

# Extended-Response Tasks – Sample questions

## Year 9 Tasks

- 1. Money and Financial Mathematics** (*calculator allowed*)  
Solving problems involving simple interest, profit, loss, percentages, income tax, business tax, GST, rent, stocks and shares, price to earnings ratios, commission and depreciation
- 2. Pythagoras' Theorem** (*calculator allowed*)  
Using Pythagoras' Theorem to find unknown lengths in right-angled triangles, understanding that results can be integers, fractions or irrational numbers, recognising Pythagorean triples and using multiples of Pythagorean triples, applying Pythagoras' Theorem to solve problems in two and three dimensions
- 3. Algebra** (*calculator not allowed*)  
Applying index laws to numerical expressions and variables using integer indices, applying the distributive law to the expansion of binomial products, including perfect squares and difference of perfect squares, collecting like terms where appropriate, identifying algebraic factors in algebraic expressions, factorising monic quadratic expressions, factorising by grouping in pairs, simplifying algebraic fractions
- 4. Measurement** (*calculator allowed*)  
Calculating the areas of composite shapes, solving problems involving the surface area and volume of right prisms, calculating the surface area and volume of cylinders and solving related problems, investigating very small and very large time scales and intervals
- 5. Linear Relationships** (*calculator not allowed*)  
Finding the distance between two points on a Cartesian plane, finding the midpoint and gradient of a line segment (interval) on the Cartesian plane, finding the rule for a linear graph given two points or one point plus the gradient, sketching linear graphs, solving linear equations
- 6. Geometric Reasoning** (*calculator not allowed*)  
Using the enlargement transformation and the standard tests for triangles to be similar, solving problems using ratio in similar figures, understanding the relationship between areas of similar figures and the ratio of corresponding sides (scale factor), using similarity as an important element of reasoning and proof
- 7. Trigonometry** (*calculator allowed*)  
Using similarity to find the sine, cosine and tangent ratios for a given angle in right-angled triangles, applying trigonometry to solve right-angled triangle problems
- 8. Probability and Statistics** (*calculator allowed*)  
Listing all outcomes for two-step chance experiments, both with and without replacement using arrays, assigning probabilities to outcomes and determining probabilities for events, calculating relative frequencies from given data to estimate probabilities of events involving 'and' or 'or', constructing back-to-back stem-and-leaf plots and histograms, describing data in terms of symmetric, skewed and bimodal, comparing data in terms of location and spread using mean, median and range
- 9. Non-linear Relationships and Proportion** (*calculator not allowed*)  
Graphing non-linear relations such as parabolas and circles and solving related equations, solving problems involving direct proportion, exploring the relationship between graphs and equations corresponding to simple rate problems

To order the Year 9 Mathematics Extended-Response Tasks, please point your browser to <http://russellboyle.com/orders.html>

## Extended-Response Tasks – Sample questions

### Year 9: Measurement (*calculator allowed*)

#### Question 3

Concrete pipes are manufactured in 2.44 m lengths to optimize transport and handling. The internal diameter of each pipe is 300 mm and the external diameter is 362 mm.

- Find the total surface area of one length of pipe. Include all internal and external surfaces and write your answer in  $\text{m}^2$ , correct to two decimal places.
  - Find the volume of concrete in one length of pipe. Write your answer correct to the nearest  $\text{cm}^3$ .
  - Find the capacity of a length of pipe, correct to the nearest litre.
- Flow-rate is defined as the volume of water that moves through a pipe in a given time. It is calculated by multiplying the area of the internal cross-section of the pipe by the velocity of the water.
- If water flows through the pipe with a velocity of 3 m/s then write an expression for the flow-rate in  $\text{m}^3/\text{s}$  and in terms of  $\pi$ .
  - Hence find how many kL of water would pass through the pipe in one hour? Write your answer correct to one decimal place.

The above question is one of four extended-response questions in the Measurement Task. To order the Year 9 Mathematics Extended-Response Tasks, please point your browser to <http://russellboyle.com/orders.html>

### Year 9: Non-linear Relationships and Proportion (*calculator not allowed*)

#### Question 2

a. Use algebra to solve  $\sqrt{16 - x^2} = \sqrt{15}$  for  $x$

b. Evaluate  $\sqrt{16 - x^2}$  when

- i.  $x = -3$                       ii.  $x = 2$

c. Complete the table of values for  $y = \sqrt{16 - x^2}$

$x$	-4	-3	-2	-1	0	1	2	3	4
$y$									

d. Sketch the graph of  $y = \sqrt{16 - x^2}$  for  $-4 \leq x \leq 4$ . Label the axis intercepts with their coordinates

e. Evaluate  $-\sqrt{16 - x^2}$  when

- i.  $x = 1$                       ii.  $x = -2$

f. Complete the table of values for  $y = -\sqrt{16 - x^2}$

$x$	-4	-3	-2	-1	0	1	2	3	4
$y$									

g. Sketch the graph of  $y = -\sqrt{16 - x^2}$  for  $-4 \leq x \leq 4$  on the same Cartesian plane as used for part d. Label the  $y$ -intercept with its coordinates

h. Transpose  $x^2 + y^2 = 16$  to make  $y$  the subject

i. Hence describe the graph of  $x^2 + y^2 = 16$

The above question is one of four extended-response questions in the Non-linear Relationships and Proportion Task. To order the Year 9 Mathematics Extended-Response Tasks, please point your browser to <http://russellboyle.com/orders.html>