac{"56"+"36"}{300}\ \left(=\frac{92}{300}\right)$ or eg $\left(\frac{"2.8"+"1.8"}{15}\right)$ or $\frac{\frac{14}{5}+\frac{9}{5}}{15}$ $"\frac{14}{75}"+"\frac{180}{1500}"$			M1 for any fraction from correct working that isn't simplified or 30.66..% or 0.3066...
		$\frac{23}{75}$		A1
				Total 5 marks

Q7.

<table>
<tr><th>Q</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>(a)</td><td>1, 2, 4, 7, 8, 14, 28, 56 and
1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84

or
2 2 2 7 and 2 2 3 7
or
 

<table>
<tr><td colspan="3">e.g.</td></tr>
<tr><td>28</td><td>56</td><td>84</td></tr>
<tr><td></td><td>2</td><td>3</td></tr>
</table></td><td></td><td>2</td><td>M1 for any correct valid method and no errors e.g.

for starting to list at least four different factors of each number and no errors or
2 2 2 7 and 2 2 3 7 seen
(may be in a factor tree or a ladder diagram and ignore 1)
or a fully correct Venn diagram
or other clear method, e.g, table</td></tr>
<tr><td></td><td></td><td>28</td><td></td><td>A1 dep M1 accept $2^2 \times 7$ oe</td></tr>
<tr><td>(b)</td><td>60, 120, 180, 240… and 72, 144, 216, 288…
or
2 2 3 5 and 2 2 2 3 3
or
 

<table>
<tr><td>2</td><td>60</td><td>72</td></tr>
<tr><td>2</td><td>30</td><td>36</td></tr>
<tr><td>3</td><td>15</td><td>18</td></tr>
<tr><td>2</td><td>5</td><td>6</td></tr>
<tr><td></td><td></td><td>3</td></tr>
</table>
or $\frac{60\times72}{12}$ or 2, 2, 2, 3, 3, 5 oe</td><td></td><td>2</td><td>M1 for any correct valid method and no errors e.g.

for starting to list at least four multiples of each number
or
2 2 3 5 and 2 2 2 3 3 seen
(may be in a factor tree or a ladder diagram and ignore 1)
or a fully correct Venn diagram
or other clear method, e.g, table</td></tr>
<tr><td></td><td></td><td>360</td><td></td><td>A1 dep M1 accept $2^3 \times 3^2 \times 5$ oe</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Total 4 marks</td></tr>
</table>

Q8.

<table>
<tr><th>Q</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td></td><td>$2^2 \times 7$ or $2 \times 3 \times 7$ or $3^2 \times 7$
oe condone 1's in factor tree

or showing at least 5 correct multiples across at least 2 lists (excluding 28, 42, 63)
(28) 56, 84, 112, 140, 168, 196, 224, 252
(42) 84, 126, 168, 210, 252
(63) 126, 189, 252</td><td></td><td>3</td><td>M1 accept prime factors seen in factor tree or correct position in Venn diagram for at least one of the numbers given.</td></tr>
<tr><td></td><td>$2^2 \times 7$ and $2 \times 3 \times 7$ and $3^2 \times 7$
or showing at least 9 correct multiples across all 3 lists (excluding 28, 42, 63)</td><td></td><td></td><td>M1 accept prime factors seen in factor tree or correct position in Venn diagram for all 3 of the numbers given.</td></tr>
<tr><td></td><td></td><td>252</td><td></td><td>A1 or $2^2 \times 3^2 \times 7$ Dep on M1</td></tr>
<tr><td>alt</td><td>
<table>
<tr><td>7</td><td>28</td><td>42</td><td>63</td></tr>
<tr><td>2</td><td>4</td><td>6</td><td>9</td></tr>
<tr><td>3</td><td>2</td><td>3</td><td>9</td></tr>
<tr><td></td><td>2</td><td>1</td><td>3</td></tr>
</table>
<table>
<tr><td>7</td><td>28</td><td>42</td><td>63</td></tr>
<tr><td>2</td><td>4</td><td>6</td><td>9</td></tr>
<tr><td>3</td><td>2</td><td>3</td><td>9</td></tr>
<tr><td>2</td><td>2</td><td>1</td><td>3</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>3</td></tr>
<tr><td>(1)</td><td>1</td><td>1</td><td>1</td></tr>
</table>
</td><td></td><td>3</td><td>M1 For one correct row in table
eg division by 7 gives 4, 6, 9
M1

Fully correct table – need only go as far as top table – we want to see prime factors along the side or prime factors along the sides and bottom (condone 1's)</td></tr>
<tr><td></td><td></td><td>252</td><td></td><td>A1 or $2^2 \times 3^2 \times 7$ Dep on M1</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Total 3 marks</td></tr>
</table>

Q9.

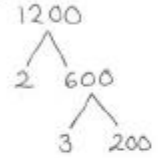
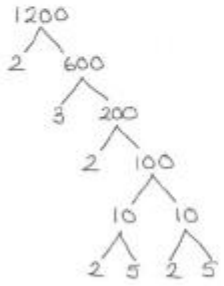
Q	Working	Answer	Mark	Notes
	$\frac{3}{8}+45\%\left(=\frac{33}{40}\text{ or }82.5(\%)\text{or }0.825\right)$		5	M1 Do **NOT** award M1 for e.g. $\frac{3}{8}+45(\%)+406(=....)$ oe
	$1-\frac{"33"}{40}\left(=\frac{7}{40}\right)$ **or** $100-"82.5"(\%)(=17.5(\%))$ **or** $1-"0.825"(=0.175)$			M1
	$406\div\frac{"7"}{40}(=2320)$ **or** $406\div\frac{"17.5"}{100}$ oe $(=2320)$ **or** $1\%=406\div$ "17.5" $(=23.2)$ oe			M1
	$0.45\times$ "2320" oe **or** $45\times$ "23.2" oe			M1
		1044		A1
				Total 5 marks

ALT	$\frac{3}{8}x+0.45x+406$ oe		5	M1 Do **NOT** award M1 for e.g. $\frac{3}{8}+45(\%)+406(=....)$ oe
	$\frac{3}{8}x+0.45x+406=x$ oe			M1 for a correct equation
	$(x=)\frac{406}{1-\frac{3}{8}-0.45}\left(=\frac{406}{7/40}=2320\right)$			M1
	$0.45\times$ "2320"			M1
		1044		A1
				Total 5 marks

Q10.

Q	Working	Answer	Mark	Notes
(a)	(231 776 – 228 314) ÷ 228 314 **or** 3462 ÷ 228 314 (= 0.01516…) **or** 231 776 ÷ 228 314 (= 1.01516…)		2	M1
		1.5		A1 for 1.5 or better (1.516…) (be careful: 3462 ÷ 231 776 × 100 = 1.49….)
(b)	231 776 ÷ 1.077 oe		3	M2 If not M2 then M1 for 1.077 or 107.7 or 1 + 0.077(=1.077) seen but not 1 + 7.7%
		215 000		A1 for 215 000 or better (215 205.19…) (if no marks awarded SCB1 for 212000 or better (211990.71…))
				Total 5 marks

Q11.

Q	Working	Answer	Mark	Notes
	eg $2 \times 2 \times 300$ $2 \times 5 \times 120$ $2 \times 3 \times 200$ $3 \times 5 \times 80$ or eg  or 2 | 1200 3 | 600 | 200		3	M1 for at least 2 correct stages in prime factorisation which give 2 prime factors – may be in a factor tree or a table or listed eg 2, 2, 300 (allow no more than one mistake ft (eg *one mistake* with 2 prime factors ft $1200 = 20 \times 600 = 2 \times 10 \times 3 \times 200$))
	2, 2, 2, 2, 3, 5, 5 or  oe 2 | 1200 3 | 600 2 | 200 5 | 100 2 | 20 5 | 10 2 | 2 | (1)			M1 for finding the correct prime factors condone inclusion of 1 (may be seen in a fully correct factor tree or ladder)
		$2^4 \times 3 \times 5^2$		A1 (dep on M2 as working requested) Can be in any order (allow $2^4 . 3 . 5^2$) but must be in index form as asked for.
				Total 3 marks

Q12.

Q	Working	Answer	Mark	Notes
	$196 \div (9 - 5)$ (= 49) oe		3	M1
	$3 \times$ "49"			M1
		147		A1 SCB1 for an answer from 34.5 – 34.6 or an answer of 42
				Total 3 marks

Q13.

Q	Working	Answer	Mark	Notes	
	eg 0.45×180 (= 81) oe **OR** $\frac{15}{180}\left(=\frac{1}{12}\text{ or }0.0833...\right)$ **OR** $\frac{15}{180}\times 100 (= 8.3(33...)\%)$		4	M1	for a method to find the number of students studying German **OR** the number of students studying French as a fraction or decimal of the total students **OR** a method to find the percentage of students studying French 81 may be seen as part of an equation
	eg 180 – 15 – "81" (= 84) **or** "81" + 15 (= 96) **OR** $1-\left(\frac{1}{12}+\frac{45}{100}\right)=\left(\frac{7}{15}\text{ or }0.466...\right)$ **or** $\frac{1}{12}+\frac{45}{100}=\left(\frac{8}{15}\text{ or }0.533...\right)$ **OR** 100 – ("8.3" + 45) (= 46.6(66…) or 46.7%) **or** "8.3" + 45 (= 53.3(33…) or 53.3%)			M1	for a method to find the number of students studying Italian/Spanish **or** French/German **OR** a method to find the fraction or decimal of students studying Italian/Spanish **or** French/German **OR** a method to find the percentage of students studying Italian/Spanish **or** French/German 84 or 96 may be seen as part of an equation
	eg $\frac{"84"}{180-"84"}(\times 100)\left(=\frac{7}{8}\text{ or }0.875\right)$ **or** $\frac{"84"}{"96"}(\times 100)\left(=\frac{7}{8}\text{ or }0.875\right)$ **or** $"\frac{7}{15}"\div"\frac{8}{15}"\left(=\frac{7}{8}\text{ or }0.875\right)$ **or** $\frac{"46.6"}{"53.3"}(\times 100)(=0.872...)$			M1	for a complete method to find the fraction or decimal or percentage of Italian/Spanish to French/German
		87.5		A1	accept 87.2 – 87.7
					Total 4 marks

Q14.

Q	Working	Answer	Mark	Notes
	$12.6 \times 10^{(-24+145)}$ or 12.6×10^{121} or 1.26×10^{n}		2	M1
		1.26×10^{122}		A1 allow 1.3×10^{122}
				Total 2 marks

Q15.

Q	Working	Answer	Mark	Notes
	216 or 2.16 or 10^{120} or 10^{122} or $6^3 \times 10^{40\times3}$		3	M1 or for digits 216
	216×10^{120} oe or or 2.16×10^{n} where $n \neq 122$			M1
		2.16×10^{122}		A1
				Total 3 marks

Q16.

Q	Working	Answer	Mark	Notes
(a)		8 800 000	1	B1
(b)		Barcelona	1	B1 accept 5.5×10^{6}
(c)	$3.7 \times 10^{7} - 7.7 \times 10^{6}$ **or** 29 300 000 oe or 37 000 000 – 7 700 000 or 29 000 000 oe or $0.29(3) \times 10^{8}$ or $29(.3) \times 10^{6}$		2	M1 allow $2.9(3) \times 10^{n}$ ($n \neq 7$)
		2.9×10^{7}		A1 accept -2.9×10^{7} accept 2.93×10^{7} or -2.93×10^{7}
				Total 4 marks

Q17.

Q	Working	Answer	Mark	Notes
(a)		8.9×10^{-5}	1	B1
(b)		83 400	1	B1
				Total 2 marks