

The Ultimate Question Pack • Higher

One question on every subtopic. GCSE Maths,
Higher tier, easiest first, answers at the back.

 One question on every subtopic

 Answers included

 400 questions • 1004 marks

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Topic checklist

Tick each question once you have tried it. Then colour R, A or G: red = got it wrong, amber = got there with help, green = got it right on your own. The same colours as our RAG Sheet.

NO.	TOPIC	✓	R	A	G	NO.	TOPIC	✓	R	A	G
1	BIDMAS with Numbers	☐	☐	☐	☐	32	Angles Round a Point	☐	☐	☐	☐
2	Ordering Decimals	☐	☐	☐	☐	33	Angles on a Straight Line	☐	☐	☐	☐
3	Ordering Negatives	☐	☐	☐	☐	34	Area of Rhombuses & Parallelograms	☐	☐	☐	☐
4	Ordering Whole Numbers	☐	☐	☐	☐	35	Area of Squares & Rectangles	☐	☐	☐	☐
5	Angle Notation	☐	☐	☐	☐	36	Area of Triangles	☐	☐	☐	☐
6	Faces, Edges & Vertices	☐	☐	☐	☐	37	Fundamentals of Congruence	☐	☐	☐	☐
7	Identifying 3D Shapes	☐	☐	☐	☐	38	Identifying Regular Polygons	☐	☐	☐	☐
8	Lines of Symmetry	☐	☐	☐	☐	39	Opposite Angles	☐	☐	☐	☐
9	The Four Quadrants	☐	☐	☐	☐	40	Perimeter of Rhombuses & Parallelo...	☐	☐	☐	☐
10	Types of Angles	☐	☐	☐	☐	41	Perimeter of Squares & Rectangles	☐	☐	☐	☐
11	Interpreting Pictographs	☐	☐	☐	☐	42	Rotational Symmetry	☐	☐	☐	☐
12	Adding & Subtracting Negatives	☐	☐	☐	☐	43	Triangle Angle & Side Facts	☐	☐	☐	☐
13	Adding Integers	☐	☐	☐	☐	44	Triangle Angle & Side Naming Conve...	☐	☐	☐	☐
14	Bus Stop Method for Division	☐	☐	☐	☐	45	Types of Quadrilaterals	☐	☐	☐	☐
15	Bus Stop Method with Large Numbers	☐	☐	☐	☐	46	Types of Triangles	☐	☐	☐	☐
16	Column Method for Multiplication	☐	☐	☐	☐	47	Volume of Cubes & Cuboids	☐	☐	☐	☐
17	Finding a Fraction of an Amount	☐	☐	☐	☐	48	Fundamentals of Probability	☐	☐	☐	☐
18	Grid Method for Multiplication	☐	☐	☐	☐	49	Constructing Pictographs	☐	☐	☐	☐
19	Integers & Non Integers	☐	☐	☐	☐	50	Discrete & Continuous Data	☐	☐	☐	☐
20	Lattice Method for Multiplication	☐	☐	☐	☐	51	Drawing Bar Charts	☐	☐	☐	☐
21	Multiplying & Dividing Negatives	☐	☐	☐	☐	52	Drawing Line Graphs	☐	☐	☐	☐
22	Rounding to Decimal Places	☐	☐	☐	☐	53	Drawing Stem & Leaf Diagrams	☐	☐	☐	☐
23	Rounding to Nearest Power of 10	☐	☐	☐	☐	54	Identifying Mistakes in Bar Charts	☐	☐	☐	☐
24	Simplifying Fractions	☐	☐	☐	☐	55	Identifying Mistakes in Line Graphs	☐	☐	☐	☐
25	Squaring & Square Rooting	☐	☐	☐	☐	56	Quantitative & Qualitative Data	☐	☐	☐	☐
26	Subtracting Integers	☐	☐	☐	☐	57	Finding Fractions of Shapes	☐	☐	☐	☐
27	Truncating Decimals	☐	☐	☐	☐	58	Drawing Inequalities on Number Lines	☐	☐	☐	☐
28	Writing Fractions as Mixed Numbers	☐	☐	☐	☐	59	Identifying Plans & Elevations	☐	☐	☐	☐
29	Collecting Like Terms	☐	☐	☐	☐	60	Identifying Biased Samples	☐	☐	☐	☐
30	Function Machines	☐	☐	☐	☐	61	Mode from a List	☐	☐	☐	☐
31	Understanding Key Vocabulary	☐	☐	☐	☐	62	Scatter Graph Fundamentals	☐	☐	☐	☐

Topic checklist (continued)

NO.	TOPIC	✓	R	A	G	NO.	TOPIC	✓	R	A	G
63	Adding Decimals	☐	☐	☐	☐	94	Area of a Circle	☐	☐	☐	☐
64	Converting Decimals & Percentages	☐	☐	☐	☐	95	Area of a Circle	☐	☐	☐	☐
65	Converting Improper Fractions to De...	☐	☐	☐	☐	96	Area of a Semi Circle	☐	☐	☐	☐
66	Dividing Decimals	☐	☐	☐	☐	97	Circumference of a Circle	☐	☐	☐	☐
67	Dividing Fractions	☐	☐	☐	☐	98	Co-Interior Angles	☐	☐	☐	☐
68	Expressing as a Fraction	☐	☐	☐	☐	99	Corresponding Angles	☐	☐	☐	☐
69	Finding the Highest Common Factor	☐	☐	☐	☐	100	External Angles in a Regular Polygon	☐	☐	☐	☐
70	Finding the Lowest Common Multiple	☐	☐	☐	☐	101	Internal Angles in a Regular Polygon	☐	☐	☐	☐
71	Multiples & Factors	☐	☐	☐	☐	102	Key Circle Terms	☐	☐	☐	☐
72	Multiplying Decimals	☐	☐	☐	☐	103	Measuring Bearings	☐	☐	☐	☐
73	Multiplying Fractions	☐	☐	☐	☐	104	Perimeter of a Circle	☐	☐	☐	☐
74	One number as a Percentage of Ano...	☐	☐	☐	☐	105	Perimeter of a Semi Circle	☐	☐	☐	☐
75	Percentage Change	☐	☐	☐	☐	106	Reflections	☐	☐	☐	☐
76	Percentage of an Amount	☐	☐	☐	☐	107	Rotations	☐	☐	☐	☐
77	Powers Greater than Two	☐	☐	☐	☐	108	Scale Drawings	☐	☐	☐	☐
78	Rounding to Significant Figures	☐	☐	☐	☐	109	Sketching Projections	☐	☐	☐	☐
79	Square, Cube & Prime Numbers	☐	☐	☐	☐	110	Surface Area of Cubes & Cuboids	☐	☐	☐	☐
80	Subtracting Decimals	☐	☐	☐	☐	111	Translations	☐	☐	☐	☐
81	Writing Decimals & Percentages as F...	☐	☐	☐	☐	112	Calculating Price Changes	☐	☐	☐	☐
82	Writing Fractions as Decimals & Perc...	☐	☐	☐	☐	113	Density, Mass & Volume Calculations	☐	☐	☐	☐
83	Expanding Single Brackets	☐	☐	☐	☐	114	Scaling Up Ratios	☐	☐	☐	☐
84	Fundamentals of Inequalities	☐	☐	☐	☐	115	Simple Interest	☐	☐	☐	☐
85	Fundamentals of Rearranging Equati...	☐	☐	☐	☐	116	Simplifying Ratios	☐	☐	☐	☐
86	Fundamentals of Solving Equations	☐	☐	☐	☐	117	Speed, Distance & Time Calculations	☐	☐	☐	☐
87	Multiplying Algebraic Terms	☐	☐	☐	☐	118	Standard Unit Conversions	☐	☐	☐	☐
88	Substituting Into Real-Life Formulae	☐	☐	☐	☐	119	Writing Ratios as Fractions	☐	☐	☐	☐
89	Substitution	☐	☐	☐	☐	120	Constructing Two Way Tables	☐	☐	☐	☐
90	Alternate Angles	☐	☐	☐	☐	121	Fair Objects	☐	☐	☐	☐
91	Angles in Quadrilaterals	☐	☐	☐	☐	122	Fundamentals of Two Way Tables	☐	☐	☐	☐
92	Angles in Triangles	☐	☐	☐	☐	123	Median from a List	☐	☐	☐	☐
93	Area of Trapeziums	☐	☐	☐	☐	124	Range from a List	☐	☐	☐	☐

Topic checklist (continued)

NO.	TOPIC	✓	R	A	G	NO.	TOPIC	✓	R	A	G
125	Simple Random Sampling	☐	☐	☐	☐	156	Direct Proportion Problems	☐	☐	☐	☐
126	Conversion Graphs	☐	☐	☐	☐	157	Inverse Proportion Problems	☐	☐	☐	☐
127	Sketching Straight Lines Using Tables	☐	☐	☐	☐	158	Like for Like Comparisons	☐	☐	☐	☐
128	Vertical & Horizontal Lines	☐	☐	☐	☐	159	Pressure, Force & Area Calculations	☐	☐	☐	☐
129	Mean, Mode, Median & Range from ...	☐	☐	☐	☐	160	Proportional Division	☐	☐	☐	☐
130	Mean from a List	☐	☐	☐	☐	161	Using Ratio Differences	☐	☐	☐	☐
131	Adding & Subtracting Mixed Numbers	☐	☐	☐	☐	162	Volume Conversions	☐	☐	☐	☐
132	Adding Fractions	☐	☐	☐	☐	163	Best Relative Frequency Estimates	☐	☐	☐	☐
133	BIDMAS with Algebra	☐	☐	☐	☐	164	Calculating Probabilities	☐	☐	☐	☐
134	Dividing Mixed Numbers	☐	☐	☐	☐	165	Calculating Relative Frequency	☐	☐	☐	☐
135	Multiplying Mixed Numbers	☐	☐	☐	☐	166	Expected Frequency	☐	☐	☐	☐
136	Ordering Fractions	☐	☐	☐	☐	167	Expressing Probabilities in Different ...	☐	☐	☐	☐
137	Ordering Fractions	☐	☐	☐	☐	168	Finding Probabilities with Frequency ...	☐	☐	☐	☐
138	Percentages Greater than 100	☐	☐	☐	☐	169	Fundamentals of Frequency Trees	☐	☐	☐	☐
139	Powers of Zero & One	☐	☐	☐	☐	170	Sample Space Diagrams	☐	☐	☐	☐
140	Simplifying Powers	☐	☐	☐	☐	171	Identifying Mistakes with Frequency ...	☐	☐	☐	☐
141	Subtracting Fractions	☐	☐	☐	☐	172	Interpreting Ungrouped Frequency T...	☐	☐	☐	☐
142	Expanding Double Brackets	☐	☐	☐	☐	173	Relative Frequency Graphs	☐	☐	☐	☐
143	Nth Term of Linear Sequences	☐	☐	☐	☐	174	Sketching Frequency Polygons	☐	☐	☐	☐
144	Position to Term Rule Using Patterns	☐	☐	☐	☐	175	Working with Tally Charts	☐	☐	☐	☐
145	Drawing Angles Bisectors	☐	☐	☐	☐	176	Calculating the Gradient of a Line	☐	☐	☐	☐
146	Drawing Perpendicular Bisectors	☐	☐	☐	☐	177	Identifying if a Point is on a Line	☐	☐	☐	☐
147	Drawing a 60 Degree Angle	☐	☐	☐	☐	178	Identifying the x & y Intercepts of a S...	☐	☐	☐	☐
148	Drawing a 90 Degree Angle	☐	☐	☐	☐	179	Midpoint of Two Points	☐	☐	☐	☐
149	Drawing a Locus of All Points	☐	☐	☐	☐	180	Rearranging to the Form $y=mx+c$	☐	☐	☐	☐
150	Drawing a Perpendicular Line from a...	☐	☐	☐	☐	181	Common Denominators	☐	☐	☐	☐
151	Enlargements with Positive Integer S...	☐	☐	☐	☐	182	Estimating Calculations	☐	☐	☐	☐
152	Perimeter of Trapeziums	☐	☐	☐	☐	183	Prime Factors & Factorisations	☐	☐	☐	☐
153	Perimeter of Triangles	☐	☐	☐	☐	184	Standard Form Conversions	☐	☐	☐	☐
154	Using Pythagoras to Find a Hypoten...	☐	☐	☐	☐	185	Factorising Single Brackets	☐	☐	☐	☐
155	Area Conversions	☐	☐	☐	☐	186	Types of Sequences	☐	☐	☐	☐

Topic checklist (continued)

NO.	TOPIC	✓	R	A	G	NO.	TOPIC	✓	R	A	G
187	Using Pythagoras to Find a Non-Hyp...	☐	☐	☐	☐	218	Finding Angles of Elevation & Depres...	☐	☐	☐	☐
188	Volume of Prisms	☐	☐	☐	☐	219	Finding Angles using SOH, CAH, TOA	☐	☐	☐	☐
189	Time Conversions	☐	☐	☐	☐	220	Finding Side Lengths of Compound ...	☐	☐	☐	☐
190	Constructing Frequency Trees	☐	☐	☐	☐	221	Finding the Height of an Equilateral T...	☐	☐	☐	☐
191	Fundamentals of Tree Diagrams	☐	☐	☐	☐	222	Fundamentals of SOH, CAH, TOA	☐	☐	☐	☐
192	Identifying Bias	☐	☐	☐	☐	223	Fundamentals of Vector Problems	☐	☐	☐	☐
193	Danger of Extrapolation	☐	☐	☐	☐	224	Hand Method for Exact Trig Values	☐	☐	☐	☐
194	Lines of Best Fit & Predicting Values	☐	☐	☐	☐	225	Identifying Congruent Triangles	☐	☐	☐	☐
195	Mean, Mode, Median & Range from ...	☐	☐	☐	☐	226	Invariant Points	☐	☐	☐	☐
196	Sketching Straight Lines Using $y=mx...$	☐	☐	☐	☐	227	Length of a Circle Arc	☐	☐	☐	☐
197	Constructing Tree Diagrams	☐	☐	☐	☐	228	Similar Side Lengths	☐	☐	☐	☐
198	Column Vectors & Vector Arithmetic	☐	☐	☐	☐	229	Surface Area of Prisms	☐	☐	☐	☐
199	General Shape of a Quadratic	☐	☐	☐	☐	230	Surface Area of Pyramids	☐	☐	☐	☐
200	Matching Shapes to Graphs	☐	☐	☐	☐	231	Surface Area of Spheres	☐	☐	☐	☐
201	Bounds & Error Intervals for Truncat...	☐	☐	☐	☐	232	Volume of Cylinders	☐	☐	☐	☐
202	Bounds Requiring Integer Values	☐	☐	☐	☐	233	Applied Best Buys	☐	☐	☐	☐
203	Finding Bounds & Error Intervals	☐	☐	☐	☐	234	Compound Interest	☐	☐	☐	☐
204	Multiplying & Dividing in Standard Fo...	☐	☐	☐	☐	235	Converting Compound Measures	☐	☐	☐	☐
205	Negative Powers	☐	☐	☐	☐	236	Currency Conversions	☐	☐	☐	☐
206	Rational & Irrational Numbers	☐	☐	☐	☐	237	Percentage Multipliers	☐	☐	☐	☐
207	Deciding if a Term is in a Sequence	☐	☐	☐	☐	238	And/Or Rules	☐	☐	☐	☐
208	Finding Terms in a Fibonacci Sequen...	☐	☐	☐	☐	239	Finding Probabilities with Tree Diag...	☐	☐	☐	☐
209	Proof by Counter Example	☐	☐	☐	☐	240	Finding Probabilities with Two Way T...	☐	☐	☐	☐
210	Proof with Multiples	☐	☐	☐	☐	241	Finding Probabilities with Venn Diag...	☐	☐	☐	☐
211	Solving Quadratics by Factorising w...	☐	☐	☐	☐	242	Fundamentals of Venn Diagrams	☐	☐	☐	☐
212	Solving Single Inequalities	☐	☐	☐	☐	243	Sets & Venn Diagrams	☐	☐	☐	☐
213	Applied Exact Trig Values Questions	☐	☐	☐	☐	244	Interpreting Grouped Frequency Tabl...	☐	☐	☐	☐
214	Area of Compound Shapes	☐	☐	☐	☐	245	Interpreting Pie Charts	☐	☐	☐	☐
215	Area of a Circle Sector	☐	☐	☐	☐	246	Reverse Mean from a List	☐	☐	☐	☐
216	Calculating Scale Factor	☐	☐	☐	☐	247	Calculating Average Speed Using Di...	☐	☐	☐	☐
217	Enlargements with Positive Fractiona...	☐	☐	☐	☐	248	Direct Proportion Graphs	☐	☐	☐	☐

Topic checklist (continued)

NO.	TOPIC	✓	R	A	G	NO.	TOPIC	✓	R	A	G
249	Distance Between Two Points	☐	☐	☐	☐	280	Volumes of Composite Shapes	☐	☐	☐	☐
250	Equations of a Straight Line Using T...	☐	☐	☐	☐	281	Compound Decay	☐	☐	☐	☐
251	Equations of a Straight Line with a P...	☐	☐	☐	☐	282	Expressing Ratios as Linear Equations	☐	☐	☐	☐
252	Finding Equations of Linear Real-Life...	☐	☐	☐	☐	283	Profit & Loss	☐	☐	☐	☐
253	Finding the Distance Between Two P...	☐	☐	☐	☐	284	Constructing Venn Diagrams	☐	☐	☐	☐
254	Gradient as a Rate of Change	☐	☐	☐	☐	285	Finding Probabilities of Sets	☐	☐	☐	☐
255	Inverse Proportion Graphs	☐	☐	☐	☐	286	Fundamentals of Set Notation	☐	☐	☐	☐
256	Key Regions on Distance-Time Graphs	☐	☐	☐	☐	287	Drawing Pie Charts	☐	☐	☐	☐
257	Plotting Quadratics	☐	☐	☐	☐	288	Plotting a Cubic	☐	☐	☐	☐
258	Properties of Parallel Lines	☐	☐	☐	☐	289	Sketching Reciprocal Graphs	☐	☐	☐	☐
259	Adding & Subtracting in Standard Fo...	☐	☐	☐	☐	290	Solving Linear Simultaneous Equatio...	☐	☐	☐	☐
260	Applied Estimating	☐	☐	☐	☐	291	Problem Solving with Bearings	☐	☐	☐	☐
261	Identifying Percentage Changes	☐	☐	☐	☐	292	Surface Area of Composite Shapes	☐	☐	☐	☐
262	Reverse Percentages	☐	☐	☐	☐	293	Mean, Mode & Median from a Group...	☐	☐	☐	☐
263	Venn Diagram Method	☐	☐	☐	☐	294	Comparing Data Using Box Plots	☐	☐	☐	☐
264	Applied Simultaneous Equations Pro...	☐	☐	☐	☐	295	Drawing Box Plots	☐	☐	☐	☐
265	Difference of Two Squares	☐	☐	☐	☐	296	Fractions with Negative Powers	☐	☐	☐	☐
266	Factorising Double Brackets	☐	☐	☐	☐	297	Fundamentals of Functions	☐	☐	☐	☐
267	Proving Equivalence	☐	☐	☐	☐	298	Simplifying Algebraic Fractions	☐	☐	☐	☐
268	Solving Compound Inequalities	☐	☐	☐	☐	299	Solving Harder Equations	☐	☐	☐	☐
269	Solving Linear Simultaneous Equations	☐	☐	☐	☐	300	Enlargements with Negative Integer ...	☐	☐	☐	☐
270	Solving Quadratics by Factorising (a...	☐	☐	☐	☐	301	Similar Areas	☐	☐	☐	☐
271	Bearings Problems Involving SOH, C...	☐	☐	☐	☐	302	Similar Volumes	☐	☐	☐	☐
272	Finding Side Lengths using SOH, CA...	☐	☐	☐	☐	303	Combining Ratios	☐	☐	☐	☐
273	Perimeter of Compound Shapes	☐	☐	☐	☐	304	Calculating Combinations	☐	☐	☐	☐
274	SOH, CAH, TOA with Exact Trig Values	☐	☐	☐	☐	305	Independence	☐	☐	☐	☐
275	Surface Area of Cones	☐	☐	☐	☐	306	Benefits of IQR & Range	☐	☐	☐	☐
276	Surface Area of Cylinders	☐	☐	☐	☐	307	Filling In Cumulative Frequency Tables	☐	☐	☐	☐
277	Volume of Cones	☐	☐	☐	☐	308	Plotting Cumulative Frequency Graphs	☐	☐	☐	☐
278	Volume of Pyramids	☐	☐	☐	☐	309	Calculating Acceleration using Spee...	☐	☐	☐	☐
279	Volume of Spheres	☐	☐	☐	☐	310	Key Regions on Speed-Time Graphs	☐	☐	☐	☐

Topic checklist (continued)

NO.	TOPIC	✓	R	A	G	NO.	TOPIC	✓	R	A	G
311	Estimating Roots	☐	☐	☐	☐	342	Combinations Problem Solving	☐	☐	☐	☐
312	Rearranging Harder Equations	☐	☐	☐	☐	343	Sets & Inequalities	☐	☐	☐	☐
313	Area of Triangles ($\frac{1}{2}ab\sin C$)	☐	☐	☐	☐	344	Cumulative Frequency Median & IQR	☐	☐	☐	☐
314	Capture-Recapture	☐	☐	☐	☐	345	Average Gradients of Lines	☐	☐	☐	☐
315	Shading Regions with Graphical Ineq...	☐	☐	☐	☐	346	Calculating Total Distance Travelled ...	☐	☐	☐	☐
316	Sketching Exponential Graphs	☐	☐	☐	☐	347	General Form of the Equation of a Ci...	☐	☐	☐	☐
317	Bounds & Error Intervals Involving C...	☐	☐	☐	☐	348	Identifying the Roots of a Quadratic f...	☐	☐	☐	☐
318	Fractional Powers	☐	☐	☐	☐	349	Instantaneous Gradients of Lines	☐	☐	☐	☐
319	Rationalising of the Form $\sqrt{A}$	☐	☐	☐	☐	350	Properties of Perpendicular Lines	☐	☐	☐	☐
320	Six Laws of Surds	☐	☐	☐	☐	351	Sketching Circles	☐	☐	☐	☐
321	Writing Fractions as Recurring Deci...	☐	☐	☐	☐	352	Sketching Linear Inequalities	☐	☐	☐	☐
322	Composite Functions	☐	☐	☐	☐	353	Solving Quadratic Simultaneous Equ...	☐	☐	☐	☐
323	Equating Coefficients	☐	☐	☐	☐	354	Turning Points of Quadratics	☐	☐	☐	☐
324	Iteration Equations	☐	☐	☐	☐	355	x Intercepts of Quadratics	☐	☐	☐	☐
325	Proof with Even Numbers	☐	☐	☐	☐	356	y Intercepts of Quadratics	☐	☐	☐	☐
326	Proof with Odd Numbers	☐	☐	☐	☐	357	Expanding Brackets with Surds	☐	☐	☐	☐
327	Proof with Square Numbers	☐	☐	☐	☐	358	Writing Recurring Decimals as Fracti...	☐	☐	☐	☐
328	Calculating Side Lengths using $\frac{1}{2}ab\sin C$	☐	☐	☐	☐	359	Expanding Triple Brackets	☐	☐	☐	☐
329	Combining the Cosine Rule with Oth...	☐	☐	☐	☐	360	Inverse Functions	☐	☐	☐	☐
330	Finding Angles Using the Sine Rule	☐	☐	☐	☐	361	Nth Term of Quadratic Sequences	☐	☐	☐	☐
331	Finding Angles using the Cosine Rule	☐	☐	☐	☐	362	Solving Quadratics by Factorising (a...	☐	☐	☐	☐
332	Finding Side Lengths using the Cosi...	☐	☐	☐	☐	363	Solving Quadratics with the Quadrati...	☐	☐	☐	☐
333	Finding Side Lengths using the Sine ...	☐	☐	☐	☐	364	Calculating Area Using $\frac{1}{2}ab\sin C$	☐	☐	☐	☐
334	Finding the Area of a Parallelogram	☐	☐	☐	☐	365	Surface Area of Frustums	☐	☐	☐	☐
335	Fundamentals of the Cosine Rule	☐	☐	☐	☐	366	Full Process for Sketching Quadratics	☐	☐	☐	☐
336	Fundamentals of the Sine Rule	☐	☐	☐	☐	367	Combining the Sine Rule with Other ...	☐	☐	☐	☐
337	Using the Area Rule with Isosceles T...	☐	☐	☐	☐	368	Conditional Probability with Two-Wa...	☐	☐	☐	☐
338	Volume of Frustums	☐	☐	☐	☐	369	Sketching Histograms	☐	☐	☐	☐
339	Algebraic Direct Proportion	☐	☐	☐	☐	370	Interpreting Histograms	☐	☐	☐	☐
340	Algebraic Inverse Proportion	☐	☐	☐	☐	371	Combining Upper & Lower Bounds	☐	☐	☐	☐
341	Finding the Initial Amount	☐	☐	☐	☐	372	Simplifying Surds	☐	☐	☐	☐

Topic checklist (continued)

NO.	TOPIC	✓	R	A	G
373	Algebraic Fractions Involving Factori...	☐	☐	☐	☐
374	Multiplying & Dividing Algebraic Frac...	☐	☐	☐	☐
375	Proof with Consecutive Numbers	☐	☐	☐	☐
376	3D Pythagoras	☐	☐	☐	☐
377	Circle Theorems	☐	☐	☐	☐
378	Combining Circle Theorems	☐	☐	☐	☐
379	Direct & Inverse Proportion with Fun...	☐	☐	☐	☐
380	Conditional Probability with Tree Dia...	☐	☐	☐	☐
381	Conditional Probability with Venn Dia...	☐	☐	☐	☐
382	Calculating Values of Trig Functions ...	☐	☐	☐	☐
383	Reflections in the x & y Axis	☐	☐	☐	☐
384	Sketching sin, cos & tan	☐	☐	☐	☐
385	Solving Trigonometric Equations Usi...	☐	☐	☐	☐
386	Transforming Trigonometric Graphs	☐	☐	☐	☐
NO.	TOPIC	✓	R	A	G
387	Translations in the x & y Axis	☐	☐	☐	☐
388	Change of Signs	☐	☐	☐	☐
389	Solving Quadratic Simultaneous Equ...	☐	☐	☐	☐
390	Solving Quadratics by Completing th...	☐	☐	☐	☐
391	3D Trigonometry	☐	☐	☐	☐
392	Median from a Histogram	☐	☐	☐	☐
393	Sketching Quadratic Inequalities	☐	☐	☐	☐
394	Rationalising of the Form $A + \sqrt{B}$	☐	☐	☐	☐
395	Solving Quadratic Inequalities	☐	☐	☐	☐
396	Solving Quadratics By Completing th...	☐	☐	☐	☐
397	Vector Ratio Problems	☐	☐	☐	☐
398	Estimating Areas Under Curves	☐	☐	☐	☐
399	Finding Equations of Tangents to Cir...	☐	☐	☐	☐
400	Vectors Along a Straight Line	☐	☐	☐	☐



For parents: how to use this pack

This pack has one exam-style question on every Higher GCSE Maths subtopic: 400 questions in all, from the easiest to the hardest. It shows quickly which topics your child can already do and which ones need work.

Over four weeks

- 1 Week 1:** questions 1 to 100. No time limit, notes closed. Mark them with the answers at the back.
- 2 Week 2:** questions 101 to 200, the same way.
- 3 Week 3:** questions 201 to 400. Some of these are hard. Getting half of them is good progress.
- 4 Week 4:** go back to every question coloured red or amber on the checklist and try it again.



After each session, colour the checklist red, amber or green. The reds are the list of topics to revise next, and that list is more useful than the score.

What the score means

Add up the marks and use the table at the back. It gives a rough idea of the grade your child is working at. It is an estimate from one pack, not an official grade boundary.

Every answer is checked

The answers at the back give the final answer and the key steps. Every numerical answer has been checked by computer.

Matt, founder of MyGCSEMaths



1

BIDMAS with Numbers

NUMBER



Non-calculator

Work out $24 \div (3 + 5)$

Answer
(2)

(Total for Question 1 is 2 marks)

2

Ordering Decimals

NUMBER



Non-calculator

Write these in order, smallest first: 0.67, 0.607, 0.7, 0.076

Answer
(2)

(Total for Question 2 is 2 marks)

3

Ordering Negatives

NUMBER



Non-calculator

Write these in order, smallest first: -4, 2, -9, 0, -1

Answer
(2)

(Total for Question 3 is 2 marks)



4

Ordering Whole Numbers

NUMBER



Non-calculator

Which is larger, 4,099 or 4,909?

Answer
(2)

(Total for Question 4 is 2 marks)

5

Angle Notation

GEOMETRY



Non-calculator

Name the angle formed at vertex E in triangle DEF using correct notation.

Answer
(2)

(Total for Question 5 is 2 marks)

6

Faces, Edges & Vertices

GEOMETRY



Non-calculator

Write down the number of faces, edges and vertices of a pentagonal prism.

Answer
(2)

(Total for Question 6 is 2 marks)



7 Identifying 3D Shapes

GEOMETRY



Non-calculator

Name a 3D shape that has 2 circular faces and 1 curved surface.

Answer
(2)

(Total for Question 7 is 2 marks)

8 Lines of Symmetry

GEOMETRY



Non-calculator

How many lines of symmetry does a regular hexagon have?

Answer
(2)

(Total for Question 8 is 2 marks)

9 The Four Quadrants

GRAPHS



Non-calculator

A point has coordinates $(-2, 0)$. What can you say about this point's location?

Answer
(2)

(Total for Question 9 is 2 marks)



10 Types of Angles **GEOMETRY** Non-calculator

Write down the type of each angle: (a) 35° (b) 135° (c) 270°

Answer
(3)

(Total for Question 10 is 3 marks)

11 Interpreting Pictographs **STATISTICS** Non-calculator

In a pictogram, one symbol stands for 4 people. On Monday there are $3\frac{1}{2}$ symbols. How many people is that?

Answer
(1)

(Total for Question 11 is 1 mark)

12 Adding & Subtracting Negatives **NUMBER** Non-calculator

Work out $8 - (-3)$

Answer
(2)

(Total for Question 12 is 2 marks)

13 Adding Integers **NUMBER** Non-calculatorWork out $4,506 + 2,397$ Answer
(2)**(Total for Question 13 is 2 marks)****14 Bus Stop Method for Division** **NUMBER** Non-calculatorWork out: $468 \div 9$ Answer
(2)**(Total for Question 14 is 2 marks)****15 Bus Stop Method with Large Numbers** **NUMBER** Non-calculatorWork out $4,725 \div 25$ Answer
(2)**(Total for Question 15 is 2 marks)**

16 Column Method for Multiplication

NUMBER



Non-calculator

Work out: $1,245 \times 13$ Answer
(2)

(Total for Question 16 is 2 marks)

17 Finding a Fraction of an Amount

NUMBER



Non-calculator

Find $\frac{3}{8}$ of 64 kg.Answer
(2)

(Total for Question 17 is 2 marks)

18 Grid Method for Multiplication

NUMBER



Non-calculator

Work out: 124×7 Answer
(2)

(Total for Question 18 is 2 marks)



19 Integers & Non Integers

NUMBER

 Non-calculatorWork out $7.2 + 3.8$

Is the answer an integer?

Answer
(2)

(Total for Question 19 is 2 marks)

20 Lattice Method for Multiplication

NUMBER

 Non-calculatorWork out: 123×45 Answer
(2)

(Total for Question 20 is 2 marks)

21 Multiplying & Dividing Negatives

NUMBER

 Non-calculatorWork out $-24 \div 8$ Answer
(2)

(Total for Question 21 is 2 marks)

22 Rounding to Decimal Places **NUMBER** Non-calculator

Round 0.0849 to 2 decimal places.

Answer
(2)

(Total for Question 22 is 2 marks)

23 Rounding to Nearest Power of 10 **NUMBER** Non-calculator

Round 17,560 to the nearest 1000.

Answer
(2)

(Total for Question 23 is 2 marks)

24 Simplifying Fractions **NUMBER** Non-calculator

Simplify $\frac{24}{36}$

Answer
(2)

(Total for Question 24 is 2 marks)

25 Squaring & Square Rooting

NUMBER



Non-calculator

Work out 12^2 Answer
(2)

(Total for Question 25 is 2 marks)

26 Subtracting Integers

NUMBER



Non-calculator

Work out $10,000 - 4,567$ Answer
(2)

(Total for Question 26 is 2 marks)

27 Truncating Decimals

NUMBER



Non-calculator

Truncate 0.999 to 1 decimal place.

Answer
(2)

(Total for Question 27 is 2 marks)



28 Writing Fractions as Mixed Numbers

NUMBER



Non-calculator

Write $\frac{17}{5}$ as a mixed number.

Answer
(2)

(Total for Question 28 is 2 marks)

29 Collecting Like Terms

ALGEBRA



Non-calculator

Simplify $6y - 3y^2 + 2y + y^2$

Answer
(2)

(Total for Question 29 is 2 marks)

30 Function Machines

ALGEBRA



Non-calculator

Input $\rightarrow \times 5 \rightarrow -2 \rightarrow$ Output The output is 18. Find the input.

Answer
(2)

(Total for Question 30 is 2 marks)

31 Understanding Key Vocabulary ALGEBRA Non-calculator

How many terms are in: (a) $5x - 3$ (b) $2xy$ (c) $a^2 + 3a - 7$

Answer
(2)

(Total for Question 31 is 2 marks)

32 Angles Round a Point GEOMETRY Non-calculator

Five angles around a point are 50° , 70° , 80° , 90° and y° . Calculate y .

Answer
(2)

(Total for Question 32 is 2 marks)

33 Angles on a Straight Line GEOMETRY Non-calculator

Three angles on a straight line measure 50° , 70° and x° . Find the value of x .

Answer
(2)

(Total for Question 33 is 2 marks)

34 Area of Rhombuses & Parallelograms**GEOMETRY**

Non-calculator

Work out the area of a parallelogram with base 12 cm and height 4.5 cm.

Answer
(2)

(Total for Question 34 is 2 marks)

35 Area of Squares & Rectangles**GEOMETRY**

Non-calculator

A rectangle has area 48 cm^2 and width 6 cm. Find its length.

Answer
(2)

(Total for Question 35 is 2 marks)

36 Area of Triangles**GEOMETRY**

Non-calculator

A triangle has area 24 cm^2 and base 12 cm. Find its height.

Answer
(2)

(Total for Question 36 is 2 marks)



37 Fundamentals of Congruence

GEOMETRY



Non-calculator

A square with side 3 cm and a rhombus with sides 3 cm are placed side by side. Are they congruent?

Answer
(2)

(Total for Question 37 is 2 marks)

38 Identifying Regular Polygons

GEOMETRY



Non-calculator

How can you tell if a polygon is regular?

Answer
(2)

(Total for Question 38 is 2 marks)

39 Opposite Angles

GEOMETRY



Non-calculator

Two lines cross. One angle is 130° . Work out the other three angles.

Answer
(2)

(Total for Question 39 is 2 marks)



40 Perimeter of Rhombuses & Parallelograms**GEOMETRY**

Non-calculator

A parallelogram has perimeter 36 cm. One side is 11 cm. Find the other side.

Answer
(2)

(Total for Question 40 is 2 marks)

41 Perimeter of Squares & Rectangles**GEOMETRY**

Non-calculator

A rectangle has perimeter 30 cm and width 5 cm. Find its length.

Answer
(2)

(Total for Question 41 is 2 marks)

42 Rotational Symmetry**GEOMETRY**

Non-calculator

A rectangle (not a square) has what order of rotational symmetry?

Answer
(2)

(Total for Question 42 is 2 marks)



43 Triangle Angle & Side Facts **GEOMETRY** Non-calculator

In triangle ABC, angle A = 45° and angle B = 65° . Calculate angle C.

Answer
(2)

(Total for Question 43 is 2 marks)

44 Triangle Angle & Side Naming Conventions **GEOMETRY** Non-calculator

In triangle XYZ, identify which side is XY.

Answer
(2)

(Total for Question 44 is 2 marks)

45 Types of Quadrilaterals **GEOMETRY** Non-calculator

What is the difference between a kite and a trapezium?

Answer
(2)

(Total for Question 45 is 2 marks)

46 Types of Triangles **GEOMETRY** Non-calculator

An isosceles triangle has one angle of 40° . This is the angle between its two equal sides. Work out the size of each of the other two angles.

Answer
(2)

(Total for Question 46 is 2 marks)

47 Volume of Cubes & Cuboids **GEOMETRY** Non-calculator

A cube has a volume of 343 cm^3 . Find the length of one side.

Answer
(2)

(Total for Question 47 is 2 marks)

48 Fundamentals of Probability **PROBABILITY** Non-calculator

A bag holds 3 red, 5 blue and 2 green counters. One counter is taken at random. Work out the probability it is not blue.

Answer
(2)

(Total for Question 48 is 2 marks)

49 Constructing Pictographs STATISTICS Non-calculator

In a pictogram, one symbol stands for 7 students. 35 students chose football and 21 chose hockey. How many symbols are needed for (a) football (b) hockey?

Answer
(2)

(Total for Question 49 is 2 marks)

50 Discrete & Continuous Data STATISTICS Non-calculator

A teacher records the number of students absent each day for 30 days. State whether this data is discrete or continuous.

Answer
(2)

(Total for Question 50 is 2 marks)

51 Drawing Bar Charts STATISTICS Non-calculator

A survey of pets: cat 14, dog 20, fish 6, rabbit 10. These are shown on a bar chart. (a) How many pets are there altogether? (b) How many more dogs than fish are there?

Answer
(2)

(Total for Question 51 is 2 marks)

52 Drawing Line Graphs STATISTICS Non-calculator

A shop's sales were Q1 £2000, Q2 £2500, Q3 £3200 and Q4 £2800. Between which two quarters did sales rise the most, and by how much?

Answer
(2)

(Total for Question 52 is 2 marks)

53 Drawing Stem & Leaf Diagrams STATISTICS Non-calculator

These values are put in a stem and leaf diagram with stems 10, 11, 12 and 13: 103, 105, 108, 112, 115, 118, 121, 125, 128, 135. Write down the leaves for each stem.

Answer
(2)

(Total for Question 53 is 2 marks)

54 Identifying Mistakes in Bar Charts STATISTICS Non-calculator

A shop recorded daily ice cream sales: Mon 25, Tue 30, Wed 20, Thu 35, Fri 40. The bar chart has no label on the y-axis and no title. Identify the problems.

Answer
(2)

(Total for Question 54 is 2 marks)

55 Identifying Mistakes in Line Graphs **STATISTICS** Non-calculator

Line graph shows data from 2020-2024. However, years are labeled as 2020, 2021, 2023, 2024 (2022 missing). What is the error?

Answer
(2)

(Total for Question 55 is 2 marks)

56 Quantitative & Qualitative Data **STATISTICS** Non-calculator

A database has these columns: Name, Age, Weight, Postcode. Which columns contain quantitative data?

Answer
(2)

(Total for Question 56 is 2 marks)

57 Finding Fractions of Shapes **NUMBER** Non-calculator

A circle is divided into 8 equal sectors. $\frac{3}{4}$ of the circle is shaded. How many sectors are shaded?

Answer
(1)

(Total for Question 57 is 1 mark)

58 Drawing Inequalities on Number Lines **ALGEBRA** Non-calculator

List the integers from -5 to 3 that satisfy $x \leq -2$.

Answer
(1)

(Total for Question 58 is 1 mark)

59 Identifying Plans & Elevations **GEOMETRY** Non-calculator

A cuboid is 6 cm long, 4 cm wide and 3 cm tall. Describe the plan view of the cuboid.

Answer
(1)

(Total for Question 59 is 1 mark)

60 Identifying Biased Samples **STATISTICS** Non-calculator

Ella wants to know how often adults in her town exercise. She asks 20 people at a gym. Give one reason why her sample is biased.

Answer
(1)

(Total for Question 60 is 1 mark)

61 Mode from a List **STATISTICS** Non-calculator

Find the mode of $4, 7, 2, 7, 9, 4, 7$.

Answer
(1)

(Total for Question 61 is 1 mark)

62 Scatter Graph Fundamentals STATISTICS Non-calculator

Plants given more water grew taller: (50 ml, 12 cm), (100 ml, 24 cm), (150 ml, 35 cm). What type of correlation does this show?

Answer
(1)

(Total for Question 62 is 1 mark)

63 Adding Decimals NUMBER Non-calculator

Work out $0.456 + 1.38$

Answer
(2)

(Total for Question 63 is 2 marks)

64 Converting Decimals & Percentages NUMBER Non-calculator

Convert 0.075 to a percentage.

Answer
(2)

(Total for Question 64 is 2 marks)



65 Converting Improper Fractions to Decimals

NUMBER



Non-calculator

Convert $\frac{9}{5}$ to a decimal.

Answer
(2)

(Total for Question 65 is 2 marks)

66 Dividing Decimals

NUMBER



Non-calculator

Work out $7.2 \div 0.04$

Answer
(2)

(Total for Question 66 is 2 marks)

67 Dividing Fractions

NUMBER



Non-calculator

Work out

$$\frac{5}{8} \div \frac{3}{4}$$

Answer
(2)

(Total for Question 67 is 2 marks)

68 Expressing as a Fraction

NUMBER



Non-calculator

A shape is split into 6 equal parts. 4 of the parts are shaded. What fraction of the shape is unshaded? Give your answer in its simplest form.

Answer
(2)

(Total for Question 68 is 2 marks)

69 Finding the Highest Common Factor

NUMBER



Non-calculator

Work out the highest common factor of 48 and 80.

Answer
(2)

(Total for Question 69 is 2 marks)

70 Finding the Lowest Common Multiple

NUMBER



Non-calculator

Find the lowest common multiple of 5, 6 and 10.

Answer
(2)

(Total for Question 70 is 2 marks)



71 Multiples & Factors

NUMBER



Non-calculator

Find a number that is both a multiple of 4 and a factor of 48.

Answer
(2)

(Total for Question 71 is 2 marks)

72 Multiplying Decimals

NUMBER



Non-calculator

Work out 2.4×1.3

Answer
(2)

(Total for Question 72 is 2 marks)

73 Multiplying Fractions

NUMBER



Non-calculator

Work out

$$\frac{5}{6} \times \frac{3}{10}$$

Answer
(2)

(Total for Question 73 is 2 marks)

74 One number as a Percentage of Another

NUMBER



Non-calculator

Write 18 as a percentage of 75.

Answer
(2)

(Total for Question 74 is 2 marks)

75 Percentage Change

NUMBER



Non-calculator

A jacket costs £60. It is reduced by 15%. Find the sale price.

Answer
(2)

(Total for Question 75 is 2 marks)

76 Percentage of an Amount

NUMBER



Non-calculator

Find 40% of 65 kg.

Answer
(2)

(Total for Question 76 is 2 marks)

77 Powers Greater than Two

NUMBER

 Non-calculatorWork out 4^3 Answer
(2)

(Total for Question 77 is 2 marks)

78 Rounding to Significant Figures

NUMBER

 Non-calculator

Round 27,849 to 3 significant figures.

Answer
(2)

(Total for Question 78 is 2 marks)

79 Square, Cube & Prime Numbers

NUMBER

 Non-calculatorWork out $5^2 + 3^3$ Answer
(2)

(Total for Question 79 is 2 marks)

80 Subtracting Decimals

NUMBER



Non-calculator

Work out $7.03 - 4.58$ Answer
(2)

(Total for Question 80 is 2 marks)

81 Writing Decimals & Percentages as Fractions

NUMBER



Non-calculator

Write 0.125 as a fraction.

Answer
(2)

(Total for Question 81 is 2 marks)

82 Writing Fractions as Decimals & Percentages

NUMBER



Non-calculator

Write $\frac{4}{5}$ as a decimal and a percentage.Answer
(2)

(Total for Question 82 is 2 marks)



83 Expanding Single Brackets ALGEBRA Non-calculatorExpand and simplify $2(x + 5) + 3(x - 1)$ Answer
(2)

(Total for Question 83 is 2 marks)

84 Fundamentals of Inequalities ALGEBRA Non-calculatorSolve $2x - 3 > 6$ Answer
(2)

(Total for Question 84 is 2 marks)

85 Fundamentals of Rearranging Equations ALGEBRA Non-calculatorMake t the subject of $v = u + at$ Answer
(2)

(Total for Question 85 is 2 marks)



86 Fundamentals of Solving Equations **ALGEBRA** Non-calculatorSolve $2(x + 3) = 14$ Answer
(2)**(Total for Question 86 is 2 marks)****87** Multiplying Algebraic Terms **ALGEBRA** Non-calculatorSimplify $4a^2b \times 3ab^3$ Answer
(2)**(Total for Question 87 is 2 marks)****88** Substituting Into Real-Life Formulae **ALGEBRA** Non-calculatorThe formula for the area of a trapezium is $A = \frac{1}{2}(a + b)h$. Find A when $a = 5$, $b = 8$, $h = 4$.Answer
(2)**(Total for Question 88 is 2 marks)**

89 Substitution **ALGEBRA** Non-calculator

If $p = -2$ and $q = 5$, find the value of $3p^2 - 2q$

Answer
(2)

(Total for Question 89 is 2 marks)

90 Alternate Angles **GEOMETRY** Non-calculator

Two parallel lines are cut by a transversal. Two alternate angles are $3x^\circ$ and $(120 - x)^\circ$.
Work out the value of x .

Answer
(2)

(Total for Question 90 is 2 marks)

91 Angles in Quadrilaterals **GEOMETRY** Non-calculator

A rectangle has four angles. What is the size of each angle?

Answer
(2)

(Total for Question 91 is 2 marks)

92 Angles in Triangles

GEOMETRY



Non-calculator

In triangle PQR, angle $P = (2x + 10)^\circ$, angle $Q = (3x - 5)^\circ$ and angle $R = (x + 25)^\circ$. Find x and all three angles.

Answer
(2)

(Total for Question 92 is 2 marks)

93 Area of Trapeziums

GEOMETRY



Non-calculator

A trapezium has area 40 cm^2 , parallel sides 6 cm and 10 cm. Find its height.

Answer
(2)

(Total for Question 93 is 2 marks)

94 Area of a Circle

GEOMETRY



Calculator

A circle has area 78.5 cm^2 . Find its radius to 1 d.p.

Answer
(2)

(Total for Question 94 is 2 marks)

95 Area of a Circle **GEOMETRY** Non-calculator

The area of a circle is 78.5 cm^2 . Find its radius. (Use $\pi \approx 3.14$)

Answer
(2)

(Total for Question 95 is 2 marks)

96 Area of a Semi Circle **GEOMETRY** Calculator

A semicircular window has diameter 1.2 m. Find its area to 2 d.p.

Answer
(2)

(Total for Question 96 is 2 marks)

97 Circumference of a Circle **GEOMETRY** Non-calculator

The circumference of a circle is 44 cm. Use $C = \pi d$ to find the diameter. (Take $\pi \approx \frac{22}{7}$)

Answer
(2)

(Total for Question 97 is 2 marks)

98 Co-Interior Angles **GEOMETRY** Non-calculator

Two parallel lines are cut by a transversal. One co-interior angle is $(3x + 5)^\circ$ and the other is $(2x + 25)^\circ$. Find x .

Answer
(2)

(Total for Question 98 is 2 marks)

99 Corresponding Angles **GEOMETRY** Non-calculator

Two parallel lines are cut by a transversal. One corresponding angle is $(x + 15)^\circ$ and the other is $(2x - 5)^\circ$. Find x .

Answer
(2)

(Total for Question 99 is 2 marks)

100 External Angles in a Regular Polygon **GEOMETRY** Non-calculator

A regular polygon has each external angle measuring 30° . How many sides does it have?

Answer
(2)

(Total for Question 100 is 2 marks)

101 Internal Angles in a Regular Polygon **GEOMETRY**

Non-calculator

Work out the internal angle of a regular octagon.

Answer
(2)

(Total for Question 101 is 2 marks)

102 Key Circle Terms **GEOMETRY**

Non-calculator

In a circle with centre O, identify the segment OB (from centre to point B on circumference). What is this called?

Answer
(2)

(Total for Question 102 is 2 marks)

103 Measuring Bearings **GEOMETRY**

Non-calculator

The bearing of B from A is 070° . Work out the bearing of A from B.

Answer
(2)

(Total for Question 103 is 2 marks)



104 Perimeter of a Circle **GEOMETRY** Non-calculator

A circle has circumference 20π cm. Find its diameter.

Answer
(2)

(Total for Question 104 is 2 marks)

105 Perimeter of a Semi Circle **GEOMETRY** Calculator

A semicircular mat has radius 30 cm. Find its perimeter to the nearest cm.

Answer
(2)

(Total for Question 105 is 2 marks)

106 Reflections **GEOMETRY** Non-calculator

A point P is reflected in the line $y = 0$ (the x-axis) to give $P'(4, -2)$. Find the original coordinates of P.

Answer
(2)

(Total for Question 106 is 2 marks)

107

Rotations

GEOMETRY



Non-calculator

The point (2,3) is rotated 90° anticlockwise about the origin. Find its image.

Answer
(2)

(Total for Question 107 is 2 marks)

108

Scale Drawings

GEOMETRY



Non-calculator

A garden plan uses a scale of 2 cm : 1 m. On the plan, the garden measures 10 cm $\times$ 6 cm. Find the actual dimensions.

Answer
(2)

(Total for Question 108 is 2 marks)

109

Sketching Projections

GEOMETRY



Non-calculator

A square-based pyramid has a base 4 cm by 4 cm and a height of 3 cm. Describe (a) its plan view (b) its front elevation.

Answer
(2)

(Total for Question 109 is 2 marks)



110 Surface Area of Cubes & Cuboids **GEOMETRY** Non-calculator

A cube has a surface area of 150 cm^2 . Find the length of one side.

Answer
(2)

(Total for Question 110 is 2 marks)

111 Translations **GEOMETRY** Non-calculator

Triangle PQR has vertices $P(2, 1)$, $Q(4, 3)$ and $R(3, 0)$. It is translated by the vector $\begin{pmatrix} 1 \\ -4 \end{pmatrix}$. Write down the new coordinates.

Answer
(2)

(Total for Question 111 is 2 marks)

112 Calculating Price Changes **RATIO AND PROPORTION** Non-calculator

A coat was £80 and is now £60 in a sale. Find the percentage decrease.

Answer
(2)

(Total for Question 112 is 2 marks)

113 Density, Mass & Volume Calculations **RATIO AND PROPORTION** Non-calculator

A substance has density 2.5 g/cm^3 and mass 100 g. Find its volume.

Answer
(2)

(Total for Question 113 is 2 marks)

114 Scaling Up Ratios **RATIO AND PROPORTION** Non-calculator

A recipe for 4 people uses 200 g of pasta. How much pasta is needed for 10 people?

Answer
(2)

(Total for Question 114 is 2 marks)

115 Simple Interest **RATIO AND PROPORTION** Non-calculator

Chloe invests £800 and earns £96 in simple interest over 3 years. Work out the annual interest rate.

Answer
(2)

(Total for Question 115 is 2 marks)

116 Simplifying Ratios**RATIO AND PROPORTION**

Non-calculator

Write the ratio 1.5 : 2.5 in its simplest form.

Answer
(2)

(Total for Question 116 is 2 marks)

117 Speed, Distance & Time Calculations**RATIO AND PROPORTION**

Non-calculator

A cyclist travels 36 km at 12 km/h. How long does the journey take?

Answer
(2)

(Total for Question 117 is 2 marks)

118 Standard Unit Conversions**RATIO AND PROPORTION**

Non-calculator

Convert 2.8 litres to ml.

Answer
(2)

(Total for Question 118 is 2 marks)



119 Writing Ratios as Fractions**RATIO AND PROPORTION**

Non-calculator

In a ratio 3 : 7, what fraction is the first part?

Answer
(2)

(Total for Question 119 is 2 marks)

120 Constructing Two Way Tables**PROBABILITY**

Non-calculator

60 people went to the cinema or the theatre. 35 of them are adults. 20 adults and 10 children chose the cinema. How many children chose the theatre?

Answer
(2)

(Total for Question 120 is 2 marks)

121 Fair Objects**PROBABILITY**

Non-calculator

A dice is rolled 600 times. The results are: 1: 95, 2: 105, 3: 98, 4: 102, 5: 100, 6: 100. Do you think the dice is fair? Explain your answer.

Answer
(2)

(Total for Question 121 is 2 marks)

122 Fundamentals of Two Way Tables **PROBABILITY** Non-calculator

150 people chose a favourite ice cream. 65 are children and 85 are adults. 20 children and 30 adults chose vanilla. 30 children and 35 adults chose chocolate. Everyone else chose strawberry. How many adults chose strawberry?

Answer
(2)

(Total for Question 122 is 2 marks)

123 Median from a List **STATISTICS** Non-calculator

Find the median of: 12, 15, 11, 18, 14, 16, 13

Answer
(2)

(Total for Question 123 is 2 marks)

124 Range from a List **STATISTICS** Non-calculator

Find the range of: 8, 12, -2, 5, 15

Answer
(2)

(Total for Question 124 is 2 marks)

125 Simple Random Sampling STATISTICS Non-calculator

A school has 800 students. Describe how to choose a simple random sample of 40 students.

Answer
(2)

(Total for Question 125 is 2 marks)

126 Conversion Graphs GRAPHS Non-calculator

1 litre is about 0.22 gallons. A conversion graph from litres to gallons is a straight line through (0, 0). How many gallons is 20 litres?

Answer
(2)

(Total for Question 126 is 2 marks)

127 Sketching Straight Lines Using Tables GRAPHS Non-calculator

Make a table of values for $y = -x + 3$ for $x = -1, 0, 1, 2, 3$.

Answer
(2)

(Total for Question 127 is 2 marks)

128

Vertical & Horizontal Lines

GRAPHS



Non-calculator

A vertical line passes through the point $(-2, 5)$. What is its equation?

Answer

(2)

(Total for Question 128 is 2 marks)

129

Mean, Mode, Median & Range from Stem & Leaf Diagrams

STATISTICS



Non-calculator

A stem and leaf diagram shows 12 values. Key: $5 \mid 2$ means 52. $5 \mid 2 \ 4 \ 5 \ 6$. $6 \mid 1 \ 3 \ 3 \ 5 \ 7$. $7 \mid 2 \ 4 \ 8$. Work out the median and the range.

Answer

(3)

(Total for Question 129 is 3 marks)



130 Mean from a List **STATISTICS** Non-calculator

Here are five numbers: 2, 4, 4, 7, 8. Work out (a) the mean (b) the median (c) the mode (d) the range.

Answer

(4)

(Total for Question 130 is 4 marks)**131** Adding & Subtracting Mixed Numbers **NUMBER** Non-calculator

Work out

$$4\frac{1}{2} - 2\frac{1}{3}$$

Answer

(2)

(Total for Question 131 is 2 marks)

132 Adding Fractions **NUMBER** Non-calculator

Work out $\frac{2}{3} + \frac{3}{4}$. Give your answer as a mixed number.

Answer
(2)

(Total for Question 132 is 2 marks)

133 BIDMAS with Algebra **NUMBER** Non-calculator

Work out the value of $(a + b)^2$ when $a = 3$ and $b = 2$.

Answer
(2)

(Total for Question 133 is 2 marks)

134 Dividing Mixed Numbers **NUMBER** Non-calculator

Work out

$$4\frac{1}{2} \div 1\frac{1}{2}$$

Answer
(2)

(Total for Question 134 is 2 marks)

135 Multiplying Mixed Numbers **NUMBER** Non-calculator

Work out

$$3\frac{1}{5} \times 1\frac{2}{3}$$

Answer
(2)

(Total for Question 135 is 2 marks)

136 Ordering Fractions **NUMBER** Non-calculator

Put these fractions in order from largest to smallest:

$$\frac{2}{5}, \frac{3}{10}, \frac{1}{2}$$

Answer
(2)

(Total for Question 136 is 2 marks)

137 Ordering Fractions **NUMBER** Non-calculator

Put these fractions in order from largest to smallest:

$$\frac{7}{8}, \frac{4}{5}, \frac{5}{6}$$

Answer
(2)

(Total for Question 137 is 2 marks)

138 Percentages Greater than 100 **NUMBER** Non-calculator

A price increases by 200%. The original price was £45. What is the new price?

Answer
(2)

(Total for Question 138 is 2 marks)

139 Powers of Zero & One **NUMBER** Non-calculator

Work out $100^0 + 100^1$

Answer
(2)

(Total for Question 139 is 2 marks)

140 Simplifying Powers **NUMBER** Non-calculator

Simplify $(c^3)^4$

Answer
(2)

(Total for Question 140 is 2 marks)

141 Subtracting Fractions

NUMBER



Non-calculator

Work out

$$\frac{7}{8} - \frac{1}{4}$$

Give your answer in its simplest form.

Answer
(2)

(Total for Question 141 is 2 marks)

142 Expanding Double Brackets

ALGEBRA



Non-calculator

Expand and simplify $(2x + 1)(x - 4)$ Answer
(2)

(Total for Question 142 is 2 marks)

143 Nth Term of Linear Sequences

ALGEBRA



Non-calculator

Find the nth term of 10, 7, 4, 1, ...

Answer
(2)

(Total for Question 143 is 2 marks)



144 Position to Term Rule Using Patterns **ALGEBRA** Non-calculator

A sequence is 2, 5, 10, 17, 26, ... Find the rule.

Answer
(2)

(Total for Question 144 is 2 marks)

145 Drawing Angles Bisectors **GEOMETRY** Non-calculator

The bisector of a right angle is constructed. What is the angle between the bisector and each arm of the right angle?

Answer
(2)

(Total for Question 145 is 2 marks)

146 Drawing Perpendicular Bisectors **GEOMETRY** Non-calculator

Describe how to construct the perpendicular bisector of a line AB using a ruler and compasses.

Answer
(2)

(Total for Question 146 is 2 marks)



147 Drawing a 60 Degree Angle **GEOMETRY** Non-calculator

Two 60° angles are constructed next to each other with compasses, sharing one arm. (a) What angle do they make together? (b) Why does the compass construction give exactly 60° ?

Answer
(2)

(Total for Question 147 is 2 marks)

148 Drawing a 90 Degree Angle **GEOMETRY** Non-calculator

Describe how to construct a 90° angle at a point P on a line AB using compasses.

Answer
(2)

(Total for Question 148 is 2 marks)

149 Drawing a Locus of All Points **GEOMETRY** Non-calculator

A point moves such that it is always 4 cm from point A and always 5 cm from point B (where A and B are 6 cm apart). Describe the locus.

Answer
(2)

(Total for Question 149 is 2 marks)

150 Drawing a Perpendicular Line from a Point

GEOMETRY



Non-calculator

Describe how to construct the perpendicular from a point P to a line AB using compasses.

Answer
(2)

(Total for Question 150 is 2 marks)

151 Enlargements with Positive Integer Scale Factors

GEOMETRY



Non-calculator

A shape has area 5 cm^2 . When enlarged by scale factor 3, what is the area of the enlarged shape?

Answer
(2)

(Total for Question 151 is 2 marks)

152 Perimeter of Trapeziums

GEOMETRY



Non-calculator

A trapezium has parallel sides 5 cm and 11 cm, and equal slant sides of 6 cm. Find the perimeter.

Answer
(2)

(Total for Question 152 is 2 marks)



153 Perimeter of Triangles

GEOMETRY



Non-calculator

An isosceles triangle has two sides of 8 cm and a base of 6 cm. Find its perimeter.

Answer
(2)

(Total for Question 153 is 2 marks)

154 Using Pythagoras to Find a Hypotenuse

GEOMETRY



Non-calculator

A right-angled triangle has sides 6 cm and 8 cm. Work out the hypotenuse.

Answer
(2)

(Total for Question 154 is 2 marks)

155 Area Conversions

RATIO AND PROPORTION



Non-calculator

Convert 2 km^2 to m^2 .

Answer
(2)

(Total for Question 155 is 2 marks)

156 Direct Proportion Problems**RATIO AND PROPORTION**

Non-calculator

3 kg of apples cost £4.50. How much would 7 kg of the same apples cost?

Answer
(2)

(Total for Question 156 is 2 marks)

157 Inverse Proportion Problems**RATIO AND PROPORTION**

Non-calculator

8 machines produce 200 items in 5 hours. How long would 10 machines take to produce 200 items?

Answer
(2)

(Total for Question 157 is 2 marks)

158 Like for Like Comparisons**RATIO AND PROPORTION**

Non-calculator

Brand A: 2 litres for £1.80. Brand B: 5 litres for £4.00. Which brand is the better value for money? Show your working.

Answer
(2)

(Total for Question 158 is 2 marks)



159 Pressure, Force & Area Calculations **RATIO AND PROPORTION** Non-calculator

A force of 600 N creates a pressure of 150 N/m^2 . Find the area.

Answer
(2)

(Total for Question 159 is 2 marks)

160 Proportional Division **RATIO AND PROPORTION** Non-calculator

Amy and Ben share sweets in the ratio 5 : 3. Amy gets 20 more sweets than Ben. Work out the total number of sweets.

Answer
(2)

(Total for Question 160 is 2 marks)

161 Using Ratio Differences **RATIO AND PROPORTION** Non-calculator

The ratio of red to blue beads is 5 : 2. There are 24 more red beads than blue. How many red beads are there?

Answer
(2)

(Total for Question 161 is 2 marks)

162 Volume Conversions **RATIO AND PROPORTION** Non-calculator

A tank holds 0.8 m^3 of water. Convert this to litres.

Answer
(2)

(Total for Question 162 is 2 marks)

163 Best Relative Frequency Estimates **PROBABILITY** Non-calculator

A spinner is spun 50 times. Red appears 18 times. It is then spun 500 times. Red appears 162 times. Which gives the better estimate of $P(\text{red})$?

Answer
(2)

(Total for Question 163 is 2 marks)

164 Calculating Probabilities **PROBABILITY** Non-calculator

Letters of MATHEMATICS are put in a bag. One is picked at random. Find $P(\text{vowel})$.

Answer
(2)

(Total for Question 164 is 2 marks)

165 Calculating Relative Frequency

PROBABILITY



Non-calculator

In 80 trials, an event occurs 24 times. Work out the relative frequency.

Answer
(2)

(Total for Question 165 is 2 marks)

166 Expected Frequency

PROBABILITY



Non-calculator

$P(\text{win}) = 0.15$. A game is played 80 times. How many times would you expect to win?

Answer
(2)

(Total for Question 166 is 2 marks)

167 Expressing Probabilities in Different Forms

PROBABILITY



Non-calculator

Write 70% as a fraction and as a decimal.

Answer
(2)

(Total for Question 167 is 2 marks)



168 Finding Probabilities with Frequency Trees

PROBABILITY



Non-calculator

80 people were surveyed. 50 have a car. 30 with a car commute. 10 without a car commute. Find $P(\text{commutes given they have a car})$.

Answer
(2)

(Total for Question 168 is 2 marks)

169 Fundamentals of Frequency Trees

PROBABILITY



Non-calculator

150 students took an exam. 90 are girls. 60 girls passed. 40 boys passed. How many boys failed?

Answer
(2)

(Total for Question 169 is 2 marks)

170 Sample Space Diagrams

PROBABILITY



Non-calculator

Two fair coins are tossed. List all outcomes and find $P(\text{exactly one head})$.

Answer
(2)

(Total for Question 170 is 2 marks)



171 Identifying Mistakes with Frequency Polygons

STATISTICS



Non-calculator

Classes 0-10, 10-20, 20-30, 30-40 and 40-50 have frequencies 2, 8, 14, 9 and 3. A student plots a frequency polygon at (5, 2), (15, 8), (25, 14), (35, 9) and (45, 3). Are the points plotted correctly? Explain.

Answer
(2)

(Total for Question 171 is 2 marks)

172 Interpreting Ungrouped Frequency Tables

STATISTICS



Non-calculator

A shop sold shoes in these sizes: size 4, 3 pairs. Size 5, 7 pairs. Size 6, 10 pairs. Size 7, 5 pairs. Size 8, 2 pairs. (a) How many pairs were sold? (b) Which size is the mode?

Answer
(2)

(Total for Question 172 is 2 marks)

173 Relative Frequency Graphs

STATISTICS



Non-calculator

A dice is rolled 300 times and lands on 6 a total of 51 times. (a) Work out the relative frequency of rolling a 6. (b) Compare it with the probability for a fair dice.

Answer
(2)

(Total for Question 173 is 2 marks)

174 Sketching Frequency Polygons STATISTICS Non-calculator

Ages of 68 people: 10-20: 7, 20-30: 18, 30-40: 23, 40-50: 15, 50-60: 5. Write down the points you would plot to draw a frequency polygon.

Answer
(2)

(Total for Question 174 is 2 marks)

175 Working with Tally Charts STATISTICS Non-calculator

20 students chose a favourite colour: red 6, blue 8, green 4, yellow 2. (a) Write the tally marks for blue. (b) What fraction of the students chose red? Give it in its simplest form.

Answer
(2)

(Total for Question 175 is 2 marks)

176 Calculating the Gradient of a Line GRAPHS Non-calculator

Find the gradient of the line through $(-1, 4)$ and $(3, -2)$.

Answer
(2)

(Total for Question 176 is 2 marks)

177 Identifying if a Point is on a Line

GRAPHS



Non-calculator

Which of these points lie on $y = 4x - 3$? (1, 1), (2, 5), (3, 8)

Answer
(2)

(Total for Question 177 is 2 marks)

178 Identifying the x & y Intercepts of a Straight Line

GRAPHS



Non-calculator

Find the y-intercept and x-intercept of $y = 4x + 8$

Answer
(2)

(Total for Question 178 is 2 marks)

179 Midpoint of Two Points

GRAPHS



Non-calculator

The midpoint of A and B is (4, 3). A is (1, 5). Find B.

Answer
(2)

(Total for Question 179 is 2 marks)

180 Rearranging to the Form $y=mx+c$

GRAPHS



Non-calculator

Rearrange $5x + 2y - 10 = 0$ into the form $y = mx + c$.

Answer

(2)

(Total for Question 180 is 2 marks)

181 Common Denominators

NUMBER



Non-calculator

Which is larger, $\frac{3}{8}$ or $\frac{2}{5}$? Show your working.

Answer

(3)

(Total for Question 181 is 3 marks)



182 Estimating Calculations

NUMBER



Non-calculator

Estimate the value of $3.2 \times 18.7 + 4.9$

Answer
(3)

(Total for Question 182 is 3 marks)

183 Prime Factors & Factorisations

NUMBER



Non-calculator

Write 84 as a product of its prime factors.

Answer
(3)

(Total for Question 183 is 3 marks)



184 Standard Form Conversions **NUMBER** Non-calculator

Write 3.6×10^4 as an ordinary number.

Answer
(3)

(Total for Question 184 is 3 marks)

185 Factorising Single Brackets **ALGEBRA** Non-calculator

Factorise fully $12a^2 + 18a$

Answer
(3)

(Total for Question 185 is 3 marks)



186 Types of Sequences **ALGEBRA** Non-calculator

What type of sequence is 1, 4, 9, 16, 25, ...?

Answer
(3)

(Total for Question 186 is 3 marks)

187 Using Pythagoras to Find a Non-Hypotenuse Side **GEOMETRY** Non-calculator

A ladder 5 m long leans against a vertical wall. The foot of the ladder is 1.4 m from the wall. How far up the wall does the ladder reach?

Answer
(3)

(Total for Question 187 is 3 marks)



188 Volume of Prisms **GEOMETRY** Non-calculator

A trapezoidal prism (trapezoid cross-section with parallel sides 5 cm and 9 cm, height 4 cm) has a length of 20 cm. Calculate the volume.

Answer
(3)

(Total for Question 188 is 3 marks)

189 Time Conversions **RATIO AND PROPORTION** Non-calculator

A train departs at 09:45 and arrives at 11:20. How long is the journey?

Answer
(3)

(Total for Question 189 is 3 marks)



190 Constructing Frequency Trees**PROBABILITY**

Non-calculator

200 people were asked if they like chocolate. 120 said yes. 75 of the people who like chocolate are under 30. (a) How many people who like chocolate are 30 or over? (b) What fraction of all 200 people like chocolate and are under 30?

Answer
(3)

(Total for Question 190 is 3 marks)

191 Fundamentals of Tree Diagrams**PROBABILITY**

Non-calculator

A bag holds 5 red balls and 3 blue balls. Two balls are taken out without replacement. Work out the probability that both balls are red.

Answer
(3)

(Total for Question 191 is 3 marks)



192 Identifying Bias

PROBABILITY



Non-calculator

A spinner has 4 equal sections. After 200 spins: A: 70, B: 45, C: 40, D: 45. Do you think the spinner is biased? Explain your answer.

Answer
(3)

(Total for Question 192 is 3 marks)

193 Danger of Extrapolation

STATISTICS



Non-calculator

A line of best fit has equation $y = 2.5x + 10$. It was drawn from data with x between 4 and 20. (a) Estimate y when $x = 12$. (b) Explain why an estimate of y when $x = 50$ is not reliable.

Answer
(3)

(Total for Question 193 is 3 marks)



194 Lines of Best Fit & Predicting Values

STATISTICS



Non-calculator

A line of best fit passes through (10, 25) and (35, 85). Use the line to estimate the value of y when $x = 22$.

Answer
(3)

(Total for Question 194 is 3 marks)

195 Mean, Mode, Median & Range from an Ungrouped Frequency Tables

STATISTICS



Calculator

The table shows the shoe sizes of 27 people. Size 4: 3 people. Size 5: 7. Size 6: 10. Size 7: 5. Size 8: 2. Work out the mean shoe size. Give your answer to 1 decimal place.

Answer
(3)

(Total for Question 195 is 3 marks)



196 Sketching Straight Lines Using $y=mx+c$

GRAPHS



Non-calculator

Write down the gradient and the y-intercept of the line $y = \frac{1}{3}x - 1$.

Answer

(3)

(Total for Question 196 is 3 marks)

197 Constructing Tree Diagrams

PROBABILITY



Non-calculator

The probability it rains tomorrow is $\frac{2}{5}$. If it rains tomorrow, the probability it rains the next day is $\frac{3}{5}$. If it doesn't, the probability is $\frac{1}{4}$. Work out the probability that (a) it rains on both days (b) it rains on exactly one of the days.

Answer

(4)

(Total for Question 197 is 4 marks)



198 Column Vectors & Vector Arithmetic

GEOMETRY



Non-calculator

$\mathbf{a} = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$. Work out $3\mathbf{a}$.

Answer
(1)

(Total for Question 198 is 1 mark)

199 General Shape of a Quadratic

GRAPHS



Non-calculator

Does the graph of $y = -2x^2$ have a maximum point or a minimum point? Explain how you know.

Answer
(1)

(Total for Question 199 is 1 mark)

200 Matching Shapes to Graphs

GRAPHS



Non-calculator

A cylindrical glass is filled with water at a steady rate. Describe the graph of depth against time.

Answer
(1)

(Total for Question 200 is 1 mark)

201 Bounds & Error Intervals for Truncated Decimals

NUMBER



Non-calculator

A length is truncated to 1 d.p. The result is 5.2 cm. Write the error interval for the length.

Answer
(2)

(Total for Question 201 is 2 marks)

202 Bounds Requiring Integer Values

NUMBER



Non-calculator

n is an integer. $-2 \leq n < 4$ Write down all the possible values of n .

Answer
(2)

(Total for Question 202 is 2 marks)

203 Finding Bounds & Error Intervals

NUMBER



Non-calculator

A distance is 200 m to the nearest 10 m. Write the error interval.

Answer
(2)

(Total for Question 203 is 2 marks)

204 Multiplying & Dividing in Standard Form

NUMBER



Non-calculator

Work out $(5 \times 10^3) \times (6 \times 10^5)$ Give your answer in standard form.

Answer
(2)

(Total for Question 204 is 2 marks)



205 Negative Powers

NUMBER



Non-calculator

Simplify 3^{-3} Answer
(2)

(Total for Question 205 is 2 marks)

206 Rational & Irrational Numbers

NUMBER



Non-calculator

State whether each number is rational or irrational:

a) $\sqrt{25}$ b) $\sqrt{3}$ c) 0.5 d) π Answer
(2)

(Total for Question 206 is 2 marks)

207 Deciding if a Term is in a Sequence

ALGEBRA



Non-calculator

The n th term is $5n + 3$. Is 47 a term in this sequence?Answer
(2)

(Total for Question 207 is 2 marks)

208 Finding Terms in a Fibonacci Sequence **ALGEBRA** Non-calculator

A Fibonacci-type sequence starts 3, 1, ... Write the next 4 terms.

Answer
(2)

(Total for Question 208 is 2 marks)

209 Proof by Counter Example **ALGEBRA** Non-calculator

Show that the statement " $n^2 + n + 1$ is always prime" is false.

Answer
(2)

(Total for Question 209 is 2 marks)

210 Proof with Multiples **ALGEBRA** Non-calculator

Prove that the sum of three consecutive multiples of 5 is always a multiple of 15.

Answer
(2)

(Total for Question 210 is 2 marks)

211 Solving Quadratics by Factorising when $c=0$

ALGEBRA



Non-calculator

Solve $2x^2 - 8x = 0$

Answer
(2)

(Total for Question 211 is 2 marks)

212 Solving Single Inequalities

ALGEBRA



Non-calculator

Solve $2x + 7 < 3$

Answer
(2)

(Total for Question 212 is 2 marks)

213 Applied Exact Trig Values Questions

GEOMETRY



Non-calculator

Solve for x : $2x = \frac{6}{\sqrt{3}}$

Answer
(2)

(Total for Question 213 is 2 marks)

214 Area of Compound Shapes **GEOMETRY** Non-calculator

A shape is made by joining a rectangle 10 cm by 4 cm to a rectangle 4 cm by 3 cm, with no overlap. Work out the area of the shape.

Answer
(2)

(Total for Question 214 is 2 marks)

215 Area of a Circle Sector **GEOMETRY** Non-calculator

A circle has radius 8 cm. A sector with central angle 45° is cut out. Calculate the area of the sector. (Use $\pi \approx 3.14$)

Answer
(2)

(Total for Question 215 is 2 marks)

216 Calculating Scale Factor **GEOMETRY** Non-calculator

Two similar shapes have areas of 16 cm^2 and 64 cm^2 . Find the linear scale factor.

Answer
(2)

(Total for Question 216 is 2 marks)

217 Enlargements with Positive Fractional Scale Factors

GEOMETRY



Non-calculator

A shape has area 18 cm^2 . It is enlarged by scale factor $\frac{1}{2}$. What is the new area?

Answer
(2)

(Total for Question 217 is 2 marks)

218 Finding Angles of Elevation & Depression

GEOMETRY



Calculator

A person looks up at a 20 m tall building from 30 m away. Find the angle of elevation.

Answer
(2)

(Total for Question 218 is 2 marks)

219 Finding Angles using SOH, CAH, TOA

GEOMETRY



Calculator

Find angle x where the opposite side is 7 cm and the adjacent side is 4 cm.

Answer
(2)

(Total for Question 219 is 2 marks)



220 Finding Side Lengths of Compound Shapes **GEOMETRY** Non-calculator

A compound shape is made from a rectangle and a triangle. The rectangle measures 8 cm by 6 cm. A right-angled triangle with base 8 cm and height 4 cm is attached to one side. Find the slant height d of the triangle.

Answer
(2)

(Total for Question 220 is 2 marks)

221 Finding the Height of an Equilateral Triangle **GEOMETRY** Calculator

An equilateral triangle has side length 8 cm. Find its area.

Answer
(2)

(Total for Question 221 is 2 marks)

222 Fundamentals of SOH, CAH, TOA **GEOMETRY** Non-calculator

In a right-angled triangle, the adjacent side is 4 cm and the hypotenuse is 5 cm. Find $\cos \theta$.

Answer
(2)

(Total for Question 222 is 2 marks)

223 Fundamentals of Vector Problems

GEOMETRY



Non-calculator

In triangle PQR, $PQ = 2a$ and $PR = 2b$. S is the midpoint of QR. Find the vector PS.

Answer
(2)

(Total for Question 223 is 2 marks)

224 Hand Method for Exact Trig Values

GEOMETRY



Non-calculator

Write the exact value of $\tan 45^\circ$.

Answer
(2)

(Total for Question 224 is 2 marks)

225 Identifying Congruent Triangles

GEOMETRY



Non-calculator

Triangle ABC has angle A = 50° , angle B = 70° , and $AB = 8$ cm. Triangle DEF has angle D = 50° , angle E = 70° , and $DE = 8$ cm. Are the triangles congruent? State the criterion.

Answer
(2)

(Total for Question 225 is 2 marks)

226 Invariant Points **GEOMETRY** Non-calculator

Under the translation by vector $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$, are there any invariant points?

Answer
(2)

(Total for Question 226 is 2 marks)

227 Length of a Circle Arc **GEOMETRY** Non-calculator

A circle has radius 5 cm. Calculate the arc length for a central angle of 120° . (Use $\pi \approx 3.14$)

Answer
(2)

(Total for Question 227 is 2 marks)

228 Similar Side Lengths **GEOMETRY** Non-calculator

Two similar pentagons have a scale factor of 2. One side of the smaller pentagon is 4 cm. What is the corresponding side of the larger pentagon?

Answer
(2)

(Total for Question 228 is 2 marks)

229 Surface Area of Prisms **GEOMETRY** Non-calculator

A rectangular prism (cuboid) $8\text{ cm} \times 6\text{ cm} \times 4\text{ cm}$. Find its surface area.

Answer
(2)

(Total for Question 229 is 2 marks)

230 Surface Area of Pyramids **GEOMETRY** Non-calculator

A rectangular pyramid has a base $10\text{ cm} \times 6\text{ cm}$. The slant heights along the length are 12 cm and along the width are 10 cm . Calculate the total surface area.

Answer
(2)

(Total for Question 230 is 2 marks)

231 Surface Area of Spheres **GEOMETRY** Non-calculator

A sphere has a surface area of $144\pi\text{ cm}^2$. Find its radius.

Answer
(2)

(Total for Question 231 is 2 marks)



232 Volume of Cylinders

GEOMETRY



Non-calculator

A cylinder has a volume of $500\pi \text{ cm}^3$ and a radius of 5 cm. Find its height.

Answer
(2)

(Total for Question 232 is 2 marks)

233 Applied Best Buys

RATIO AND PROPORTION



Non-calculator

Small: 330 ml for 55p. Medium: 500 ml for 80p. Large: 1 litre for £1.45. Which size is the best value for money? Show your working.

Answer
(2)

(Total for Question 233 is 2 marks)

234 Compound Interest

RATIO AND PROPORTION



Calculator

A house is worth £200,000. Its value increases by 4% each year. Find its value after 5 years to the nearest £.

Answer
(2)

(Total for Question 234 is 2 marks)



235 Converting Compound Measures **RATIO AND PROPORTION**

Non-calculator

A density is 2.5 g/cm^3 . Convert it to kg/m^3 .

Answer
(2)

(Total for Question 235 is 2 marks)

236 Currency Conversions **RATIO AND PROPORTION**

Calculator

£1 = €1.15. A coat costs €92. How much in £?

Answer
(2)

(Total for Question 236 is 2 marks)

237 Percentage Multipliers **RATIO AND PROPORTION**

Calculator

A jacket costs £64. It is increased by 12.5% and then decreased by 8%. Work out the final price.

Answer
(2)

(Total for Question 237 is 2 marks)



238 And/Or Rules **PROBABILITY** Non-calculator

$P(A) = 0.6$, $P(B) = 0.4$, $P(A \text{ and } B) = 0.15$. Find $P(A \text{ or } B)$.

Answer
(2)

(Total for Question 238 is 2 marks)

239 Finding Probabilities with Tree Diagrams **PROBABILITY** Non-calculator

A student guesses two multiple-choice questions. $P(\text{correct}) = \frac{1}{4}$ for each. Find $P(\text{at least one correct})$.

Answer
(2)

(Total for Question 239 is 2 marks)

240 Finding Probabilities with Two Way Tables **PROBABILITY** Non-calculator

60 students were asked how they travel to school. 25 are boys and 35 are girls. 15 boys and 20 girls walk. A student is chosen at random. Work out the probability that the student walks.

Answer
(2)

(Total for Question 240 is 2 marks)

241 Finding Probabilities with Venn Diagrams**PROBABILITY**

Non-calculator

In a school of 200 students, 120 play basketball (B), 90 play tennis (T), 50 play both. Find $P(\text{plays at least one sport})$.

Answer
(2)

(Total for Question 241 is 2 marks)**242 Fundamentals of Venn Diagrams****PROBABILITY**

Non-calculator

A survey of 30 people asks about coffee (C) and tea (T). 18 drink coffee, 20 drink tea, 12 drink both. How many drink at least one?

Answer
(2)

(Total for Question 242 is 2 marks)**243 Sets & Venn Diagrams****PROBABILITY**

Non-calculator

In a class of 40 students, 22 play football (F), 18 play tennis (T), 8 play both. Find how many play neither sport.

Answer
(2)

(Total for Question 243 is 2 marks)

244 Interpreting Grouped Frequency Tables STATISTICS Non-calculator

The heights, h cm, of 30 plants: $0 < h \leq 10$, 5 plants. $10 < h \leq 20$, 12 plants. $20 < h \leq 30$, 9 plants. $30 < h \leq 40$, 4 plants. (a) Which class contains the median? (b) Write down the modal class.

Answer
(2)

(Total for Question 244 is 2 marks)

245 Interpreting Pie Charts STATISTICS Non-calculator

In a pie chart representing 150 cars in a car park, the red cars occupy 72° . How many red cars are in the car park?

Answer
(2)

(Total for Question 245 is 2 marks)

246 Reverse Mean from a List STATISTICS Non-calculator

4 numbers have a mean of 10. One number is removed and the mean becomes 12. What number was removed?

Answer
(2)

(Total for Question 246 is 2 marks)

247 Calculating Average Speed Using Distance Time Graphs

GRAPHS



Non-calculator

Sam walks 8 km from home in 2 hours. He rests for 30 minutes, then walks home in 1 hour 30 minutes. Work out his speed on the way home. Give your answer to 1 decimal place.

Answer
(2)

(Total for Question 247 is 2 marks)

248 Direct Proportion Graphs

GRAPHS



Non-calculator

If y is directly proportional to x with $y = \frac{3}{2}x$, find y when $x = 8$.

Answer
(2)

(Total for Question 248 is 2 marks)

249 Distance Between Two Points

GRAPHS



Non-calculator

Find the distance between $(0, 0)$ and $(5, 12)$.

Answer
(2)

(Total for Question 249 is 2 marks)

250 Equations of a Straight Line Using Two Points **GRAPHS** Non-calculator

Find the equation of the line through (0, 4) and (2, 0).

Answer
(2)

(Total for Question 250 is 2 marks)

251 Equations of a Straight Line with a Point & a Gradient **GRAPHS** Non-calculator

Find the equation of the line with gradient $\frac{1}{2}$ that passes through (4, 3).

Answer
(2)

(Total for Question 251 is 2 marks)

252 Finding Equations of Linear Real-Life Graphs **GRAPHS** Non-calculator

A car rental company charges £30 per day plus £0.15 per mile. Write the equation for total cost (T) in terms of miles (d) driven per day.

Answer
(2)

(Total for Question 252 is 2 marks)



253 Finding the Distance Between Two Points **GRAPHS** Non-calculator

Find the distance between (0, 0) and (5, 12).

Answer
(2)

(Total for Question 253 is 2 marks)

254 Gradient as a Rate of Change **GRAPHS** Non-calculator

Water is poured into a tank at a steady rate. The depth rises from 20 cm to 50 cm in 6 minutes. Work out the rate of change of the depth.

Answer
(2)

(Total for Question 254 is 2 marks)

255 Inverse Proportion Graphs **GRAPHS** Non-calculator

Two quantities are inversely proportional with equation $y = \frac{20}{x}$. Find y when $x = 5$.

Answer
(2)

(Total for Question 255 is 2 marks)

256 Key Regions on Distance-Time Graphs **GRAPHS** Non-calculator

On a distance-time graph, what does (a) a horizontal section show (b) a section sloping down towards the time axis show?

Answer
(2)

(Total for Question 256 is 2 marks)

257 Plotting Quadratics **GRAPHS** Non-calculator

Complete the table of values for $y = x^2 - 2x - 3$ for $x = -1, 0, 1, 2, 3$.

Answer
(2)

(Total for Question 257 is 2 marks)

258 Properties of Parallel Lines **GRAPHS** Non-calculator

Are the lines $y = 4x + 1$ and $y = 4x - 3$ parallel? Explain.

Answer
(2)

(Total for Question 258 is 2 marks)

259 Adding & Subtracting in Standard Form

NUMBER



Non-calculator

Work out $(4.5 \times 10^3) + (6 \times 10^2)$ Give your answer in standard form.

Answer
(3)

(Total for Question 259 is 3 marks)

260 Applied Estimating

NUMBER



Non-calculator

489 people each pay £19.50 for a ticket. Estimate the total amount paid.

Answer
(3)

(Total for Question 260 is 3 marks)



261 Identifying Percentage Changes

NUMBER

 Non-calculator

Last year 200 students passed. This year 230 students passed. Find the percentage increase.

Answer
(3)

(Total for Question 261 is 3 marks)

262 Reverse Percentages

NUMBER

 Non-calculator

After a 15% pay rise, Emma earns £23,000. What did she earn before the pay rise?

Answer
(3)

(Total for Question 262 is 3 marks)



263 Venn Diagram Method **NUMBER**

Non-calculator

Given that $48 = 2^4 \times 3$ and $72 = 2^3 \times 3^2$, find (a) the HCF of 48 and 72 (b) the LCM of 48 and 72.

Answer
(3)

(Total for Question 263 is 3 marks)

264 Applied Simultaneous Equations Problems **ALGEBRA**

Non-calculator

Adult tickets cost £a and child tickets cost £c. 3 adults and 2 children pay £38. 1 adult and 4 children pay £29. Find a and c.

Answer
(3)

(Total for Question 264 is 3 marks)



265 Difference of Two Squares

ALGEBRA



Non-calculator

Factorise $x^2 - 100$ Answer
(3)

(Total for Question 265 is 3 marks)

266 Factorising Double Brackets

ALGEBRA



Non-calculator

Factorise $x^2 + 2x - 15$ Answer
(3)

(Total for Question 266 is 3 marks)



267 Proving Equivalence

ALGEBRA



Non-calculator

Prove that $n^2 + (n+1)^2 + (n+2)^2 = 3n^2 + 6n + 5$

Answer
(3)

(Total for Question 267 is 3 marks)

268 Solving Compound Inequalities

ALGEBRA



Non-calculator

Solve $-5 < 4x + 3 \leq 15$

Answer
(3)

(Total for Question 268 is 3 marks)



269 Solving Linear Simultaneous Equations ALGEBRA Non-calculator

Solve the simultaneous equations $5x + 3y = 21$ and $2x - y = 4$.

Answer
(3)

(Total for Question 269 is 3 marks)

270 Solving Quadratics by Factorising (a=1) ALGEBRA Non-calculator

Solve by factorising $x^2 + 2x - 15 = 0$

Answer
(3)

(Total for Question 270 is 3 marks)



271 Bearings Problems Involving SOH, CAH, TOA**GEOMETRY** Calculator

A plane flies 150 km due north, then 80 km due east. Work out the bearing of the plane from its starting point. Give your answer to 1 decimal place.

Answer
(3)

(Total for Question 271 is 3 marks)

272 Finding Side Lengths using SOH, CAH, TOA**GEOMETRY** Calculator

In a right-angled triangle, the hypotenuse is 12 cm. One angle is 35° . Work out the length of the side opposite the 35° angle. Give your answer to 1 decimal place.

Answer
(3)

(Total for Question 272 is 3 marks)



273 Perimeter of Compound Shapes

GEOMETRY

 Calculator

A compound shape consists of a rectangle 12 cm by 8 cm with a semicircle of diameter 12 cm attached to one of the longer sides. Calculate the perimeter.

Answer
(3)

(Total for Question 273 is 3 marks)

274 SOH, CAH, TOA with Exact Trig Values

GEOMETRY

 Non-calculator

A right triangle has angle 45° and hypotenuse 10 cm. Use exact trig values to find both other sides.

Answer
(3)

(Total for Question 274 is 3 marks)



275 Surface Area of Cones **GEOMETRY** Non-calculator

A cone has a base radius of 6 cm and a vertical height of 8 cm. Find the slant height, then calculate the total surface area.

Answer
(3)

(Total for Question 275 is 3 marks)

276 Surface Area of Cylinders **GEOMETRY** Non-calculator

A cylinder has a total surface area of $150\pi \text{ cm}^2$ and radius 5 cm. Find its height.

Answer
(3)

(Total for Question 276 is 3 marks)



277 Volume of Cones

GEOMETRY



Non-calculator

A cone has a volume of $36\pi \text{ cm}^3$ and a radius of 3 cm. Find its height.

Answer
(3)

(Total for Question 277 is 3 marks)

278 Volume of Pyramids

GEOMETRY



Non-calculator

A rectangular pyramid has a rectangular base of dimensions 5 cm by 8 cm and height 12 cm. Calculate the volume.

Answer
(3)

(Total for Question 278 is 3 marks)



279 Volume of Spheres **GEOMETRY** Non-calculator

A sphere has a volume of $36\pi \text{ cm}^3$. Find its radius.

Answer
(3)

(Total for Question 279 is 3 marks)

280 Volumes of Composite Shapes **GEOMETRY** Calculator

A cuboid $10 \times 6 \times 4 \text{ cm}$ has a cylinder of radius 2 cm drilled through its length. Find the remaining volume in cm^3 to 1 d.p.

Answer
(3)

(Total for Question 280 is 3 marks)



281 Compound Decay **RATIO AND PROPORTION** Non-calculator

A radioactive substance decays by 8% per hour. Starting mass: 200 g. Find the mass after 4 hours to 1 d.p.

Answer
(3)

(Total for Question 281 is 3 marks)

282 Expressing Ratios as Linear Equations **RATIO AND PROPORTION** Non-calculator

The ratio of x to y is 3 : 7. If $x + y = 50$, find x and y .

Answer
(3)

(Total for Question 282 is 3 marks)



283 Profit & Loss**RATIO AND PROPORTION**

Non-calculator

A shop buys a pair of shoes for £12 and wants to make a 40% profit on them. What should the selling price be?

Answer
(3)

(Total for Question 283 is 3 marks)

284 Constructing Venn Diagrams**PROBABILITY**

Non-calculator

$X = \{a, b, c, d, e, f\}$, $Y = \{d, e, f, g, h\}$ and the universal set is $\{a, b, c, d, e, f, g, h, i\}$. List the elements of (a) $X \cap Y$ (b) X but not Y (c) neither X nor Y .

Answer
(3)

(Total for Question 284 is 3 marks)



285 Finding Probabilities of Sets

PROBABILITY



Non-calculator

$A = 1, 2, 3, 4, 5, 6, 7, 8$ $B = 3, 6, 9, 12$ A value is chosen at random from A. Find $P(\text{also in } B)$.

Answer
(3)

(Total for Question 285 is 3 marks)

286 Fundamentals of Set Notation

PROBABILITY



Non-calculator

$A = 1, 2, 3$ $B = 3, 4, 5$ Find $A \cup B$.

Answer
(3)

(Total for Question 286 is 3 marks)



287 Drawing Pie Charts **STATISTICS** Non-calculator

In a survey, 60 people chose their favourite sport: football 25, rugby 20, tennis 15. Work out the angle of each sector of a pie chart.

Answer
(3)

(Total for Question 287 is 3 marks)

288 Plotting a Cubic **GRAPHS** Non-calculator

For $y = x^3 + 2$, calculate values at $x = -2, -1, 0, 1, 2$ and describe the transformation from $y = x^3$.

Answer
(3)

(Total for Question 288 is 3 marks)



289 Sketching Reciprocal Graphs **GRAPHS** Non-calculator

For the graph of $y = \frac{4}{x}$: (a) find y when $x = 2$ and when $x = -8$ (b) write down the two lines the graph never meets.

Answer
(3)

(Total for Question 289 is 3 marks)

290 Solving Linear Simultaneous Equations Graphically **GRAPHS** Non-calculator

The lines $y = -x + 5$ and $y = 2x - 1$ are drawn on a grid. Work out the coordinates of the point where they cross.

Answer
(3)

(Total for Question 290 is 3 marks)



291 Problem Solving with Bearings**GEOMETRY**

Town B is 12 km due east of town A. Town C is 5 km due south of town B. Work out (a) the distance AC (b) the bearing of C from A, to 1 decimal place.

Answer
(4)

(Total for Question 291 is 4 marks)

292 Surface Area of Composite Shapes**GEOMETRY**

A solid is made from a cylinder of radius 3 cm and height 10 cm with a hemisphere of radius 3 cm on top. Work out the total surface area. Give your answer in terms of π .

Answer
(4)

(Total for Question 292 is 4 marks)



293 Mean, Mode & Median from a Grouped Frequency Table

STATISTICS



Non-calculator

The times, t minutes, of 25 runners: $0 \leq t < 10$: 4 runners. $10 \leq t < 20$: 9. $20 \leq t < 30$: 7. $30 \leq t < 40$: 5. (a) Which class contains the median? (b) Work out an estimate for the mean.

Answer

(4)

(Total for Question 293 is 4 marks)**294 Comparing Data Using Box Plots**

STATISTICS



Non-calculator

Reaction times (ms). Group 1: min 200, LQ 250, median 310, UQ 380, max 450. Group 2: min 180, LQ 270, median 300, UQ 360, max 420. Compare the two groups.

Answer

(2)

(Total for Question 294 is 2 marks)

295 Drawing Box Plots **STATISTICS** Non-calculator

A data set has minimum 20, lower quartile 35, median 45, upper quartile 58 and maximum 75. Work out (a) the range (b) the interquartile range.

Answer
(2)

(Total for Question 295 is 2 marks)

296 Fractions with Negative Powers **NUMBER** Non-calculator

Evaluate $27^{-\frac{1}{3}}$

Answer
(3)

(Total for Question 296 is 3 marks)



297 Fundamentals of Functions

ALGEBRA



Non-calculator

$f(x) = 2x + 5$. Find x when $f(x) = 11$.

Answer
(3)

(Total for Question 297 is 3 marks)

298 Simplifying Algebraic Fractions

ALGEBRA



Non-calculator

Simplify $\frac{x^2 + 3x}{x}$

Answer
(3)

(Total for Question 298 is 3 marks)



299 Solving Harder Equations

ALGEBRA



Non-calculator

Solve $\frac{2x - 1}{3} = \frac{x + 2}{4}$

Answer
(3)

(Total for Question 299 is 3 marks)

300 Enlargements with Negative Integer Scale Factors

GEOMETRY



Non-calculator

A shape has area 8 cm^2 and is enlarged by scale factor -2 from a centre. What is the area of the enlarged shape? (Note: negative scale factor)

Answer
(3)

(Total for Question 300 is 3 marks)



301 Similar Areas**GEOMETRY**

Non-calculator

Two similar triangles have corresponding sides 4 cm and 6 cm. The smaller triangle has area 20 cm^2 . Work out the area of the larger triangle.

Answer
(3)

(Total for Question 301 is 3 marks)

302 Similar Volumes**GEOMETRY**

Non-calculator

Two similar cylinders have heights 4 cm and 6 cm. The smaller cylinder has volume 64 cm^3 . Work out the volume of the larger cylinder.

Answer
(3)

(Total for Question 302 is 3 marks)



303 Combining Ratios**RATIO AND PROPORTION** Non-calculator

$A : B = 2 : 3$ and $B : C = 4 : 5$. Write $A : B : C$ in its simplest form.

Answer
(3)

(Total for Question 303 is 3 marks)

304 Calculating Combinations**PROBABILITY** Non-calculator

3 shirts and 4 pairs of trousers. How many different outfits can be made?

Answer
(3)

(Total for Question 304 is 3 marks)



305 Independence

PROBABILITY



Non-calculator

$P(A) = 0.3$, $P(B) = 0.4$, $P(A \text{ and } B) = 0.12$. Show that A and B are independent.

Answer
(3)

(Total for Question 305 is 3 marks)

306 Benefits of IQR & Range

STATISTICS



Non-calculator

Test scores for two classes: Class P = 45, 50, 55, 60, 65, Class Q = 40, 55, 60, 65, 80.
Calculate range and IQR for each. Which statistic better shows which class has more consistent performance?

Answer
(3)

(Total for Question 306 is 3 marks)



307 Filling In Cumulative Frequency Tables

STATISTICS



Non-calculator

Heights (cm) of plants: 20-30, 30-40, 40-50, 50-60 with frequencies 8, 15, 20, 7. Fill cumulative frequency.

Answer
(3)

(Total for Question 307 is 3 marks)

308 Plotting Cumulative Frequency Graphs

STATISTICS



Non-calculator

The cumulative frequency table shows 40 test marks. ≤ 10 : 4. ≤ 20 : 12. ≤ 30 : 25. ≤ 40 : 34. ≤ 50 : 40. (a) How many students scored more than 30? (b) Which class contains the median?

Answer
(3)

(Total for Question 308 is 3 marks)



309 Calculating Acceleration using Speed-Time Graphs

GRAPHS



Non-calculator

A car accelerates from 10 m/s to 30 m/s in 5 seconds. Calculate the acceleration.

Answer
(3)

(Total for Question 309 is 3 marks)

310 Key Regions on Speed-Time Graphs

GRAPHS



Non-calculator

What does a horizontal line on a speed-time graph represent?

Answer
(3)

(Total for Question 310 is 3 marks)



311 Estimating Roots **NUMBER** Non-calculator

Estimate the cube root of 30 to 1 decimal place.

Answer
(4)

(Total for Question 311 is 4 marks)

312 Rearranging Harder Equations **ALGEBRA** Non-calculator

Make x the subject of $y = \frac{3x - 1}{x + 2}$

Answer
(4)

(Total for Question 312 is 4 marks)



313 Area of Triangles ($\frac{1}{2}ab\sin C$)

GEOMETRY



Non-calculator

Triangle ABC has $a = 12$ cm, $b = 9$ cm and $C = 60^\circ$. Find the exact area.

Answer
(4)

(Total for Question 313 is 4 marks)

314 Capture-Recapture

STATISTICS



Non-calculator

20 birds tagged. Second sample of 60, 4 are tagged. Estimate the population.

Answer
(4)

(Total for Question 314 is 4 marks)



315 Shading Regions with Graphical Inequalities

GRAPHS

 Non-calculator

List all the points with whole-number coordinates (x, y) that satisfy $x > 0$, $y > 0$ and $x + y < 4$.

Answer
(2)

(Total for Question 315 is 2 marks)

316 Sketching Exponential Graphs

GRAPHS

 Non-calculator

Complete the table of values for $y = 3^x$ for $x = -1, 0, 1, 2, 3$.

Answer
(2)

(Total for Question 316 is 2 marks)

317 Bounds & Error Intervals Involving Calculations

NUMBER

 Non-calculator

$p = 4.6$, $q = 2.3$ both correct to 1 d.p. Find the upper bound of $p \times q$

Answer
(3)

(Total for Question 317 is 3 marks)



318 Fractional Powers

NUMBER



Non-calculator

Evaluate $16^{\frac{3}{4}}$ Answer
(3)

(Total for Question 318 is 3 marks)

319 Rationalising of the Form $\sqrt{A}$

NUMBER



Non-calculator

Rationalise the denominator of $\frac{10}{\sqrt{5}}$ Answer
(3)

(Total for Question 319 is 3 marks)



320 Six Laws of Surds

NUMBER



Non-calculator

Simplify $\sqrt{3} \times \sqrt{12}$ Answer
(3)

(Total for Question 320 is 3 marks)

321 Writing Fractions as Recurring Decimals

NUMBER



Non-calculator

Convert $\frac{5}{6}$ to a recurring decimal.Answer
(3)

(Total for Question 321 is 3 marks)



322 Composite Functions

ALGEBRA



Non-calculator

$f(x) = x^2 + 1$, $g(x) = 2x$. Find $fg(x)$.

Answer
(3)

(Total for Question 322 is 3 marks)

323 Equating Coefficients

ALGEBRA



Non-calculator

Find a and b such that $a(x + 2) + b(x - 1) \equiv 5x + 1$

Answer
(3)

(Total for Question 323 is 3 marks)



324 Iteration Equations

ALGEBRA

 Calculator

Use $x_{n+1} = \sqrt{5x_n + 2}$ with $x_0 = 3$. Find x_1 , x_2 and x_3 to 3 d.p.

Answer
(3)

(Total for Question 324 is 3 marks)

325 Proof with Even Numbers

ALGEBRA

 Non-calculator

Prove that if n is even, then $n^2 + 2n$ is a multiple of 4.

Answer
(3)

(Total for Question 325 is 3 marks)

326 Proof with Odd Numbers **ALGEBRA** Non-calculator

Prove that the square of an odd number is always odd.

Answer
(3)

(Total for Question 326 is 3 marks)

327 Proof with Square Numbers **ALGEBRA** Non-calculator

Prove that 4 times any square number, plus 1, is always odd.

Answer
(3)

(Total for Question 327 is 3 marks)



328 Calculating Side Lengths using $\frac{1}{2}ab\sin C$

GEOMETRY

 Calculator

Area = 42 cm^2 , sides a and 12 , angle between = 45° . Find side a (to 1 d.p.).

Answer
(3)

(Total for Question 328 is 3 marks)

329 Combining the Cosine Rule with Other Rules

GEOMETRY

 Non-calculator

Find the area of a triangle with sides 9 , 12 and 15 .

Answer
(3)

(Total for Question 329 is 3 marks)



330 Finding Angles Using the Sine Rule **GEOMETRY** Calculator

In triangle ABC, $a = 9$, $c = 7$, $C = 35^\circ$. Find angle A.

Answer
(3)

(Total for Question 330 is 3 marks)

331 Finding Angles using the Cosine Rule **GEOMETRY** Non-calculator

In triangle ABC, $a = 12$, $b = 15$, $c = 9$. Find angle B.

Answer
(3)

(Total for Question 331 is 3 marks)



332 Finding Side Lengths using the Cosine Rule

GEOMETRY

 Calculator

In triangle ABC, $BC = 7$ cm, $AC = 9$ cm and angle $C = 60^\circ$. Work out the length of AB. Give your answer to 1 decimal place.

Answer
(3)

(Total for Question 332 is 3 marks)

333 Finding Side Lengths using the Sine Rule

GEOMETRY

 Calculator

In triangle ABC, angle $A = 40^\circ$, angle $B = 75^\circ$ and $BC = 8$ cm. Work out the length of AC. Give your answer to 1 decimal place.

Answer
(3)

(Total for Question 333 is 3 marks)



334 Finding the Area of a Parallelogram

GEOMETRY

 Calculator

A parallelogram has an area of 80 cm^2 . One side is 10 cm and the angle is 40° . Find the other side.

Answer
(3)

(Total for Question 334 is 3 marks)

335 Fundamentals of the Cosine Rule

GEOMETRY

 Calculator

In triangle ABC, $AB = 8 \text{ cm}$, $AC = 11 \text{ cm}$ and angle $A = 50^\circ$. Work out the length of BC. Give your answer to 1 decimal place.

Answer
(3)

(Total for Question 335 is 3 marks)



336 Fundamentals of the Sine Rule

GEOMETRY

 Calculator

In triangle ABC, angle A = 70° , angle C = 50° and BC = 12 cm. Work out the length of AB.
Give your answer to 1 decimal place.

Answer
(3)

(Total for Question 336 is 3 marks)

337 Using the Area Rule with Isosceles Triangles

GEOMETRY

 Calculator

The area of an isosceles triangle is 60 cm^2 . The two equal sides are 12 cm. Find the angle between them.

Answer
(3)

(Total for Question 337 is 3 marks)



338 Volume of Frustums **GEOMETRY** Non-calculator

A frustum of a cone has bottom radius 9 cm, top radius 3 cm, and height 10 cm. Calculate the volume.

Answer
(3)

(Total for Question 338 is 3 marks)

339 Algebraic Direct Proportion **RATIO AND PROPORTION** Non-calculator

y is directly proportional to $\sqrt{x}$. When $x = 16$, $y = 12$. Find y when $x = 25$.

Answer
(3)

(Total for Question 339 is 3 marks)

340 Algebraic Inverse Proportion**RATIO AND PROPORTION**

Non-calculator

y is inversely proportional to x^2 . When $x = 2$, $y = 5$. Find y when $x = 4$.

Answer
(3)

(Total for Question 340 is 3 marks)

341 Finding the Initial Amount**RATIO AND PROPORTION**

Non-calculator

After a 15% decrease, a value is £425. Find the original value.

Answer
(3)

(Total for Question 341 is 3 marks)



342 Combinations Problem Solving**PROBABILITY**

Non-calculator

There are 120 different outfits possible using shirts, trousers and hats. There are 4 shirts and 6 trousers. How many hats are there?

Answer
(3)

(Total for Question 342 is 3 marks)

343 Sets & Inequalities**PROBABILITY**

Non-calculator

Solve $3x - 5 > 10$ and express as a set inequality.

Answer
(3)

(Total for Question 343 is 3 marks)



344 Cumulative Frequency Median & IQR

STATISTICS



Non-calculator

60 times were recorded. Cumulative frequencies: up to 10 s, 6. Up to 20 s, 15. Up to 30 s, 30. Up to 40 s, 45. Up to 50 s, 54. Up to 60 s, 60. Use the table to write down (a) the median (b) the interquartile range.

Answer
(3)

(Total for Question 344 is 3 marks)

345 Average Gradients of Lines

GRAPHS



Non-calculator

Find the average gradient of $y = x^2$ between $x = 0$ and $x = 4$.

Answer
(3)

(Total for Question 345 is 3 marks)



346 Calculating Total Distance Travelled Using Speed-Time Graphs

GRAPHS



Non-calculator

A car speeds up steadily from rest to 12 m/s in 4 seconds. It travels at 12 m/s for 12 seconds, then slows steadily to rest in 4 seconds. Work out the total distance travelled.

Answer
(3)

(Total for Question 346 is 3 marks)

347 General Form of the Equation of a Circle

GRAPHS



Non-calculator

Convert $x^2 + y^2 + 4x - 6y - 12 = 0$ to standard form and find the centre and radius.

Answer
(3)

(Total for Question 347 is 3 marks)



348 Identifying the Roots of a Quadratic from a Graph

GRAPHS



Non-calculator

How many real roots does $x^2 - 6x + 9 = 0$ have? Explain your answer.

Answer
(3)

(Total for Question 348 is 3 marks)

349 Instantaneous Gradients of Lines

GRAPHS



Non-calculator

Explain the difference between average gradient and instantaneous gradient using the curve.

Answer
(3)

(Total for Question 349 is 3 marks)



350 Properties of Perpendicular Lines

GRAPHS



Non-calculator

Find the equation of the line perpendicular to $y = 2x + 1$ that passes through $(4, 3)$.

Answer
(3)

(Total for Question 350 is 3 marks)

351 Sketching Circles

GRAPHS



Non-calculator

Find the points where the circle $(x + 3)^2 + (y - 2)^2 = 25$ crosses the y-axis.

Answer
(3)

(Total for Question 351 is 3 marks)



352 Sketching Linear Inequalities

GRAPHS



Non-calculator

Write down the three inequalities that describe the triangle with vertices $(0, 0)$, $(4, 0)$ and $(0, 4)$, including its edges.

Answer
(3)

(Total for Question 352 is 3 marks)

353 Solving Quadratic Simultaneous Equations Graphically

GRAPHS



Non-calculator

Find where $y = x^2 - 4x + 3$ intersects with $y = -x + 1$.

Answer
(3)

(Total for Question 353 is 3 marks)



354 Turning Points of Quadratics

GRAPHS



Non-calculator

Find the turning point of $y = x^2 + 4x + 1$ by completing the square.

Answer
(3)

(Total for Question 354 is 3 marks)

355 x Intercepts of Quadratics

GRAPHS



Non-calculator

Find the roots of $y = x^2 + 2x - 8$

Answer
(3)

(Total for Question 355 is 3 marks)



356 y Intercepts of Quadratics

GRAPHS



Non-calculator

Find the y-intercept of $y = x^2 - 9$

Answer
(3)

(Total for Question 356 is 3 marks)

357 Expanding Brackets with Surds

NUMBER



Non-calculator

Expand and simplify $(3 + \sqrt{2})^2$

Answer
(4)

(Total for Question 357 is 4 marks)



358 Writing Recurring Decimals as Fractions

NUMBER



Non-calculator

Express $0.\dot{4}$ as a fraction in its simplest form.

Answer
(4)

(Total for Question 358 is 4 marks)

359 Expanding Triple Brackets

ALGEBRA



Non-calculator

Expand and simplify $(x-2)^3$

Answer
(4)

(Total for Question 359 is 4 marks)



360 Inverse Functions **ALGEBRA** Non-calculator

$$f(x) = \frac{x+1}{2} \text{ Find } f^{-1}(x)$$

Answer
(4)

(Total for Question 360 is 4 marks)

361 Nth Term of Quadratic Sequences **ALGEBRA** Non-calculator

Find the nth term of 0, 3, 8, 15, 24, ...

Answer
(4)

(Total for Question 361 is 4 marks)



362 Solving Quadratics by Factorising (a>1)

ALGEBRA



Non-calculator

Solve by factorising $6x^2 + x - 2 = 0$

Answer
(4)

(Total for Question 362 is 4 marks)

363 Solving Quadratics with the Quadratic Formula

ALGEBRA



Non-calculator

Solve $3x^2 + 2x - 4 = 0$ Give answers in surd form.

Answer
(4)

(Total for Question 363 is 4 marks)



364 Calculating Area Using $\frac{1}{2}ab\sin C$

GEOMETRY



Non-calculator

Triangle with sides 12 and 9 with included angle 60° . Find the exact area.

Answer
(4)

(Total for Question 364 is 4 marks)

365 Surface Area of Frustums

GEOMETRY



Calculator

A frustum of a cone has bottom radius 10 cm, top radius 6 cm and curved surface area $192\pi \text{ cm}^2$. (a) Work out the slant height. (b) Work out the total surface area in terms of π .

Answer
(4)

(Total for Question 365 is 4 marks)



366 Full Process for Sketching Quadratics

GRAPHS



Non-calculator

For $y = x^2 - 4$, find the roots, the coordinates of the vertex and the line of symmetry.

Answer

(4)

(Total for Question 366 is 4 marks)**367 Combining the Sine Rule with Other Rules**

GEOMETRY



Calculator

Triangle ABC has $AB = 9$ cm, angle $A = 72^\circ$ and angle $B = 54^\circ$. (a) Work out the length of BC. (b) Work out the area of the triangle. Give your answers to 1 decimal place.

Answer

(5)

(Total for Question 367 is 5 marks)

368 Conditional Probability with Two-Way Tables

PROBABILITY



Non-calculator

80 people were asked what they drink. 45 drink tea. 35 of the tea drinkers are adults. One of the tea drinkers is chosen at random. Work out the probability that they are an adult.

Answer
(2)

(Total for Question 368 is 2 marks)

369 Sketching Histograms

STATISTICS



Non-calculator

Work out the frequency density of each class. 0 to 2: frequency 12. 2 to 8: frequency 30. 8 to 12: frequency 20. 12 to 15: frequency 9.

Answer
(2)

(Total for Question 369 is 2 marks)

370 Interpreting Histograms

STATISTICS



Non-calculator

A histogram shows masses, m kg. $0 < m \leq 2$: frequency density 3.5. $2 < m \leq 5$: frequency density 2. $5 < m \leq 10$: frequency density 1.2. Work out the frequency of each class.

Answer
(3)

(Total for Question 370 is 3 marks)

371 Combining Upper & Lower Bounds

NUMBER

 Calculator

Density = mass $\div$ volume. Mass = 45 g (2 s.f.) Volume = 12 cm³ (2 s.f.) Find the lower bound of the density.

Answer
(4)

(Total for Question 371 is 4 marks)

372 Simplifying Surds

NUMBER

 Non-calculator

Simplify $3\sqrt{8} + 2\sqrt{2}$

Answer
(4)

(Total for Question 372 is 4 marks)

373 Algebraic Fractions Involving Factorising

ALGEBRA



Non-calculator

Simplify $\frac{x^2 - 4}{x^2 + 4x + 4}$

Answer
(4)

(Total for Question 373 is 4 marks)

374 Multiplying & Dividing Algebraic Fractions

ALGEBRA



Non-calculator

Simplify $\frac{x+1}{x} \times \frac{x^2}{x+1}$

Answer
(4)

(Total for Question 374 is 4 marks)



375 Proof with Consecutive Numbers

ALGEBRA



Non-calculator

Prove that the sum of the squares of two consecutive integers is always odd.

Answer
(4)

(Total for Question 375 is 4 marks)

376 3D Pythagoras

GEOMETRY



Calculator

A cube has side length 5 cm. Find the length of the face diagonal.

Answer
(4)

(Total for Question 376 is 4 marks)



377 Circle Theorems

GEOMETRY



Non-calculator

A circle has a tangent at point T. The radius OT is perpendicular to the tangent. A chord from T makes an angle of 40° with the tangent. What angle does this chord subtend at the centre?

Answer
(4)

(Total for Question 377 is 4 marks)

378 Combining Circle Theorems

GEOMETRY



Non-calculator

In a circle, angle in a semicircle is 90° . If a chord makes an angle of 25° with a diameter at one endpoint, what angle does it make with the tangent at that point?

Answer
(4)

(Total for Question 378 is 4 marks)



379 Direct & Inverse Proportion with Functions

RATIO AND PROPORTION



Non-calculator

$y \propto x^3$. When $x = 2$, $y = 40$. Find y when $x = 3$.

Answer
(4)

(Total for Question 379 is 4 marks)

380 Conditional Probability with Tree Diagrams

PROBABILITY



Non-calculator

A coin is biased. $P(\text{Head}) = \frac{2}{3}$, $P(\text{Tail}) = \frac{1}{3}$. Flip twice. Find $P(\text{first flip Head} \mid \text{at least one Head})$.

Answer
(4)

(Total for Question 380 is 4 marks)

381 Conditional Probability with Venn Diagrams

PROBABILITY



Non-calculator

Cards in a deck: 52 total. Red (R) = 26, Face card (F) = 12, Red and Face = 6. If card is red, find P(is face card).

Answer
(4)

(Total for Question 381 is 4 marks)

382 Calculating Values of Trig Functions Using Graphs

GRAPHS



Calculator

Write down the exact value of $\tan 60^\circ$. Give it to 2 decimal places as well.

Answer
(4)

(Total for Question 382 is 4 marks)



383 Reflections in the x & y Axis **GRAPHS** Non-calculator

The curve $y = f(x)$ has a maximum at $(3, 7)$. State the coordinates of the maximum of $y = -f(x)$.

Answer
(4)

(Total for Question 383 is 4 marks)

384 Sketching sin, cos & tan **GRAPHS** Non-calculator

Write down the period and amplitude of $y = \sin x$.

Answer
(4)

(Total for Question 384 is 4 marks)



385 Solving Trigonometric Equations Using A Graph

GRAPHS



Non-calculator

Solve $\sin x = -0.5$ for $0^\circ \leq x \leq 360^\circ$.

Answer
(4)

(Total for Question 385 is 4 marks)

386 Transforming Trigonometric Graphs

GRAPHS



Non-calculator

Describe the transformation that maps $y = \cos x$ to $y = \cos(x - 60^\circ)$.

Answer
(4)

(Total for Question 386 is 4 marks)



387 Translations in the x & y Axis

GRAPHS



Non-calculator

The curve $y = \sqrt{x}$ is translated to have vertex at (5, 3). What is the new equation?

Answer
(4)

(Total for Question 387 is 4 marks)

388 Change of Signs

ALGEBRA



Non-calculator

Show that $x^3 + x - 5 = 0$ has a root between $x = 1$ and $x = 2$.

Answer
(5)

(Total for Question 388 is 5 marks)



389 Solving Quadratic Simultaneous Equations

ALGEBRA

 Non-calculator

Solve simultaneously: $x^2 + y^2 = 25$, $y = x + 1$

Answer
(5)

(Total for Question 389 is 5 marks)



390 Solving Quadratics by Completing the Square (a=1)

ALGEBRA

 Non-calculator

Write in the form $(x + a)^2 + b$ and hence solve $x^2 - 8x + 10 = 0$

Answer
(5)

(Total for Question 390 is 5 marks)



391 3D Trigonometry

GEOMETRY

 Calculator

A cube has side 6 cm. Find the angle between the space diagonal and the base.

Answer
(5)

(Total for Question 391 is 5 marks)



392 Median from a Histogram

STATISTICS



Non-calculator

Histogram of 180 data points. Cumulative: 0-5 (25), 5-10 (70), 10-15 (140), 15-20 (180).
Estimate the median.

Answer
(5)

(Total for Question 392 is 5 marks)



393 Sketching Quadratic Inequalities

GRAPHS



Non-calculator

Solve $x^2 - 9 \geq 0$ and represent on a number line.

Answer

(5)

(Total for Question 393 is 5 marks)

394 Rationalising of the Form $A + \sqrt{B}$

NUMBER



Non-calculator

Rationalise $\frac{\sqrt{5} + 1}{\sqrt{5} - 1}$

Answer

(4)

(Total for Question 394 is 4 marks)

395 Solving Quadratic Inequalities ALGEBRA Non-calculatorSolve $(x - 1)(x + 2) > 0$.Answer
(4)

(Total for Question 395 is 4 marks)

396 Solving Quadratics By Completing the Square ($a > 1$) ALGEBRA Non-calculatorWrite in the form $a(x + p)^2 + q$: $3x^2 + 6x - 1$ Answer
(4)

(Total for Question 396 is 4 marks)



397 Vector Ratio Problems

GEOMETRY



Non-calculator

OACB is a parallelogram. $OA = a$ and $OB = b$. P divides AC in the ratio 2:3. Find OP.

Answer
(4)

(Total for Question 397 is 4 marks)

398 Estimating Areas Under Curves

GRAPHS



Non-calculator

Use 3 trapeziums of equal width to estimate the area under $y = x^2 + 1$ between $x = 0$ and $x = 6$.

Answer
(4)

(Total for Question 398 is 4 marks)



399 Finding Equations of Tangents to Circles

GRAPHS



Non-calculator

Find the equation of the tangent to $x^2 + y^2 = 10$ at the point $(-1, -3)$.

Answer
(4)

(Total for Question 399 is 4 marks)

400 Vectors Along a Straight Line

GEOMETRY



Non-calculator

$OA = 2a + 3b$, $OB = 6a + 9b$, $OC = 10a + 15b$. Show that A, B and C are collinear.

Answer
(5)

(Total for Question 400 is 5 marks)



Your score

TOTAL MARKS

/ 1004

MARKS	PERCENTAGE	WORKING AT (ESTIMATE)
0 to 401	0 to 39%	Working towards Grade 4
402 to 602	40 to 59%	Around Grade 4/5
603 to 803	60 to 79%	Around Grade 6/7
804 to 1004	80 to 100%	Around Grade 8/9



This is an estimate, not an official grade boundary. Exam boards set real boundaries for each paper after it is sat, and they change every year. Use the band as a rough guide, and the red topics on your checklist as the plan.



Answers

1 BIDMAS with Numbers

Brackets first: $3 + 5 = 8$

Answer: $24 \div 8 = 3$

3 Ordering Negatives

Negatives smallest: $-9 < -4 < -1$

Then zero: 0

Then positive: 2

Complete order: $-9 < -4 < -1 < 0 < 2$

Answer: -9, -4, -1, 0, 2

5 Angle Notation

The angle at vertex E is written as angle DEF or $\angle DEF$.

Answer: The vertex (E) is always the middle letter.

7 Identifying 3D Shapes

Cylinder

Answer: It has 2 flat circular faces and 1 curved surface.

9 The Four Quadrants

The point $(-2, 0)$ lies on the x-axis, 2 units to the left of the origin. Points with y-coordinate 0 always lie on the x-axis.

Answer: The point $(-2, 0)$ lies on the x-axis, 2 units to the left of the origin. Points with y-coordinate 0 always lie on the x-axis.

11 Interpreting Pictographs

$3.5 \times 4 = 14$

Answer: 14 people

13 Adding Integers

Ones: $6 + 7 = 13$ (write 3, carry 1)

Tens: $0 + 9 + 1 = 10$ (write 0, carry 1)

Hundreds: $5 + 3 + 1 = 9$

Thousands: $4 + 2 = 6$

Answer: 6,903

2 Ordering Decimals

0.607: tenths=6, hundredths=0

0.67: tenths=6, hundredths=7

0.7: tenths=7

Order: $0.076 < 0.607 < 0.67 < 0.7$

Answer: 0.076, 0.607, 0.67, 0.7

4 Ordering Whole Numbers

Compare thousands: both are 4 (equal)

Compare hundreds: 0 vs 9

$9 > 0$

Answer: 4,909 is larger

6 Faces, Edges & Vertices

A pentagonal prism has:

Answer: 7 faces, 15 edges, 10 vertices

8 Lines of Symmetry

A regular hexagon has 6 lines of symmetry:

3 through opposite vertices

Answer: 3 through midpoints of opposite sides

10 Types of Angles

$35^\circ < 90^\circ$: acute

$90^\circ < 135^\circ < 180^\circ$: obtuse

$270^\circ > 180^\circ$: reflex

Answer: (a) acute (b) obtuse (c) reflex

12 Adding & Subtracting Negatives

Start at 8

Subtract -3 is same as add +3

Answer: 11

14 Bus Stop Method for Division

9 into 4 doesn't go, carry the 4.

9 into 46 = 5 remainder 1, carry the 1.

9 into 18 = 2.

Answer: 52



Answers (continued)

15 Bus Stop Method with Large Numbers

$$25 = 5 \times 5$$

$$4,725 \div 5 = 945$$

Answer: $945 \div 5 = 189$

17 Finding a Fraction of an Amount

$$64 \div 8 = 8$$

$$3 \times 8 = 24$$

Answer: 24 kg

19 Integers & Non Integers

$$7.2 + 3.8 = 11$$

11 is a whole number

Answer: Yes, the answer is an integer

21 Multiplying & Dividing Negatives

Negative $\div$ Positive = Negative

Answer: $-24 \div 8 = -3$

23 Rounding to Nearest Power of 10

Look at the hundreds digit: 5

Since $5 \geq 5$, round up

$$17,000 \rightarrow 18,000$$

Answer: 18,000

25 Squaring & Square Rooting

$$12^2 \text{ means } 12 \times 12$$

$$12 \times 12 = 144$$

Answer: 144

27 Truncating Decimals

Keep 1 decimal place: 0.9

Remove everything after: 0.9__

Answer: 0.9

16 Column Method for Multiplication

$$1,245 \times 3 = 3,735$$

$$1,245 \times 10 = 12,450$$

Answer: $3,735 + 12,450 = 16,185$

18 Grid Method for Multiplication

$$100 \times 7 = 700$$

$$20 \times 7 = 140$$

$$4 \times 7 = 28$$

Answer: $700 + 140 + 28 = 868$

20 Lattice Method for Multiplication

$$123 \times 40 = 4,920$$

$$123 \times 5 = 615$$

Answer: $4,920 + 615 = 5,535$

22 Rounding to Decimal Places

Look at 2 decimal places: 0, 8

Look at 3rd decimal place: 4

Since $4 < 5$, round down (no change)

0.08 stays as 0.08

Answer: 0.08

24 Simplifying Fractions

$$\text{HCF of } 24 \text{ and } 36 = 12$$

$$24 \div 12 = 2, 36 \div 12 = 3$$

Answer: $\frac{2}{3}$

26 Subtracting Integers

$$\text{Ones: } 10 - 7 = 3$$

$$\text{Tens: } 9 - 6 = 3$$

$$\text{Hundreds: } 9 - 5 = 4$$

$$\text{Thousands: } 9 - 4 = 5$$

Answer: 5,433

28 Writing Fractions as Mixed Numbers

$$17 \div 5 = 3 \text{ remainder } 2$$

Answer: $3\frac{2}{5}$



Answers (continued)

29 Collecting Like Terms

Group like terms

$$y^2 \text{ terms: } -3y^2 + y^2 = -2y^2$$

$$y \text{ terms: } 6y + 2y = 8y$$

Combine

$$\text{Answer: } -2y^2 + 8y$$

31 Understanding Key Vocabulary

Consider (b) $2xy$

(b) is a single term with no + or - separators

(b) has 1 term

Consider (c) $a^2 + 3a - 7$

Answer: (c) has 3 terms: a^2 , $3a$, and -7

33 Angles on a Straight Line

$$50^\circ + 70^\circ + x = 180^\circ$$

$$120^\circ + x = 180^\circ$$

$$\text{Answer: } x = 60^\circ$$

35 Area of Squares & Rectangles

$$48 = \text{length} \times 6$$

$$\text{length} = 48 \div 6 = 8$$

$$\text{Answer: } 8 \text{ cm}$$

37 Fundamentals of Congruence

No, they are not congruent.

Answer: Although both have sides 3 cm, a square has all 90° angles while a rhombus may have different angles. Congruence requires identical shape and size.

39 Opposite Angles

Opposite angle = 130° (vertically opposite angles are equal)

Adjacent angles = $180^\circ - 130^\circ = 50^\circ$ (angles on a straight line)

Answer: The four angles are: 130° , 50° , 130° , 50°

41 Perimeter of Squares & Rectangles

Rectangle with perimeter 30 cm and width 5 cm

$$\text{Perimeter} = 2(\text{length} + \text{width})$$

$$30 = 2(\text{length} + 5)$$

$$15 = \text{length} + 5$$

$$\text{Answer: length} = 10 \text{ cm}$$

30 Function Machines

Work backwards from output:

$$18 + 2 = 20$$

$$20 \div 5 = 4$$

$$\text{Answer: Input} = 4$$

32 Angles Round a Point

$$50^\circ + 70^\circ + 80^\circ + 90^\circ + y = 360^\circ$$

$$290^\circ + y = 360^\circ$$

$$\text{Answer: } y = 70^\circ$$

34 Area of Rhombuses & Parallelograms

Area = base $\times$ height

$$\text{Area} = 12 \times 4.5$$

$$\text{Answer: Area} = 54 \text{ cm}^2$$

36 Area of Triangles

Triangle with area 24 cm^2 and base 12 cm

$$\text{Area} = \left(\frac{1}{2}\right) \times \text{base} \times \text{height}$$

$$24 = \left(\frac{1}{2}\right) \times 12 \times \text{height}$$

$$24 = 6 \times \text{height}$$

$$\text{Answer: height} = 4 \text{ cm}$$

38 Identifying Regular Polygons

A regular polygon has all sides the same length and all angles the same size.

Answer: If either the sides or the angles are different, it is irregular.

40 Perimeter of Rhombuses & Parallelograms

Parallelogram with perimeter 36 cm, one side 11 cm

$$\text{Perimeter} = 2(11 + \text{other side})$$

$$36 = 2(11 + \text{other})$$

$$18 = 11 + \text{other}$$

$$\text{Answer: other side} = 7 \text{ cm}$$

42 Rotational Symmetry

A non-square rectangle has rotational symmetry of order 2 (it looks identical after rotating 180° and 360°).

Answer: A non-square rectangle has rotational symmetry of order 2 (it looks identical after rotating 180° and 360°).



Answers (continued)

43 Triangle Angle & Side Facts

Angle C = $180^\circ - 45^\circ - 65^\circ = 70^\circ$

Answer: 70°

45 Types of Quadrilaterals

A kite has 2 pairs of adjacent sides that are equal and one pair of equal opposite angles.

Answer: A trapezium has exactly one pair of parallel sides.

47 Volume of Cubes & Cuboids

Volume = $\text{side}^3 = 343$

Answer: 7 cm

49 Constructing Pictographs

$$35 \div 7 = 5$$

$$21 \div 7 = 3$$

Answer: (a) 5 (b) 3

51 Drawing Bar Charts

$$14 + 20 + 6 + 10 = 50$$

$$20 - 6 = 14$$

Answer: (a) 50 (b) 14

53 Drawing Stem & Leaf Diagrams

The stem is the first two digits, the leaf is the last digit

Answer: 10 | 3 5 8 · 11 | 2 5 8 · 12 | 15 8 · 13 | 5

55 Identifying Mistakes in Line Graphs

ERROR: Missing year 2022 on x-axis label.

Answer: The axis should show consecutive years: 2020, 2021, 2022, 2023, 2024. If data for 2022 doesn't exist, either: (1) leave gap on axis but note it, or (2) skip year entirely and relabel axis accordingly. Current format is confusing and misrepresents timeline.

44 Triangle Angle & Side Naming Conventions

Side XY is the side connecting vertices X and Y.

Answer: It is opposite to vertex Z.

46 Types of Triangles

$$180 - 40 = 140$$

$$140 \div 2 = 70$$

Answer: 70° and 70°

48 Fundamentals of Probability

$$\text{Not blue} = 3 + 2 = 5$$

$$P = \frac{5}{10} = \frac{1}{2}$$

Answer: $\frac{1}{2}$

50 Discrete & Continuous Data

Number of students is counted in whole numbers

Cannot have 3.7 students absent

Answer: This is discrete data

52 Drawing Line Graphs

Q1 to Q2: +500, Q2 to Q3: +700, Q3 to Q4: -400

Answer: Q2 to Q3, by £700

54 Identifying Mistakes in Bar Charts

The bar chart is missing a label on the y-axis (should say "Number of ice creams sold" or "Frequency") and has no title. A good bar chart needs labelled axes and a title so the reader knows what the data represents.

Answer: The bar chart is missing a label on the y-axis (should say "Number of ice creams sold" or "Frequency") and has no title. A good bar chart needs labelled axes and a title so the reader knows what the data represents.

56 Quantitative & Qualitative Data

Age: quantitative (numerical)

Weight: quantitative (numerical)

Answer: Name and Postcode: qualitative (descriptive)



Answers (continued)

57 Finding Fractions of Shapes

$$\frac{3}{4} \times 8 = 6$$

Answer: 6 sectors

59 Identifying Plans & Elevations

The plan is the view from above
6 cm by 4 cm

Answer: A rectangle 6 cm by 4 cm

61 Mode from a List

7 appears three times, more than any other value

Answer: 7

63 Adding Decimals

Line up decimal points: $0.456 + 1.380$
 $6+0=6$, $5+8=13$ carry 1, $4+3+1=8$, $0+1=1$

Answer: 1.836

65 Converting Improper Fractions to Decimals

Divide: $9 \div 5$
 $9.0 \div 5 = 1.8$

Answer: 1.8

67 Dividing Fractions

Keep, change, flip: $\frac{5}{8} \times \frac{4}{3}$
 $5 \times 4 = 20$, $8 \times 3 = 24$
 $\frac{20}{24} = \frac{5}{6}$

Answer: $\frac{5}{6}$

69 Finding the Highest Common Factor

$48 = 2^4 \times 3$
 $80 = 2^4 \times 5$

Answer: 16

71 Multiples & Factors

Multiples of 4: 4, 8, 12, 16, 20, 24...
Factors of 48: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

Answer: Both: 4, 8, 12, 16, 24 (any of these)

58 Drawing Inequalities on Number Lines

$x \leq -2$ includes -2

Answer: $-5, -4, -3, -2$

60 Identifying Biased Samples

People at a gym exercise more than most adults
So the sample does not represent everyone in the town

Answer: Gym users exercise more than the average adult (and 20 is a small sample)

62 Scatter Graph Fundamentals

As water goes up, height goes up

Answer: Positive correlation

64 Converting Decimals & Percentages

$0.075 \times 100 = 7.5$

Answer: 7.5%

66 Dividing Decimals

$$\begin{aligned} 7.2 \div 0.04 &= \frac{72}{10} \div \frac{4}{100} \\ &= \frac{72}{10} \times \frac{100}{4} \\ &= \frac{7200}{40} \end{aligned}$$

Answer: 180

68 Expressing as a Fraction

Unshaded $= 6 - 4 = 2$
 $\frac{2}{6} = \frac{1}{3}$

Answer: $\frac{1}{3}$

70 Finding the Lowest Common Multiple

Multiples of 5: 5, 10, 15, 20, 25, 30...
Multiples of 6: 6, 12, 18, 24, 30...
Multiples of 10: 10, 20, 30...

Answer: LCM = 30

72 Multiplying Decimals

$$\begin{aligned} 2.4 \times 1.3 &= \frac{24}{10} \times \frac{13}{10} \\ &= \frac{24 \times 13}{10 \times 10} \\ &= \frac{312}{100} \end{aligned}$$

Answer: 3.12



Answers (continued)

73 Multiplying Fractions

$$5 \times 3 = 15, 6 \times 10 = 60$$

$$\frac{15}{60} = \frac{1}{4}$$

Answer: $\frac{1}{4}$

75 Percentage Change

$$10\% = 60 \div 10 = 6$$

$$5\% = 6 \div 2 = 3$$

$$15\% = 6 + 3 = 9$$

$$\text{Sale price} = 60 - 9 = 51$$

Answer: £51

77 Powers Greater than Two

$$4^3 \text{ means } 4 \times 4 \times 4$$

$$= 16 \times 4$$

$$= 64$$

Answer: 64

79 Square, Cube & Prime Numbers

$$5^2 = 5 \times 5 = 25$$

$$3^3 = 3 \times 3 \times 3 = 27$$

Answer: $25 + 27 = 52$

81 Writing Decimals & Percentages as Fractions

$$0.125 = \frac{125}{1000}$$

Divide both by 125

Answer: $\frac{1}{8}$

83 Expanding Single Brackets

$$\text{Expand the second bracket: } 3(x - 1) = 3x - 3$$

$$\text{Combine: } 2x + 10 + 3x - 3$$

$$\text{Collect like terms: } 2x + 3x + 10 - 3$$

$$5x + 7$$

Answer: $5x + 7$

85 Fundamentals of Rearranging Equations

$$\text{Start with } v = u + at$$

$$\text{Subtract } u \text{ from both sides: } v - u = at$$

$$\text{Divide both sides by } a: (v - u)/a = t$$

Answer: $t = (v - u)/a$

74 One number as a Percentage of Another

$$\frac{18}{75} \times 100$$

$$= 24\%$$

Answer: 24%

76 Percentage of an Amount

$$\text{Calculation: } \left(\frac{40}{100}\right) \times 65$$

$$= 0.4 \times 65$$

$$= 26 \text{ kg}$$

Answer: 26 kg

78 Rounding to Significant Figures

Second s.f.: 7

Third s.f.: 8

Look at 4th s.f.: 4

Since $4 < 5$, round down

Answer: 27,800

80 Subtracting Decimals

Subtract from right to left:

$$3 - 8: \text{borrow from tenths, } 13 - 8 = 5$$

$$0 - 1 - 5: \text{borrow from units, } 9 - 5 = 4$$

$$7 - 1 - 4 = 2 \text{ (units)}$$

Answer: 2.45

82 Writing Fractions as Decimals & Percentages

$$\frac{4}{5} = 4 \div 5 = 0.8$$

Answer: $0.8 \times 100 = 80\%$

84 Fundamentals of Inequalities

$$\text{Add 3 to both sides: } 2x > 9$$

$$\text{Divide both sides by 2: } x > 4.5$$

Answer: $x > 4.5$

86 Fundamentals of Solving Equations

$$\text{Divide both sides by 2: } x + 3 = 7$$

$$\text{Subtract 3 from both sides: } x = 7 - 3$$

Answer: $x = 4$



Answers (continued)

87 Multiplying Algebraic Terms

Multiply the coefficients: $4 \times 3 = 12$

Multiply the a terms: $a^2 \times a = a^3$

Multiply the b terms: $b \times b^3 = b^4$

Answer: $12a^3b^4$

89 Substitution

Substitute $p = -2$ and $q = 5$

$$3(-2)^2 - 2(5)$$

$$3(4) - 10$$

$$12 - 10$$

Answer: 2

91 Angles in Quadrilaterals

Each angle in a rectangle is 90 degrees.

Answer: A rectangle is a quadrilateral where all angles are right angles.

93 Area of Trapeziums

$$\text{Area} = \left(\frac{1}{2}\right) \times (a + b) \times h$$

$$40 = \left(\frac{1}{2}\right) \times (6 + 10) \times h$$

$$40 = \left(\frac{1}{2}\right) \times 16 \times h$$

$$40 = 8h$$

Answer: height = 5 cm

95 Area of a Circle

$$78.5 = 3.14 \times r^2. \quad r^2 = \frac{78.5}{3.14} = 25. \quad r = 5 \text{ cm.}$$

Answer: 5 cm.

97 Circumference of a Circle

$$44 = \pi d. \text{ Using } \pi \approx \frac{22}{7}: 44 = \frac{22}{7} \times d.$$

Answer: 14 cm.

99 Corresponding Angles

Corresponding angles are equal: $x + 15 = 2x - 5$.

Solving: $15 + 5 = 2x - x$, so $x = 20^\circ$.

Answer: Angles are both 35° .

88 Substituting Into Real-Life Formulae

Substitute $a = 5$, $b = 8$, $h = 4$

$$A = \frac{1}{2}(5 + 8) \times 4$$

$$A = \frac{1}{2} \times 13 \times 4$$

$$A = \frac{1}{2} \times 52$$

Answer: $A = 26$

90 Alternate Angles

Alternate angles are equal: $3x = 120 - x$.

Solving: $4x = 120$, so $x = 30^\circ$.

Answer: Alternate angles are both 90° .

92 Angles in Triangles

$$6x = 150$$

$$x = 25$$

$$P = 2(25) + 10 = 60^\circ$$

$$Q = 3(25) - 5 = 70^\circ$$

Answer: 50°

94 Area of a Circle

$$\text{Area} = \pi r^2$$

$$78.5 = \pi r^2$$

$$r^2 = 78.5 \div \pi$$

$$r^2 = 24.98...$$

Answer: $r = 5.0 \text{ cm}$ (to 1 d.p.)

96 Area of a Semi Circle

Diameter = 1.2 m, so radius = 0.6 m

$$\text{Area} = (\pi r^2) \div 2$$

$$\text{Area} = (\pi \times 0.6^2) \div 2$$

$$\text{Area} = 0.36\pi \div 2$$

Answer: Area = 0.57 m^2 (to 2 d.p.)

98 Co-Interior Angles

Co-interior angles sum to 180° : $(3x + 5) + (2x + 25) = 180$.

Solving: $5x + 30 = 180$, so $5x = 150$, $x = 30^\circ$.

Answer: 30° .

100 External Angles in a Regular Polygon

Number of sides = $360^\circ \div 30^\circ = 12$ sides (dodecagon)

Answer: 12 sides (dodecagon)



Answers (continued)

101 Internal Angles in a Regular Polygon

For a regular octagon (8 sides):

$$\text{Sum of internal angles} = (8 - 2) \times 180^\circ = 6 \times 180^\circ = 1080^\circ$$

Answer: 135°

103 Measuring Bearings

$$70 + 180 = 250$$

Answer: 250°

105 Perimeter of a Semi Circle

$$\text{Radius} = 30 \text{ cm}$$

$$\text{Perimeter} = \pi r + 2r$$

$$\text{Perimeter} = \pi(30) + 2(30)$$

$$\text{Perimeter} = 30\pi + 60$$

Answer: Perimeter = 154 cm (to nearest cm)

107 Rotations

90° anticlockwise about origin: $(x, y) \rightarrow (-y, x)$.

Answer: $(-3, 2)$

109 Sketching Projections

Plan (from above): the square base, with lines from each corner to the apex in the centre

Front elevation: an isosceles triangle, base 4 cm, height 3 cm

Answer: (a) a 4 cm square with its diagonals (b) an isosceles triangle, base 4 cm, height 3 cm

111 Translations

Add 1 to each x , subtract 4 from each y

Answer: $P'(3, -3)$, $Q'(5, -1)$, $R'(4, -4)$

113 Density, Mass & Volume Calculations

$$\text{Volume} = \text{mass} \div \text{density}$$

Answer: 40 cm^3

115 Simple Interest

$$\text{Simple interest} = \text{PRT}/100$$

$$96 = (800 \times R \times 3)/100$$

$$96 = 2400R/100$$

$$9600 = 2400R$$

Answer: $R = 4\%$

102 Key Circle Terms

OB is a radius of the circle.

Answer: OB is a radius of the circle.

104 Perimeter of a Circle

$$\text{Circumference} = \pi d$$

$$20\pi = \pi d$$

Answer: $d = 20 \text{ cm}$

106 Reflections

Reflection in x -axis: $(x, y) \rightarrow (x, -y)$.

Answer: $(4, 2)$.

108 Scale Drawings

Scale ratio: 2 cm = 1 m. So 1 cm = 0.5 m.

Actual width = $10 \times 0.5 = 5 \text{ m}$.

Answer: $5 \text{ m} \times 3 \text{ m}$.

110 Surface Area of Cubes & Cuboids

$$\text{Surface area} = 6 \times \text{side}^2$$

$$150 = 6 \times \text{side}^2$$

$$\text{side}^2 = 25$$

Answer: side = 5 cm

112 Calculating Price Changes

$$\text{Decrease} = £80 - £60 = £20$$

Answer: 25%

114 Scaling Up Ratios

$$4 \text{ people} \rightarrow 200 \text{ g}$$

$$1 \text{ person} \rightarrow \frac{200}{4} = 50 \text{ g}$$

Answer: 10 people $\rightarrow 50 \times 10 = 500 \text{ g}$

116 Simplifying Ratios

$$1.5:2.5$$

Multiply both by 10 to remove decimals: 15:25

Find the GCD of 15 and 25: GCD = 5

Divide both by 5: $15 \div 5 : 25 \div 5$

Answer: 3:5



Answers (continued)

117 Speed, Distance & Time Calculations

Time = distance/speed

Answer: 3 hours

119 Writing Ratios as Fractions

Total parts = $3 + 7 = 10$

Answer: Fraction of first part = $\frac{3}{10}$

121 Fair Objects

If fair, each number should appear ~100 times

Expected frequency = $\frac{600}{6} = 100$

All results are close to 100

Answer: The dice appears to be fair

123 Median from a List

Order: 11, 12, 13, 14, 15, 16, 18

7 values, median is middle (4th)

Answer: Median = 14

125 Simple Random Sampling

Number the students 1 to 800

Use a random number generator to pick 40 different numbers

Choose those students

Answer: Number every student, then pick 40 different numbers at random

127 Sketching Straight Lines Using Tables

When $x = -1$: $y = -(-1) + 3 = 4$. When $x = 0$: $y = 3$.

When $x = 1$: $y = 2$. When $x = 2$: $y = 1$.

When $x = 3$: $y = 0$.

Answer: The line has gradient -1 and passes through (0, 3).

129 Mean, Mode, Median & Range from Stem & Leaf Diagrams

6th and 7th values: 63, 63 $\Rightarrow$ Median = 63

Range = $78 - 52 = 26$

Answer: Median 63, range 26

131 Adding & Subtracting Mixed Numbers

Subtract wholes: $4 - 2 = 2$

$$\frac{1}{2} - \frac{1}{3} = \frac{3}{6} - \frac{2}{6} = \frac{1}{6}$$

Answer: $2\frac{1}{6}$

118 Standard Unit Conversions

1 litre = 1000 ml

Answer: 2800 ml

120 Constructing Two Way Tables

Children = $60 - 35 = 25$

$25 - 10 = 15$

Answer: 15

122 Fundamentals of Two Way Tables

$85 - 30 - 35 = 20$

Answer: 20

124 Range from a List

Highest = 15

Lowest = -2

Answer: 17

126 Conversion Graphs

$20 \times 0.22 = 4.4$

Answer: 4.4 gallons

128 Vertical & Horizontal Lines

A vertical line has the form $x = a$ constant.

Answer: Since the line passes through (-2, 5), the x-coordinate is always -2. The equation is $x = -2$.

130 Mean from a List

Mean = $25 \div 5 = 5$

Median = middle value = 4

Mode = 4, Range = $8 - 2 = 6$

Answer: (a) 5 (b) 4 (c) 4 (d) 6

132 Adding Fractions

$$\frac{8}{12} + \frac{9}{12} = \frac{17}{12}$$

$$= 1\frac{5}{12}$$

Answer: $1\frac{5}{12}$



Answers (continued)

133 BIDMAS with Algebra

$$\begin{aligned}(a + b)^2 \\ = (3 + 2)^2 \\ = 5^2\end{aligned}$$

Answer: 25

135 Multiplying Mixed Numbers

$$16 \times 5 = 80, 5 \times 3 = 15$$

Answer: $5\frac{1}{3}$

137 Ordering Fractions

Common denominator = 120

$$\frac{7}{8} = \frac{105}{120}, \frac{5}{6} = \frac{100}{120}, \frac{4}{5} = \frac{96}{120}$$

Answer: Order: $\frac{7}{8}, \frac{5}{6}, \frac{4}{5}$

139 Powers of Zero & One

$100^0 = 1$ (anything to power 0 is 1)

$100^1 = 100$ (anything to power 1 is itself)

Add: $1 + 100 = 101$

Answer: 101

141 Subtracting Fractions

Common denominator = 8

$$\frac{1}{4} = \frac{2}{8}$$

Answer: $\frac{7}{8} - \frac{2}{8} = \frac{5}{8}$

143 Nth Term of Linear Sequences

Common difference $d = -3$

Answer: $-3n + 13$

145 Drawing Angles Bisectors

(1) Using the method from Q1, construct the angle bisector. (2) The bisector divides the 90° angle into two 45° angles. Each angle between the bisector and a side of the right angle is 45° .

Answer: (1) Using the method from Q1, construct the angle bisector. (2) The bisector divides the 90° angle into two 45° angles. Each angle between the bisector and a side of the right angle is 45° .

134 Dividing Mixed Numbers

Keep, change, flip: $\frac{9}{2} \times \frac{2}{3}$

Answer: $\frac{18}{6} = 3$

136 Ordering Fractions

Common denominator = 10

$$\frac{2}{5} = \frac{4}{10}, \frac{3}{10} = \frac{3}{10}, \frac{1}{2} = \frac{5}{10}$$

Answer: Order: $\frac{1}{2}, \frac{2}{5}, \frac{3}{10}$

138 Percentages Greater than 100

200% increase means new price is 300% of original

Calculation: 3×45

= 135

Answer: £135

140 Simplifying Powers

$$(c^3)^4 = c^{3 \times 4}$$

Answer: c^{12}

142 Expanding Double Brackets

$$2x^2 - 8x + x - 4$$

Answer: $2x^2 - 7x - 4$

144 Position to Term Rule Using Patterns

First differences: 3, 5, 7, 9

Second differences: 2, 2, 2 $\rightarrow n^2$ coefficient = 1

Sequence - n^2 : 1, 1, 1, 1

Answer: Rule: $n^2 + 1$

146 Drawing Perpendicular Bisectors

Open the compasses to more than half of AB

Draw arcs above and below the line from A, then from B, with the same radius

Join the two points where the arcs cross

Answer: Arcs from A and B with the same radius; join the crossing points



Answers (continued)

147 Drawing a 60 Degree Angle

$$60 + 60 = 120$$

The arcs make an equilateral triangle, and every angle in an equilateral triangle is 60°

Answer: (a) 120° (b) it makes an equilateral triangle

149 Drawing a Locus of All Points

The locus is the intersection of two circles: one centered at A with radius 4 cm, and one centered at B with radius 5 cm. They intersect at two points (if such intersection exists). Since $4 + 5 = 9 > 6$ and $|5 - 4| = 1 < 6$, the circles do intersect at two points.

Answer: $1 < 6$, the circles do intersect at two points.

151 Enlargements with Positive Integer Scale Factors

$$\text{Area scale factor} = SF^2 = 3^2 = 9.$$

Answer: 45 cm^2 .

153 Perimeter of Triangles

Isosceles triangle with two sides 8 cm, base 6 cm

$$\text{Perimeter} = 8 + 8 + 6$$

Answer: 22 cm

155 Area Conversions

$$1 \text{ km} = 1,000 \text{ m}$$

$$1 \text{ km}^2 = 1,000 \times 1,000 = 1,000,000 \text{ m}^2$$

Answer: $2 \text{ km}^2 = 2,000,000 \text{ m}^2$

157 Inverse Proportion Problems

$$\text{Total machine-hours} = 8 \times 5 = 40$$

Answer: 4 hours

159 Pressure, Force & Area Calculations

$$\text{Area} = \text{force/pressure}$$

Answer: 4 m^2

148 Drawing a 90 Degree Angle

With the compass point on P, draw arcs cutting AB on both sides of P

From each of those points, draw arcs with a larger radius that cross above P

Join P to the crossing point

Answer: Equal arcs either side of P; larger equal arcs crossing above P; join P to the crossing

150 Drawing a Perpendicular Line from a Point

With the compass point on P, draw an arc that cuts AB twice

From each of those two points, draw arcs (same radius) that cross on the other side of AB

Join P to where the arcs cross

Answer: Arc from P cutting AB twice; equal arcs from those points; join P to the crossing

152 Perimeter of Trapeziums

Isosceles trapezium: parallel sides 5 and 11 cm, slant sides 6 cm

$$\text{Perimeter} = 5 + 11 + 6 + 6$$

Answer: 28 cm

154 Using Pythagoras to Find a Hypotenuse

$$h^2 = 6^2 + 8^2 = 36 + 64 = 100$$

Answer: 10 cm

156 Direct Proportion Problems

$$\text{Cost per kg} = \frac{4.50}{3} = \text{£}1.50$$

Answer: $\text{£}10.50$

158 Like for Like Comparisons

$$\text{Brand A: } \frac{1.80}{2} = \text{£}0.90 \text{ per litre}$$

$$\text{Brand B: } \frac{4.00}{5} = \text{£}0.80 \text{ per litre}$$

Answer: Brand B is better value

160 Proportional Division

$$\text{Difference in parts} = 5 - 3 = 2 \text{ parts} = 20 \text{ sweets}$$

$$\text{One part} = \frac{20}{2} = 10 \text{ sweets}$$

$$\text{Total parts} = 5 + 3 = 8$$

Answer: 80



Answers (continued)

161 Using Ratio Differences

Difference = $5 - 2 = 3$ parts = 24

One part = $\frac{24}{3} = 8$

Answer: 40

163 Best Relative Frequency Estimates

50 spins: $\frac{18}{50} = 0.36$

500 spins: $\frac{162}{500} = 0.324$

Larger sample (500 spins) gives better estimate

Answer: 500 spins is better because larger sample size

165 Calculating Relative Frequency

Relative frequency = $\frac{24}{80} = \frac{3}{10} = 0.3$

Answer: 0.3

167 Expressing Probabilities in Different Forms

$70\% = \frac{70}{100} = \frac{7}{10}$

Answer: 0.7

169 Fundamentals of Frequency Trees

Boys = $150 - 90 = 60$

Boys who passed = 40

Answer: 20

171 Identifying Mistakes with Frequency Polygons

A frequency polygon plots each frequency at the class midpoint

The midpoints are 5, 15, 25, 35, 45

Answer: Yes: each point is at its class midpoint

173 Relative Frequency Graphs

$\frac{51}{300} = 0.17$

Fair: $\frac{1}{6} = 0.166\dots$

Answer: (a) 0.17 (b) very close to 1/6, so the dice looks fair

175 Working with Tally Charts

8 = one gate of 5, then 3

$\frac{6}{20} = \frac{3}{10}$

Answer: (a) |||| ||| (b) $\frac{3}{10}$

162 Volume Conversions

$1 \text{ m}^3 = 1000 \text{ litres}$

$0.8 \times 1000 = 800$

Answer: 800 litres

164 Calculating Probabilities

Letters: M-A-T-H-E-M-A-T-I-C-S (11 letters)

Vowels in MATHEMATICS: A, E, A, I (4 vowels)

Answer: $P(\text{vowel}) = \frac{4}{11}$

166 Expected Frequency

Expected frequency = $0.15 \times 80 = 12$ times

Answer: 12 times

168 Finding Probabilities with Frequency Trees

People with car who commute = 30

Total with car = 50

Answer: $\frac{3}{5}$

170 Sample Space Diagrams

Outcomes: HH, HT, TH, TT (4 total)

Exactly one head: HT, TH (2 outcomes)

Answer: $\frac{1}{2}$

172 Interpreting Ungrouped Frequency Tables

$3 + 7 + 10 + 5 + 2 = 27$

The highest frequency is 10, for size 6

Answer: (a) 27 (b) size 6

174 Sketching Frequency Polygons

Plot each frequency at the midpoint of its class

Answer: (15, 7), (25, 18), (35, 23), (45, 15), (55, 5)

176 Calculating the Gradient of a Line

Gradient = $\frac{-2-4}{3-(-1)} = \frac{-6}{4} = -\frac{3}{2}$

Answer: $-\frac{3}{2}$



Answers (continued)

177 Identifying if a Point is on a Line

$$x = 1: y = 4(1) - 3 = 1 \checkmark$$

$$x = 2: y = 4(2) - 3 = 5 \checkmark$$

$$x = 3: y = 4(3) - 3 = 9 \neq 8 \times$$

Answer: (1, 1) and (2, 5) lie on the line.

179 Midpoint of Two Points

$$\text{Midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$\frac{1 + x_2}{2} = 4 \rightarrow x_2 = 7$$

$$\frac{5 + y_2}{2} = 3 \rightarrow y_2 = 1$$

Answer: B = (7, 1)

181 Common Denominators

LCM of 8 and 5 = 40

$$\frac{3}{8} = \frac{15}{40}$$

$$\frac{2}{5} = \frac{16}{40}$$

$$\frac{16}{40} > \frac{15}{40}$$

Answer: $\frac{2}{5}$ is larger

183 Prime Factors & Factorisations

$$84 = 2 \times 42$$

$$42 = 2 \times 21$$

$$21 = 3 \times 7$$

$$84 = 2 \times 2 \times 3 \times 7$$

Answer: $2^2 \times 3 \times 7$

185 Factorising Single Brackets

Numeric HCF of 12 and 18 is 6

Variable HCF is a (the lowest power of a)

$$\text{HCF} = 6a$$

$$12a^2 + 18a = 6a(2a + 3)$$

Answer: $6a(2a + 3)$

187 Using Pythagoras to Find a Non-Hypotenuse Side

$$h^2 = 5^2 - 1.4^2 = 25 - 1.96 = 23.04$$

$$h = \sqrt{23.04} = 4.8$$

Answer: 4.8 m

178 Identifying the x & y Intercepts of a Straight Line

$$y\text{-intercept } (x = 0): y = 4(0) + 8 = 8 \rightarrow (0, 8)$$

Answer: -2 $\rightarrow$ (-2, 0)

180 Rearranging to the Form $y=mx+c$

$$5x + 2y - 10 = 0. \text{ Rearranging: } 2y = -5x + 10,$$

$$\text{so } y = -\frac{5}{2}x + 5.$$

Answer: The gradient is $-\frac{5}{2}$ and the y-intercept is 5.

182 Estimating Calculations

$$3.2 \approx 3$$

$$18.7 \approx 20$$

$$4.9 \approx 5$$

$$\text{Estimate: } 3 \times 20 + 5 = 60 + 5 = 65$$

Answer: 65

184 Standard Form Conversions

$$10^4 = 10,000$$

$$3.6 \times 10,000 = 36,000$$

Or: Move decimal 4 places right

$$3.6 \rightarrow 36,000$$

Answer: 36,000

186 Types of Sequences

These are $1^2, 2^2, 3^2, 4^2, 5^2$

This is the sequence of SQUARE NUMBERS.

First differences: 3, 5, 7, 9 (not constant)

Second differences: 2, 2, 2 (constant)

Answer: This is a QUADRATIC sequence.

188 Volume of Prisms

Volume = area of trapezoidal cross-section $\times$ length

$$= \left(\frac{1}{2} \times (5 + 9) \times 4 \right) \times 20$$

$$= \left(\frac{1}{2} \times 14 \times 4 \right) \times 20$$

$$= 28 \times 20$$

Answer: 560 cm^3



Answers (continued)

189 Time Conversions

From 09:45 to 11:20

From 09:45 to 10:00 is 15 minutes

From 10:00 to 11:00 is 1 hour = 60 minutes

From 11:00 to 11:20 is 20 minutes

Answer: 1 hour 35 minutes

191 Fundamentals of Tree Diagrams

$$\frac{5}{8} \times \frac{4}{7} = \frac{20}{56}$$

$$= \frac{5}{14}$$

Answer: $\frac{5}{14}$

193 Danger of Extrapolation

$$y = 2.5 \times 12 + 10 = 40$$

$x = 50$ is far outside the data (extrapolation)

Answer: (a) 40 (b) 50 is outside the range of the data

195 Mean, Mode, Median & Range from an Ungrouped Frequency Tables

$$4 \times 3 + 5 \times 7 + 6 \times 10 + 7 \times 5 + 8 \times 2 = 158$$

$$158 \div 27 = 5.85 \dots$$

Answer: 5.9

197 Constructing Tree Diagrams

$$(a) \frac{2}{5} \times \frac{3}{5} = \frac{6}{25}$$

$$(b) \frac{2}{5} \times \frac{2}{5} + \frac{3}{5} \times \frac{1}{4} = \frac{4}{25} + \frac{3}{20} = \frac{31}{100}$$

Answer: (a) $\frac{6}{25}$ (b) $\frac{31}{100}$

199 General Shape of a Quadratic

The coefficient of x^2 is negative, so the curve is an upside-down U

Answer: A maximum point, because the x^2 term is negative

201 Bounds & Error Intervals for Truncated Decimals

Truncated to 1 d.p. means $5.2 \leq \text{length} < 5.3$

Answer: Error interval: $5.2 \leq \text{length} < 5.3$

190 Constructing Frequency Trees

$$120 - 75 = 45$$

$$\frac{75}{200} = \frac{3}{8}$$

Answer: (a) 45 (b) $\frac{3}{8}$

192 Identifying Bias

A: 70 (much higher)

B: 45 (slightly lower)

C: 40 (much lower)

D: 45 (slightly lower)

Answer: Yes, appears biased - A appears too often, C too rarely

194 Lines of Best Fit & Predicting Values

$$\text{Gradient} = \frac{85-25}{35-10} = 2.4$$

$$y = 25 + 2.4 \times 12 = 53.8$$

Answer: 53.8 (accept about 54)

196 Sketching Straight Lines Using $y=mx+c$

The y-intercept (c) is -1,

so the line crosses the y-axis at (0, -1).

The gradient is $\frac{1}{3}$,

so for every 3 units right, go 1 unit up.

Answer: The line passes through (3, 0) and (6, 1).

198 Column Vectors & Vector Arithmetic

Multiply each component by 3

Answer: $\begin{pmatrix} 12 \\ -6 \end{pmatrix}$

200 Matching Shapes to Graphs

Same width all the way up, so the depth rises at the same rate

Answer: A straight line through the origin

202 Bounds Requiring Integer Values

$n \geq -2$ and $n < 4$ (integers)

Answer: $n = -2, -1, 0, 1, 2, 3$



Answers (continued)

203 Finding Bounds & Error Intervals

Rounding to nearest 10:

Lower bound: 195 m

Upper bound: 205 m

Answer: Error interval: $195 \leq \text{distance} < 205$

205 Negative Powers

$$3^{-3} = \frac{1}{27}$$

Answer: $3^{-3} = \frac{1}{27}$

207 Deciding if a Term is in a Sequence

Set $5n + 3 = 47$

$5n = 44$

$n = 8.8$

Answer: Since n is not a whole number, 47 is NOT a term in the sequence.

209 Proof by Counter Example

Counter example: $n = 4$

$$4^2 + 4 + 1 = 16 + 4 + 1 = 21$$

$$21 = 3 \times 7 \text{ (not prime)}$$

Answer: Therefore the statement is false.

211 Solving Quadratics by Factorising when $c=0$

Find the common factor: $2x$

$$2x(x - 4) = 0$$

Either $2x = 0$ or $x - 4 = 0$

Answer: 4

213 Applied Exact Trig Values Questions

$$\text{Simplify: } \frac{6}{\sqrt{3}} = \frac{6\sqrt{3}}{3} = 2\sqrt{3}$$

$$2x = 2\sqrt{3}$$

Answer: $x = \sqrt{3}$

215 Area of a Circle Sector

$$\text{Area} = \frac{45}{360} \times 3.14 \times 8^2 = \frac{1}{8} \times 3.14 \times 64$$

Answer: 25.12 cm^2 .

204 Multiplying & Dividing in Standard Form

Multiply the numbers: $5 \times 6 = 30$

Multiply the powers: $10^3 \times 10^5 = 10^8$

Result: $30 \times 10^8 = 3 \times 10^9$

Answer: 3×10^9

206 Rational & Irrational Numbers

a) $\sqrt{25} = 5 \rightarrow$ rational

b) $\sqrt{3}$ is a non-terminating, non-repeating decimal $\rightarrow$ irrational

c) $0.5 = \frac{1}{2} \rightarrow$ rational

Answer: d) π cannot be written as a fraction $\rightarrow$ irrational

208 Finding Terms in a Fibonacci Sequence

3, 1, 4, 5, 9, 14

Answer: Next 4 terms: 4, 5, 9, 14

210 Proof with Multiples

Let the three consecutive multiples of 5 be $5n$, $5(n+1)$, $5(n+2)$

$$\text{Sum} = 5n + 5n + 5 + 5n + 10 = 15n + 15 = 15(n + 1)$$

Answer: Since $15(n + 1)$ is a multiple of 15, the sum is always a multiple of 15.

212 Solving Single Inequalities

$$2x + 7 < 3$$

$$2x < 3 - 7$$

$$2x < -4$$

Answer: $x < -2$

214 Area of Compound Shapes

$$10 \times 4 = 40$$

$$4 \times 3 = 12$$

$$40 + 12 = 52$$

Answer: 52 cm^2

216 Calculating Scale Factor

$$\text{Area scale factor} = \frac{64}{16} = 4.$$

Answer: SF = 2.



Answers (continued)

217 Enlargements with Positive Fractional Scale Factors

Area scale factor = $SF^2 = (\frac{1}{2})^2 = \frac{1}{4}$.

Answer: 4.5 cm².

219 Finding Angles using SOH, CAH, TOA

$\tan x = \frac{7}{4} = 1.75$

Answer: 60.3° (1 d.p.)

221 Finding the Height of an Equilateral Triangle

Height: $h^2 = 8^2 - 4^2 = 64 - 16 = 48$

$h = \sqrt{48} = 6.928 \text{ cm}$

Answer: 27.7 cm² (1 d.p.)

223 Fundamentals of Vector Problems

$QR = QP + PR = -2a + 2b = 2b - 2a$

$QS = \frac{1}{2}QR = b - a$

Answer: a + b

225 Identifying Congruent Triangles

Corresponding angles are equal ($A = D = 50^\circ$, $B = E = 70^\circ$) and the side between them is equal ($AB = DE = 8 \text{ cm}$). By ASA (Angle-Side-Angle), triangle ABC $\cong$ triangle DEF.

Answer: 8 cm). By ASA (Angle-Side-Angle), triangle ABC $\cong$ triangle DEF.

227 Length of a Circle Arc

Arc length = $\frac{120}{360} \times 2\pi r$
 $= \frac{1}{3} \times 2 \times 3.14 \times 5$

Answer: $\frac{1}{3} \times 31.4 \approx 10.47 \text{ cm}$.

229 Surface Area of Prisms

Surface area = $2(8 \times 6 + 8 \times 4 + 6 \times 4)$

$= 2(48 + 32 + 24)$

$= 2(104)$

Answer: 208 cm²

218 Finding Angles of Elevation & Depression

$\tan \theta = \frac{20}{30} = 0.6667$

Answer: 33.7° (1 d.p.)

220 Finding Side Lengths of Compound Shapes

Using Pythagoras' theorem for the slant height:

$d^2 = 8^2 + 4^2 = 64 + 16 = 80$

Answer: $4\sqrt{5} \approx 8.94 \text{ cm}$

222 Fundamentals of SOH, CAH, TOA

$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{4}{5} = 0.8$

Answer: 0.8

224 Hand Method for Exact Trig Values

$\tan 45^\circ = 1$

Answer: $\tan 45^\circ = 1$

226 Invariant Points

A translation has no invariant points because every point moves by the same amount in the same direction.

Answer: A translation has no invariant points because every point moves by the same amount in the same direction.

228 Similar Side Lengths

Scale factor = 2. Corresponding side = $4 \times 2 = 8 \text{ cm}$.

Answer: 8 cm.

230 Surface Area of Pyramids

Base area = $10 \times 6 = 60 \text{ cm}^2$

Two triangular faces with base 10 and slant height 12: $2(\frac{1}{2} \times 10 \times 12) = 120 \text{ cm}^2$

Two triangular faces with base 6 and slant height 10: $2(\frac{1}{2} \times 6 \times 10) = 60 \text{ cm}^2$

Answer: 240 cm²



Answers (continued)

231 Surface Area of Spheres

$$\text{Surface area} = 4\pi r^2$$

$$144\pi = 4\pi r^2$$

$$36 = r^2$$

Answer: $r = 6$ cm

233 Applied Best Buys

Small: 55p/330 ml = 0.167p per ml

Medium: 80p/500 ml = 0.16p per ml

Large: 145p/1000 ml = 0.145p per ml

Answer: Large is best value

235 Converting Compound Measures

$$2.5 \text{ g/cm}^3 = 2.5 \times 1000 \text{ kg/m}^3$$

Answer: 2500 kg/m³

237 Percentage Multipliers

Increase multiplier = 1.125

Decrease multiplier = 0.92

$$£64 \times 1.125 \times 0.92 = £66.24$$

Answer: £66.24

239 Finding Probabilities with Tree Diagrams

$$P(\text{at least one correct}) = 1 - P(\text{both incorrect}) = 1 - \left(\frac{3}{4} \times \frac{3}{4}\right) = 1 - \frac{9}{16} = \frac{7}{16}. \text{ Or: } P(CC) + P(CI) + P(IC) = \frac{1}{16} + \frac{3}{16} + \frac{3}{16} = \frac{7}{16}.$$

Answer: $\frac{7}{16}$.

241 Finding Probabilities with Venn Diagrams

Students playing at least one sport = 70 + 50 + 40 = 160.

$$P(\text{at least one}) = \frac{160}{200} = \frac{4}{5} = 0.8.$$

Answer: 0.8.

243 Sets & Venn Diagrams

F only = 22 - 8 = 14. T only = 18 - 8 = 10. Both = 8.

Total playing at least one = 14 + 10 + 8 = 32.

Answer: 8.

245 Interpreting Pie Charts

$$\text{Fraction of red cars} = 72/360 = 1/5.$$

Answer: 30 cars.

232 Volume of Cylinders

$$\text{Volume} = \pi r^2 h$$

$$500\pi = \pi \times 5^2 \times h$$

$$500\pi = 25\pi h$$

Answer: 20 cm

234 Compound Interest

$$A = P(1 + r/100)^n$$

$$A = 200000(1.04)^5$$

$$A = 200000 \times 1.2166529$$

Answer: A = £243331 (to nearest £)

236 Currency Conversions

$$£ = € \div 1.15$$

$$£ = 92 \div 1.15$$

Answer: £ = £80

238 And/Or Rules

Using the addition rule: $P(A \text{ or } B)$

$$= P(A) + P(B) - P(A \text{ and } B)$$

Answer: 0.85

240 Finding Probabilities with Two Way Tables

$$\text{Walk} = 15 + 20 = 35$$

$$P = \frac{35}{60} = \frac{7}{12}$$

Answer: $\frac{7}{12}$

242 Fundamentals of Venn Diagrams

At least one = C only + both + T only = 6 + 12 + 8 = 26.

$$\text{Or: } |C \cup T| = |C| + |T| - |C \cap T| = 18 + 20 - 12 = 26.$$

Answer: 26.

244 Interpreting Grouped Frequency Tables

Median between the 15th and 16th values: $5 + 12 = 17 \geq 16$

Highest frequency: 12

Answer: (a) $10 < h \leq 20$ (b) $10 < h \leq 20$

246 Reverse Mean from a List

$$\text{Sum of 4 numbers} = 4 \times 10 = 40$$

$$\text{Sum of 3 numbers} = 3 \times 12 = 36$$

Answer: 4



Answers (continued)

247 Calculating Average Speed Using Distance Time Graphs

$$\text{Speed} = 8 \div 1.5 = 5.33 \dots$$

Answer: 5.3 km/h

249 Distance Between Two Points

$$d = \sqrt{5^2 + 12^2} = \sqrt{25 + 144}$$

Answer: 13 units

251 Equations of a Straight Line with a Point & a Gradient

$$y = mx + c$$

$$3 = \frac{1}{2}(4) + c \rightarrow 3 = 2 + c \rightarrow c = 1$$

Answer: Equation: $y = \frac{1}{2}x + 1$

253 Finding the Distance Between Two Points

$$d = \sqrt{5^2 + 12^2}$$

Answer: 13

255 Inverse Proportion Graphs

$$\text{The equation is } y = \frac{20}{x}.$$

$$\text{When } x = 5: y = \frac{20}{5} = 4.$$

Key points: (1, 20), (2, 10), (4, 5), (5, 4), (10, 2).

Answer: The product xy is always 20 (the constant of proportionality).

257 Plotting Quadratics

$$x = -1 : 1 + 2 - 3 = 0$$

$$x = 1 : 1 - 2 - 3 = -4$$

Answer: $y = 0, -3, -4, -3, 0$

259 Adding & Subtracting in Standard Form

$$4.5 \times 10^3 = 4,500$$

$$6 \times 10^2 = 600$$

$$\text{Add: } 4,500 + 600 = 5,100$$

$$\text{Convert to standard form: } 5.1 \times 10^3$$

Answer: 5.1×10^3

248 Direct Proportion Graphs

$$\text{The equation is } y = \frac{3}{2}x.$$

$$\text{When } x = 8: y = \frac{3}{2} \times 8 = 12.$$

$$\text{The constant of proportionality } k = \frac{3}{2}.$$

Answer: The line passes through the origin and has gradient $\frac{3}{2}$.

250 Equations of a Straight Line Using Two Points

$$\text{Gradient} = \frac{0-4}{2-0} = \frac{-4}{2} = -2$$

$$y\text{-intercept} = 4 \text{ (passes through } (0, 4))$$

Answer: Equation: $y = -2x + 4$

252 Finding Equations of Linear Real-Life Graphs

Fixed charge is £30, so $c = 30$.

Variable cost is £0.15 per mile, so $m = 0.15$.

Answer: The equation is $T = 0.15d + 30$.

254 Gradient as a Rate of Change

$$(50 - 20) \div 6 = 5$$

Answer: 5 cm per minute

256 Key Regions on Distance-Time Graphs

Horizontal: the distance isn't changing

Sloping down: the distance from the start is getting smaller

Answer: (a) stopped (b) travelling back towards the start

258 Properties of Parallel Lines

$$\text{Line 1 gradient} = 4$$

$$\text{Line 2 gradient} = 4$$

Answer: Same gradient $\rightarrow$ YES, the lines are parallel.

260 Applied Estimating

Round to 1 s.f.

$$489 \approx 500$$

$$£19.50 \approx £20$$

$$\text{Total} \approx 500 \times 20 = £10,000$$

Answer: £10,000



Answers (continued)

261 Identifying Percentage Changes

Percentage increase = (change/original) $\times$ 100
 $= \left(\frac{30}{200}\right) \times 100$
 $= 0.15 \times 100$
 $= 15\%$

Answer: 15% increase

263 Venn Diagram Method

HCF = $2^3 \times 3 = 24$
 LCM = $2^4 \times 3^2 = 144$

Answer: (a) 24 (b) 144

265 Difference of Two Squares

Recognise this as a difference of two squares
 $x^2 = (x)^2$
 $100 = (10)^2$
 $x^2 - 100 = (x + 10)(x - 10)$

Answer: $(x + 10)(x - 10)$

267 Proving Equivalence

Expand each term:

$n^2 = n^2$
 $(n+1)^2 = n^2 + 2n + 1$
 $(n+2)^2 = n^2 + 4n + 4$

Answer: Sum: $n^2 + n^2 + 2n + 1 + n^2 + 4n + 4 = 3n^2 + 6n + 5$ ✓

269 Solving Linear Simultaneous Equations

$(2) \times 3: 6x - 3y = 12$
 Add: $11x = 33 \Rightarrow x = 3$
 $6 - y = 4 \Rightarrow y = 2$

Answer: $x = 3, y = 2$

271 Bearings Problems Involving SOH, CAH, TOA

$\tan \theta = \frac{80}{150}$
 $\theta = 28.07\dots^\circ$

Answer: 028.1°

262 Reverse Percentages

If increased by 15%, new salary is 115% of original
 115% of original = £23,000
 Original = $23,000 \div 1.15$
 Original = £20,000

Answer: £20,000

264 Applied Simultaneous Equations Problems

$a + 4c = 29 \dots (2)$
 Multiply (2) by 3: $3a + 12c = 87 \dots (3)$
 Subtract (1) from (3): $10c = 49$, so $c = 4.9$
 Substitute: $a + 19.6 = 29$, so $a = 9.4$

Answer: Adult £9.40, Child £4.90

266 Factorising Double Brackets

We need two numbers that multiply to give -15 and add to give 2
 Factors of 15: $1 \times 15, 3 \times 5$
 Since the product is negative, one must be negative
 $(x + 5)(x - 3)$

Answer: $(x + 5)(x - 3)$

268 Solving Compound Inequalities

$-5 < 4x + 3 \leq 15$
 Subtract 3 from all parts:
 $-8 < 4x \leq 12$
 Divide all parts by 4:

Answer: $-2 < x \leq 3$

270 Solving Quadratics by Factorising ($a=1$)

Find two numbers that multiply to -15 and add to 2
 Numbers are 5 and -3 ($5 \times -3 = -15, 5 + -3 = 2$)
 $(x + 5)(x - 3) = 0$
 Either $x + 5 = 0$ or $x - 3 = 0$

Answer: 3

272 Finding Side Lengths using SOH, CAH, TOA

$\sin 35^\circ = \frac{x}{12}$
 $x = 12 \sin 35^\circ = 6.88\dots$

Answer: 6.9 cm



Answers (continued)

273 Perimeter of Compound Shapes

Perimeter = two long sides + one short side + semicircle
 $= 8 + 8 + 12 + (\pi \times 12 \div 2)$
 $= 28 + 6\pi$
 $= 28 + 18.85$

Answer: ≈ 46.85 cm

275 Surface Area of Cones

Surface area = $\pi r(r + l)$
 $= \pi \times 6 \times (6 + 10)$
 $= 6\pi \times 16$
 $= 96\pi$

Answer: ≈ 301.59 cm²

277 Volume of Cones

Volume = $\frac{1}{3}\pi r^2 h$
 $36\pi = \frac{1}{3}\pi \times 3^2 \times h$
 $36\pi = \frac{1}{3}\pi \times 9 \times h$
 $36\pi = 3\pi h$

Answer: $h = 12$ cm

279 Volume of Spheres

Volume = $\frac{4}{3}\pi r^3$
 $36\pi = \frac{4}{3}\pi r^3$
 $36 = \frac{4}{3}r^3$
 $r^3 = 36 \times \frac{3}{4} = 27$

Answer: $r = 3$ cm

281 Compound Decay

$A = P(1 - r/100)^n$
 $A = 200 \times (1 - \frac{8}{100})^4$
 $A = 200 \times 0.92^4$
 $A = 200 \times 0.71639\dots$

Answer: $A = 143.3$ g (1 d.p.)

283 Profit & Loss

Cost price = £12
 Profit = 40% of cost price = $0.4 \times £12 = £4.80$
 Selling price = Cost price + Profit
 $= £12 + £4.80$

Answer: £16.80

274 SOH, CAH, TOA with Exact Trig Values

$\sin 45^\circ = \frac{\sqrt{2}}{2}$ (exact value)
 $\frac{\sqrt{2}}{2} = \text{opposite} / 10$
 Opposite = $10 \times \frac{\sqrt{2}}{2} = 5\sqrt{2}$ cm
 For 45° angle triangle: opposite = adjacent

Answer: Adjacent = $5\sqrt{2}$ cm

276 Surface Area of Cylinders

Surface area = $2\pi r(r + h)$
 $150\pi = 2\pi \times 5 \times (5 + h)$
 $150\pi = 10\pi(5 + h)$
 $15 = 5 + h$

Answer: $h = 10$ cm

278 Volume of Pyramids

Volume = $\frac{1}{3} \times \text{base area} \times \text{height}$
 $= \frac{1}{3} \times (5 \times 8) \times 12$
 $= \frac{1}{3} \times 40 \times 12$
 $= \frac{1}{3} \times 480$

Answer: 160 cm³

280 Volumes of Composite Shapes

Cuboid $10 \times 6 \times 4$ with cylinder ($r=2$) drilled through length 10
 Cuboid volume = $10 \times 6 \times 4 = 240$
 Cylinder removed = $\pi \times 4 \times 10 = 40\pi \approx 125.66$
 Remaining = $240 - 125.66 = 114.34 \approx 114.3$ cm³

Answer: 114.3 cm³

282 Expressing Ratios as Linear Equations

$x = 3k, y = 7k$
 $3k + 7k = 50$
 $10k = 50$
 $k = 5$

Answer: 35

284 Constructing Venn Diagrams

$X \cap Y$: in both sets
 X but not Y : remove d, e, f
 Neither: not in X or Y

Answer: (a) d, e, f (b) a, b, c (c) i



Answers (continued)

285 Finding Probabilities of Sets

$$A = 1, 2, 3, 4, 5, 6, 7, 8$$

$$B = 3, 6, 9, 12$$

Elements in both A and B: 3, 6

Count = 2

Answer: $\frac{1}{4}$

287 Drawing Pie Charts

$$360 \div 60 = 6^\circ \text{ per person}$$

$$25 \times 6 = 150, 20 \times 6 = 120, 15 \times 6 = 90$$

Answer: Football 150° , rugby 120° , tennis 90°

289 Sketching Reciprocal Graphs

$$\frac{4}{2} = 2, \quad \frac{4}{-8} = -0.5$$

$x = 0$ and $y = 0$ (the axes)

Answer: (a) 2 and -0.5 (b) $x = 0$ and $y = 0$

291 Problem Solving with Bearings

$$AC = \sqrt{12^2 + 5^2} = 13$$

$$\tan \theta = \frac{5}{12} \Rightarrow \theta = 22.6^\circ$$

$$\text{Bearing} = 90 + 22.6 = 112.6^\circ$$

Answer: (a) 13 km (b) 112.6°

293 Mean, Mode & Median from a Grouped Frequency Table

Median is the 13th value: $4 + 9 = 13 \Rightarrow 10 \leq t < 20$

$$5 \times 4 + 15 \times 9 + 25 \times 7 + 35 \times 5 = 505$$

$$505 \div 25 = 20.2$$

Answer: (a) $10 \leq t < 20$ (b) 20.2 minutes

295 Drawing Box Plots

$$75 - 20 = 55$$

$$58 - 35 = 23$$

Answer: (a) 55 (b) 23

297 Fundamentals of Functions

$$2x + 5 = 11$$

$$2x = 6$$

Answer: $x = 3$

286 Fundamentals of Set Notation

$A \cup B$ contains all elements in A or B (or both).

Elements in A: 1, 2, 3

Elements in B: 3, 4, 5

Combined (without repetition): 1, 2, 3, 4, 5

Answer: $A \cup B = 1, 2, 3, 4, 5$

288 Plotting a Cubic

$$x = -2: y = -8 + 2 = -6. \quad x = -1: y = -1 + 2 = 1.$$

$$x = 0: y = 2. \quad x = 1: y = 1 + 2 = 3.$$

$$x = 2: y = 8 + 2 = 10.$$

This is $y = x^3$ translated 2 units up.

Answer: The point of rotational symmetry is at (0, 2).

290 Solving Linear Simultaneous Equations Graphically

$$-x + 5 = 2x - 1$$

$$3x = 6 \Rightarrow x = 2, \quad y = 3$$

Answer: (2, 3)

292 Surface Area of Composite Shapes

$$\text{Base: } \pi \times 3^2 = 9\pi$$

$$\text{Curved side: } 2\pi \times 3 \times 10 = 60\pi$$

$$\text{Hemisphere: } \frac{1}{2} \times 4\pi \times 3^2 = 18\pi$$

$$\text{Total} = 87\pi$$

Answer: $87\pi \text{ cm}^2$

294 Comparing Data Using Box Plots

Medians: $310 > 300$

$$\text{IQRs: } 380 - 250 = 130, \quad 360 - 270 = 90$$

Answer: Group 1 has the higher median (slower on average) and the larger IQR (less consistent)

296 Fractions with Negative Powers

Negative power means reciprocal

$$27^{\frac{1}{3}} = 3$$

Answer: $\frac{1}{3}$

298 Simplifying Algebraic Fractions

$$\frac{x^2+3x}{x} = \frac{x(x+3)}{x}$$

Answer: $x + 3$



Answers (continued)

299 Solving Harder Equations

Cross multiply: $4(2x - 1) = 3(x + 2)$

$$8x - 4 = 3x + 6$$

$$5x = 10$$

Answer: $x = 2$

301 Similar Areas

Length scale factor = 1.5

Area scale factor = $1.5^2 = 2.25$

$$20 \times 2.25 = 45$$

Answer: 45 cm^2

303 Combining Ratios

Make B the same: $2 : 3 = 8 : 12$, $4 : 5 = 12 : 15$

$$A : B : C = 8 : 12 : 15$$

Answer: $8 : 12 : 15$

305 Independence

For independent events: $P(A \text{ and } B)$ should equal $P(A) \times P(B)$

$$P(A) \times P(B) = 0.3 \times 0.4 = 0.12$$

Given $P(A \text{ and } B) = 0.12$

Answer: Since $0.12 = 0.12$, A and B ARE independent.

307 Filling In Cumulative Frequency Tables

CF: 8, $8+15=23$, $23+20=43$, $43+7=50$.

Cumulative frequency column: 8, 23, 43, 50.

Answer: Total frequency = 50.

309 Calculating Acceleration using Speed-Time Graphs

$$\text{Acceleration} = (30 - 10) \div (5 - 0) = 20 \div 5 = 4 \text{ m/s}^2$$

Answer: 4 m/s^2

311 Estimating Roots

So the cube root of 30 is between 3 and 4

Try 3.1: $3.1^3 = 29.791$ (too low)

Try 3.2: $3.2^3 = 32.768$ (too high)

Cube root of 30 ≈ 3.1

Answer: 3.1

300 Enlargements with Negative Integer Scale Factors

Area scale factor = $SF^2 = (-2)^2 = 4$ (area is always positive). New area = $8 \times 4 = 32 \text{ cm}^2$.

Answer: 32 cm^2 .

302 Similar Volumes

Length scale factor = $6 \div 4 = 1.5$

Volume scale factor = $1.5^3 = 3.375$

$$64 \times 3.375 = 216$$

Answer: 216 cm^3

304 Calculating Combinations

Multiply choices:

Answer: $3 \times 4 = 12$ different outfits

306 Benefits of IQR & Range

Class P: Range = $65 - 45 = 20$, IQR = $Q3 - Q1 = 60 - 50 = 10$.

Class Q: Range = $80 - 40 = 40$, IQR = $Q3 - Q1 = 65 - 55 = 10$.

Answer: Range suggests Class Q is much more spread (40 vs 20), but IQR shows both classes have the same middle-50% spread (10). The wider range in Q is due to more extreme values at both ends. IQR is better for measuring typical consistency.

308 Plotting Cumulative Frequency Graphs

$$40 - 25 = 15$$

Median is the 20th value: $12 < 20 \leq 25 \Rightarrow 20 < m \leq 30$

Answer: (a) 15 (b) $20 < \text{mark} \leq 30$

310 Key Regions on Speed-Time Graphs

A horizontal line on a speed-time graph represents constant speed (no acceleration)

Answer: The object is moving but not speeding up or slowing down

312 Rearranging Harder Equations

$$\text{Expand: } yx + 2y = 3x - 1$$

Rearrange to collect x terms: $yx - 3x = -1 - 2y$

$$\text{Factor out x: } x(y - 3) = -1 - 2y$$

$$\text{Divide by } (y - 3): x = \frac{-1 - 2y}{y - 3}$$

Answer: $x = \frac{-1 - 2y}{y - 3}$



Answers (continued)

313 Area of Triangles ($\frac{1}{2}ab\sin C$)

Triangle ABC: $a = 12$ cm, $b = 9$ cm, $C = 60^\circ$

$$\text{Area} = \left(\frac{1}{2}\right) \times 12 \times 9 \times \sin(60^\circ)$$

$$= \left(\frac{1}{2}\right) \times 108 \times \frac{\sqrt{3}}{2}$$

$$= \frac{108\sqrt{3}}{4} = 27\sqrt{3}$$

Answer: $27\sqrt{3}$ cm²

315 Shading Regions with Graphical Inequalities

$$x = 1 : y = 1, 2$$

$$x = 2 : y = 1$$

Answer: (1, 1), (1, 2), (2, 1)

317 Bounds & Error Intervals Involving Calculations

Upper bound of p : 4.65

Upper bound of q : 2.35

Answer: Upper bound of $p \times q$: $4.65 \times 2.35 = 10.93$

319 Rationalising of the Form $\sqrt{A}$

Multiply by $\frac{\sqrt{5}}{\sqrt{5}}$

Answer: $2\sqrt{5}$

321 Writing Fractions as Recurring Decimals

Divide: $5 \div 6$

$5.000 \div 6 = 0.8333\dots$

The digit 3 repeats after 8

Answer: $0.8\dot{3}$

323 Equating Coefficients

Expand: $(a + b)x + (2a - b)$

$$a + b = 5 \text{ and } 2a - b = 1$$

Add: $3a = 6$, $a = 2$

Answer: $b = 3$

325 Proof with Even Numbers

Let $n = 2k$ (even)

$$n^2 + 2n = (2k)^2 + 2(2k) = 4k^2 + 4k = 4(k^2 + k)$$

Answer: This is a multiple of 4.

327 Proof with Square Numbers

Let the square number be n^2

$$4n^2 + 1 = 2(2n^2) + 1$$

Answer: This is in the form $2k + 1$, so it is always odd. ✓

314 Capture-Recapture

$$N = (M \times C) / R$$

$$M = 20$$

$$C = 60$$

$$R = 4$$

Answer: 300 birds

316 Sketching Exponential Graphs

$$3^{-1} = \frac{1}{3}, 3^0 = 1$$

Answer: $\frac{1}{3}, 1, 3, 9, 27$

318 Fractional Powers

$$16^{\frac{3}{4}} = (16^{\frac{1}{4}})^3$$

$$= 2^3$$

Answer: 8

320 Six Laws of Surds

Use the law $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$

$$\sqrt{3} \times \sqrt{12} = \sqrt{3 \times 12}$$

$$\sqrt{36} = 6$$

Answer: 6

322 Composite Functions

$$g(x) = 2x$$

$$fg(x) = f(2x) = (2x)^2 + 1$$

Answer: $4x^2 + 1$

324 Iteration Equations

$$x_1 = \sqrt{5(3) + 2} = \sqrt{17} \approx 4.123$$

$$x_2 = \sqrt{5(4.123) + 2} = \sqrt{22.615} \approx 4.756$$

Answer: $\sqrt{25.78} \approx 5.077$

326 Proof with Odd Numbers

Let the odd number be $(2n + 1)$

$$(2n + 1)^2 = 4n^2 + 4n + 1 = 2(2n^2 + 2n) + 1$$

Answer: This is in the form $2k + 1$, so it is odd.



Answers (continued)

328 Calculating Side Lengths using $\frac{1}{2}ab\sin C$

$$42 = \left(\frac{1}{2}\right) \times a \times 12 \times \sin 45^\circ$$

$$42 = 6a \times \frac{\sqrt{2}}{2}$$

$$42 = 3\sqrt{2} a$$

Answer: $7\sqrt{2} \approx 9.9 \text{ cm}$ (1 d.p.)

330 Finding Angles Using the Sine Rule

$$\frac{\sin A}{a} = \frac{\sin C}{c}$$

$$\sin A = \frac{9 \times \sin 35^\circ}{7} = \frac{9 \times 0.5736}{7} = 0.7375$$

Answer: 47.5° (1 d.p.)

332 Finding Side Lengths using the Cosine Rule

$$AB^2 = 7^2 + 9^2 - 2 \times 7 \times 9 \cos 60^\circ = 67$$

$$AB = \sqrt{67} = 8.18 \dots$$

Answer: 8.2 cm

334 Finding the Area of a Parallelogram

$$\text{Area} = ab \sin C$$

$$80 = 10 \times b \times \sin 40^\circ$$

$$80 = 10b \times 0.6428$$

Answer: 12.4 cm (1 d.p.)

336 Fundamentals of the Sine Rule

$$\frac{AB}{\sin 50^\circ} = \frac{12}{\sin 70^\circ}$$

$$AB = 9.78 \dots$$

Answer: 9.8 cm

338 Volume of Frustums

$$V = \frac{1}{3}\pi h(R^2 + Rr + r^2)$$

$$= \frac{1}{3} \times \pi \times 10 \times (81 + 27 + 9)$$

$$= \frac{10\pi}{3} \times 117$$

Answer: $390\pi \approx 1225.22 \text{ cm}^3$

340 Algebraic Inverse Proportion

$$y = \frac{k}{x^2}$$

$$5 = \frac{k}{4} \rightarrow k = 20$$

$$y = \frac{20}{x^2}$$

Answer: 1.25

342 Combinations Problem Solving

$$120 = 4 \times 6 \times \text{hats}$$

$$120 = 24 \times \text{hats}$$

Answer: 5

329 Combining the Cosine Rule with Other Rules

First find an angle using cosine rule:

$$\cos C = \frac{81+144-225}{216} = \frac{0}{216} = 0$$

$$C = 90^\circ$$

Answer: 54 cm^2

331 Finding Angles using the Cosine Rule

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$= \frac{144+81-225}{2 \times 12 \times 9} = \frac{0}{216} = 0$$

Answer: 90°

333 Finding Side Lengths using the Sine Rule

$$\frac{AC}{\sin 75^\circ} = \frac{8}{\sin 40^\circ}$$

$$AC = \frac{8 \sin 75^\circ}{\sin 40^\circ} = 12.02 \dots$$

Answer: 12.0 cm

335 Fundamentals of the Cosine Rule

$$BC^2 = 8^2 + 11^2 - 2 \times 8 \times 11 \cos 50^\circ = 71.87 \dots$$

$$BC = 8.47 \dots$$

Answer: 8.5 cm

337 Using the Area Rule with Isosceles Triangles

$$60 = \frac{1}{2} \times 12 \times 12 \times \sin \theta = 72 \sin \theta$$

$$\sin \theta = \frac{60}{72} = 0.8333$$

Answer: 56.4° (1 d.p.)

339 Algebraic Direct Proportion

$$y = k\sqrt{x}$$

$$12 = k \times 4 \rightarrow k = 3$$

$$y = 3\sqrt{x}$$

Answer: 15

341 Finding the Initial Amount

After 15% decrease, new value = 85% of original

$$425 = 0.85 \times \text{Original}$$

Answer: $\text{£}500$

343 Sets & Inequalities

$$3x - 5 > 10, \text{ so } 3x > 15, \text{ thus } x > 5.$$

Solution set: $x > 5$.

Answer: Show open circle at 5 with arrow extending right.



Answers (continued)

344 Cumulative Frequency Median & IQR

Median: 30th value = 30 s

LQ: 15th value = 20, UQ: 45th value = 40

IQR = 40 - 20 = 20

Answer: (a) 30 s (b) 20 s

346 Calculating Total Distance Travelled Using Speed-Time Graphs

Distance =

area under the speed-time graph (a trapezium)

$$\frac{1}{2}(12 + 20) \times 12 = 192$$

Answer: 192 m

348 Identifying the Roots of a Quadratic from a Graph

The parabola touches the x-axis at exactly one point: $x = 3$. This is a repeated root (double root). The quadratic is $y = (x - 3)^2$, so $x = 3$ is the only root. Geometrically, the vertex lies on the x-axis.

Answer: 3 is the only root. Geometrically, the vertex lies on the x-axis.

350 Properties of Perpendicular Lines

Gradient of given line = 2

Perpendicular gradient = $-\frac{1}{2}$

$$3 = -\frac{1}{2}(4) + c \rightarrow 3 = -2 + c \rightarrow c = 5$$

Answer: $y = -\frac{1}{2}x + 5$

352 Sketching Linear Inequalities

Left edge: $x = 0$, bottom edge: $y = 0$, sloping edge: $x + y = 4$

Answer: $x \geq 0, y \geq 0, x + y \leq 4$

354 Turning Points of Quadratics

$$y = x^2 + 4x + 1$$

Half of 4 is 2, square it: 4

$$y = (x + 2)^2 - 4 + 1 = (x + 2)^2 - 3$$

Answer: Turning point = $(-2, -3)$

345 Average Gradients of Lines

At $x = 0$: $y = 0$. At $x = 4$: $y = 16$

Answer: 4

347 General Form of the Equation of a Circle

$$\text{Rearrange: } (x^2 + 4x) + (y^2 - 6y) = 12.$$

Answer: 25. Centre: $(-2, 3)$, Radius: 5.

349 Instantaneous Gradients of Lines

Average gradient uses a chord between two points, it gives the overall rate of change over an interval
Instantaneous gradient uses a tangent at one point, it gives the exact rate of change at that specific moment

Answer: As the two points of the chord get closer together, the average gradient approaches the instantaneous gradient

351 Sketching Circles

Centre: $(-3, 2)$, Radius: 5.

Finding x-axis crossings ($y = 0$): $(x + 3)^2 + 4 = 25$,

Answer: 6 or -2.

353 Solving Quadratic Simultaneous Equations Graphically

Plot parabola $y = x^2 - 4x + 3$ (opens upward, vertex at $(2, -1)$) and line $y = -x + 1$. Setting equal: $x^2 - 4x + 3 = -x + 1$, so $x^2 - 3x + 2 = 0$, $(x - 1)(x - 2) = 0$. Intersections at $(1, 0)$ and $(2, -1)$. Solutions: $x = 1, y = 0$ and $x = 2, y = -1$.

Answer: -1.

355 x Intercepts of Quadratics

$$\text{Set } y = 0: x^2 + 2x - 8 = 0$$

$$\text{Factorise: } (x + 4)(x - 2) = 0$$

Answer: 2



Answers (continued)

356 y Intercepts of Quadratics

Set $x = 0$:

$$y = 0 - 9 = -9$$

Answer: y-intercept is (0, -9)

358 Writing Recurring Decimals as Fractions

$$10x = 4.444\dots$$

$$10x - x = 4$$

$$9x = 4$$

$$x = \frac{4}{9}$$

Answer: $\frac{4}{9}$

360 Inverse Functions

$$\text{Let } y = \frac{x+1}{2}$$

$$\text{Swap } x \text{ and } y: x = \frac{y+1}{2}$$

$$\text{Solve: } 2x = y + 1$$

$$y = 2x - 1$$

Answer: $f^{-1}(x) = 2x - 1$

362 Solving Quadratics by Factorising ($a > 1$)

$$\text{Group: } 2x(3x + 2) - 1(3x + 2) = 0$$

$$(2x - 1)(3x + 2) = 0$$

$$\text{Either } 2x - 1 = 0 \text{ or } 3x + 2 = 0$$

$$x = \frac{1}{2} \text{ or } x = -\frac{2}{3}$$

Answer: $x = 0.5$ or $x = -0.67$ (or $x = \frac{1}{2}$ or $x = -\frac{2}{3}$)

364 Calculating Area Using $\frac{1}{2}ab\sin C$

$$\text{Area} = \left(\frac{1}{2}\right) \times 12 \times 9 \times \sin 60^\circ$$

$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

$$\text{Area} = \left(\frac{1}{2}\right) \times 108 \times \frac{\sqrt{3}}{2}$$

$$\text{Area} = \frac{108\sqrt{3}}{4}$$

Answer: Area = $27\sqrt{3} \text{ cm}^2$

366 Full Process for Sketching Quadratics

$$\text{Factorising: } y = (x - 2)(x + 2).$$

$$\text{Roots are } x = -2 \text{ and } x = 2. \text{ Axis of symmetry: } x = 0.$$

$$\text{Vertex at } (0, -4).$$

This is $y = x^2$ translated 4 units down.

Answer: The parabola is symmetric about the y-axis.

357 Expanding Brackets with Surds

$$(3 + \sqrt{2})^2 = (3 + \sqrt{2})(3 + \sqrt{2})$$

Use FOIL

$$9 + 3\sqrt{2} + 3\sqrt{2} + 2$$

$$\text{Combine like terms: } 11 + 6\sqrt{2}$$

Answer: $11 + 6\sqrt{2}$

359 Expanding Triple Brackets

$$(x^2 - 4x + 4)(x - 2)$$

$$x^2 \times x - 4x \times x + 4 \times x - 2 \times x^2 + (-4x) \times (-2) + 4 \times (-2)$$

$$x^3 - 4x^2 + 4x - 2x^2 + 8x - 8$$

$$\text{Simplify: } x^3 - 6x^2 + 12x - 8$$

Answer: $x^3 - 6x^2 + 12x - 8$

361 Nth Term of Quadratic Sequences

Second differences: 2, 2, 2 $\rightarrow$ coefficient of $n^2 = 1$

Sequence: 0, 3, 8, 15, 24

n^2 : 1, 4, 9, 16, 25

Subtract: -1, -1, -1, -1, -1

Answer: nth term = $n^2 - 1$

363 Solving Quadratics with the Quadratic Formula

$$x = \frac{-2 \pm \sqrt{52}}{6}$$

$$\text{Simplify } \sqrt{52} = \sqrt{4 \times 13} = 2\sqrt{13}$$

$$x = \frac{-2 \pm 2\sqrt{13}}{6}$$

$$x = \frac{-1 \pm \sqrt{13}}{3}$$

Answer: $x = \frac{-1 + \sqrt{13}}{3}$ or $x = \frac{-1 - \sqrt{13}}{3}$

365 Surface Area of Frustums

$$\pi(10 + 6)l = 192\pi \Rightarrow l = 12$$

$$\text{Total} = 192\pi + \pi \times 6^2 + \pi \times 10^2 = 328\pi$$

Answer: (a) 12 cm (b) $328\pi \text{ cm}^2$ (about 1030.4 cm^2)

367 Combining the Sine Rule with Other Rules

$$C = 180 - 72 - 54 = 54^\circ$$

$$BC = \frac{9 \sin 72^\circ}{\sin 54^\circ} = 10.58\dots$$

$$\text{Area} = \frac{1}{2} \times 9 \times 10.58\dots \times \sin 54^\circ = 38.51\dots$$

Answer: (a) 10.6 cm (b) 38.5 cm^2



Answers (continued)

368 Conditional Probability with Two-Way Tables

$$P(\text{adult} \mid \text{tea}) = \frac{35}{45}$$

$$= \frac{7}{9}$$

Answer: $\frac{7}{9}$

370 Interpreting Histograms

Frequency = frequency density $\times$ class width
 $3.5 \times 2 = 7$, $2 \times 3 = 6$, $1.2 \times 5 = 6$

Answer: 7, 6 and 6

372 Simplifying Surds

$$\sqrt{8} = \sqrt{4} \times \sqrt{2} = 2\sqrt{2}$$

$$3\sqrt{8} = 3 \times 2\sqrt{2} = 6\sqrt{2}$$

Answer: $6\sqrt{2} + 2\sqrt{2} = 8\sqrt{2}$

374 Multiplying & Dividing Algebraic Fractions

$$\frac{(x+1) \times x^2}{x \times (x+1)} = \frac{x^2}{x} = x$$

Answer: x

376 3D Pythagoras

$$\text{Face diagonal} = \sqrt{5^2 + 5^2} = \sqrt{50}$$

Answer: 7.07 cm (2 d.p.)

378 Combining Circle Theorems

Let diameter be AB, chord AC at point A.
 Angle CAB = 25° .
 Tangent at A is perpendicular to radius OA.

Answer: 65° .

380 Conditional Probability with Tree Diagrams

$$P(\text{at least one H}) = \frac{4}{9} + \frac{2}{9} + \frac{2}{9} = \frac{8}{9}$$

$$P(\text{first H and at least one H}) = \frac{4}{9} + \frac{2}{9} = \frac{6}{9}$$

$$P(\text{first H} \mid \text{at least one H}) = \left(\frac{6}{9}\right) / \left(\frac{8}{9}\right) = \frac{6}{8} = \frac{3}{4}$$

Answer: $\frac{3}{4}$.

382 Calculating Values of Trig Functions Using Graphs

From the graph, $\tan 60^\circ \approx 1.73$

Answer: (The curve passes through approximately $(60^\circ, 1.73)$)

369 Sketching Histograms

Frequency density = frequency $\div$ class width
 $12 \div 2$, $30 \div 6$, $20 \div 4$, $9 \div 3$

Answer: 6, 5, 5, 3

371 Combining Upper & Lower Bounds

LB mass: 44.5 g, UB volume: 12.5 cm^3

Answer: LB density: $44.5 \div 12.5 = 3.56 \text{ g/cm}^3$

373 Algebraic Fractions Involving Factorising

Factorise numerator: $x^2 - 4 = (x + 2)(x - 2)$
 Factorise denominator: $x^2 + 4x + 4 = (x + 2)^2$

$$\text{Answer: } \frac{(x+2)(x-2)}{(x+2)^2} = \frac{x-2}{x+2}$$

375 Proof with Consecutive Numbers

Let the integers be n and $n + 1$
 $n^2 + (n + 1)^2 = n^2 + n^2 + 2n + 1 = 2n^2 + 2n + 1 = 2(n^2 + n) + 1$

Answer: This is in the form $2k + 1$, so it is always odd.

377 Circle Theorems

By the alternate segment theorem, the angle in the alternate segment = 40° . The central angle is twice the inscribed angle: $2 \times 40^\circ = 80^\circ$.

Answer: 80° .

379 Direct & Inverse Proportion with Functions

$$y = kx^3$$

$$40 = k \times 8 \rightarrow k = 5$$

$$y = 5x^3$$

Answer: 135

381 Conditional Probability with Venn Diagrams

$$P(F \mid R) = |R \cap F| / |R| = 6/26 = \frac{3}{13}$$

Answer: Given card is red, probability it's also a face card.

383 Reflections in the x & y Axis

$y = -f(x)$ is a reflection in the x-axis
 The maximum at $(3, 7)$ becomes a minimum at $(3, -7)$

Answer: $(x, y) \rightarrow (x, -y)$



Answers (continued)

384 Sketching sin, cos & tan

Period = 360° (one complete cycle)

Answer: Amplitude = 1 (distance from centre line to peak)

386 Transforming Trigonometric Graphs

Translation of 60° to the right (in the positive x direction)
The graph has the same shape, amplitude and period
Every point moves 60° to the right

Answer: For example, the maximum moves from $(0^\circ, 1)$ to $(60^\circ, 1)$

388 Change of Signs

$$\begin{aligned} f(x) &= x^3 + x - 5 \\ f(1) &= 1 + 1 - 5 = -3 \\ f(2) &= 8 + 2 - 5 = 5 \\ f(1) &< 0 \text{ and } f(2) > 0 \end{aligned}$$

Answer: 2.

390 Solving Quadratics by Completing the Square (a=1)

$$\begin{aligned} (x - 4)^2 &= x^2 - 8x + 16, \text{ need } +10 \text{ not } +16 \\ (x - 4)^2 - 6 &= 0 \\ (x - 4)^2 &= 6 \\ x - 4 &= \pm\sqrt{6} \end{aligned}$$

Answer: $x = 4 \pm \sqrt{6}$

392 Median from a Histogram

CF shows 70 below 10 and 140 below 15.
The 90th value is in the 10-15 interval.
Position within interval: $90 - 70 = 20$.
Class size: $140 - 70 = 70$.

Answer: $11.43 \approx 11.4$.

394 Rationalising of the Form $A + \sqrt{B}$

$$\begin{aligned} \text{Multiply by } & \frac{\sqrt{5}+1}{\sqrt{5}+1} \\ \text{Numerator: } & (\sqrt{5} + 1)^2 = 6 + 2\sqrt{5} \\ \text{Denominator: } & 5 - 1 = 4 \end{aligned}$$

Answer: $\frac{6+2\sqrt{5}}{4} = \frac{3+\sqrt{5}}{2}$

385 Solving Trigonometric Equations Using A Graph

sin is negative in 3rd and 4th quadrants

$$\text{Reference angle: } \sin^{-1}(0.5) = 30^\circ$$

$$x = 180^\circ + 30^\circ = 210^\circ$$

Answer: 330°

387 Translations in the x & y Axis

To move the vertex from $(0, 0)$ to $(5, 3)$: translate 5 units right (replace x with $x - 5$) and 3 units up (add 3). New equation: $y = \sqrt{x - 5} + 3$.

Answer: To move the vertex from $(0, 0)$ to $(5, 3)$: translate 5 units right (replace x with $x - 5$) and 3 units up (add 3). New equation: $y = \sqrt{x - 5} + 3$.

389 Solving Quadratic Simultaneous Equations

$$\begin{aligned} x^2 + x - 12 &= 0 \\ (x + 4)(x - 3) &= 0 \\ x &= -4 \text{ or } x = 3 \\ \text{When } x = -4: y &= -3. \text{ When } x = 3: y = 4 \end{aligned}$$

Answer: Solutions: $(-4, -3)$ and $(3, 4)$

391 3D Trigonometry

$$\begin{aligned} \text{Base diagonal} &= \sqrt{6^2 + 6^2} = \sqrt{72} \\ &= 6\sqrt{2} \\ \text{Height of cube} &= 6 \text{ cm} \\ \tan \theta &= \frac{6}{6\sqrt{2}} = \frac{1}{\sqrt{2}} \end{aligned}$$

Answer: 35.3° (1 d.p.)

393 Sketching Quadratic Inequalities

Factorise: $(x - 3)(x + 3) \geq 0$
Roots at $x = -3$ and $x = 3$
Parabola is positive outside roots
Solution: $x \leq -3$ or $x \geq 3$

Answer: Closed circles at -3 and 3 , shade outwards

395 Solving Quadratic Inequalities

Roots at $x = -2$ and $x = 1$.
Expression positive when both factors same sign.

Answer: Solution: $x < -2$ or $x > 1$.



Answers (continued)

396 Solving Quadratics By Completing the Square ($a > 1$)

$$\begin{aligned} & 3(x^2 + 2x) - 1 \\ &= 3((x + 1)^2 - 1) - 1 \\ &= 3(x + 1)^2 - 3 - 1 \end{aligned}$$

Answer: $3(x + 1)^2 - 4$

398 Estimating Areas Under Curves

$$\begin{aligned} x &= 0, 2, 4, 6 \Rightarrow y = 1, 5, 17, 37 \\ \frac{1}{2} \times 2 \times [(1 + 37) + 2(5 + 17)] &= 82 \end{aligned}$$

Answer: 82 square units

400 Vectors Along a Straight Line

$$\begin{aligned} \mathbf{AB} &= \mathbf{AO} + \mathbf{OB} = -(2\mathbf{a} + 3\mathbf{b}) + (6\mathbf{a} + 9\mathbf{b}) = 4\mathbf{a} + 6\mathbf{b} \\ \mathbf{AC} &= \mathbf{AO} + \mathbf{OC} = -(2\mathbf{a} + 3\mathbf{b}) + (10\mathbf{a} + 15\mathbf{b}) = 8\mathbf{a} + 12\mathbf{b} \\ \mathbf{AC} &= 2(4\mathbf{a} + 6\mathbf{b}) = 2 \times \mathbf{AB} \\ \mathbf{AB} \text{ and } \mathbf{AC} &\text{ are parallel and share point A} \end{aligned}$$

Answer: Therefore A, B and C are collinear

397 Vector Ratio Problems

$$\begin{aligned} \mathbf{AC} &= \mathbf{OB} = \mathbf{b} \text{ (parallelogram)} \\ \mathbf{AP} &= \frac{2}{5}\mathbf{b} \end{aligned}$$

Answer: $\mathbf{a} + \frac{2}{5}\mathbf{b}$

399 Finding Equations of Tangents to Circles

$$\begin{aligned} \text{Centre: } (0, 0). \text{ Radius gradient: } \frac{-3}{-1} &= 3. \\ \text{Tangent gradient: } -\frac{1}{3}. \end{aligned}$$

Answer: -10.



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