**GCSE Mathematics**

**1MA1**

**Problem-solving questions 3**

**Foundation Tier: Gold**

**Time: 1 hour 30 minutes**

You should have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Calculator permitted

Questions with \* could be seen on Higher Tier

**1.** A solid cuboid is made from centimetre cubes.

The diagram below shows the bottom layer of cubes in the cuboid.

The volume of the cuboid is 60 cm3.

Find the height of the cuboid.

**(Total for question 1 is 2 marks)**

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**2.** Harry works as a gardener.

The table shows the length of time Harry worked last week.

|  |  |  |
| --- | --- | --- |
|  | **Morning** | **Afternoon** |
| **Monday** | 1 hour 30 minutes |  |
| **Tuesday** | 2 hour 5 minutes | 2 hours |
| **Wednesday** |  |  |
| **Thursday** | 1 hour 28 minutes |  |
| **Friday** |  | 2 hour 15 minutes |

Charlotte is also a gardener.

She worked for 580 minutes last week.

Who worked as a gardener for the greater length of time last week, Harry or Charlotte?

You must show your working.

**(Total for question 2 is 3 marks)**

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**3.** Work out the number that is halfway between  and 1.8

**(Total for question 3 is 2 marks)**

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**4.** The diagram shows four poles **A**, **B**, **C** and **D** in a straight line in a field.

The diagram also shows the distance between poles **A** and **B** and the distance between

poles **C** and **D**.

**A B C D**

X X X X

20 metres  16 metres

The total distance between poles **A** and **D** is 60 metres.

Samuel plants bushes in a straight line, a metre apart, between **B** and **C**.

He does not plant a bush at **B** or at **C**.

Work out how many bushes he plants between **B** and **C**.

**(Total for question 4 is 3 marks)**

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**5.** A small slab weighs 9 pounds.

Tom can carry a maximum weight of 50kg.

1 kilogram = 2.2 pounds

Work out the maximum number of small slabs Tom can carry.

**(Total for question 5 is 3 marks)**

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**6.** Jaya has 2 dogs.

Each dog eats  of a tin of food in the morning.

Each dog eats  of a tin of food in the evening.

Each tin of food costs 72p.

Work out the total cost of the tins of food to feed the dogs for 12 days.

**(Total for question 6 is 4 marks)**

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**7.** Tanya wants to print some photographs.

She finds two printing companies.

**Infinity Printers**

Cost in pence

= 30 × colour prints + 10 × grey prints

**Snappy Print**

Cost in pence

= 15 × number of prints + 50

Tanya needs 5 colour prints and 3 grey prints.

She wants to spend the least amount of money.

Which printing company should she choose?

You must show your working.

**(Total for question 7 is 3 marks)**

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**8.** Patrick buys some fruit.

He buys 1.6 kg of bananas and 0.7 kg of apples.

The total cost for this fruit is £3.18

Bananas cost 85p per kg.

Work out the cost of 1 kg of apples.

**(Total for question 8 is 4 marks)**

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**9.** *F*

5*x* − 45

*A y B*

2*x* + 15

*C z D*

*E*

*AB*, *CD* and *EF* are straight lines.

Work out the size of angle *y* and the size of angle *z*.

**(Total for question 9 is 4 marks)**

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**10.** Annabel buys 50 plums for £5

She sells 6 bags of 7 plums at 90p per bag.

She sells the rest of the plums at 12p each.

Work out her percentage profit.

**(Total for question 10 is 5 marks)**

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**\*11.** There are 884 members of an online language club.

The ratio of the number of males to the number of females is 8 : 9

A member is chosen at random.

The probability that a male member studies Latin is 

The probability that a female member studies Latin is 

Work out the percentage of members in the language club who study Latin.

**(Total for question 11 is 5 marks)**

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**\*12.** *ABCD* is a square.

*A*

*B*

*C*

*D*

*E*

*BCE* is an equilateral triangle.

Work out angle *AED*.

Give a reason for each stage of calculation.

**(Total for question 12 is 4 marks)**

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**\*13.** There are some coloured cards in a box.

The cards are yellow or black or white or pink.

A card is selected at random from the box.

The table shows the probabilities that the card will be yellow or black or white.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Colour** | **yellow** | **black** | **white** | **pink** |
| **Probability** | 0.32 | 0.21 | 0.27 |  |

There are 60 pink cards in the box.

Work out how many yellow cards are in the box.

**(Total for question 13 is 4 marks)**

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\***14.** The diagram shows a triangular patio.

*A*

*B*

*C*

*D*

*AB* = *BC*

*BD* = 15 m

The area of the patio is 120m2.

Work out the perimeter of the patio.

**(Total for question 14 is 4 marks)**

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**\*15.** The diagram shows two water containers.

**Container *B***

**Container *A***

0.75 m

0.5 m

0.8 m

Container *A* is in the shape of a cube and empties at a rate of 0.016m3 per minute.

Container *B* is in the shape of a cylinder with radius 0.5 m and empties at a rate of 0.017 m3 per minute.

Which water container, *A* or *B*, will empty the fastest?

You must show your working.

**(Total for question 15 is 4 marks)**

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**Foundation Problem Solving Questions – Mark schemes**

| **Qn** | **Answer** | **Mark** | **Notes** |
| --- | --- | --- | --- |
| **1** | 4 cm | 2 | P1 process to find the height of the cuboid,  e.g. 60 ÷ (3 × 5) or adding multiples of (5 × 3) to get to 60  A1 4 cm |
| **2** | Charlotte | 3 | P1 process to work out the total time for Harry,  e.g. 1hr 30mins + 2hr 5mins + 2hr + 1hr 28mins + 2hr 15mins (= 8hr 78mins)  P1 process to work out the total time for Harry in correct units or converting Charlottes time,  e.g. 9 hrs 18mins or 558mins or 9hr 40mins  A1 for Charlotte with 558 **or** 9h 18 min and 9h 40 min |
| **3** | 1.1 | 2 | P1 process to convert one of the numbers to the same form,  e.g. 0.4 or  with or  with  A1 1.1 oe |
| **4** | 23 | 3 | P1 process to work out the distance between B and C,  e.g. 60 − (20 + 16) (= 24)  P1 process to work out the number of bushes between B and C, e.g. “24” – 1 or tally marks  A1 23 |
| **5** | 12 | 3 | P1 process to work out the weight of a slab in kilograms or convert maximum weight into pounds,  e.g. 9 ÷ 2.2 (= 4.0909...) or 50 × 2.2 (= 110)  P1 process to work out the number of slabs Tom can carry,  e.g. 50 ÷ “4.0909” (= 12.222) or “110” ÷ 9 (= 12.222)  A1 12 |
| **6** | £23.04  or  2304p | 4 | P1 process to work out the number of tins needed for one day for two dogs, e.g. (+) × 2 (=)  P1 process to work out the number of tins for 12 days,  e.g. 12 ×  (= 32)  P1 process to work out the total cost of the tins,  e.g. “32” × 72 (= 2304) or “32” × 0.72 (23.04)  A1 £23.04 or 2304p |
| **7** | Snappy Print  with working | 3 | P1 process to substitute the number of prints into the equation for Snappy Print or Infinity Printers,  e.g. 30 × 5 + 10 × 3 (= 180) or 15 × 8 + 50 (= 170)  P1 process to work out the cost of the prints for Infinity Printers and Snappy Print,  e.g. 150 + 30 (= 180) and 120 + 50 (= 170)  A1 for Snappy Print with 170 and 180 |
| **8** | £2.60  or  260p | 4 | P1 process to work out the cost of the bananas,  e.g. 1.6 × 0.85 (=1.36) or  1.6 × 85 (=136)  P1 process to work out the cost of the apples,  e.g. 3.18 – “1.36” (= 1.82) or 318 – “136” (= 182)  P1 process to work out the cost of apples per kg,  e.g. “182” ÷ 0.7 (= 260) or “1.82” ÷ 0.7 (= 2.60)  A1 £2.60 or 260p |
| **9** | *y* = 55°  and  *z* = 125° | 4 | P1 process to equate two expressions, e.g. 5*x* – 45 = 2*x* + 15  P1 process to solve the equation,  e.g. 5*x* – 2*x* = 15 + 45 or 3*x* = 60 or *x* = 20  A1 *y* = 55°  A1 *z* = 125° |
| **10** | 27.2% | 5 | P1 process to work out the cost of 6 bags of plums,  e.g. 6 × 90 (= 540) or 6 × 0.90 (= 5.40)  P1 process to work out the cost of the remaining plums,  e.g. (50 – (7 × 6)) × 12 (= 96)  or (50 – (7 × 6)) × 0.12 (= 0.96)  P1 process to work out the total amount of money,  e.g. “540” + “96” (= 636) or “5.40” + “0.96” (= 6.36)  P1 process to work out the percentage profit,  e.g. [( 636 – 500) ÷ 500 × 100]  or [( 6.36 – 5.00) ÷ 5.00 × 100]  A1 27.2% |
| **\*11** | 32.4% | 5 | P1 process to work out the number of female or male members, e.g. × 884 (= 416) or × 884 (= 468)  or 884 – 416 (= 468) or 884 – 468 (= 416)  P1 process to work out the number of male or female members who study Latin,  e.g. × “416” (= 130) or × “468” (= 156)  P1 process to work out the total number of members who study Latin, e.g. “130” + “156” (= 286)  P1 process to work out the percentage of members who study Latin, e.g. “286” ÷ 884 × 100  A1 32.4% |
|  |  |  | ALTERNATIVE |
|  | 32.4% | 5 | P1 process to work out the proportion of male members who study Latin, e.g.  P1 process to work out the proportion of female members who study Latin, e.g.  P1 process to work out the proportion of male members and female members who study Latin,  e.g. +  or +  P1 process to work out the percentage of members who study Latin, e.g. × 100  A1 32.4% |
| **\*12** | 150° | 4 | P1 process to find the angle *ABE* or angle *DCE* with reason,  e.g. 90° − 60° (= 30°) and right angle  P1 process to find the angle *BEA* or angle *CED* with reason,  e.g. (180° − “30°”) ÷ 2 (= 75°) and isosceles triangle  P1 process to find the angle *AED* with reason,  e.g. 360° − “75°” – “75°” – “60°” and angles around a point add up to 360°  A1 150° |
| **\*13** | 96 | 4 | P1 process to work out the probability of the pink card,  e.g. 1 – (0.32 + 0.21 + 0.27) (= 0.20)  P1 process to work out the total number of cards,  e.g. 60 ÷ “0.20” (= 300) or 60 × 5 = (300)  P1 process to work out the number of yellow cards,  e.g. “300” × 0.32  A1 96 |
| **\*14** | 50m | 4 | P1 process to work out length *AC* or length *DC* or length *AD*,  e.g. 120 × 2 ÷ 15 (= 16) or [120 × 2 ÷ 15] ÷ 2 (= 8)  P1 process to work out length *AB* or length *BC*,  e.g.  (= 17)  P1 process to work out the perimeter of the patio,  e.g. “17” + “17” +”16”  A1 50m |
| **\*15** | Container *A* with 32 **and** 34.6... or 35 | 4 | P1 process to work out the volume of container *A* or volume of container *B*, e.g. 0.8 × 0.8 × 0.8 (= 0.512)  or *π* × 0.52 × 0.75 (= 0.589….)  P1 process to work out how long it takes container *A* to empty, e.g. “0.512” ÷ 0.016 (= 32)  P1 process to work out how long it takes container *B* to empty, e.g. “0.589(0486)” ÷ 0.017 (= 34.6…)  A1 container *A* with 32 **and** 34.6... or 35 |