***GCSE TestBank***

This document contains test questions assessing the statements of the National Curriculum Programmes of Study as referenced in the **Kangaroo Maths** Stage 10 scheme of work, and their prerequisites.

The questions are arranged in the same order as the units of the **Kangaroo Maths** Stage 10 scheme of work.

Most questions are very closely modeled on the AQA Specimen Papers published in June 2015.

Questions are coded as follows:

|  |  |
| --- | --- |
| FC | Foundation paper, calculator allowed |
| FHC | Foundation and higher papers, calculator allowed |
| HC | Higher paper, calculator allowed |
| FN | Foundation paper, calculator not allowed |
| FHN | Foundation and higher papers, calculator not allowed |
| HN | Higher paper, calculator not allowed |

A very small number of questions are based on specimen papers published by Edexcel or OCR. These questions do not have codes.

**1**  Simplify 45 × 47

 Circle the answer.

**[HN, 1 mark]**

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| --- | --- | --- | --- |
| 1635 | 412 | 1612 | 435 |

**2**  Work out $1\frac{2}{3}+3\frac{2}{5}$

 Give your answer as a mixed number in its simplest form.

**[FHN, 3 marks]**

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| Answer |  |  |

**3**  Patricia is trying to work out the values of *q* for which *q*(*q*2 – 12) = 16

 Her values are -2 and 4

 Are Patricia’s values correct?

 You **must** show your working.

**[HN, 2 marks]**

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**4**  *ABEH* is a rectangle

 *BCDE* is a square

 *EFGH* is a square

 The three shapes are joined to make an L-shape.

*Not drawn accurately*

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *A* |  |  | *B* |  |  |  |  | *C* |  |  |
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|  |  |  |  |  |  |  |  |  | (*x* + 2) cm |
|  |  |  |  |  |  |  |  |  |  |  |  |
| *H* |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | *E* |  |  |  |  | *D* |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
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| *G* | 4 cm | *F* |  |  |  |  |  |  |  |

 Show that the total area of the L-shape, in cm2, is *x*2 + 8*x* + 28

**[FHN, 4 marks]**

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**5** Here are sketches of four triangles

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| --- | --- |
|  | *Not drawn accurately* |
| 2 cm1.66 cm34° | 2 cm1.2 cm34° |
| 2 cm34 °1.12 cm | 1.17 cm2 cm34° |

In each triangle

 the longest side is **exactly** 2 cm

the other length is given to 2 decimal places

**5 a)** Circle the value of sin 34° to 2 decimal places.

**[FHN, 1 mark]**

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| --- | --- | --- | --- |
| 0.84 | 0.6 | 0.56 | 0.585 |

**5 b)** Work out the value of *x*.

 Give your answer to 1 decimal place.

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| --- | --- |
|  | *Not drawn accurately* |
| 8 cm*x* cm34° |

**[FHN, 2 marks]**

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|  |
| Answer |  |  |

**6**  *a* × 105 + *a* × 103 = 181800 where *a* is a number

 Work out *a* × 104

 Give your answer in standard form.

**[HN, 2 mark]**

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| Answer |  |  |

**7** Rectangle *OABC* is constructed on a coordinate grid.

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| --- | --- | --- | --- |
| *O* is the origin | *A* is (4, 0) | *B* is (4, 2) | *C* is (0, 2) |



**7 a)** *OABC* is rotated 180°, centre (2, 1)

 Circle the number of invariant points on the perimeter of the rectangle

**[HN, 1 mark]**

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 1 | 2 | 4 |

**7 b)** *OABC* is enlarged, scale factor 1.5, centre (0, 0)

 Circle the number of invariant points on the perimeter of the rectangle

**[HN, 1 mark]**

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 1 | 2 | 4 |

**7 c)** *OABC* is reflected in the line *y* = 1

 Circle the number of invariant points on the perimeter of the rectangle

**[HN, 1 mark]**

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| --- | --- | --- | --- |
| 0 | 1 | 2 | 4 |

**8**  Show that 10 tan 60° + 2 sin 60° can be written in the form $a\sqrt{b}$ where *a* and *b* are integers

**[HN, 3 marks]**

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**9** Show that $\sqrt{108}$ can be written in the form $a\sqrt{3}$ where *a* is an integer.

**[2 marks]**

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**10 a)** Write down the value of $9^{\frac{1}{2}}$

**[1 mark]**

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| --- | --- | --- |
| Answer |  |  |

**10 b)** Find the value of $\left(\frac{1}{64}\right)^{-\frac{2}{3}}$

**[3 marks]**

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| Answer |  |  |

**11** Work out the cube root of eight million.

Circle your answer.

**[FHC, 1 mark]**

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| --- | --- | --- | --- |
| 20 | 200 | 2000 | 20000 |

**12** Circle the decimal that is closest in value to $\frac{7}{9}$.

**[FHC, 1 mark]**

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| --- | --- | --- | --- |
| 0.7 | 0.77 | 0.78 | 0.8 |

**13 a)** Use your calculator to work out $\frac{12.42^{2}+ \sqrt[3]{121}}{5.02}$

 Write down your full calculator display.

**[FHC, 1 mark]**

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| Answer |  |  |

**13** **b)** Use approximations to check that your answer to part (a) is sensible.

 You **must** show your working.

**[FHC, 2 marks]**

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**14** Use ruler and compasses to answer this question.

 Point *X* is

* the same distance from lines *AB* and *AC*
* 5 cm from point *A*

*B*

*A*

*C*

 Show the position of point *X* on the diagram

**[FHC, 3 marks]**

**15**  Tick whether each statement is true or false.

 Give a reason for your answer.

**15 a)** If *x*2 = 9, the only value that *x* can be is 3

 **[FHC, 1 mark]**

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| --- | --- | --- | --- |
|  | True |  | False |

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| --- | --- |
| Reason  |  |
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**15 b)** When *n* is a positive integer, the value of 6*n* is **always** a multiple of 3*n*.

 **[HC, 1 mark]**

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| --- | --- | --- | --- |
|  | True |  | False |

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| --- | --- |
| Reason  |  |
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**15 c)** When *p* is an integer, the value of *p*5 is **always** greater than the value of *p*.

 **[HC, 1 mark]**

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| --- | --- | --- | --- |
|  | True |  | False |

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| Reason  |  |
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**16**  Circle the expression that is equivalent to –8*b* – 10*b* ÷ 2b + 3*b*

**[HC, 1 mark]**

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| --- | --- | --- | --- |
| –8*b* – 2 | –9 + 3*b* | –5(*b* – 1) | –5*b* – 5 |

**17** Here is the graph of 5*y* − 3*x* = 15 for values of *x* from -5 to 6



By drawing a second graph on the grid,

work out an approximate solution to the simultaneous equations

5*y* − 3*x* = 15 and 4*x* + 2*y* = 12

**[HC, 3 marks]**

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| Answer |  |  |

**18**  Written as the product of its prime factors 560 = 24 × 5 × 7

**18 a)** Write 450 as the product of its prime factors

**[HC, 2 marks]**

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| Answer |  |  |

**18 b)** Work out the value of the highest common factor of 560 and 450.

**[HC, 1 mark]**

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| Answer |  |  |

**19**  Factorise 5*x*2 – 13*x* – 6

**[HN, 2 marks]**

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| Answer |  |  |

**20**  In the formula *C* = (*m* + 3)3 + 8 *m* is an integer.

**20 a)** Lynette says,

 “The value of *C* is always greater than 8

 because (*m* + 3)3 is always greater than 0”

 Comment on her statement.

**[HC, 1 mark]**

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**20 b)** What is the only value of *C* that is a cube number?

**[HC, 1 mark]**

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| Answer |  |  |

**21** $T= \frac{a}{b^{2}}$

 *a* = 2.4 × 106

 *b* = 2.5 × 10-2

 Work out the value of *T*.

 Give your answer in standard form to an appropriate degree of accuracy.

**[HC, 3 marks]**

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| Answer |  |  |

**22**  Mercury orbits the sun in 88 days at an average speed of 1.72 × 106 kmh-1.

 Pluto orbits the sun in 249 years at an average speed of 1.71 × 104 kmh-1.

 Assume that their orbits are circles centred on the sun.

**22 a)** Work out the least distance between Mercury and Pluto at any time.

**[HC, 4 marks]**

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| Answer |  | km |

**22 b)** Mercury’s speed has been rounded to three significant figures.

 Write the lower and upper bounds of Mercury’s speed.

 Give your answers as ordinary numbers.

**[HC, 2 marks]**

|  |  |  |
| --- | --- | --- |
| Lower bound |  | kmh-1 |
|  |
| Upper bound |   | kmh-1 |

**23** A theodolite is a surveying tool used to measure angles.

 The diagram shows a theodolite placed 13 metres from a tree.

 The theodolite is 1.2 metres tall.

13 m

*t* m

1.2 m

102°

 The theodolite is pointed at the top of the tree.

 An angle of 102° is measured from the vertical.

 Work out the height of the tree.

**[HC, 4 marks]**

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| Answer |  | m |

**24**  An approximate solution to an equation is found using this iterative process.

 $x\_{n+1}=\frac{(x\_{n})^{2}+3}{5}$ and $x\_{1}=1$

**24 a)** Work out the values of $x\_{2}$ and $x\_{3}$

**[HC, 2 marks]**

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| $$x\_{2}=$$ |  |  |
|  |  |
| $$x\_{3}=$$ |   |

**24 b)** Work out the solution to 6 decimal places.

**[HC, 1 mark]**

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| $$x=$$ |  |  |

**25**  Jack is assembling a storage unit for CDs.

 The unit has six shelves.

 Each shelf of the unit is 18 cm wide to the nearest **centimetre**.

A jewel CD case is 10 mm wide to the nearest **millimetre**.

Explain why Jack may not be able to fit 100 CD cases in the unit.

**[HN, 4 marks]**

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**26**  Copper costs £3.20 per kilogram.

 Tin costs £1.40 per kilogram.

 Bronze is made using copper and tin in the ratio 9 : 1.

 Work out the cost of the metal needed when making 45 kilograms of bronze.

 **[FHN, 4 marks]**

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| Answer £ |  |  |

**27** To complete a task in 14 days a building company needs

 6 builders each working for 6 hours a day.

 The company decides to use

 7 builders each working for 8 hours a day.

 Assume that each builder works at the same rate.

**27 a)** How many days will the task take to complete?

 You must show your working

**[HN, 3 marks]**

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| Answer |  |  |
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**27 b)** Comment on how the assumption affects your answer to part (a).

**[HN, 1 mark]**

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**28** Here is a quadratic sequence

7 18 33 52

 The expression for the *n*th term of this sequence is *an*2 + *bn*.

 Find the value of *a*  and the value of *b*.

**[4 marks]**

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| $$a=$$ |  | $$b=$$ |  |  |

**29** The *n*th term of a sequence is 4*n* – 1

 The *n*th term of a different sequence is 3*n* + 2

 Work out three numbers that are

 in both sequences

 and

 less than 100

 **[FHN, 3 marks]**

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| Answer  | \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ |  |

**30** In this question all dimensions are in centimetres.

 A solid has a uniform cross-section.

 The cross-section is a square and a quadrant joined together.

2*y*

2*y*

*y*

 Work out an expression, in cm3, for the **total** volume of the solid.

 Write your expression in the form *y*3(*a* + *b*π) where *a* and *b* are integers.

 **[HN, 4 marks]**

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| Answer  |  | cm3 |

**31**  Colin is solving a problem.

Cuboid A has side lengths one third of the lengths of cuboid B

Cuboid A has a volume of 30 cm3

What is the volume of cuboid B?

To solve this problem, Colin decides to

* Find the value of 3 cubed
* Multiply his answer by 30

Evaluate Colin’s method.

**[HN, 2 marks]**

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**32** The region *R* satisfies three inequalities

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| $$x\geq -2$$ | $$x+y<4$$ | $$y\leq \frac{x}{2}+1$$ |

 Show the region *R* on the grid.

**[HC, 4 marks]**



**33** Which sequence is a geometric progression?

 Circle your answer

**[FHC, 1 mark]**

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| --- | --- |
| 1 1 2 3 | 2 5 9 14 |
| 2 4 6 8 | 100 50 25 12.5 |

**34** A company analyses its workforce and realises that

 number of men : number of women = 3 : 5

 There are 38 more women than men.

 Work out the total number of people on the workforce.

 **[FHC, 3 marks]**

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| Answer  |  |  |

**35** *y* is inversely proportional to *x*.

 Which graph shows this?

 Circle the correct letter.

**[FHC, 1 mark]**

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| --- | --- |
| **A** | **B** |
|  |  |
| **C** | **D** |
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**36** Two similar pyramids have heights in the ratio 9 : 2

 Circle the ratio of their surface areas.

**[HC, 1 mark]**

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| --- | --- | --- | --- |
| 81 : 4 | 18 : 4 | 9 : 2 | 729 : 8 |

**37** Here is a pyramid

13.6 cm

15.2 cm

15.2 cm

 Volume of pyramid = $\frac{1}{3}$ × area of base × perpendicular height

 Work out the volume of the pyramid

**[FC, 3 marks]**

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| Answer  |  | cm3 |

**38** A food producer creates a new snack called ‘*Dilwyn Dippers’*.

 A standard size packet contains 80 grams of snack.

 They have two ideas for a special offer:

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| --- | --- | --- |
| ***Option 1****30% extra free* |  | ***Option 2****25% off usual price* |
|  |

 Which option is the better value for the customer?

 You **must** show your working.

 **[HC, 3 marks]**

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| Answer  |  |  |

**39** **a)** A pattern is made from two similar trapeziums.

 *Not drawn accurately*

20 cm

20 cm

20 cm

8 cm

 Show that the shaded area is 235.2 cm2

 **[FHC, 4 marks]**

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**39** **b)** The trapeziums are isosceles.

 *Not drawn accurately*

20 cm

20 cm

20 cm

8 cm

*x*°

 Work out the size of angle *x*.

 **[HC, 3 marks]**

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| Answer  |  | degrees |

**40** A bowl is a hemisphere with radius 8 cm.

 Water fills three-fifths of the volume of the bowl.

 The water is poured into a hollow cone.

The depth of the water is 18 cm.

18 cm

|  |
| --- |
| Volume of sphere = $\frac{4}{3}πr^{3}$ where r is the radiusVolume of cone = $\frac{1}{3}πr^{2}h$ where r is the radius and h is the perpendicular height |

 Work out the radius of the surface of the water in the cone.

**[HC, 4 marks]**

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| Answer  |  | cm |

**41** *y* is directly proportional to *x*2

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| --- | --- | --- |
| *x* | 2 | *a* |
| *y* | 1 | 25 |

 Work out the value of *a*.

  **[HC, 4 marks]**

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| Answer  |  |  |

**42** Here are the first five terms of a quadratic sequence

2 7 14 23 34

 Find an expression, in terms of *n*, for the *n*th term of this quadratic sequence

 **[4 marks]**

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| Answer  |  |  |